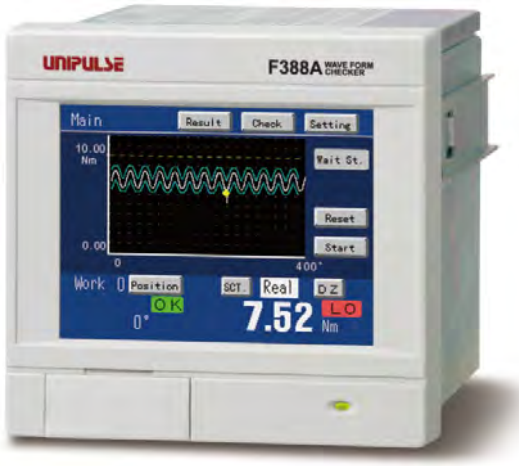


F388A

WAVE FORM CHECKER

OPERATION MANUAL

01JAN2025REV.3.09E

UNIPULSE

Introduction

Thank you very much for purchasing our Wave Form Checker F388A.

The F388A is the indicator that measures pressure, load, torque, etc. Being equipped with the waveform comparison and hold functions, the F388A can be used for multipurposes, such as in automatic assembling machines, testing machines, etc.

For good performance, and proper and safe use of the F388A, be sure to read this instruction manual and properly understand the contents of it before use. Also, carefully keep 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.

In order to have an F388A Digital Indicator used safely, notes we 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 F388A 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 F388A becomes faulty or malfunctions, provide a safety circuit outside the F388A.
- Before using the F388A as described below, make sure to consult with our sales personnel.
  - Use in environments not described in the operation manual.
  - Use greatly impacting human lives and assets, such as medical devices, transport devices entertainment devices, and safety devices.

Warning on installation

- Do not modify the F388A. Doing so may cause fire or electric shocks.
- 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.
  - Attachment/detachment of connectors of options, etc.
  - 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 power supply voltage and load within the specified range and rating.
- 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.

⚠ 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 F388A as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Locations where temperature or humidity exceeds specifications;
  - Locations subjected to drastic temperature fluctuations or icing and condensing;
  - Outdoors or locations above 2,000m;
  - Locations exposed to direct sunlight;
  - Locations subject to dust accumulation;
  - Locations with poor ventilation;
  - Locations with a lot of salt and metal powder;
  - Locations where the main unit is subject to direct vibration and shock.
- 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.
- Install as far away as possible from equipment generating high frequency, high voltage, large current, surge, etc. Perform wiring of cables separately from these power lines. Do not perform parallel wiring and identical wiring.
- Do not use the product if damaged.

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 sensors, external inputs/outputs, RS-232C and options, use shielded cables.
- The temporary overvoltage applied to the power should not exceed 1500V.

Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- Use after warming up for 30 minutes or longer following the startup of power supply.
- If the F388Ais not used by the specified method, its protective performance may be impaired.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Please use a dry cloth. 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.
    Do not wipe with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the F388A.

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

Caution during transportation

- When the F388A 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 F388A 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.

About the Built-in Lithium Battery

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

- Never disassemble, deform under pressure or throw the battery into fire.The battery may explode, catch fire or leak.

- Battery

Model:	CR2450N made by RENATA company
Nominal voltage:	3V
Nominal electric capacity:	540mAh
Battery life:	Approx 5 years

Product Compliant to RoHS2 Directive

The parts and attachments (including the instruction manual, packaging box, etc.) used for this unit are compliant with the RoHS2 Directive, restricting the use of hazardous substances with regard to adverse effects on the environment and human body.

RoHS2 Directive

It is based on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE). The Directive restricts the use of specific substances in electrical and electronic equipments that could harm environment and human body. The substances are lead, mercury, cadium, hexavalent chromium, PBB (polybrominated biphenyls), PBDE (polybrominated diphenyl ethers), DEHP (bis(2-ethylhexyl) phthalate), BBP (benzyl butyl phthalate), DBP (dibutyl phthalate), and DIBP (diisobutyl phthalate).

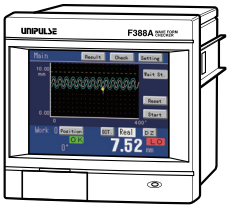
Contents

M E M O

1 OUTLINE

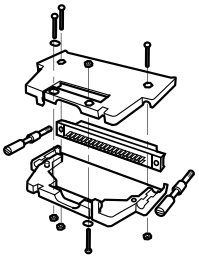
1-1. Contents of the package

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

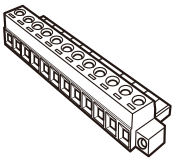


F388A body ... 1

F388A operation manual ... 1



External input/output connector ... 1set
[Model: CN52]



Analog input/output connector ... 1
[Model: CN81]
* Already mounted on the main unit

Jumper wire ... 1
* For connecting current output device

SD memory card ... 1
[Model: SD1G]

The following is optionally available.

- RS-232C cable (cross) [Model: CA81-232X]

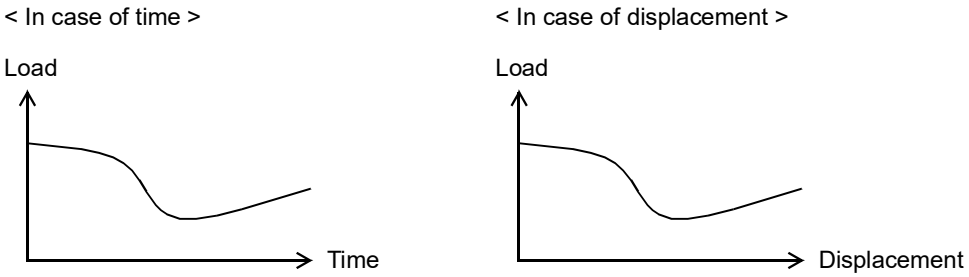
1-2. Features

The F388A is a Wave Form Checker that can display waveforms of physical quantities, such as load, pressure, torque, etc., in combination with a device of voltage or current output type (sensor). Changes in physical quantities that are hard to grasp numerically can be grasped visually on waveform display.

With the color liquid crystal touch panel display adopted, twists have been provided in many places by thoroughly paying attention to ease of understanding so that all operations can be performed without the instruction manual. Also, having a high-speed processing capability of 4,000 times/sec ready for fine changes in values, and being equipped with the waveform display, HI/LO limit comparison and other various hold and judgment functions, it can be used for a wide range of applications, such as in production control systems, automatic equipment, and testing machines.

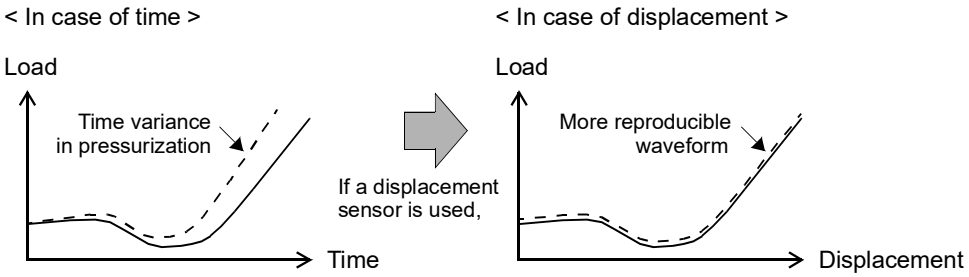
● Drawing of load-time and load-displacement waveforms

Not only a load-time waveform in connection with a load sensor but also a load-displacement waveform can be drawn in combination with a load sensor and displacement sensor.



● Compensation for time variance in pressurization by a pressing machine with a displacement sensor

Use of a displacement sensor prevents the influence of time variation in pressurization by a pressing machine.



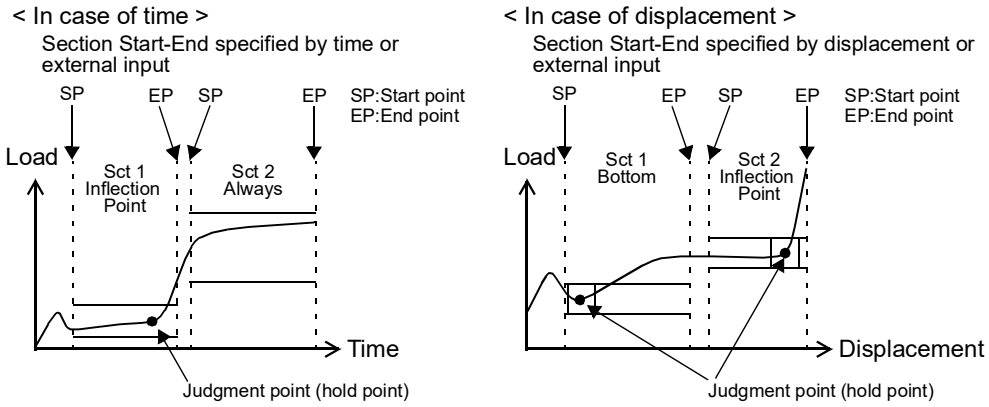
● Measurement waveform control as divided by using the hold function

A measurement waveform can be divided into up to five sections, and the waveform can be judged on each section by specifying each HI limit, LO limit, and method of judgment.

Each section can be specified by Setting (time or displacement) or external input signal “Hold.”

The method of judgment can be changed by selection under “Use Hold.”

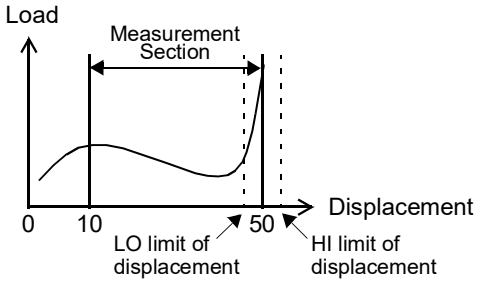
Judgment point(s) can be kept depending on the selection under “Use Hold.”



● Control of the position at the measurement completion

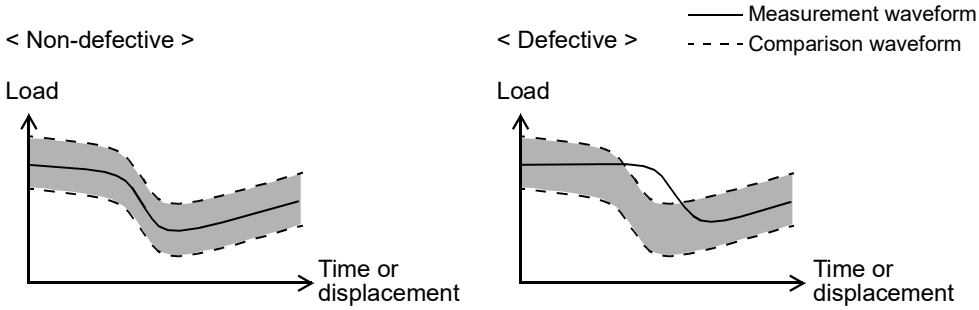
The position of the measurement completion can be judged by using the End Displacement for the Use Hold.

The End Displacement is different from other hold types, so it judges not based on a wave starting point but based on an original point of the displacement.



● Entire waveform control by using the waveform comparison function

Comparisons can be made to judge whether or not a measurement waveform is between HI limit and LO limit waveforms.

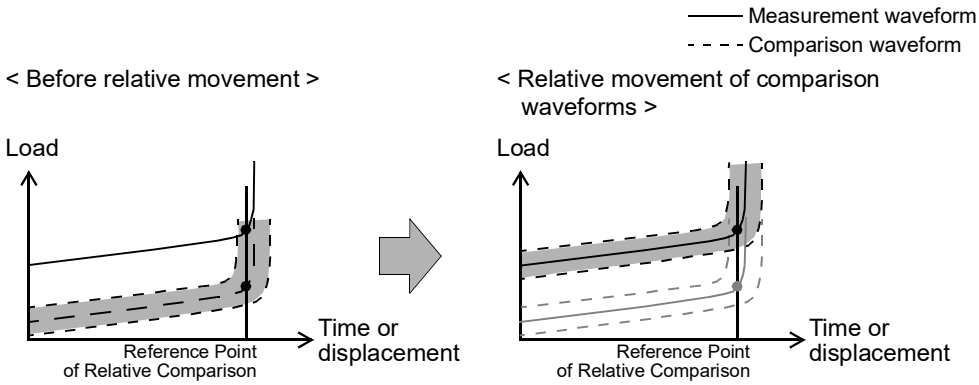


● Measurement-waveform-following control by using the relative comparison function

Waveforms fluctuating up and down with each measurement can be relatively compared.

By this function, comparison waveforms are relatively moved according to the load at the Reference Point of Relative Comparison, which should previously be set by time or displacement, on a measurement waveform.

* Relative movement can only be made in the Y-axis direction.

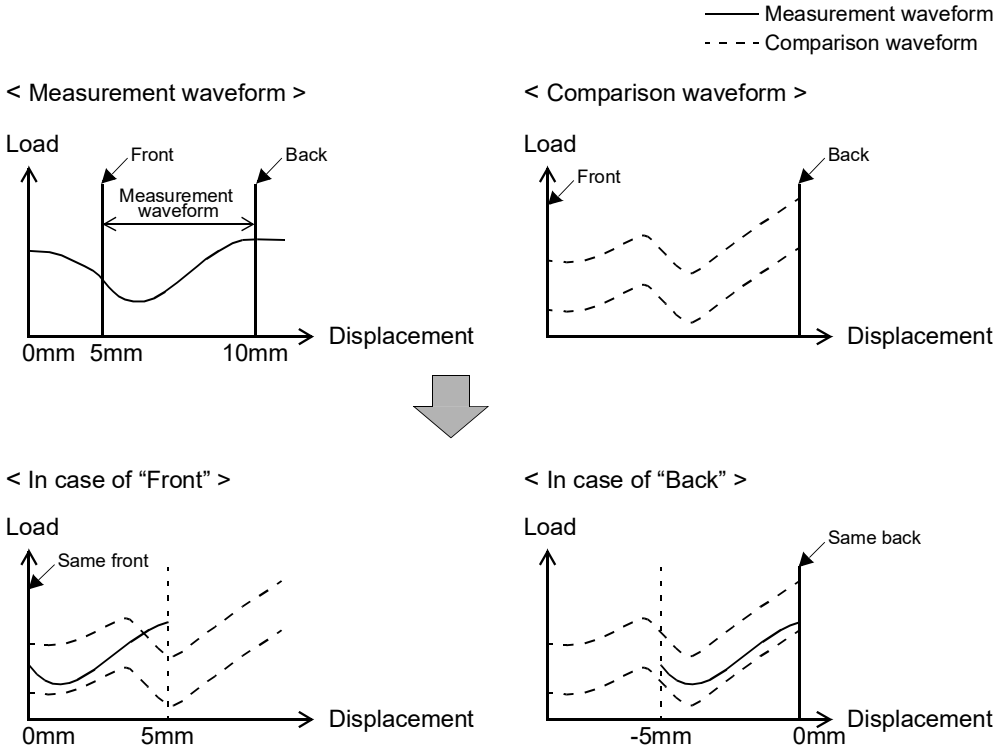


● Change of the control reference to the point at which loading is started or the point at which it is finished

In the case where the X-axis of the waveform represents displacement, the reference for the hold function and waveform comparison function can be selected from either the measurement start point or measurement stop point.

For the measurement start point and measurement stop point, set “Front” and “Back,”

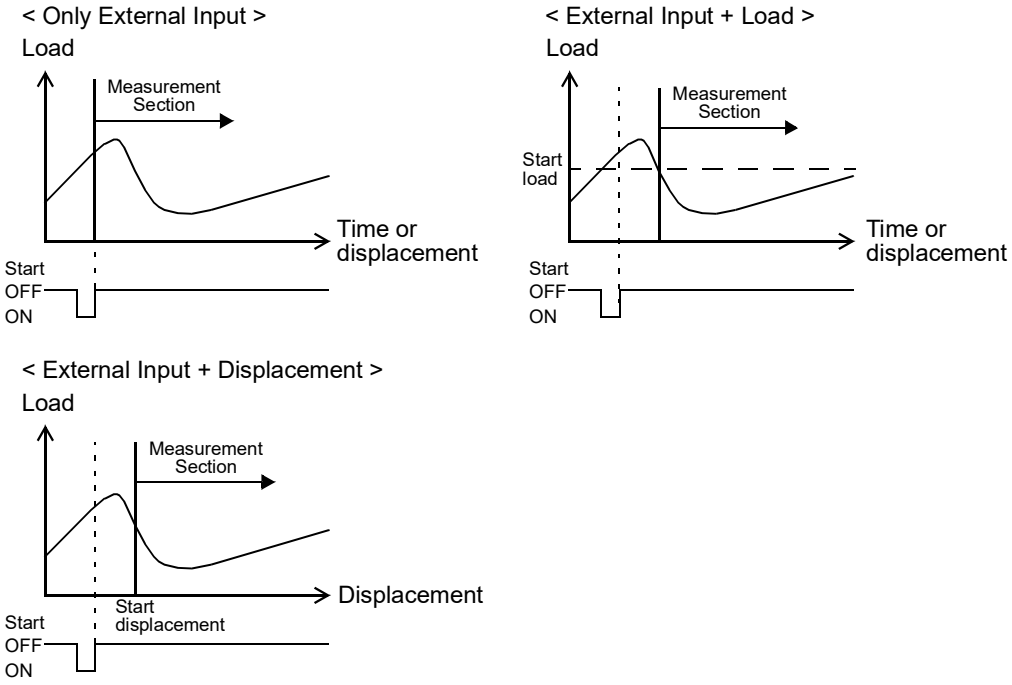
respectively, as “Waveform Reference.”
Normally use “Front,” but use “Back” if the displacement for insertion work is applied.
* In case of “Front”, the waveform of which 0mm is the measurement start point is displayed.
In case of “Back”, the waveform of which 0mm is the measurement stop point is displayed.



● Various measurement start and stop conditions

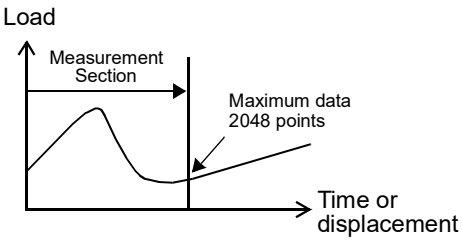
Measurement start and stop conditions can be selected according to application.

- Measurement Start Condition

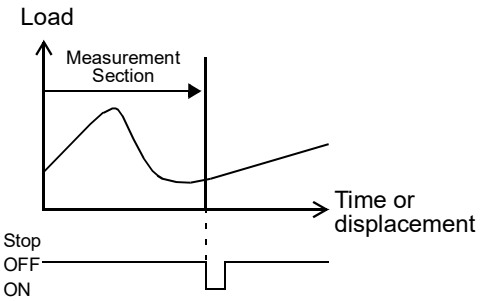


- Measurement Stop Condition

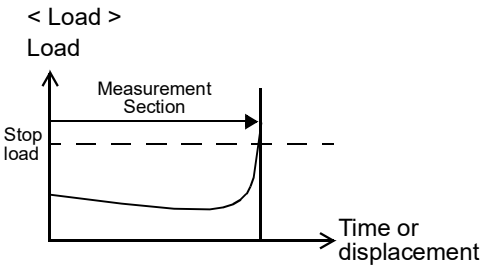
< Forced-Stop (maximum data acquisition) >



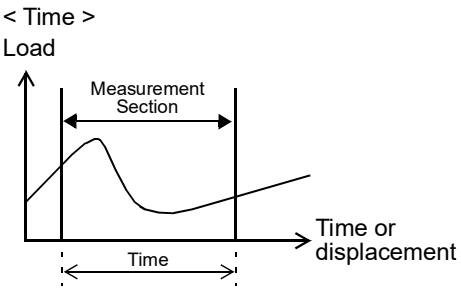
< Forced-Stop (external input) >



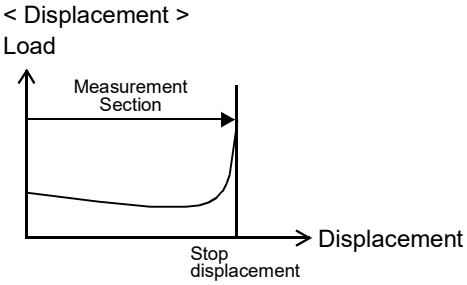
< Load >



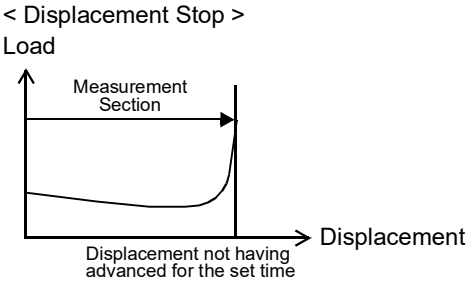
< Time >



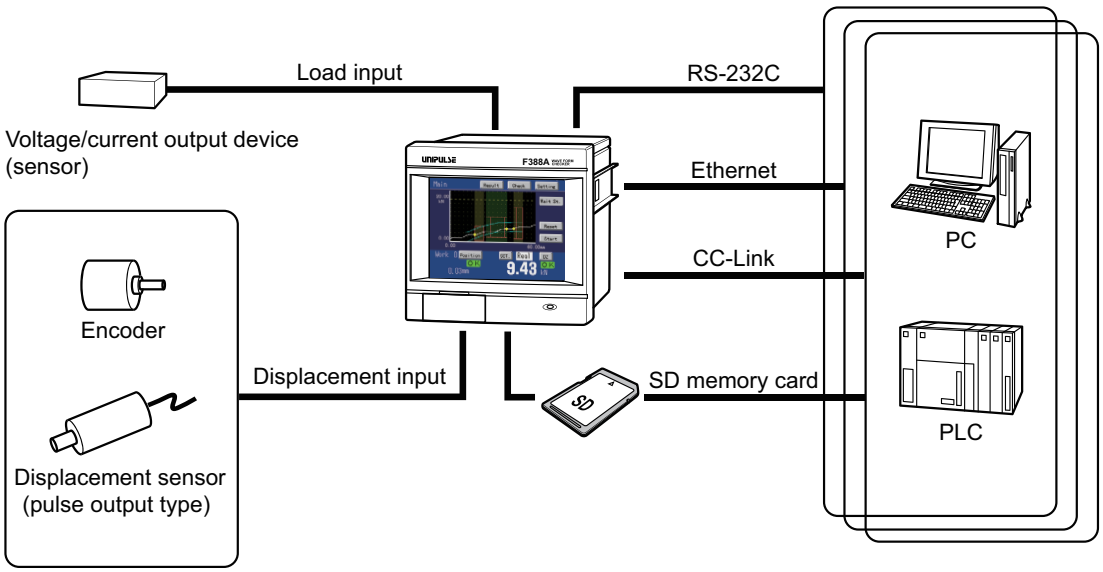
< Displacement >



< Displacement Stop >

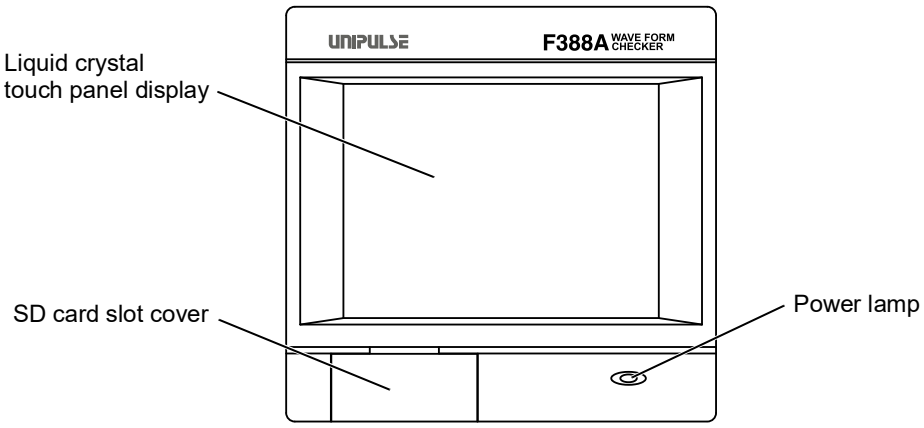


1-3. About connectable devices



1-4. Part names and functions

■Front panel



Liquid crystal touch panel display

Indicated values and graphs are displayed, and various items are set on this liquid crystal touch panel display.

SD card slot cover

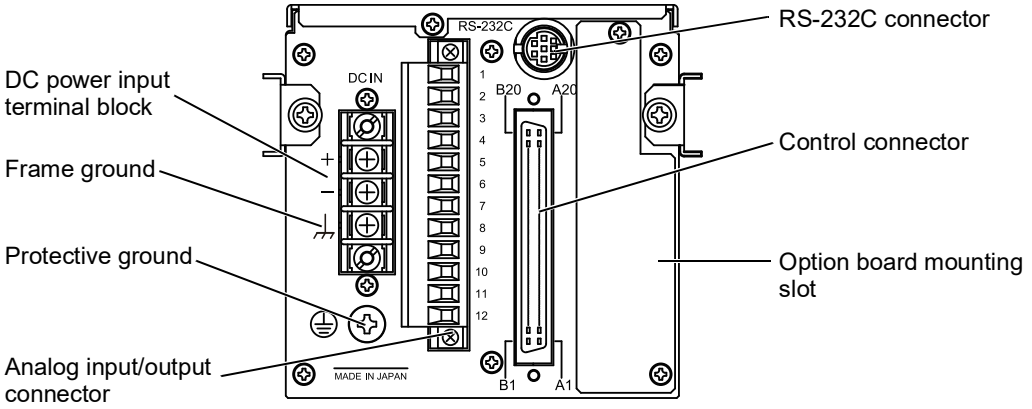
Insert/eject an SD memory card from here.

