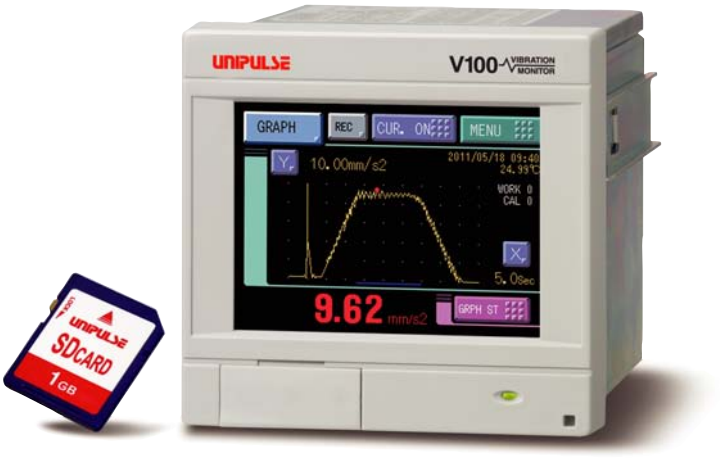


V100

VIBRATION MONITOR

OPERATION MANUAL

01JUL2016REV.1.05

UNIPULSE

Introduction

We appreciate your kind purchase of V100 Weighing Indicator.
The V100 is a vibration measuring instrument that can measure machining vibrations and then can display amplitudes of it, record it, and make pass/fail judgments by threshold value for it.
To take full advantage of high performance of V100, thoroughly read this operating manual first before use and understand the explanations contained herein for correct operating procedures.
Also, carefully store this instruction manual so that it can be referred to at any time.

Safety Precautions

For safety reasons, please read the following safety precautions thoroughly.

Installation, maintenance and inspection of the V100 should be performed by personnel having technical knowledge of electricity.
In order to have an V100 Weighing Indicator used safely, notes I would like you to surely follow divide into "⚠ WARNING" and "⚠ CAUTION", and are indicated by the following documents. Notes indicated here are the serious contents related to safely. Please use V100 after understanding the contents well.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

Warning on design

- For the entire system to function safely when the V100 becomes faulty or malfunctions, provide a safety circuit outside the V100.

Warning on installation

- Do not modify the V100. Doing so may cause a fire or an electric shock.
- Do not install in the following environments.
  - Places containing corrosive gas or flammable gas.
  - Where the product may be splashed with water, oil or chemicals.

Warning on wiring

- Do not connect a commercial power source directly to the signal input/output terminals.
- Be sure to ground the protective ground terminal.
- Before performing the following, make sure that no power is applied.
  - Wiring/connection of cables to the power input terminals.
  - Wiring/connection of cables to the signal input/output terminals.
  - Connection to the ground terminal.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
- Be sure to install the attached terminal block cover after wiring to the power input terminals. Otherwise, electric shocks may result.
- Before applying power, carefully check the wiring, etc.

Warning during startup and maintenance

- Use at a proper power supply voltage.
- Do not damage the power cord. Doing so may cause fire or electric shocks.
- Do not touch any signal input/output terminal while applying power. Doing so may cause electric shocks or malfunctions.
- If the cover of the main body is opened, it may cause an electric shock internally. Even if the power is off, the internal capacitor is charged. Contact us for internal inspection or repair.
- In the case of smoke, an abnormal smell or strange sound, immediately turn off the power, and disconnect the power cable.
- As for the batteries used in V100, do not at any time dismantle the batteries, change the batteries shape by subjecting it to pressure or throw the batteries into fires as these may cause the batteries to explode, catch fire or leak.
  - Battery Model: CR2477-1HF made by Matsushita Battery Industrial Co., Ltd.
    Nominal voltage: 3V
    Nominal electric capacity: 1000mAh
    Battery life: Approx 5 to 7 years

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

Caution on installation

- Use the V100 as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Where the temperature/humidity exceeds the range of the specifications.
  - Outdoors, or where the altitude exceeds 2000m.
  - Places exposed to direct sunlight
  - Dusty places
  - Poor-ventilated places
  - Places containing large quantities of salt or iron powder.
  - Where the main body is directly affected by vibrations or shocks.
- Take adequate shielding measures when using at the following locations.
  - Near a power line.
  - Where a strong electric field or magnetic field is formed.
  - Where static electricity, relay noise or the like is generated.

Caution on wiring

- Tighten the screws for the signal input/output terminals at the specified torque.
  If they are loose, shorts, fire or malfunctions may occur.
  Tightening torque: 0.5N•m
- For external inputs/outputs and RS-232C, use shielded cables.

Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- If the V100is not used by the specified method, its protective performance may be impaired.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Do not wipe with a wet rag, or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the V100. In the case of heavy contamination, wipe off the contamination with a cloth after dipping it into a diluted neutral detergent and wringing it well, and then wipe with a soft, dry cloth.

Caution during transportation

- When the V100 is shipped, spacers made of corrugated cardboard are used as cushioning materials.
  Though it is factory-designed so that shocks can sufficiently be absorbed, breakage may result if shocks are applied when the spacers are reused for transportation. If you send the V100 to us for repair, etc., take adequate measures against shocks by using polyurethane materials, etc., separately.

Caution during disposal

- If you dispose of the product, handle it as industrial waste.

RoHS-compliant product

The parts and attachments (including the instruction manual, packaging box, etc.) used for this unit are compliant with the RoHS Directive restricting the use of hazardous substances with regard to adverse effects on the environment and human body.

What is RoHS?

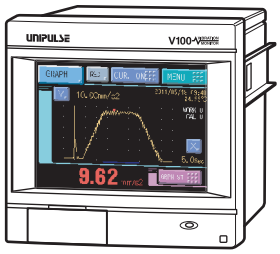
It is an abbreviation for Restriction on Hazardous Substances, which is implemented by the European Union (EU). The Directive restricts the use of six specific substances in electric and electronic equipment handled within EU borders. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).

Contents

1 OUTLINE

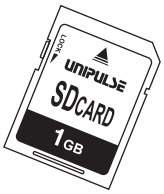
1-1. Contents of the package

The packaging box contains the following.
Be sure to check them before use.

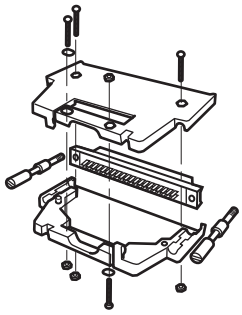


V100 body・・・1

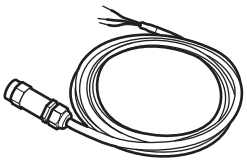
V100 operation manual・・・1



SD card・・・1



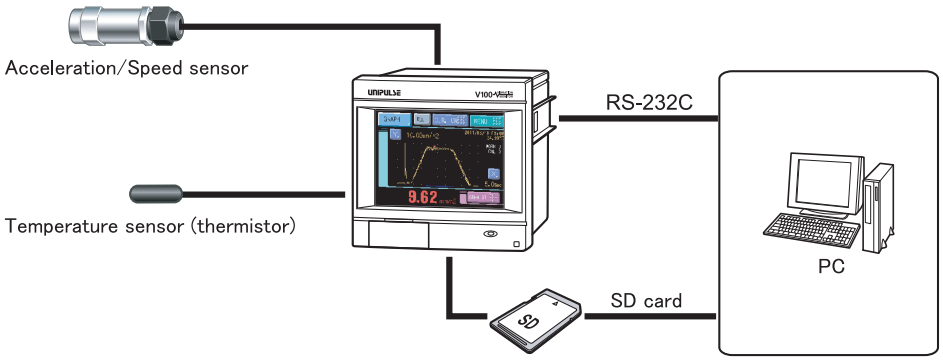
External input/output connector
・・・1set
[Connector: FCN-361J040-AU
Cover: FCN-360C040-B]



Acceleration sensor・・・1
(with magnet)

Temperature sensor・・・1

1-2. About connectable devices

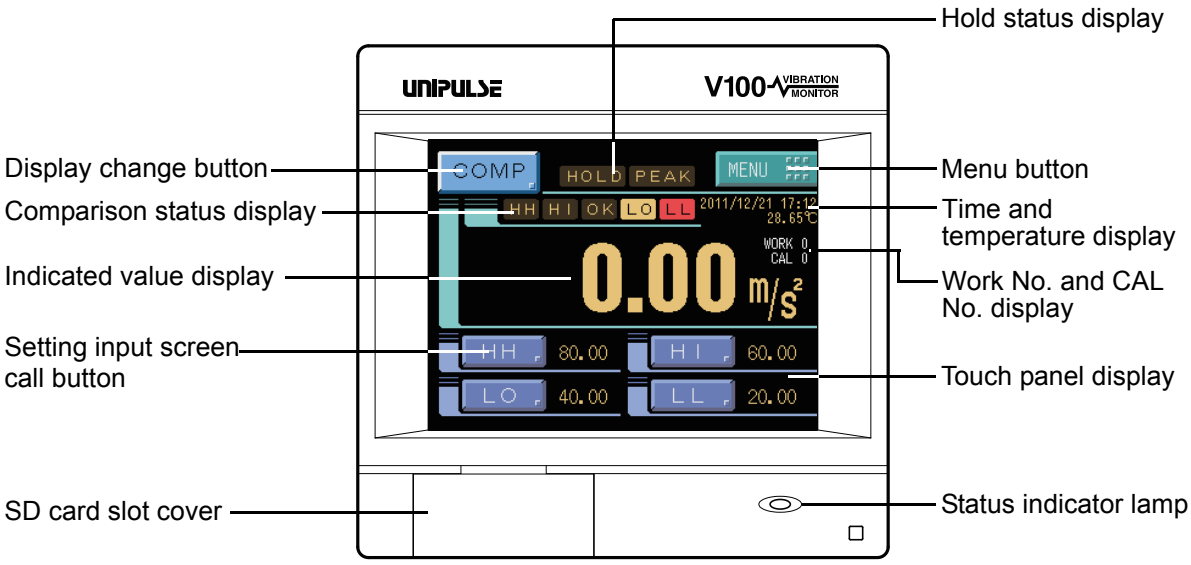


Chapter 1

OUTLINE

1-3. Appearance description

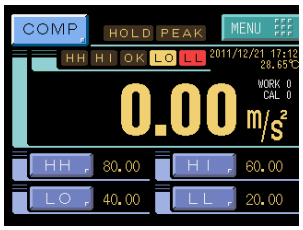
■Front panel



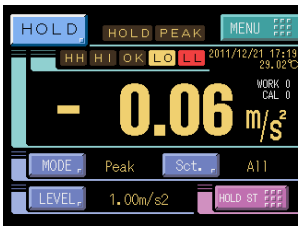
Touch panel display

This is the touch panel display for displaying an indicated value and graph set value and for setting various setting items of the V100. During measurement, a comparison display, hold display, graph display and FFT display can be selected according to the function in use.

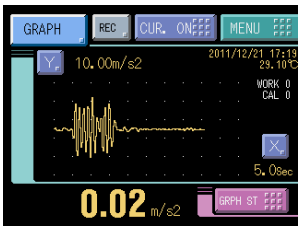
Comparison display



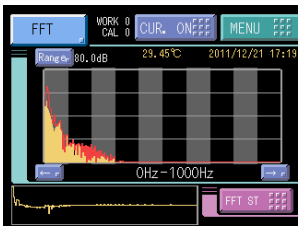
Hold display



Graph display



FFT display

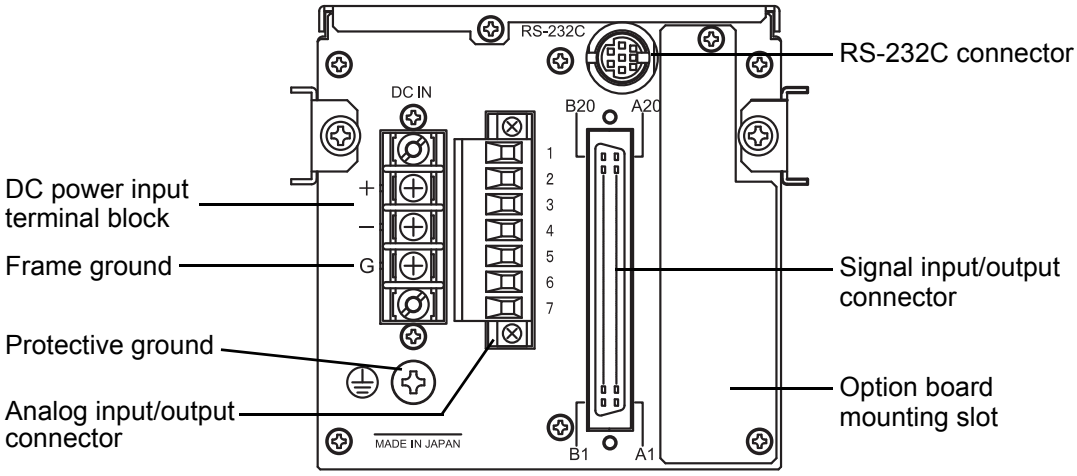


Status indicator lamp

This lamp indicates the power and internal processing status.

Lamp condition	Power and internal processing status
Lights (green)	Power ON
Flashes (orange)	Writing in the internal NOV RAM (nonvolatile memory); or processing with an SD memory card when the SD card slot option is mounted. Do not turn off the power of the main unit while this lamp is flashing.
Flashes (yellow)	The voltage of the lithium battery for internal memory backup has dropped. The battery needs to be replaced. Ask us for replacement of the battery.

■Rear panel

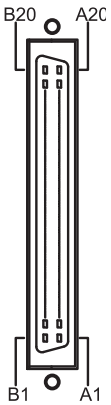


Analog input/output connector

1	THERMISTOR
2	THERMISTOR
3	DC OUT (+5V 30mA max)
4	ACC SIG
5	GND
6	ACC MONITOR+
7	ACC MONITOR-

Signal input/output connector

A1	in	T/H	WORK0	in	B1
A2	in	SECTION	WORK1	in	B2
A3	in	GRAPH TRIG	WORK2	in	B3
A4	in	FFT TRIG	WORK3	in	B4
A5	in	N.C.	N.C.	in	B5
A6	in	N.C.	N.C.	in	B6
A7	in	N.C.	CAL0	in	B7
A8	in	LOCK	CAL1	in	B8
A9	—	COM1	COM1	—	B9
A10	—	COM1	COM1	—	B10
A11	—	COM2	COM2	—	B11
A12	—	COM2	COM2	—	B12
A13	out	HH	FFT OK	out	B13
A14	out	HI	FFT NG	out	B14
A15	out	OK	N.C.	out	B15
A16	out	LO	N.C.	out	B16
A17	out	LL	N.C.	out	B17
A18	out	HOLD END	N.C.	out	B18
A19	out	RUN	N.C.	out	B19
A20	out	EVENT	SD CARD	out	B20



Adaptable plug (FCN-361J040-AU) (manufactured by FUJITSU COMPONENT or equivalent)
Connector cover (FCN-360C040-B (manufactured by FUJITSU COMPONENT or equivalent)
(Connector & Cover optional type: CN52)

THERMISTOR	The terminal for connecting to a temperature sensor (accessory).

See the section on "■Temperature sensor connection" on page 8 for connection.

DC OUT ACC SIG GND	The terminal for connecting to an acceleration sensor (accessory).

See the section on "■Acceleration sensor connection" on page 8 for connection.

ACC MONITOR+ ACC MONITOR-	The voltage output terminal for sensor input monitor. → "7-15.Monitor output filter" on page 54

See the section on "■Voltage output connection" on page 8 for connection.

COM1	The terminal common to input signals.
WORK0 WORK1 WORK2 WORK3	Selects the work No. for the multi-hold function. → "7-9.Measurement work selection by external input" on page 45
T/H SECTION	The input for controlling the hold signal. → "7-8.Hold Functions" on page 38
GRAPH TRIG	The input for controlling the drawing of graphic display. → " ■ Graph plotting" on page 49
FFT TRIG	The input for controlling the drawing of FFT display. → "5-2.Vibration diagnosis function" on page 26
CAL0 CAL1	Selects the CAL No. for calibration value selection function. → " ■ Calibration value selection by external signal input" on page 17
LOCK	The screen and key input LOCK terminal. → "7-16.Screen lock/key lock (LOCK function selection)" on page 55

See the section on "■External I/O connection" on page 9 for connection.

COM2	The terminal common to output signals.
OK HI LO HH LL	Outputs the OK signal. Outputs the HI signal. Outputs the LO signal. Outputs the HH signal. Outputs the LL signal. → "7-7.Comparison functions" on page 34
RUN	Outputs the RUN signal. → "7-18.RUN output" on page 56
FFT OK FFT NG	Outputs the OK signal by FFT comparison function. Outputs the NG signal by FFT comparison function. → "5-3.FFT comparison functions" on page 29
HOLD END (H/E)	Outputs the hold end signal. → "7-8.Hold Functions" on page 38
EVENT	Outputs the event signal when graph plotting ends. → "7-17.Event output at the end of graph plotting" on page 55
SD CARD	Turns OFF with an error in the SD memory card or while waveform data is automatically saved.

See the section on "■External I/O connection" on page 9 for connection.

DC power input terminal block

Connect the DC power cord. The power supply voltage is 24V DC (±15%).

Adaptable crimp terminal [TMEV1.25-3S]

Frame ground (Functional ground)

This is a ground terminal block. Be sure to ground the F.G. terminal to prevent electric shocks and failures due to static electricity. (There is continuity between the casing and F.G. terminal.)

Protective ground

Protective ground terminal. Be sure to ground the protective ground terminal to prevent electric shocks and failures due to static electricity. (There is continuity between the casing and protective ground terminal.)

RS-232C connector

RS-232C connector to transmit / receive measurement data and status information, etc.
The adaptable plug is HOSIDEN-manufactured TCP8080-015267 or equivalent.
Optionally available RS-232C cable (cross) [CA81-232X] is connectable.

Optional slot

1-4. Use procedure

① Connect peripheral equipment such as a sensor.	⇒ 2.INSTALLATION & CONNECTION
② Perform calibration	⇒ 4.CALIBRATION
③ Make vibration detection settings.	⇒5.VIBRATION DETECTION AND DIAGNOSIS FUNCTIONS
④ Set the hold function.	⇒ 7-8.Hold Functions Hold setting
⑤ Set the comparison function.	⇒ 7-7.Comparison functions
⑥ Set the graph function.	⇒ 7-14.Waveform display
⑦ Save measurement data on the SD card.	⇒ 8-2.Measurement data save
⑧ Perform measurement.	⇒ 7-8.Hold Functions Hold operation How to specify the hold detection section
⑨ Check the measurement history.	⇒ 6.MEASUREMENT RECORD

* For the setting methods of the V100, see the section "3.SETTING PROCEDURE" on page 12.

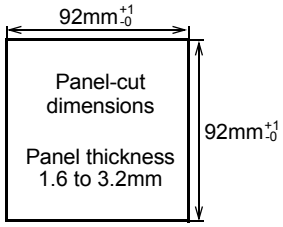
* The V100 also comes with useful functions other than those described in this procedure. Use other items after carefully reading this operation manual.

2 INSTALLATION & CONNECTION

2-1. Installation

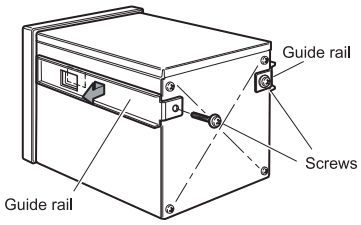
To install the V100 into a control panel, use the following procedure.

1. Make a hole in the panel according to the panel-cut dimensions.

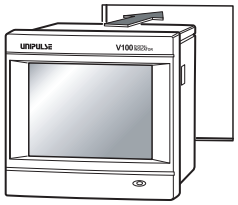


2. Remove the screws (two), and remove the guide rails from both sides.

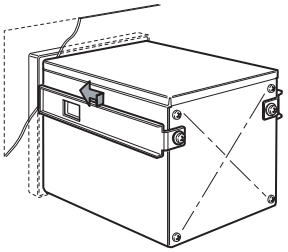
* Do not use other screws than those installed to the V100 body.



3. Fit in the V100 from the front of the panel.



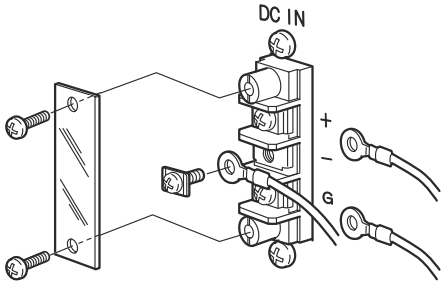
4. Install from the rear the guide rails having been removed from both sides in Step 2, and fix them with the screws (two).



2-2. Connection

■Power input connection

Connect the positive (+) side of the power source to the red screw side of the terminal block on the back of the V100, and its negative (-) side to the black screw side. The input voltage is 24V DC(±15%).



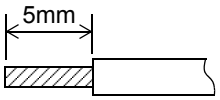
CAUTION

Be aware that the voltage drops depending on the wire thickness and length. Also, never input an AC power source. Doing so will cause a failure.

■Analog input / output terminals connection

How to connect

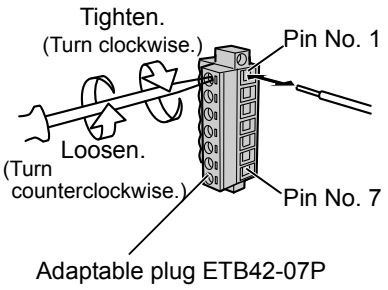
1. Strip 5mm of the covering of the wire to be connected.
The size of connectable wires is from 0.21 to 3.31mm^2 (AWG12 to 24).



2. Twist the tip to such an extent that it will not spread out.

3. Loosen the screw with a screwdriver to open the connection hole.
A Phillips screwdriver 3 to 3.5mm #1 in shaft diameter is recommended. (Precision screwdriver, etc.)

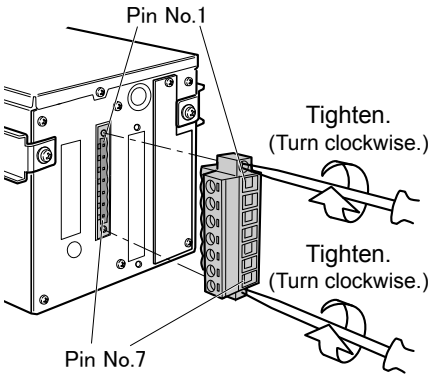
4. Insert the wire into the connection hole so as not to let the tip spread out.



5. Tighten the screw with the screwdriver.
0.5Nm of tightening torque is recommended.

6. Lightly pull the wire to make sure that it is securely clamped.

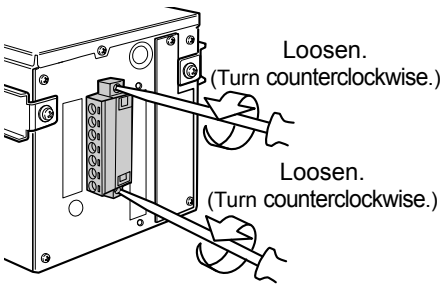
7. Insert the wire-connected plug into the V100 body, and tighten the screws (two).



How to remove the terminal block

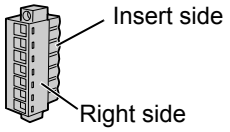
1. Loosen the screws (two) with a screwdriver.

2. Remove the terminal block by giving it a strong pull.



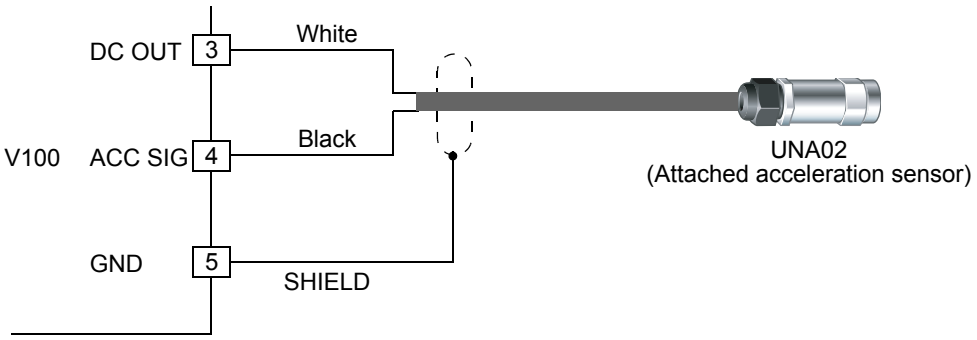
Attention

When installing the terminal block to the V100 body, check its orientation.
(See the illustration at the right.)



■Acceleration sensor connection

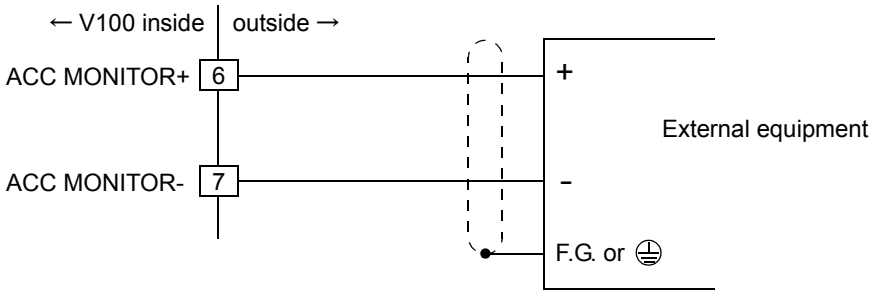
Acceleration sensor UNA02 connection



■Temperature sensor connection

■Voltage output connection

The monitor output terminal is an interface to extract analog voltage proportional to sensor signal inputs.



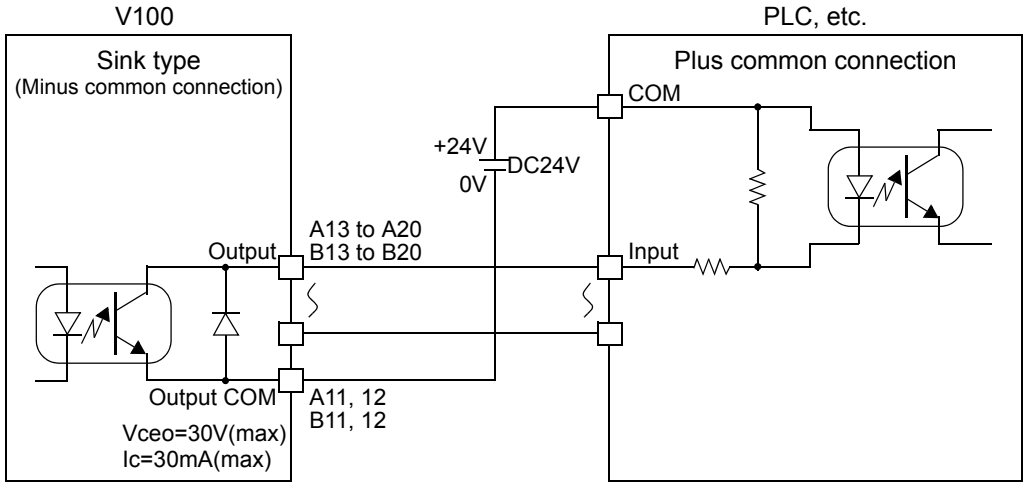
- Since the ACC MONITOR terminals are not insulated from the internal circuit, use two-core shielded twisted pair wires for connection with external equipment, and carry out with as short a wiring as possible.
- Do not short-circuit. Doing so will cause a failure.
- Do not apply voltage from the outside. Doing so will cause breakage.

