AG3103

Charge Amplifier

INSTRUCTION MANUAL

A&D Company, Ltd.

1WMPD4003956

Cautions

- Read carefully before using this product.
- Place this manual with reach of this product.

Introduction

▲Introduction▼

Thank you very much for purchasing the Charge Amplifier AG3103. Prior to using this product, please carefully read the instruction manual so that you can correctly use it.

This instruction manual provides information necessary for you to safely and correctly operate the product. Please always place this instruction manual together with the product whenever you use it so you can access and refer to the manual at any time.

If you have any questions about the content of this manual, please contact your local A&D dealer.

▲Examining contents in package▼

When opening the package in a warm room during the cold season, open the package after it has reached room temperature to avoid any operational failure due to condensation on the surface of the product.

Be sure to observe the following instructions when using this product. The warranty does not cover damages resulting from actions that go against instructions, cautions, or warnings mentioned in this manual.

This unit is delivered after a thorough examination at the factory prior to shipment.

However, please examine the product's condition and verify that no obvious shipping damage has occurred after opening the package. Also, examine the specifications of the inputs and accessories. If there are any missing or damaged items, please contact your local A&D dealer.

▲Notice▼

- The contents of this manual are subject to change without notice.
- This manual is copyrighted with all rights reserved. No parts of this manual may be transcribed or reproduced without written permission.
- Please let us know if there are any points that are unclear or missing in this manual.
- We do not assume any responsibility for the outcome of the use of this product.

Safety measures

Be sure to observe the following precautions when using this amplifier. The warranty does not cover damages resulting from actions that go against instructions, cautions, or warnings mentioned in this manual.

To safely use the amplifier, the following statements are used in this manual to call the readers' attention.

⚠WARNING

This sign indicates warnings if there is a risk of danger to the life or physical health of the operator, such as an electric shock, in order to avoid the danger.

⚠CAUTION

This sign indicates cautions if there is a risk of damage to the equipment or describes general precautions for handling.

⚠WARNING

● Power supply

Be sure to check that the power supply is within the rating of this product before turning it on.

To prevent electric shock or fire, be sure to correctly use the power cable and connection cable provided by A&D.

● Protective grounding and protective functions

Protective grounding must be used to safely use this product and protect the user and surrounding equipment. Please read the following instructions.

1) Protective grounding

This product uses a three-pole power cable with a ground wire in order to prevent electric shock. Be sure to connect to a power outlet with a protective ground terminal.

2) Caution for protective grounding

Make sure that the protective ground wire is not cut off or the protective ground terminal is not disconnected while power is supplied to this product. If it is cut off or disconnected, the safety of this product cannot be guaranteed.

3) Protective function failure

Avoid using this product when it is suspected that there is a failure in protective grounding or protective functions.

Confirm that there is no failure in the protective function before using this product.

● Use in gaseous atmosphere

Never use this product in a flammable or explosive atmosphere or in an atmosphere of steam. Use in such atmospheres will result in danger to the user and the product.

● Removal of the housing case

Removing the housing case of the amplifier unit is extremely dangerous. Do not remove it from the unit except when switching between 100 VAC and 200 VAC with the AC power supply selection switch.

● Input signal connection

Ground the grounding terminal of this product securely before connecting to the input terminal. In order to prevent electric shock or burnout, make sure first that no signal or common-mode voltage is applied to the input line, and then perform the work.

● Caution during operation

During operation of this product, high voltage may be generated between the input terminal (input signal line) and the housing (protective grounding) and between the input terminal and output (output signal line). Be careful of electric shock accidents.

● Installation category and contamination level

This product is of Installation Category II and Pollution Degree II. Use within this range. Be sure to check that the power supply is within the rating of this product before turning it on.

⚠CAUTION

● Caution in handling

When using this product, always follow the precautions below.

1) Limiting users

Avoid use by anyone other than those who know how to operate this product.

2) Storage and usage environment for this product

The storage temperature of this product is -20 to 70 °C, and the storage humidity is 10 to 90%. During hot seasons in particular, do not store this product in a place where it is exposed to long-term sunlight or where the temperature becomes excessively high (such as in a car).

Do not store or use this product at the following places.

1. Places where the temperature and humidity rise due to direct sunlight or a heater. (The operating environment of this product; temperature: -10 to 50 °C, humidity: 20 to 85%)
2. Wet places
3. Places where salt, oil, or a corrosive gas is present
4. Damp or dusty places
5. Places subject to strong vibrations

3) Cautions on power supply

1. Be careful of power supply voltage fluctuations. Do not use this product when voltage is likely to exceed the rated voltage.
2. If the power supply includes much noise or high-voltage inductive noise, use noise filters to avoid operation errors.

4) Calibration

We recommend periodical calibration to maintain the product's accuracy. More reliable measurements are possible by calibrating the amplifier once a year (optional for extra cost).

Caution in handling

Read the manual carefully before using this product.

1. **In the sensor check function of this product, a check signal (up to about 0.9 Vp-p) is applied to the sensor. Do not use if sensor damage is suspected.**
   Also, if the sensor cable common wire (negative) is connected to the object to be measured through the sensor case, the voltage is also applied to the object to be measured. Please electrically isolate the sensor or perform a sensor check before installing the sensor.
2. Pay attention to the input charge range of the unit. (When using a piezoelectric acceleration sensor)
   1.35×10^5 pC (When input charge is 10,000 to 100,000 pC)
   1.35×10^4 pC (When input charge is 1,000 to 10,000 pC)
   1.35×10^3 pC (When input charge is 1,000pC or less)* See 4-2-4 “Maximum input charge.”
   This amplifier does not have an input protection circuit to keep the input section at high impedance.
3. Do not apply voltage or current to the output terminal of this product from an external source.
4. Use this amplifier with power supply voltages from 85 VAC to 132 VAC, 180 VAC to 264 VAC, or 10 VDC to 30 VDC. An AC power supply selection switch is provided inside the housing case. To switch the AC power supply voltage, see page 6-4. If the power fuse is blown, check the cause of fuse blowout. To replace the fuse, always disconnect the power plug and input and output signal cables first, and then replace the fuse in the fuse holder. For how to replace the fuse, see 6-3. When replacing, examine the ratings of the fuse (e.g. for AC or DC).
5. The operation temperature and humidity of the inputs is –10 to 50 °C and 20 to 85% RH without condensation, respectively. If the product has been stored in a high-humidity or low-temperature environment, use only after it has reached room temperature to avoid any operational failure due to condensation on the surface of the product.
   Do not use this unit at the following places.
   - High-humidity places
   - Places with direct sunlight exposure
   - In the vicinity of high-temperature heat source
   - Place with vibrations
   - Places where salt, water, oil, or corrosive gases are present
6. When using multiple channels, ventilate properly and install a fan unit.
7. When using this product, the housing must be grounded.

8. When connecting a microdot connector to the input connector, depending on the cable used, it may be necessary to remove the rubber ring attached to the seat of the input connector (INT) of the main unit.
9. This product is equipped with flash memory to save setting values, so no battery replacement is required.
10. This product is equipped with control knobs using a rotary encoder. Note that if a knob is turned then left at any position other than where it clicks, the settings at the time when the power was turned off may change when the power is turned on, though this seldom happens. If the knob is at the position where it clicks, there is no problem.

Warranty

We ship our products after conducting quality control, which covers from design to manufacturing. It is possible, however, that failures may occur in the products. If the product does not operate correctly, please make a check of the power supply, cable connections, or other conditions before returning this product to us.

For repair or calibration, contact your local A&D dealer. Before returning, be sure to inform us of the model, serial number, and problematic points.

The following is our warranty.

Limited warranty

1. Warranty period: Two years from our shipment.

2. Warranty limit: We will repair the defects of our product free of charge as necessary within the warranty period; however, this warranty does not apply in the following cases.

(1) Damage or faults caused by incorrect use.
(2) Damage or faults caused by fire, earthquake, traffic accident, or other natural disasters.
(3) Damage or faults caused by a repair or modification that is carried out by someone other than a service representative of A&D Company, Limited.
(4) Damage or faults caused by use or storage in environmental conditions that should be avoided.
(5) Periodical calibration.
(6) Damage or faults caused during transport.

3. Liability: We do not assume any liabilities for equipment other than that of A&D Company, Limited.

When disposing of the used product

In the European Union

EU-wide legislation as implemented in each Member State requires that used electrical and electronic products carrying this mark (left) must be disposed of separately from normal household waste. This includes electrical accessories, such as chargers or AC adaptors.

The mark on the electrical and electronic products only applies to the current European Union Member States.

Outside the European Union

If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority and ask for the correct method of disposal.

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1. Overview

1.1 Features

The AG3103 is a charge amplifier allowing isolation of the input, output, and power supply system and enables wideband signal input (0.2 Hz to 100 kHz). The sensor is capable of multi-input ("voltage output" piezoelectric sensor with built-in amplifier or "charge output" piezoelectric type sensor) with the measurement range greatly expanded (10 times compared to previous product) from 1 to 50,000 m/s^2, thus enabling a wide range of vibration measurements such as impact, rotating body vibration, and noise. In addition, the product is designed with environmental conservation in mind, as seen by eliminating use of lead in the device and eliminating the batteries used for the storage memory for setting status, etc., and adopting flash memory.

When several units are installed in the optional case, setting of the power supply, CAL application and key lock for all channels can be made by one operation.

If you have any problem, read the section for maintenance, and then contact with your local A&D dealer if the problem is not solved.

1.2 Optional products

The following cases are available for AG3103.

Product name	Type	Item	Remarks
Bench top case	AS16-104	4-channel bench top case	All include CH ±CAL, BAL, Key-lock, Power Supply SW. Can be operated/synchronized with other cases.
	AS16-105	6-channel bench top case	
	AS16-106	8-channel bench top case	
Rackmount case	AS16-107	8-channel rackmount case	

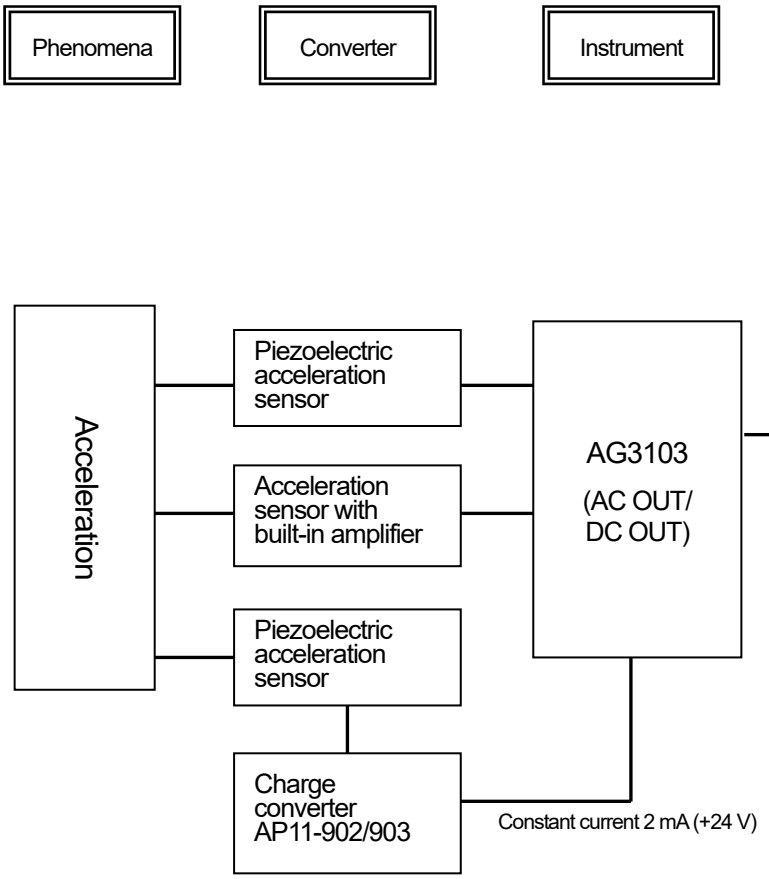
* The optional cases above can be used for both the AG3103 and the strain amplifier series (AS1603/AS1703/AS1803R).

1.3 Accessories

- Output cord (0311-2057) x 1
- Time-lag fuse
  (Fuse for AC power supply: 85 to 132 V AC/180 to 264 V AC, 100 mA: 0334-4306 x1)
  (Fuse for DC power supply: 10 to 30 V DC, 500 mA: 0334-4313 x 1)
- AC power cord (0311-5044 (for 100 V) or 0311-5112 (for 200 V)) x 1
- Instruction manual x 1

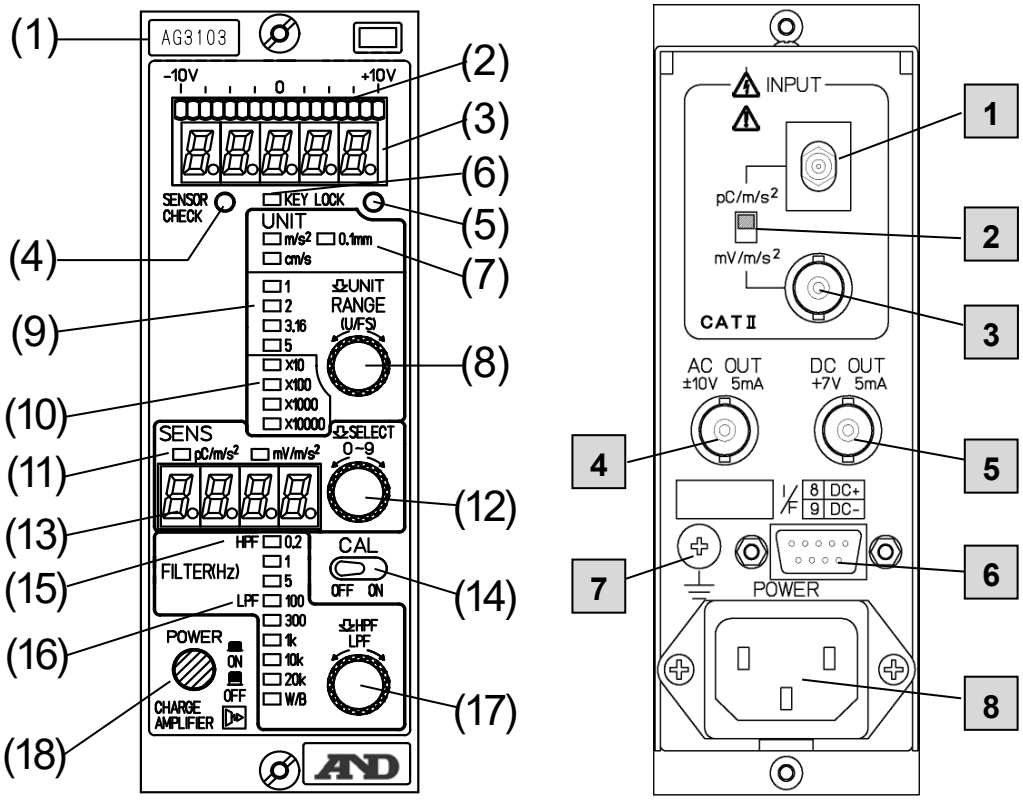
1.4 Block diagram of measurement

The following diagram illustrates a typical measurement system that broadly covers a variety of factors including signal amplitude, frequencies, and measurement time.