Power lamp

This lamp indicates the power and internal processing status.

Lamp condition	Power and internal processing status
Lights (green)	Power ON
Flashes (red)	Writing in the internal NOV RAM (nonvolatile memory); or processing with an SD memory card. 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



DC power input terminal block

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

Frame ground ⏚

Please ground the frame ground terminal to prevent failures due to static electricity.
(The frame and the frame ground terminal are conducted.)
It may be better to remove depending on the environment of the installation location.

Protective ground ⏚

Be sure to ground the protective ground terminal to prevent electric shocks.

Analog input/output connector

Terminal block to connect a load sensor/displacement sensor.
The adaptable connector is CN81.

RS-232C connector

RS-232C connector to transmit/receive measurement data and status information, etc.
The adaptable connector is CN60.
Optionally available RS-232C cable (cross) [CA81-232X] is connectable.

Control connector

Connector to input external signals and output control signals.
The input/output and internal circuits are photocoupler-isolated electrically.
Input: Plus common/minus common shared
Output: Sink type/source type selectable
The adaptable connector is CN52.

Option board mounting slot

One of the following options can be mounted.
- CC-Link interface (CCL)
- Ethernet interface (ETN)

1-5. Terms

Terms used in this manual are explained below.

- Load

Analog and digital values of load sensor input are expressed as load.

- Displacement

Analog and digital values of displacement sensor input are expressed as displacement.

- Waveform comparison

Checking to see if the acquired waveform is between the HI limit and LO limit waveforms having been prepared in advance is called waveform comparison.

- Hold function

Controlling a measurement waveform by dividing it into up to five sections and specifying the method of judgment for each section is called the hold function.
Judgment point(s) can be kept depending on the selected method of judgment (“Use Hold”).

- Measurement

Acquiring a waveform from the start until it stops is called measurement.

- Waveform reference

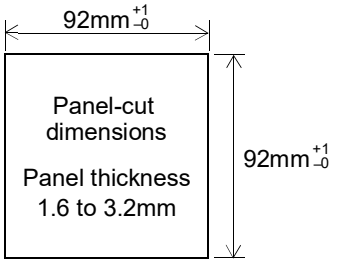
A reference point is required for controlling a measurement waveform. Such a reference point for controlling a measurement waveform is called the waveform reference. The reference can be the measurement start point or measurement stop point.

2 INSTALLATION AND CONNECTION

2-1. Installation

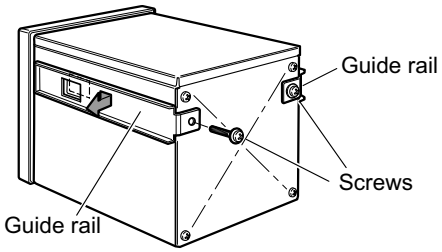
To install the F388A into a control panel, use the following procedure.

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

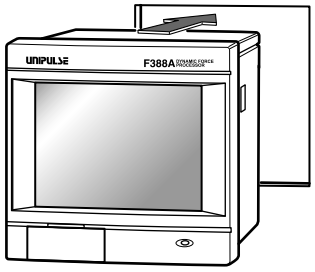


2. Remove the screws (two), and remove the guide rails from both sides.

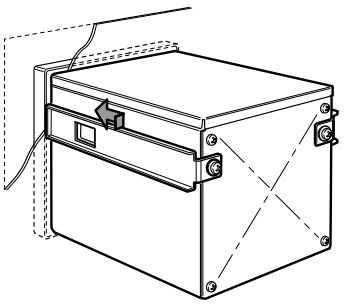
* Do not use other screws than those installed to the F388A body.



3. Fit in the F388A 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).

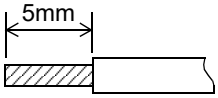


2-2. Sensor connection

■Connection of analog input/output terminals

How to connect

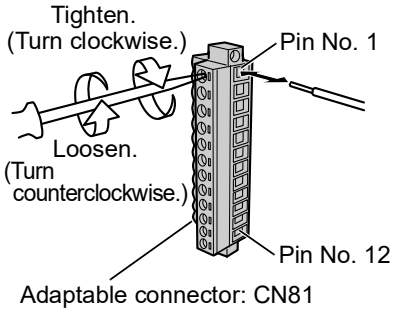
1. Strip 5mm of the covering of the wire to be connected.
The size of connectable wires is from 0.21 to 3.31mm^2 (AWG12 to 24).



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.)

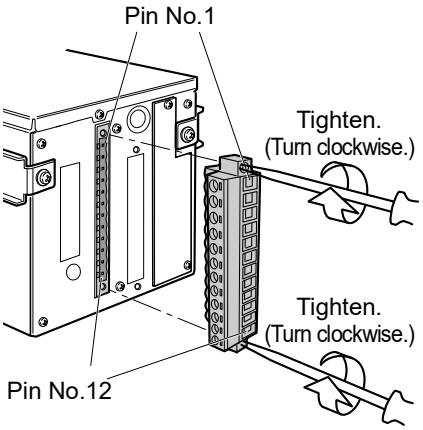
4. Insert the wire into the connection hole so as not to let the tip spread out.



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.

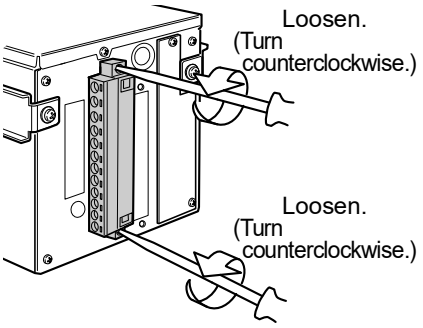
7. Insert the wire-connected plug into the F388A body, and tighten the screws (two).



How to remove the terminal block

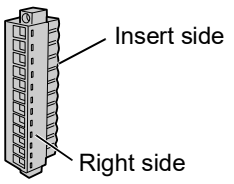
1. Loosen the screws (two) with a screwdriver.

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



Attention

When installing the terminal block to the F388A body, check its orientation. (See the illustration at the right.)



Analog input/output terminal pin assignments

Type	Pin No.	Signal	Use
Load input	1	V IN+	The terminal for connecting a device of voltage or current output type (sensor). See "■Load sensor connection" on p.11 for connection.
	2	I IN+	
	3	IN-	
	4	GND	
	5	SHIELD	
Analog monitor output	6	VOL OUT	Terminal to output voltage proportional to the input of the device (sensor). (Approx. 0.6V per 1V/ approx. 0.15V per 1mA) Connect a pen recorder, etc., for simply monitoring the input of the device (sensor).
	7	GND	Ground terminal of VOL OUT.
Displacement input	8	SHIELD	Frame ground terminal to connect the shielded wire of the pulse output sensor connecting cable.
	9	COM	Common terminal of the pulse output sensor. (+common) Connect the + side (+24) of the external power supply (24V) for the pulse output sensor.
	10	A	Terminal to input the A-phase output of the pulse output sensor. Connect the A-phase output of the pulse output sensor.
	11	B	Terminal to input the B-phase output of the pulse output sensor. Connect the A-phase output of the pulse output sensor.
	12	Z	Terminal to input the Z-phase output of the pulse output sensor. Connect the A-phase output of the pulse output sensor. It is not usually wired. It is wired only when the indicated value is adjusted to zero at the original point of the rotary encoder.

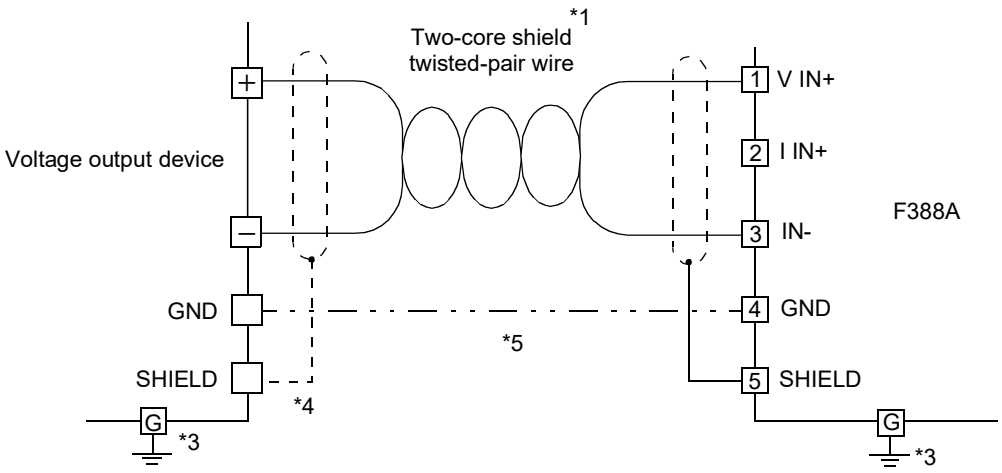
* Although pin4 and pin7 are common inside, GND for a load input should use pin4.
* Displacement input is a pulse input (open collector).

Attention

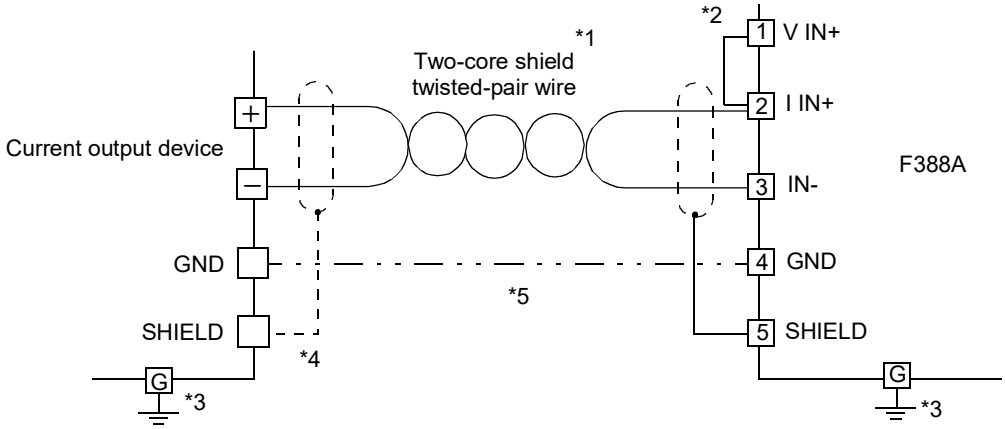
Please calibrate it after wiring the sensor.
See the following:
Load: "4-2.Y-axis setting" on p.35
Displacement: "4-3.X-axis setting" on p.38

■Load sensor connection

- Voltage input



- Current input



*1 Use two-core shield twisted-pair wire to connect F388A to Voltage/Current out put device.

*2 V IN+ to I IN+ should be short-circuited with the jumper wire attached when current input is done. (Set「Input Select」in Y-axis setting when you use it by current input.)

*3,4 F388A and the device connected should be grounded when you use them. (Usually, one side of shield wire should be connected to avoid the cause of faulty operation by forming ground loop. However, when high frequency noise affects the operation, it will be improved by connecting both sides of the shield wire.)

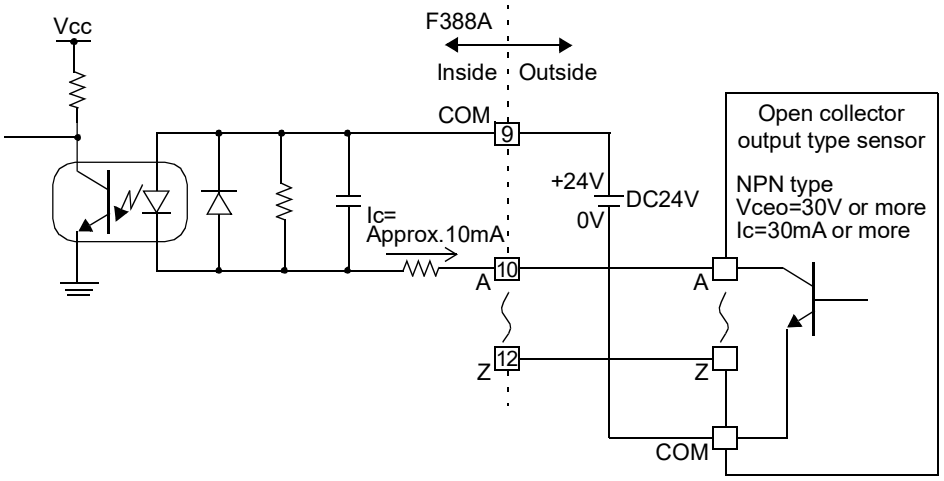
*5 Usually, there is no need to wire GND, but it causes the fluctuation of the indicated value when the potential difference between GND terminal and GND terminal of the device connected is produced .
In this case, the symptom may be improved by connecting GND to GND of the device connected.

*6 F388A is a high resolution type indicator which can perform A/D conversion at supper-high speed. The wiring between F388A and device connected should be in the short distance to eliminate the effects of induction noise. Moreover, the connection should be apart from AC power source and wiring of large volume current. Conduct adequate checking before the operation.

■Displacement sensor connection

- Input equivalent circuit

An open collector output type sensor (Incremental type) can be connected.



* Z-Phase is not usually wired. It is wired when the indicated value is adjusted to zero at the original point of the rotary encoder.

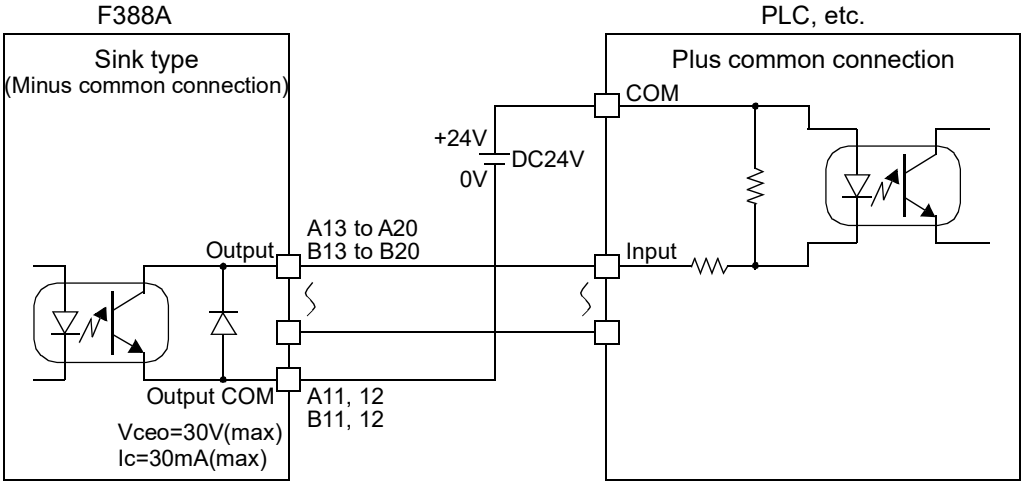
* Please wire for the power supply of the sensor separately.

2-3. External control equipment connection

While external input signals of both sink type and source type can be connected, external output signals of either sink type or source type can be connected, which should be order-specified. (Standard: sink type, ISC: source type)

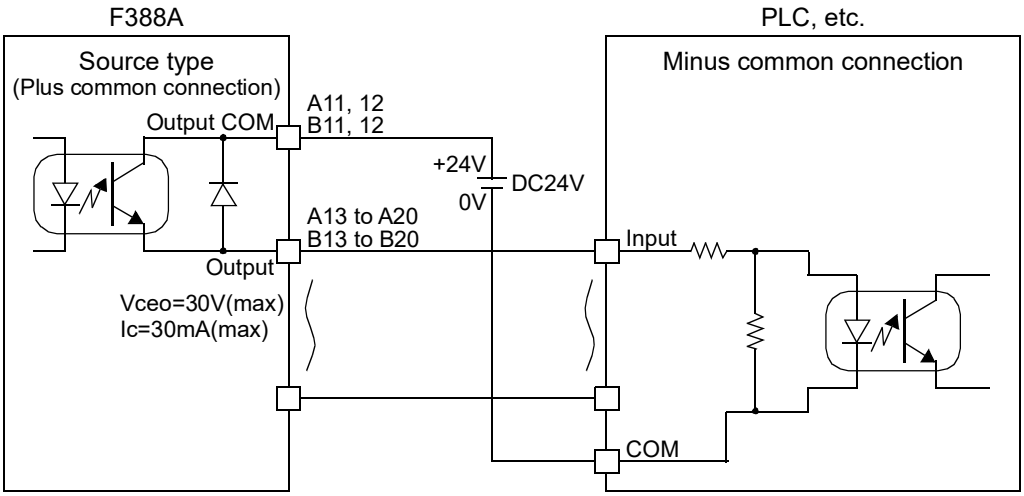
■External output equivalent circuits and example connections

- In case of minus common connection (Standard: sink type)



- In case of plus common connection (ISC: source type)

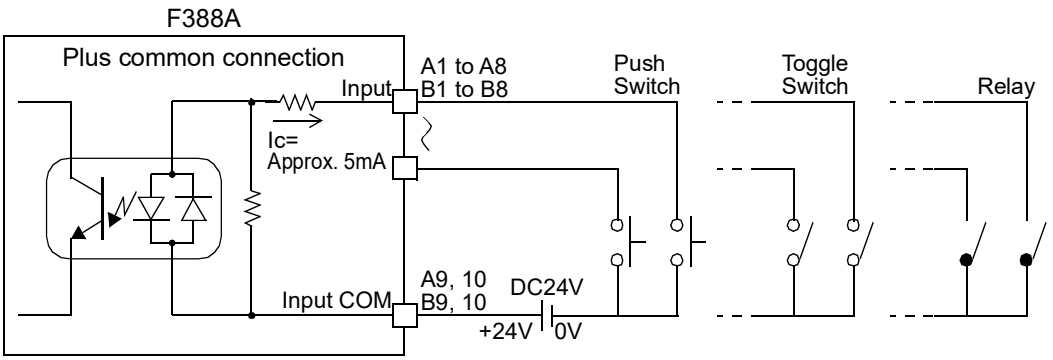
(The plus common connection is order-specified.)



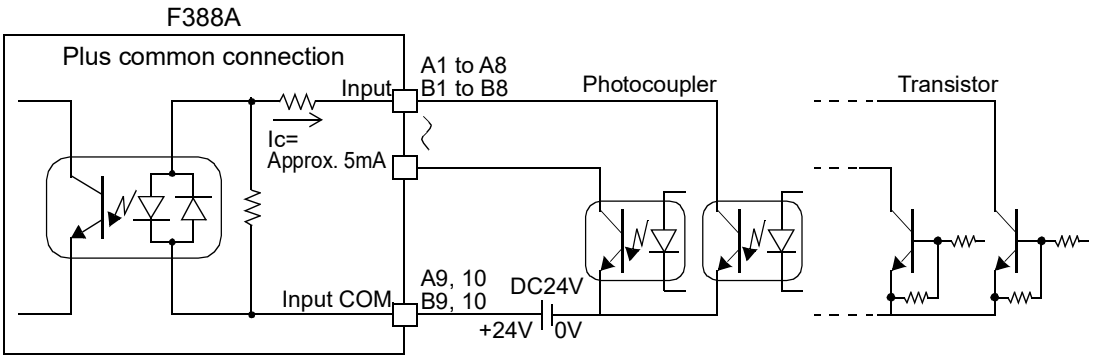
■External input equivalent circuits and example connections

- In case of plus common connection

When you connect the relay and the switch, etc.

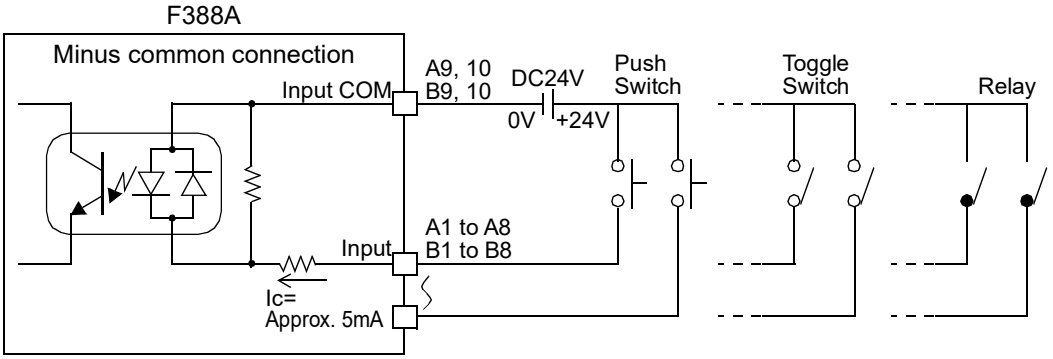


When you connect the transistor and the photocoupler, etc.

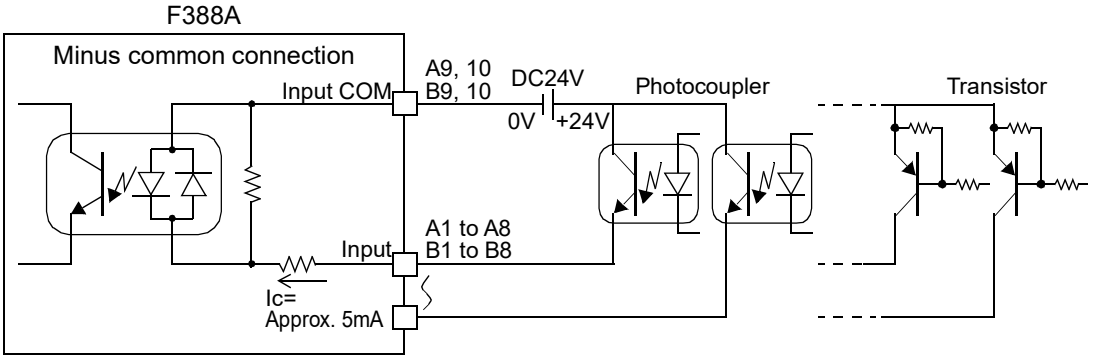


- In case of minus common connection

When you connect the relay and the switch, etc.



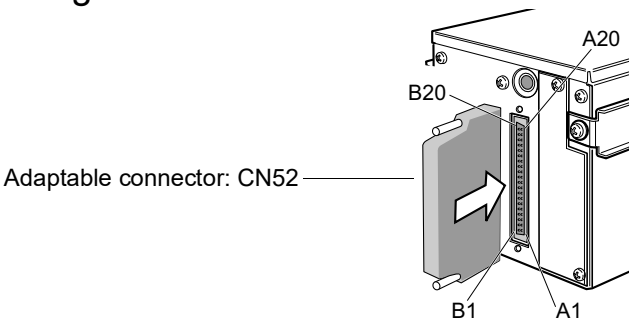
When you connect the transistor and the photocoupler, etc.



Attention

Connect elements that can pass Ic=10mA or more.
The leak current of the elements connected should be 400μA or less.

■Connector pin assignments



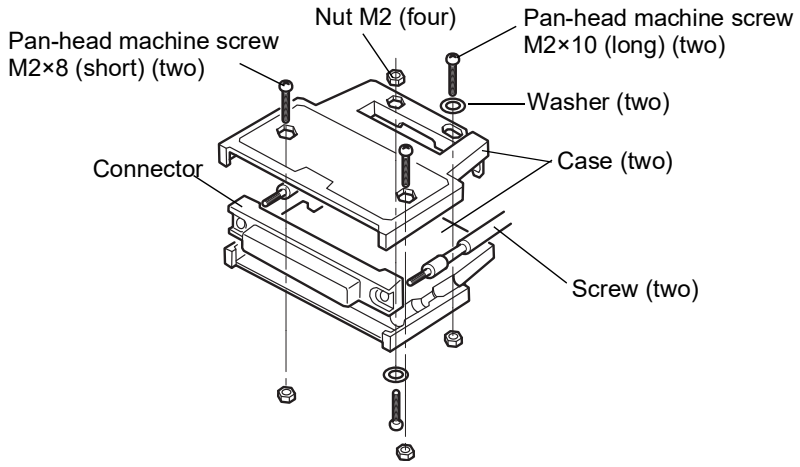
A1	IN	Load Digital Zero			B1	IN	Work 1		
A2	IN	DPM Positioning			B2	IN	Work 2		
A3	IN	Start			B3	IN	Work 4		
A4	IN	Stop			B4	IN	Work 8		
A5	IN	Hold			B5	IN	N.C		
A6	IN	Reset			B6	IN	N.C		
A7	IN	Backlight On			B7	IN	N.C		
A8	IN	Prohibit Touch Panel			B8	IN	N.C		
A9	IN	COM (Input)	Plus common connection: +24V Minus common connection: 0V		B9	IN	COM (Input)	Plus common connection: +24V Minus common connection: 0V	
A10	IN	COM (Input)	Plus common connection: +24V Minus common connection: 0V		B10	IN	COM (Input)	Plus common connection: +24V Minus common connection: 0V	
A11	OUT	COM (Output)	Sink type (Standard): 0V Source type (ISC): +24V		B11	OUT	COM (Output)	Sink type (Standard): 0V Source type (ISC): +24V	
A12	OUT	COM (Output)	Sink type (Standard): 0V Source type (ISC): +24V		B12	OUT	COM (Output)	Sink type (Standard): 0V Source type (ISC): +24V	
A13	OUT	Hold Result	Load	LO[1]	B13	OUT	Wave Result		LO[1]
A14	OUT			OK[1]	B14	OUT			OK[1]
A15	OUT			HI[1]	B15	OUT			HI[1]
A16	OUT		DPM	LO[1]	B16	OUT	Complete[1][2]		
A17	OUT			OK[1]	B17	OUT	Run		
A18	OUT			HI[1]	B18	OUT	Load OK		
A19	OUT	Overload			B19	OUT	DPM OK		
A20	OUT	N.C			B20	OUT	SD OK		

* Input COM and Input COM, Output COM and Output COM are internally connected.
* Input COM and Output COM are internally isolated.
* Input COM and the frame (frame ground), Output COM and the frame (frame ground) are connected with the capacitor.