■External I/O connection

External output equivalent circuits and example connections (sink type)

The external output circuit is operated through an open collector. A11/12 (B11/12) COM2 is the common terminal. The open collector output capacity is 30mA and the withstand voltage is up to 30V.

- In case of minus common connection

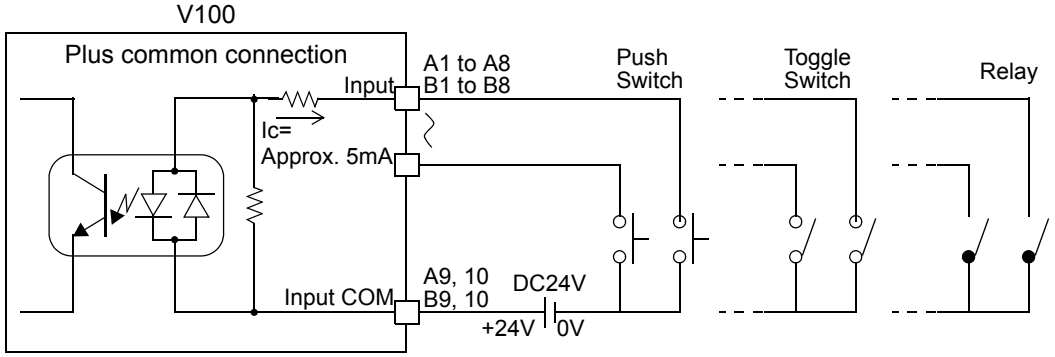


External input equivalent circuits and example connections

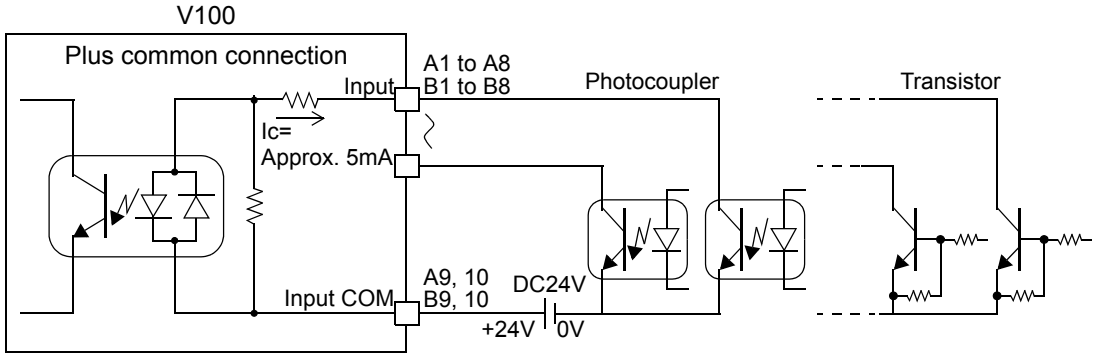
A signal is inputted to the signal input circuit by short-circuiting or opening the input terminal and the COM1 terminal. Short-circuiting is effected by means of a contact (such as a relay or a switch) or a noncontact (such as a transistor or an open-collector TTL).

- In case of plus common connection

When you connect the relay and the switch, etc..

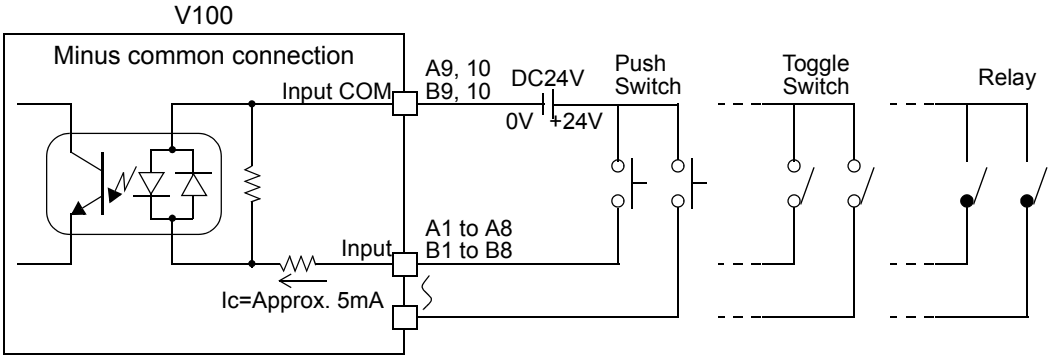


When you connect the transistor and the photocoupler, etc..

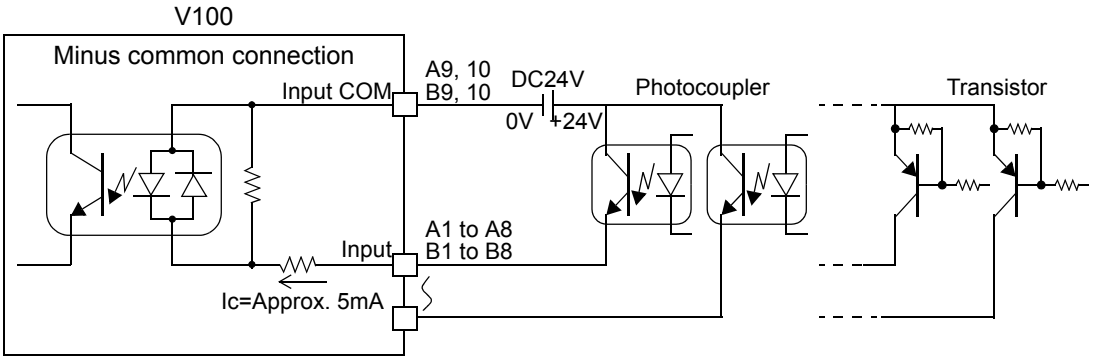


- In case of minus common connection

When you connect the relay and the switch, etc..



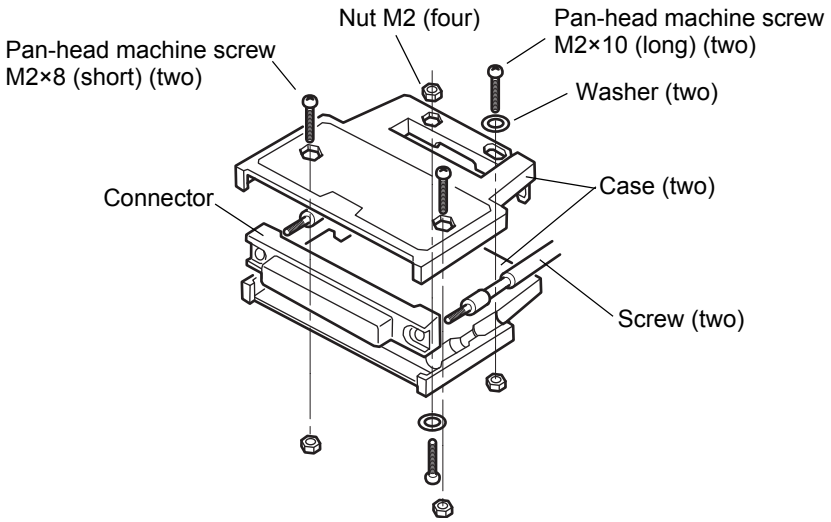
When you connect the transistor and the photocoupler, etc..



Attention

- Connect elements that can pass Ic=5mA or more.
- The leak current of the elements connected should be 400μA or less.

How to assemble the connector



1. Set the connector and screws (two) into the grooves of the case (one side).

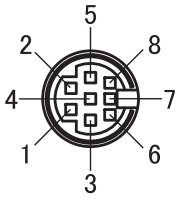
2. Cover with the other case, and fit the cases.

3. Tighten the M2×8 pan-head machine screws (two).
Tighten the M2×10 pan-head machine screws (two).
Be aware that washers should be set to the M2×10 pan-head machine screws (two).

■RS-232C interface connection

This connector connects the RS-232C.

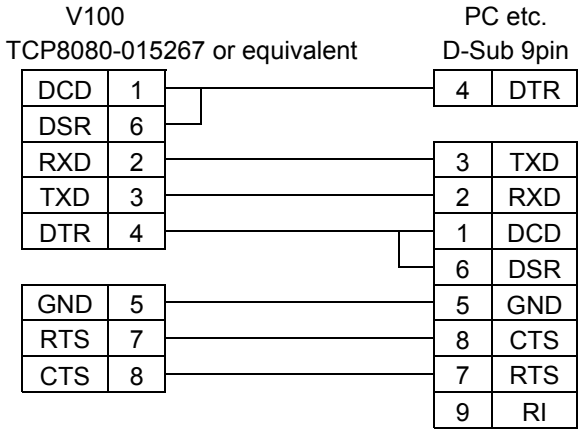
Pin No.	Signal name
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
Case	F.G.



Example of cabling

The following shows an example of connection between DTE-DTE terminals. This will require modification depending on the equipment to be connected. For details, see the operation manual of the equipment to be connected.

Adaptable plug (TCP8080-015267) (manufactured by HOSIDEN or equivalent)
(Connector optional type: CN60)



Cabling diagram
CA81-232X (optional)

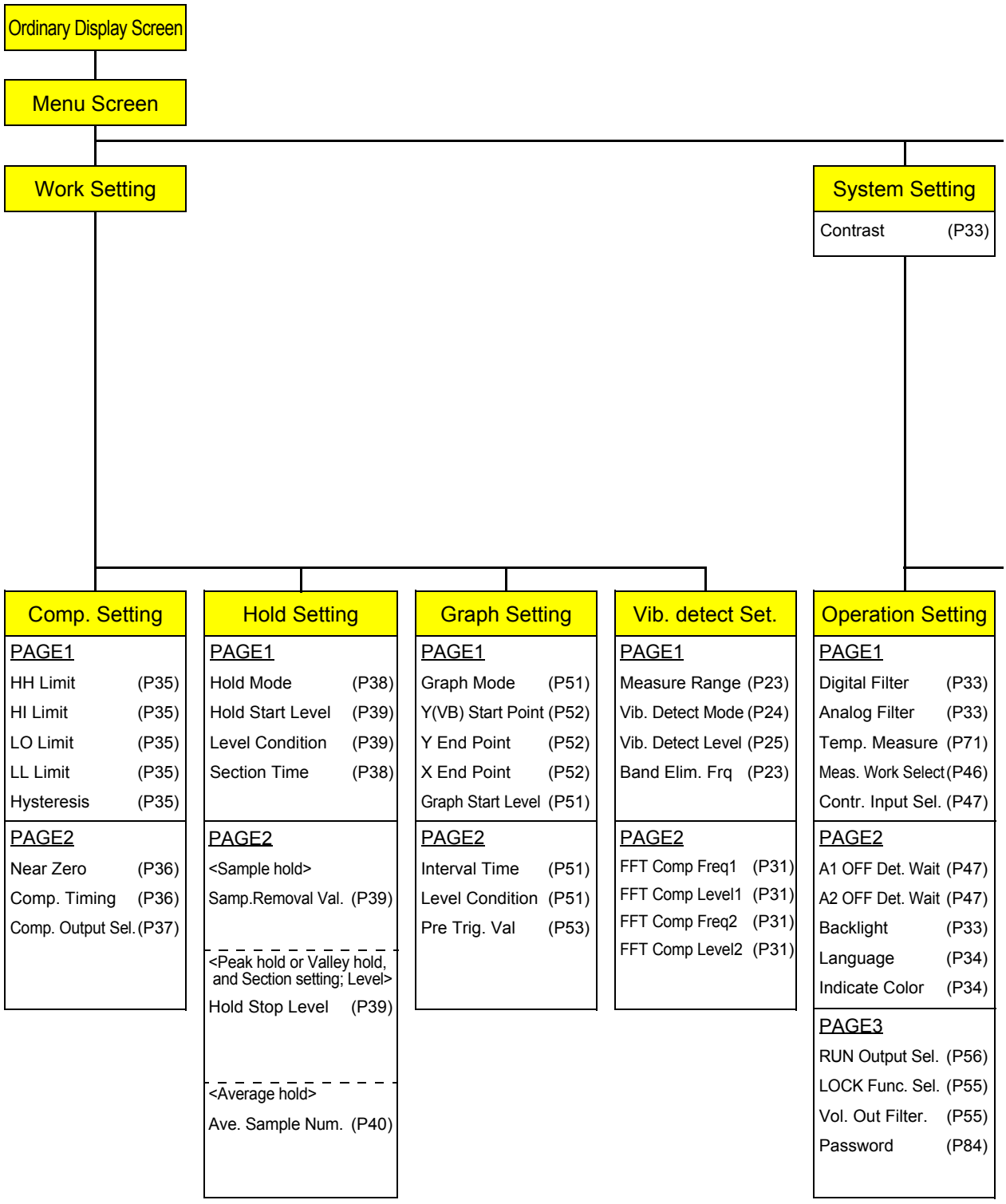
* This connection diagram shows cabling applicable to the case where your PC is DTE (data terminal equipment).
For connection with DCE (data circuit-terminating equipment), such as a modem, use straight type cabling.

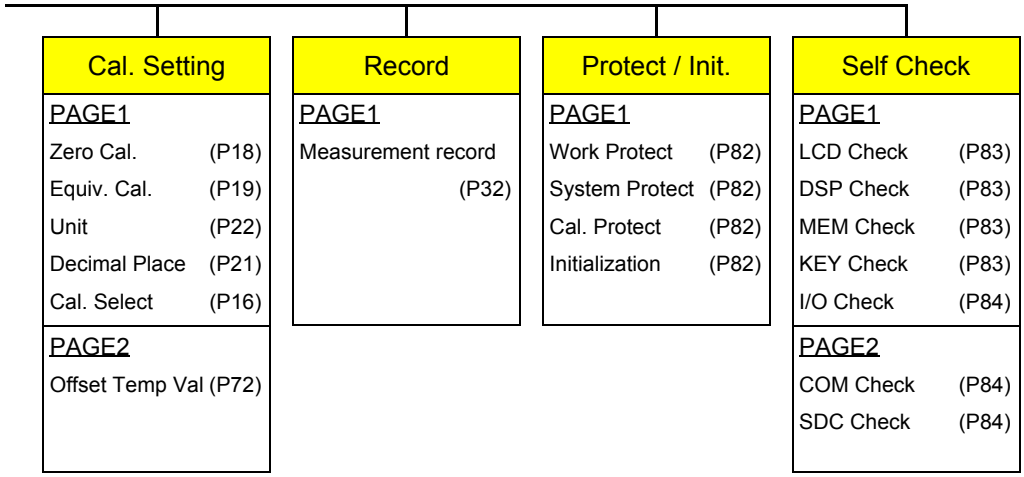
* Prepare cabling after reconfirmation of the connector shape and signal lines (pin assignments) of the equipment you use.

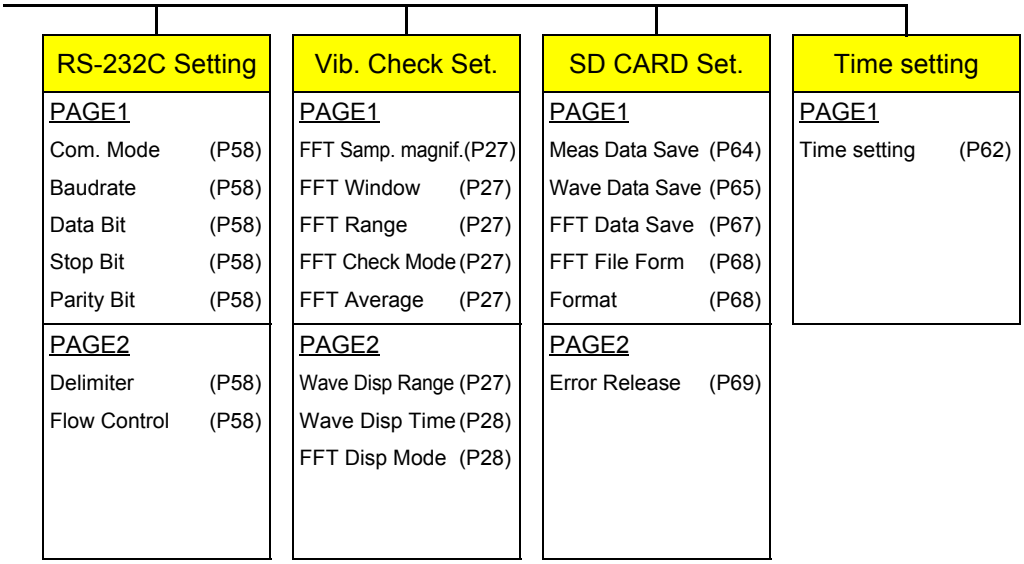
3 SETTING PROCEDURE

3-1. Screens and operations

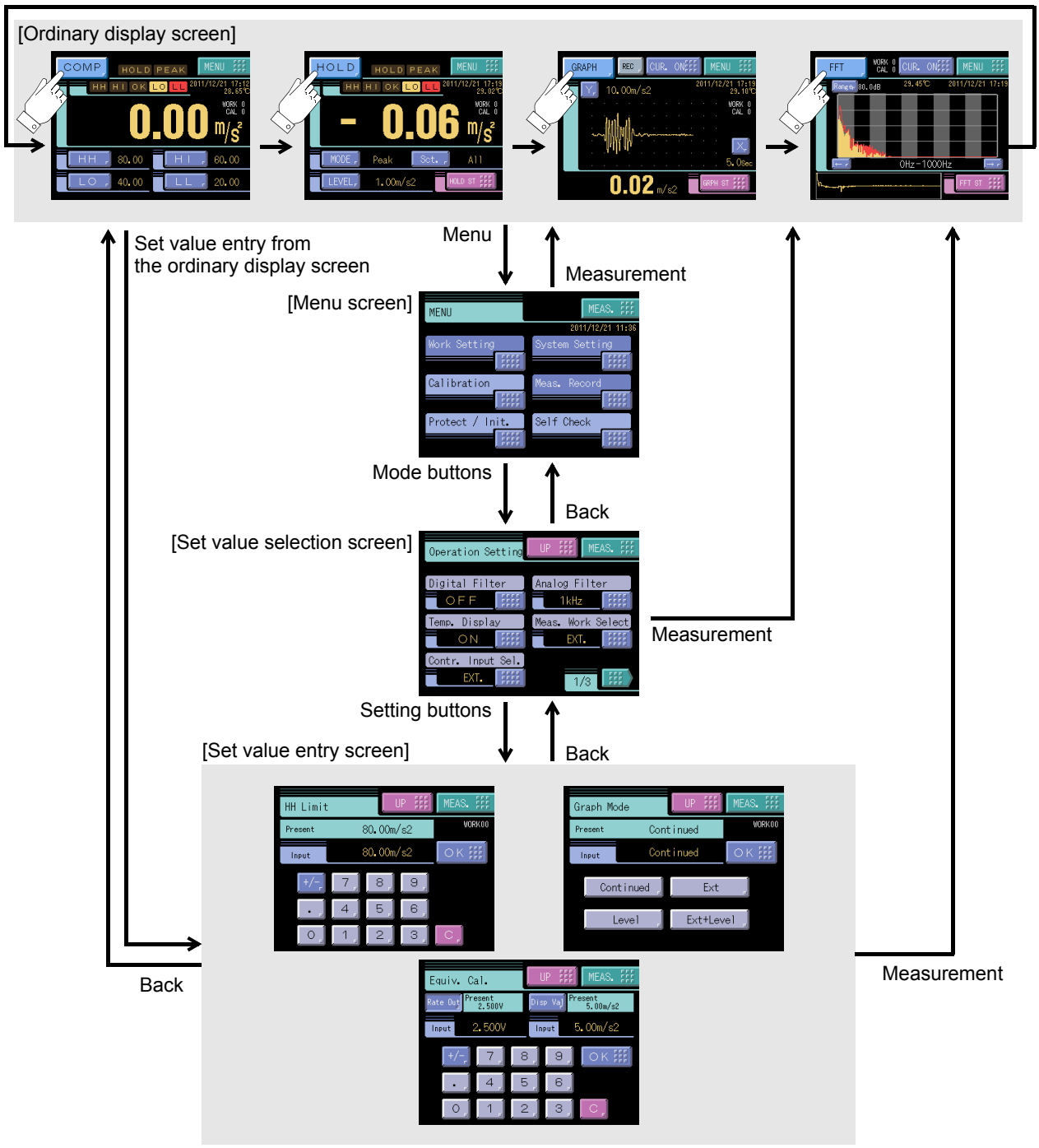
■Setting modes tree




Cal. Setting
PAGE1
Zero Cal. (P18)
Equiv. Cal. (P19)
Unit (P22)
Decimal Place (P21)
Cal. Select (P16)
PAGE2
Offset Temp Val (P72)
Record
PAGE1
Measurement record (P32)
Protect / Init.
PAGE1
Work Protect (P82)
System Protect (P82)
Cal. Protect (P82)
Initialization (P82)
Self Check
PAGE1
LCD Check (P83)
DSP Check (P83)
MEM Check (P83)
KEY Check (P83)
I/O Check (P84)
PAGE2
COM Check (P84)
SDC Check (P84)


RS-232C Setting
PAGE1
Com. Mode (P58)
Baudrate (P58)
Data Bit (P58)
Stop Bit (P58)
Parity Bit (P58)
PAGE2
Delimiter (P58)
Flow Control (P58)
Vib. Check Set.
PAGE1
FFT Samp. magnif. (P27)
FFT Window (P27)
FFT Range (P27)
FFT Check Mode (P27)
FFT Average (P27)
PAGE2
Wave Disp Range (P27)
Wave Disp Time (P28)
FFT Disp Mode (P28)
SD CARD Set.
PAGE1
Meas Data Save (P64)
Wave Data Save (P65)
FFT Data Save (P67)
FFT File Form (P68)
Format (P68)
PAGE2
Error Release (P69)
Time setting
PAGE1
Time setting (P62)

■V100 screen configuration



■About a setting call

In this manual, a setting function call is described as follows.

Example) Digital filter

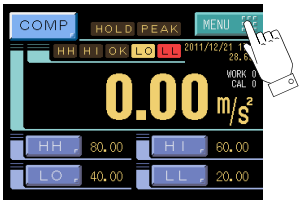
Menu → System Setting → Operation → Page 1

↑ Setting menu ↑ Item classification ↑ Page

This call can be made by the following procedure.

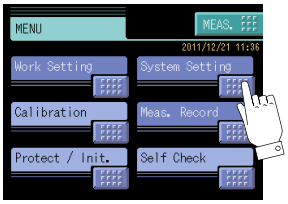
1. Press the [MENU] button on the ordinary display screen.

Menu call

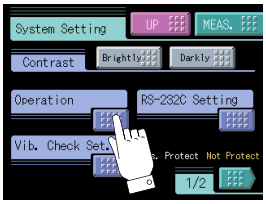


2. The menu screen appears. Select the item.

Menu

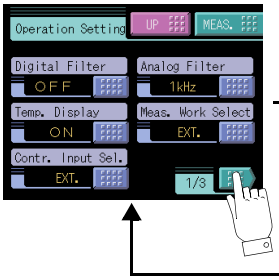


Item classification

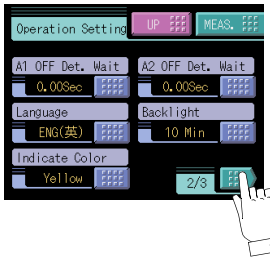


3. The setting function setting screen appears. Select the function.

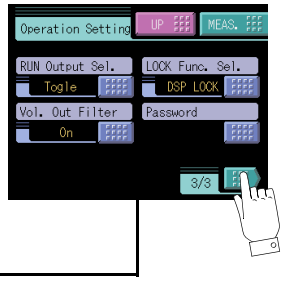
Page 1



Page 2



Page 3



4 CALIBRATION

How to calibration

Calibration is performed for matching the V100 to an acceleration sensor.

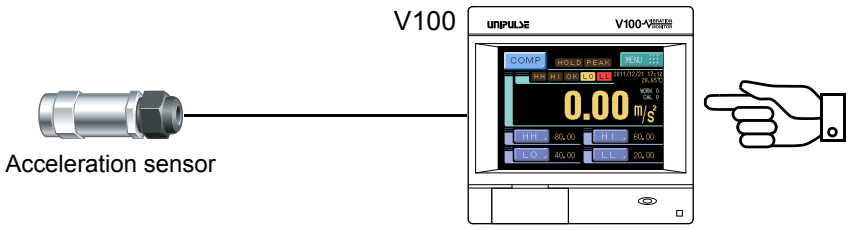
● Equivalent input calibration

Calibration is performed without an actual load by simple key-input of the output value (V) of the equipment (sensor) and the value to be indicated.

For example, the gain is automatically determined by entering the value based on the voltage sensitivity on the test report attached to the acceleration sensor as follows:

Test report: Voltage sensitivity (100Hz) 4.97mV/m/s^2

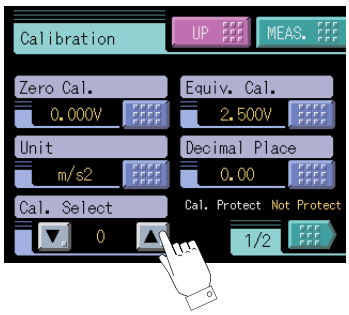
$$\frac{4.97\text{mV}}{\text{Output}} - \frac{1.00\text{m/s}^2}{\text{Indicated value}}$$



4-1. Calibration value selection

By storing up to four calibration values in the memory, the desired calibration value can be called to switch the indicated value. Setting values that can be switched are as follows.

Calibration Mode Setting
Zero Cal.
Equiv. Cal.
Unit
Decimal place



■Calibration value selection by touch panel

Select "0" - "3" by pressing the ▼ ▲ button on the CALIBRATION screen.
When not using, set "0".