Recorder & analyzer	
Oscilloscope	Waveform observation
Data recorder	Data recording
Digital voltage meter	Digital display
Pen-type oscilloscope	Low frequency waveform recording (DC to 120 Hz)
X-Y recorder	Drawing
Thermal dot recorder	High bandwidth waveform recording (DC to 20 kHz)
Digital oscilloscope	High speed waveform recording (DC to 100 kHz)
Data processor	Statistical processing of waveforms, Data analysis

2. Part names and functions

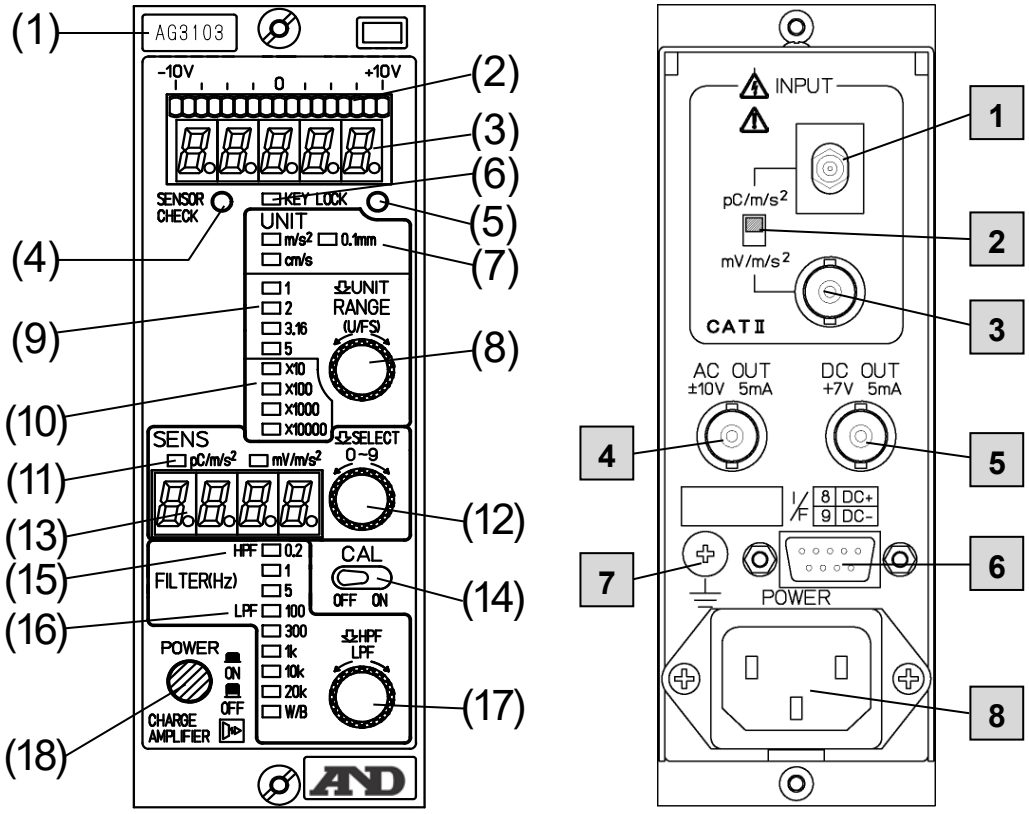


2.1 Names and functions of parts on front panel

No.	Name	Function
1	Model	AG model number
2	17-dot LED monitor meter	Checks the output of AC OUT [4]. The green LED at the center illuminates when the output is within ±100 mV. When the output voltage exceeds ±10.5 V, the LED at the over-voltage side flashes.
3	4-digit 1/2 digital LED monitor	Digitally displays the output voltage of DC OUT [5]. This value is the effective value converted from the amplitude value of the AC output [4].

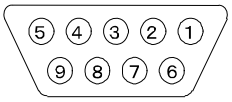
No.	Name	Function
4	Sensor check (SENSOR CHECK)	When the switch is pressed, a calibration voltage is applied to the sensor and the signal from the sensor is measured to automatically detect the presence of disconnection occurring between the sensor and the input connector [1] on the back of this amplifier. *Note: With sensor check, it is possible to set the disconnection judgment level. For details, see page 3-4.*
5	Keylock switch (KEY LOCK)	Pressing the switch for one second switches on/off the keylock. While the keylock LED (6) is turned on, the switches on the front panel are locked. While locked, the switches other than the keylock (5), CAL (14) and power (18) switches cannot be used.
6	Keylock LED	Indicates whether keylock is enabled or not. On: Enabled. Off: Disabled.
7	Unit setting display (UNIT)	Pressing knob (8) changes the unit setting. The unit setting is displayed as follows. Acceleration: m/s^2. Velocity: cm/s. Displacement: 0.1 mm.
8	Measurement range and unit setting selection knob (RANGE/UNIT)	Pressing the knob switches the unit setting. Also, turning the knob switches the measurement range, with steps 1, 2, 3.16, and 5, from 1 to 50,000 at the maximum. There is a limit depending on the sensor sensitivity setting.
9	Measurement range LED	Displays the measurement range setting, with steps 1, 2, 3.16, and 5, and magnification LED (10). Indicates the measurement range in full scale. (Up to ±1 (peak value) with “1”.) The unit of the measurement range is the unit of UNIT display (m/s^2, cm/s, 0.1 mm).
10	Measurement range magnification LED	The value obtained by multiplying the measurement range value by the magnification displayed in this window is the full scale.
11	Sensor input selection display LED	Displays the selection status of input connector selection switch [2] on the rear panel. Switches according to the type of sensor used (piezoelectric acceleration sensor or acceleration sensor with built-in amplifier). Indicates the unit of sensor sensitivity.
12	Sensor sensitivity setting knob	When changing the sensitivity of the sensor, press knob (12) to select a digit. To change the value, turn knob (12). For details, see page 2-6.

No.	Name	Function
13	Sensor sensitivity display	Displays the sensitivity of the sensor. The displayed value is in the range of 0.010 to 999. For switching, use knob (12).
14	Calibration voltage application switch (CAL)	This is the switch for calibration signal output. On the ON side, a sine wave with a full scale voltage of 10 V (single amplitude) and a frequency of 80 Hz is output to AC OUT 4. To DC OUT, 7.07 V (RMS conversion value) is output.
15	High-pass filter (HPF) LED	Displays the setting value of high-pass filter LED. Pressing knob (17) switches the setting.
16	Low-pass filter (LPF) LED	Displays the setting value of low-pass filter LED. Turning knob (17) switches the setting.
17	Filter switch knob (FILTER HPF/LPF)	Pressing this knob switches the high-pass filter cutoff frequency from 0.2 Hz, 1 Hz, 5 Hz to 0.2 Hz in this order. Also, turning this knob to the right switches the cutoff frequency of the low-pass filter from W/B to 100 Hz and turning it to the left switches from 100 Hz to W/B.
18	Power switch (POWER)	When the switch is pressed, the yellow ring of the knob disappears and the power is turned on. When the button is pressed again, the yellow ring becomes visible and the power turns off.



2.2 Names and functions of parts on rear panel

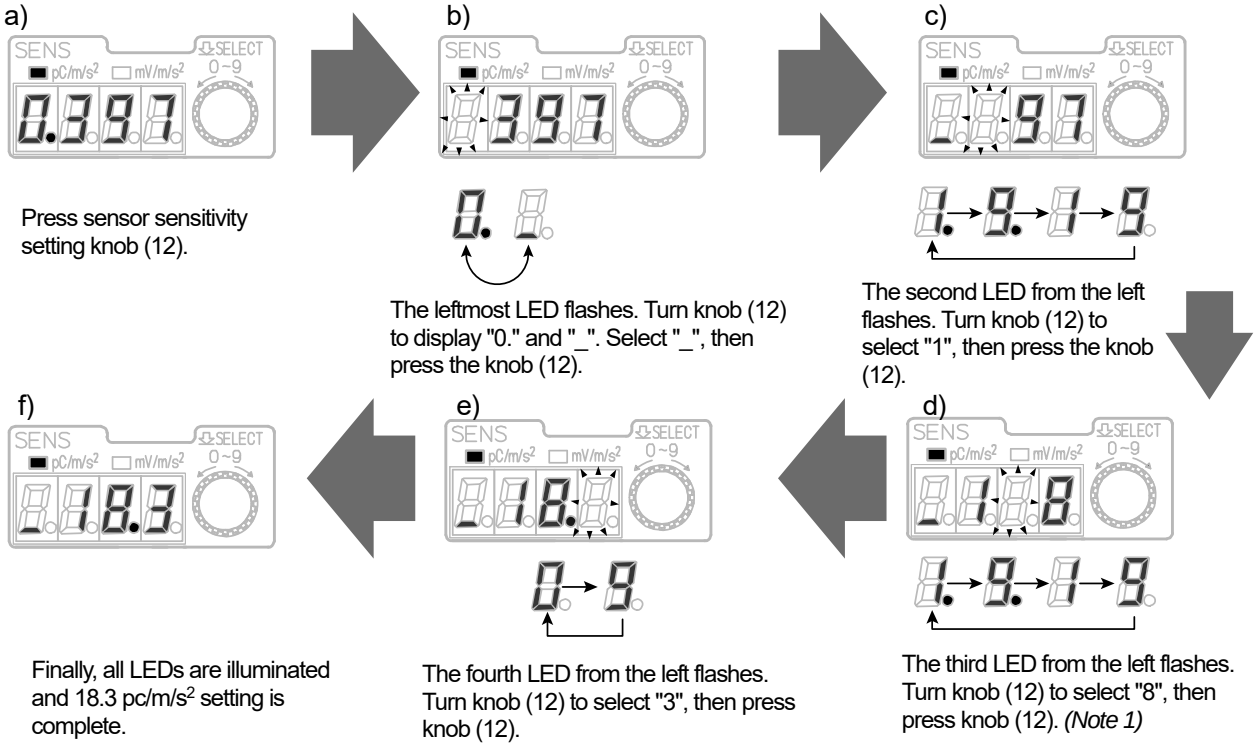
No.	Name	Function
1	Input connector for piezoelectric acceleration sensor	Connects to the cable from a piezoelectric acceleration sensor. This is the dedicated input connector for a microdot connector (10-32 pitch coaxial receptacle). Use this connector to connect an input cable with a microdot connector.
2	Input connector selector switch	(1) When using a piezoelectric acceleration sensor, set this switch to the up position. (2) When using an acceleration sensor with a built-in amplifier. Set this switch to the down position.
3	Input connector for acceleration sensor with a built-in amplifier	Connects to the cable from an acceleration sensor with a built-in amplifier. This is the dedicated input connector for a BNC connector. When an acceleration sensor with a built-in amplifier is used, a constant current of +24 V/+2 mA is output from the connector as the power supply for the sensor. Do not use any sensors other than those that operate at +24 V/+2 mA.
4	Output connector (AC OUT)	Output voltage: ±10 V. Current: 5 mA.
5	Output connector (DC OUT)	Outputs the RMS value of the signal which is output to AC OUT 4.

<table>
<tr><th>No.</th><th>Name</th><th>Function</th></tr>
<tr><td>6</td><td>Interface connector (I/F)</td><td>This connector is the electrical interface between the amplifier and the optional case. Connecting the CAL terminal (I/F:1) to the GND terminal (I/F pin: 7) applies the calibration value. The calibration value is applied when either this terminal or CAL switch (14) turns on. Similarly, connecting the KEY LOCK terminal (I/F: 6) to the GND terminal (I/F: 7) locks each setting switch. Each setting switch is locked when either this terminal or KEY LOCK switch (5) is turned on. The I/F connector’s pin layout is as follows.
 

I/F connector (on the real panel)
<table><tr><td>(1) +CAL</td><td>(2) N/A</td><td>(3) N/A</td></tr><tr><td>(4) NC</td><td>(5) NC</td><td>(6) KEYLOCK</td></tr><tr><td>(7) GND</td><td>(8) DC+</td><td>(9) DC-</td></tr></table></td></tr>
<tr><td>7</td><td>Protective grounding terminal</td><td>If the 3-pin power cord cannot be connected, ground this terminal.</td></tr>
<tr><td>8</td><td>AC power input connector</td><td>Connects to the AC power cable. The withstand voltage of this product's AC power input section is 1.5 kV/min for input, output and the case.
Note: For 100 V AC, use the AC power cord (0311-5044). For 110 V, 120 V and 180 to 264 V AC, use the optional AC power cord 200 V (0311-5112).</td></tr>
</table>

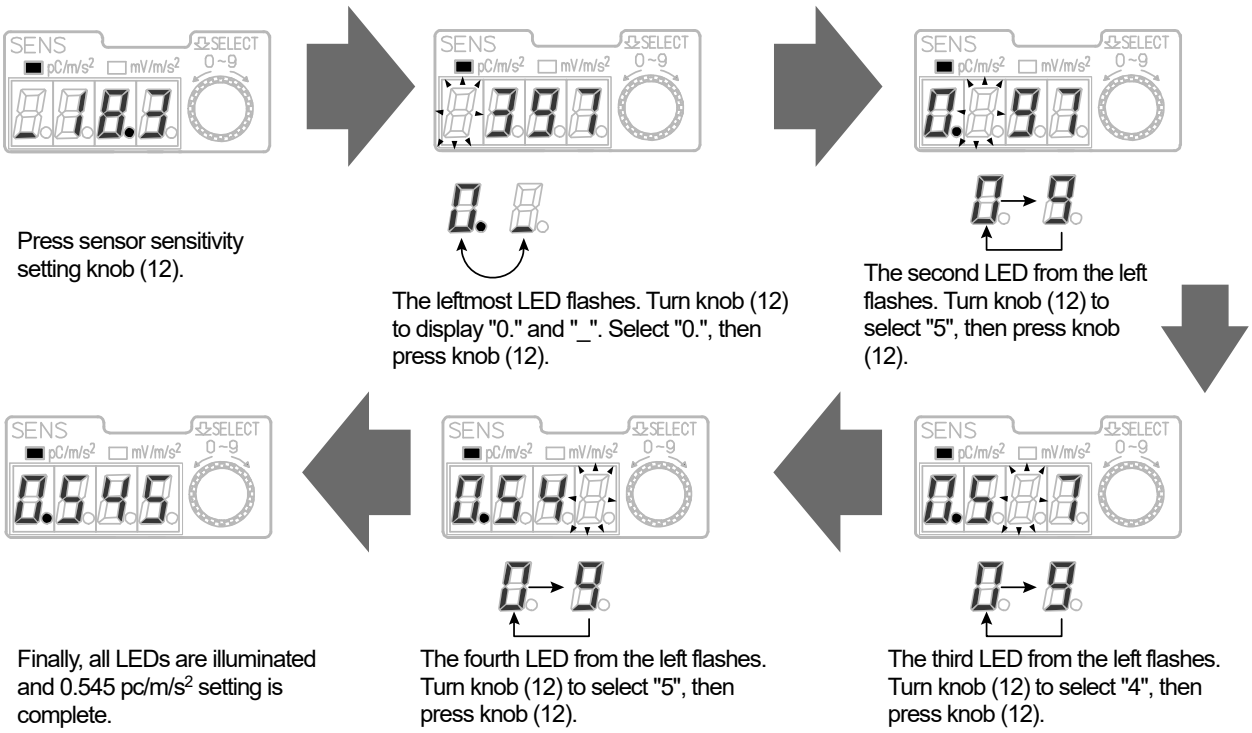
2.3 Sensor sensitivity (SENS) setting

[Setting example: 1.00 to 9.99 pC/m/s^2]



Note 1: Here, the value can be selected from 0., 1., 2., 2., 3., 4., 5., 6., 7., 8., and 9., and 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. In sensor sensitivity setting, select a value from "0." to "9." for 1.00 to 9.99 and for 10.0 to 99.9 in (c) and (d) respectively.

[Setting example: 0.100 to 0.999 pC/m/s^2]



Press sensor sensitivity setting knob (12).

The leftmost LED flashes. Turn knob (12) to display "0." and "_". Select "0.", then press knob (12).

The second LED from the left flashes. Turn knob (12) to select "5", then press knob (12).

The third LED from the left flashes. Turn knob (12) to select "4", then press knob (12).

The fourth LED from the left flashes. Turn knob (12) to select "5", then press knob (12).

Finally, all LEDs are illuminated and 0.545 pc/m/s^2 setting is complete.