[1] There is a judgment (NG judgment) which all of the judgment outputs LO, OK and HI are not set to on.Please fetch the outputs in synchronization with the Complete output is changed from OFF→ON. （See Page 19 "- Input signal timing check"）

[2] Please confirm turning OFF and ON(OFF→ON) of the Complete output at every measurement to confirm the measurement has been updated.

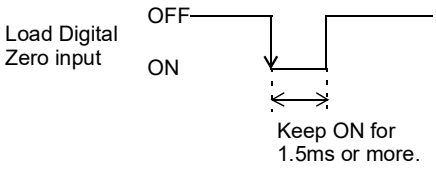
■How to assemble the connector



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).

Input signals

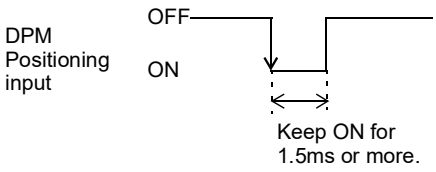
- Load Digital Zero



It should normally be wired. Perform Digital Zero by unloading the load sensor before measurement to simply adjust the deviation of the zero point of the load by temperature drift, etc. The load is zeroed by turning the signal from OFF to ON. As long as the signal is ON, the Load OK output is kept OFF.

* Digital zero value is cleared when the power supply is turned on.If you want to maintain digital zero value, Please do zero calibration instead.

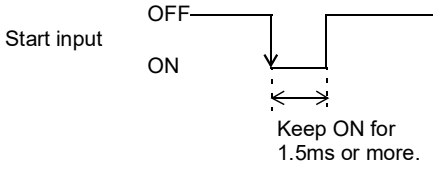
- DPM Positioning



It should be wired according to application. Use it for adjusting the zero point of displacement just before measurement start.

It is not used if the X-axis of the waveform represents time or the zero point of displacement does not need to be adjusted. By turning the signal from OFF to ON, displacement is brought to the DPM Positioning set value, and the internal counter of the pulse input is cleared. As long as the signal is ON, the DPM OK output is kept OFF.

- Start

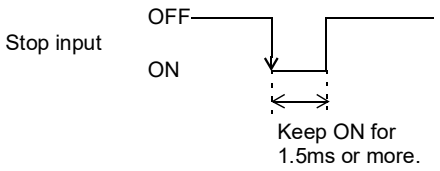


It should normally be wired. Use it for starting measurement. By turning the signal from OFF to ON when the Start signal input is waited for, a "Wait Off" state is brought about, and the Hold

Result, Wave Result, Complete, Load OK, and DPM OK outputs are turned OFF. By turning the signal from ON to OFF, a "Wait Lv." State is brought about, or the measurement is started according to the Measurement Start Condition.

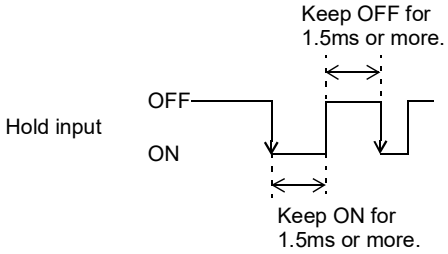
- Stop

It should normally be wired. Use it for stopping measurement. By turning the signal from OFF to ON during measurement, the measurement is stopped.



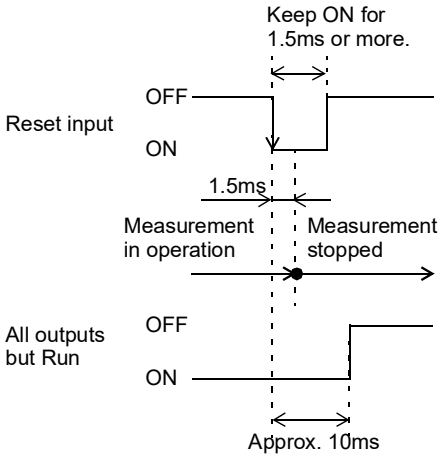
- Hold

It should be wired according to application. Use only for using the section control function by External Input. It is not used if the hold function is not used or Change of Section is made by Setting. By turning the signal from OFF to ON, the hold section is changed.



- Reset

It should normally be wired. Use it for releasing some errors, etc., in emergencies. Irrespective of the measurement status, by turning the signal from OFF to ON, the Hold Result, Wave Result, Load OK, and DPM OK outputs are turned OFF, and a "Wait St." state is brought about. If the Reset signal is turned from OFF to ON during measurement, the measurement is forcedly stopped and the measurement data is annulled. For keeping the data, check the data after completion of the measurement, and then turn the Reset signal from OFF to ON.



- Prohibit Touch Panel

It should be wired according to application. Use it for controlling so as to prevent touch panel operations. As long as the signal is ON, no setting operation can be performed with the touch panel. (Only switching to Result (List) screen and Wave Check screen can be performed.)

- Backlight On

It should be wired according to application. Use it for controlling the backlight externally. By turning the signal from OFF to ON, the backlight lights up. As long as the signal is ON, the backlight stays ON.

- Work

It should be wired according to application. Use it for using two or more work Nos. It is not used if only work No. 0 is used. Specify work No(s). to be used before measurement.

- COM (Input)

It should always be wired if input signals are used. It is a common terminal to input signals. Input COMs are internally connected.

Output signals

- Hold Result (Load/DPM)

It should be wired according to application. Use it for acquiring judgment results by using the hold function. If displacement needs to be judged, also use DPM. It is not used if the hold function is not used. Hold results are output.

LO: Turns ON when the hold result falls below the LO limit, and the output is held.

HI: Turns ON when the hold result exceeds the HI limit, and the output is held.

OK: Turns ON when judgment is made during measurement and the LO and HI outputs are not ON after completion of the measurement. OK will not turn ON if no hold is made for the specified Number of Use Sections.

- Overload

It should be wired according to each application. Use Overload to stop the equipment in case of emergency due to the excess load applied to the sensor. Irrespective of the measurement status, it turns ON at the Overload. It turns OFF, when the Overload is released.

- Complete

It should normally be wired. Use it for recognizing the completion of measurement. It turns ON when the measurement is completed.

- Wave Result

It should be wired according to application. Use it for acquiring judgment results by using the waveform comparison function. It is not used if the waveform comparison function is not used. Waveform comparison results are output.

LO: Turns ON when the waveform comparison result falls below the LO limit, and the output is held.

HI: Turns ON when the waveform comparison result exceeds the HI limit, and the output is held.

OK: Turns ON when the Compare Area is passed through during measurement and the LO and HI outputs are not ON after completion of the measurement. OK will not turn ON if the measurement does not reach the Compare Area or the Reference Point of Relative Comparison when Relative Comparison is made.

- Load OK

It should normally be wired. Use it for recognizing the abnormality of the load sensor. It is normally ON. It turns OFF with a sensor error (sensor ±error), or display error (±OVER), or when load exceeds the Overload or when the Load-Digital-Zeroed value exceeds the Digital Zero Limit. It also turns OFF when the Start, Reset, or Load Digital Zero signal is ON.

- DPM OK

It should be wired according to application. Use it if the X-axis of the waveform represents displacement. It is not used when the X-axis of the waveform represents time. It turns OFF when measuring points of 10 data or more are skipped because the pacing of displacement is too fast. It also turns OFF when the Start, Reset, or DPM Positioning signal is ON.

- Run

It should normally be wired. Use it for confirming that the CPU is running normally.

When the CPU is running normally, switching between ON and OFF is done about every 0.5 sec. If it is ON or OFF for a few seconds, there may be something wrong.

- SD OK

It should be wired according to application. It turns OFF with a memory card error*1, or when the measurement start input OFF→ON is ignored because a measurement waveform is not saved in time while being saved automatically*2. It also turns OFF when the Start or Reset signal is ON.

*1 It does not turn ON until the error is cleared.

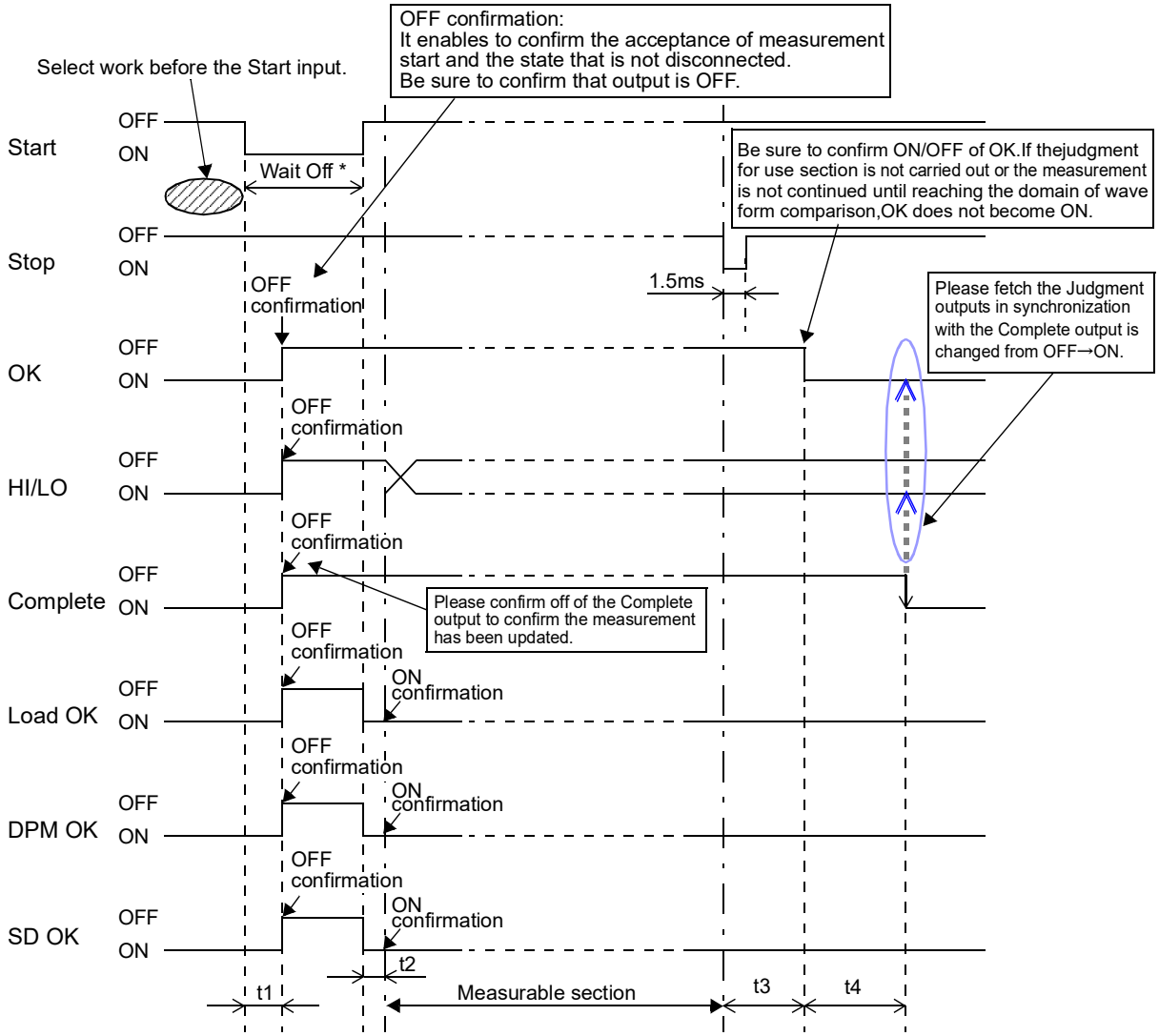
*2 It is reset by starting measurement being saved in time.

- COM (Output)

It should always be wired if output signals are used. It is a common terminal to external outputs. Output COMs are internally connected.

- Input signal timing check

Before measurement, properly check the timing of input/output signals.



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

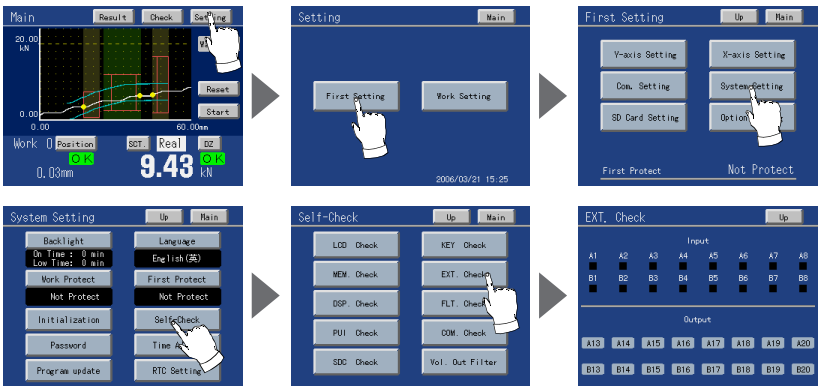
t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started ... 1.5ms
(However, it varies depending on the Measurement Start Condition.)

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms
(However, there are differences between measurements.)

t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

* Be sure to check that the output is OFF, and then turn OFF the Start input.

■How to check wiring



Operation

Main screen→Setting→First Setting→System Setting→Self-Check→EXT Check

Output

Press the output signal key, and check that there is input to the connected equipment.
(Pressing the key turns ON the output.)

Input

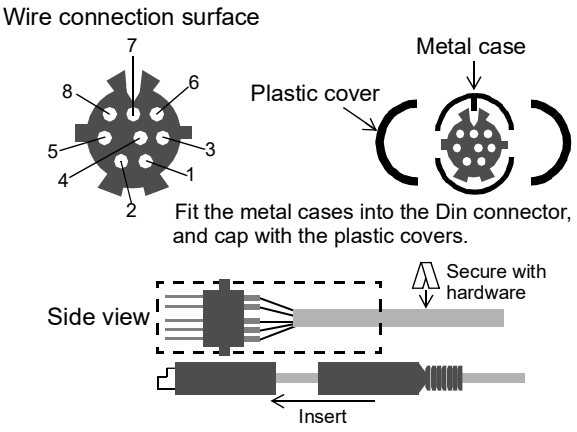
Turn ON the output of the connected equipment.
The pin recognized by the F388A turns yellow.

2-4. RS-232C Connection

■Connector Pin Assignment

The adaptable connector is CN60.

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



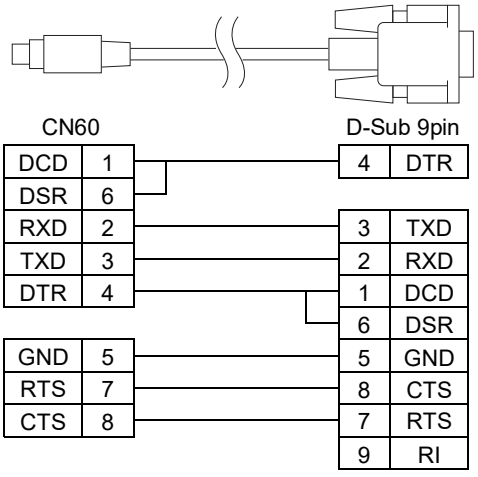
■Communication establishment procedure

1. Connect the cable.

Point

For connection with DTE (data terminal equipment), such as a PC, use optionally available RS-232C cross cable (CA81-232X).
For connection with DCE (data circuit-terminating equipment), such as a modem, use optionally available RS-232C straight cable (CA81-232S).

When connecting RS-232C cross cable [CA81-232X].



2. Coordinate the communication settings with the equipment connected.

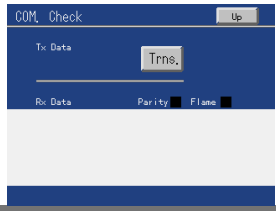
- Transmission Speed
- Data Bit
- Stop Bit
- Parity Bit
- Header
- Flow Control
- Delimiter

3. Set the Communication Mode to Normal.（The default is Normal.）

Operation

Main screen→Setting→First Setting→Com. Setting→Com. Mode

4. Go to the COM. Check screen under Self-Check.



Operation

Main screen→Setting→First Setting→System Setting→Self-Check→COM. Check

5. Transmit any statement from the equipment connected.
(Check only when the Communication Mode is Normal.)
The data received by the F388A is displayed.
Check that the transmitted data is displayed.
If the Parity or Frame lights in red and the data is not displayed properly, go back to Step 1 or 2, and check again the cable or communication settings.

6. Press the Trns. Key.
Pressing the Trns. key transmits the statement having the same contents as the display reading.
Check that it can be received properly on the side of the equipment connected.
If not, go back to Step 1 or 2, and check again the cable or communication settings.

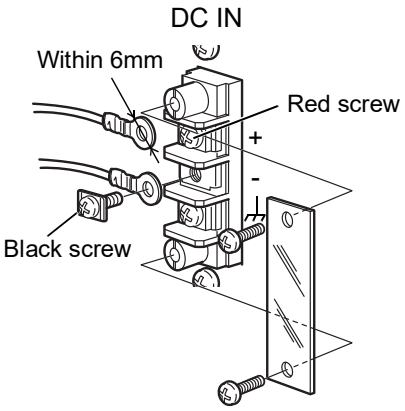
7. Set again the Communication Mode according to application.

Operation

Main screen→Setting→First Setting→Com. Setting→Com. Mode

2-5. Power-on

Connect the DC power cord. (24V DC (±15%) 20W)



1. Check that no power is applied.

2. Remove the screws (two), and remove the terminal block cover.

3. Remove the screws (two) from the terminal block.

4. Fit the crimp contacts to the screw holes, and fix them with the screws.
Carry out wiring from the silk-screen-printed side.
+: Red screw
-: Black screw

5. Install the terminal block cover, and fix it with the screws (two).

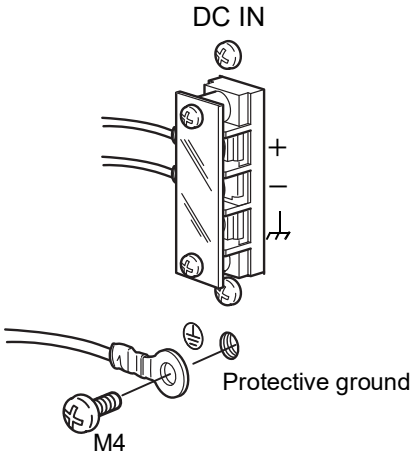
Attention

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.

2-6. Protective Ground Connection

The grounding terminal is for prevention of electric shocks.
Use an approx. 0.75mm^2 thick wire, and be sure to ground.

1. Make sure that no power is applied.
2. Remove the screws(M4) at the protective ground.
3. Align the solderless terminals(M4) with the screw holes, and then tighten the screws.

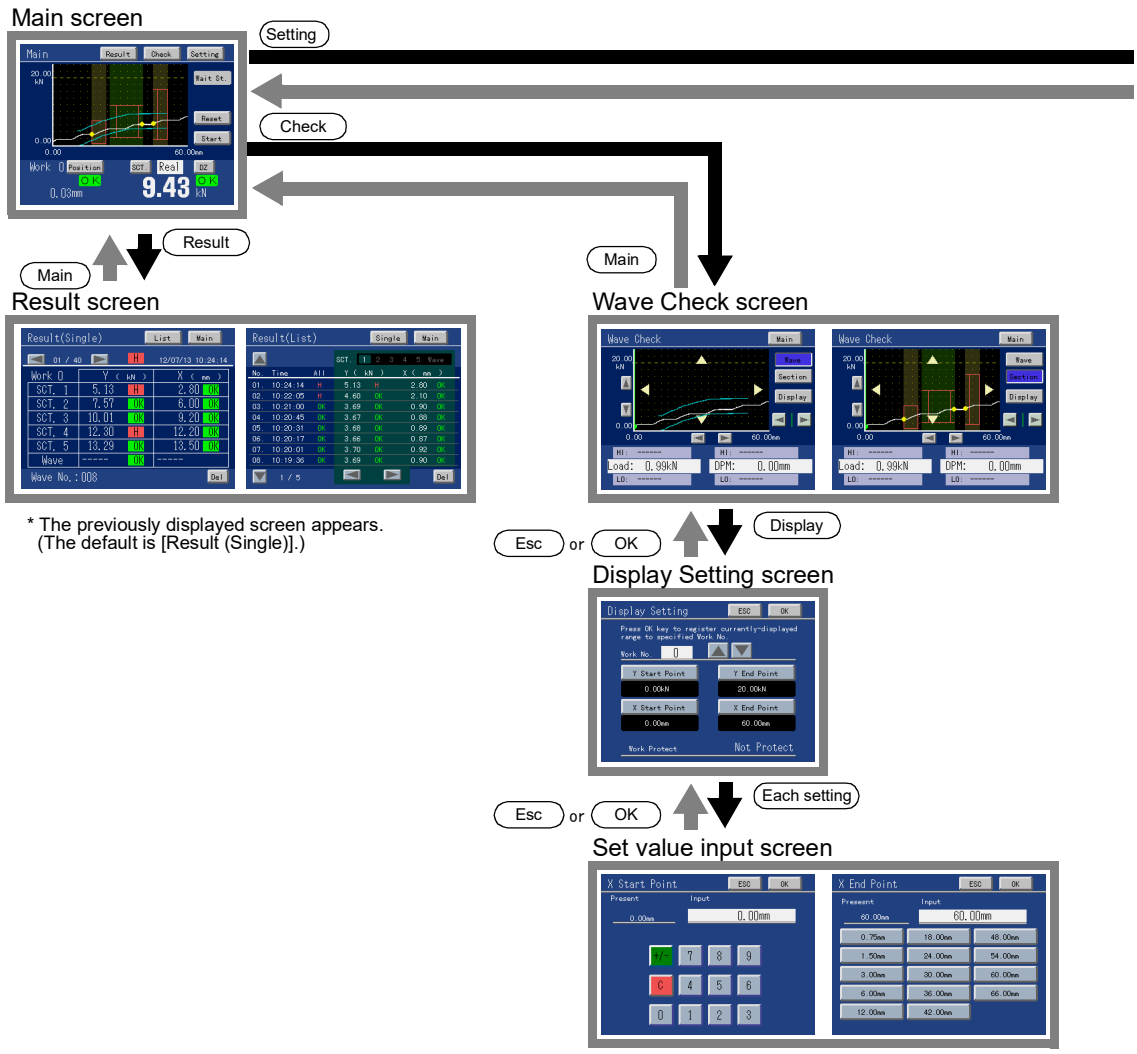


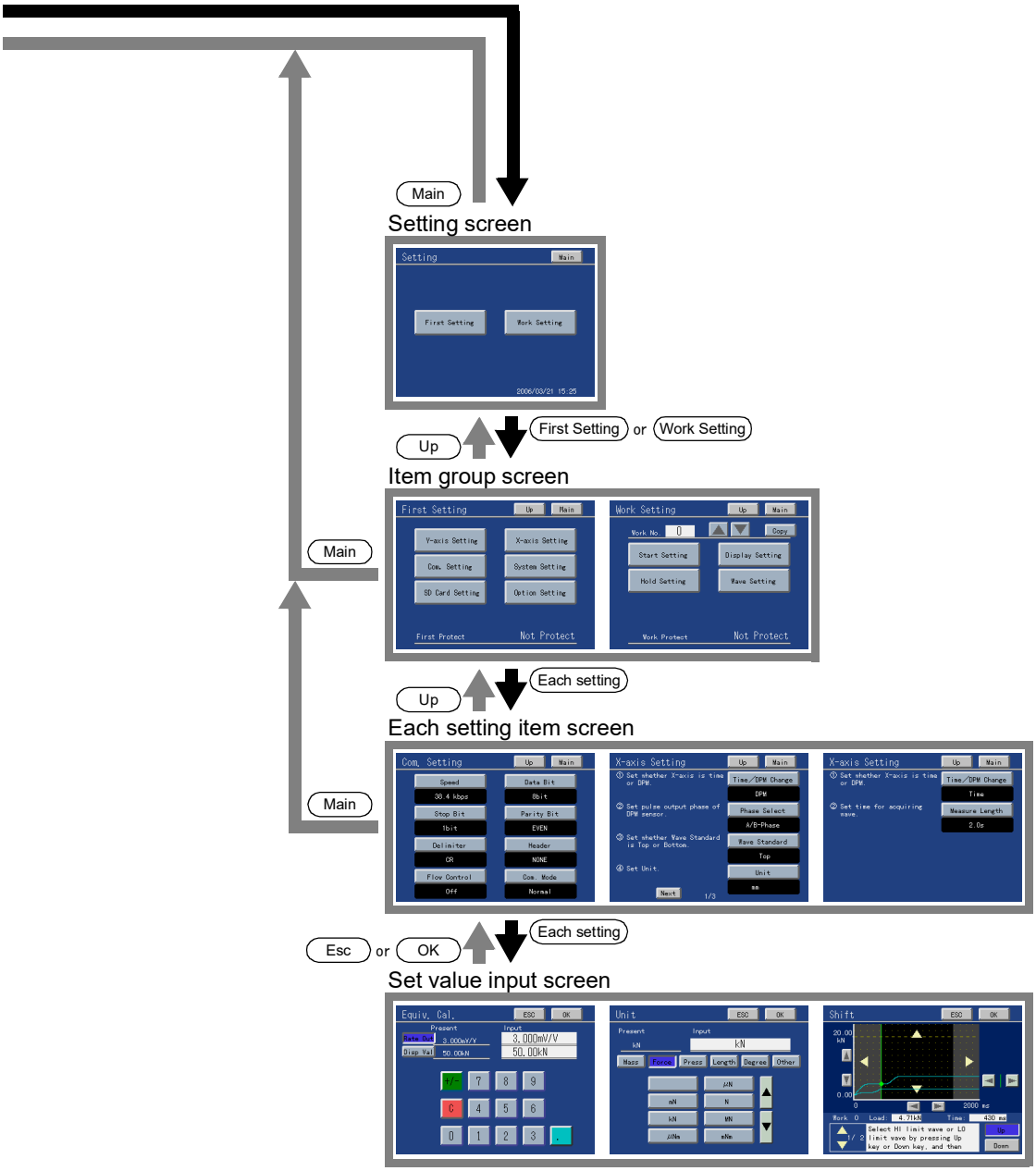
⚠ CAUTION

- Connect with no power applied because it may cause an electric shock.
- Since the F388A has no power switch, install a breaker.
- Be sure to ground the protective ground terminal to prevent electric shocks.
  Do not use other screws than that attached to the main body.