■Calibration value selection by external signal input

With this function, four types of calibration values can be selected with external selector signals CAL0 and CAL1 (when the calibration value selection setting is external). Set EXT 0 by pressing the  button on the CALIBRATION screen. According to the input conditions of external signal inputs CAL0 and CAL1, the display changes as EXT 0 to EXT 3. Normally, when there is no input to CAL0 and CAL1 (the terminals are open), calibration value 0 is selected. When each terminal is in the following condition, each calibration value is selected

CAL1	CAL0	Calibration value
0	0	Calibration value 0
0	1	Calibration value 1
1	0	Calibration value 2
1	1	Calibration value 3

(0: Open, 1: ON)

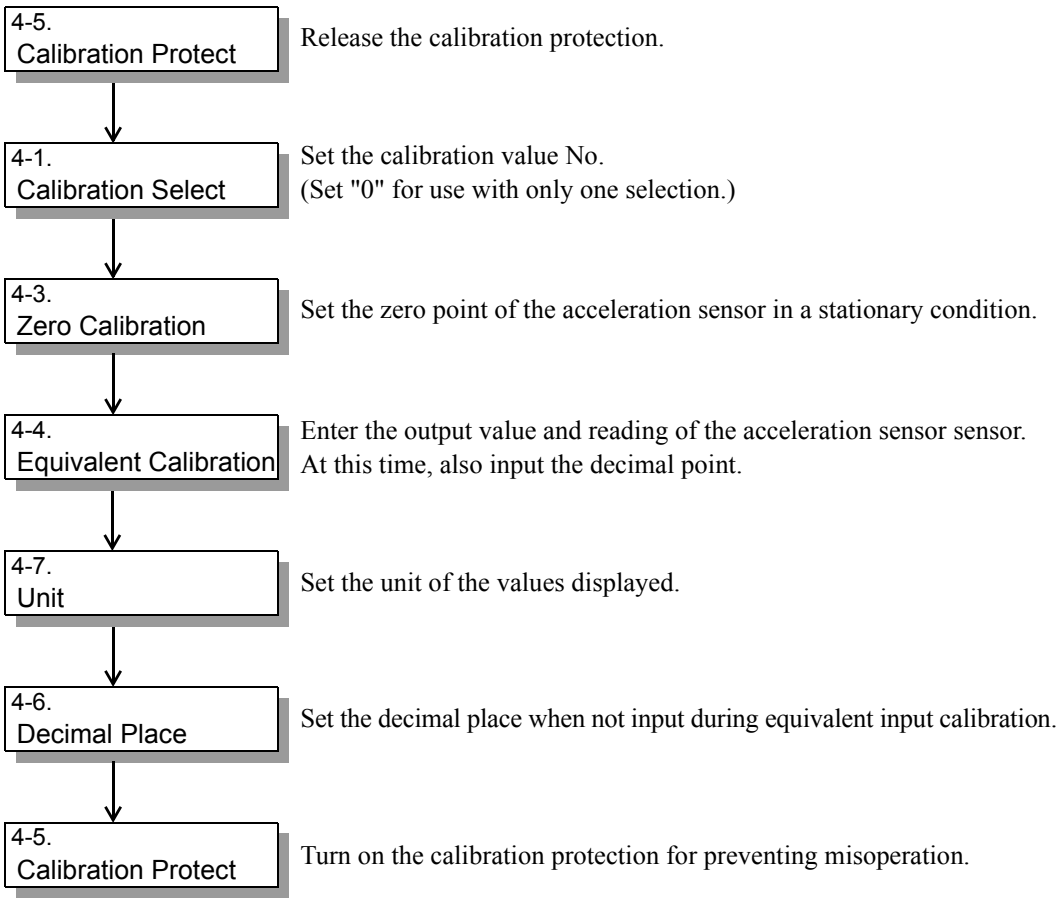
I/O connector

A9, B9 A10, B10	COM1
B7	CAL0
B8	CAL1

CAUTION

It takes one second at maximum for the changed calibration value to become effective. During this time, the calibration value is indefinable. Also, the indicated value is accordingly indefinable.

4-2. Calibration procedures



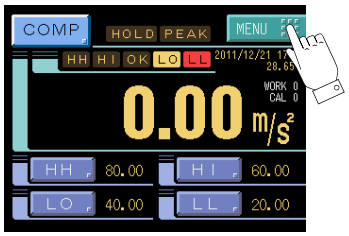
4-3. Zero Calibration

Set the zero point in a stationary condition.

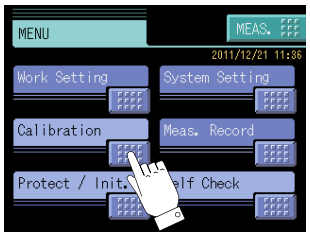
How to set

Menu → Calibration → Page 1

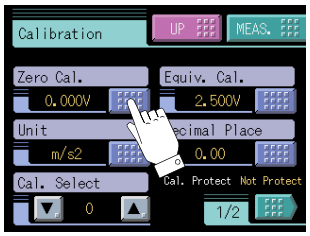
1. Press the [MENU] button.



2. Press the [Calibration] button.



3. Press the [Zero Cal.] button.



4. Press [OK] button after confirming no-load was applied to the sensor.

* The filter by Measure Range in Work Setting is not reflected in the input value on the zero calibration screen.
At this time, the hold and judgment functions are disabled.

4-4. Equivalent input calibration

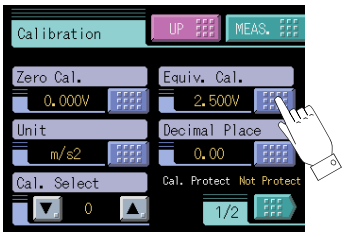
Set the output value and reading of the acceleration sensor.

Setting range Output value: 0.1 to 500.0 [mV]
Display value: -9999 to 9999 (0 is excluded.)

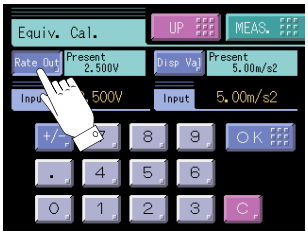
How to set

Menu → Calibration → Page 1

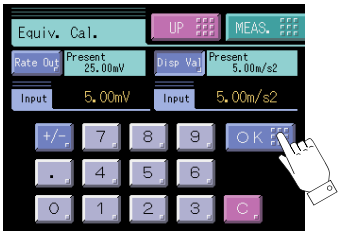
1. Press the [MENU] button. (refer to page 18)
2. Press the [Calibration] button. (refer to page 18)
3. Press the [Equiv. Cal.] button.



4. After pressing the [Rate Out] button, enter the rated output of the sensor with the numerical keys.



5. After pressing the [Disp Val] button, enter the display value with the numerical keys. Also, set the decimal place here. Press the [OK] button to perform calibration. To eliminate a decimal point, register by inputting a numerical value and then pressing the decimal point key at the end.



■Registration method at decimal place

Example)

The indicated value is made "200.0" by Equivalent Input Calibration.

It is a specification to which the decimal point is input with the numerical keys.
Please input it in the image that operates the calculator.

Press [2] → [0] → [0] → [.] → [0]

The display of the decimal point of the input value moves.

Please put it again from the start pushing [C] when you correct it.

Point

- The decimal point ten keys are registered pushing at the end after the numerical value is input when the decimal point is lost.
- All set values concerning acceleration input are interlocked with the decimal place of the indicated value (rated capacity).However, if Crest or Form is set by Vib. Detect Mode (See page 24.), the number of decimal places of the indicated value automatically becomes one.

4-5. Calibration Protect

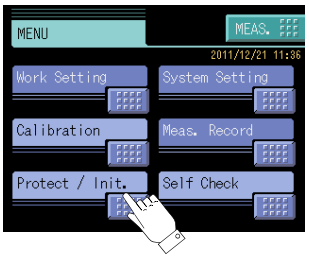
Calibration-related set values can be protected so that they will not be changed by misoperation. When Cal. Protect is ON, no change can be made while the alarm sounds.

Setting range ON: Protected
OFF: Unprotected

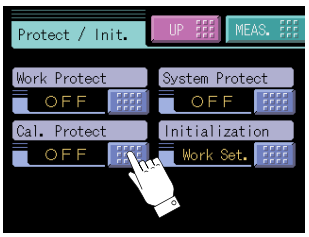
How to set

MENU → Protect / Init. → Page 1

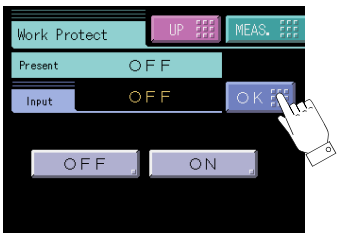
1. Press the [MENU] button. (refer to page 18)
2. Press the [Protect / Init.] button.



3. Press the [Cal. Protect] button.



4. Select the ON/OFF and determine with the [OK] button.



4-6. Decimal place

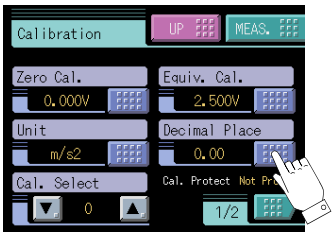
Set the decimal place of the indicated value.

Setting range 0, 0.0, 0.00, 0.000

How to set

Menu → Calibration → Page 1

1. Press the [MENU] button. (refer to page 18)
2. Press the [Calibration] button. (refer to page 18)
3. Press the [Decimal Place] button.



4. Select the Decimal Place and determine with the [OK] button.

4-7. Unit

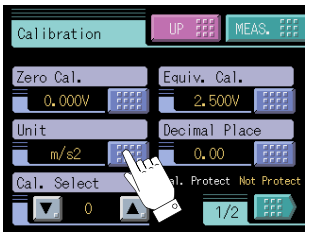
Set the unit of the values displayed.

Setting range None, m/s^2, mm/s^2, m/s, mm/s, mm, µm, %

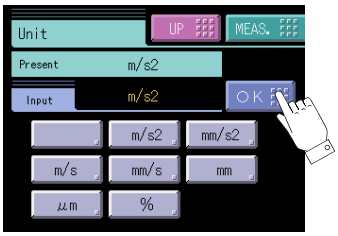
How to set

Menu → Calibration → Page 1

1. Press the [MENU] button. (refer to page 18)
2. Press the [Calibration] button. (refer to page 18)
3. Press the [Unit] button.



4. Select the Unit and determine with the [OK] button.



* Even if the unit is changed, the display value (calibration value) will not change.

CAUTION

If Crest or Form is selected by Vib. Detect Mode (See page 24.), "000.0%" is displayed irrespective of setting.

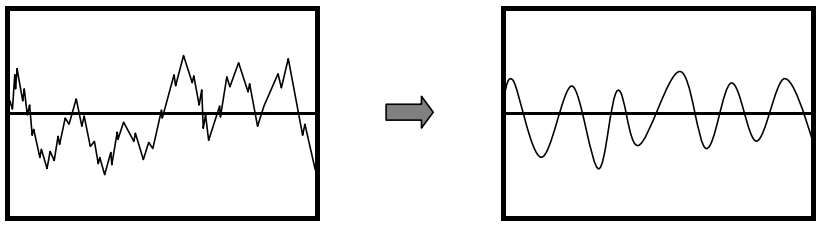
5 VIBRATION DETECTION AND DIAGNOSIS FUNCTIONS

5-1. Vibration detection function

A vibrational input waveform can be detected under various conditions.
The detected value can be pass-fail judgment by the comparison-and-hold function. (See the section on "7-7.Comparison functions" on page 34 and "7-8.Hold Functions" on page 38.)

■Extraction of vibration components through a bandpass filter

The bandpass filter can be set to extract necessary frequency components by eliminating unnecessary noise components from an input vibration waveform.
This bandpass filter can be set for esch work, and appropriate judgments can be made by switching it according to phenomenon.



Measure range

Set the frequency band to detect vibration.
The Digital Filter allows detection concentrating on a specific band.

Setting range HPF: 1 to 500 [Hz] Initial value: 1Hz
LPF: 1 to 500 [Hz] Initial value: 500Hz

* Make sure to input as HPF < LPF.

How to set

MENU → Work Setting → Vib. detect Set. → Page 1

■Elimination of noise components by a band elimination filter

The band elimination filter can be set to eliminate unique frequency components, such as inductive noise, in Measure Range. (Setting can be made for esch work.)

Band elimination frequency

Setting range 0.0 to 500.0 [Hz] Initial value: 0.0Hz

* When 0Hz is set, the filter is disabled.

How to set

MENU → Work Setting → Vib. detect Set. → Page 1

■Vibration detect mode

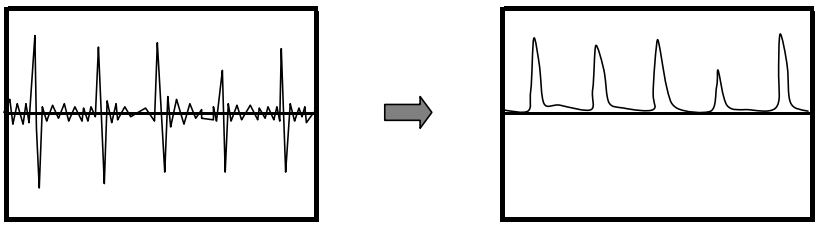
The Vib. Detect Mode can be selected from Vib. Val, Envelope, Peak, RMS, Crest, and Form. The detection mode can be selected according to the change in the waveform to be judged. The Vib. Detect Mode can be set for esch work, and appropriate judgments can be made by switching it according to phenomenon.

- Vibration value mode

The input waveform is bandpass-filtered and elimination-filtered and used for detection.

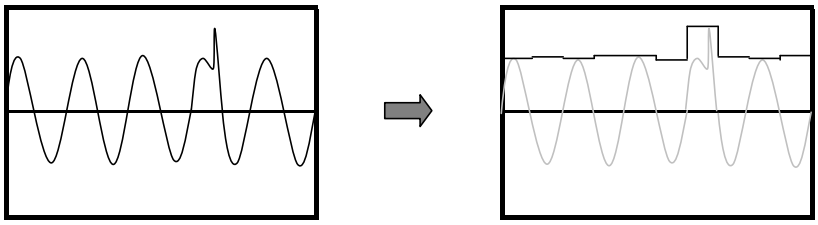
- Envelope mode

The input waveform is envelope-processed (envelope-detection) and used for detection. After high-pass filtering of the bandpass-filter, absolute value processing is performed, and then low-pass filtering of the bandpass-filter is performed.



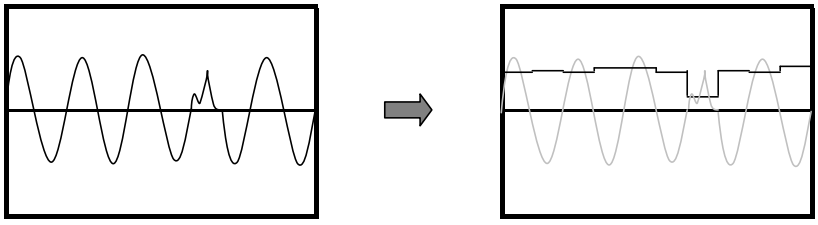
- Peak value mode

A peak value is detected at each half-wave of the input waveform. After elimination-filterd and bandpass-filtered, absolute value processing is performed, and then peak detection is performed. In this mode, a delay of 100mSec occurs due to detection processing. Also, half-wave processing can be performed when the input signal is 10Hz or more.



- RMS (root mean square) value mode

An RMS value is calculated at each half-wave of the input waveform. After elimination-filterd and bandpass-filtered, absolute value processing is performed, and then the RMS value is calculated. In this mode, a delay of 100mSec occurs due to calculation processing. Also, half-wave processing can be performed when the input signal is 10Hz or more.

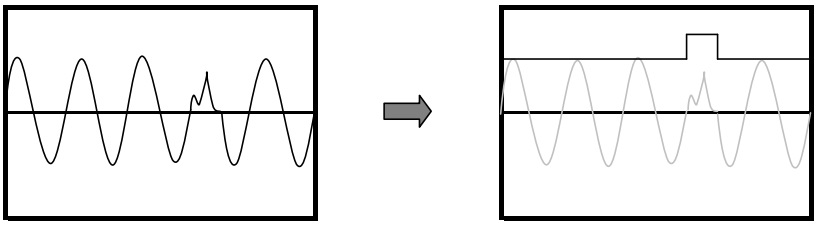


- Crest factor mode

A crest factor is calculated at each half-wave of the input waveform. After elimination-filterd and bandpass-filtered, absolute value processing is performed, and then the crest factor is calculated. In this mode, a delay of 100mSec occurs due to calculation processing. Also, half-wave processing can be performed when the input signal is 10Hz or more.

Crest factor＝Peak value÷RMS value (Sine wave：141.4%)

* The indicated value is displayed as multiplied by 1000. (Number of decimal places: 1, unit: %)

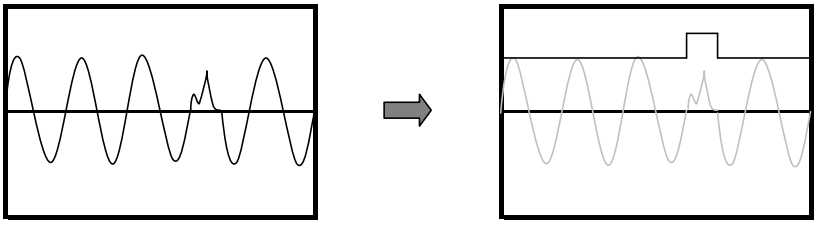


- Form factor mode

A form factor is calculated at each half-wave of the input waveform. After elimination-filterd and bandpass-filtered, absolute value processing is performed, and then the form factor is calculated. In this mode, a delay of 100mSec occurs due to calculation processing. Also, half-wave processing can be performed when the input signal is 10Hz or more.

Form factor＝RMS value÷Mean value (sine wave：111.1%)

* The indicated value is displayed as multiplied by 1000. (Number of decimal places: 1, unit: %)



Vibration detect mode

Select the mode in which vibration values are judged.

Setting range　Vib. Val, Envelope, Peak, RMS, Crest, Form
Initial value: Vib. Val

How to set

MENU → Work Setting → Vib. detect Set. → Page 1

■Vibration detect level

Set the level to perform half-wave detection when the Vib. Detect Mode is Peak / RMS / Crest / Form. For signals at or below the detection level, half-wave detection is not performed.

Setting range　0 to 9999

How to set

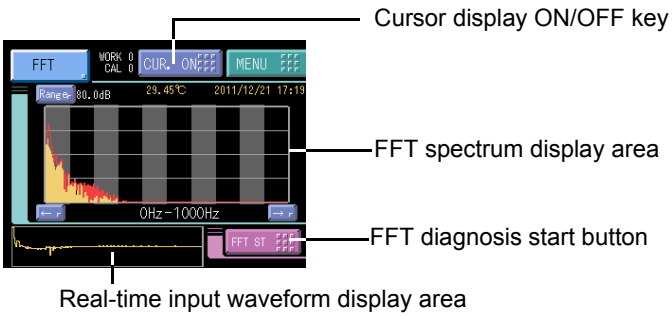
MENU → Work Setting → Vib. detect Set. → Page 1

5-2. Vibration diagnosis function

■Input waveform frequency diagnosis function by FFT

Frequency changes in a vibrational input waveform can be monitored by FFT spectrum easily. Equipment abnormality can be detected by monitoring the frequency changes that cannot be judged from the level shift of the vibrational input waveform.

FFT display screen



Spectrum display area (1000Hzmax)

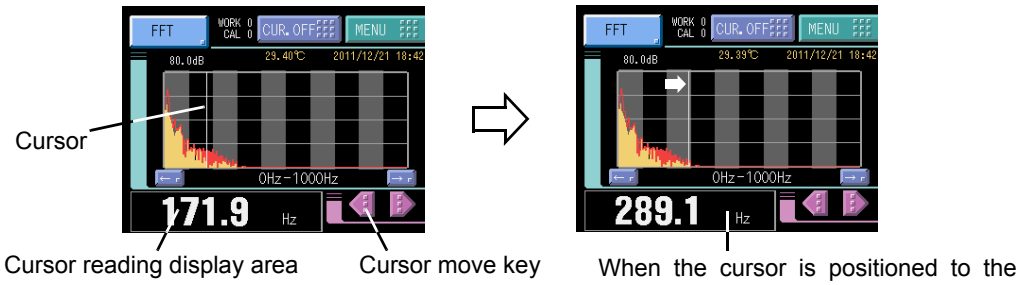
Since the sampling rate (fs) of the V100 is 2000 times/sec, the maximum frequency that can be diagnosed by FFT is 1/2 of fs, which is 1000Hz. The number of frequency points that can be displayed is 256. When the FFT Samp. Magnif. setting is 1, frequency values that can be read as 1000Hz are divided by 256. The FFT Samp. Magnif. setting can be up to 8, so that frequency values that can also be read as 1000Hz are divided by 2048.

Real-time input waveform display area

Input values selected by FFT Check Mode are waveform-displayed.
(The display range and display time can be set.)

Cursor display screen

Press the cursor display button, and the cursor appears in the spectrum display area, so that the cursor-positioned frequency value can be read.



FFT sampling magnification

Set the data sampling magnification used for FFT processing.

As the sampling magnification decreases, the frequency unit of the frequency analysis result increases, while the frequency range of one-screen display expands.

As the sampling magnification increases, the frequency unit of the frequency analysis result decreases, while the frequency range of one-screen display narrows.

Analyzed frequency unit [Hz] ＝1000Hz÷ (FFT Samp. Magnif.×256)

Setting range 1, 2, 4, 8 [times]

FFT window

Select the window function used for FFT processing.

Setting range Rectangular, Hanning, Hamming, Blackman

FFT check mode

Select the FFT diagnosis mode.

Setting range Vibration value, Envelope value

* Unique processing is performed for FFT diagnosis irrespective of the Vib. Detect Mode under Vib. Detect Set. in Work Setting. For processing, see the section "Vibration detect mode" on page 24.

FFT average

Set the average counts to display the spectrum value at each frequency obtained by FFT.

Setting range 1 to 16 [times]

FFT range

Set the upper end and lower end of the FFT spectrum display range.

Setting range Upper end: -99.8 to 99.9 [dB]
Lower end: -99.9 to 99.8 [dB]

How to set

MENU → System Setting → Vib. Check Set. → Page 1

Wave display range

Set the real-time input waveform display range for display on the FFT display.

If "0" is set, switching can be done to auto-range. For display, automatic adjustment is made so that the maximum value in the waveform display time falls within the display area.

Setting range 0 to 9999

Wave display time

Set the real-time input waveform display time for display on the FFT display.
The number of points in the waveform display area is 200 as on the graph screen.

Setting range 0.1 to 1.0 [sec.]

How to set

MENU → System Setting → Vib. Check Set. → Page 2

FFT display mode

Set the FFT display mode.

Continued FFT is started by making an FFT start/stop key input, and stopped by making an FFT start/stop key input again.
Or, FFT is performed as long as the external FFT TRIG input is ON.

Single FFT is started by making an FFT start/stop key input or at the ON edge of the external FFT TRIG input. An automatic stop is made after sampling of the data volume determined by FFT Samp. Magnif. is performed once and the FFT spectrum is displayed.

How to set

MENU → System Setting → Vib. Check Set. → Page 2

Point

Relationship between the sampling data volume and FFT Samp. Magnif. used for one FFT

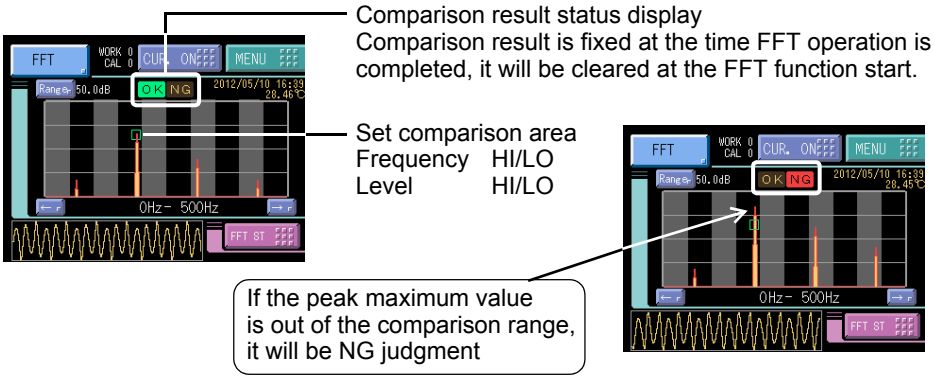
Data volume = FFT Samp. Magnif. × 512

For example, when the FFT Samp. Magnif. is 2, the data volume becomes 1024.
Since the sampling rate of the V100 is 2000 times/sec., it corresponds to approximately 0.5 seconds of data.

5-3. FFT comparison functions

The analysis waveform of frequency components by the FFT function by setting the frequency and level can be compared.

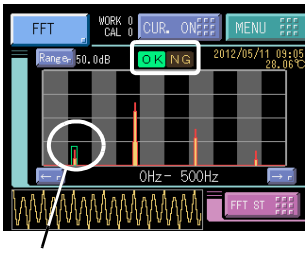
Among the set FFT comparison frequency range, and compares the maximum value of the peak line (red). The result of the comparison to confirm at the time of FFT operation is completed. And make the status display and external FFT judgment output.



CAUTION

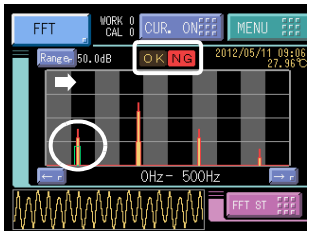
- When the comparison frequency set with the comparison level setting to perform the FFT compared to the initial value, it will be the result of the comparison is always "OK".
- If the difference between the HI setting and the LO setting of the comparison frequency is small, without frequency component of the FFT diagnostic results are included in the comparison area, there is the comparison result is always "NG".

Method for detecting an increase in spectral peaks due to abnormal



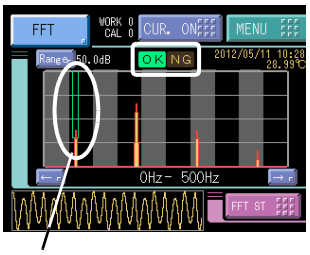
Set the comparison value so as to surround the spectrum of normal.

Spectral peak	62.5Hz 8.1dB
Comparison frequency	55 to 75Hz
Comparison level	0.0 to 10.0dB

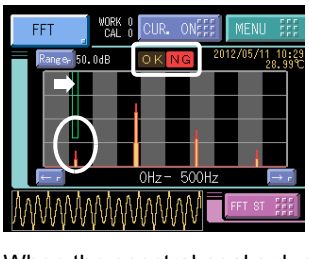


When the spectral peaks due to abnormal increases will be NG judgment.