3 . Preparation for measurement

3.1 Cable connections

3-1-1 Connecting the input cables

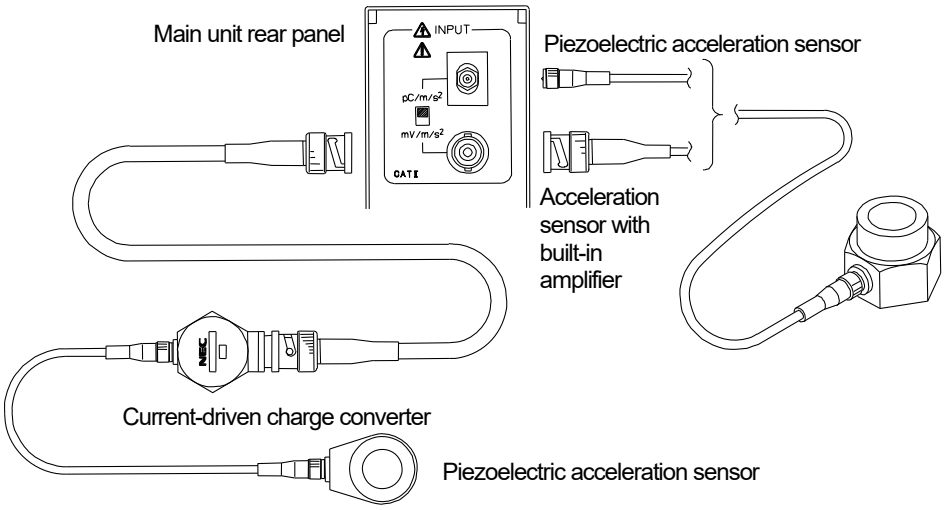


Fig. 3-1 Input connections

3-1-2 Connecting the power supply and output cables

1) Connect the power cord for 100 V AC (0311-5112 for 110 V AC or more), 200 V AC, or 12V DC according to the power source to be used.
2) Connect the output cable according to the recorder to be connected.
3) The housing of this amplifier is connected to the output common wire. Ground to the system common wire.

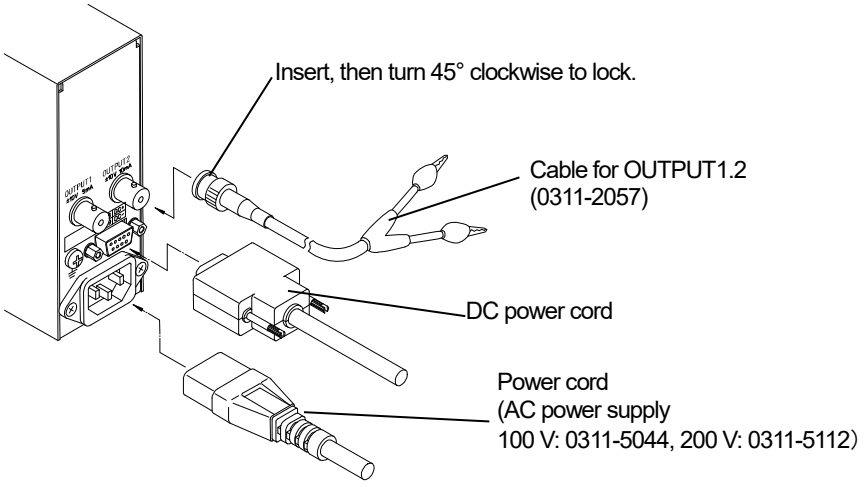


Fig. 3-2 Connections of output, I/F connector, and power supply

3-1-3 Connecting the output cable

This amplifier is equipped with two kinds of connection, AC OUT and DC OUT. They are both for connection to a voltage input device, such as a data recorder, thermal dot recorder, or oscilloscope.

1) AC OUT

The output voltage and current of this output are ±10 V/±5 mA (2 kΩ or greater load). The signal waveform is output as is to this output. Connect here mainly devices to observe and record acceleration waveforms.

2) DC OUT

The output voltage and current of this output are +7.07 V/+5 mA. The AC OUT signal is converted into an average value detection equivalent effective value, and an effective value is output. Connect here to perform measurement of vibration phenomenon, amplitude value, or fluctuation trend.

Output cable (0311-2057) is shown in the figure below.

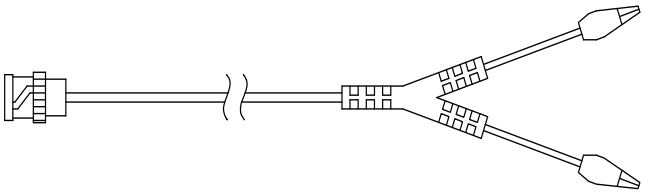


Fig. 3-3 Output cable

(1) Example of connection to a data recorder

Be careful to check the input level of the data recorder. Especially with a data recorder with FM modulation method, overmodulation caused by excessive input results in recording failure. For that reason, this amplifier has a function to indicate excessive output voltage. As shown in the figure, the indicator on the side exceeding the excessive level (approx. ±10.5 V) flashes. The monitor meter can check excessive level up to approx. 100 Hz.

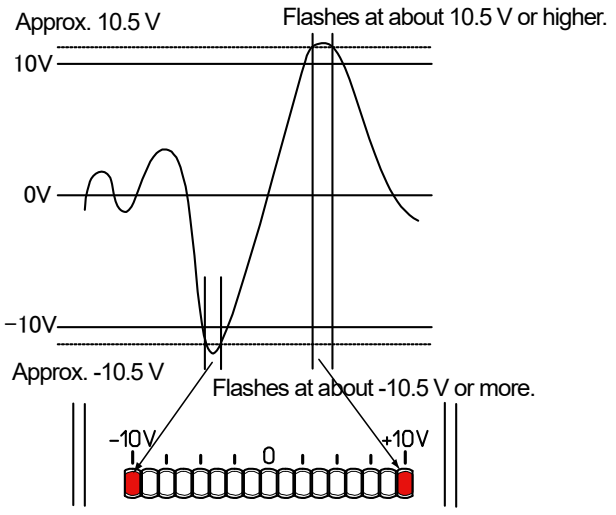


Fig. 3-4 Output over display

Note the following points when connecting to a data recorder.

a) For direct connection

A data recorder allowing 20 Vp-p (±10 V) or greater input level power application can be directly connected.

b) For Input requiring a voltage divider circuit

A data recorder whose input level is ±1 V requires a voltage divider circuit. In this case, take notice of impedance.

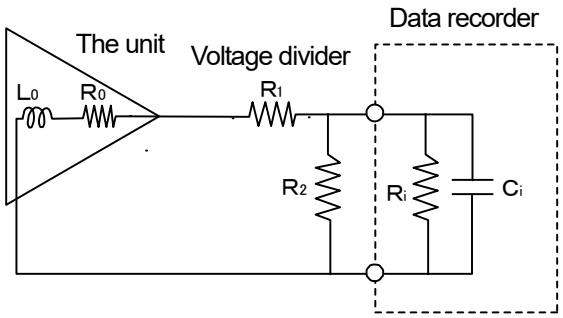


Fig. 3-5 Voltage divider

R2 is reduced to lower the influence of the data recorder's input impedance (Ri).

Example)

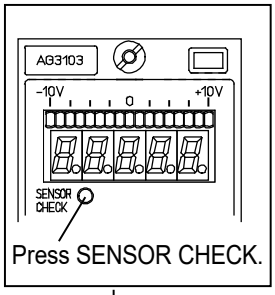
When the partial pressure ratio is 1/10, the minimum values that R1 and R2 can take are as shown below.

Table 3-1 Voltage divider resistance

	R1	R2
AC OUT	1.8 k Ω	200 Ω
DC OUT	1.26 k Ω	140 Ω

3.2 Operation of sensor check function

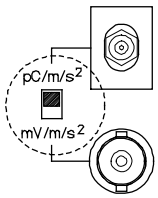
[Caution]
The sensor check function applies a signal (up to approx. 0.9 Vp-p) to the sensor. Do not use the function if it may cause damage to the sensor or voltage application to the object being measured.



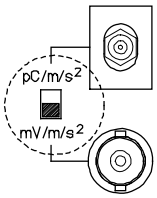
Press SENSOR CHECK.

[Caution]
If the sensor is connected through a sensor case to the object being measured, insulate the sensor electrically or perform sensor check before installing the sensor.

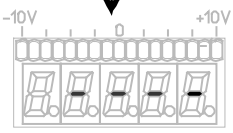
Input:
Piezoelectric acceleration transducer



Input:
Piezoelectric acceleration transducer with built-in amplifier



Displays error reference value.

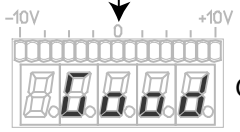


No sensor check.

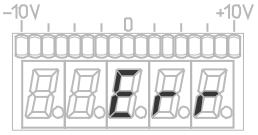
Measures the capacitance of the cable and sensor, and displays the capacitance.

Judges error based on error reference value and measured capacitance.

If the cable capacity is larger than the sensor capacity value, it may not be judged correctly.



Good: No disconnection

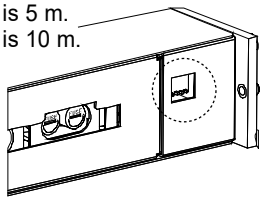


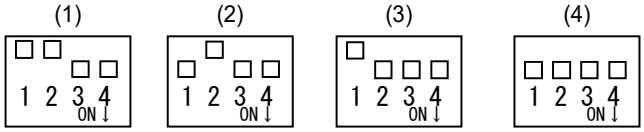
Error: Disconnected

When you hold down the sensor check button while “Err” is flashing, the sensor check is performed again.

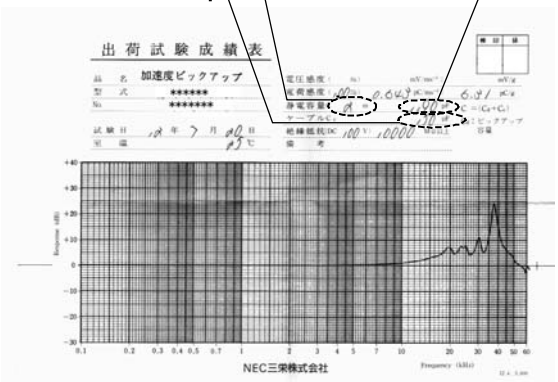
Select the error reference value according to the cable length connected to the sensor. (Switching with the DIP switch on the bottom of this product.)

(1) No judgment criteria.
(2) When the cable length is 2 m.
(3) When the cable length is 5 m.
(4) When the cable length is 10 m.


Back of main unit
Front of main unit



Cable capacity Cable length Sensor and cable



Example of a test report

3.3 The case

3-3-1 Parts of the case

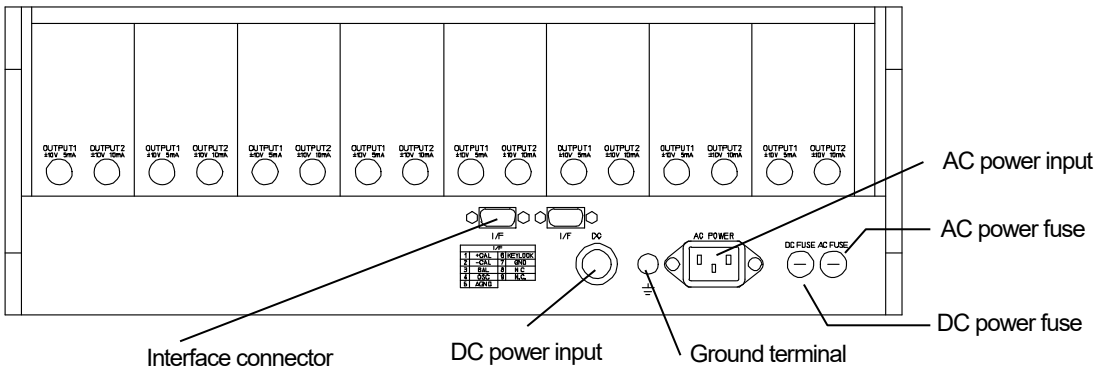


Fig. 3-6 Storage case rear view

- Use standard AC power cord (0311-5044) that is attached to the case as a standard for 100 VAC power supply.
- Use optional DC power cord (47229) for DC power supply.

3-3-2 Using the case

A) Power supply cable connection

When installing the unit in the case and using it with a battery (12 V DC: 10 V to 30 V DC), pay attention to voltage drop due to the wire length and wire diameter of the DC power cord. A voltage drop occurs when multiple channels are used and the power cord is extended long, and then voltage may fall below the power input range of 10 V for the DC power input connector of this product.

For example, with the DC power cord (47229) of 1.25 mm^2, when eight channels are installed, 0.4 A x 8 = 3.2 A flows, and when it is extended to 10 m in length, voltage drops by 0.5 V. Similarly, with a 10 m cable of 0.75 mm^2, voltage drops by 1.65 V. Under a situation like this, it is necessary to supply power in anticipation of a voltage drop or to reconsider the wire diameter and length of the power cord.

B) Simultaneous operation between units/cases

When multiple units are installed in the cases, the control signals are wired inside the cases.

The calibration value application and key lock can be applied to all units in the cases by using the all-channel calibration value application switch and all-channel key lock switch on the front of the case.

In addition, the same operation as above can be performed when connecting the cases using a dedicated sync cable. (See Fig. 3-7.)

Note that the BAL switch and negative CAL application switch do not operate with the AG3103 because the AG3103 is not equipped with a balancing function and negative calibration value application function.

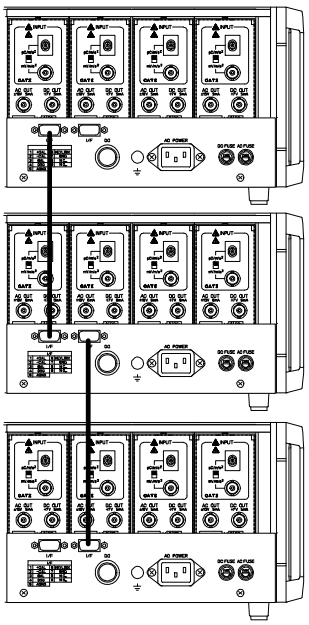


Fig. 3-7 Rear view of the case

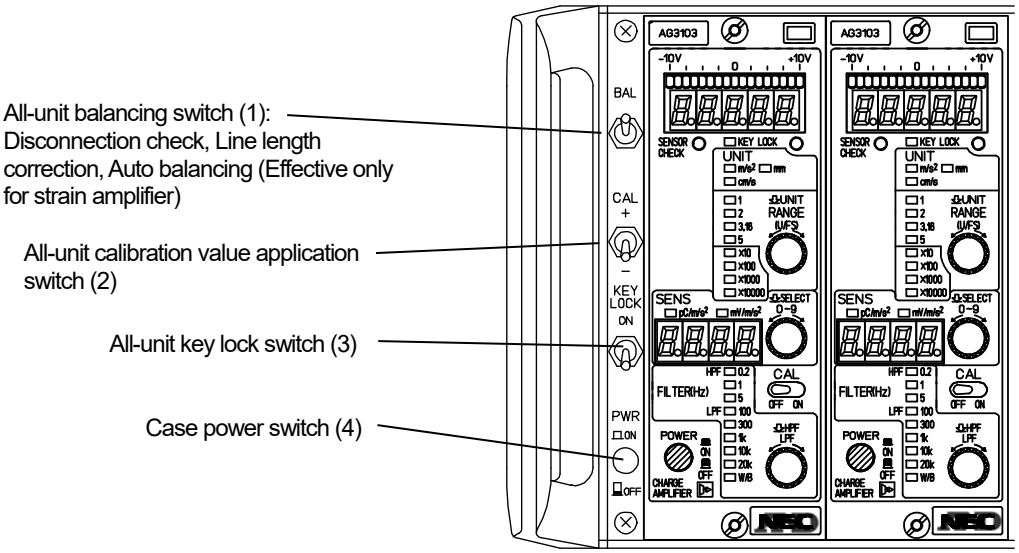


Fig. 3-8 Front view of the case

C) All-unit calibration value application switch (2)

When the all-unit calibration value application switch (2) of the case is turned to the + side, the all-unit calibration value application switch takes precedence regardless of the ON/OFF position of the calibration value application switch (14) of each unit, and a calibration value is applied. The same applies when multiple units are connected with a dedicated sync cable. When applying a calibration value to a single unit with the calibration value application switch (14) on the unit, check that the all-unit calibration value application switch of the case is turned off.