3 SCREENS AND OPERATIONS

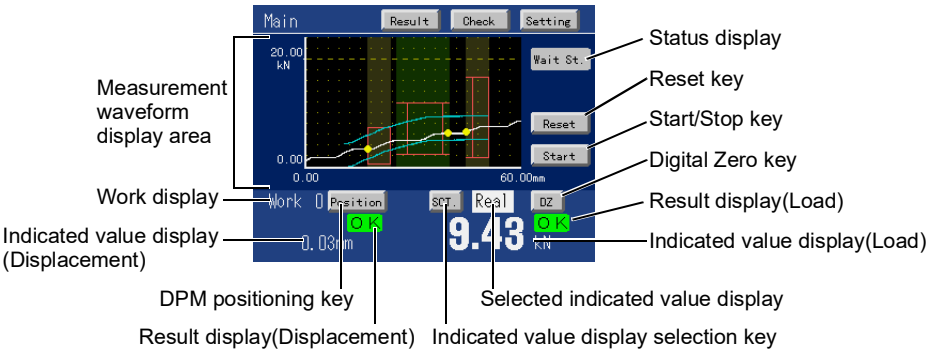
3-1. Screen configuration




Main
Setting screen
Setting
Main
First Setting
Work Setting
2006/03/21 15:25
Up
First Setting
or
Work Setting
Item group screen
First Setting
Up
Main
Y-axis Setting
X-axis Setting
Com. Setting
System Setting
SD Card Setting
Option Setting
First Protect
Not Protect
Work Setting
Work No.
0
Copy
Start Setting
Display Setting
Hold Setting
Wave Setting
Work Protect
Not Protect
Main
Up
Each setting
Each setting item screen
Com. Setting
Speed
38.4 kbps
Data Bit
8bit
Stop Bit
1bit
Parity Bit
EVEN
Delimiter
CR
Header
NONE
Flow Control
Off
Com. Mode
Normal
X-axis Setting
Time/DPM Change
DPM
Phase Select
A/B-Phase
Wave Standard
Top
Unit
ms
Next
1/3
X-axis Setting
Time/DPM Change
Time
Measure Length
2.0s
Main
Esc
or
OK
Each setting
Set value input screen
Equiv. Cal.
ESC
OK
Present
Input
3.000mV/V
50.00kN
Unit
Mass
Force
Press
Length
Degree
Other
Shift
20.00
0.00
2000 ms
Up
Down

3-2. Explanation of each screen and key operations

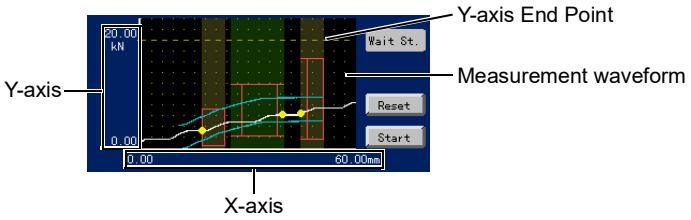
■Main screen



Display

Measurement waveform display area:

Displays a measurement waveform, comparison waveforms used for measurement, section(s), and HI/LO limit.



Measurement waveform ..... Displays a measurement waveform in white.

Y-axis .....Load axis consistent with the indicated value of load.

X-axis .....Axis showing the amount of displacement or time advanced after measurement start. Basically, in the case of time or displacement (Reference; Front), the left end corresponds to the point of origin, and in the case of displacement (Reference; Back), the right end corresponds to the point of origin.

Y-axis End Point

.....Indicates the end point of the Y-axis by a dotted line.

Status display : Displays the present measurement status.

Wait St.....The Start signal input is waited for. Input the Start signal. Measurement can also be started by pressing the Start key.

Wait Off.....It is waited for that the Start signal input is turned OFF. Turn OFF the Start signal.

Wait Lv. .....It is waited for that load or displacement crosses the Measurement Start Level. Apply load to the sensor so as to cross the Measurement Start Level.

Sampling.....Measurement is in progress. The measurement is stopped when the Measurement Stop Condition is met.

* During measurement, the present measurement waveform is not displayed.

Complete .....Measurement is completed. The measurement waveform is displayed.

Reset On .....It is waited for that the Reset signal is turned OFF.

Result display : The result is displayed.

The waveform comparison and the hold results of each section are displayed overall according to the priority.

* The displacement result is not displayed if X axis is time.

Priority	Result	Judgment condition
1	H/L	HI/LO limit over (HI limit over and LO limit over)
2	HI	HI limit over (judgment point > HI limit set value)
	LO	LO limit over (judgment point < LO limit set value)
3	NG	<Hold operation> - Measurement did not reach the section. - Failure to detect the judgment point. * If the setting is such that Start Point of Section n = End Point of Section n = Start Point of Section n+1, the result of the present section is always "NG." <Waveform comparison operation> - Measurement did not reach the Compare Area. - Measurement did not reach the Reference Point of Relative Comparison when Relative Comparison is made.
4	OK	Normal (LO limit set value ≦ Judgment point ≦ HI limit set value)

Indicated value display:

Displays the indicated value selected by SCT. (digital value of the load sensor/ displacement sensor input), and also displays load sensor/displacement sensor errors.

* When the indicated value selected by SCT. is Section 1 - 5, if there is no hold value, "-----" is displayed.

Work display: Displays the present work No. specified by external input "Work."

Selected indicated value display: Displays the currently-selected indicated value.

Present.....Present value: Updates the indicated value in real-time. (Does not hold)

Last.....Last hold value: Displays the value that was held last.
(When not holding, it updates the indicated value in real-time.)

1 .....Section 1: Displays the value that was held in Section 1.
2 .....Section 2: Displays the value that was held in Section 2.
3 .....Section 3: Displays the value that was held in Section 3.
4 .....Section 4: Displays the value that was held in Section 4.
5 .....Section 5: Displays the value that was held in Section 5.

(When not holding, "----" is displayed.)

* The displayed values that can be read by the communication (RS-232C, CC-Link and Ethernet) are either "Present value" or "Last hold value." "Last hold value" is displayed during Section 1 to 5.

Keys

Result : Moves to a result screen.
There are two types of screens: [Result (Single)] and [Result (List)].
In moving from the Main screen, the previously displayed screen appears.
(The default display is [Result (Single)].)

Check : Moves to the Wave Check screen.

Setting : Moves to the Setting screen.

Reset : Simply makes the same movement as the Reset signal.
Also, when the error display appears, this key clears it after release.

Start : Simply makes the same movement as the Start signal. This key is valid when the status display is Complete or Wait St. When pressed, it changes to Stop.

Stop : Simply makes the same movement as the Stop signal. This key is valid when the status display is Wait Lv. or Sampling. When pressed, it changes to Start.

Position : Simply makes the same movement as the DPM Positioning signal.
However, it cannot be operated when the X-axis represents time.

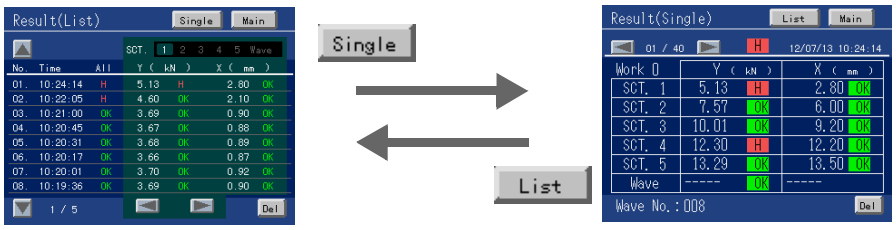
DZ : Simply makes the same movement as the Load Digital Zero signal.

SCT. : Selects the indicated value to be displayed. Each time you press the key, the displayed indicated value changes.
* The displayed section is stored even if the power is turned off.

■Comparison result screen

Judgment results by the waveform comparison function and hold function (last 40 data) can be checked. A selection can be made from the List display and Single display.

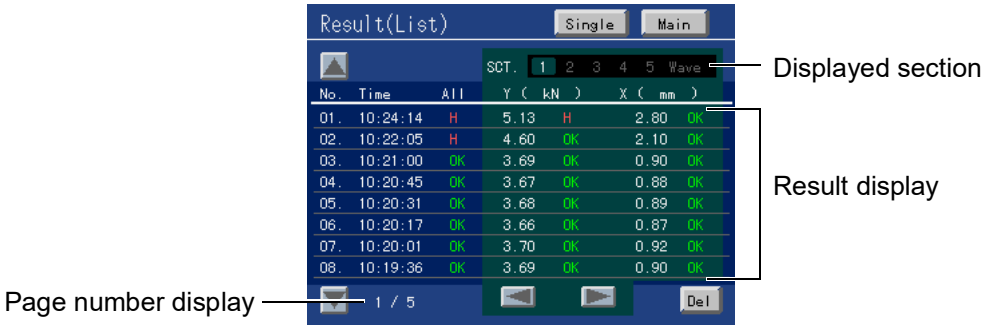
Result display(List) Result display(Single)



Point

If the power is turned OFF with the comparison result screen displayed, the comparison result screen will appear at next power-on.

■Result display(List)



Display

Result display : Displays Nos., measurement times, overall judgments, each section selected by SCT., and waveform comparison judgment results.

No. : ..... Displays the order of measurement. No. 01 is the most recent result.

Time : ..... Displays the time of measurement.

All : .....Displays the judgments (Y-axis and X-axis) of each section and the judgments of waveform comparisons overall.
The order of priority is as follows:
H/L > H,L > NG > OK

SCT.1～5 : Displays the Y-axis (load) and X-axis (displacement or time) values of the judgment point of each section and judgment results.

Wave : Displays the Y-axis (load) and X-axis (displacement or time) values of the point at which the upper/lower limit comparison waveform is first exceeded, and the Y-axis (load) judgment result.

SCT. : Displays the currently displayed section.

Page number display : Displays the current page. 8 pieces of data are displayed per page.

Point

- For the 41st and subsequent measurements, the data of No. 40 is deleted, and the most recent data is saved at No. 01.
- Measurement can be made as the comparison result screen is displayed. However, measurement results are updated. For checking the comparison results of the same contents, stop measurement.

Keys

▲、▼ (display page selection keys) : Switch the page number displayed.

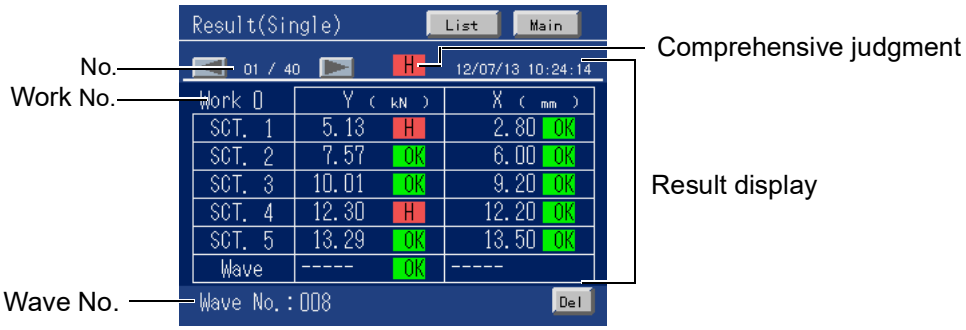
Del : Deletes all comparison results.
* When the Delete key is pressed, the deletion confirmation screen appears.

◄、► (display selection keys): Switch the section displayed.

Single : Switches the display to Single.

Main : Moves to the Main screen.

■Result display(Single)



Display

Result display : Displays the date and time of measurement, overall judgment, each section, and judgment results of waveform comparisons.

Date and time : Displays the date and time of measurement.

Comprehensive judgment : Displays the judgments (Y-axis and X-axis) of each section and the judgments of waveform comparisons overall.
The order of priority is as follows:
H/L > H,L > NG > OK

Work No. : Displays the work No. used for measurement.

SECT.1～5 : Displays the Y-axis (load) and X-axis (displacement or time) values of the judgment point of each section and judgment results.

Wave : Displays the Y-axis (load) and X-axis (displacement or time) values of the point at which the upper/lower limit comparison waveform is first exceeded, and the Y-axis (load) judgment result.

No. : Displays the order of measurement. No. 01 is the most recent result.

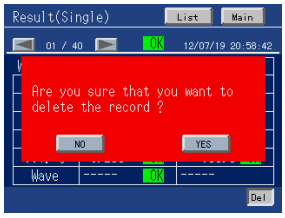
Wave No. : Displays the Wave No. associated with judgment results. It is not displayed if not established.

Point

- For the 41st and subsequent measurements, the data of No. 40 is deleted, and the most recent data is saved at No. 01.
- Measurement can be made as the comparison result screen is displayed. However, measurement results are updated. For checking the comparison results of the same contents, stop measurement.

Keys

Del : Deletes all comparison results.
* When the Delete key is pressed, the deletion confirmation screen appears.

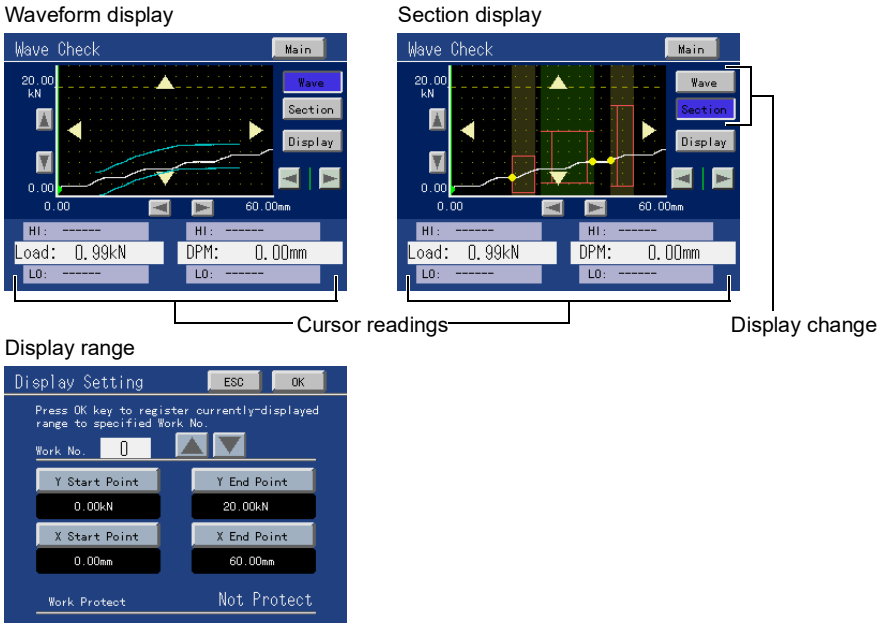


◀ 、 ▶ (display No. selection keys) : Switch the number displayed.

List : Switches the display to List.

Main : Moves to the Main screen.

■Wave Check screen



Display

Cursor readings: Display the cursor-positioned load and displacement (time).
Also, the HI and LO limits of comparison waveforms and the HI and LO limits of the currently-cursor-positioned section are displayed on waveform display and section display, respectively.

Keys

Display:Switches the display between that for waveform comparison and that for section (hold).

Wave ..... Switches the display to that for waveform comparison.
Displays the HI limit waveform, LO limit waveform, and area.
The HI and LO limits correspond to the values of comparison waveforms.

Section ..... Switches the display to that for section (hold).
Displays the range, HI limit, and LO limit of each section.
The HI and LO limits correspond to those of each section.

Display : Moves to the Display Setting screen.

Main : Moves to the Main screen.

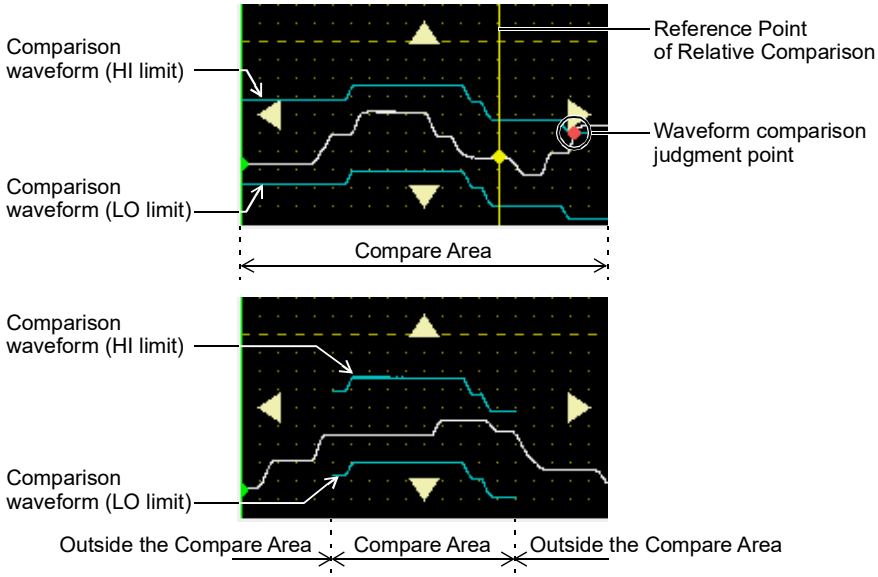
(cursor keys): Move the cursor rightward/leftward.

(area move keys): Move the waveform display area by 1/8 of the screen.

(X-axis zoom keys): Zoom in/out the waveform in the X-axis direction.
(: Zooms in. : Zooms out.)

(Y-axis zoom keys): Zoom in/out the waveform in the Y-axis direction.
(: Zooms in. : Zooms out.)

- About the waveform display



Comparison waveforms (HI and LO limits):

The comparison waveforms set by Waveform Comparison Setting are displayed in blue only in the Compare Area. Since the comparison waveforms are not displayed outside the Compare Area, the Compare Area can be seen at a glance.

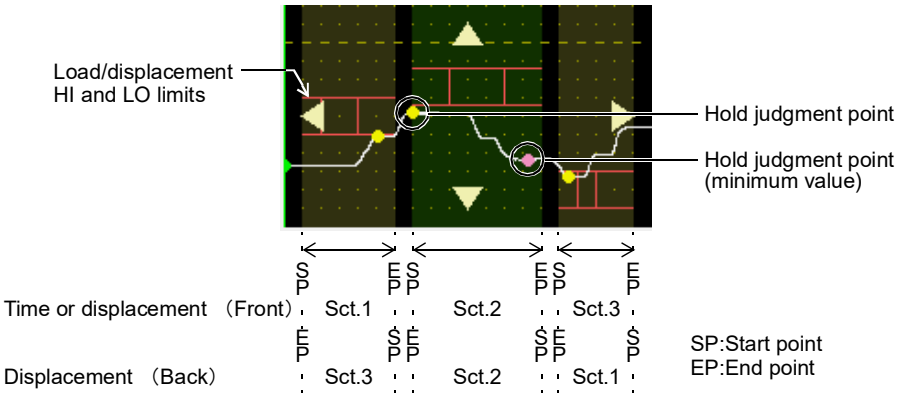
Waveform comparison judgment point:

Indicates in red the point at which the HI/LO limit of comparison waveforms is first exceeded.

Reference Point of Relative Comparison:

Indicated by a yellow dot and line when Relative Comparison is made.

- About the section display



Clear indication of sections: Sections are separated by color for ease of understanding.

Sections 1, 3, and 5: Shaded in gray.

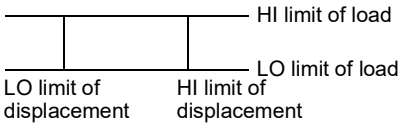
Sections 2 and 4: Shaded in green.

Hold judgment point:

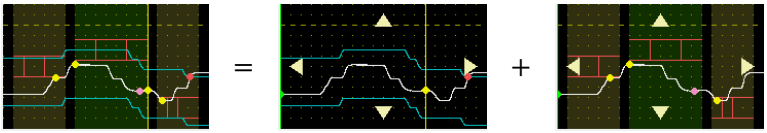
Judgment point(s) (hold point(s)) of each section, if any, is indicated by a yellow dot. However, at a “Peak to Peak” section, the minimum value is indicated in pink, and the maximum value is indicated in yellow.

Load/displacement HI and LO limits:

The HI and LO limits of each section are indicated by red lines.



The measurement waveform display area on the Main screen is as follows:



- About the display range

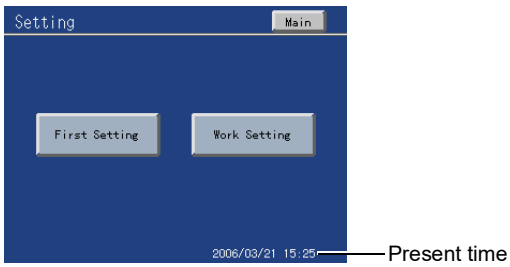
For example, this function is convenient for changing the display range with an observation of the details of the waveform.

1. On the Wave Check screen, display the part you want to analyze by zooming in/out and/or moving the graph.
2. Press Display, and select the work No. to set the present display range.
3. You can input numerical values to Y-axis Start Point, etc., but press OK as it is if such an input is not needed.

Point

Although it will be explained later, “Work Setting” includes the item “Display Range Setting.” With this, you cannot make settings while observing the waveform; therefore, do so from Wave Check.

■Setting screen



Display

The present time is displayed.

2 0 0 6 / 0 2 / 0 1 / 1 9 : 0 5

Year Month Day Hour Minute (24-hour display)

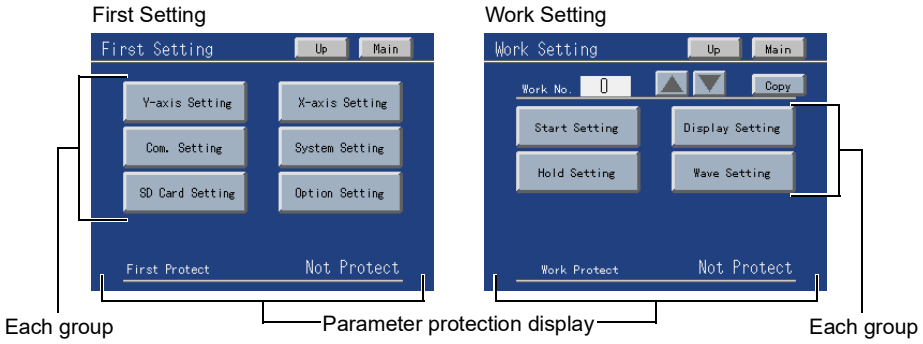
Keys

First Setting : Moves to the First Setting screen.

Work Setting : Moves to the Work Setting screen.

Main : Moves to the Main screen.

■Item group screen



Display

First Protect: Displays whether parameters can be changed or not. Select by System Setting.

Work Protect: Displays whether parameters can be changed or not. Select by System Setting.

Keys

Main : Moves to the Main screen.

Up : Moves to the Setting screen.

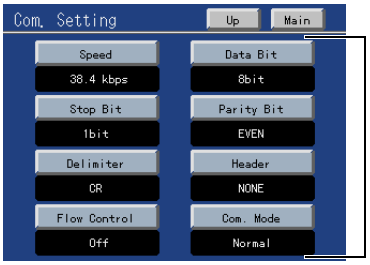
: Select the work No. to make settings.
The main work No. display will not change even if this work No. is changed.

Copy : Moves to the set value input screen for Copy.

Each group: Moves to each group screen.

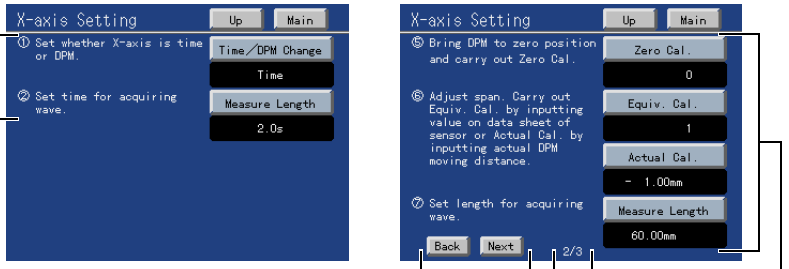
■Each setting item screen

Normal display screen



Each setting item

Setting order display screen



Order display

Page change

Page display

Each setting item

Display

Page display: Displays the page number/total number of pages when there are two or more pages of setting items.

Order display: Displays the setting order.

Keys

Up : Moves to the item group screen.