Method of detecting the lowering of the spectral peaks due to abnormal



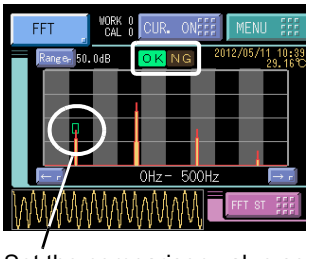
Set the comparison value to include the upper end of the spectrum of normal.



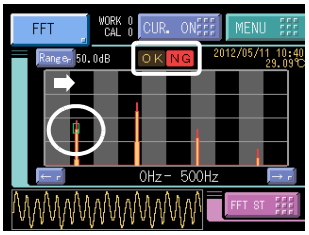
When the spectral peaks due to the abnormal is lowered it will be NG judgment.

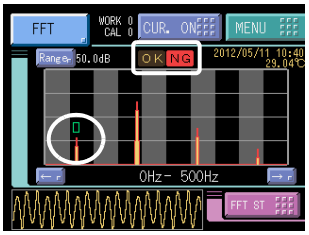
Spectral peak	62.5Hz 18.9dB
Comparison frequency	55 to 75Hz
Comparison level	15.0 to 99.9dB

Method of detecting a change in the spectral peak due to abnormal



Set the comparison value so as to surround the upper end of the spectrum peak at the time of normal.



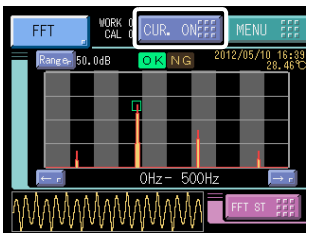


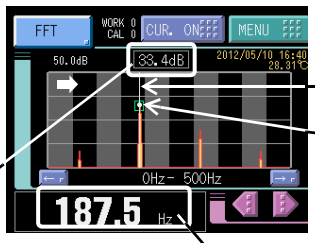
When the spectral peaks due to abnormal rise or fall will be NG judgment.

Spectral peak	62.5Hz 18.9dB
Comparison frequency	55 to 75Hz
Comparison level	17.5 to 22.5dB

How to check the spectrum frequency and peak values

Press the cursor display button on the upper side of the screen.





Cursor

Peak point

It displays the spectrum peak value of the cursor position. (red line)

It displays the frequency of the cursor position.

■FFT comparison frequency1, FFT comparison frequency2

Set the frequency range to compare the FFT of the waveform.

Setting range	LO:	0 to 999 [Hz]	Initial value: 0Hz
	HI:	1 to 1000 [Hz]	Initial value: 1000Hz

* Make sure to input as LO < HI.

How to set

MENU → Work Setting → Vib. detect Set. → Page 2

■FFT comparison level1, FFT comparison level2

Set the spectrum level to compare the FFT of the waveform.

Setting range	LO:	-99.9 to 99.8 [dB]	Initial value: -99.9dB
	HI:	-99.8 to 99.9 [dB]	Initial value: 99.9dB

* Make sure to input as LO < HI.

How to set

MENU → Work Setting → Vib. detect Set. → Page 2

6 MEASUREMENT RECORD

6-1. Measurement record

The last 50 times of data obtained by measurement can be accumulated for each work. Accumulation is carried out when hold release is executed.

* For hold release, see the section "Hold operation" on page 40.

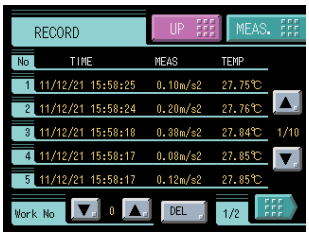
In record, the following data are saved.

- Time
- Measurement value (including decimal place data)
- Display unit
- Temperature
- Judgment result
- Vibration detection mode
- Hold mode

How to set

MENU → RECORD → Page 1

■Record screen



* On the history screen, up to 50 pieces of data can be monitored for each work, and for storage of the measurement history exceeding that, an SD card should be used. (See the section "Measurement data save" on page 64.)

7 SETTING OF FUNCTIONS

7-1. Digital filter

The digital filter is a function for reducing fluctuation of the indicated value by means of a moving average of data converted from analog to digital. With an increase in the number of filterings, the indicated value becomes more stable, but the response to inputs becomes slower.

Setting range OFF, 2 to 999 [times]

How to set

MENU → System Setting → Operation → Page 1

7-2. Analog filter

A low-pass filter is provided for filtering input signals from voltage output type equipment (sensor) and canceling unnecessary noise components.
The cut-off frequency can be selected in a range between 30Hz, 100Hz and 1kHz. With an increase in the cut-off frequency, the response becomes faster, but noise components may be indicated.

Cut-off frequency: 30, 100, 1k [Hz]

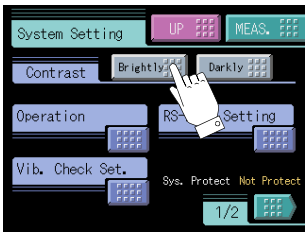
How to set

MENU → System Setting → Operation → Page 1

7-3. Contrast adjustment

Adjust the contrast of the touch panel display.

Adjust with the Brightly Darkly button.



How to set

MENU → System Setting → Page 1

7-4. Backlight

The backlight is turned off if no button operation is performed for the set time (minutes).
The backlight is turned on by touching the panel. Setting 00 disables this function.

Setting range 00 to 99 [minutes]

How to set

MENU → System Setting → Operation → Page 2

7-5. About japanese/english display selection

The display language of the V100 is selectable between Japanese and English.

Setting range JPN(日): Japanese, ENG(英): English

How to set

MENU → System Setting → Operation → Page 2

7-6. Indicate color

The indicated value display color can be changed. By setting Comp.(Comparison Result), the indicated value display color changes following the comparison status.

OK: green
HI, LO: yellow
HH, LL: red

Setting range Yellow, Green, Blue, Comp.

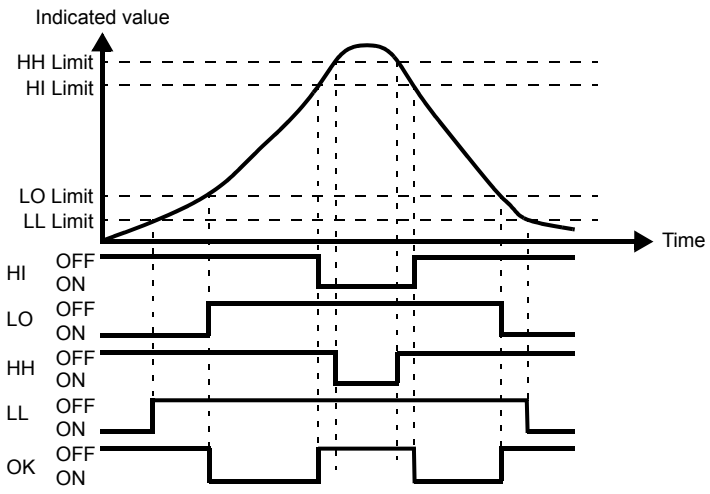
How to set

MENU → System Setting → Operation → Page 2

7-7. Comparison functions

By the comparison function, the HI limit and LO limit values are set, and when the indicated value exceeds the HI limit, the HI output is turned on, and when the indicated value falls below the LO limit, the LO output is turned on. Also, HH limit and LL limit values may be set outside the HI-LO limit comparison. When the indicated value exceeds the HH limit, the HH output is turned on, and when the indicated value falls below the LL limit, the LL output is turned on. When the HI, HH, LO and LL outputs are all off, the OK output is turned on.

〈HI/LO output conditions〉	HI:	Indicated value > HI limit value
	LO:	Indicated value < LO limit value
〈HH/LL output conditions〉	HH:	Indicated value > HH limit value
	LL:	Indicated value < LL limit value
〈OK output conditions〉	OK:	All conditions of HH, HI, LO and LL are OFF.



■HI limit / LO limit / HH limit / LL limit

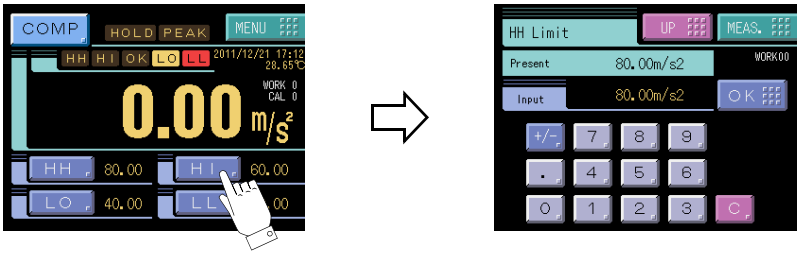
Setting range -9999 to 9999

How to set

MENU → Work Setting → Comp. Setting → Page 1

Simple setting call

Press any of the [HH], [HI], [LO] and [LL] buttons at the bottom of the indicated value display screen to go direct to the entry screen.



■Hysteresis

The hysteresis value may be determined so as to allow a margin for timing the turning off of the HI-LO limit comparison. Normally, it is turned on when the indicated value exceeds the HI limit and is turned off when the indicated value falls below it. However, by setting the hysteresis, it is turned off when the indicated value falls below the HI limit further lowered by the hysteresis value.
This function is effective to prevent chattering in such a case where signals fluctuate (vibrate) subtly.

〈Comparison conditions〉

- HI limit: ON condition: indicated value > HI limit value
  OFF condition: indicated value≦(HI limit value-hysteresis value)
- LO limit: ON condition: indicated value < LO limit value
  OFF condition: indicated value≧(LO limit value+hysteresis value)
- HH limit: ON condition: indicated value > HH limit value
  OFF condition: indicated value≦(HH limit value-hysteresis value)
- LL limit: ON condition: indicated value < LL limit value
  OFF condition: indicated value≧(LL limit value+hysteresis value)

Setting range -9999 to 9999

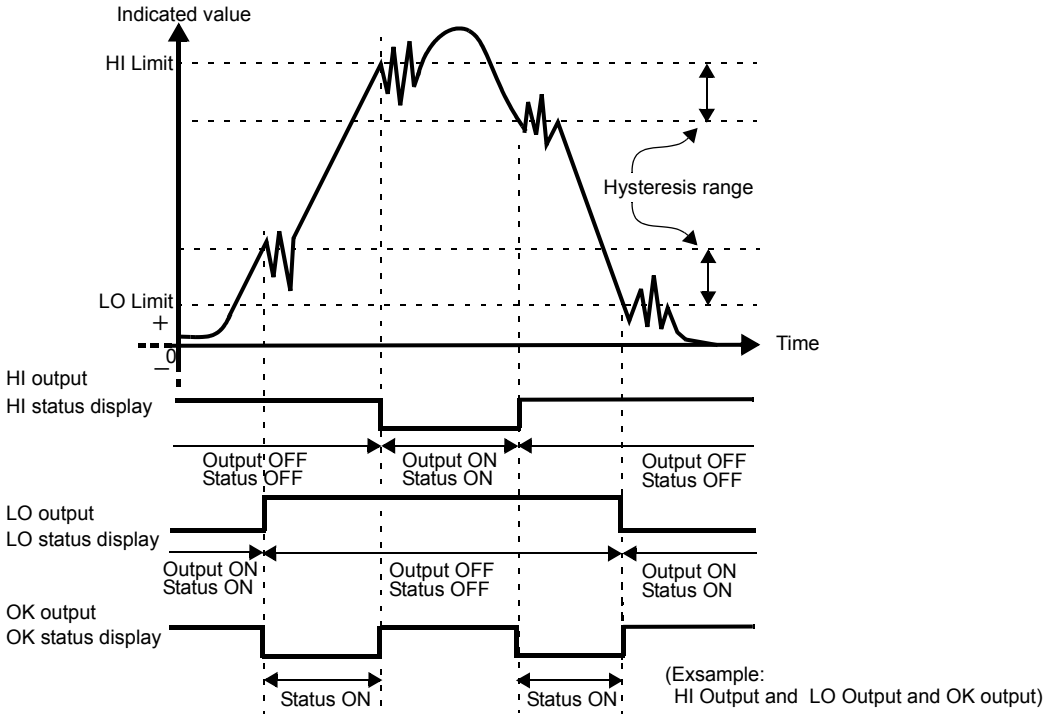
How to set

MENU → Work Setting → Comp. Setting → Page 1

Point

Hysteresis setting value is common to all HI limit value.

- Hysteresis operation



■Near zero

By this function, it is detected that the indicated value is near zero.

Near-zero ON: |Indicated value| ≦ near zero set value
Near-zero OFF: |Indicated value| > near zero set value

Setting range 0000 to 9999

Point

Near-zero ON/OFF is closely related to the Function and Comparison timing.
For details, see the section on "■Comparison timing" on page 36.

How to set

MENU → Work Setting → Comp. Setting → Page 2

■Comparison timing

Set the operating condition of HI-LO limit comparison. Select the condition from the following.

ALL: HI-LO limit comparison is performed continuously.

Not NZ: HI-LO limit comparison is performed when the indicated value is not near zero. Set the near zero parameters by the near zero operation.

HOLD: HI-LO limit comparison is performed when the indicated value is held.

How to set

MENU → Work Setting → Comp. Setting → Page 2

■Comparison output selection

The number of HI-LO limits can be changed.

Correspondence between comparison screens and external I/O output terminals

Mode	HI limit operation	LO limit operation
H4 / L0	HI-1 to HI-4	None
H3 / L1	HI-1 to HI-3	LO
H2 / L2	HH, HI	LO, LL
H1 / L3	HI	LO-1 to LO-3
H0 / L4	None	LO-1 to LO-4

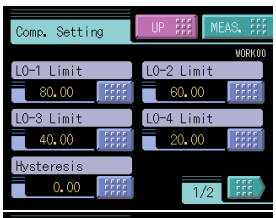
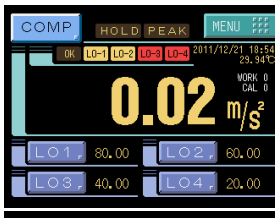
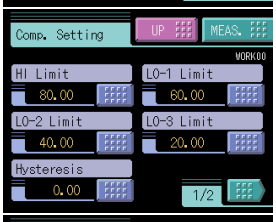
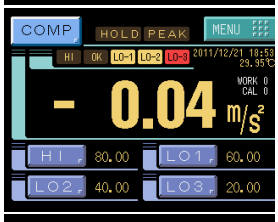
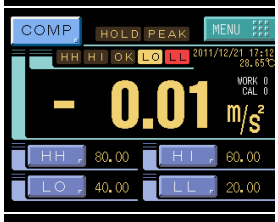
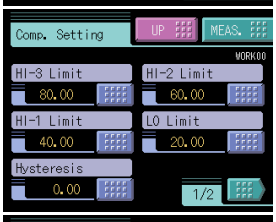
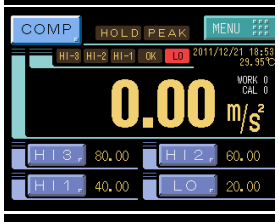
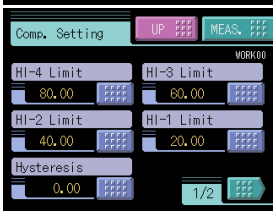
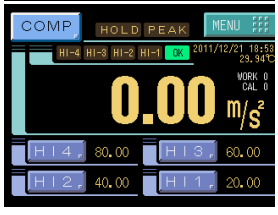
	A13	A14	A15	A16	A17
H4 / L0	HI-4	HI-3	OK	HI-2	HI-1
H3 / L1	HI-3	HI-2	OK	HI-1	LO
H2 / L2	HH	HI	OK	LO	LL
H1 / L3	HI	LO-1	OK	LO-2	LO-3
H0 / L4	LO-1	LO-2	OK	LO-3	LO-4

Point

The HI limit output is turned on when the indicated value becomes larger than the set value.
The LO limit output is turned on when the indicated value becomes smaller than the set value.

How to set

MENU → Work Setting → Comp. Setting → Page 2

	[Setting]	[Comparison]
[HI-0, LO-4]		
[HI-1, LO-3]		
[HI-2, LO-2]		
[HI-3, LO-1]		
[HI-4, LO-0]		

7-8. Hold Functions

By the hold function, a specific point in a waveform is taken out for HI-LO limit comparison.
The operation of each hold will be described in detail.

■Hold setting --- Common ---

Hold mode

The V100 includes 6 hold modes as shown in the table below.
In the peak, valley, peak-to-peak and average modes, section setting is required. Select all section, external signal, external signal+time, level+time, level.
When not using any hold function, be sure to set the hold mode to OFF.
(In the OFF state, hold operation is not performed but input values are always displayed.)

Hold mode	Hold section
OFF	—
Sample	None
Peak Valley P-P Average	Required

*There is a section setup.
- All
- EXT
- EXT+TM
- LVL+TM
- LVL*1

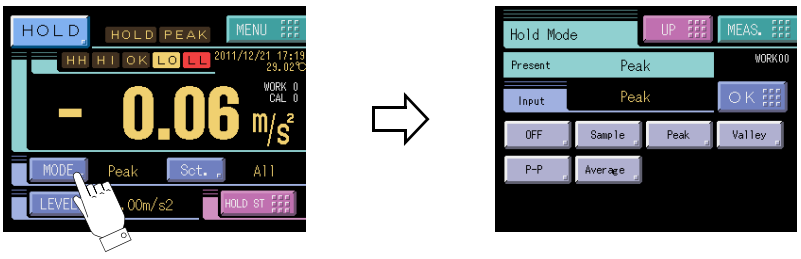
*1: Selectable only for Peak or Valley.

How to set

MENU → Work Setting → Hold Setting → Page 1

Simple setting call

Press the [MODE] button at the bottom of the indicated value display screen to go direct to the hold mode entry screen.



Section time

If you set the hold section setting in the hold function setting to external signal+time or level+time, set the time.

Setting range 0.01 to 99.99 [sec.]

How to set

MENU → Work Setting → Hold Setting → Page 1

Hold start level

Set the start level in the case where the Section setting is Level + Time or Level for Peak, Valley, P-P, or Average hold.

Setting range -9999 to 9999

How to set

MENU → Work Setting → Hold Setting → Page 1

Hold stop level

Set the hold stop level in the case where the Section setting is Level for Peak or Valley hold.

Setting range -9999 to 9999

How to set

MENU → Work Setting → Hold Setting → Page 2

Level condition

(hold section setting; Level + Time or Level, or detection start condition; External + Level)

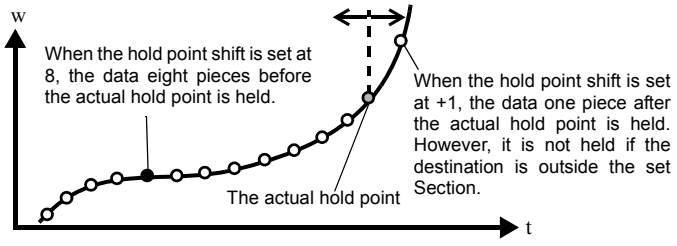
Setting range Passed, Passed HI, Passed LO

- Passed:	Detection starts when the indicated value passes the level set value.
- Passed HI:	Detection starts when the indicated value passes the level set value in the direction from smaller toward larger values.
- Passed LO:	Detection starts when the indicated value passes the level set value in the direction from larger toward smaller values.

Hold point shift

In the "sample hold", the sampling data is held as it is shifted back or forth by the numerical value set under Sample Removal Value.

Setting range -999 to 999



CAUTION

This does not work for other holds.

How to set

MENU → Work Setting → Hold Setting → Page 2

■Hold setting --- Average value ---

Average sample number

In average hold, the average in each sampling can be detected for up to 5 seconds. Then, if the average sample number is set at 2 or more, the representative value of the sampling values by the set number (average by the number) is adopted as the sampling data used for average calculation. The maximum average value detection time with the setting "1" is 5 sec., but the average value detection time can be extended by this setting.

Maximum average value detection time ＝ Average sample number×5 [sec.]

where the number of updates of the average value will decrease.

Number of updates of the average value ＝ 2000/Average sample number [times/sec.]

Setting range 1 to 999 [times]

How to set

MENU → Work Setting → Hold Setting → Page 2

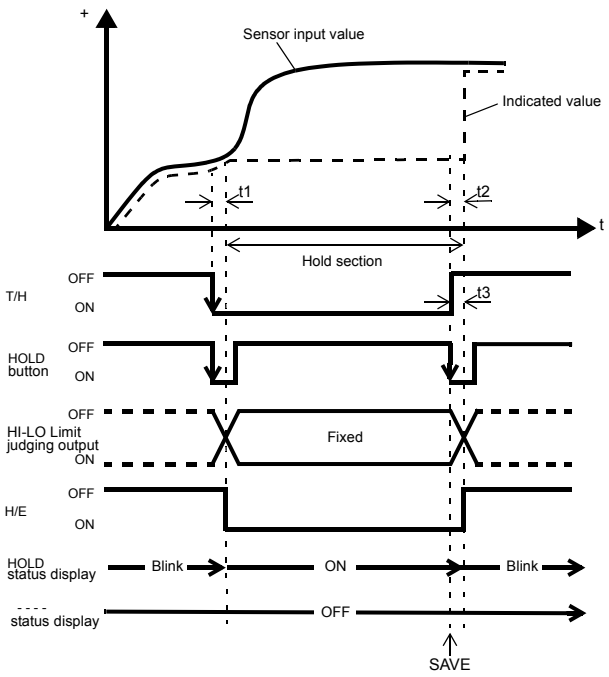
Point

About the maximum average value detection time
Although the detection section is specified by the SECTION signal, etc., detection cannot be carried out exceeding the maximum average value detection time set according to the average sample number. If the maximum average value detection time is exceeded, detection ends automatically, when the average value is held.

■Hold operation

Sample hold

When the T/H signal is inputted, a desired point is held, and the H/E output is turned on.
Hold of the value continues as long as the T/H signal is on.



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
1.0ms (max.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
1.0ms (max.)

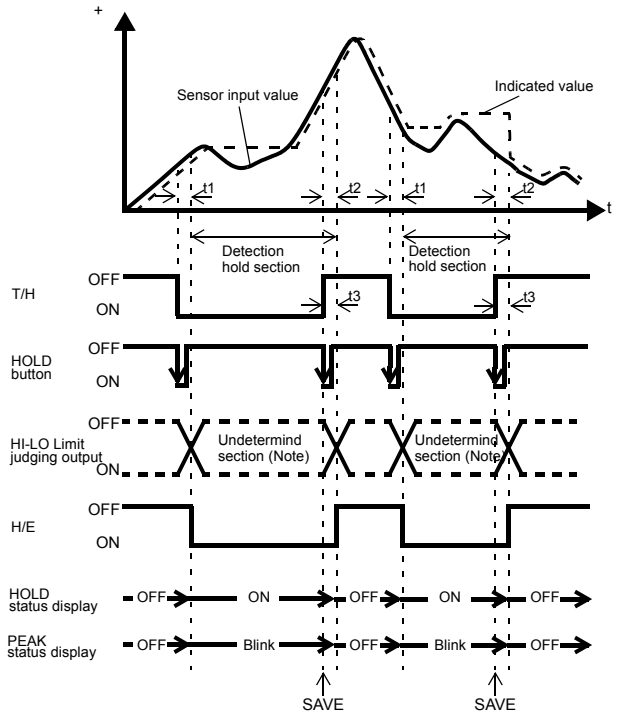
t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

SAVE: Measurement results are saved in history and written on an SD card.

Peak hold

The maximum value (peak) in the positive direction of the specified section is held.
The section is specified by the setting of “all section”, “external signal”, “external signal+time”, “level+time”, or “level”.

Example) All section peak hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
1.0ms (max.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
1.0ms (max.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

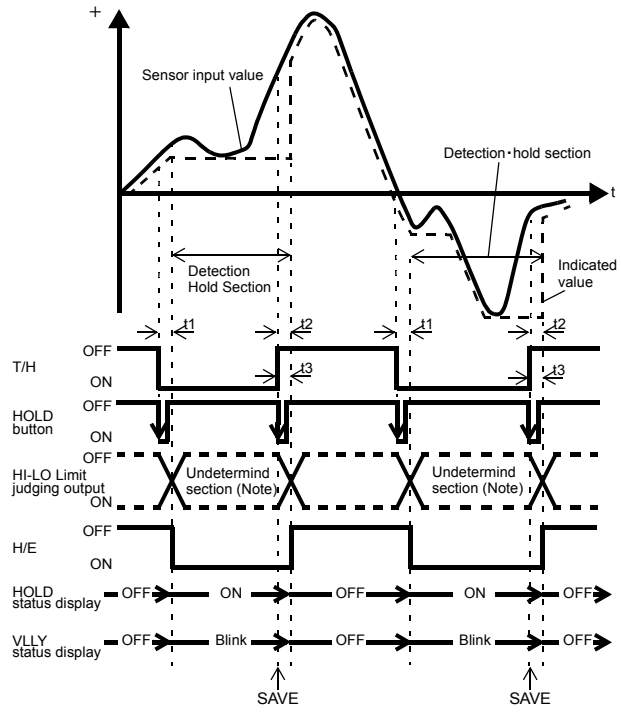
SAVE: Measurement results are saved in history and written on an SD card.

Note:
During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

Valley hold

The maximum value (valley) in the negative direction of the specified section is held.
The section is specified by the setting of “all section”, “external signal”, “external signal+time”, “level+time”, or “level”.

Example) All section valley hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
1.0ms (max.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
1.0ms (max.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

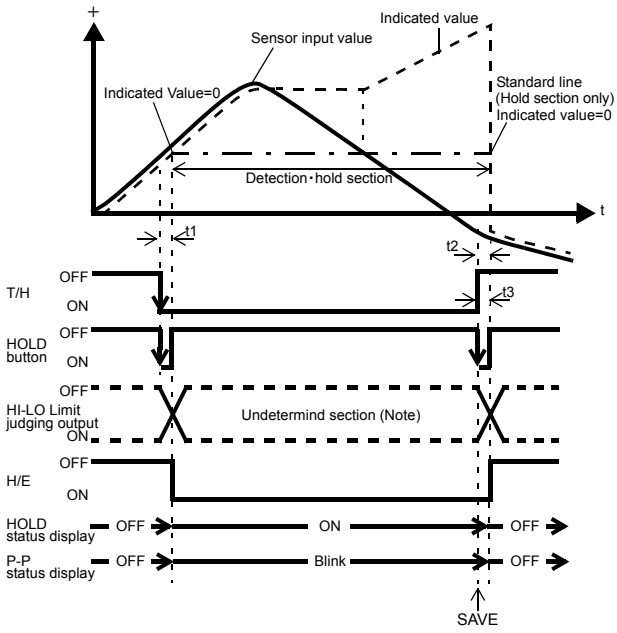
SAVE: Measurement results are saved in history and written on an SD card.