D) All-unit key lock switch (3)

When the all-unit key lock switch (3) of the case is turned to ON (upward), the key lock is applied to all units, and the key lock LEDs (6) on all units illuminate. The function is the same as each unit's key lock setting. To unlock, turn the all-unit key lock switch (3) downward. When unlocked, the unit whose key lock is turned on remains locked. The same applies when multiple units are connected.

Table 3-2 Operation of each switch of the case

Switch on the front of the case		AG3103
AUTO		No operation
CAL	+	All channels, CAL
	-	No operation
Key Lock		All channels, key lock
PWR		Power supplied

3-3-3 Dissipating heat for case mounting

A) When installing one rackmount case

⚠CAUTION

Do not place the rackmount case, which has no feet, directly on the surface of a desk, floor, etc. Heat that cannot be dissipated may cause a malfunction.

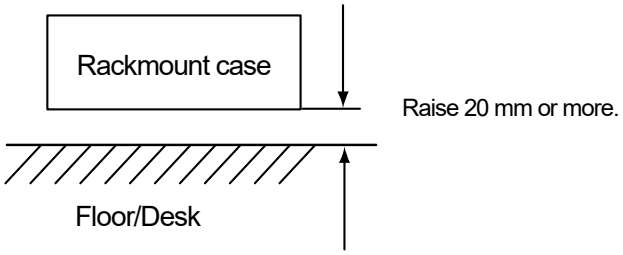


Fig. 3-9 Installation of rackmount case

B) When installing more than one rackmount cases

As the temperature inside the units rises depending on the number of mounted cases, load conditions, and ambient temperature, reliability is impaired, so, the number of fans to install should be decided referring to the table below.

Table 3-3 Numbers of rackmount cases and fans for heat dissipation

Number of rackmount cases	Under extreme conditions *(Note)* Number of Fan units B
1 to 3	1
3 to 6	2
6 to 9	3

Note:

Extreme conditions are as follows.

- Supply voltage: 110 V AC (+10%)
- Output voltage/current: +10V, 10mA
- Operating temperature: +50 °C (ambient temperature)

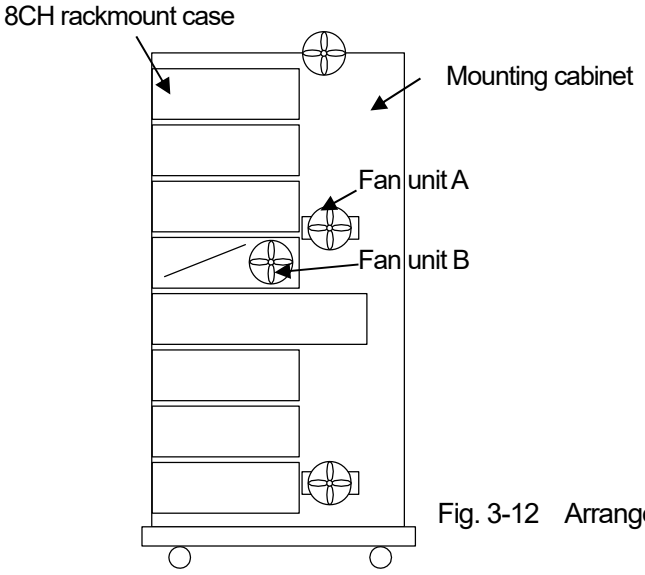


Fig. 3-12 Arrangement of fan units

As shown here, if there is a case that prevents the wind from flowing upward (a diagonal line shown in the figure or case with different length), install fan unit A just above that to improve ventilation, and fan unit B to promote natural convection. When multiple units are mounted, fan units B should be placed in close contact with the case at a ratio of 1 to 3. *Note: To install yourself, please contact your local A&D dealer regarding the mounting method.*

4 . How to measure

4 . 1 Checking before measurement

Be sure to check the following points in the table below before measuring.

Item	Points to check	Remarks
Installation environment for piezoelectric sensors	Use within the specification range of the sensor, and secure the mounting completely with studs.	• Intrusion of noise • Errors in peak values and response characteristics
	Securely attach the connector.	• Intrusion of noise • Unstable operation
	Avoid sudden temperature changes	• Generation of low-frequency noise
	Keep the cable from the sensor as short as possible	• Increase in noise
Installation environment for this unit (charge amplifier)	Ambient temperature and humidity should be -10 to + 50 °C and 20 to 85% RH (without condensation).	• Unstable operation
	Vibration is within 3G.	• Possible damage or noise
	Do not install in a strong magnetic field or electric field	• Intrusion of noise
	Be sure to ground the housing (especially when using AC power).	• Intrusion of noise
Operation of this unit (charge amplifier)	Connect the connector securely.	• Unstable operation • Contact failure
	The power supply voltage should be within specifications (85 to 132V AC, 180 to 264V AC, 10 to 30V DC). Pay particular attention to the polarity when using a DC power supply.	• Unstable operation when power supply voltage is low If it is high, it generates heat and exceeds the rating of the element • Does not operate when the polarity of the DC power supply is reversed
	A low-pass filter should be used after understanding its characteristics.	• Phase difference • Amplitude reduction
	Do not short the output cable.	• The power supply may not start. • Heat generation of circuit
Countermeasures against noise	(1) Ground the case. (2) Insulate the sensor from the base material	

Table 4-1 Cautions before measurement

4 . 2 Operation

4-2-1 Turning on power

When the power switch (POWER) is pressed, current is supplied to the unit. Let it warm up for about 10 minutes.

4-2-2 Sensor sensitivity setting

Set the sensor sensitivity to be used with switch (12). The setting details are displayed on the sensor sensitivity display LED (13). The setting range is 0.010 pC/m/s^2 to 999 pC/m/s^2 (or 0.010 mV/m/s^2 to 999 mV/m/s^2).

4-2-3 Setting the range

Operate the range setting switch (8) according to the acceleration to be measured. When an input signal of the setting range value is input, the output voltage of this unit is ±10 V for AC OUT and +7.07 V for DC OUT.

The following table shows the measurable acceleration range according to the range setting.

Table 4-2 Relationship between sensor sensitivity and range when selecting charge sensor input (pC/m/s^2)

Sensor sensitivity SENS	0.010 to 0.099	0.100 to 0.999	1.00 to 9.99	10.0 to 99.9	100 to 999	Input charge
	pC/m/s^2	pC/m/s^2	pC/m/s^2	pC/m/s^2	pC/m/s^2	pC (max)
RANGE m/s^2/FS	100	10	1			10
	200	20	2			20
	316	31.6	3.16			31.6
	500	50	5			50
	1,000	100	10	1		100
	2,000	200	20	2		200
	3,160	316	31.6	3.16		316
	5,000	500	50	5		500
	10,000	1,000	100	10	1	1,000
	20,000	2,000	200	20	2	2,000
	31,600	3,160	316	31.6	3.16	3,160
	50,000	5,000	500	50	5	5,000
		10,000	1,000	100	10	10,000
		20,000	2,000	200	20	20,000
		31,600	3,160	316	31.6	31,600
		50,000	5,000	500	50	50,000
			10,000	1,000	100	100,000

* In the setting for the same line, the amplifier is set to the same gain range.

Table 4-3 Relationship between sensor sensitivity and range when selecting acceleration sensor with a built-in amplifier input (mV/m/s^2)

Sensor sensitivity SENS	0.010 to 0.099	0.100 to 0.999	1.00 to 9.99	10.0 to 99.9	100 to 999
	mV/m/s^2	mV/m/s^2	mV/m/s^2	mV/m/s^2	mV/m/s^2
RANGE m/s^2/FS	5,000	500	50	5	
	10,000	1,000	100	10	1
	20,000	2,000	200	20	2
	31,600	3,160	316	31.6	3.16
	50,000	5,000	500	50	5
		10,000	1,000	100	10
		20,000	2,000	200	20
		31,600	3,160	316	31.6
		50,000	5,000	500	50

* In the setting for the same line, the amplifier is set to the same gain range.

4-2-4 Maximum input charge

In order to keep the input impedance high, there is no protection circuit at the input.

Therefore, do not exceed the following maximum input charge.

Table 4-4 Relationship between each range and maximum input charge

Sensor sensitivity	0.010 to 0.099	0.100 to 0.999	1.00 to 9.99	10.0 to 99.9	100 to 999	Maximum input charge (pC)
SENS	pC/m/s^2	pC/m/s^2	pC/m/s^2	pC/m/s^2	pC/m/s^2	
RANGE m/s^2/FS	100 to 10,000	10 to 1,000	1 to 100	1 to 10	1	1,350
	20,000 to 50,000	2,000 to 10,000	200 to 1,000	20 to 100	2 to 10	13,500
		20,000 to 50,000	2,000 to 10,000	200 to 1000	20 to 100	135,000

4-2-5 Unit selection

The AG3103 can measure not only acceleration but also velocity and displacement. Press the UNIT/RANGE knob (8) to switch to the required unit. The other settings are the same as for acceleration. Since the basic measurement is acceleration, make sure that acceleration can be measured.

Acceleration: m/s^2

Velocity: cm/s

Displacement: 0.1 mm

4-2-6 Securing insulation

In order to ensure that the sensor charge is transmitted to the charge amplifier, the connector that connects the piezoelectric sensor to the connection cable and the input connector of this unit should not be contaminated by dust, oil, water, etc.

4-2-7 When measurement is completed

Turn the power switch to OFF. The settings when the power is turned off are retained.

4-2-8 Using the charge converter

When the distance between the piezoelectric accelerometer and the main unit (AG3103) is long, the effect of noise can be reduced by using a charge converter (optional).

There are two types of charge converters. The specifications are as follows.

Specification		Model	
		AP11-902	AP11-903
Input		Single input	<-
Gain	Setting gain	1 mV/pC	0.1 mV/pC
	Gain accuracy (1 kHz)	±2.5% (Input capacity: 1000 to 3000 pF)	±2.5%
		±5.0% (Input capacity: 3000 to 10000 pF)	<-
Frequency range		1.6 Hz to 50 kHz ±3dB (Gain at 1kHz is 0dB)	<-
Maximum input charge		5000 cPc-p (In the range of maximum output voltage 5.0 Vp-p)	50000 pCp-p (In the range of maximum output voltage 5.0 Vp-p)
Maximum input capacity		10^4 pF	<-
Noise		100 µVrms	50 µVrms
Maximum output voltage		5.0 Vp-p or higher (Depending on output cable capacity, drive current, frequency)	<-
Phase		180 degrees	<-
Output impedance		100 Ω max	50 Ω max
Power supply		12 to 25 V DC, 0.5 to 5 mA constant current	<-
Operating temperature and humidity range		-20 °C to +110 °C, 20 to 80% RH (Excluding condensation)	<-
External dimension and weight		Hex 21 x 34 (H) mm, approx. 34 g	<-

Note 1: Input connector -> Miniature connector (No.10-32UNF)
Note 2: Output/Power connector -> BNC connector (Female)
Note 3: The main body is a non-insulating structure, so be careful when installing the main body when using it.

1) When using AP11-902

Set the input connector selector switch to the side of the acceleration sensor with a built-in amplifier (mV/m/s^2).
For the sensor sensitivity, consider the piezoelectric acceleration sensor and charge converter as one acceleration sensor with a built-in amplifier and set it and set it with the sensor sensitivity setting knob (12).
For the measurement range, see "Table 4-3 Relationship between sensor sensitivity and range when selecting acceleration sensor with a built-in amplifier input (mV/m/s^2)".

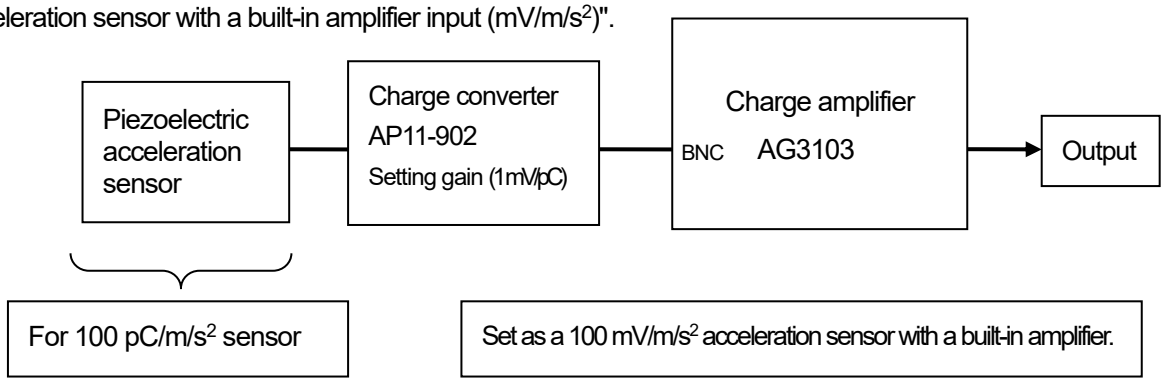


Fig. 4-1 Connection diagram when using charge converter (AP11-902)

2) When using AP11-903

Set the input connector selector switch to the side of the acceleration sensor with a built-in amplifier (mV/m/s^2). For the sensor sensitivity, consider piezoelectric type acceleration sensor and charge converter as one acceleration sensor with a built-in amplifier and set it with the sensor sensitivity setting knob (12).

However, since this AP11-903 has a setting gain of 1/10 that of the AP11-902, the output voltage of this unit will also be 1/10.

For the measurement range, see "Table 4-3 Relationship between sensor sensitivity and range when selecting acceleration sensor with a built-in amplifier input (mV/m/s^2)".

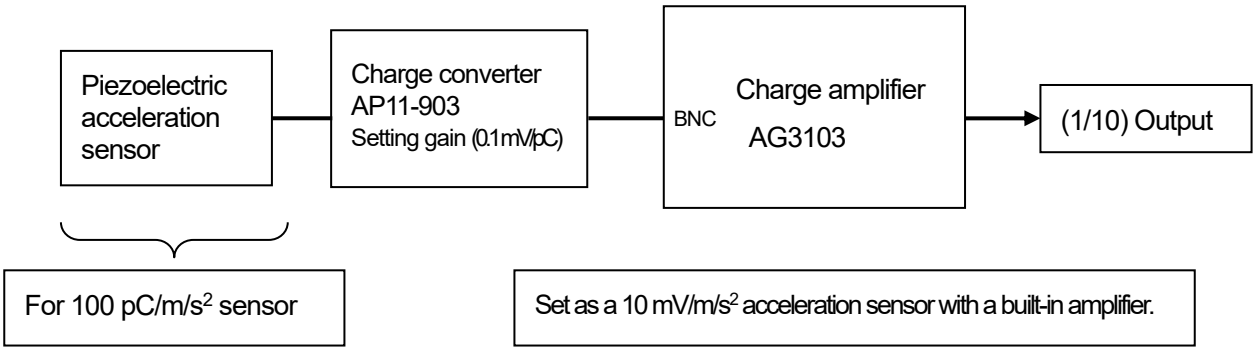


Fig. 4-2 Connection diagram when using charge converter (AP11-903)

4.3 Reading and calibration of measured values

4-3-1 How to read measured values

The input level can be determined from the output amplitude and input from (7), (9), and (10) on the panel.

If the sensor sensitivity of the acceleration sensor to be used is set to the unit, the relationship between the output voltage and the measured acceleration is as follows.

Measured acceleration (m/s^2) = Measured range (m/s^2) x Measured voltage (V) / Full scale voltage (V)

Here, the full-scale voltage value when measured with AC OUT is ±10 V, and the full-scale voltage value when measured with DC OUT is + 7.071 V.