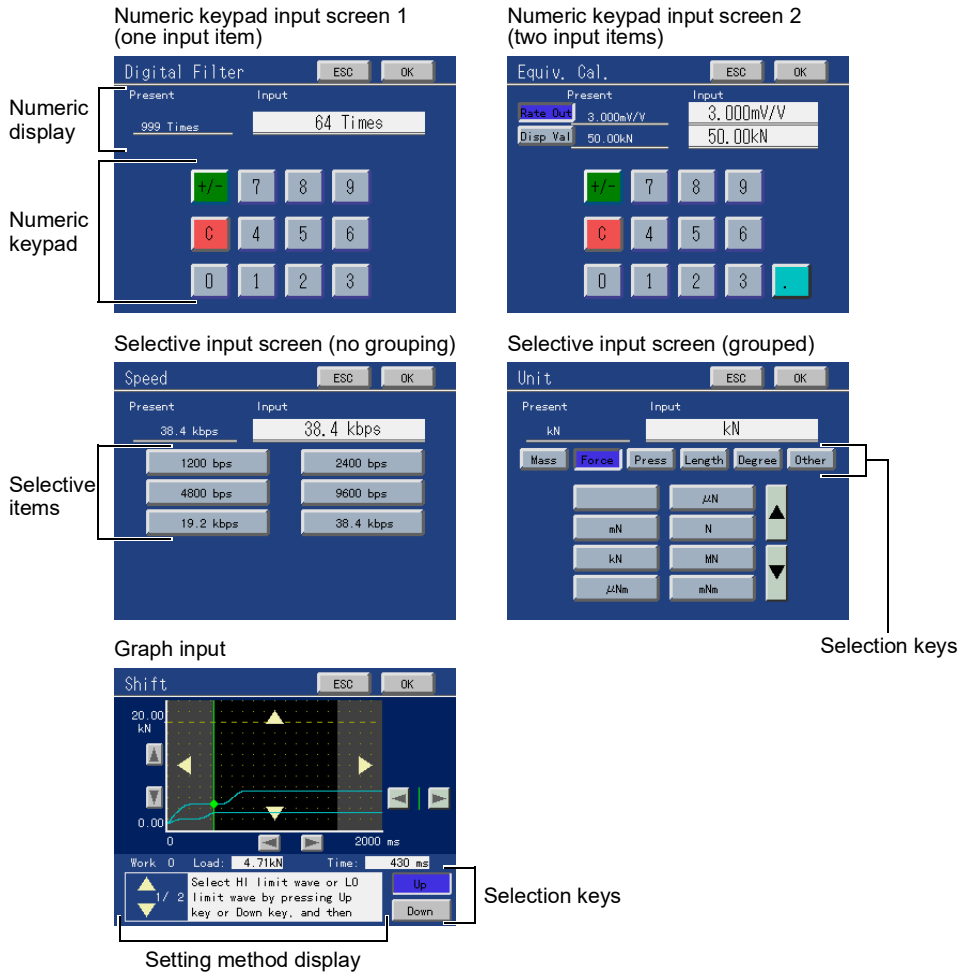
Main : Moves to the Main screen.

Each setting item: Moves to the set value input screen.

Next : Moves to the next page.

Back : Moves to the previous page.

■Set value input screen



Display

Numeric display: Displays the currently-set value and currently-input value.

Setting method display: Displays the setting method, and also the page number/total number of pages of the message.

Keys

OK : Accepts the currently-input value.

ESC : Cancels the currently-input value, and moves to the setting item screen.

: Move the cursor/waveform/point according to the setting item.

Selective item keys: Select the item of a set value.

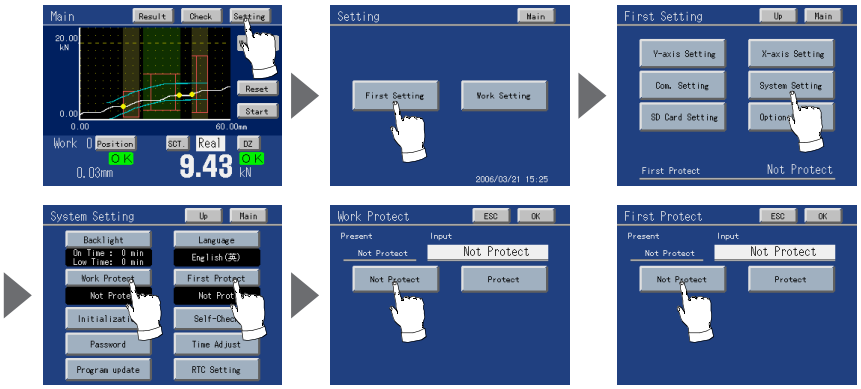
Selection keys: Select the corresponding cursor/waveform/input item(s)/group(s). The button of the selected item turns blue.

: Scroll the description of the setting method line by line.

4 SETTINGS AND CALIBRATIONS

4-1. Release of parameter protection

To change set values, release their respective locks.



Release of Work Setting Parameter Protection

Operation

Main screen→Setting→First Setting→System Setting→Work Protect→Not Protect

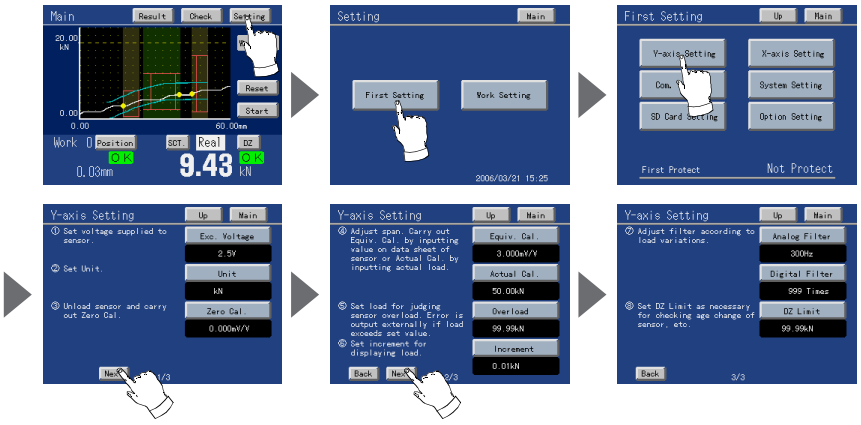
Release of First Setting Parameter Protection

Operation

Main screen→Setting→First Setting→System Setting→First Protect→Not Protect

4-2. Y-axis setting

Calibrate and set the load sensor by Y-axis Setting. Set each item according to the setting order.



Operation

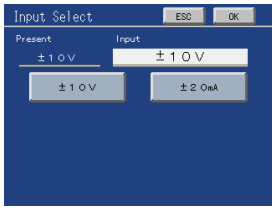
Main screen→Setting→First Setting→Y-axis Setting (→Next→Next)

1. Input Selection

Select the output type of the device (sensor) connected to analog input terminal.

The output type can be chosen ±10V (voltage) or ±20mA (current).

* After this setting, be sure to perform calibration.



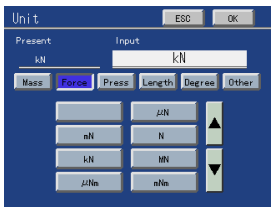
Setting range (±10V, ±20mA)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Input Select

2. Unit

Select a unit.



Setting range (See "9-3.Unit setting list"on p.141.)

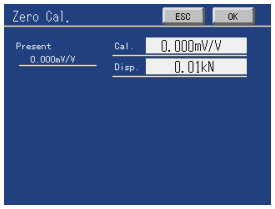
Operation

Main screen→Setting→First Setting→Y-axis Setting→Unit

3. Zero Calibration

Register the present sensor input as zero.

Press OK with the load sensor unloaded.



Setting range (-11 to 11 V, -22 to 22 mA)

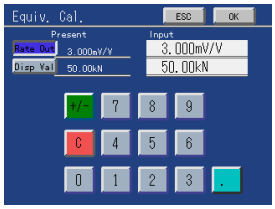
Operation

Main screen→Setting→First Setting→Y-axis Setting→Zero Cal.

4. Equivalent Input Calibration

Input the rated output and rated capacity (display value) described on the data sheet of the load sensor.

Also, set the decimal place here. Input the decimal point together when inputting the display value.



Setting range

Rated output (-99.99～99.99 V, -99.99～99.99 mA) (0 is excluded)

Display value (rated capacity) (-9999 to 9999)

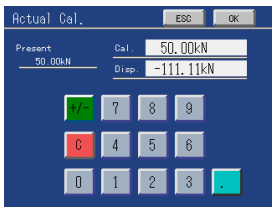
Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Equiv. Cal.

5. Actual Load Calibration

Apply actual load to the load sensor, and input the load value at that time.

Also, set the decimal place here. Input the decimal point together when inputting the calibration value.



Setting range

Calibration value(-9999 to 9999)

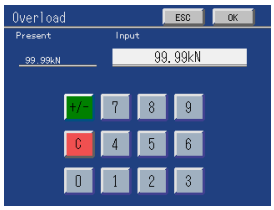
Display value (display only)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Actual Cal.

6. Overload

Set the load at which the sensor is judged to be overloaded. The Load OK output turns OFF when the load exceeds the set value.



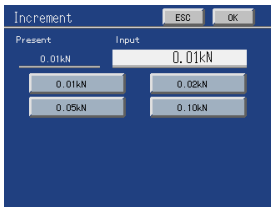
Setting range (0 to 9999)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Overload

7. Increment

Set the minimum unit of load display. Loads are displayed in the set increments.



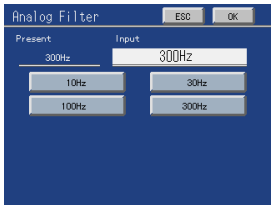
Setting range (1, 2, 5, 10)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Increment

8. Analog Filter

The low-pass filter of the set cut-off frequency is inserted with respect to the input of the load sensor.



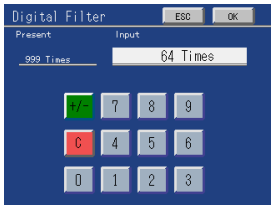
Setting range (10, 30, 100, 300 Hz)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Next→Analog Filter

9. Digital Filter

Loads are moving-averaged by the set number of times.



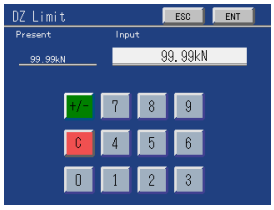
Setting range (0, 2 to 999 Times)

Operation

Main screen→Setting→First Setting→Y-axis Setting→Next→Next→Digital filter

10. Digital Zero Limit

Set the limit of load that can be digital-zeroed. If Digital Zero is performed with a load larger (smaller) than the zero-calibrated load by the set load, an error will result, and the load will not be zeroed.



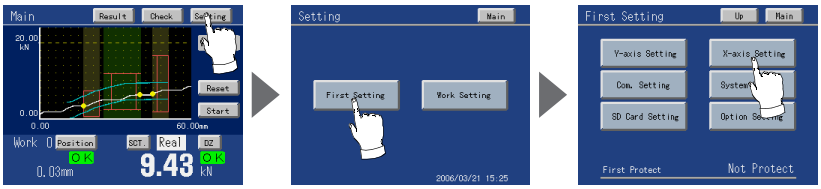
Setting range (0 to 9999)

Operation

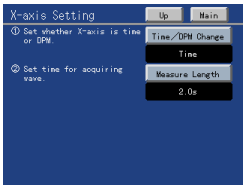
Main screen→Setting→First Setting→Y-axis Setting→Next→Next→DZ Limit

4-3. X-axis setting

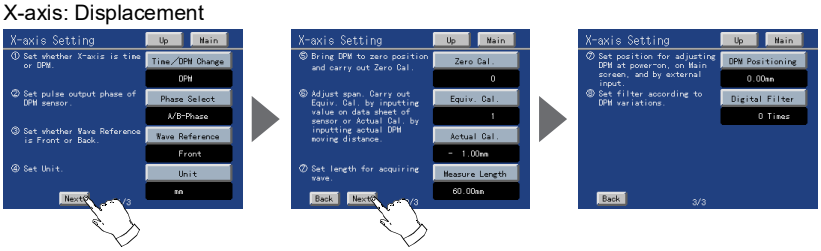
Calibrate and set the displacement sensor by X-axis Setting. Set each item according to the setting order. Settings vary depending on whether the X-axis represents time or displacement.



X-axis: Time



X-axis: Displacement

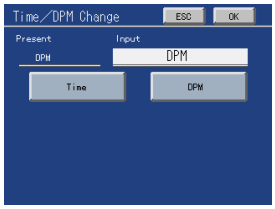


Operation

Main screen→Setting→First Setting→X-axis Setting (→Next→Next)

1. Time/Displacement Change

Select whether the X-axis represents time or displacement.



Setting range

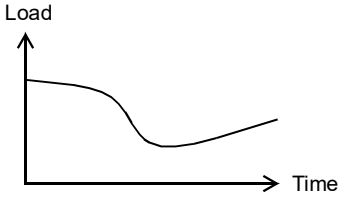
Time: Load relative to time is wave-formed.

Displacement: Load relative to displacement is wave-formed. Select “Displacement” when using a displacement sensor.

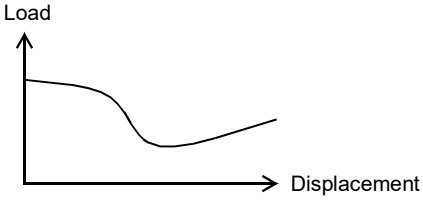
Operation

Main screen→Setting→First Setting→X-axis Setting→Time/DPM Change

< In case of time >



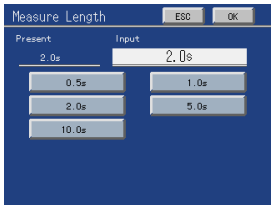
< In case of displacement >



When the X-axis represents time

2 Measurement Length

Set the time for waveform acquisition.



Setting range (0.5, 1.0, 2.0, 5.0, 10.0 s)

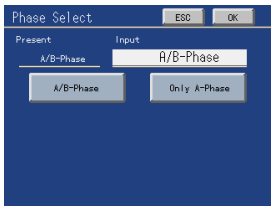
Operation

Main screen→Setting→First Setting→X-axis Setting→Measure Length

When the X-axis represents displacement

2 Sensor Phase Select

Select the output phase of the displacement sensor.



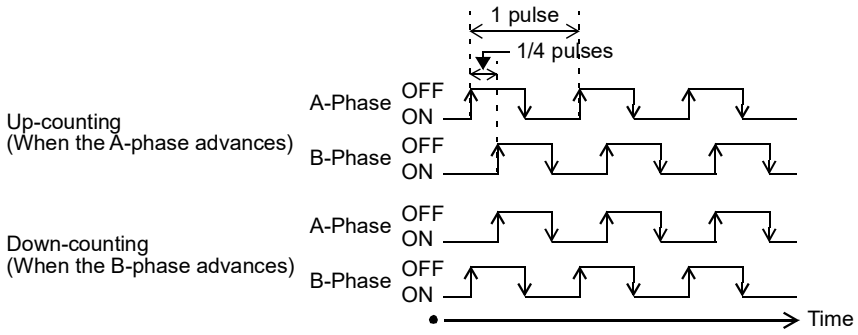
Setting range (A/B-Phase, Only A-Phase)

Operation

Main screen→Setting→First Setting→X-axis Setting→Phase Select

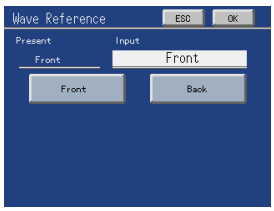
- Only A-Phase: A-Phase of the sensor is used. Resolution is 1 pulse. (Positive counting only.)

- A/B-Phase: A/B-Phase of the sensor is used. Resolution is 1/4 pulses. The counting conditions are as follows.



3. Waveform Reference

Select whether the waveform reference is front or back.



Setting range

Front: The measurement start point becomes the waveform reference.

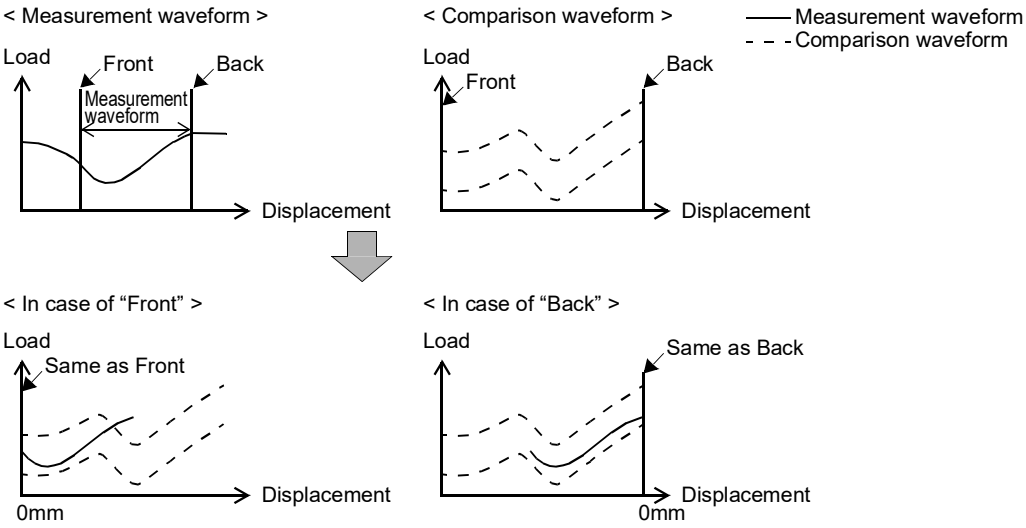
Back: The measurement stop point becomes the waveform reference.

Operation

Main screen→Setting→First Setting→X-axis Setting→Wave Reference

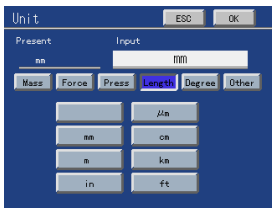
Point

When the Waveform Reference is set at Back, Change of Section cannot be made externally.



4. Unit

Select a unit.



Setting range (See "9-3.Unit setting list"on p.145.)

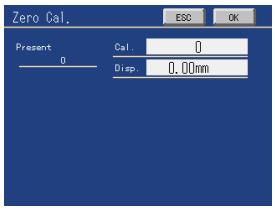
Operation

Main screen→Setting→First Setting→X-axis Setting→Unit

5. Zero Calibration

Register the present sensor input as zero.

Press OK with the displacement sensor zeroed.



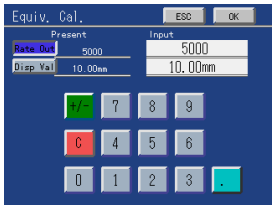
Setting range (0 to 1000000)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Zero Cal.

6. Equivalent Input Calibration

Input the relationship between the number of pulses (rated output) and displacement value (display value) determined from the data sheet of the displacement sensor. Also, set the decimal place here. Input the decimal point together when inputting the display value.



Setting range

Rated output (number of pulses) (1 to 1000000)

Display value (displacement value) (-99999 to 99999)

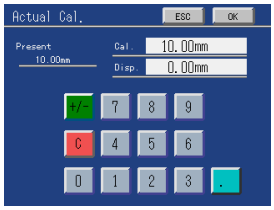
(Calibration can be made within ranges above, but the usable range is -9999 to 32000.)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Equiv. Cal.

7. Actual Load Calibration

Move the cylinder, and input its position. Also, set the decimal place here. Input the decimal point together when inputting the calibration value.



Setting range

Calibration value (-9999 to 32000)

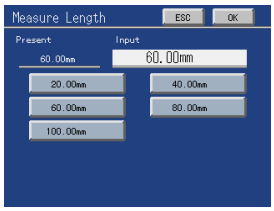
Display value (display only)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Actual Cal.

8. Measurement Length

Set the length for waveform acquisition.



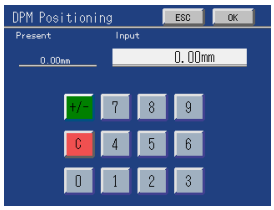
Setting range (2000, 4000, 6000, 8000, 10000)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Measure Length

9. Displacement Positioning

Set the position for displacement adjustment at power-on, on the Main screen, and by external input.



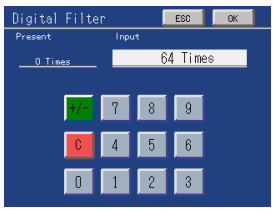
Setting range (-9999 to 32000)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Next→DPM Positioning

10. Digital Filter

Displacements are moving-averaged by the set number of times.

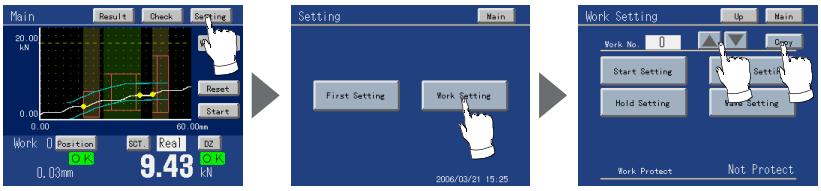


Setting range (0, 2 to 999 Times)

Operation

Main screen→Setting→First Setting→X-axis Setting→Next→Next→Digital Filter

4-4. Work No. selection and work copy



■Work No. selection

Press  on the Work Setting screen, and specify the work No. you want to set.

Setting range (0 to 15, All)

When each item is set with the work No. specified as “All,” the same set value enters into all of work 0 to 15 on the set item. This function is convenient when there is any item you want to set all work in common.

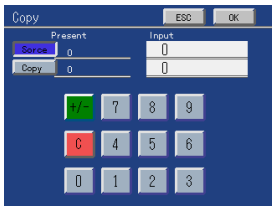
Operation

Main screen→Setting→Work Setting→Work No.

■Work copy

Work can be copied. Press Copy on the Work Setting screen. Set Source and Copy.

Data to be copied are all set values in Work Setting including comparison waveforms.



Setting range

Source (0 to 15)

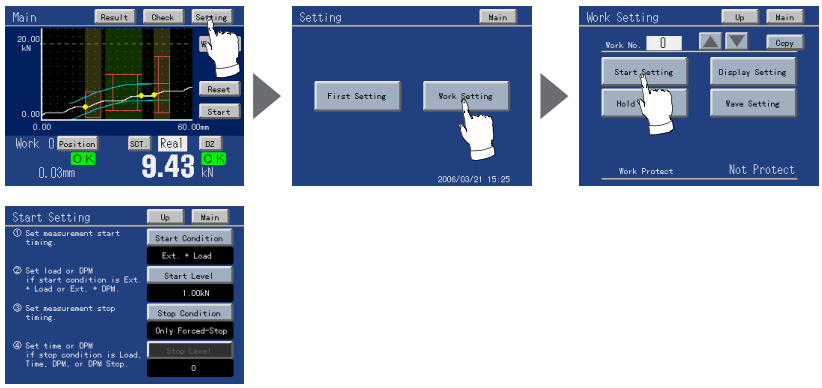
Copy (0 to 15)

Operation

Main screen→Setting→Work Setting→Copy

4-5. Measurement start condition setting

Set measurement conditions by Measurement Start Condition Setting. The Measurement Start Condition is as follows:

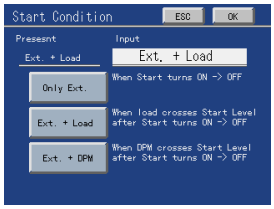


Operation

Main screen→Setting→Work Setting→Start Setting

1. Measurement Start Condition

Set the measurement start timing.



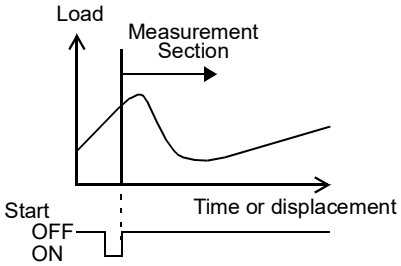
Operation

Main screen→Setting→Work Setting→Start Setting→Start Condition

①Only External Input

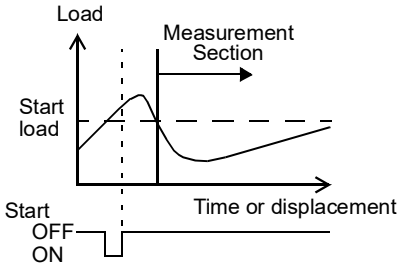
Measurement starts when the external input signal "Start" turns OFF →ON →OFF.

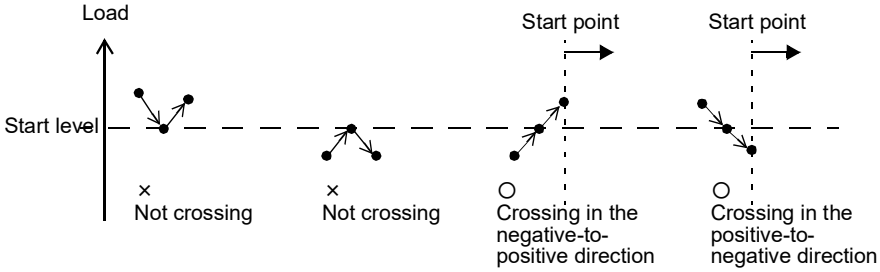
Setting of "2. Measurement Start Level" is disabled.



②External Input + Load

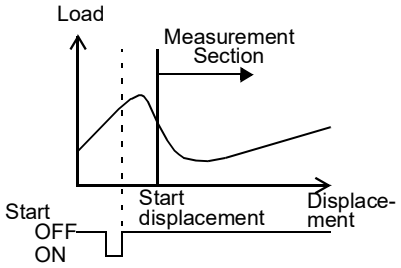
Measurement starts when the load crosses the Measurement Start Level after the external input signal "Start" turns OFF → ON → OFF.