Note:
During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

Peak-to-Peak (P-P) hold

The difference value between the peak and valley over the specified section is held.
The section is specified by the setting of “all section”, “external signal”, “external signal+time”, or “level+time”.

Example) All section Peak-to-Peak (P-P) hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
1.0ms (max.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
1.0ms (max.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

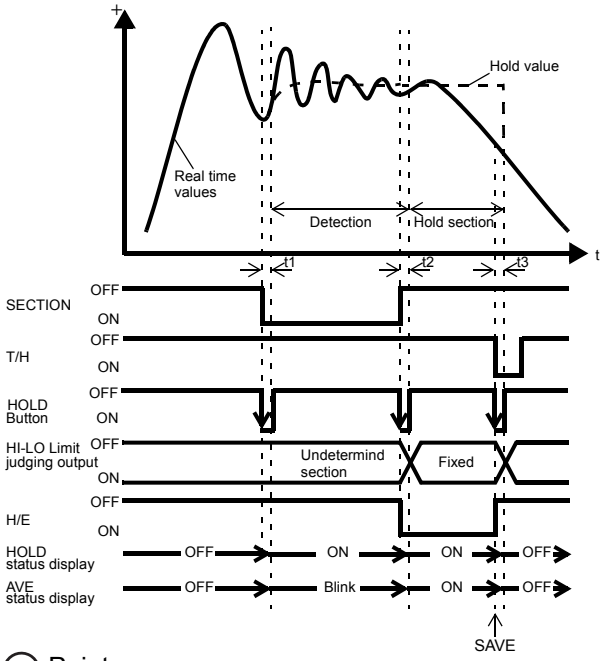
SAVE: Measurement results are saved in history and written on an SD card.

Note:
During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

Average hold

The average value of the sampling values over the specified section is calculated and updated to perform comparison operation. The section is specified by the setting of “all section”, “external signal”, “external signal+time”, or “level+time”.

Example) Externally specified section average value hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when detection is performed.
1.0ms (max.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined
1.0mS (MAX.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

SAVE: Measurement results are saved in history and written on an SD card.

Point

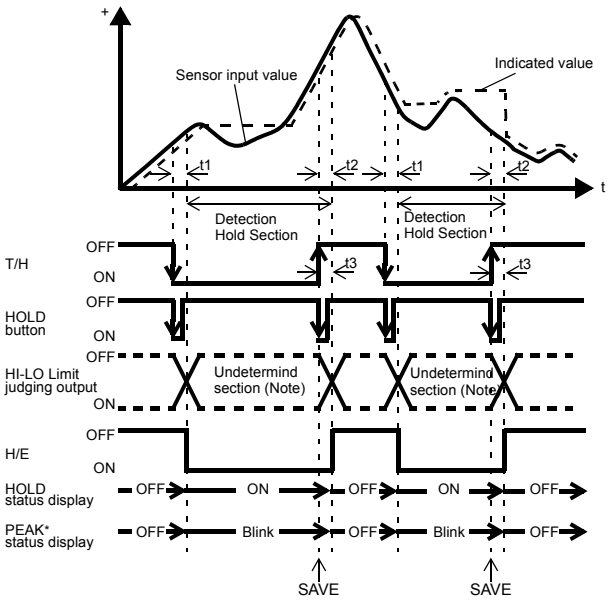
The detection section is limited by the maximum average value detection time set according to the “Average sample number”.
For details, see the section on "Average sample number" on page 40.

■How to specify the hold detection section(Peak, Valley, P-P, Average)

All section

By this method, the hold detection section is externally specified by the T/H signal.
Detection starts with the T/H signal ON to perform each hold operation.
According to the ON/OFF state of the T/H signal, detection and tracking are repeated. There is no fixed hold section.

Example) All section peak hold



* The status display changes depending on the hold mode.

t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held
1.0ms (max.)

t2: A delay time between the instant when the T/H signal is released and the instant when the indicated value returns to tracking
1.0ms (max.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

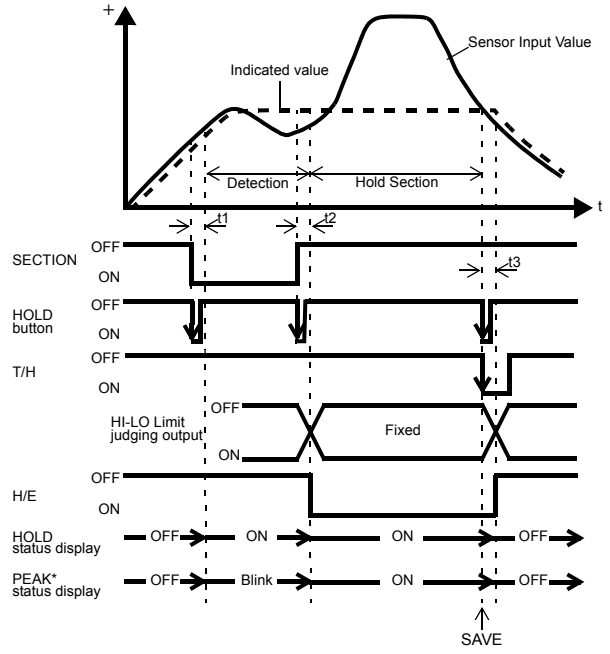
SAVE: Measurement results are saved in history and written on an SD card.

Note:
During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

External signal

By this method, the hold detection section is externally specified by the SECTION signal to maintain the hold value until the reset signal is turned on.
The hold is released by turning on the T/H signal as a reset signal.
The H/E output signal is on between the instant when the SECTION signal is turned off and the instant when the T/H signal is turned on.

Example) Externally specified section peak hold



* The status display changes depending on the hold mode.

t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected
1.0ms (max.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined
1.0ms (max.)

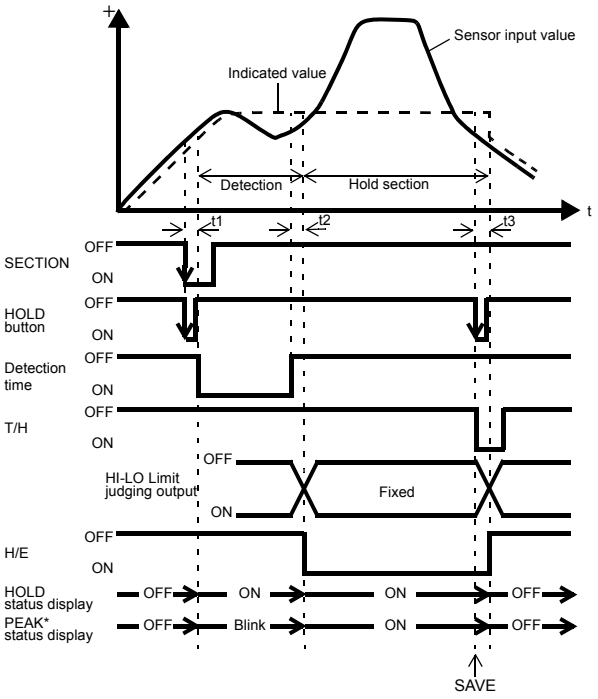
t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

SAVE: Measurement results are saved in history and written on an SD card.

External signal + time

Hold is detected during the predetermined time (hold section time) from the point in time when the SECTION signal is turned on. The hold is released by turning on the T/H signal as a reset signal.
The H/E output signal is on between the instant when the SECTION signal is turned off and the instant when the T/H signal is turned on.

Example) External + Time specified section peak hold



* The status display changes depending on the hold mode.

t1: A delay time between the instant when the H/M signal is inputted and the instant when the value to be held is detected
1.0ms (max.)

t2: A delay time between the instant when the hold section time is expired and the instant when the value to be held is determined
1.0ms (max.)

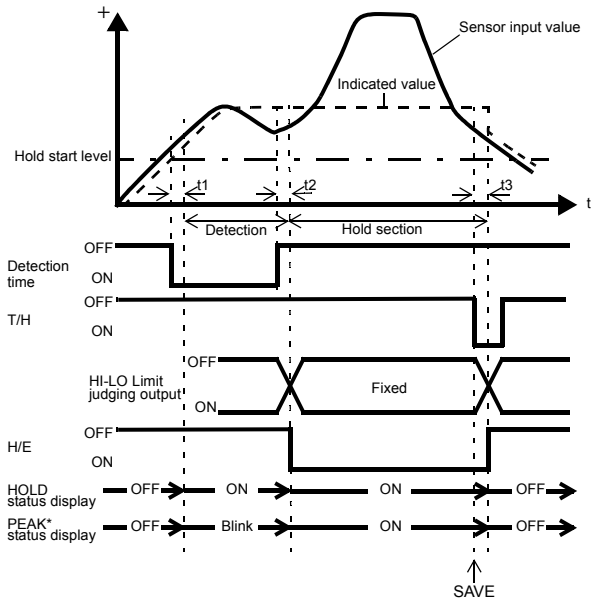
t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

SAVE: Measurement results are saved in history and written on an SD card.

Level + time

Hold is detected during the predetermined time (hold section time) from the point in time when the indicated value crosses the hold start level. The hold is released by turning on the T/H signal as a reset signal.
The H/E output signal is on between the instant when the hold section time ends and the instant when the T/H signal is turned on.

Example) Level + Time specified section peak hold



* The status display changes depending on the hold mode.

t1: A delay time between the instant when the indicated value exceeds the hold start level and the instant when the value to be held is detected
0.5ms (max.)

t2: A delay time between the instant when the hold section time is expired and the instant when the value to be held is determined
1.0ms (max.)

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

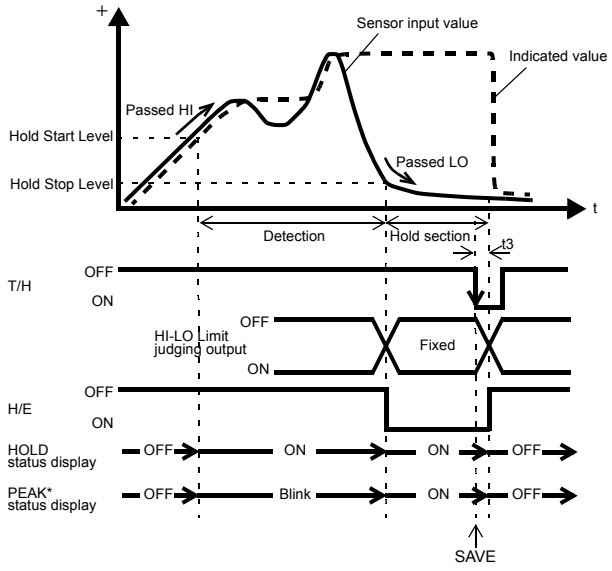
SAVE: Measurement results are saved in history and written on an SD card.

Level (only Peak and Valley)

By this method, the hold detection section is from the point in time when the indicated value crosses the Hold Start Level until it crosses the Hold Stop Level. The hold is released by turning on the T/H signal as a reset signal. The H/E output signal is on between the instant when the hold section time ends and the instant when the T/H signal is turned on.

However, there are limitations that the Hold Start Level should be passed HI and the Hold Stop level be passed LO in peak hold, while the Hold Start Level should be passed LO and the Hold Stop level be passed HI in valley hold.

Example) Level specified section peak hold



* The status display changes depending on the hold mode.

t3: A minimum reset signal width required for releasing the hold
1.0ms (min.)

SAVE: Measurement results are saved in history and written on an SD card.

7-9. Measurement work selection by external input

This function allows storage of up to 16 types of set values of vibration detection, hold, graph, and comparison, which can be selected by external selection signals from WORK0 to WORK3.

Normally, if there is no entry for WORK0 - WORK3, the set value of WORK00 is selected, but when WORK0 - WORK3 are in the following conditions, the set value of each Measurement work is selected.

WORK3	WORK2	WORK1	WORK0	Measurement work
0	0	0	0	WORK00
0	0	0	1	WORK01
0	0	1	0	WORK02
0	0	1	1	WORK03
0	1	0	0	WORK04
0	1	0	1	WORK05
0	1	1	0	WORK06
0	1	1	1	WORK07
1	0	0	0	WORK08
1	0	0	1	WORK09
1	0	1	0	WORK10
1	0	1	1	WORK11
1	1	0	0	WORK12
1	1	0	1	WORK13
1	1	1	0	WORK14
1	1	1	1	WORK15

(0: open, 1: short)

I/O terminal block

A9, A10 B9, B10	COM1
B1	WORK0
B2	WORK1
B3	WORK2
B4	WORK3*

CAUTION

It takes 15msec at the maximum for the changed work No. to become effective. During this section, which work is measured is undefined.
Also, when the work is switched, the hold and graph functions are reset under the after-switching work conditions irrespective of the previous operation.

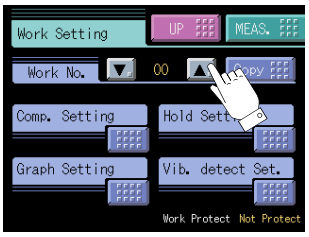
* If Measurement Work Selection is not set to External Input, measurement work cannot be specified by external input.

■About changing of the setting work

When changing the hold or comparison set value of each work, set the Work No. with the Work change key on the mode selection screen, and change the set value.

How to set

1. Select the setting Work on the Work setting screen.
2. Then, enter each set value in a likewise manner.



Point

For making the settings of all Works equal, set the Work No. to “All”.
The value set with “All” is set for all WORK00 - WORK15.

CAUTION

The setting work change key is not for specifying the measurement work.
Designate Measurement Work(s) with external selector signals WORK0 - WORK3.

7-10.Measurement work selection

Select the method for specifying the measurement work.

COM.: Measurement work specification by external input becomes ineffective, and only measurement work specification by communication (RS-232C) becomes effective.

EXT.: Measurement work specification by communication (RS-232C) becomes ineffective, and only measurement work specification by external input becomes effective.

How to set

MENU → System Setting → Operation → Page 1

7-11. Control input selection

Select the method for specifying the control (SECTION signal, T/H signal, or GRAPH TRIG signal) input.

COM.: Control by external input becomes ineffective, and only control by communication (RS-232C) becomes effective.

EXT.: Control by communication (RS-232C) becomes ineffective, and only control by external input becomes effective.

How to set

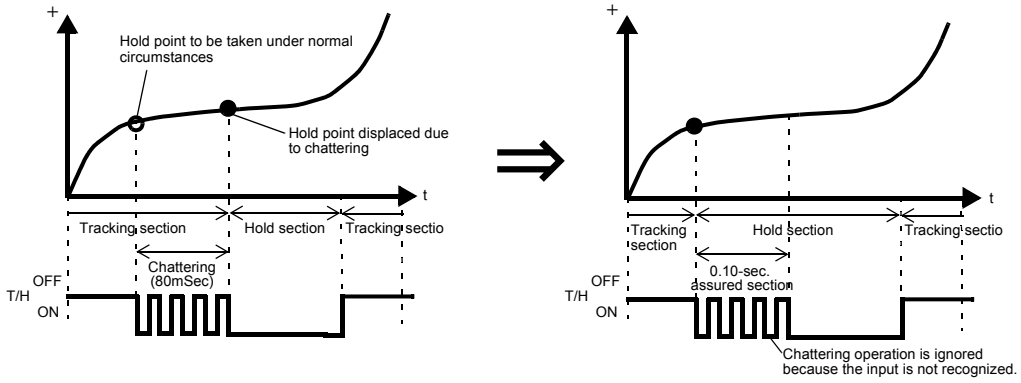
MENU → System Setting → Operation → Page 1

7-12. A1 OFF detection wait

In hold controlled by the TH/signal alone, detection/hold section is assured during the set waiting time. This is convenient for ignoring chattering parts.

Setting range 0.00 to 1.00 [sec.]

Example) Sample hold



When the waiting time is 0.00 sec.. When the waiting time is 0.10 sec..

How to set

MENU → System Setting → Operation → Page 2

7-13. A2 OFF detection wait

This is convenient in hold controlled by the SECTION signal.
Operationally, detection/hold section is assured as in the case of A1 OFF Detection Wait.
The timer functions so as to also ignore chattering when the OFF edge is detected.

Setting range 0.00 to 1.00 [sec.]

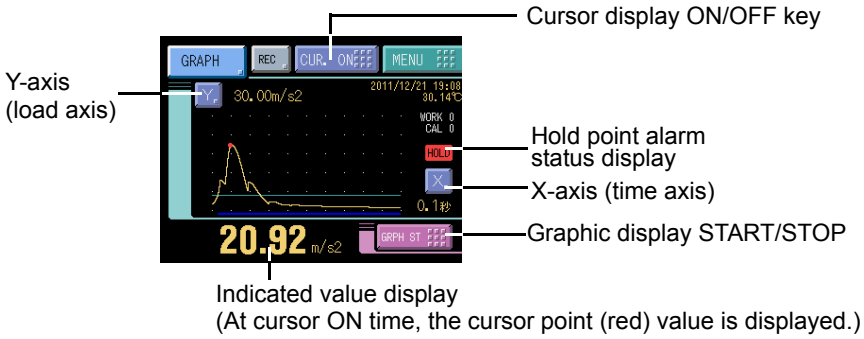
How to set

MENU → System Setting → Operation → Page 2

7-14.Waveform display

■Graphic display screen

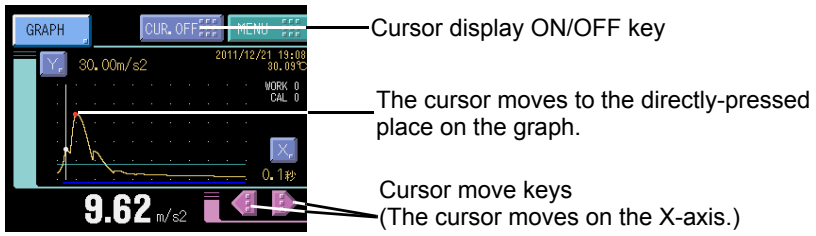
Graph is updated while operating on the ordinary display screen (a comparison, a hold, graph).



CAUTION

When the cursor display is on and when the setting screen is open, the graph is not upgraded.

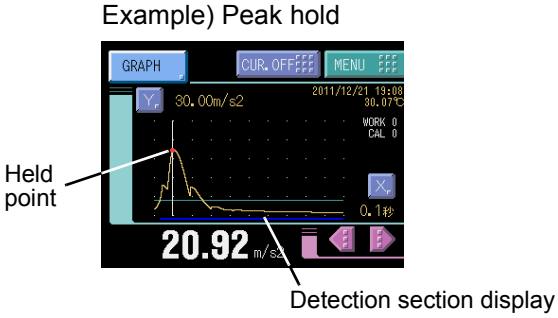
■Cursor display screen



Hold point plotting

By using the hold function and the graph plotting function together, the held point (red) can be plotted.

Example) Peak hold



CAUTION

If the hold value is simply renewed without renewing the graph, the value will differ from the hold point on the graph. In such a case, the hold point alarm status is displayed.

Detection section display

By plotting a graph at the same time as the hold function, a cobalt line indicating the detection section is displayed at the bottom of the X-axis.

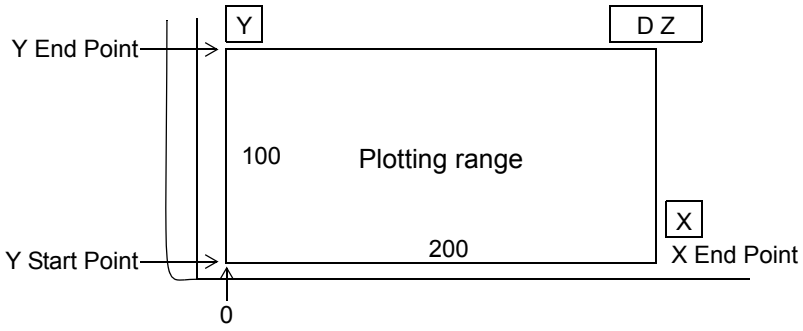
Hold start level display

If the Hold Start Level is used in the hold function, a light blue line is displayed. Also, a dotted line appears when the Hold Start Level is outside the graph area.

X-axis and Y-axis on the graph plotting screen

X-axis: The X-axis is a time setting axis. One graph screen is plotted between the start signal input point and the X start point.
There are 200 plotting points, and typical values for the predetermined time divided by this number of plotting points are plotted.

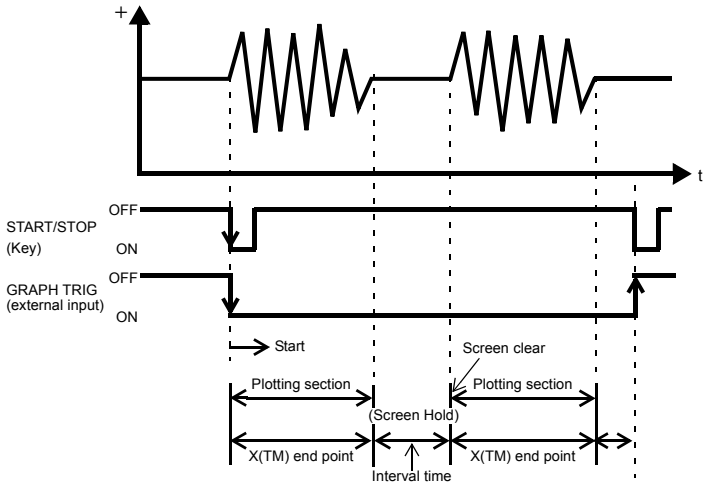
Y-axis: The Y-axis is a load setting value. A graph is plotted between the Y start point and the Y end point. (There are 100 plotting points.)



■Graph plotting

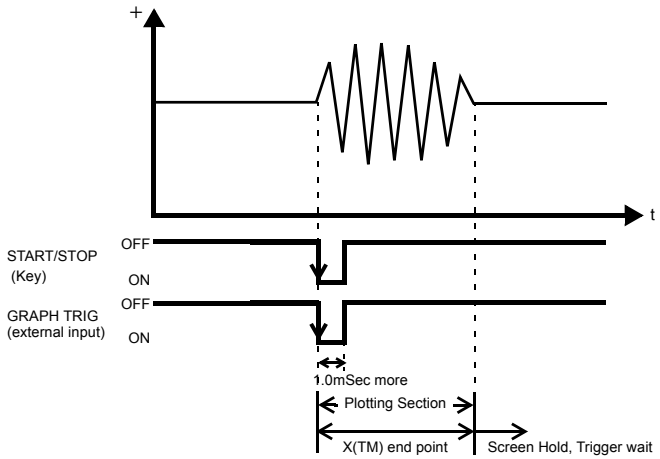
Continued

Graph plotting starts with the GRAPH Start/Stop key input or the GRAPH TRIG external input ON. When it ends on one screen, the screen is cleared after expiration of the interval time and graph plotting restarts on the next screen. Plotting ends with the GRAPH Start/Stop key input or the GRAPH TRIG external input OFF.



External

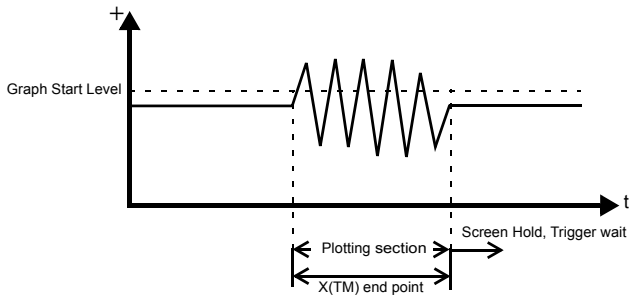
Graph plotting starts with the GRAPH Start/Stop key input or the GRAPH TRIG external input ON.
Plotting ends on one screen at the predetermined time of the X end point.



Level

Plotting starts when the Level Condition is met in comparison of the Graph Start Level set value and indicated value. Plotting ends on one screen at the predetermined time of the X end point.

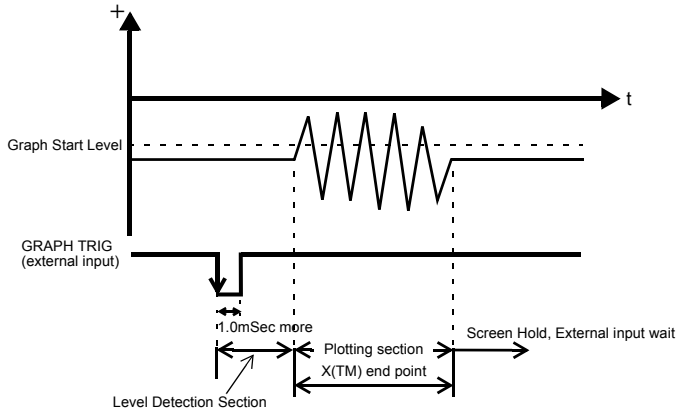
Example) Graph Start Level→Passed HI



External+level

Plotting starts when the Level Condition is met in comparison of the Graph Start Level and indicated value after GRAPH TRIG external input ON.
Plotting ends on one screen at the predetermined time of the X end point.

Example) Graph Start Level→Passed LO



■Graph mode

Set the graph plotting mode.

Setting range Continued, Ext, Level, Ext+Level

How to set

MENU → Work Setting → Graph Setting → Page 1

■Interval time

If you select "Continued" in the graph function setting, set the graph plotting operation interrupting time from clearing the screen until moving to the next graph plotting operation. During this time, the graph screen is held.

Setting range 0.001 to 9.999 [sec.]

How to set

MENU → Work Setting → Graph Setting → Page 2

■Graph start level

If you select [level] or [external + level] in the graph function setting, set the graph plotting start level.

Setting range -9999 to 9999

How to set

MENU → Work Setting → Graph Setting → Page 1

■Level condition

If you select [level] or [external + level] in the graph function setting, set the graph plotting start level comparison conditions.

Setting range Passed, Passed HI, Passed LO, Beyond, Below

How to set

MENU → Work Setting → Graph Setting → Page 2

- Passed
  Graph plotting starts when the indicated value crosses the level set value.
- Passed HI
  Graph plotting starts when the indicated value crosses the level set value upward.
- Passed LO
  Graph plotting starts when the indicated value crosses the level set value downward.
- Beyond
  Graph plotting starts when the indicated value is larger than the level set value.
- Below
  Graph plotting starts when the indicated value is smaller than the level set value.

■X end point

Set the time to display by one screen.