The input charge during this measurement is

Input charge (pC) = Sensor sensitivity ($pC/m/s^2$) x Measured acceleration (m/s^2).

Example) When using an acceleration sensor of 2.50 $pC/m/s^2$.

When the sensor sensitivity is set to "_2.50" ($pC/m/s^2$) and the measurement range is set to "500" (m/s^2), when the measured voltage at AC OUT is 5.000 V (pk), the measured acceleration is 250 m/s^2 (pk). The input charge at that time is 625 pC.

Table 4-5 Relationship between measured voltage and measured acceleration

Measured voltage	Full scale	Measured range	Measurement acceleration	Sensor sensibility	Input charge
(Vpk)	(Vpk)	(m/s^2)	(m/s^2)	($pC/m/s^2$)	(pC)
5.000 V	10.000 V	500	250	2.50	625

4-3-2 Measurement of velocity and displacement

Example) When an acceleration sensor of 2.50 $pC/m/s^2$ is used.

1. First, it is assumed that acceleration can be measured, so operate (push) the unit setting knob (8) and set UNIT (7) to m/s^2.
   When
   Sensor sensitivity setting (13) is "_2.50" ($pC/m/s^2$) and
   Range setting (10) is "5 x 100" (m/s^2)
   With the above settings, if the output amplitude is
   3.535 Vrms (DC OUT), acceleration = 250m/s^2 (pk).
2. Now, operate (push) the unit setting knob (8) to set UNIT (7) to cm/s.
   In this state, the output corresponding to the speed (cm/s) is obtained corresponding to the acceleration (m/s^2) of each range. In this case, the measurement range is "5 x 100" (cm/s), and if the output amplitude is 353.5 mVrms (DC OUT), the velocity is 25 cm/s (pk).
3. Similarly, operate (push) the unit setting knob (8) to set UNIT (7) to 0.1 mm.
   In this state, an output corresponding to the displacement (0.1 mm) corresponding to the acceleration (m/s^2) of each range is obtained. In this case, the measurement range is "5 x 100 x 0.1" (mm). If the output amplitude is 35.35 mVrms (DC OUT), the displacement is 0.25 mm (pk).

4-3-3 Calibration

1) When the calibration voltage application switch is used

   The calibration voltage is output while the calibration voltage application switch is turned to the ON side.

   The calibration voltage in full scale (AC OUT: 10 Vpk, 20 Vp-p, DC OUT: 7.07 Vrms), 80 Hz sine wave, is output regardless of the range setting and sensor sensitivity setting, so it can be used to set the input range on the load side.

2) When a remote input terminal is used

   Calibration input can be added using the remote input terminal.

* When applying calibration values, set the LPF setting to 1 kHz or higher.

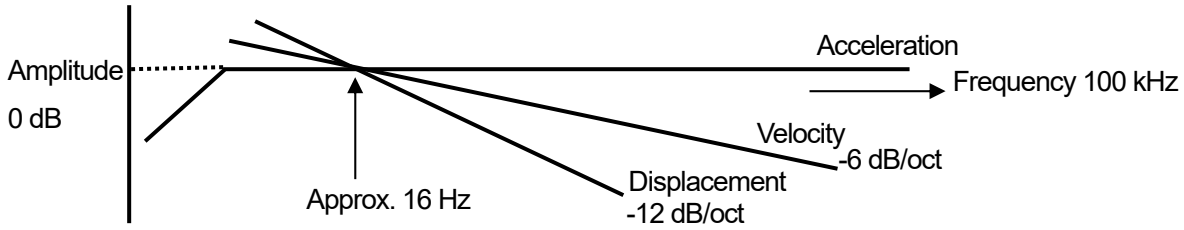
Cautions

1. Dynamic range

   Set the measurement range so that the output is below full scale when in acceleration mode.

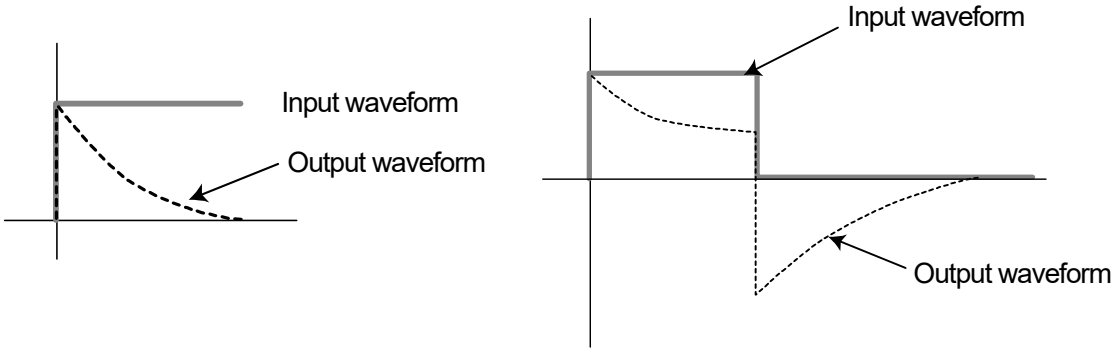
   If waveform distortion occurs due to scale over in the acceleration signal, large errors will occur in the velocity and displacement.

   With this product, when the acceleration signal frequency is about 16 Hz, the amplitude is the same as the acceleration amplitude even if the acceleration, velocity, displacement and UNIT are switched. The output amplitude decreases at a rate of -6 dB/oct for the velocity amplitude and -12 dB/oct in relation to the displacement amplitude.



2. Input waveform

   Since the charge amplifier cuts off low frequency components, the DC component cannot be measured. Therefore, the response to the step input is as shown in the figure below, resulting in an error.



Therefore, care must be taken when measuring a single impact.

Reference

The relationships between velocity (V), displacement (D), and acceleration (A) are as follows.

$V = \int A \cdot dt, \quad D = \int V \cdot dt$

Since the charge amplifier cuts off the DC component, it is suitable for periodic vibration measurement.

Here, when the maximum acceleration of periodic vibration is A_0 and the angular frequency of periodic vibration is W, they are expressed as follows.

Acceleration $A = A_0 \sin(wt)$

And,

Velocity $V = \int A \cdot dt$, then $V = -\frac{A_0}{w} \cos(wt)$

Similarly, displacement $D = -\frac{A_0}{w^2} \sin(wt)$

5. Operation theory

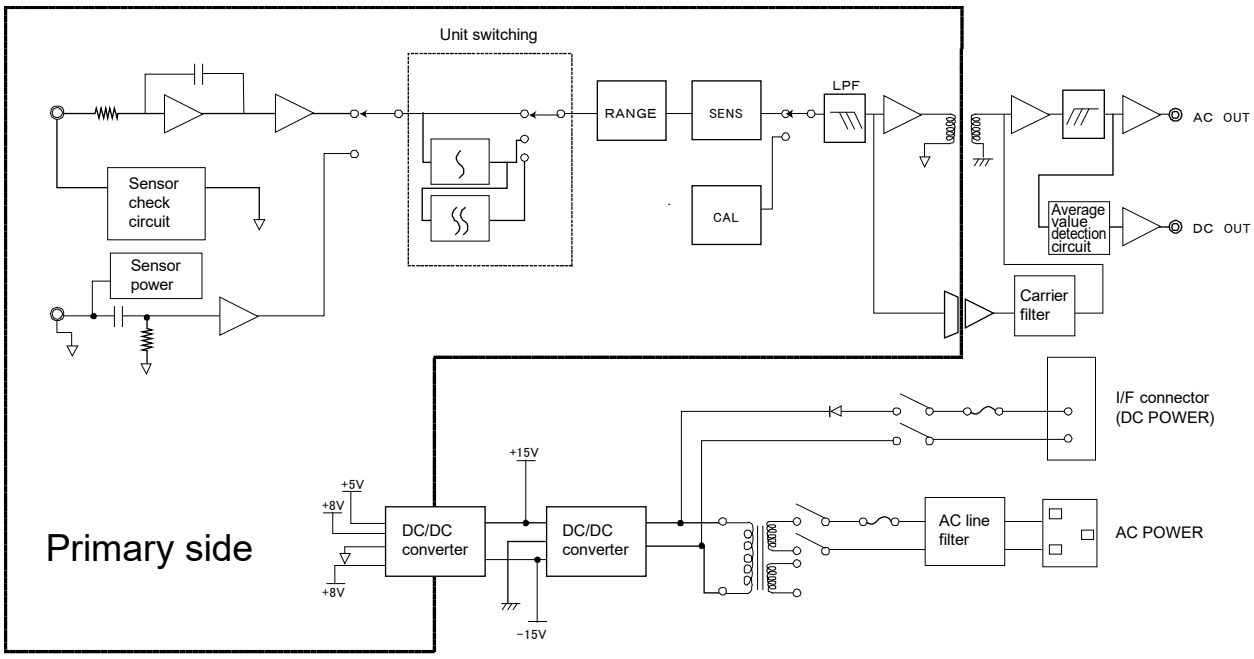


Fig. 5-1 Block diagram

5.1 Measurement signal flow

The sensor input can be switched with the slide switch on the rear panel.

The charge signal from the piezoelectric acceleration sensor is converted into a voltage by the charge input head amplifier (upper left in Fig. 5-1) and sent to the sensor input switching circuit. After that, it passes through the UNIT switching circuit (integration circuit) for acceleration, velocity, and displacement, and is amplified based on the RANGE setting and SENS setting. The low-pass filter removes unnecessary high frequency components, and the signal is sent to the isolation circuit (between input and output).

After isolation, the signal is output as AC OUT (ordinary waveform signal output) and DC OUT (AC OUT effective value (average value detection equivalent effective value) output) through a high-pass filter (removal of unnecessary components on the low frequency side). AC OUT is displayed on the 17-dot LED display, and DC OUT is displayed on the 7-segment 4-digit numerical display.

A constant current of 2 mA (maximum 24 V) for driving the sensor is supplied to the piezoelectric acceleration sensor input with a built-in amplifier, and it is sent to the aforementioned sensor input switching circuit as a voltage signal. Subsequent signal paths are the same as for piezoelectric accelerometers.

6. Maintenance

6.1 Items to be checked

This product is shipped after strict checks, but abnormal operation may occur due to natural failure of parts, performance degradation caused by deterioration, failure, poor connection, etc.

If an abnormal operation occurs, you must identify the cause and take corrective action. If you think that sufficient performance cannot be obtained, check the following contents and also page 4-1.

If you still cannot find the cause or suspect that there is a malfunction, please contact your local A&D dealer with as much details as possible about the situation, phenomenon, or location.

Table 6-1 Check items and countermeasures

Phenomenon	Check
The output fluctuates.	1. Connection of input cable (See section 3-1-1) 2. Disconnection of input cable 3. Vibration of input cable If an ordinary coaxial cable is used, noise* may occur due to vibration, kinks, etc. To eliminate noise, use a cable treated for low noise. (* Noise caused by changes in capacitance due to the change in the position of the shield cable)
No output.	1. Connection of output cable The load is heavier than the rating. Or, a short-circuit is present. 2. Disconnection of output cable Check the continuity with a tester.
Over display does not disappear.	1. Change the range switch and wait for a while. (Over-staggering longer than one minute is deemed to be an internal failure.)

6.2 Calibration

The calibration in section 4-3-3 does not include that for the input converter circuit. The following measuring instruments and jigs are required for inspection purposes.

Jig parts (example) Adapter: Microdot/BNC conversion adapter: 1 piece
BNC seat 31-10: 2 pieces
100pF standard capacitor: 1 piece
Coaxial cable with BNC connector (as short as possible): 2 pieces

Measuring instruments (example) Oscillator (0.1 Hz to 200 kHz): 1 unit
AC voltmeter (3 digits or more): 1 unit

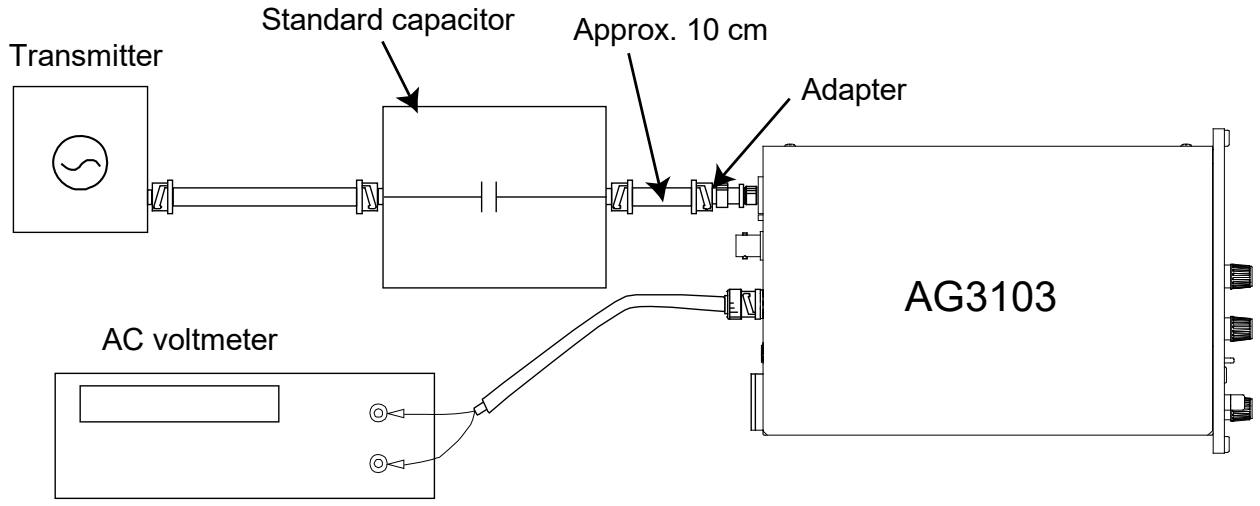


Fig. 6-1 Calibration method

With the setup shown in Fig. 6-1, an arbitrary charge can be applied to the input section of this unit.

When the capacitor capacity is C (pF), the relationship between the charge Q (pC) and the output voltage E (V) of the transmitter is

$$Q = CE$$

For example, if you want to add 54 pC, C is 100pF, so

$$E = \frac{54}{100} = 0.54 \text{ (V)}$$

If a sine wave of 0.54 Vpk is added to the input, and the range setting (9) of this unit is 1 m/s^2 and sensitivity (13) is 54.0 (pC/m /s^2), the output voltage is 7.07 V.

Note (1) Since the AC voltmeter displays an effective value, set it to 7.07 V or less when the output of this unit is a sine wave.

Note (2) Since the accuracy of the capacitor is 1% and the accuracy of this unit is 1%, the total accuracy is 2% at worst.

6.3 How to replace fuse

Follow the following fuse replacement procedure.

1. Turn the power switch to off, and then disconnect input and output cables from the amplifier unit.
2. As shown in Figure 6-2, place the unit so that its front faces left, its bottom faces forward, and its rear faces right.
3. Use a flat-blade screw driver and turn the fuses in the direction of the arrows marked on the fuse holders. (See Fig. 6-3, 90° counter-clockwise)

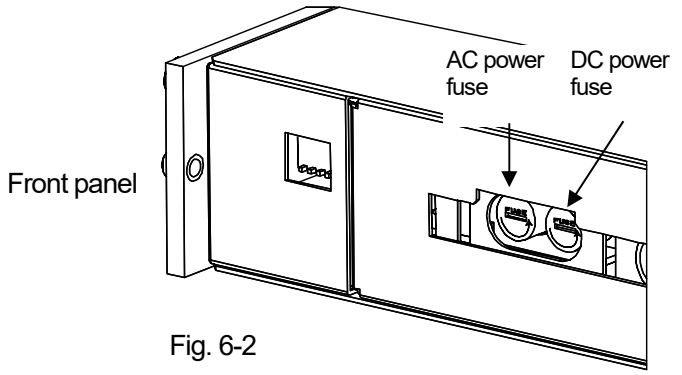


Fig. 6-2

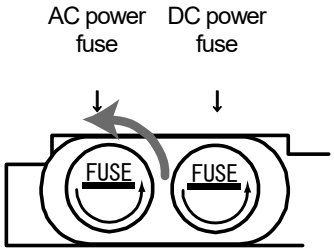


Fig. 6-3

4. Replace the fuses at the ends of the fuse holders.
5. The fuse ratings are: 100 mA for AC power supply fuse and 500 mA time-lag fuse (slow blowing) for DC power supply fuse. When replacing, be careful not to mix up AC and DC.
6. When installing the fuse holder, use a flat-blade screw driver. When pushing the fuse, keep the fuse holder slit (Fig. 6-4) vertical to the unit (Fig. 6-5, dotted line), and then press deeply and turn clockwise 90°.