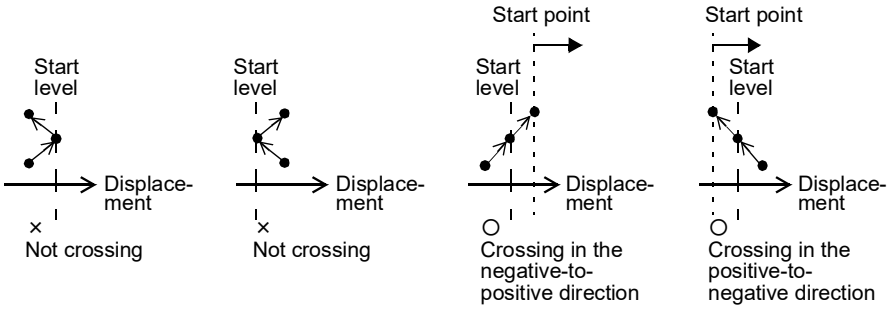




③External Input + Displacement

Measurement starts when the displacement crosses the Measurement Start Level after the external input signal "Start" turns OFF → ON → OFF.



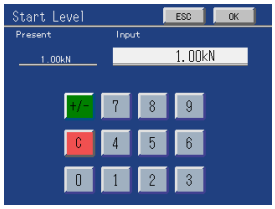


Point

The operation of turning the external input signal OFF → ON → OFF is the same as pressing Start on the Main screen.

2. Measurement Start Level

Set load or displacement when the Measurement Start Condition is "External Input + Load" or "External Input + Displacement."



Setting range

External Input + Load (-9999 to +9999)

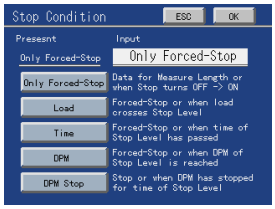
External Input + Displacement (-9999 to +32000)

Operation

Main screen→Setting→Work Setting→Start Setting→Start Level

3. Measurement Stop Condition

Set the Measurement Stop Condition.



Operation

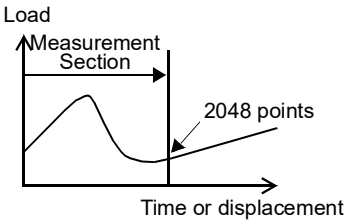
Main screen→Setting→Work Setting→Start Setting→Stop Condition

① Only Forced-Stop

Setting of "4. Measurement Stop Level" is disabled.

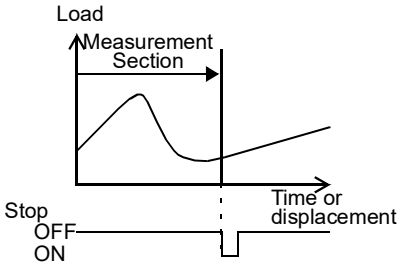
- 2048 points

Measurement stops when the number of points of measurement data exceeds 2048.



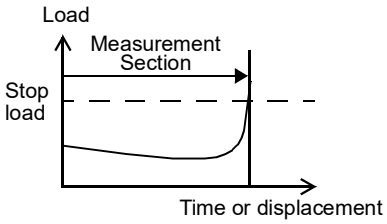
- External input

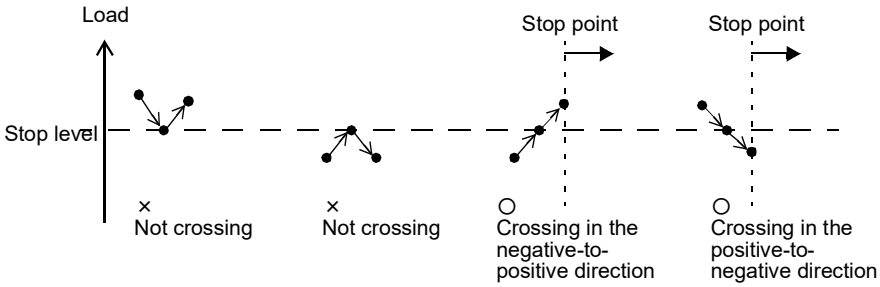
Measurement stops when the external input signal "Stop" turns OFF → ON.



②Load

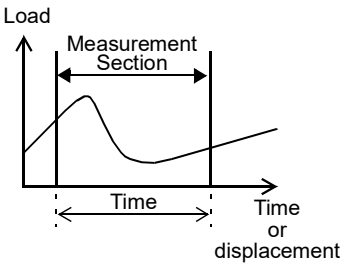
Measurement stops when the forced-stop or the load crosses the Measurement Stop Level.





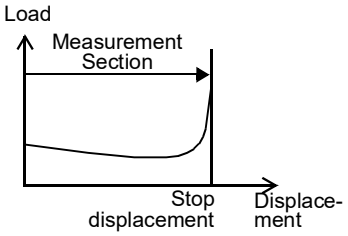
③Time

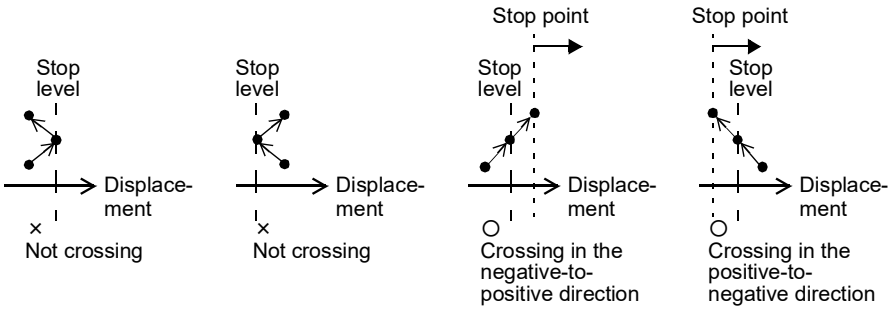
Measurement stops when the forced-stop or the time specified under Measurement Stop Level has passed after measurement start.



④Displacement

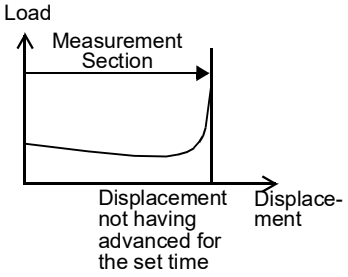
Measurement stops when the forced-stop or the displacement reaches the Measurement Stop Level.





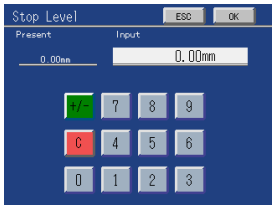
⑤Displacement Stop

Measurement stops when the forced-stop or the displacement stops advancing to the time specified under Measurement Stop Level.



4. Measurement Stop Level

Set load, time or displacement when the Measurement Stop Condition is “Load,” “Time,” “Displacement” or “Displacement Stop.”



Setting range

Load	(-9999 to +9999)
Time	(0.1 to 10.0 sec.)
Displacement	(-9999 to +32000)
Displacement Stop	(0.1 to 10.0 sec.)

Operation

Main screen→Setting→Work Setting→Start Setting→Stop Level

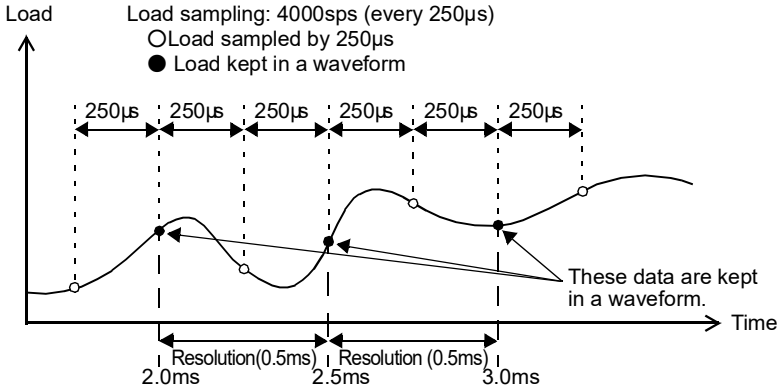
■Measurement data

- The sampling rate is fixed at 4000sps (samples per second).
- Measurement is carried out at 4000sps, but the data kept in a waveform is 2000 pieces per the Measurement Length. (Maximum data: 2048)
  Therefore, the waveform resolution is the Measurement Length/2000.

When the Time/Displacement Change setting is Time

During measurement, the load is sampled at 4000sps, and after completion of the measurement, the load by resolution is kept in a waveform.

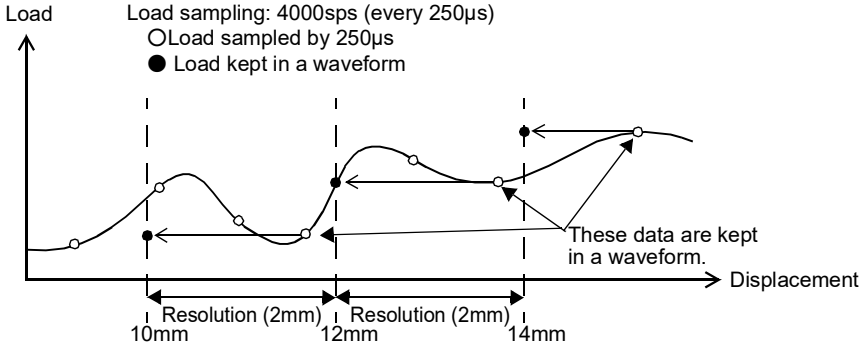
Example) When the Measurement Length is 1.0s



When the Time/Displacement Change setting is Displacement

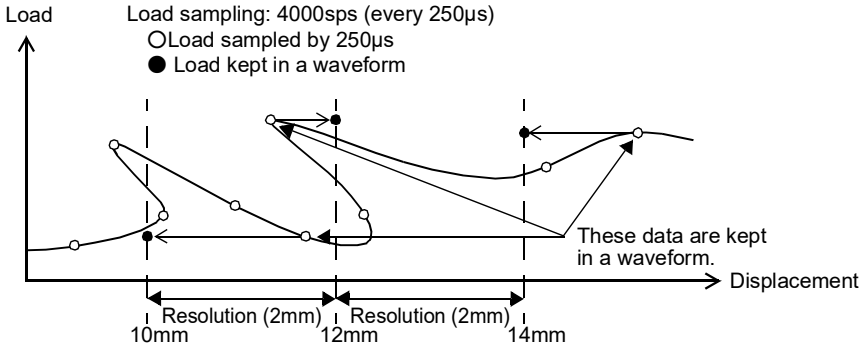
The load and displacement are sampled at 4000sps, and the load is kept in a waveform every time the displacement advances.

Example) When the Measurement Length is 4000mm



When the displacement returns, all the data of the corresponding load is recognized as that of the previous displacement.

Example) When the displacement returns

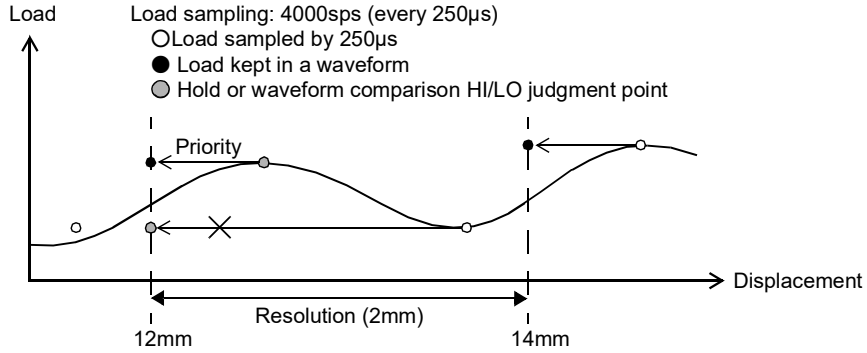


* Out of the points not kept in a waveform, those meeting the following conditions are kept in the waveform by priority.

① Data kept as judgment points but not kept in a waveform when Peak Hold, Bottom Hold, Peak to Peak Hold, Relative Maximum Hold, Relative Minimum Hold, or Inflection Point Hold is used

② HI or LO result data not kept in a waveform when waveform comparisons are made

Example) When a hold or waveform comparison HI/LO judgment point does not fall into the data that should be kept in a waveform



■When the displacement advances suddenly

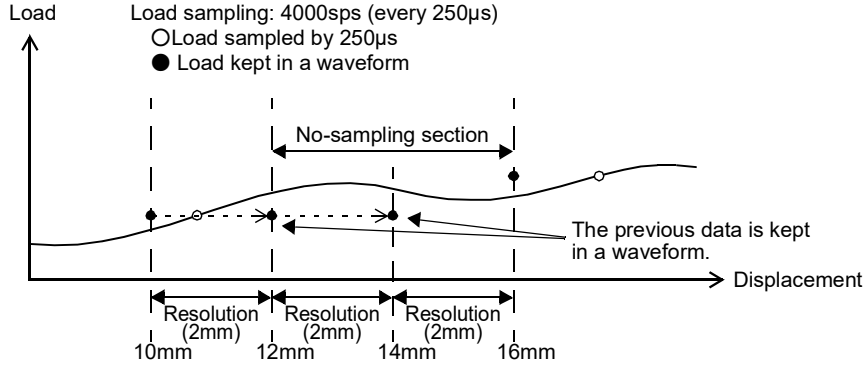
・ When the displacement advances suddenly, a phenomenon occurs in which sampling is not performed in time and the data that should be kept in a waveform is dropped. In that case, the data of the immediately preceding displacement is kept in the waveform as the data of the dropped displacement. If 10 or more pieces of data are dropped, a pace error will result and the DPM OK signal will turn OFF.

* Guide for the displacement pace

Displacement pace at which one piece of data is dropped: waveform resolution × 4000sps (/s)

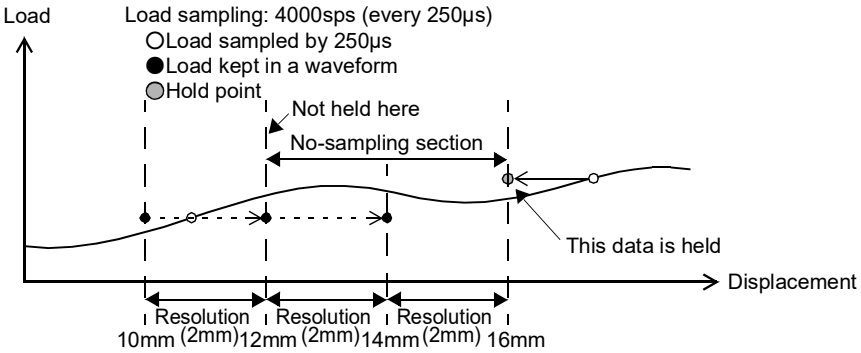
Example) When the Measurement Length is 4000mm → 2mm×4000sps＝8000mm/s

Example) When the displacement advances suddenly



・ If the displacement pace is fast, sampling may not be performed at the section start point.
In that case, no load is held at the section start point, but the load in time for sampling near the section start point is held.

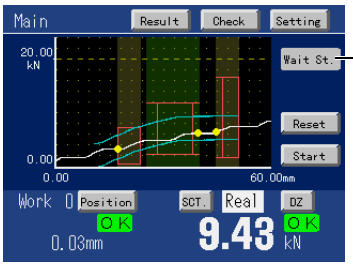
Example) When the section start point is 12mm and Sample Hold is used



* When the section start point and end point are set identically, if the displacement pace is fast, no load may be held. Set the section start point and end point having a margin in consideration of the case where the displacement pace is fast.

* In the case of Waveform Reference at Back, where hold operation is performed with the waveform kept after completion of measurement, the above phenomenon will not occur.

4-6. Measurement



Carry out measurement according to the following procedure on the Main screen.

1. Check that the status display is “Wait St.” or “Complete.”
If not, check that the Start signal is not input externally, and then press Reset.

2. Satisfy the Measurement Start Condition, and start measurement.
When measurement is started, the status display changes to “Sampling.”

* If “Sampling” does not appear, check the following according to the status display.

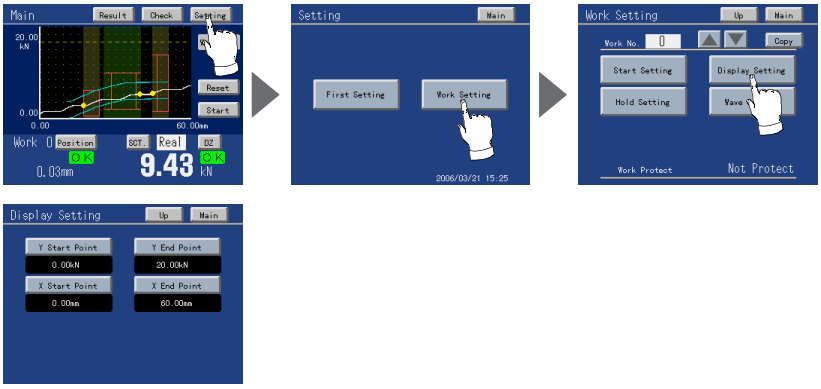
Wait St.: The Start signal is not acknowledged. Input the Start signal or press Start.
Wait Off: The Start signal is not OFF. Turn OFF the Start signal.
Wait Lv.: After the Start signal is input, the load or displacement does not cross the Measurement Start Level. Change the Measurement Start Level or change the Start signal input timing.
Complete: Measurement is already stopped. See Step 4 onward.

3. Satisfy the Measurement Stop Condition, and stop measurement.
Upon completion of measurement, the status display changes to “Complete.”

4. As needed, press Check to check the waveform.

4-7. Adjustment of waveform display

Adjust the waveform display axis by Display Range Setting.

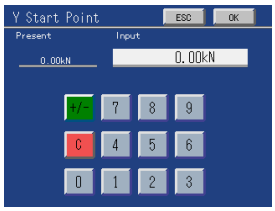


Operation

Main screen→Setting→Work Setting→Display Setting

1. Y-axis Start Point

Set the Y-axis start point of the waveform.



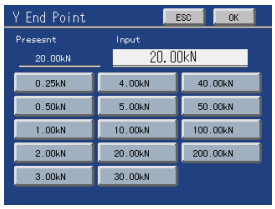
Setting range (-10000 to 10000)

Operation

Main screen→Setting→Work Setting→Display Setting→Y Start Point

2. Y-axis End Point

Set the Y-axis end point of the waveform.



Setting range

(Y-axis start point +
25, 50, 100, 200, 300, 400, 500, 1000, 2000, 3000, 4000, 5000, 10000, 20000)

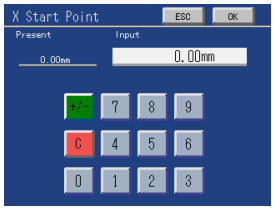
Operation

Main screen→Setting→Work Setting→Display Setting→Y End Point

3. X-axis Start Point

Set the X-axis start point of the waveform.

The setting range differs according to the setting of Wave Reference and Measurement Length.



Setting range

Time or displacement (Front) (0 to 2000 × Measurement Length/2000)

Displacement (Back) (-2000 to 0 × Measurement Length/2000)

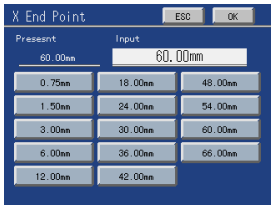
Operation

Main screen→Setting→Work Setting→Display Setting→X Start Point

4. X-axis End Point

Set the X-axis end point of the waveform.

The setting range differs according to the setting of Wave Reference and Measurement Length.



Setting range

Time or displacement (Front)

(X-axis start point + 25, 50, 100, 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2200 × Measurement Length/2000)

Displacement (Back)

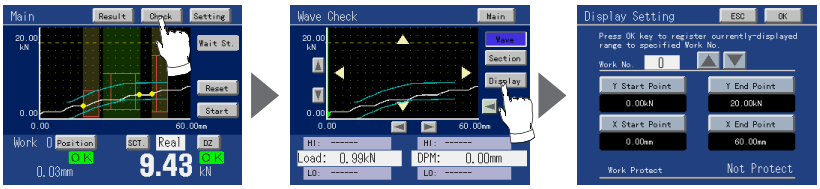
(X-axis start point + -25, -50, -100, -200, -400, -600, -800, -1000, -1200, -1400, -1600, -1800, -2000, -2200 × Measurement Length/2000)

Operation

Main screen→Setting→Work Setting→Display Setting→X End Point

Setting from Waveform Check

The waveform display axis can also be adjusted by the following operation.



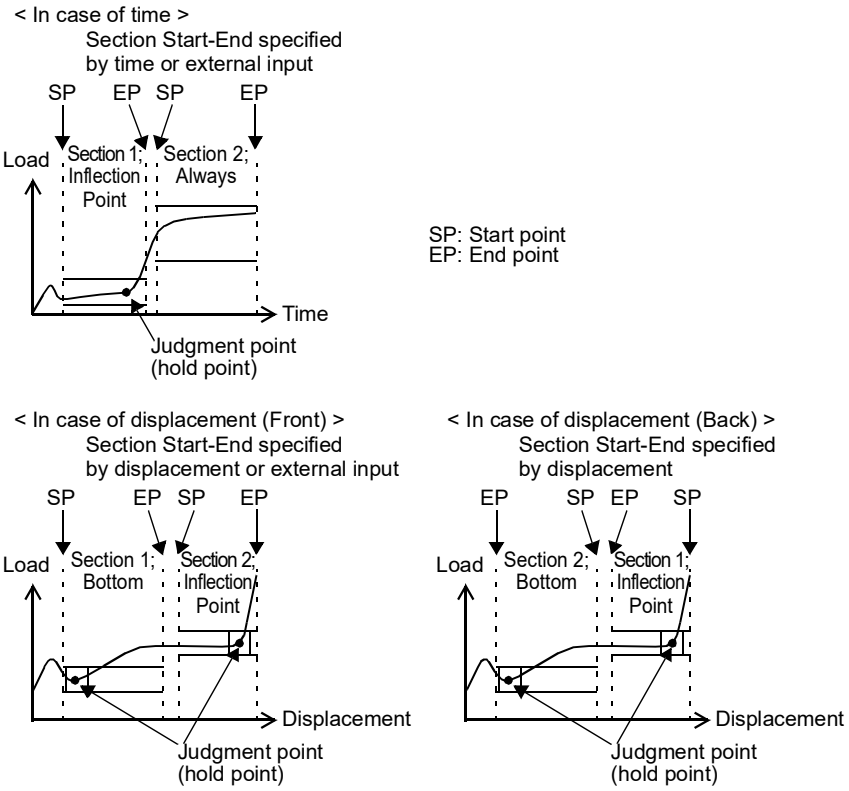
Operation

Main screen→Check→Display

4-8. Hold setting

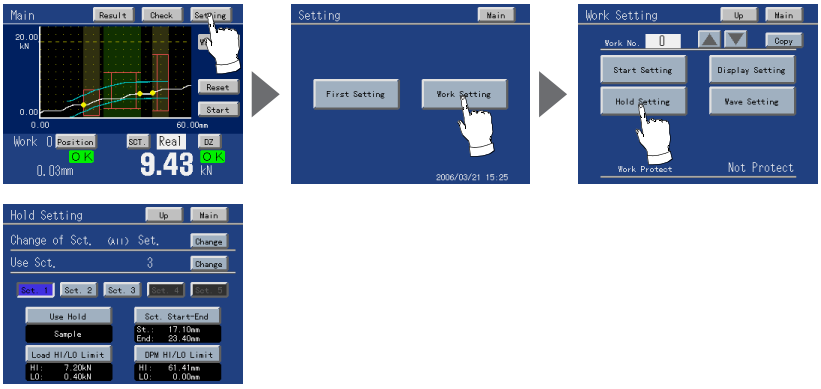
■What is the hold function?

- By dividing a measurement waveform into up to five sections and specifying the HI limit, LO limit and the method of judgment for each section, the waveform can be judged on each section.
- The method of judgment can be changed by selection under “Use Hold.”
- Judgment point(s) can be kept depending on the selection under “Use Hold.”
- Make Change of Section by the external input signal “Hold” or Setting.



■Section control setting

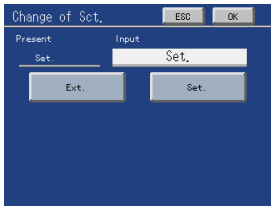
Set each section by Hold Setting.



Operation

Main screen→Setting→Work Setting→Hold Setting

- Change of Section



Select whether Change of Section is made by External Input or Setting.

Setting range (External Input or Setting)

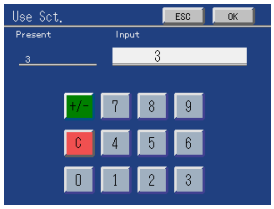
Operation

Main screen→Setting→Work Setting→Hold Setting→Change (Change of Sct.)

Point

When the Waveform Reference is set at Back, Change of Section cannot be made externally.

- Number of Use Sections



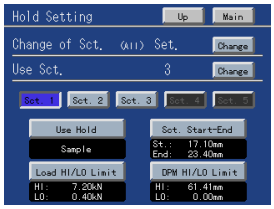
Set the number of sections to take hold.

Setting range (1 to 5)

Operation

Main screen→Setting→Work Setting→Hold Setting→Change (Use Sct.)

- Section No.



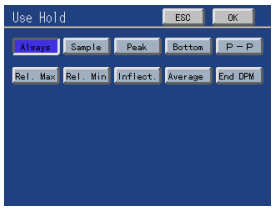
Select the section(s) to set. Selection can be made by the number of sections set under “Number of Use Sections.”