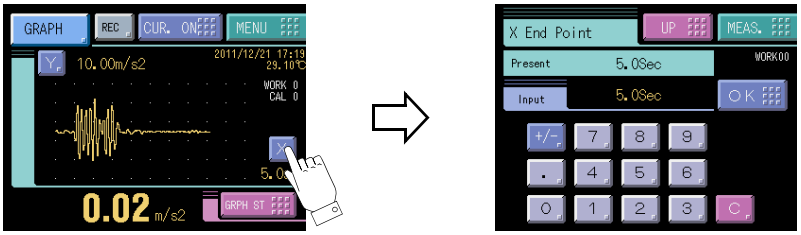
Setting range 00.1 to 99.9 [sec.]

How to set

MENU → Work Setting → Graph Setting → Page 1

Simple setting call

Press the [X] button on the graph display to go direct to the X end point entry screen.



■Y(VB) start point and Y end point

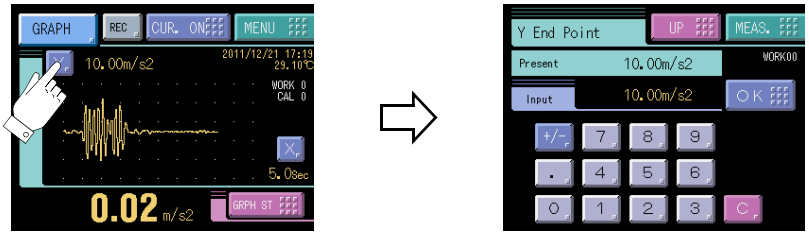
Setting range -9999 to 9999 (where Y start point < Y end point)

How to set

MENU → Work Setting → Graph Setting → Page 1

Simple setting call

Press the [Y] button on the graph display to go direct to the Y end point entry screen.



CAUTION

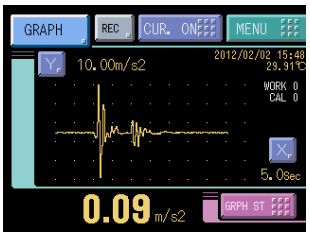
About the case to switch work and to draw

When beginning to draw, X end point and Graph mode, etc. are read. Therefore, please do not do the work switch while drawing when these settings are different in each work. Please do after drawing ends.

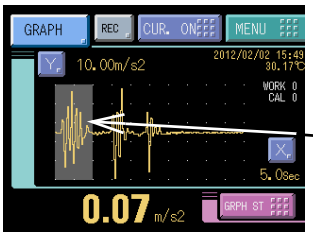
■Pre trigger display function

A graph is plotted by tracking back the time by the percentage set for Pre Trigger Display.

Absence of Pre Trigger Display



Presence of Pre Trigger Display (20%)



A graph is plotted by tracking back the time.

* The Pre Trigger Value can be set in the range of 0 to 20%.
* Even if the Pre Trigger Value is set, the graph plotting time is fixed, in which plotting is performed from the head of the Pre Trigger Value: therefore, the time of plotting from its start becomes short by the Pre Trigger Value.
* The Pre Trigger Value can be set on each piece of work.
* No hold point is marked in the Pre Trigger Display area.

Pre trigger value

Setting range 0 to 20 [%] Initial value: 0

How to set

MENU → Work Setting → Graph Setting → Page 1

■Graph Record

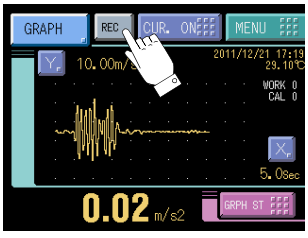
The last 16 times' waveform data obtained by measurement can be accumulated for each work. Accumulation is carried out when one page of plotting is finished.

In the waveform record, the following data are saved.

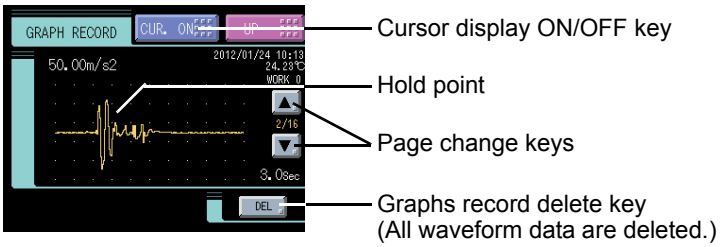
- Waveform data
- Time
- Unit
- X-axis
- Y-axis
- Hold point
- Pre-trigger range
- Temperature

How to set

Graph record screen → REC

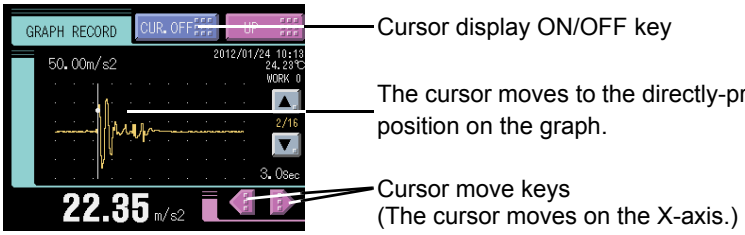


Graph record screen



Cursor display screen

Press the cursor display button, and the cursor appears in the graph display area, so that the cursor-positioned vibration value can be read.



* If the work or calibration value is switched during graph plotting, the value is not saved properly. Do not switch the work and calibration value during graph plotting.

* If you go to the history screen during graph plotting, the waveform being plotted is saved, but the hold point is not saved because the graph plotting is not finished.
To display the hold point, go back to the graph screen once, and confirm that the graph plotting is finished, and then display the graph history screen again.

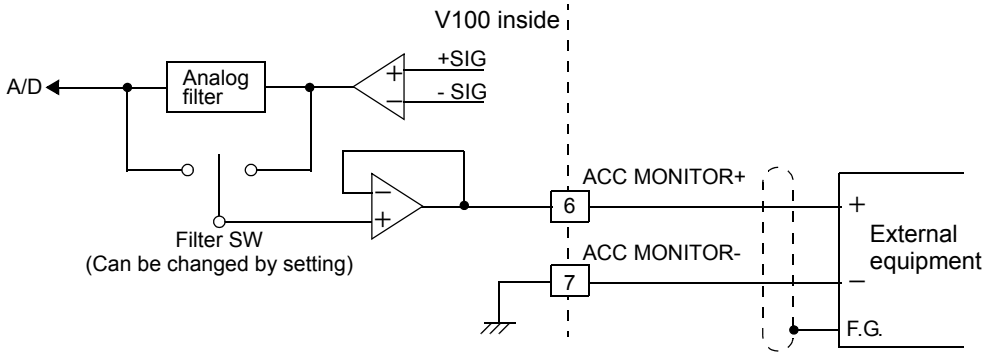
Chapter 7

SETTING OF FUNCTIONS

7-15. Monitor output filter

This interface extracts analog voltage proportional to acceleration input signals. This interface is convenient for observation and recording of waveforms with a recorder, etc., connected.
The output level is approx. 1V(1V/G) per 50mV of input.

- Example of output equivalent circuit and external equipment connection



Output signals are not the indicated values themselves because they are extracted before analog input signals are A/D-converted.
Therefore, output signals do not synchronize with the digitally processed indicated values, such as the digital filter.

■Monitor output filter

This setting is for switching the analog filter of the monitor output.

ON: Analog filter is applied
OFF: Analog filter is not applied

* The cut-off frequency of the analog filter is set by "Analog filter" on page 33.

How to set

MENU → System Setting → Operation → Page 3

7-16. Screen lock/key lock (LOCK function selection)

By the setting of LOCK function selection, the external LOCK input terminal can be switched to DSP_LOCK terminal function or KEY_LOCK terminal function.

DSP_LOCK: When the terminal is short-circuited, key operations on the measurement screens (comparison, hold, and graph, FF) are disabled. However, the measurement screen can be changed (hold to graph) and the cursor function is enabled.

KEY_LOCK: When the terminal is short-circuited, all key operations are disabled.

[DSP_LOCK]

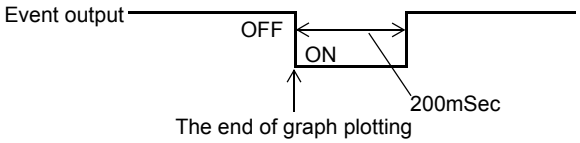
[KEY_LOCK]

How to set

MENU → System Setting → Operation → Page 3

7-17. Event output at the end of graph plotting

Each time a graph is plotted on screen, a pulse signal is output (the pulse width is 200mSec). The waveform can automatically be taken in through the RS-232C interface by connecting to the event input of the DS400.



* If the time to start the next graph plotting is less than 200mSec, the pulse is forcedly turned OFF when the plotting starts.

7-18.RUN output

External output “RUN” stops when abnormal state of indicated value is detected.
The conditions of stopping the output caused by abnormal state are as follows.

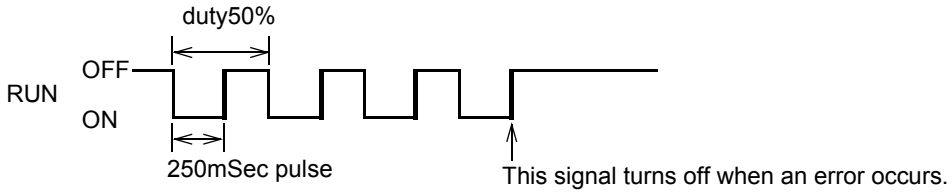
- Sensor ±error
- ±OVER (Overflow error)
- Zero error (Zero calibration error)
- Span error (Span calibration error)

Refer to "11-1.Error display list" on page 81 about the contents of errors.

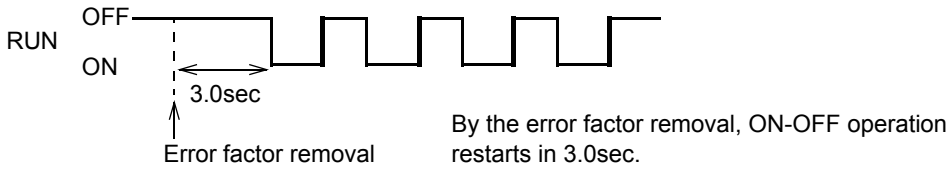
RUN out specifications are as follows.

You can select the output form of the external output signal RUN (A19)

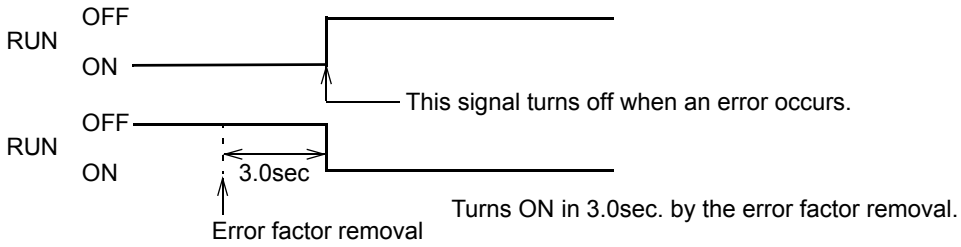
- ON-OFF operation



Normally, the signal repeating ON-OFF operation is output.



- ON operation



・OFF operation

The ON-OFF relationship is the inverse of the ON-fixed case.

■RUN output form

Setting range ON-OFF operation, ON fixed, OFF fixed Initial value: ON-OFF operation

How to set

MENU → System Setting → Operation → Page 3

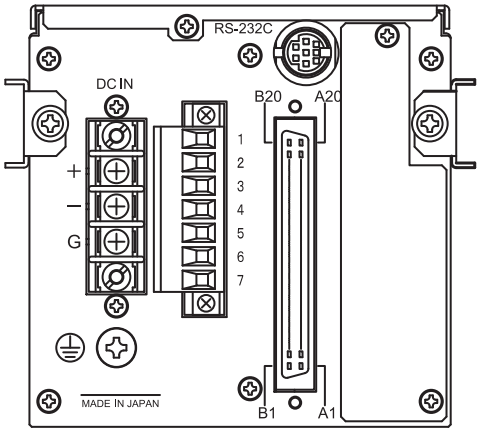
CAUTION

Be aware that judgment is difficult if a hardware error occurs (if the level is fixed for some reason) when the output is fixed.

7-19.RS-232C interface

The RS-232C is an interface to read the indicated value and status of the V100 and to write parameters into the V100.

This interface is convenient to process controls, totals, records, etc., by connecting the V100 to a computer, process controller, sequencer or the like.



■Communication specifications

Specifications

Signal level:	Based on RS-232C	
Transmitting distance:	Approx.15m	
Transmitting method:	Asynchronous, Full duplex	
Transmitting speed:	9600, 19200, 38400, or 57600 bps Selectable	
Bit configuration:	Start bit	1bit
	Data bit	7 or 8 bit Selectable
	Stop bit	1 or 2 bit Selectable
	Parity	Parity none, odd or even Selectable
	Delimiter for sending	CR, CR+LF Selectable
Code:	ASCII	

Connector pin assignment

This connector connects the RS-232C.

(→"■RS-232C interface connection" on page 11)

Cable

(→"■RS-232C interface connection" on page 11)

Communication check

The communication can be checked.

(→"⑥COM check" on page 84)

■RS-232C interface setting

Set the RS-232C communication conditions of the V100.

Communication mode

Setting range Normal, Continu., Single

How to set

MENU → System Setting → RS-232C Setting → Page 1

Baudrate

Setting range 9600, 19200, 38400, 57600 [bps]

How to set

MENU → System Setting → RS-232C Setting → Page 1

Data bit

Setting range 7, 8 [bit]

How to set

MENU → System Setting → RS-232C Setting → Page 1

Stop bit

Setting range 1, 2 [bit]

How to set

MENU → System Setting → RS-232C Setting → Page 1

Parity bit

Setting range NONE, ODD, EVEN

How to set

MENU → System Setting → RS-232C Setting → Page 1

Delimiter

Setting range CR, CR＋LF

How to set

MENU → System Setting → RS-232C Setting → Page 2

Flow control

Setting range Off, RTS/CTS

How to set

MENU → System Setting → RS-232C Setting → Page 2

■Communication mode

1. Normal

   Communications are carried out by commands from the host computer.

   The indicated value, status and parameters can be read, and parameters can be written.

2. Continue

   The indicated value and status are continuously transmitted.

3. Single

   Transmission is carried out once when the hold of the indicated value is released.

■Communication format

Transmit mode

●Indicated value / status read commands

Indicated value/status read

Function	Header Main	Header Sub	Protocol
Vibration (with HOLD)	R	A	Host: R A CR / V100: R A + 1 2 3 . 4 Delimiter — Sign, decimal point, 4-digit indicated value
Temperature	R	B	Host: R B CR / V100: R B + 2 3 . 4 5 Delimiter — Sign, decimal point, 4-digit indicated value
Status 1	R	C	Host: R C CR / V100: R C 0 0 0 0 0 0 0 0 Delimiter — Sensor +Error 0:OFF 1:ON; Sensor -Error 0:OFF 1:ON; +OVER 0:OFF 1:ON; -OVER 0:OFF 1:ON; HH 0:OFF 1:ON; LL 0:OFF 1:ON; Undefined
Status 2	R	D	Host: R D CR / V100: R D 0 0 0 0 0 0 0 0 Delimiter — Hold 0:OFF 1:ON; FFT OK 0:OFF 1:ON; Near Zero 0:OFF 1:ON; HI 0:OFF 1:ON; OK 0:OFF 1:ON; LO 0:OFF 1:ON; FFT NG 0:OFF 1:ON
Graph data	R	G	Host: R G * * CR / V100: R G * * + 1 2 3 . 4 … … + 1 2 3 . 4 + 1 2 3 . 4 Delimiter — Sign, decimal point, 4-digit indicated value; ** : Section 00 - 19; * 10 points of data can be read on one section.
Graph hold point data; one point only	R	H	Host: R H CR / V100: R H 0 0 0 、 + 1 2 3 . 4 Delimiter — Graph data no. 000～199; Sign, decimal point, 4-digit indicated value
Vibration (without HOLD)	R	J	Host: R J CR / V100: R J + 1 2 3 . 4 Delimiter — Sign, decimal point, 4-digit indicated value

●Set value read / write commands

To read/write set value(s) in Work Setting, first write the work no. of the set value(s).

Work no. write for work setting

Function	Header Main	Header Sub	Protocol
Setting work no.	W	A	Host: W A 0 0 0 1 0 0 0 1 2 Delimiter Work no. 00 – 16 Specify 16 for setting the same value to all work nos.

Work no. read for work setting

Function	Header Main	Header Sub	Protocol
Setting work no.	W	A	Host: W A 0 0 0 1 CR V100: W A 0 0 0 1 0 0 0 1 2 Delimiter Work no. 00 – 16

This work no. is specific to 232C.

If the power is turned on again, and in the case of entry into the COM Check screen in Self Check, "0" will result.

Setting write

Function	Header Main	Header Sub	Protocol
Each set value	W	A	Host: W A 1 2 3 4 + 1 2 3 4 CR Command / Sign, 4-digit set value * When the number of digits of the set value is smaller than 4, put "0" in the high-order digit(s). Example) In the case of 3 digits W A 1 2 3 4 + 0 1 2 3 Delimiter * When the set value is a selection, put "0" in the sign digit. W A 1 2 3 4 0 0 0 0 1 Delimiter

Setting read

Function	Header Main	Header Sub	Protocol
Each set value	W	A	Host: W A 1 2 3 4 CR Command V100: W A 1 2 3 4 + 1 2 3 4 Delimiter Sign, 4-digit set value

For the command no. of the WA command, use each 4-digit set value no.

(Refer to "11-4.Setting item list" on page 85.)

●Special function commands

Special function commands

Function	Header Main	Header Sub	Protocol
Measure-ment work selection	C	W	Host: C W 0 0 Delimiter Measurement work no. 00 – 15 (Numerical values other than the above are ignored.) * Effective when the operation setting menu item "Meas. Work Select" in System Setting is COM.
Measure-ment work read	C	W	Host: C W CR V100: C W 0 0 Delimiter Measurement work no. 00 – 15
Control input selection	C	C	Host: C C 0 0 0 0 Delimiter FFT TRIG 0:OFF 1:ON GRAPH TRIG 0:OFF 1:ON SECTION 0:OFF 1:ON T/H 0:OFF 1:ON * Effective when the operation setting menu item "Control input selection" in System Setting is COM.
Screen change	C	–	Host: C 1 Delimiter 1:Comparison screen 2:Hold screen 3:Graph screen 4:FFT screen

●Continuous transmission / Single

Continuous transmission/Single

Function	Header Main	Header Sub	Protocol
Indicated value and status	G	S	V100: G S , S1 , S2 , S3 , S4 , S5 , (0 1 2 3 4 5 6 7 8 9 10 11 12) + 1 2 3 . 4 + 1 2 . 3 4 Delimiter (13 14 15 16 17 18 19 20 21 22 23 24 25 26) Sign, decimal point, 4-digit indicated value Sign, decimal point, 4-digit indicated value

S1	S2	S3	S4	S5
O:Sensor ±Error or ±Over	0:Vib. Val	H:HI ON	H:HH ON	N: Near Zero OFF
H:Hold	1:Envelope	L:LO ON	L:LL ON	Z:Near Zero ON
	2:Peak	G:HI/LO OFF	G:HH/LL OFF	
	3:RMS	N:HI/LO ON	N:HH/LL ON	
	4:Crest	F:Comparison OFF	F:Comparison OFF	
	5:Form			
H>O		N>(HorL)>F>G	N>(HorL)>F>G	

●Time read / write commands

Time read/write commands			
Function	Header Main	Header Sub	Protocol
Time read	T	R	Host: T R CR V100: T M 1 1 / 0 9 / 0 1 _ 2 3 : 5 9 : 5 9 Delimiter
Time write	T	W	Host: T W 1 1 / 0 9 / 0 1 _ 2 3 : 5 9 : 5 9 Delimiter

7-20. Time setting

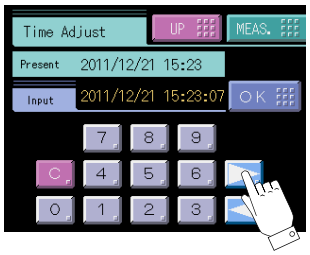
Set the current time.

Setting range 2000/01/01 00:00:00 - 2079/12/31 23:59:59

How to set

MENU → System Setting → Page 2 → Time Adjust → Page 1

1. Press / to flash the place you want to set.



Each time / is pressed, a change is made in the order of year → month → day → hour → minute → second → year → •••

2 0 0 0 / 0 1 / 0 1 / 0 1 : 2 3 : 5 5
Year Month Day Hour Minute Second

2. Input numerical values.

Input of year / month / day / hour / minute / second are all two digits.

Year: 00 to 79 (Last two digits of year)
Month: 01 to 12
Day: 01 to 31 (The last day varies according to the set month.)
Hour: 00 to 23 (24-hour display)
Minute: 00 to 59
Second: 00 to 59

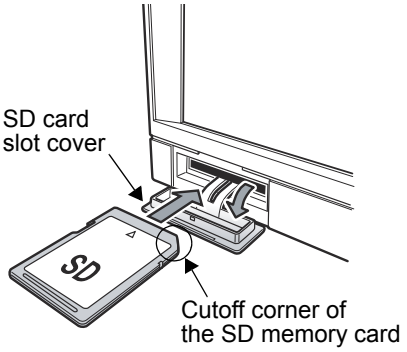
3. Confirm with the OK button.

8 SD CARD FUNCTIONS

8-1. SD card insertion / ejection

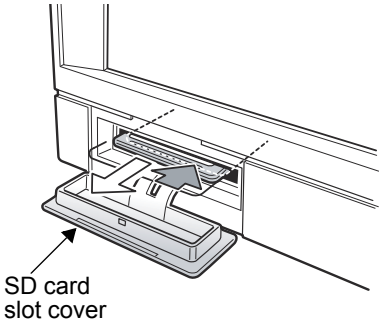
■SD card insertion

1. Open the SD card slot cover of the main unit.
2. Insert an SD memory card paying attention to its cutoff corner as shown at the right.
3. Push in until you hear it click.
4. Close the SD card slot cover.



■SD memory card ejection

1. Check that the SD memory card is not in processing.
2. Open the SD card slot cover of the main unit.
3. Once push in the SD memory card, and then release it.
   You will hear it click, and the SD memory card will pop out slightly.
4. Pick the SD memory card, and draw it out frontward.
5. Close the SD card slot cover.



8-2. Measurement data save

When measurement is finished and hold is released, the measurement data can be saved on an SD card. A saved file is created for each work.

* For hold release, see the section "Hold operation" on page 40.

File name format: V 1 0 0 D ＊ ＊ ＊ . C S V
① ②

① Work No. 00 to 15
② File No. 0 to 9

Files are created from No. 0 for each work. Up to No. 9 (maximum 10 files) are created.
One file, having a data capacity of 5M bytes, can store the results of approximately 65000 measurements.
When the last file is filled with data, data save is continued while the data in the oldest file is deleted.

Setting range ON/OFF

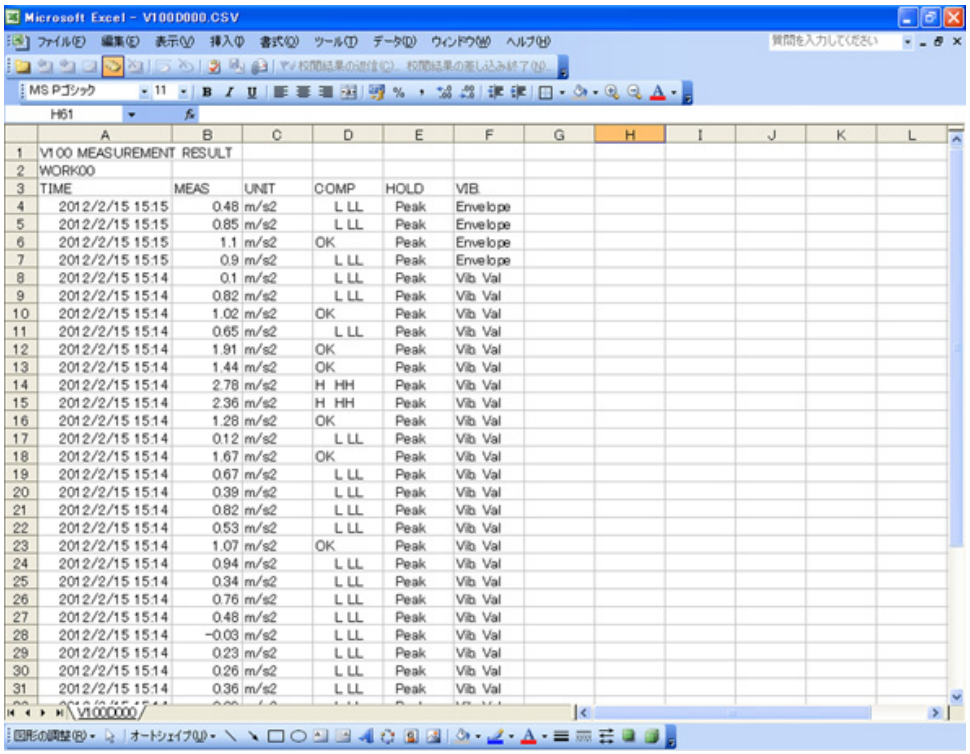
How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 1

⚠ CAUTION

- Carry out measurement at intervals of 1 sec or more.
  If the next measurement is finished and hold is released while measurement results are written on the SD card, an SD card writing error will occur, so that data will not be written.
- Format an SD memory card on the V100 or with dedicated formatting software. Formatting it in other ways disables writing of measurement waveforms in 1 or second because the SD memory card processing speed becomes slow due to an inappropriate format for the V100.
  In that case, reformat it on the V100 before use.
- During preservation and reading of data and formatting of an SD memory card, a warning is displayed across the screen. Never eject the SD memory card or turn off the power. Also, measurement cannot be started.