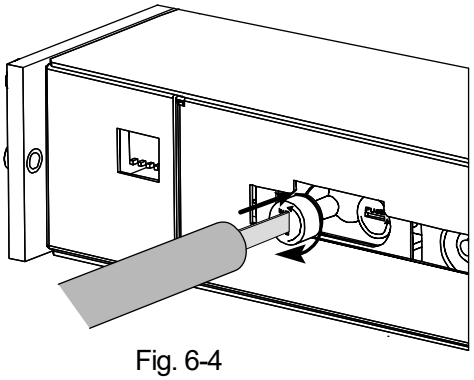


Fig. 6-4

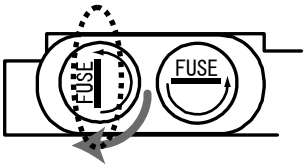


Fig. 6-5

7. Confirm that the fuse holder is fully installed in the unit as shown in Fig. 6-2. Also, confirm that the fuse holder slit (flat-blade screw driver contact portion) is parallel to the unit as shown in Fig. 6-3.
8. The fuse replacement is completed. Always investigate why the fuse blew.

⚠WARNING Power cord and input/output cable should be disconnected from the amplifier unit.
Rated and specified fuse should be used.

6.4 Changing AC power supply voltage

Follow the steps below to switch the AC power supply voltage.

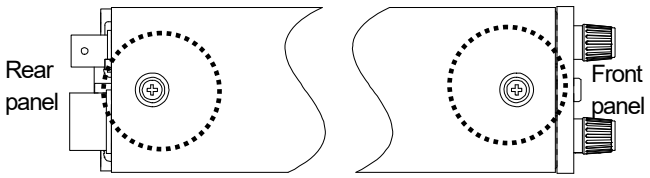


Fig. 6-6

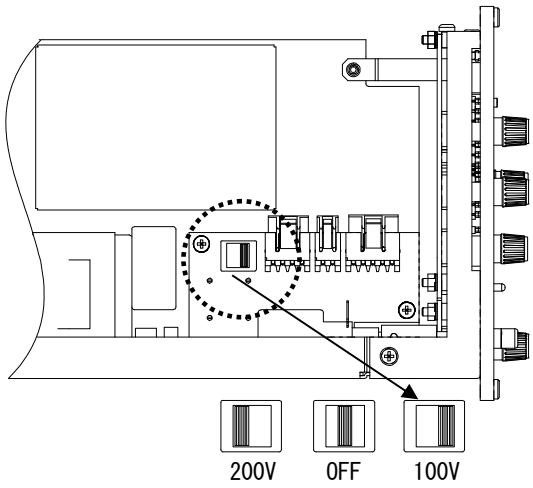
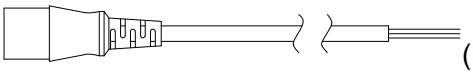


Fig. 6-7 AC power supply voltage selector

1. Turn the power off and disconnect the power cord and input/output cable from the amplifier unit.
2. Remove the cover using two screws (M3) on the top face (Fig. 6-6).
3. The AC power supply selection switch is positioned at the location shown in Figure 6-7. Selection to 200 VAC, OFF, and 100 VAC is available. Voltage switching is available by sliding the switch to the target voltage position. The AC fuse can support both 100 VAC and 200 VAC. The preinstalled fuse (100 VAC/200 VAC, 100 mA: 0334-4306) can therefore be used for both supply voltages.
4. Attach the amplifier cover so that the slit of the amplifier cover fits to the frame of the amplifier unit.
5. Fasten the screws on the top side of the unit.
6. When using 110 to 200 VAC power supply, use an optional AC power cord 200 V (Fig. 6-8: 0311-5112).



(Length: 3.5 m, bare wire)

Fig. 6-8 AC power cord 200 V

⚠WARNING

Power cord and input/output cable should be disconnected.
As the AC power cord 200 V (0311-5112) has bare wire at one end, care must be taken when connecting to the power source.
After switching the power supply voltage, change the power supply voltage rating indicated on the plate on the amplifier cover.

6.5 Switching special function settings

By switching dip switches on the bottom side of the product, settings for special functions can be made.

- Sensor check function judgment level setting
- Switching the decimal point of digital monitor (3).

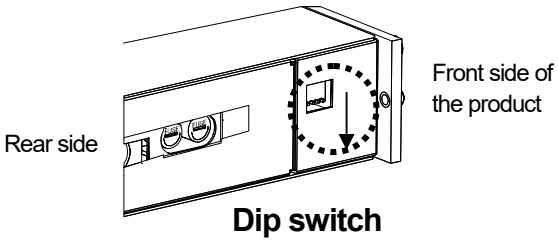
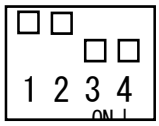
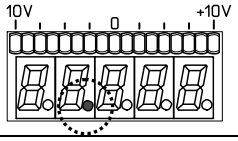
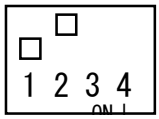
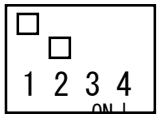
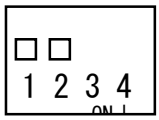
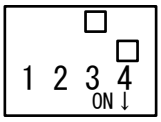
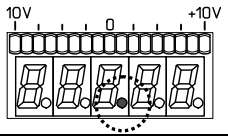
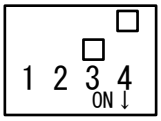
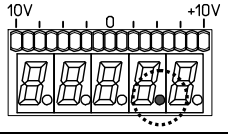
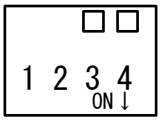
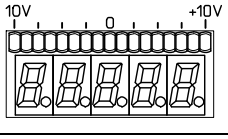


Fig. 6-9 Position of dip switches

Table 6-2 Functions of dip switches

Dip switch	Function	Description
	Standard settings (Factory settings)	No sensor check judgment (displays only measured capacitance value) Switches 1 and 2 both down: OFF Decimal point of digital monitor (3), displaying decimal point at the fourth place: 10.000 (Switches 3 and 4 are ON.) 
	Sensor check function judgment level setting (Switches 1 and 2 combination setting)	Set the sensor check function judgment level to 2 m input cable. (Switch 1 down: ON, Switch 2 up: OFF)
	Sensor check function judgment level setting (Switches 1 and 2 combination setting)	Set the sensor check function judgment level to 5 m input cable. (Switch 1 up: OFF, Switch 2 down: ON)
	Sensor check function judgment level setting (Switches 1 and 2 combination setting)	Set the sensor check function judgment level to 10 m input cable. (Switches 1 and 2 both down: ON)
	Decimal point display (Switches 3 and 4 combination setting)	Display the decimal point of digital monitor at the third place: 100.00 
	Decimal point display (Switches 3 and 4 combination setting)	Display the decimal point of digital monitor at the second place: 1000.00 
	Decimal point display (Switches 3 and 4 combination setting)	No decimal point displayed on digital monitor: 10000 

7. Specifications

Item	Description
Number of channels	1 channel/unit
Piezoelectric acceleration transducer input	Input connector selector switch: Set to "pC/m/s^2" Single input, Input impedance: 110 M Ω ±5%
Sensor check function	When using a piezoelectric acceleration sensor, disconnection of the cable and sensor is checked by measurement of the capacitance value and displayed on the LED display
Piezoelectric acceleration sensor with a built-in amplifier input	Input connector selector switch: Set to “mV/m/s^2“ Single input, Input impedance: Approx. 1 M Ω ±5% Sensor power supply: +2 mA (+24 V)
Measurement unit switching	Acceleration (m/s^2), Velocity (cm/s), Displacement (0.1 mm)
Pickup sensitivity	0.010 to 999 pC/m/s^2 (When a piezoelectric acceleration transducer is used) 0.010 to 999 mV/m/s^2 (When a piezoelectric acceleration sensor with a built-in amplifier is used)
Measurement range	Setting display with magnification: x1, x10, x100, x1,000, x10,000, Range values: 1, 2, 3.16, 5 (Without LED display and setting display of x1) 1. Input: pC/m/s^2 (Piezoelectric acceleration transducer input) Acceleration: Sensor sensibility 0.010 to 0.099 pC/m/s^2: 100 to 50,000 m/s^2 Sensor sensibility 0.100 to 0.999 pC/m/s^2: 10 to 50,000 m/s^2 Sensor sensibility 1.00 to 9.99 pC/m/s^2: 1 to 10,000 m/s^2 Sensor sensibility 10.0 to 99.9 pC/m/s^2: 1 to 1,000 m/s^2 Sensor sensibility 100 to 999 pCm/s^2: 1 to 100 m/s^2 Velocity: Sensor sensibility 0.010 to 0.099 pC/m/s^2: 100 to 50,000 cm/s Sensor sensibility 0.100 to 0.999 pC/m/s^2: 10 to 50,000 cm/s Sensor sensibility 1.00 to 9.99 pC/m/s^2: 1 to 10,000 cm/s Sensor sensibility 10.0 to 99.9 pC/m/s^2: 1 to 1,000 cm/s Sensor sensibility 100 to 999 pC/m/s^2 :1 to 100 cm/s Displacement: Sensor sensibility 0.010 to 0.099 pC/m/s^2: 10 to 5,000 mm Sensor sensibility 0.100 to 0.999 pC/m/s^2: 1 to 5,000 mm Sensor sensibility 1.00 to 9.99 pC/m/s^2: 0.1 to 1,000 mm Sensor sensibility 10.0 to 99.9 pC/m/s^2: 0.1 to 100 mm Sensor sensibility 100 to 999 pC/m/s^2: 0.1 to 10 mm

Table 7-1 Specification list for AG3103 (1)

Item	Description
(Continued) Measurement range	2. Input: mV/m/s^2 (Piezoelectric acceleration transducer with a built-in amplifier input) Acceleration: Sensor sensibility 0.010 to 0.099mV/m/s^2: 5,000 to 50,000 m/s^2 Sensor sensibility 0.100 to 0.999mV/m/s^2: 500 to 50,000 m/s^2 Sensor sensibility 1.00 to 9.99mV/m/s^2: 50 to 5,000 m/s^2 Sensor sensibility 10.0 to 99.9mV/m/s^2 : 5 to 500 m/s^2 Sensor sensibility 100 to 999mV/m/s^2 : 1 to 50 m/s^2 Velocity: Sensor sensibility 0.010 to 0.099mV/m/s^2 : 5,000 to 50,000 cm/s Sensor sensibility 0.100 to 0.999mV/m/s^2: 500 to 50,000 cm/s Sensor sensibility 1.00 to 9.99mV/m/s^2: 50 to 5,000 cm/s Sensor sensibility 10.0 to 99.9mV/m/s^2: 5 to 500 cm/s Sensor sensibility 100 to 999mV/m/s^2: 1 to 50 cm/s Displacement: Sensor sensibility 0.010 to 0.099mV/m/s^2: 500 to 5,000 mm Sensor sensibility 0.100 to 0.999mV/m/s^2: 50 to 5,000 mm Sensor sensibility 1.00 to 9.99mV/m/s^2: 5 to 500 mm Sensor sensibility 10.0 to 99.9mV/m/s^2: 0.5 to 50 mm Sensor sensibility 100 to 999mV/m/s^2: 0.1 to 5 mm
Gain accuracy	Acceleration (m/s^2): ±1% (80 Hz) Velocity (cm/s): ±2% (80 Hz) Displacement (0.1 mm): ±3% (80 Hz)
Calibration voltage	At AC OUT 80 Hz, Sine wave: 10 Vpk (20 Vp-p), Voltage accuracy: ±1%
Frequency characteristics (W/B)	0.2 Hz to 100 kHz +1 dB, -3 dB, 1 Hz to 20 kHz ±0.5 dB
Low-pass filter	100 Hz, 300 Hz, 1 kHz, 10 kHz, 20 kHz 4 pole vessel type (Descent characteristics -24 dB/oct)
High-pass filter	1 Hz, 5 Hz, 2 pole vessel type (Descent characteristics -12 dB/oct)
Maximum input charge (Piezoelectric acceleration transducer input)	1.35×10^5 pC (input charge: 10,000 to 100,000 pC) 1.35×10^4 pC (Input charge: 1,000 to 10,000 pC) 1.35×10^3 pC (Input charge: 1,000 pC or less)
Maximum input capacity (Piezoelectric acceleration transducer input)	1 µF (Input charge: 10,000 to 100,000 pC) 0.1 µF (Input charge: 1,000 to 10,000 pC) 0.01 µF (Input charge: 1,000 pC or less)

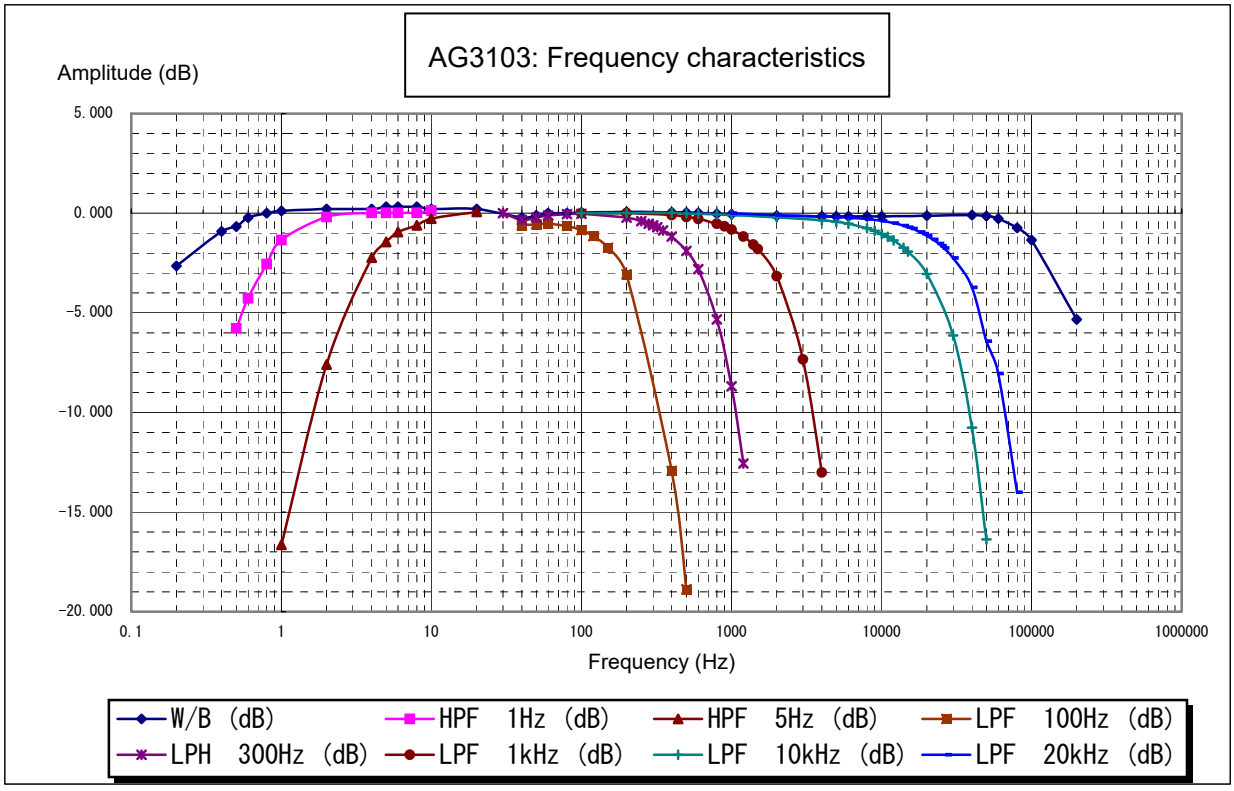
Table 7-1 Specification list for AG3103 (2)