Setting range (Sct. 1, Sct. 2, Sct. 3, Sct. 4, Sct. 5)

Operation

Main screen→Setting→Work Setting→Hold Setting→Sct. 1 to Sct. 5

- Use Hold



Set the hold to detect judgment point(s).

* End displacement can be set only final section among the sections set by "Number of Use Sections" when X-axis of wave form is displacement.

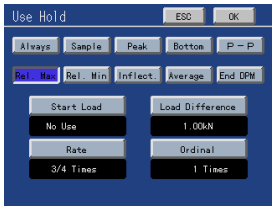
Setting range

(Always, Sample, Peak, Bottom, Peak to Peak, Relative Maximum, Relative Minimum, Inflection Point, Average, End Displacement)

Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold

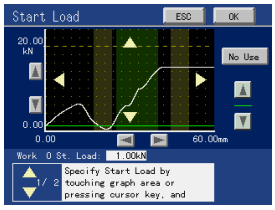
If Relative Minimum or Relative Maximum is selected to Hold, the following setting items are displayed.



- Detection Start Load

Set the load to start the detection of Relative Maximum (Relative Minimum).

If you do not use Detection Start Load, press [No Use].



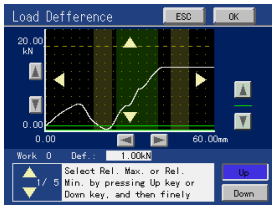
Setting range (-9999 to 9999)

Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold →Rel. Max. (or Rel. Min.)→Start Load

- Detection Load Difference

Set the load difference of Relative Maximum or Relative Minimum. Select with the Up key for the Relative Maximum, and with the Down key for the Relative Minimum.



Setting range (1 to 19998)

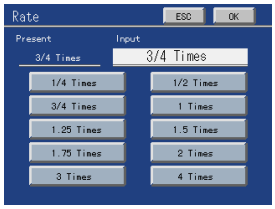
Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold →Rel. Max. (or Rel. Min.)→Load Difference

- Detection Rate

Set the rate to detect Relative Maximum (Relative Minimum).

Relative Maximum (Relative Minimum) is detected when the detection rate is exceeded based on the relative minimum.



Setting range

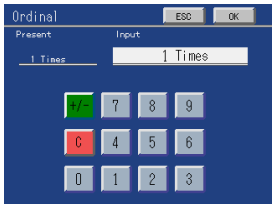
(1/4, 1/2, 3/4, 1, 1.25, 1.5, 1.75, 2, 3, 4 Times)

Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold →Rel. Max. (or Rel. Min.)→Rate

- Detection Ordinal

Set the number of points to be counted before judgment of Relative Maximum (Relative Minimum).



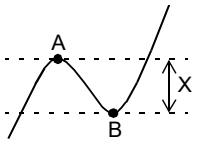
Setting range (1 to 15 Times)

Operation

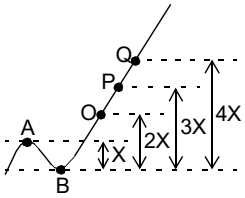
Main screen→Setting→Work Setting→Hold Setting→Use Hold →Rel. Max. (or Rel. Min.)→Ordinal

How to detect Relative Maximum and Relative Minimum

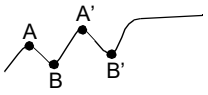
First, when Difference X between Point A and Point B exceeds Detection Load Difference, Point A is judged to be Relative Maximum, and Point B is judged to be Relative Minimum.



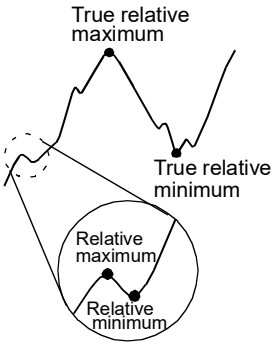
When Relative Maximum A and Relative Minimum B are detected, and Difference X between them exceeds Detection Rate (1/4 to 4 Times), at each point (Point Q if the Rate is 4 Times for example), A and B are displayed and held when the settings of "Use Hold" are Relative Maximum and Relative Minimum, respectively.



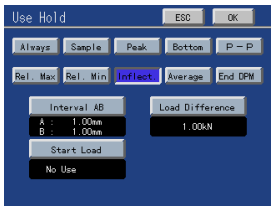
In the case where Relative Maximum and Relative Minimum appear more than once on a waveform, Relative Maximum and Relative Minimum are held after counting the number of times set under "Detection Ordinal." For example, if the setting is "2," A' and B' are held as Relative Maximum and Relative Minimum, respectively.



If the value of Detection Load Difference is too small, noise in the waveform as shown at the right may be regarded as Relative Maximum and Relative Minimum so that correct values may not be able to be held. Set an appropriate value by checking the input waveform on the screen.

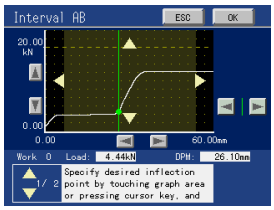


If Inflection Point is selected to Hold, the following setting items are displayed.



- Detection Interval AB

Set Detection Interval A and Detection Interval B.



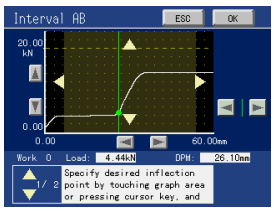
Setting range (The range is the same for A and B.)

(1 to 999 × Measurement Length/2000)

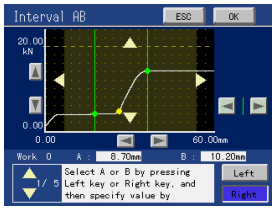
Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold→Inflect.
→Interval AB

① Set the inflection point you want to take. Touch the graph area or specify with the cursor keys, and then press OK .

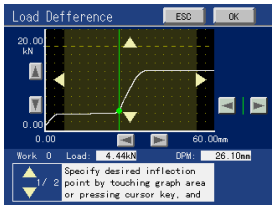


② To set Detection Interval A, press Left , and to set Detection Interval B, press Right , and then set a value. After setting A and B, press OK .



- Detection Load Difference

Set the load difference between Load A and Load B.



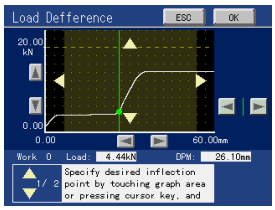
Setting range (1 to 19998)

Operation

Main screen→Setting→Work Setting→Hold Setting→Use Hold→Inflect.
→Load Difference

① Set the inflection point you want to take. Touch the graph area or specify with the cursor keys, and then press OK .

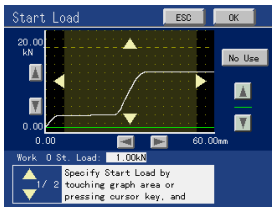
② To set Load A, press Left , and to set Load B, press Right , and then set a value. After setting A and B, press OK .



- Detection Start Load

Set the load to start the detection of Inflection Point.

Start detecting the Inflection Point after the load crosses the Detection Start Load in the section. If you do not use Detection Start Load, press No Use . Inflection Point will be detected since the load crosses the start point of the section.



Setting range (-9999 to 9999)

Operation

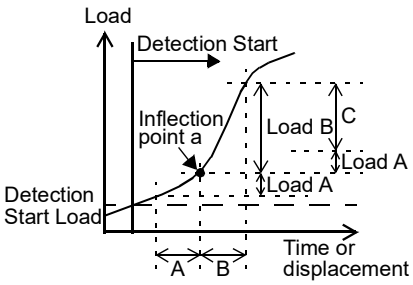
Main screen→Setting→Work Setting→Hold Setting→Use Hold→Inflect.
→Start Load

How to detect an inflection point

The amount of change in the indicated value at Detection Interval A (load A) and the amount of change in the indicated value at Detection Interval B (load B) are compared, and when Difference C between these loads exceeds the Detection Load Difference set value, point a is held as an inflection point.

If there are two or more inflection points in the hold section, the point with a larger amount of change is held.

Normally A=B, but if A<B with a gradual inclination, it becomes easy to detect the inflection point.

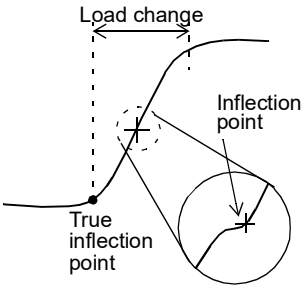


A: Detection Interval A
B: Detection Interval B
C: Load Difference

Held as an inflection point if C>Detection Load Difference.

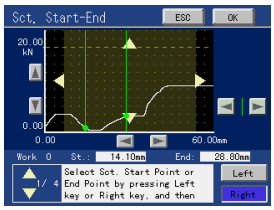
Point

If the setting of Detection Interval AB is too short, fine changes in load are detected so that a correct value may not be able to be held.
In this case, set Detection Interval B large as close to the load change time as possible, and also set Detection Load Difference large according to the amount of change, by which an inflection point is held in the correct position.



- Section Start-End

(only when Change of Section is made by Setting)



Set the start point and end point of the selected section.

Setting range

(The range is the same for the start point and end point.)

Time or displacement (Front)

(0 to 2047 × Measurement Length/2000)

* Setting the start point > the end point is unacceptable.

Displacement (Back)

(-2047 to 0 × Measurement Length/2000)

* Setting the start point < the end point is unacceptable.

Operation

Main screen→Setting→Work Setting→Hold Setting→Sct. Start-End

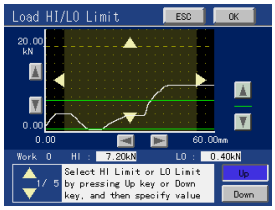
Point

- If the section start point and end point of two sections are set identically
  Front reference: The start point of the next section becomes valid.
  Back reference: The end point of the previous section becomes valid.

  Example) If the setting is the end point (section 1) = start point (section 2) = X
  Front reference: The X point falls on section 2.
  Back reference: The X point falls on section 1.

- If the displacement pace is fast, sampling may not be performed in time and no load may be held at the section start point. In that case, the load in time for sampling near the section start point is held.
  Also, when the section start point and end point are set identically, if the displacement pace is fast, no load may be held. Set the section start point and end point having a margin in consideration of the case where the displacement pace is fast.
  It is preferable to have a margin of the Measurement Length/2000×10 or more.

- Load HI/LO Limit



Set the range of load in which the judgment point is judged to be OK.

Setting range (-9999 to +9999: The range is the same for the HI limit and LO limit.)

* Setting the HI limit < the LO limit is unacceptable.

Operation

Main screen→Setting→Work Setting→Hold Setting→Load HI/LO Limit

Point

About the Load HI and LO Limit set values for “Peak to Peak”

“Peak to Peak” judgment is made by the maximum value – minimum value. Therefore, the judgment value will never be negative. So, set the Load HI/LO Limit in the range of 0 to 9999.

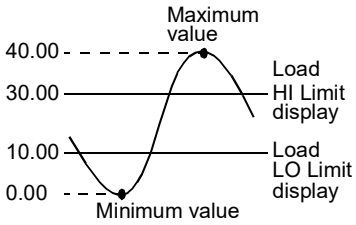
On the Main screen, the Load HI/LO Limit is offset-displayed (red line) on the basis of the minimum value (=0).

Value of Load HI Limit display = Load HI Limit set value + minimum value

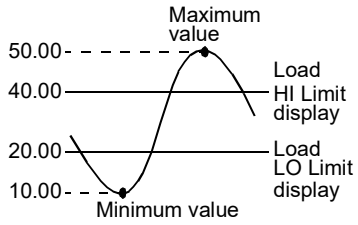
Value of Load LO Limit display = Load LO Limit set value + minimum value

Example) When Load HI Limit is 30.00kN, and Load LO Limit is 10.00kN,

[Measurement 1]
When the detected minimum value is 0.00kN, and the detected maximum value is 40.00kN

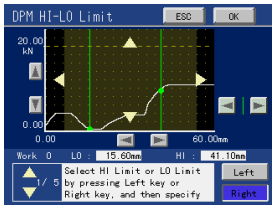


[Measurement 2]
When the detected minimum value is 10.00kN, and the detected maximum value is 50.00kNN



- Displacement HI/LO Limit

(only when the X-axis represents displacement)



Set the range of displacement in which the judgment point is judged to be OK.

Setting range

Displacement (Front): (0 to 2047 × Measurement Length/2000)

Displacement (Back): (-2047 to 0 × Measurement Length/2000)

* Setting the HI limit < the LO limit is unacceptable.

* When End Displacement in Use Hold is selected, the screen of Displacement HI/LO becomes a numeric keypad. Moreover, the setting range changes too. Setting range (-9999 to 32000)

Operation

Main screen→Setting→Work Setting→Hold Setting→DPM HI/LO Limit

■Types of holds

All holds are to carry out detection in each valid section.

The valid section is as follows:

When the setting of Change of Section is External Input: As long as the Hold input is ON

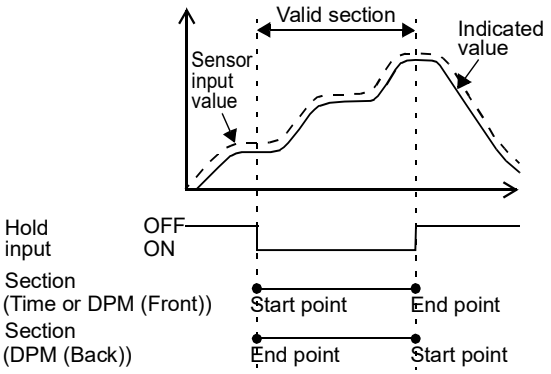
When the setting of Change of Section is Setting: Between the start point and end point of the set section

- Always

The indicated value and the HI and LO Limit set values are always compared in the valid section.

Judgment points are all data in the valid section.

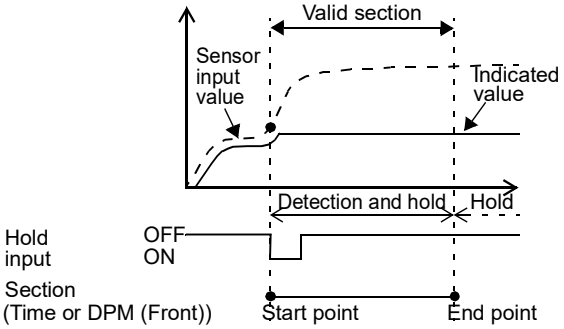
No judgment points are kept.

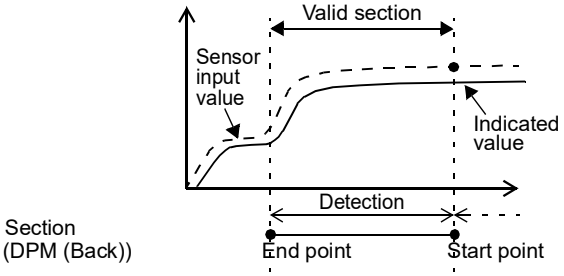


- Sample

The load at the start point of the valid section is held.

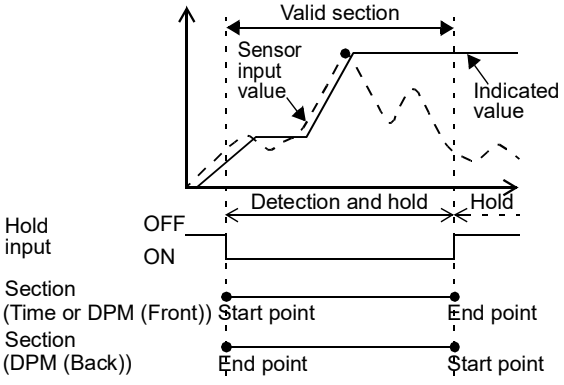
* It is not necessary to make the section start point and end point identical.
* When the Waveform Reference is set at Back, it detects a judgment point when the measurement ends.





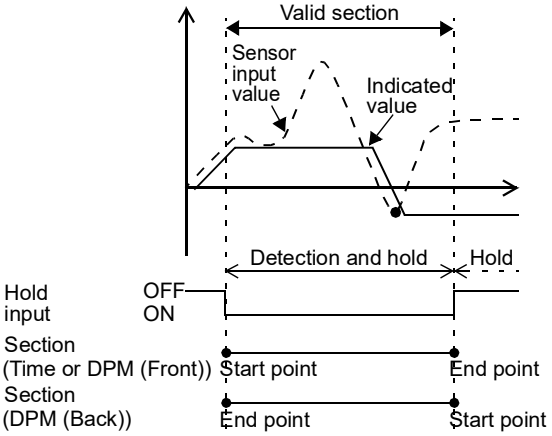
- Peak

The maximum value (peak value) is held.



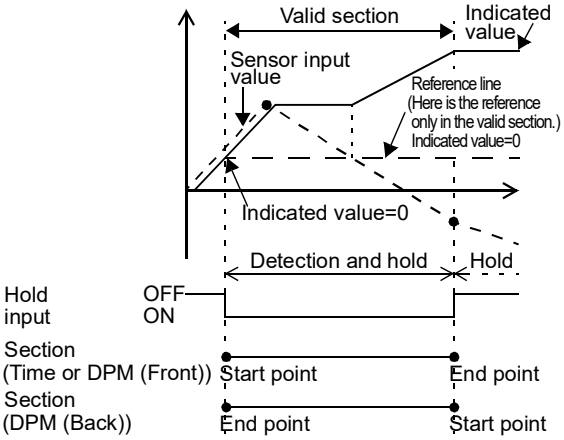
- Bottom

The minimum value (bottom value) is held.



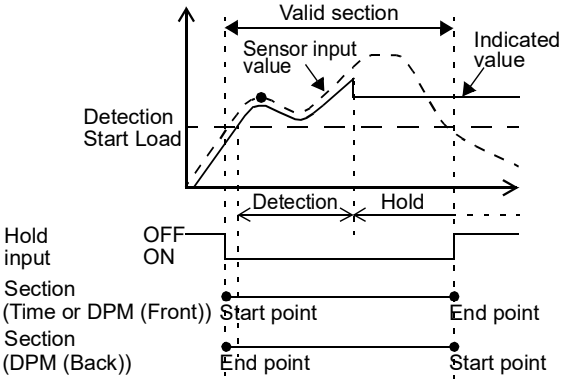
- P-P (Peak to Peak)

The difference between the peak value and the bottom value is held.



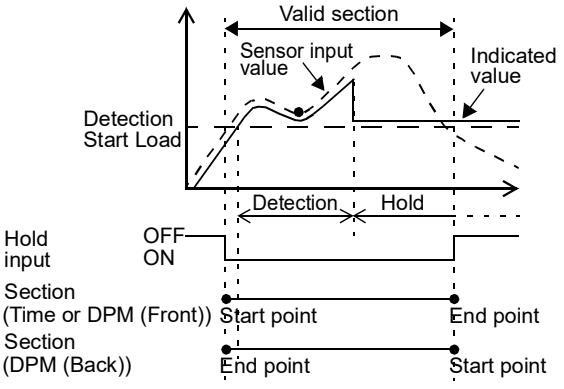
- Relative Maximum

Detection is carried out from the point at which the Detection Start Load is crossed, and when the relative maximum detection conditions are met, the relative maximum is held.



- Relative Minimum

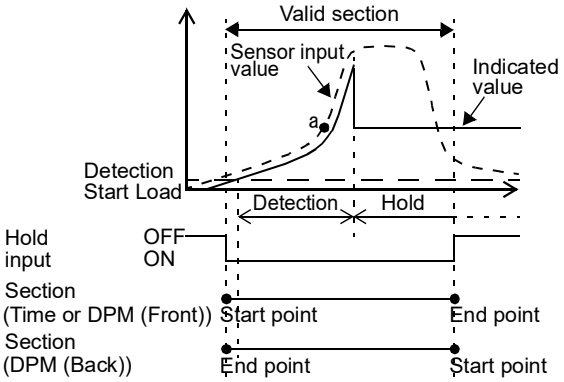
Detection is carried out from the point at which the Detection Start Load is crossed, and when the relative minimum detection conditions are met, the relative minimum is held.



- Inflection Point

The point at which the load changes drastically is held.

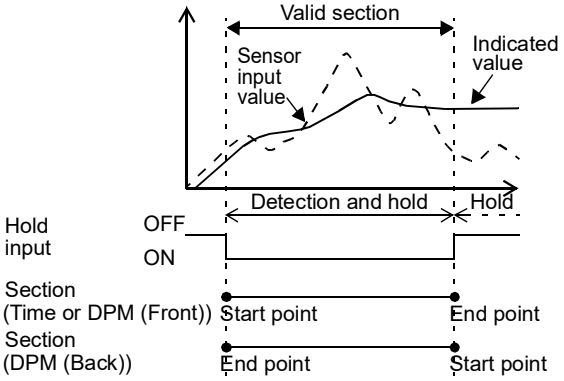
Detection is carried out from the point at which the Detection Start Load is crossed, and when the inflection point detection conditions are met, the inflection point is held.



- Average

Average is calculated and held.

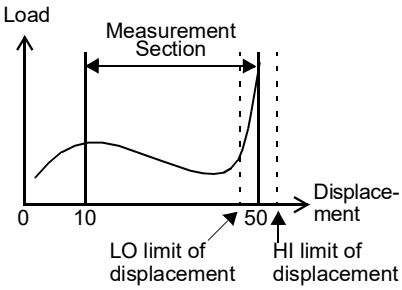
Average is calculated and held when X-axis represents displacement upon completion of measurement.



- End Displacement

The position of the measurement completion can be judged by using the End Displacement for the Use Hold.

The End Displacement is different from other hold types, so it judges not based on a wave starting point but based on an original point of the displacement.



* It is not necessary to input Change of Sct. and to set Sct. Start-End of Hold.

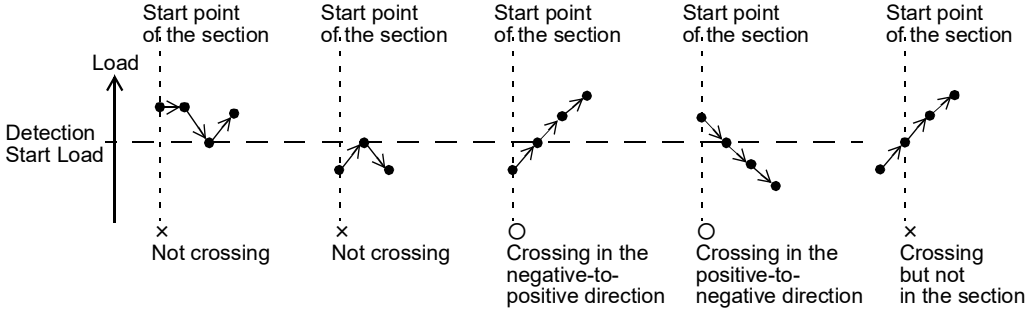
* End displacement can be set only final section among the sections set by "Number of Use Sec." when X-axis of wave form is displacement.

* The line of DPM HI/LO Limit is not displayed on the actual measurement screen.

What is “crossing” the Detection Start Load?

Load's passing the detection start load in the positive-to-negative or negative-to-positive direction is called "crossing."

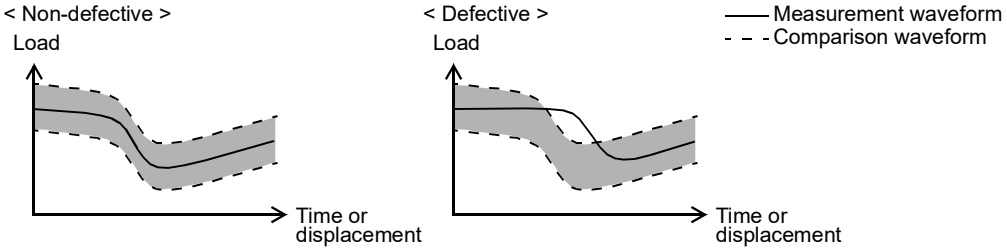
If detection is not started, check again the setting of Detection Start Load and the change of load in the section referring to the following examples.



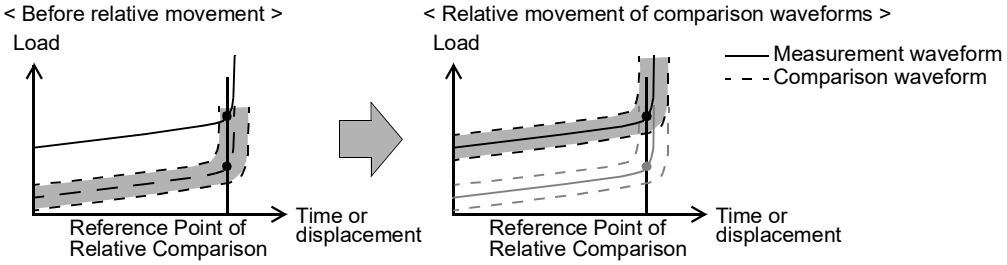
4-9. Waveform comparison setting

■What is the waveform comparison function?

- Whether or not a measurement waveform is between comparison waveforms is judged by preparing the comparison waveforms in advance.



- If Relative Comparison is selected, waveforms fluctuating up and down with each measurement can relatively be compared.
- By this function, comparison waveforms are relatively moved according to the load at the Reference Point of Relative Comparison, which should previously be set by time or displacement, on a measurement waveform.
- If the measurement does not reach the Reference Point, no judgment is made. (All Wave Result outputs are OFF.)