■ Measurement data file (CSV format)



	A	B	C	D	E	F	G	H	I	J	K	L
1	V100 MEASUREMENT RESULT											
2	WORK00											
3	TIME	MEAS	UNIT	COMP	HOLD	VIB						
4	2012/2/15 15:15	0.48	m/s2	L LL	Peak	Envelope						
5	2012/2/15 15:15	0.85	m/s2	L LL	Peak	Envelope						
6	2012/2/15 15:15	1.1	m/s2	OK	Peak	Envelope						
7	2012/2/15 15:15	0.9	m/s2	L LL	Peak	Envelope						
8	2012/2/15 15:14	0.1	m/s2	L LL	Peak	Vib. Val						
9	2012/2/15 15:14	0.82	m/s2	L LL	Peak	Vib. Val						
10	2012/2/15 15:14	1.02	m/s2	OK	Peak	Vib. Val						
11	2012/2/15 15:14	0.65	m/s2	L LL	Peak	Vib. Val						
12	2012/2/15 15:14	1.91	m/s2	OK	Peak	Vib. Val						
13	2012/2/15 15:14	1.44	m/s2	OK	Peak	Vib. Val						
14	2012/2/15 15:14	2.78	m/s2	H HH	Peak	Vib. Val						
15	2012/2/15 15:14	2.36	m/s2	H HH	Peak	Vib. Val						
16	2012/2/15 15:14	1.28	m/s2	OK	Peak	Vib. Val						
17	2012/2/15 15:14	0.12	m/s2	L LL	Peak	Vib. Val						
18	2012/2/15 15:14	1.67	m/s2	OK	Peak	Vib. Val						
19	2012/2/15 15:14	0.67	m/s2	L LL	Peak	Vib. Val						
20	2012/2/15 15:14	0.39	m/s2	L LL	Peak	Vib. Val						
21	2012/2/15 15:14	0.82	m/s2	L LL	Peak	Vib. Val						
22	2012/2/15 15:14	0.53	m/s2	L LL	Peak	Vib. Val						
23	2012/2/15 15:14	1.07	m/s2	OK	Peak	Vib. Val						
24	2012/2/15 15:14	0.94	m/s2	L LL	Peak	Vib. Val						
25	2012/2/15 15:14	0.34	m/s2	L LL	Peak	Vib. Val						
26	2012/2/15 15:14	0.76	m/s2	L LL	Peak	Vib. Val						
27	2012/2/15 15:14	0.48	m/s2	L LL	Peak	Vib. Val						
28	2012/2/15 15:14	-0.03	m/s2	L LL	Peak	Vib. Val						
29	2012/2/15 15:14	0.23	m/s2	L LL	Peak	Vib. Val						
30	2012/2/15 15:14	0.26	m/s2	L LL	Peak	Vib. Val						
31	2012/2/15 15:14	0.36	m/s2	L LL	Peak	Vib. Val						

8-3. Wave data save

When measurement is finished and hold is released, or when graph plotting is finished, the waveform data can be saved on an SD card.

What is saved is the data input in the section specified as a condition of the hold function or when a graph is plotted by the time set on the X-axis of the graph.

Data can be saved up to 99.9 seconds, and when the hold section is specified by the external SECTION signal, the section should end before 99.9 seconds. If it is exceeded, the data up to 99.9 seconds are saved.

File name format: V 1 0 0 W * * * . C S V

File No. 000 to 099

The latest waveform data file is created.

Up to 100 files can be saved.

Be aware that if 100 files are exceeded, the oldest file is overwritten.

The section time is within 20 seconds ⇒ Data are saved at a rate of 2000 times/sec. (All sampling data can be saved.)

The section time is 20 seconds or more ⇒ Data are saved at a rate of 400 times/sec. (Data are saved at a rate of once every five times of sampling.)

* There is no function by which waveform data are called from the SD card and regenerated on the screen. Set so as to plot a graph in advance.

* On the FFT display, the hold and graph functions are stopped; therefore, this Wave Data Save function cannot also be used.

CAUTION

As the section time comes close to 20 seconds or 99.9 seconds, the data volume increases, and the time for writing on an SD card may take several seconds (around 5 seconds).
For Wave Data Save, prior evaluation should carefully be made with attention to the measurement interval.

Wave data save

Condition to save waveform data can be set as follows:

Setting range OFF, Hold, Hold NG, Graph

How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 1

■Hold

When measurement is finished and hold is released, the waveform data can be saved on an SD card.

■Hold NG

When measurement is finished and hold is released, the waveform data input at NG-judged measurement can be saved on an SD card.

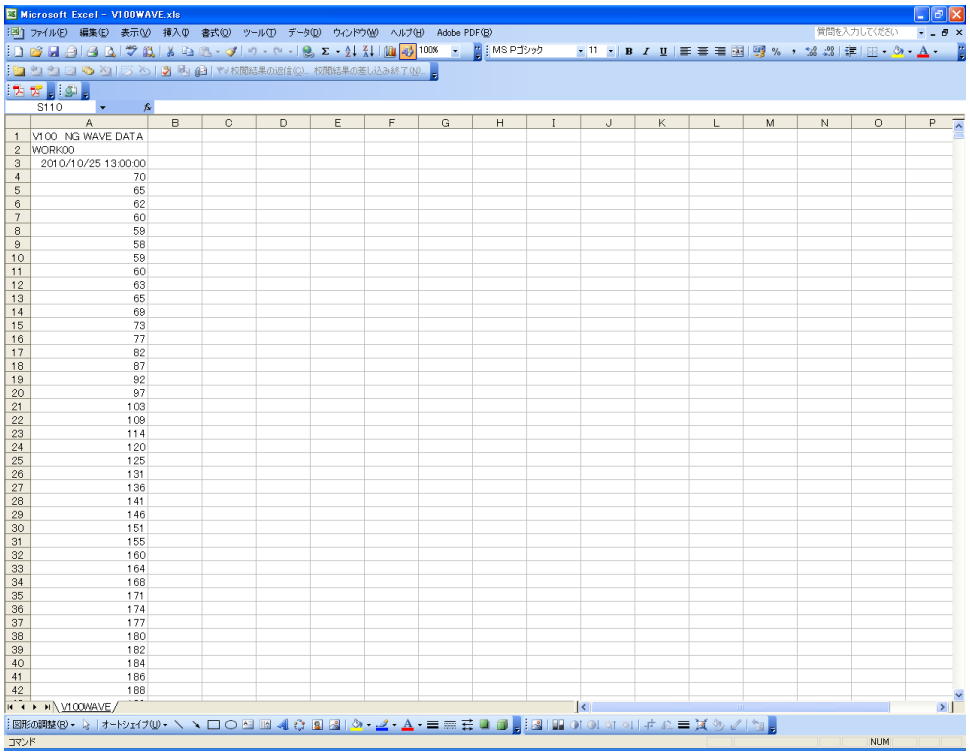
* The judgment condition NG for NG waveform save is when any of HH, HI, LO, and LL of the comparison functions is ON.

■Graph

When graph plotting is finished, the waveform data can be saved on an SD card.

* Data in the pre-trigger range are not saved.
* Set the X End Point in Graph Setting at 1 second or more because writing on an SD card will not be done in time.

■Waveform data file (CSV format)



8-4. FFT data save

When the FFT has been completed, you can choose the conditions you want to save the data on the SD card.

Setting range OFF, Every FFT, FFT NG, Hold, Hold NG

How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 1

- Every FFT

  At the FFT finished, data is saved every time.

- FFT judgment NG (FFT NG)

  The determination result of the FFT comparison function will be saved only when the NG.

- Hold

  Only saved when the hold function is performed during FFT diagnosis.

- Hold NG

  Run the hold function while performing FFT diagnostic function. Only saved when the value detected by the hold function becomes NG in the comparison function.

8-5. FFT file format

File format when save the FFT data on the SD card.

Setting range BMP, CSV

How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 1

■Save by BMP format

The FFT display screen can be saved as bitmap data.

File name format: V 1 0 0 B ＊ ＊ ＊ . B M P

File No. 000 to 099

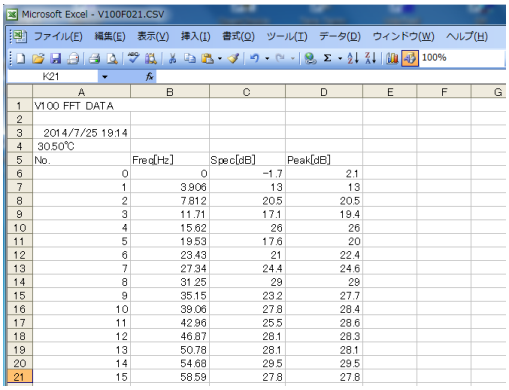
■Save by CSV format

Spectral data and frequency values displayed on the FFT screen can be saved to a CSV format file.

File name format: V 1 0 0 F ＊ ＊ ＊ . C S V

File No. 000 to 099

■FFT save data file (CSV format)



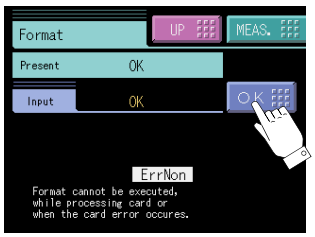
Microsoft Excel - V100F021.CSV

	A	B	C	D
1	V100 FFT DATA			
2				
3	2014/7/25 19:14			
4	30.50℃			
5	No.	Freq[Hz]	Spec[dB]	Peak[dB]
6	0	0	-1.7	2.1
7	1	3.906	1.3	1.3
8	2	7.812	20.5	20.5
9	3	11.71	17.1	19.4
10	4	15.62	26	26
11	5	19.53	17.6	20
12	6	23.43	21	22.4
13	7	27.34	24.4	24.6
14	8	31.25	29	29
15	9	35.15	23.2	27.7
16	10	39.06	27.8	28.4
17	11	42.96	25.5	28.6
18	12	46.87	28.1	28.3
19	13	50.78	28.1	28.1
20	14	54.68	29.5	29.5
21	15	58.59	27.8	27.8

8-6. Format

■SD card format

For formatting, press the OK button.



How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 1

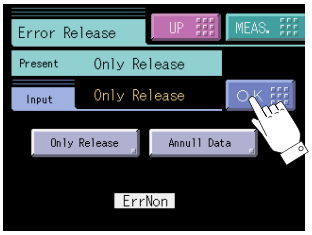
8-7. Error release

■Release of SD card error

When an error is displayed, release the error by this function.

If such an error is displayed, SD memory card processing cannot be performed until it is released.

Press the OK button, and the current error is reset.



Setting range

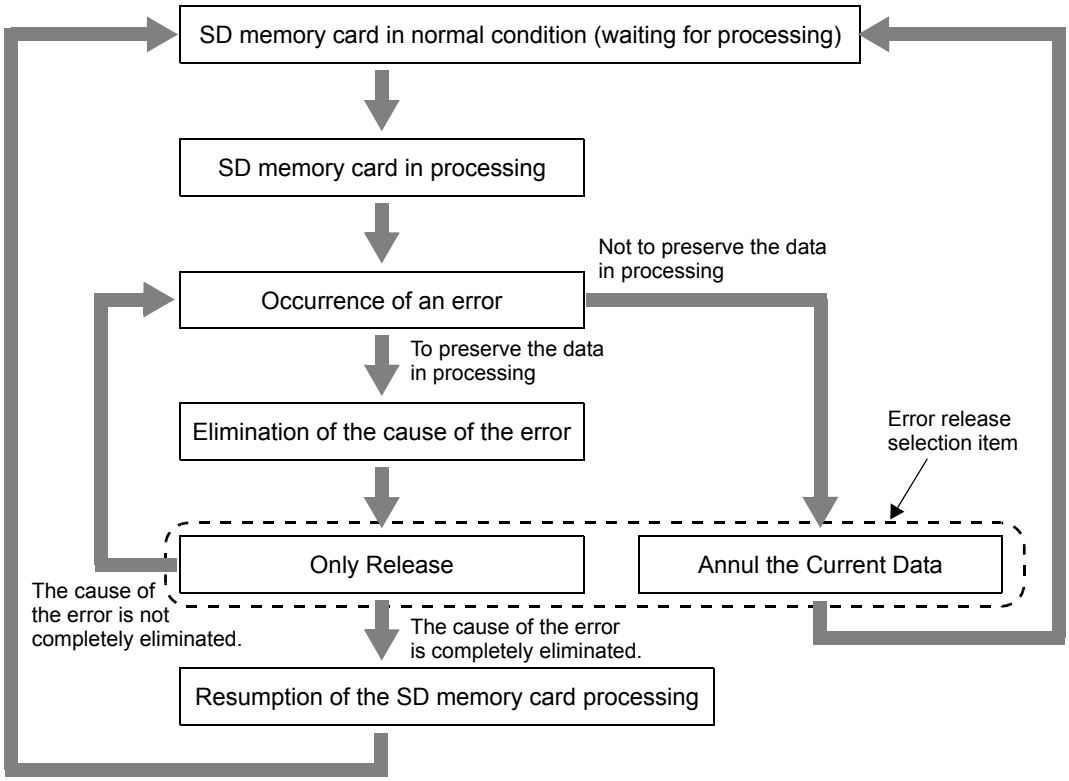
Only Release: Processing resumes if the SD memory card is in normal condition when the error is released during measurement data save preservation.

Annul Data: The data that are about to be written on the present SD memory card are annulled to release the error when it occurs during measurement data save preservation.

How to set

MENU → System Setting → Page 2 → SD CARD Set. → Page 2

- SD memory card error release flow during measurement data save preservation



Point

The data in processing can also be annulled to release the error by turning the power off and then on again.

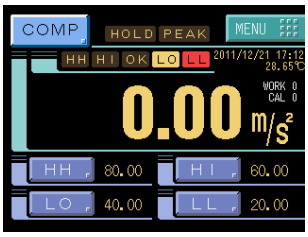
SD card error list

Error	Description
Error 01	No SD memory card is set to the main unit. Check again to see if an SD memory card is in the SD memory card slot, or if it is properly inserted.
Error 02	Initialization error. Initialization of the SD memory card was unsuccessful. Release the error, and format the SD memory card again.
Error 03	The format is incompatible. The V100 format is FAT16.
Error 04	SD memory card processing is not ready.
Error 33	The SD memory card is write-protected.
Error 88	There is no file that can be read by the V100.
Error 8B	This error is displayed when the number of files on the SD memory card is about to exceed its capacity.
Error 8C	Data cannot be preserved because the SD memory card has no free space.
Error 91	The data file is read-only.
Other errors	The cause is an indefinite error. The noise and the breakdown of SD memory card, etc. are thought. It is necessary to review the working environment when frequently happening.

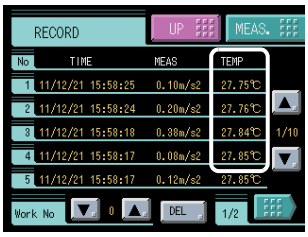
9 TEMPERATURE MEASUREMENT

Temperature under vibration measurement can be measured by connecting the attached thermistor. The measuring temperature range is from -10°C to 90°C, and the data of vibration measurement values and temperature can be saved together in history and recorded on an SD card.

[Example of temperature display on the main screen]



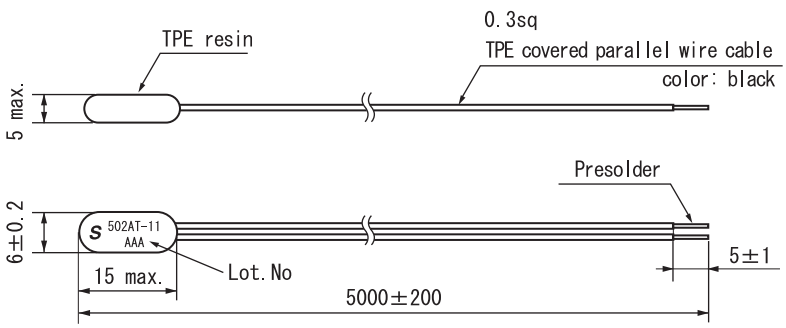
[Example of temperature storage on the history screen]



For thermistor connection, see the section "Temperature sensor connection" on page 8.
For temperature measurement, make sure to use the attached thermistor.
If any other thermistor is used, temperature cannot be measured properly.

■Attached thermistor

[Unit: mm]



CAUTION

- Do not apply excessive tensile load to the junction of the element and wiring material at the end of the thermistor.
- Do not use in water, oil, or corrosive gas.
- Do not extend the cable for use. Specified accuracy may not be ensured.

■Temperature measurement function ON/OFF

If the temperature measurement function is not needed, the function can be turned off by setting.
If it is turned off, temperature data will not be displayed, saved, or recorded.

Setting range ON/OFF

How to set

MENU → System Setting → Operation → Page 1

■Offset temperature

The set value is added to the measured temperature as an offset.
Deviation from the reference temperature can be corrected.

Setting range -99.99 to 99.99 [℃]

How to set

Menu → Calibration → Page 2

10 SPECIFICATIONS

10-1. Main unit specifications

■Analog section

Signal input range	±150mV (Up to 3G can be measured when UNA02 is used.)
Analog filter	First-order low-pass filter Cut-off frequency: 30/ 100/ 1k Hz
A/D conversion speed	2000 times/sec. 24 bits (binary)
A/D resolution	1/10000 (at 150mV input)
Voltage output	Load resistance 2kΩ or more Approximately 20-times output with respect to input (When the input is 50mV, the output is approximately 1V.)
Sensor excitation	+5V±10% 30mAmax

■Vibration diagnosis section

Vibration detect	Band pass filter:	High-pass filter 1 to 500 Hz Low-pass filter 1 to 500 Hz (Second-order Butterworth digital filter) * However, HPF < LPF
	Judgment mode:	Vib. Val, Envelope, Peak, RMS, Crest, Form * Peak, RMS, Crest, and Form are calculated at each half-wave. Due to half-wave processing, a delay of 100mSec occurs in each output, such as judgment. Also, half-wave processing can be performed at 10Hz or more.
	Hold mode:	Sample, Peak, Valley, P-P, Average
	Comparison judgment:	HH Limit, HI Limit, LO Limit, LL Limit
	Setting selection:	16 patterns (selectable by external input and communication)
Vibration analysis(FFT)	FFT Samp. Magnif.:	1 times, 2 times, 4 times, 8 times * Analyzed frequency unit [Hz] ＝ 1000Hz ÷ (FFT Samp. Magnif.×256)
	FFT Window:	Rectang., Hanning, Hamming, Blackman
	Analysis mode :	Vib. Val, Envelope
	FFT Average:	1 to16 times (moving average at each frequency)
	Disp Range:	99.9dBmax
	FFT Disp Mode:	Continuation, Single

■Record section

Recording medium	SD card
Record data	Wave data (up to 99.9 seconds; 100 files) Measurements result data (10 files for each work; 1 file ≒ 5MB, 65530 measurements) FFT result data (100 file)

■Display section

Display	3.5-inch STN color LCD (320×240dot)
Indicated value display range	±9999
Decimal point	0/ 0.0/ 0.00/ 0.000
Unit	None, m/s^2, mm/s^2, m/s, mm/s, mm, μm, %
Number of display times	Fixed at 3 times/sec.

■Operation section

Input unit	Analog type touch panel

■External input and output

External input:

Voltage input circuit (plus common/minus common shared)

ON voltage	DC12V or more	
OFF voltage	DC3V or less	
Forward current	Approx. 5mA (at DC24V)	
Isolation	Photocoupler	
Signal	Hold control:	T/H, SECTION
	Graph control:	GRAPH TRIG
	FFT control:	FFT TRIG
	Work selection:	WORK0 to WORK3
	Calibration selection:	CAL0, CAL1
	Prohibit:	LOCK

External output:

Open collector output circuit
(sink type plus common input equipment connectable)

Rated voltage	DC30V	
Rated current	30mA or less	
Isolation	Photocoupler	
Signal	Comparison result:	HH, HI, OK, LO, LL
	Hold end:	HOLD END
	Normal operation:	RUN
	Graph plotting end:	EVENT
	SD card OK:	SD CARD

■RS-232C interface

System	Start/stop system	
Communications protocol	Baud rate:	9600bps, 19200bps, 38400bps, 57600bps
	Data bit:	7, 8 bit
	Parity bit:	None, Even, Odd
	Stop bit:	1, 2 bit
	Delimiter:	CR, CR+LF
	Flow Control:	Off, RTS/CTS control

■Temperature measurement

Temperature measuring range	-10 to 90℃
Accuracy	±1.5℃
Resolution	0.01℃

■General performance

Power source	DC24V (±15%)
Power consumption	24Wmax
Rush current	2A, 10mSec (Typ: ordinary temperature, at cold-start time)
Operating conditions	Operation temperature: 0℃ to +40℃ Storage temperature: -20℃ to +60℃ Humidity: 85% RH or below (non-condensing)
Dimensions	99.5 (W)×96.0 (H)×117.3 (D) mm (excluding projected parts)
Panel cout out dimensions	92×92 mm
Weight	Approx. 1.0kg

■Accessories

Operation manual.....1

Control signal Input/Output connector.....1

SD card.....1

Acceleration sensor.....1

Temperature sensor.....1

10-2. Acceleration sensor specifications

Model	UNA02
Pickup system	Shear type piezoelectric
Signal output sensitivity	5.0mV/m/s^2 (±10%)
Resonance frequency	Approx. 24kHz
Frequency band	3 to 10000Hz±3dB
Insulation resistance	10000MΩ or more
Maximum transverse sensitivity	5% or less
Maximum operating acceleration	400m/s^2
Maximum impact resistance	10000m/s^2 or more
Output impedance	100Ω or less
Power supply voltage	DC+5V
Operating temperature range	-20 to +60℃
DC output voltage	+2.5V±0.3
Outer dimensions	17 (Hex)×39.6 (H) mm (not including projections and cable)
External case material	Stainless steel (SUS304)
Main body mass	Approx. 48g (not including cable)
Cable	Length 10m +5Vdc input line Acceleration output line GND line 4.3φ 2-core shielded cable (ETFE/soft fluorine resin)
Magnet	Attracting force 120N or more (in a vertical direction at ordinary temperature) Operating temperature range -20 to +100℃ Mass Approx. 44g Magnet material Samarium-cobalt magnet External case material SUS420J

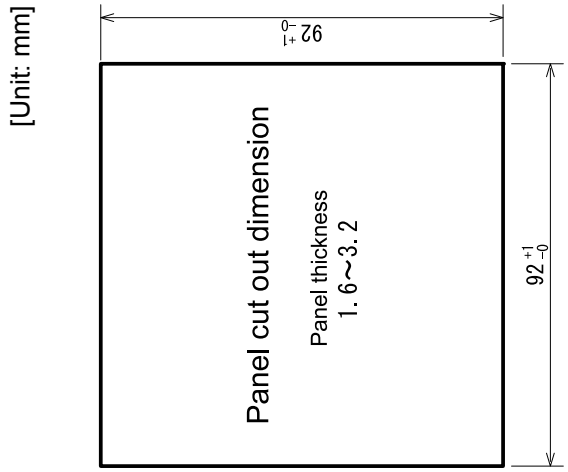
10-3. Temperature sensor specifications

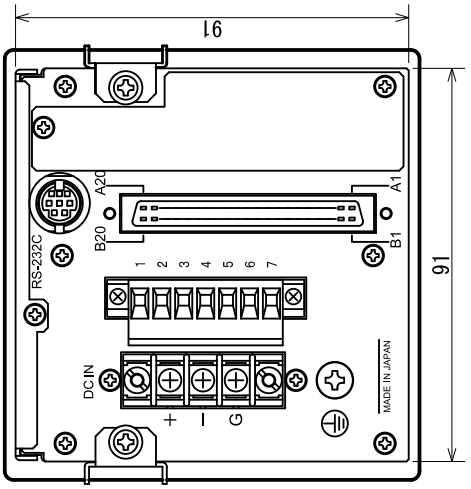
Type	Thermistor (502AT)
Nominal zero-power resistance	5kΩ±1%
B-constant	3324K±1%
Heat dissipation constant	Approx. 2.6mW/℃
Thermal time constant	Approx. 75 sec. (in air)
Operating temperature range	-50～+105℃
Outer dimensions	6 (W)×5 (H)×15 (D) mm (not including projections and cable)
Cable length	5m

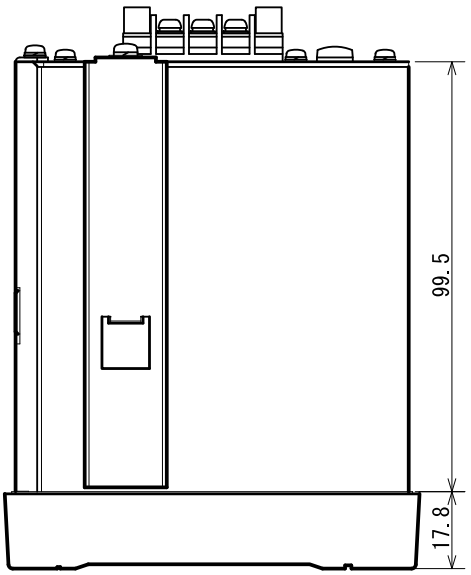
10-4. Dimensions

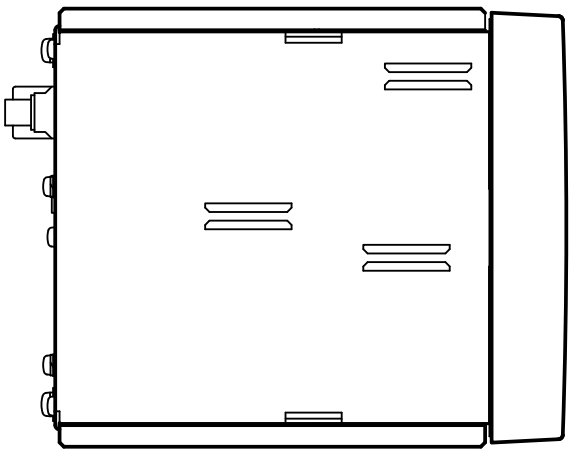
■Main unit

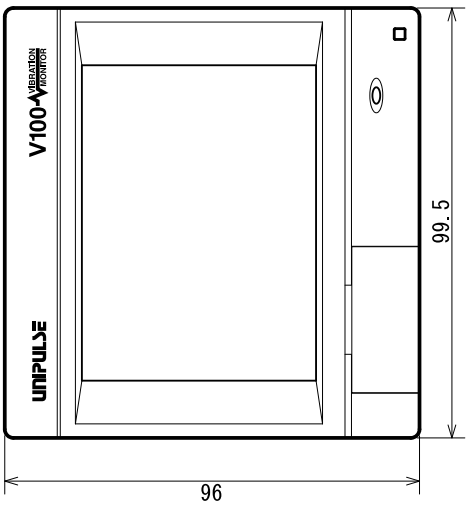
[Unit: mm]