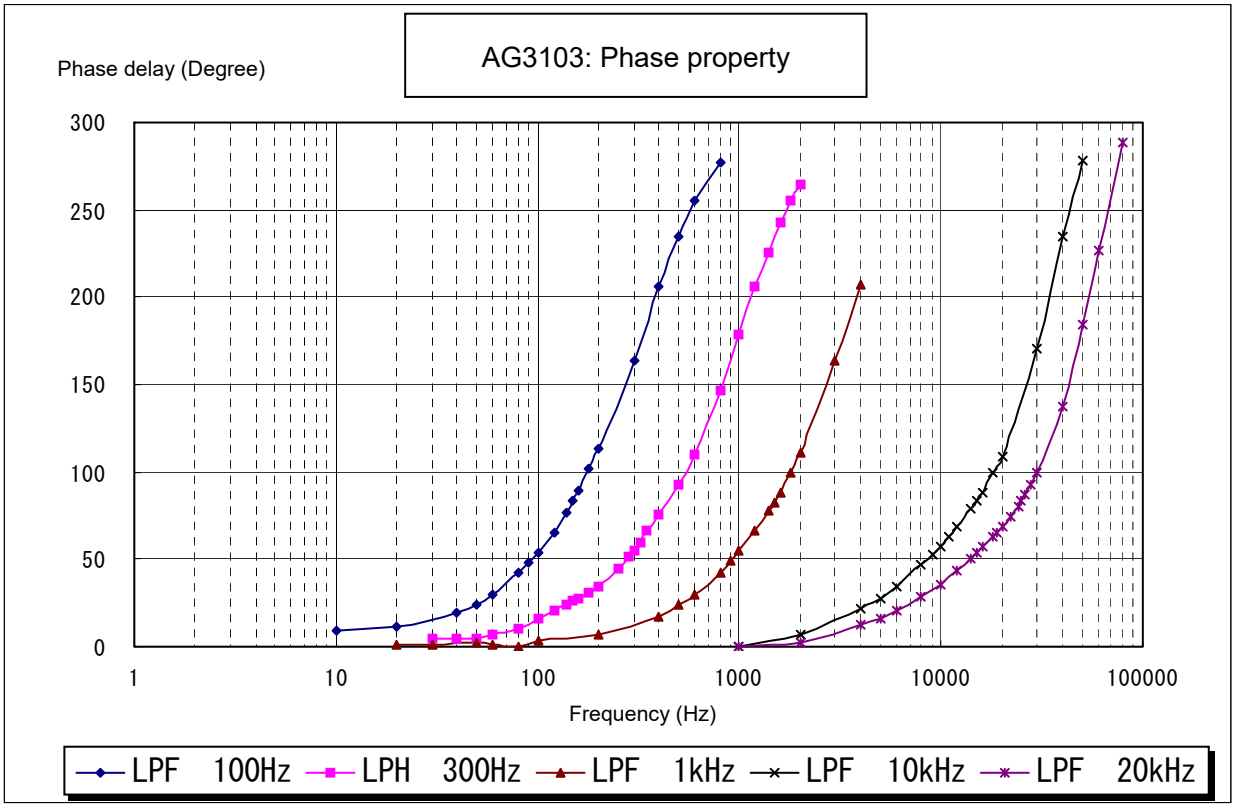
Item	Description
Noise level	1. When pC/m/s^2 (piezoelectric acceleration transducer) input, Input terminal: 1,000 pF connection, Within 0.05 pCp-p (RTI) at Pickup sensitivity 1.0 pC/m/s^2, Measurement range 1.0 m/s^2 2. When mV/m/s^2 (piezoelectric acceleration transducer) input, Within 500 mVp-p (RTO) at Pickup sensitivity 1.0mV/m/s^2, Input short circuit, Measurement range: 50m/s^2
Output	AC OUT ±10 V, ±5 mA DC OUT +7.07 V, +5 mA (average value detection equivalent effective value output) Output impedance: 0.5 Ω or less, Capacitive load: Operable up to 0.1 μF
Output monitor display	17-dot LED display (AC OUT monitor), Green LED at center blinks when voltage is within approximately ±100 mV. LEDs at both ends blink when voltage is greater than approximately ±10.5 V.
Digital display	4 1/2 digital display (DC OUT monitor), Accuracy: Within ±0.05% rdg ±1 count, Displaying location of decimal point can be changed by using the bottom setting SW.
Key lock function	Turning the key lock ON/OFF by pressing the key lock button approximately for one second. (Except CAL switch and input connector switch)
Setting value storage	Saving the value in flush memory. (Can be saved without back-up battery)
Vibration resistance	29.4m/s^2 (50 Hz, X/Y/Z 10 minutes for each) and conforming to MIL-STD-810F 514.5C-1
Withstand voltage	1 k V AC, 1 minute, between each input terminal, output and housing case 1.5 k V AC, 1 minute, between AC power input and input, output and housing case (AC power input: Includes serge resistor) 1 k V AC, 1 minute, between DC power input and input 500 V AC, 1 minute, between DC power input, output and housing case
AC power supply	85 to 132 V AC/ 180 to 264 V AC (Internal switch to change), 7 VA or less
DC power supply	10 to 30 V DC, 5 VA or less
Operating temperature and humidity range	-10 °C to 50 °C, Within 20% to 85% RH (without condensation)
Storage temperature range	-20 °C to +70 °C, Within 10% to 90% RH
External dimension	H143 (±1.0) × W49.5 (±0.5) × D253 (±2.0) mm　* Excluding protrusions
Weight	1.4 (±0.1) kg

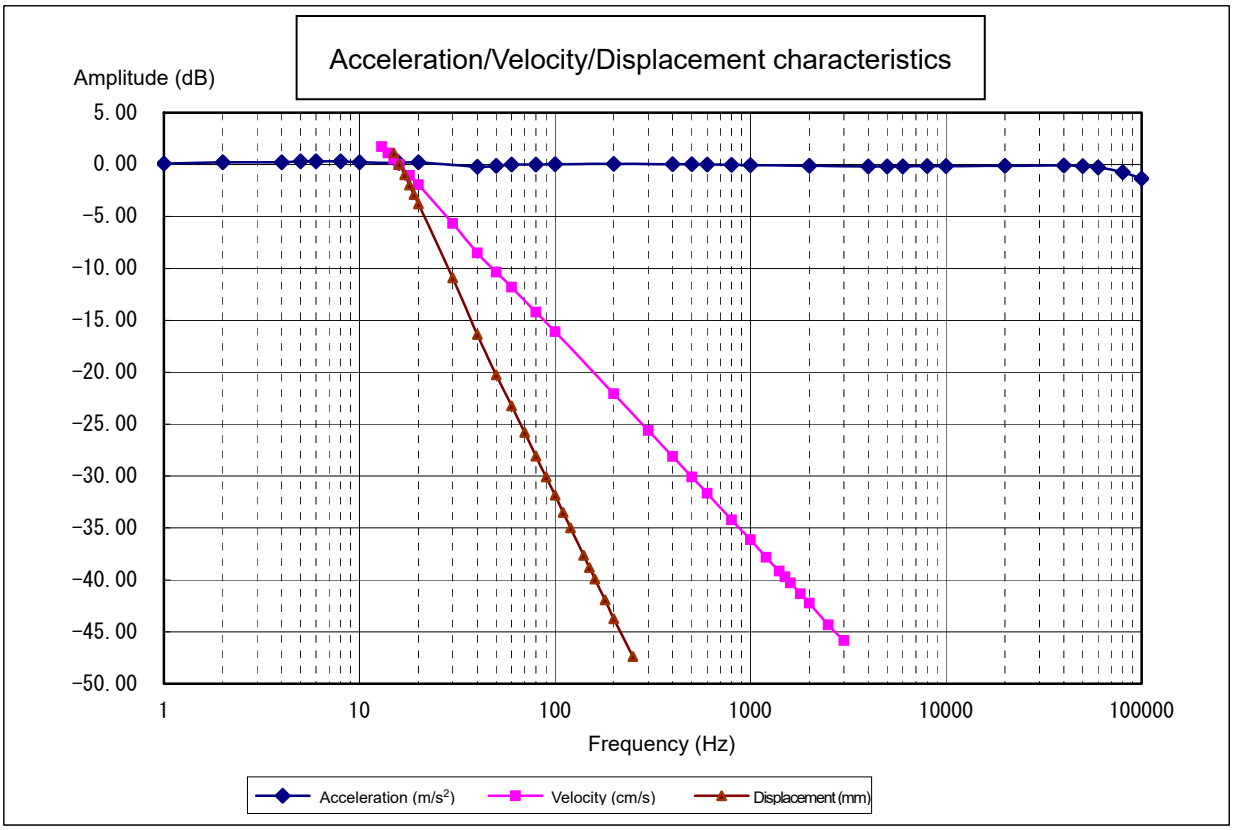
Table 7-1　Specification list for AG3103 (3)

8． References

8.1 Frequency characteristics and phase property






Acceleration/Velocity/Displacement characteristics
Amplitude (dB)
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
-45.00
-50.00
1
10
100
1000
10000
100000
Frequency (Hz)
Acceleration (m/s2)
Velocity (cm/s)
Displacement (mm)

8.2 Cable list

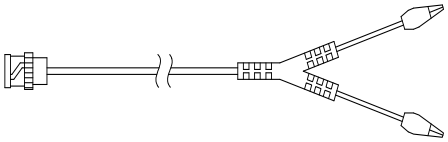
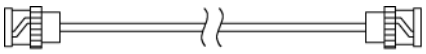
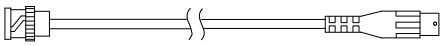
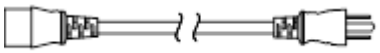
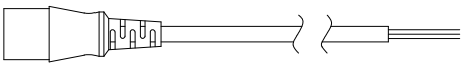
Cable	Shape	Pin allocation	Remarks
Output cable Type: 0311-2057 (Black mold)		Red: +Output (BNC core wire) Black: Common	**Length: 2 m** **Metal BNC – alligator clip (+:Red, -:Black)** **The unit: Attached as standard (One piece)**
Output cable Type: 47226			**Length: 2 m** **Metal BNC – Metal BNC**
Output cable Type: 0311-5200			**Length: 2 m** **Insulated BNC – Metal BNC, For RA,DL connection**
AC power cord For the unit/case (AC 100V) Type: 0311-5044			**Length: 2.5 m** **The unit and case: Attached as standard (One piece)**
DC power cord For the unit (200V) Type: 0311-5112			**Length: 3.5 m** **Bare wire**

Table 8-4 Cable list (1)

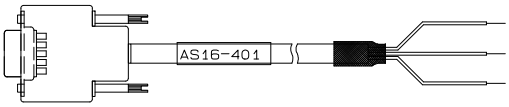
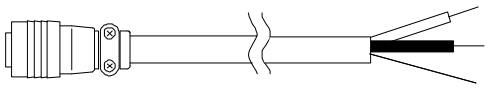
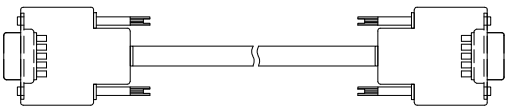
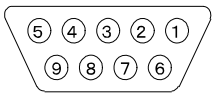
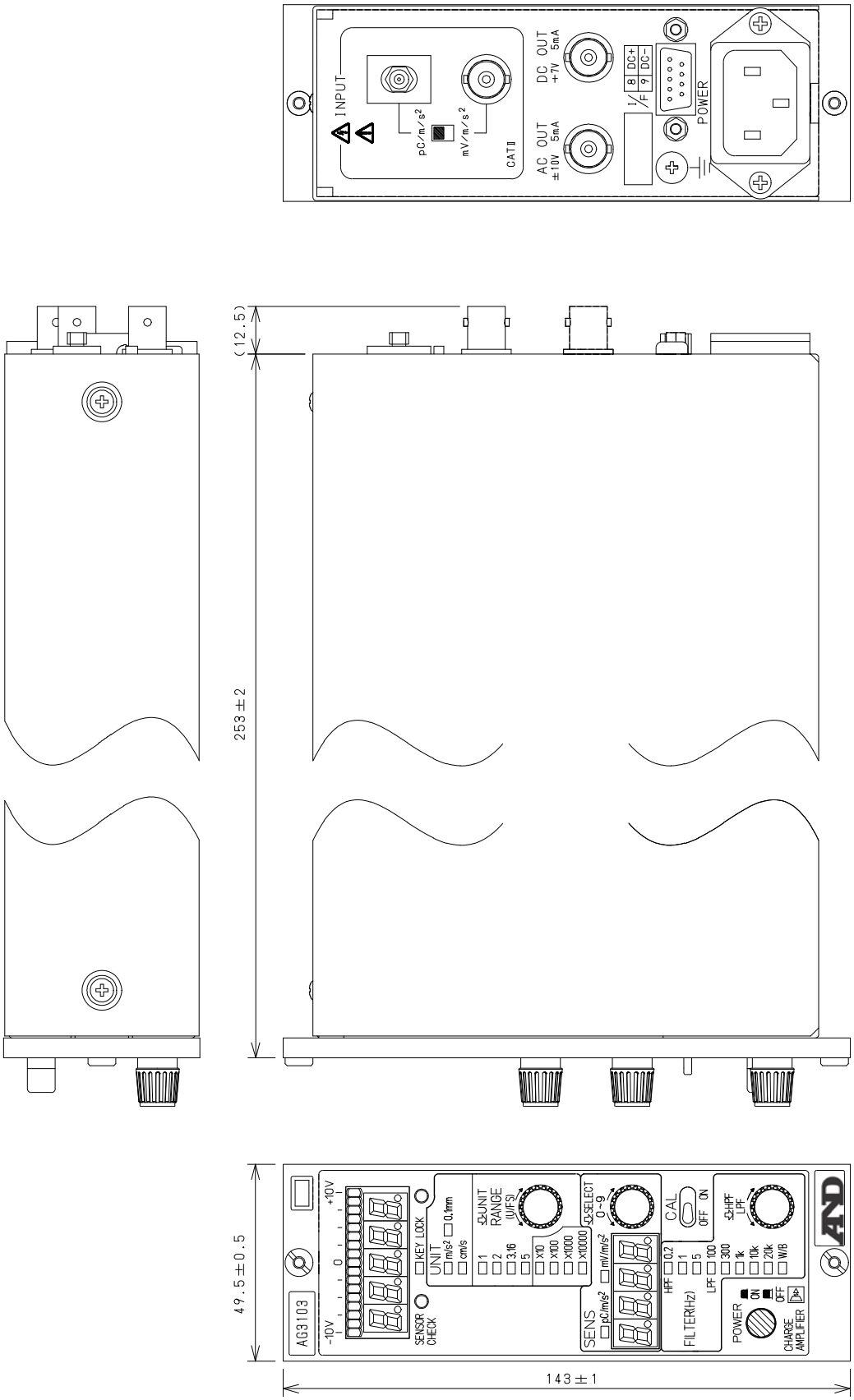
Cable	Shape	Pin allocation	Remarks
DC power cord For the unit Type: AS16-401		Red: DC (+) Black: DC (-) Green: Shield	**Length: 2 m** **D-sub 9pin male Bare wire**
DC power cord For the case Type: 47229		Red: DC (+) Black: DC (-) Shield	**Length: 2.5 m** **External diameter of cable: Φ10** **Core wire: 1.25 mm²**
Sync cable For the new cases Type: AS16-402	  **(Rear side of the unit)**	1: +CAL 2: -CAL 3: BAL 4: OSC 5: GND 6: KEYLOCK 7: GND 8: DC+ 9: DC-	**Length: 1.8 m** **D-Sub 9pin male** **---D-Sub 9pin male** **Straight cable**