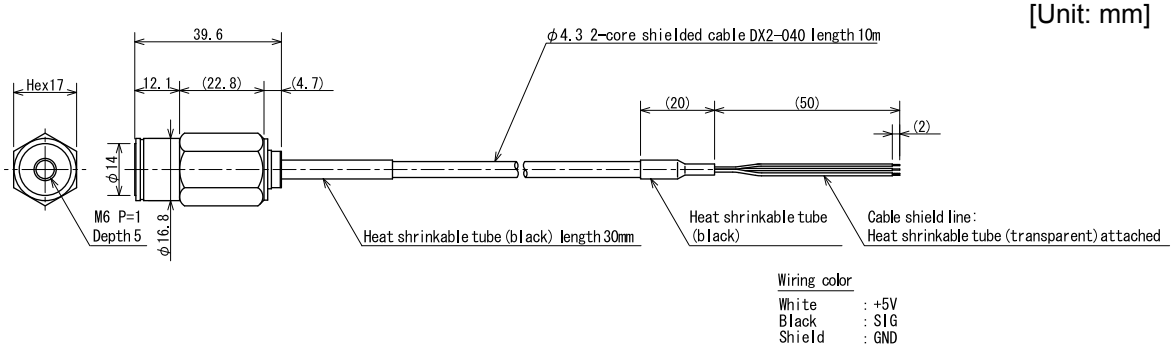






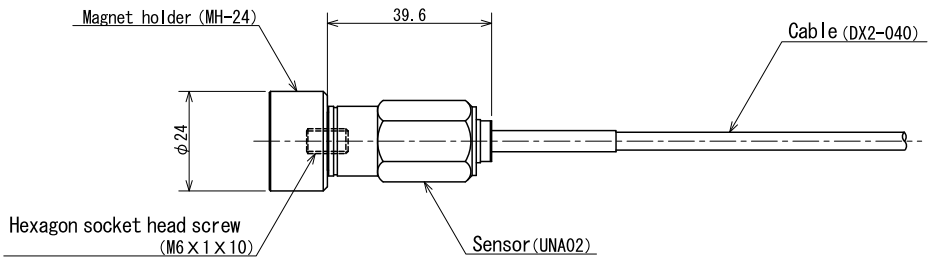
■Acceleration sensor

[Unit: mm]



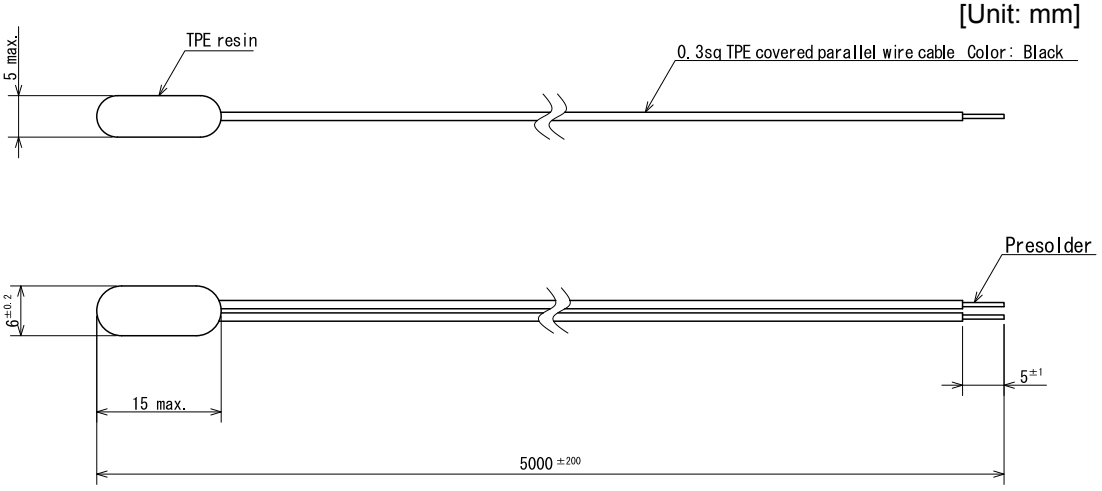
Magnet attached

[Unit: mm]

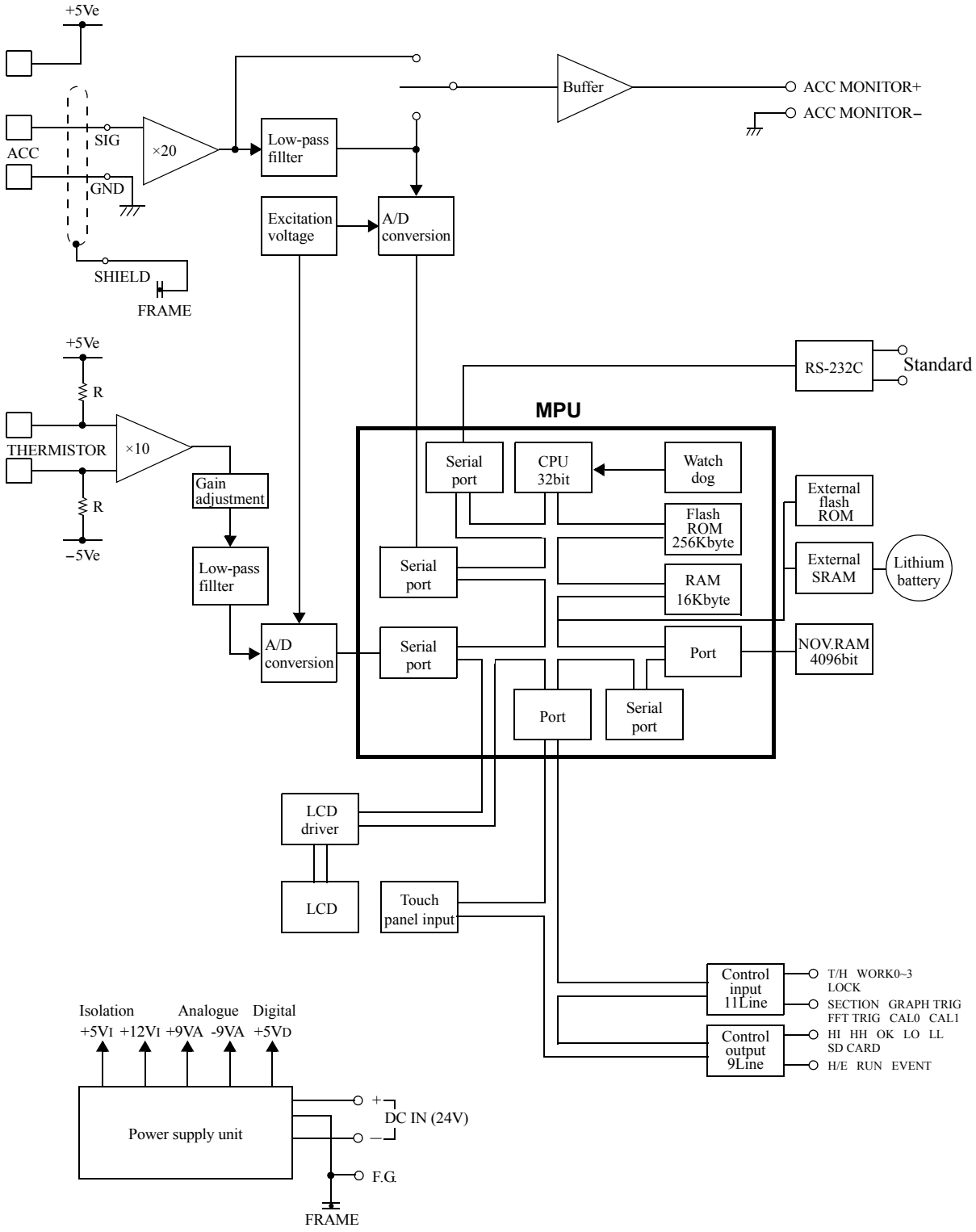


■Temperature sensor

[Unit: mm]



10-5.V100 block diagram



11 SUPPLEMENTS

11-1. Error display list

When either of the following errors occur, the RUN signal of an external output is turned OFF.

■Sensor+error or Sensor-error

This message indicates that the inputted electric signal exceeds the input voltage range of the element (ADC) which converts the inputted electric signal to a digital value whereby the signal cannot be converted to a correct digital value.

Sensor +error and Sensor -error indicate that the inputted electric signal exceeds the input range in the positive direction and negative direction, respectively.

This message may also be displayed when an excessive vibration is applied to the sensor or the input terminals are opened due to a break in the cable.

■+Over or -Over (Overflow error)

This message indicates that the value to be displayed except the decimal point and sign exceeds four digits. The message and a value of as much as five digits appear alternately.

+OVER and -OVER indicate that the value to be displayed exceeds four digits in the positive direction and negative direction, respectively.

This message is displayed in such a case wherein a vibration larger than expected is applied or calibration is performed below the measuring range. Check calibration and the measuring object.

■Zero error (Zero calibration error)

This message indicates that calibration cannot be performed because the inputted electric signal exceeds the input voltage range.

Check the cables for breaks or miswiring.

11-2. Protect / Initialization

■Work setting protect

Set whether to protect the set values in Work Setting from changing.

Setting range ON/OFF

How to set

Menu → Protect / Init. → Page 1

■System setting protect

Set whether to protect the set values in System Setting from changing.

Setting range ON/OFF

How to set

Menu → Protect / Init. → Page 1

■Calibration protect

→See "4-5.Calibration Protect" on page 20.

How to set

Menu → Protect / Init. → Page 1

■Initialization

All the set values of each setting item are initialized to their factory defaults.
Select the setting item you want to initialize.

Setting range Work Set., System Set., Calibration Set.

* If the setting item on which you intend to execute initialization is protected, initialization cannot be executed.

How to set

Menu → Protect / Init. → Page 1

11-3. Self-check

■Self-check

The self-check function includes a memory check to check the memory automatically for detecting problems, a visual check to check the display visually, a touch panel key input check and an external I/O check.

①LCD check

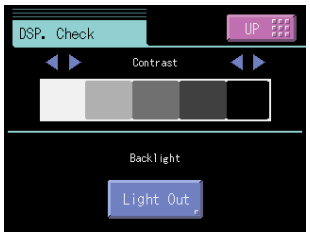
Check the display to see that it is free from color and display defects, etc. The screen changes from red, green, blue, horizontal stripes, to vertical stripes. Touching the screen restores the previous screen.

How to set

Menu → Self Check → Page 1

②DSP check

Check the contrast, backlight, and status indicator lamp. Check the contrast by pressing the five buttons from white to black.
The backlight goes out when the Light Out button is pressed, and after that, it recovers when the screen is touched.
The status indicator lamp lights in green and orange alternately.

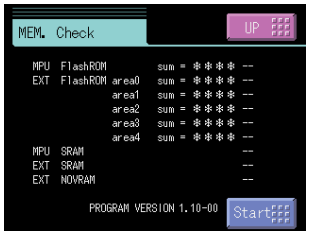


How to set

Menu → Self Check → Page 1

③MEM check

Check the memory to see that it is free from defects. The result is displayed in a moment after the Start at the lower right of the screen is pressed. Or, check the version here.

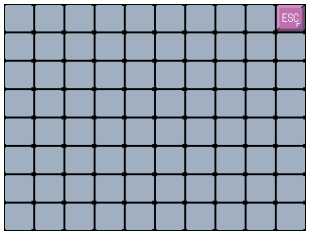


How to set

Menu → Self Check → Page 1

④KEY check

Check the touch panel to see that it is free from unrecognized parts. One touched square turns yellow. Pressing the ESC at the upper right of the screen restores the previous screen.

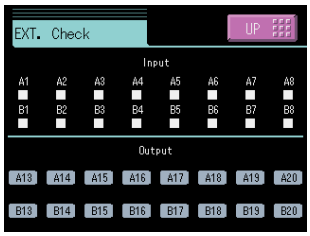


How to set

Menu → Self Check → Page 1

⑤I/O check

Check the operations of the external input/output signals.
Each output turns on when the corresponding button is pressed.
Each input turns green when its ON state is recognized.

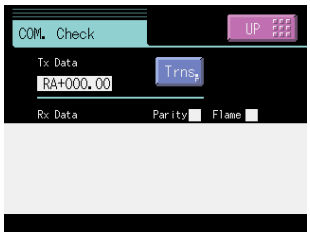


How to set

Menu → Self Check → Page 1

⑥COM check

The data displayed under "Transmit data" is sent by pressing the Trns button.
Under "Receive data", externally transmitted data is displayed.



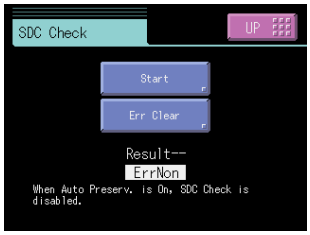
How to set

Menu → Self Check → Page 2

Please transmit something information sentence from connected equipment side to the check on the reception. The data received to "Receive data" is displayed. Please confirm the cable or the setting of communication condition when it is not correctly displayed, when "Parity" or "Frame" lights in red.
Please press the Trns button to the check on the transmission. The data displayed in "Transmit data" is transmitted. It will be confirmed to receive it correctly on connected equipment side. Please confirm the cable or the setting of communication condition when it is not possible to confirm it.

⑦SDC check

Check the operation of the SD memory card.
Press the Start button. SD memory card writing and reading are checked.
If there is any error, the error is displayed.



How to set

Menu → Self Check → Page 2

■Password

This setting is for maintenance and inspection. Do not operate.

11-4. Setting item list

LOCK ○: Work Setting Protect, ◎: System Setting Protect, ●: Calibration Protect
Memory S: SRAM, N: NOVRAM

■Work setting Comparison setting (CH0 to CH15)

Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	HH Limit	8000	-9999 to 9999	S	○	0103
	2	HI Limit	6000	-9999 to 9999	S	○	0101
	3	LO Limit	-6000	-9999 to 9999	S	○	0102
	4	LL Limit	-8000	-9999 to 9999	S	○	0104
	5	Hysteresis	0	-9999 to 9999	S	○	0105
2	6	Near Zero	100	0 to 9999	S	○	0106
	7	Comp. Timing	0:ALL	0:ALL 1:Not NZ 2:HOLD	S	○	0107
	8	Comp. Output Sel.	2:H2/L2	*1	S	○	0108
	9						
	10						

*1 0:H4/L0 1:H3/L1 2:H2/L2 3:H1/L3 4:H0/L4

■Work setting Hold setting (CH0 to CH15)

Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Hold Mode	OFF	*2 *3 *4	S	○	0201
	2	Hold Start Level	100	-9999 to 9999	S	○	0202
	3	Level Condition	0:Passed	0:Passed 1:PassedHI 2:PassedLO	S	○	0203
	4	Section Time	10.00 sec.	0.01 to 99.99 [sec.]	S	○	0204
	5						

*2

Hold
0:OFF
1:Sample
2:Peak
3:Valley
4:P-P
5:Average

*3: Peak/Valley hold

Hold Section	Command No.
0:All	0216
1:EXT	
2:EXT+TM	
3:LVL+TM	
4:LVL *	

*4: P-P/Average hold

Hold Section	Command No.
0:All	0216
1:EXT	
2:EXT+TM	
3:LVL+TM	

* By setting LVL, level conditions are limited.
(Peak → 1: Passed HI, Valley → 2: Passed LO)

Standard —Peak/Valley hold (Settable only when the Section setting is "Level.")—

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
2	6	Hold Stop Level	100	-9999 to 9999	S	○	0206
	7						
	8						
	9						
	10						

Standard －Average hold－

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
2	6	Ave. Sample Num.	1 times	1 to 999 [times]	S	○	0207
	7						
	8						
	9						
	10						

■Work setting　Graph setting (CH0 to CH15)

Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Graph Mode	0:Continu.	0:Continu. 1:Ext 2:Level 3:Ext+Level	S	○	0301
	2	Graph Start Level	100	-9999 to 9999	S	○	0302
	3	Y(VB) Start Point	0	-9999 to 9999	S	○	0303
	4	Y End Point	5000	-9999 to 9999	S	○	0304
	5	X End Point	1.0 sec.	0.1 to 99.9 [sec.]	S	○	0305
2	6	Interval Time	1.000 sec.	0.001 to 9.999 [sec.]	S	○	0306
	7	Level Condition	1:PassedHI	0:Passed 1:PassedHI 2:PassedLO 3:Beyond 4:Below	S	○	0307
	8	Pre Trig. Val	0%	0 to 20 [%]	S	○	0308
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	10						
3	11						
	12						
	13						
	14						
	15						

■Work setting　Vibration detect setting (CH0 to CH15)

Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Measure Range	HPF:1Hz LPF:500Hz	HPF:1 to 500 [Hz]　LPF:1 to 500 [Hz] However, HPF＜LPF	S	○	0401 0402
	2	Vib. Detect Mode	0:Vib. Val	0:Vib. Val　1:Envelope　2:Peak 3:RMS　4:Crest　5:Form	S	○	0403
	3	Vib. Detect Level	100	0 to 9999	S	○	0404
	4	Band Elim. Frq	0.0Hz	0.0 to 500.0 [Hz] (It is invalid at 0.0Hz)	S	○	0405
	5						
2	6	FFT Comp Freq1	LO:0Hz HI:1000Hz	LO:0 to 999 [Hz]　HI:1 to 1000 [Hz] However, LO＜HI	S	○	0407 0408
	7	FFT Comp Level1	LO:-99.9dB HI:99.9dB	LO:-99.9 to 99.8 [dB]　HI:-99.8 to 99.9 [dB] However, LO＜HI	S	○	0409 0410
	8	FFT Comp Freq2	LO:0Hz HI:1000Hz	LO:0 to 999 [Hz]　HI:1 to 1000 [Hz] However, LO＜HI	S	○	0411 0412
	9	FFT Comp Level2	LO:-99.9dB HI:99.9dB	LO:-99.9 to 99.8 [dB]　HI:-99.8 to 99.9 [dB] However, LO＜HI	S	○	0413 0414
	10						
3	11						
	12						
	13						
	14						
	15						

■System setting

Operation setting　Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Digital Filter	OFF	OFF, 2 to 999 [times]	N	◎	0501
	2	Analog Filter	2:1kHz	0:30　1:100　2:1k [Hz]	N	◎	0502
	3	Temp. Measure	1:ON	0:OFF　1:ON	N	◎	0503
	4	Meas. Work Select	1:EXT.	0:COM.　1:EXT.	N	◎	0504
	5	Contr. Input Sel.	1:EXT.	0:COM.　1:EXT.	N	◎	0505
2	6	A1 OFF Det. Wait	0.00 sec.	0.00 to 1.00 [sec.]	N	◎	0506
	7	A2 OFF Det. Wait	0.00 sec.	0.00 to 1.00 [sec.]	N	◎	0507
	8	Backlight	10 min.	0 to 99 [min.] (Always lighting when "0".)	N	◎	0508
	9	Language	0:JPN(日)	0:JPN(日)　1:ENG(英)	N	◎	0509
	10	Indicate color	2:Yellow	0:Yellow　1:Green　2:Blue　3:Comp.	N	◎	0510
3	11	RUN Output Sel.	0:Togle	0:Togle　1:ON Level　2:OFF Level	N	◎	0511
	12	LOCK Func. Sel.	0:DSP_LOCK	0:DSP_LOCK　1:KEY_LOCK	N	◎	0512
	13	Vol. Out Filter.	1:ON	0:OFF　1:ON	N	◎	0513
	14	Password	0	0 to 9999			
	15						

Vibration check setting

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	FFT Samp. magnif.	0:1 times	0:1 1:2 2:4 3:8 [times]	N	◎	0801
	2	FFT Window	0:Rectang.	0:Rectang. 1:Hanning 2:Hamming 3:Blackman	N	◎	0802
	3	FFT Check Mode	0:Vib. Val	0:Vib. Val 1:Envelope	N	◎	0803
	4	FFT Average	8 times	1 to 16 [times]	N	◎	0804
	5	FFT Range	0.0 to 80.0dB	Upper end:-99.8 to 99.9 [dB] Lower end:-99.9 to 99.8 [dB]	N	◎	0805 0806
2	6	Wave Disp Range	9999	0 to 9999 (It is auto-range at 0)	N	◎	0807
	7	Wave Disp Time	1.0 sec.	0.1 to 1.0 [sec.]	N	◎	0808
	8	FFT Disp Mode	0:Continu.	0:Continu. 1:Single	N	◎	0809
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3	11						
	12						
	13						
	14						
	15						

RS-232C setting Standard

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Com. Mode	0:Normal	0:Normal 1:Continu. 2:Single	N	◎	0601
	2	Baudrate	1:19200bps	0:9600 1:19200 2:38400 3:57600 [bps]	N	◎	0602
	3	Data Bit	0:8 bit	0:8 bit 1:7 bit	N	◎	0603
	4	Stop Bit	0:1 bit	0:1 bit 1:2 bit	N	◎	0604
	5	Parity Bit	1:EVEN	0:NONE 1:EVEN 2:ODD	N	◎	0605
2	6	Delimiter	0:CR	0:CR 1:CR+LF	N	◎	0606
	7	Flow Control	0:Off	0:Off 1:RTS/CTS	N	◎	0607
	8						
	9						
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3	11						
	12						
	13						
	14						
	15						

SD CARD

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Meas Data Save	0:OFF	0:OFF 1:ON	N	◎	0901
	2	Wave Data Save	0:OFF	0:OFF 1:Hold 2:Hold NG 3:Graph	N	◎	0902
	3	FFT Data Save	0:OFF	0:OFF 1:Every FFT 2:FFT NG 3:Hold 4:Hold NG	N	◎	0903
	4	FFT File Form	0:BMP	0:BMP 1:CSV	N	◎	0904
	5	Format	OK	Only“OK” (Not formatting, press the "UP" button)	N	◎	*1
2	6	Error Release	0:Only Release	0:Only Release 1:Annull Data	N	◎	*1
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3	11						
	12						
	13						
	14						
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*1 Executable by key operation only.

■Calibration (CAL0 to CAL3)

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Zero Cal.	0	-5.000 to 5.000 [V]	N	●	2001
	2	Equiv. Cal.	5.00mV	0.01 to 99.99 [mV]	N	●	2003
			100	-9999 to 9999	N	●	2002
	3	Unit	1:m/s^2	0:None 1:m/s^2 2:mm/s^2 3:m/s 4:mm/s 5:mm 6:μm 7:%	N	●	2006
	4	Decimal Place	2:0.00	0:0 1:0.0 2:0.00 3:0.000	N	●	2007
	5	Cal. Select	0:Cal 0	0:Cal 0 1:Cal 1 2:Cal 2 3:Cal 3 4:EXT	N	●	2005
2	6	Offset Temp Val	0.00	-99.99 to 99.99 [℃]	N	●	2008
	7						
	8						
	9						
	10						

* The bandpass-filter does not affect to the Input value on the zero calibration screen. At this time, the hold and judgment functions are disabled.

■Protect / Initialization

Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	Work Protect	0:OFF	0:OFF 1:ON	N	○	4001
	2	System Protect	0:OFF	0:OFF 1:ON	N	◎	4002
	3	Cal. Protect	0:OFF	0:OFF 1:ON	N	●	4003
	4						
	5	Initialization	0:Work Set.	0:Work Set. 1:Sys. Set. 2:Cal. Set.	S		
2	6						
	7						
	8						
	9						
	10						

■Self check

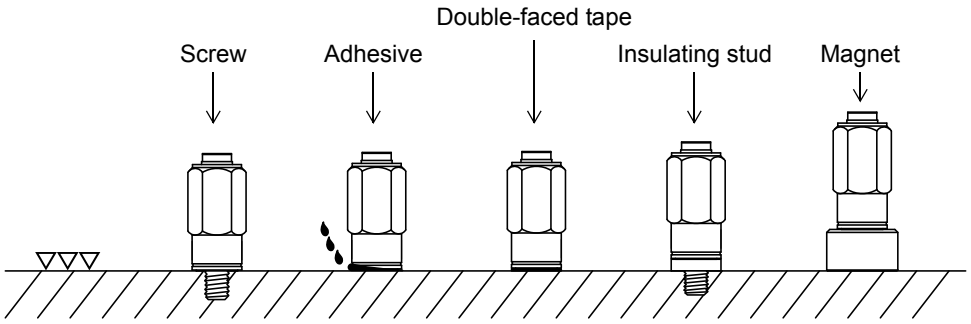
Page	No.	Item	Initial value	Setting range	Memory	LOCK	Command No.
1	1	LCD					
	2	DISPLAY					
	3	MEMORY					
	4	KEY					
	5	I/O					
2	6	COMM					
	7	SD CARD					
	8						
	9						
	10						

11-5. How to handle the acceleration sensor

When the acceleration sensor is mounted on a vibrating body, one vibration system is formed, and the resonance frequency specific to the system is determined. This is called contact resonance frequency.

The contact resonance frequency varies with the fixing methods and contact conditions between the acceleration sensor mounting surface and vibrating body surface.

What is most important for fixing the acceleration sensor is absolute contact between the bottom of the sensor and vibrating body surface.



Fixing method	Description
Screw	Tightening at a specified torque through silicone grease on a fine-finished surface is the most ideal fixing method, by which the maximum performance of the acceleration sensor can be delivered. If silicone grease is not used or the finish of the measuring surface is coarse, the contact resonance frequency will deteriorate.
Adhesive	In the case of fixing to the fine-finished surface with adhesive, performance close to screw-fixing can be obtained if the conditions in adhesion are good.
Double-faced tape	This method is convenient for temporarily fixing the sensor if the vibrational frequency is low and the amplitude is small.
Insulating stud	A non-insulated acceleration sensor may be affected by noise due to ground loop. Since the insulating stud electrically insulates the acceleration sensor from the object to be measured, the influence from noise can be reduced. Characteristics close to screw-fixing can be obtained if the mounting conditions are good.
Magnet	If the object to be measured is made from metal that is attracted to a magnet, the magnet holder can be used. This is a simple fixing method for preliminary measurement, etc., but if the mounting surface conditions are good, characteristics fairly close to screw-fixing can be obtained by applying silicone grease.

Standard tightening torque

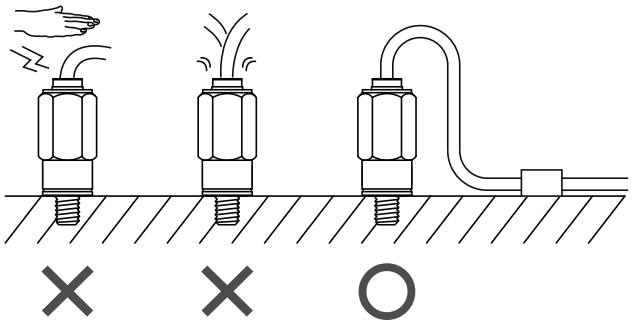
If excessive tightening force is applied when the sensor is mounted, the internal adhesive fracture may occur; therefore, it should be tightened at a proper torque.

Nominal diameter	Standard tightening torque (N・m)
M3	0.6
M4	1.6
M5	3.0
No.10-32UNF	3.0
M6	5.0
M8	12.0

Handling of the signal cable

If the sensor is used with excessive force applied to the connector and signal cable draw-out part or if the signal cable is vibrating greatly, not only can sufficient performance not be obtained but also the signal cable may be broken or the connector may be damaged in the worst case.

Use the signal cable as fixed to the object to be measured, etc., to prevent excessive force from being applied to it.



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