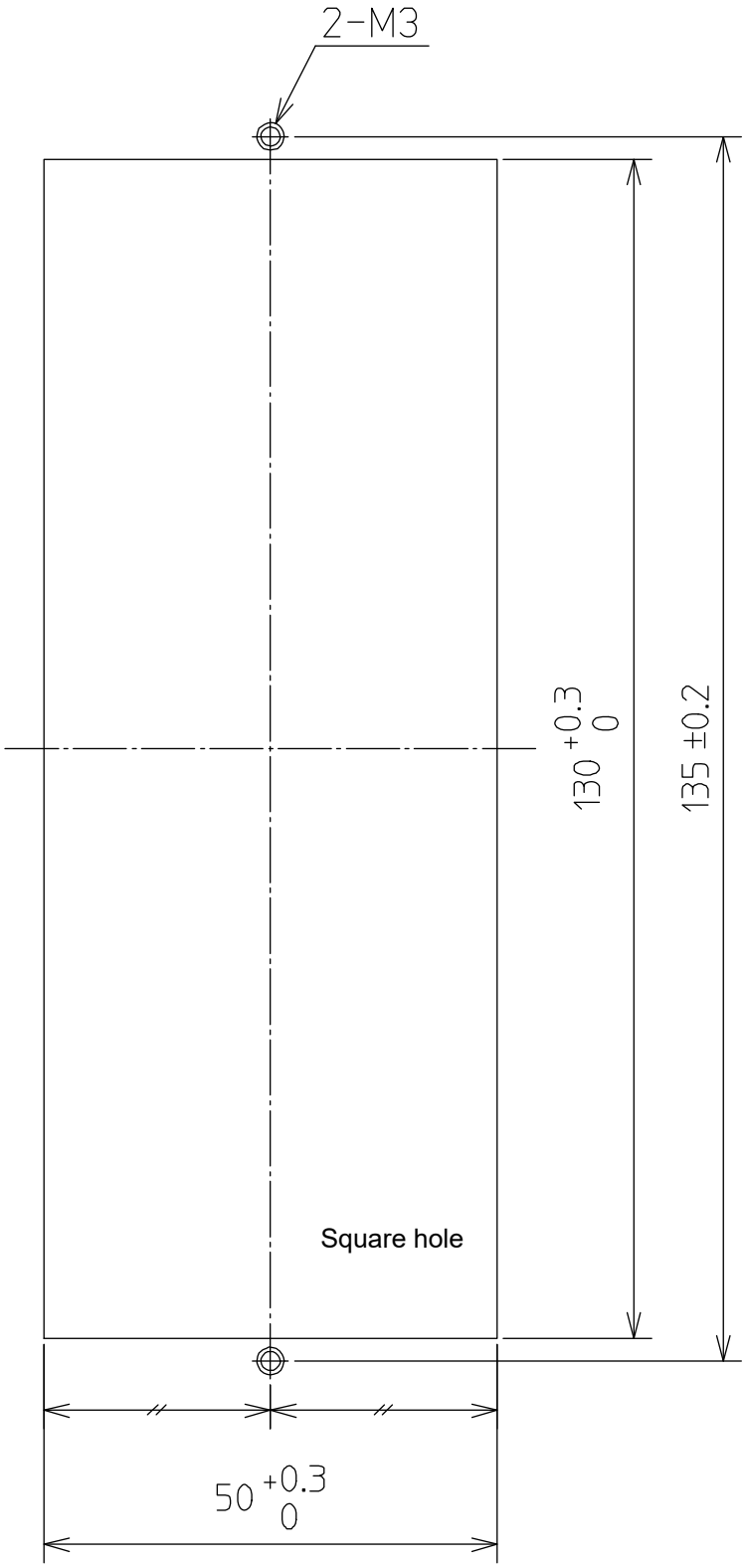
Table 8-4 Cable list (2)

8.3 External dimensions

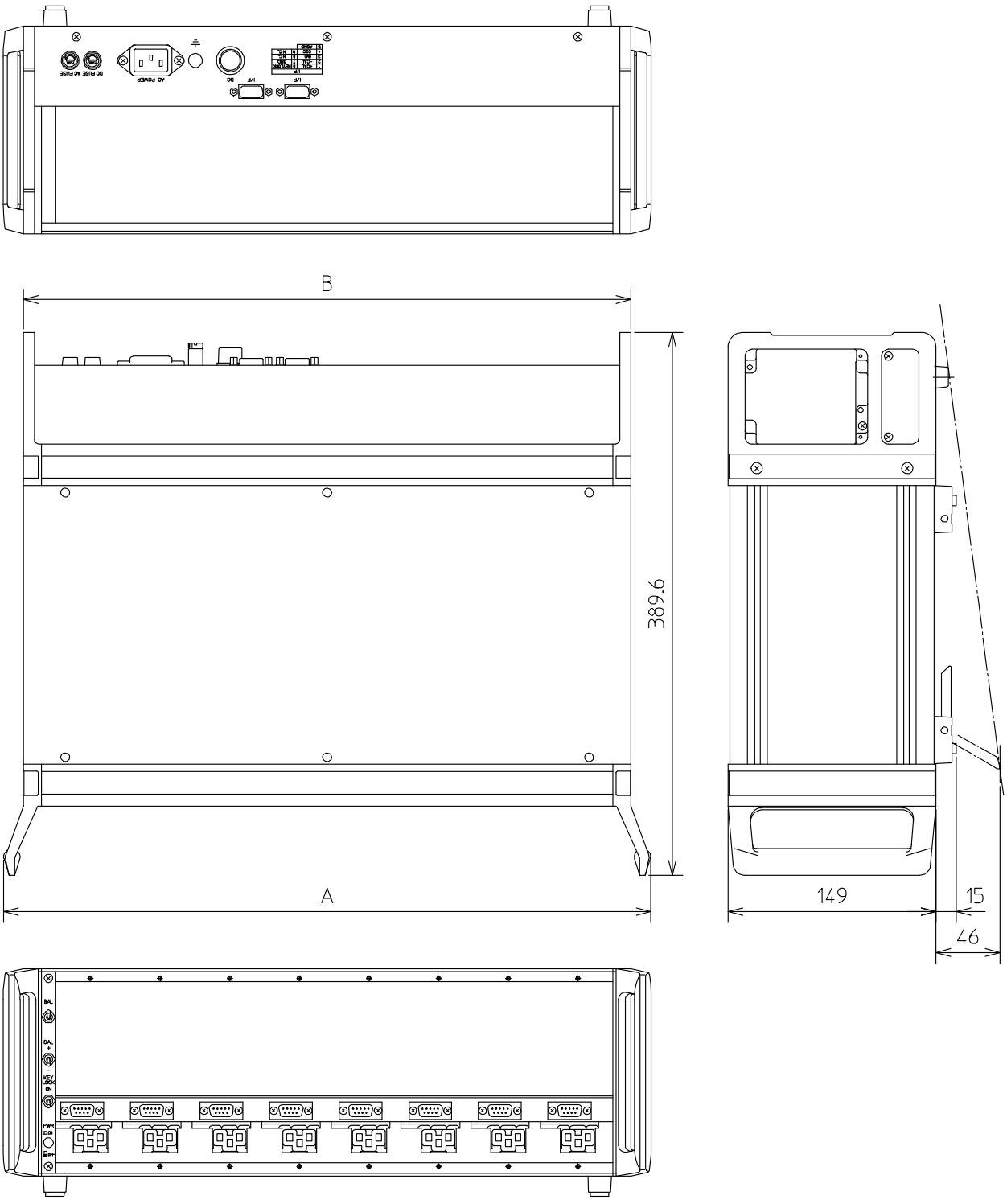
8-3-1 The unit



8-3-2 Panel cutout dimensions

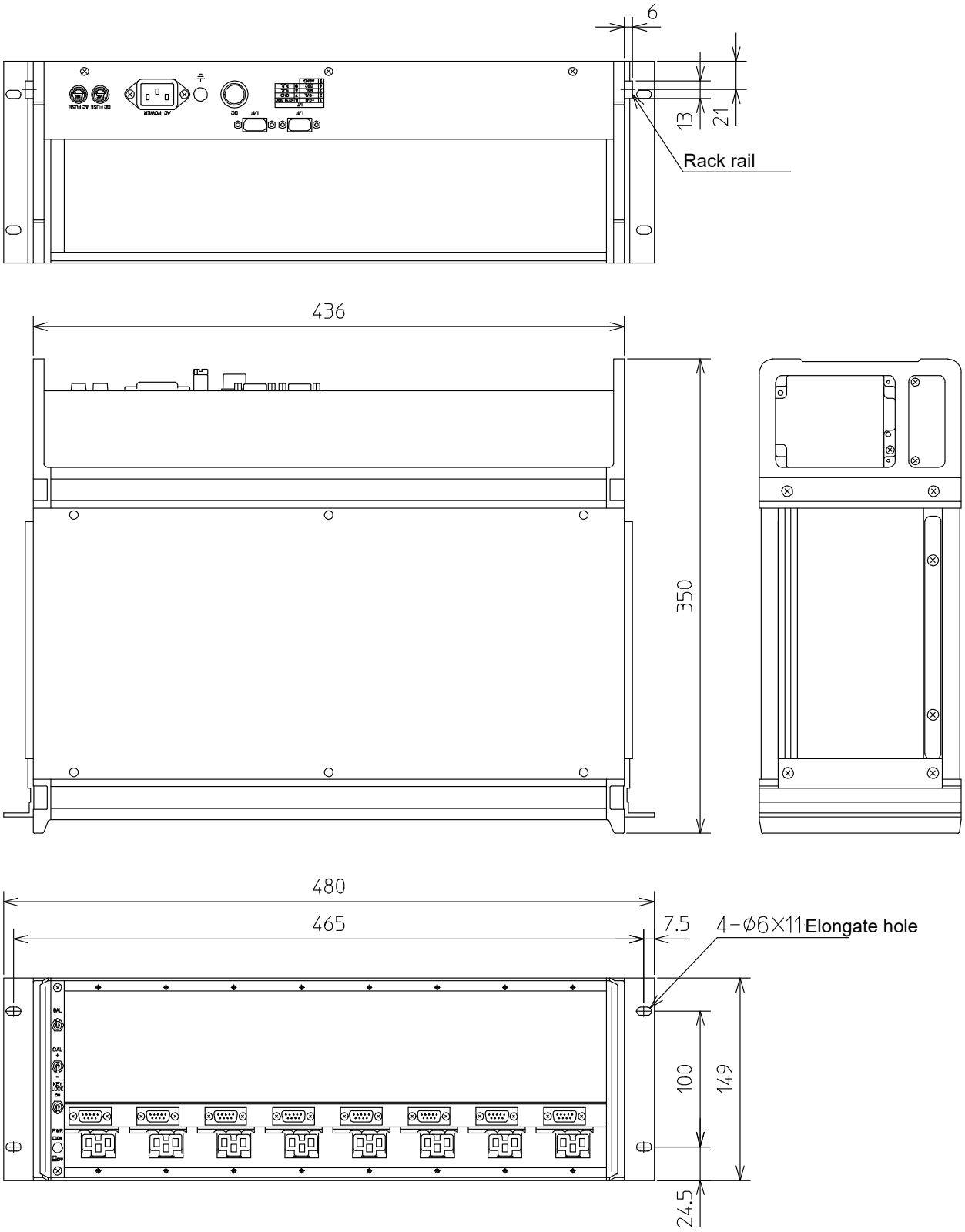


8-3-3 Benchtop case

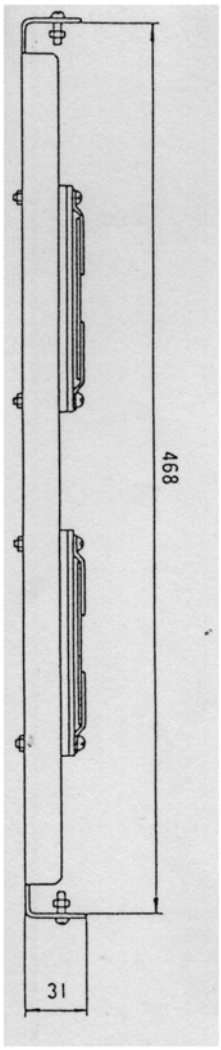


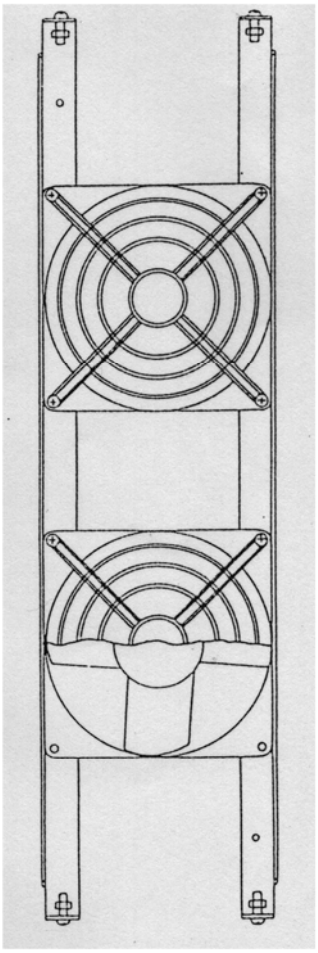
Name	Type	A	B
8CH benchtop case	AS16-106	462.6	436

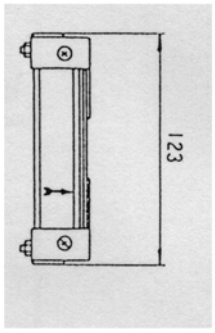
8-3-4 Rackmount case

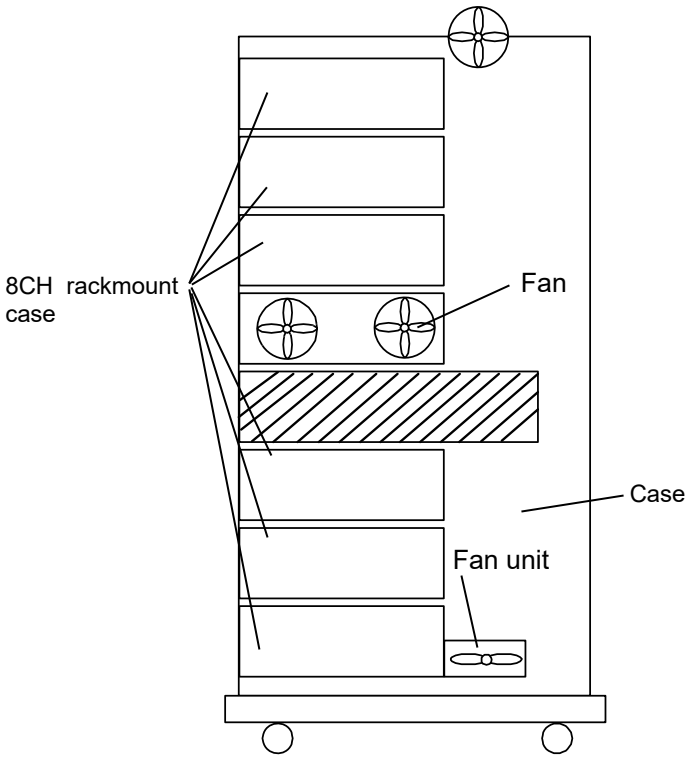


8-3-5 Fan unit









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Charge amplifier
AG3103

1WMPD4003956

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