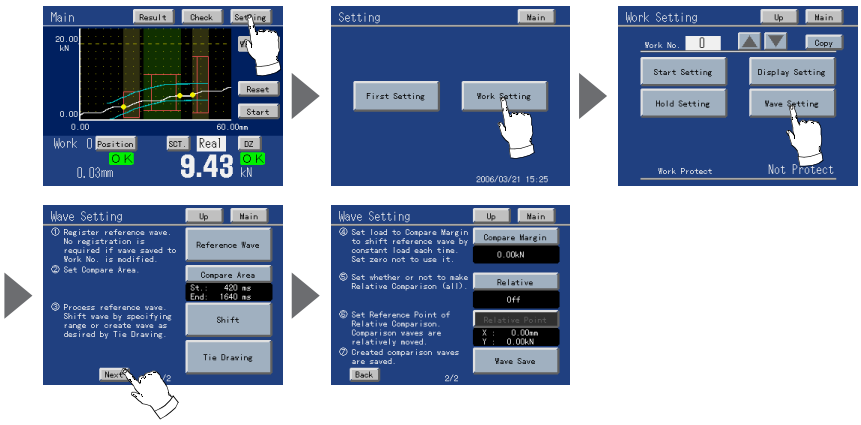


Point

Relative movement can only be made in the Y-axis direction.

■Waveform Comparison Setting

Set the waveform comparison function by Wave Comparison Setting. Set each item according to the setting order. Skip unnecessary setting items.

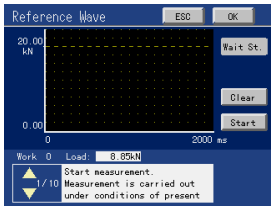


Operation

Main screen→Setting→Work Setting→Wave Setting (→Next)

1. Registration of Reference Waveform

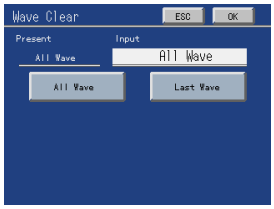
Input and register reference waveform(s).



Operation

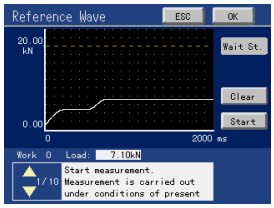
Main screen→Setting→Work Setting→Wave Setting→Reference Wave

① Not to use the currently-registered waveform(s), press Clear, and select All Wave.

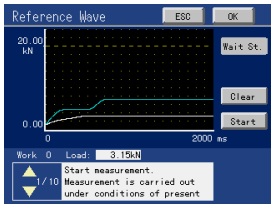


② Satisfy the Measurement Start Condition, and start measurement.

③ Satisfy the Measurement Stop Condition, and stop measurement.

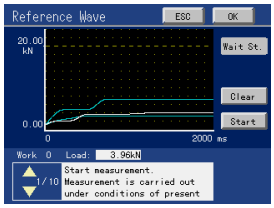


④ A measurement waveform is displayed.
Now, to delete the measurement waveform, press Clear, and select Last Wave.

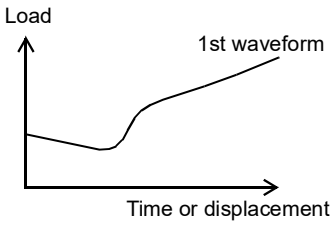


⑤ To input a waveform again, repeat ② to ④.

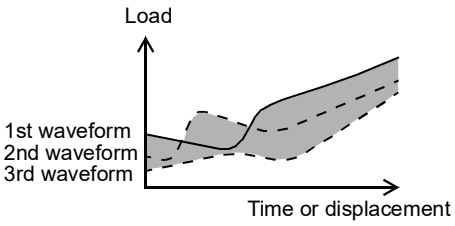
⑥ Pressing OK registers the reference waveform(s).



In the case of one reference waveform, it is recognized that the HI limit waveform and LO limit waveform are the same.

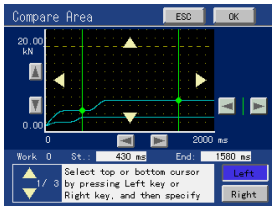


If two or more waveforms are input, the upper limit of all waveforms becomes the HI limit waveform, and the lower limit of all waveforms becomes the LO limit waveform.



2. Compare Area

Set the waveform comparison target.



Setting range (start point, end point)

Time or displacement (Front)

(0 to 2047 × Measurement Length/2000)

Displacement (Back)

(-2047 to 0 × Measurement Length/2000)

Operation

Main screen→Setting→Work Setting→Wave Setting→Compare Area

① To change the start point of the area, press Left (Displacement (Back): Right), and then move the cursor to specify it.

② To change the end point of the area, press Right (Displacement (Back): Left), and then move the cursor to specify it.

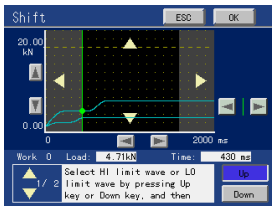
③ To register the specified area, press OK.

④ After the registration of the area, the background color outside the area becomes gray on the waveform processing screens set later so that the boundaries of the area become clear.

3. Shift

This is one of the waveform processing methods.

A part of waveform can be shifted up/down.



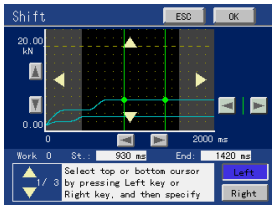
Setting range (range set under “Compare Area”)

Operation

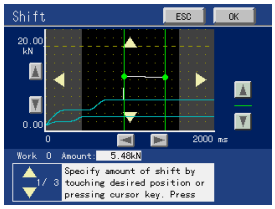
Main screen→Setting→Work Setting→Wave Setting→Shift

① To shift the HI limit waveform, press Up, and to shift the LO limit waveform, press Down to select each waveform, and then press OK.

② Determine the range you want to shift. To specify the left of the range, press Left, and then move the cursor.
To specify the right of the range, press Right, and then move the cursor.
After specifying the range, press OK.

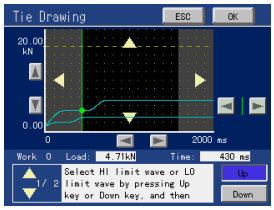


③ Determine the amount of shift.
Touch the desired position, or specify the amount of shift with ▲/▼, and then press OK.



Tie Drawing

A waveform can be created or processed as desired by preparing one or more points and tying the point(s) by straight lines. If there is only one point, a spine-like waveform will result as passing that point.



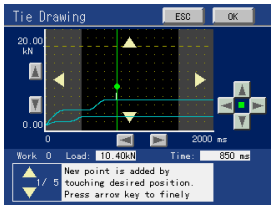
Setting range (1 to 10 points)

Operation

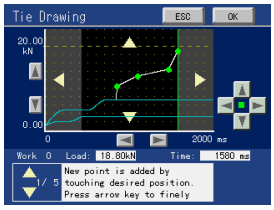
Main screen→Setting→Work Setting→Wave Setting→Tie Drawing

① To create/process the HI limit waveform, press [Up], and to create/process the LO limit waveform, press [Down] to select each waveform, and then press [OK].

② Touching a desired position creates a point. To finely adjust the point position, press the arrow key to move the point to the target position.



③ To add point(s), repeat the operation in ②.
To correct already-created point(s), touch the left side of the point(s) you want to correct.
All the points on the right side from the touched place are erased, and a new point is created at the touched place.

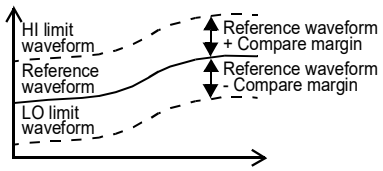


④ After specifying all points, press [OK].

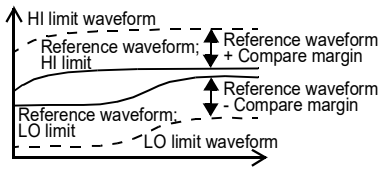
4. Compare Margin

Entire waveforms are shifted by the set value. Use this when it is required to simply shift reference waveform(s) by the set load. If the Compare Margin is set in advance, comparison waveforms can be created by simply inputting and saving reference waveform(s).

<In the case of one reference waveform>



<In the case of two reference waveforms>



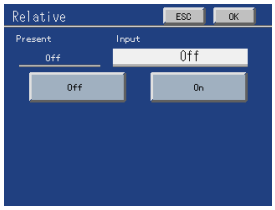
Setting range (0 to 9999)

Operation

Main screen→Setting→Work Setting→Wave Setting→Compare Margin

5. Relative Comparison

Select whether waveform comparison is made as standard or by relative value.



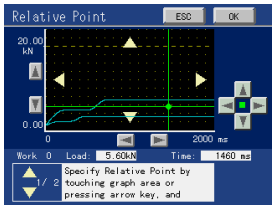
Setting range (Off, On)

Operation

Main screen→Setting→Work Setting→Wave Setting→Relative

6. Reference Point of Relative Comparison

Set the reference point for making waveform comparison by relative movement. This setting can be made only when the setting of Relative Comparison is On.



Setting range

X-axis:

Time or displacement (Front) (0 to 2047 × Measurement Length/2000)

Displacement (Back) (-2047 to 0 × Measurement Length/2000)

Y-axis: (-9999 to 9999)

Operation

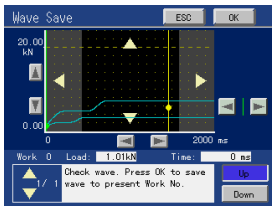
Main screen→Setting→Work Setting→Wave Setting→Relative Point

7. Waveform Save

Check and save the waveform.

If there is no problem, press OK .

The present waveform is not saved until OK is pressed.



Operation

Main screen→Setting→Work Setting→Wave Setting→Wave Save

Point

Upon completion of creation/processing of a waveform, be sure to check and save it by Waveform Save.

When not using comparison waveforms ...

1. Press Clear on the Registration of Reference Waveform screen, and select All Wave .

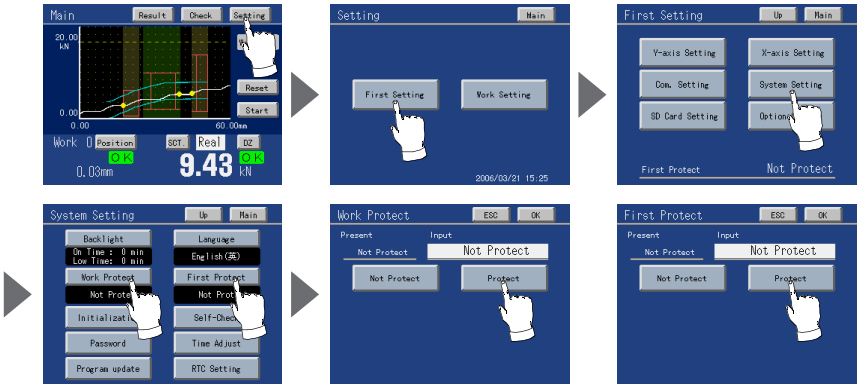
2. Since the Registration of Reference Waveform screen is restored, press OK .

3. If the setting of Relative Comparison is On, set it to Off.

4. Press Wave Save, and press OK .

4-10.Parameter protection

Protect set values from being changed by mistake.



Work Setting Parameter Protection

Operation

Main screen→Setting→First Setting→System Setting→Work Protect→Protect

First Setting Parameter Protection

Operation

Main screen→Setting→First Setting→System Setting→First Protect→Protect

4-11. Measuring work specification

Up to 16 types of work set values can be stored in the F388A, and the work No. (measuring work) used for measurement must be specified.
For this, the external input signals “Work 1 to Work 8” are used.
Normally, if there is no input to “Work 1 to Work 8,” the Work 0 set value is selected, while if “Work 1 to Work 8” are in the following conditions, each work is selected.

Work 8	Work 4	Work 2	Work 1	Main work display (measuring work)
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

(0:Open, 1:ON)

Control connector

A9, A10 B9, B10	COM (Input)
B1	Work 1
B2	Work 2
B3	Work 4
B4	Work 8

Point

Measuring work is accepted when the Start input signal is turned ON.

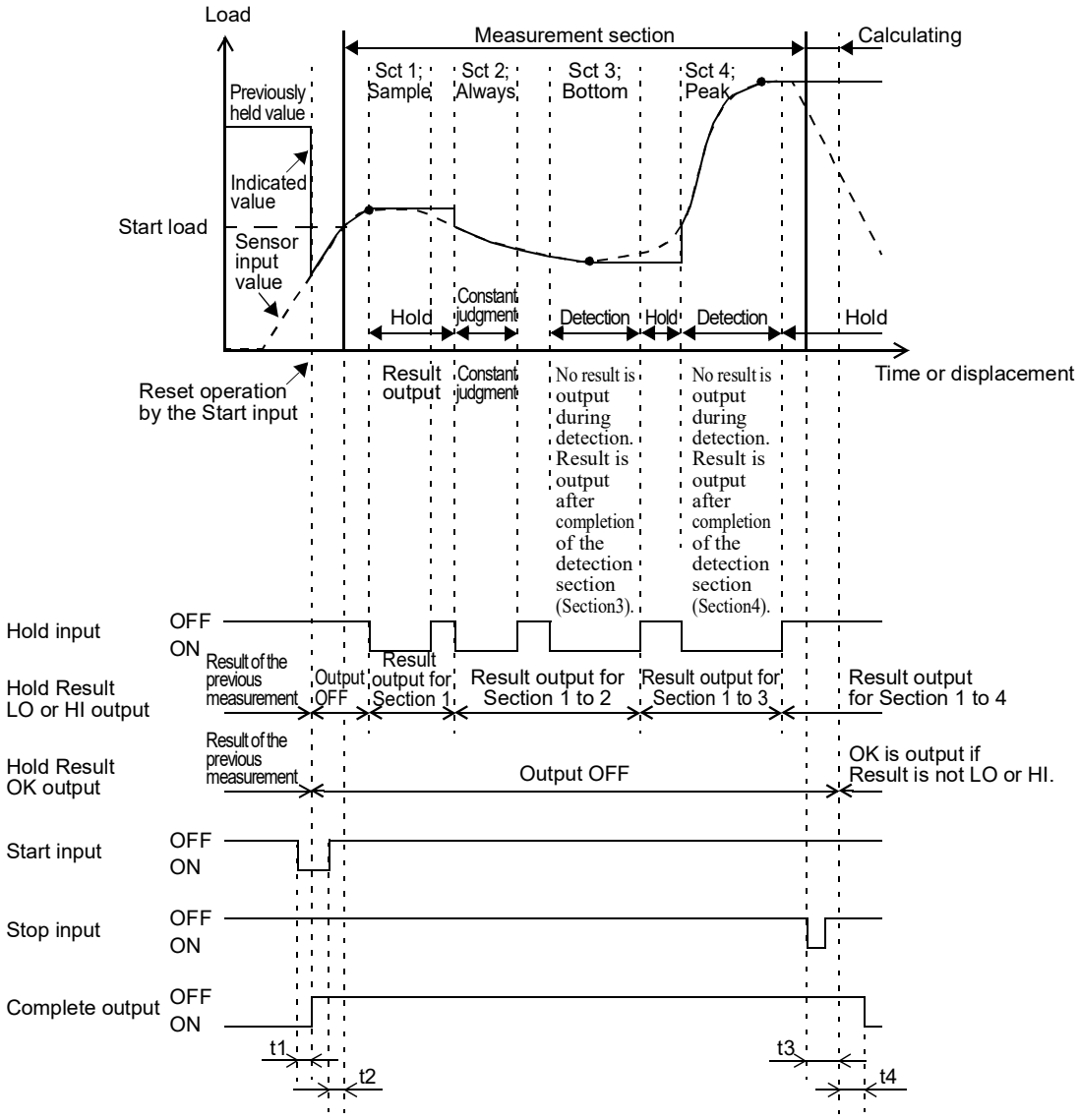
Even if the measuring work is changed during measurement, it is ignored.

4-12. Judgment timing chart

Here, some example timing charts using the hold function and waveform comparison function are given.

■Example timing chart by the hold function

- External control (only time or displacement (Reference; Front))



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started. It varies depending on the time of crossing the Start Load.

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms (However, there are differences between measurements.)

t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

- Turning OFF → ON the external input signal “Start” releases the hold, and turns OFF all outputs but Run. (Reset operation by the Start input)

- Turning OFF → ON the external input signal “Hold” changes the section and gets the start point of the section.

- Turning ON → OFF the external input signal “Hold” gets the end point of the section.

- If Always or Sample is specified under “Use Hold,” the result (except OK) is output from the start point of the section. If any of the other holds is specified, the result is not output until the end of the section but the result (except OK) of the last section is output.

- Once the judgment of output becomes LO or HI, the output is maintained.

- The OK signal is output when it is confirmed that judgment has been made at all sections and the results are not HI or LO upon completion of measurement.
  OK will not result if judgment is not made for the Number of Use Sections.

  Example 1: Failure in hold detection when Relative Maximum, Relative Minimum, or Inflection Point hold is used.

  Example 2: Sections not changed for the Number of Use Sections.

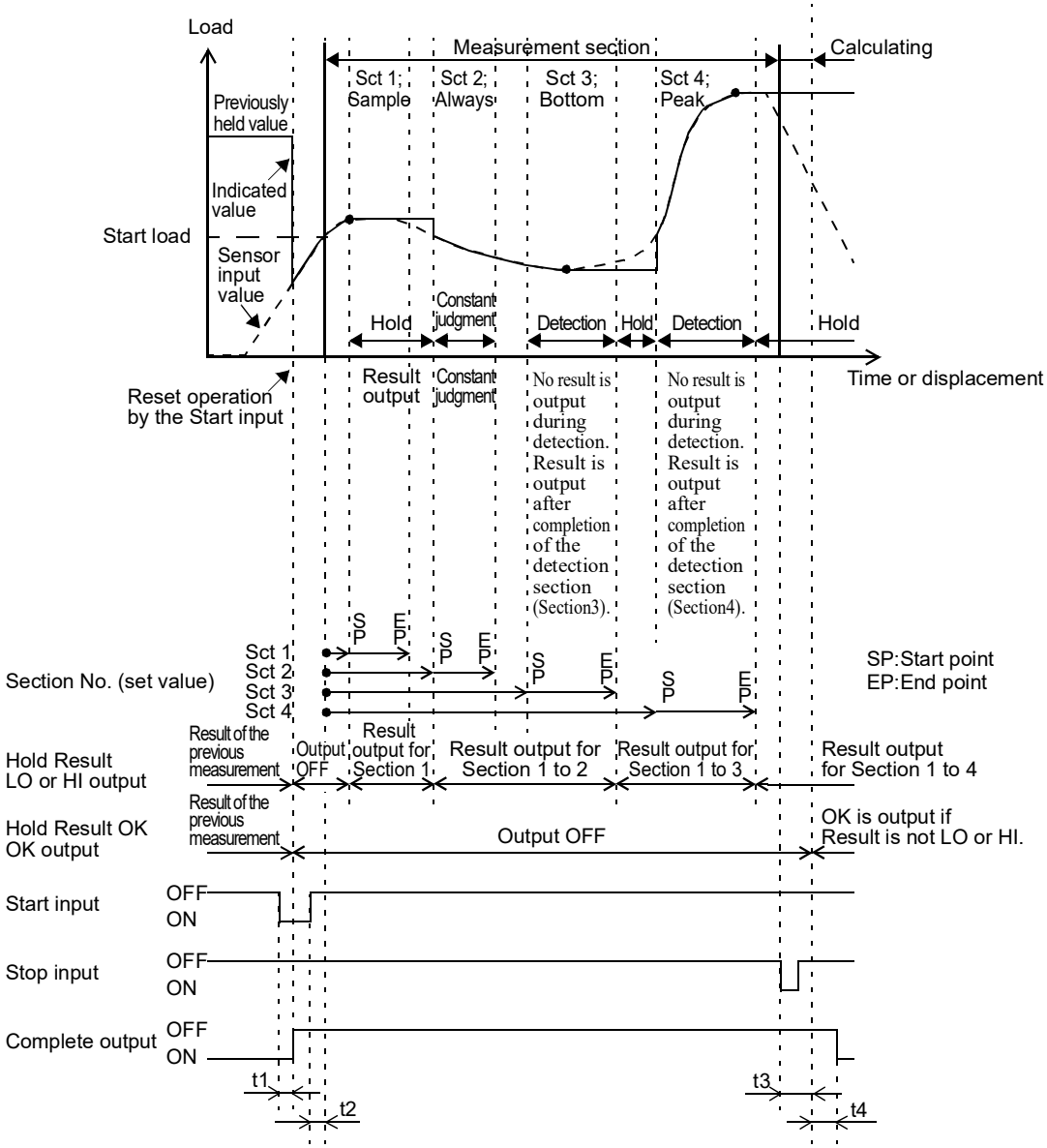
- Turning OFF → ON the Stop signal or taking data of 2048 points turns ON the Complete signal.

- When the X-axis of the waveform represents displacement, the relative maximum, relative minimum, inflection point, and average are judged upon completion of measurement.

Point

To start a section from the start of measurement, turn ON the external input signal “Hold” before the start of measurement.

- Internal setting control (time or displacement (Reference; Front))



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started. It varies depending on the time of crossing the Start Load.

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms (However, there are differences between measurements.)

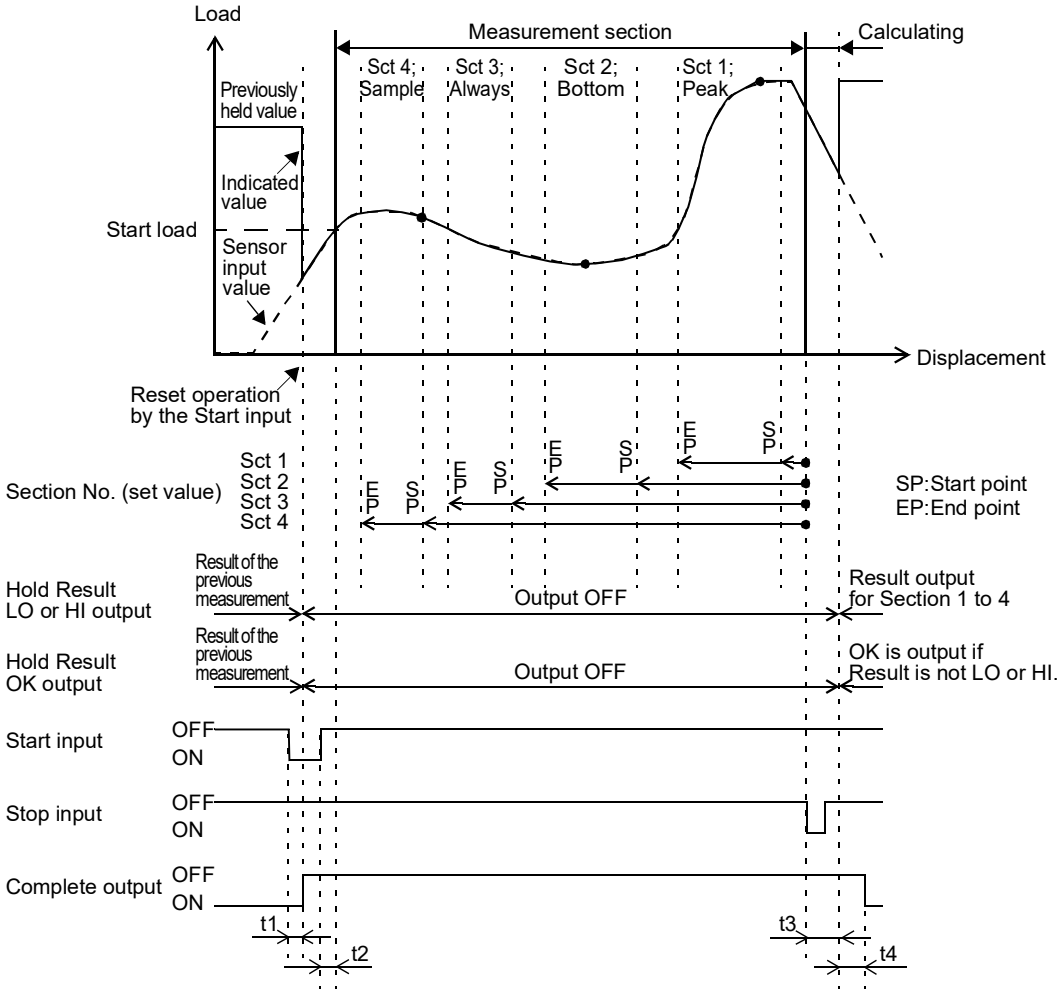
t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

- Specify the start point and end point of the section by time or displacement.
- During measurement, each hold operation is performed by the set Section Start-End.
- Turning OFF → ON the external input signal "Start" releases the hold, and turns OFF all outputs but Run. (Reset operation by the Start input)
- If Always or Sample is specified under "Use Hold," the result (except OK) is output from the start point of the section. If any of the other holds is specified, the result is not output until the end of the section but the result (except OK) of the last section is output.
- Once the judgment of output becomes LO or HI, the output is maintained.
- The OK signal is output when it is confirmed that judgment has been made at all sections and the results are not HI or LO upon completion of measurement.
  OK will not result if judgment is not made for the Number of Use Sections.

  Example 1: Failure in hold detection when Relative Maximum, Relative Minimum, or Inflection Point hold is used.

  Example 2: Sections not changed for the Number of Use Sections.
- Turning OFF → ON the Stop signal or taking data of 2048 points turns ON the Complete signal.
- When the X-axis of the waveform represents displacement, the relative maximum, relative minimum, inflection point, and average are judged upon completion of measurement.

- Internal setting control (displacement (Reference; Back))



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started. It varies depending on the time of crossing the Start Load.

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms (However, there are differences between measurements.)

t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

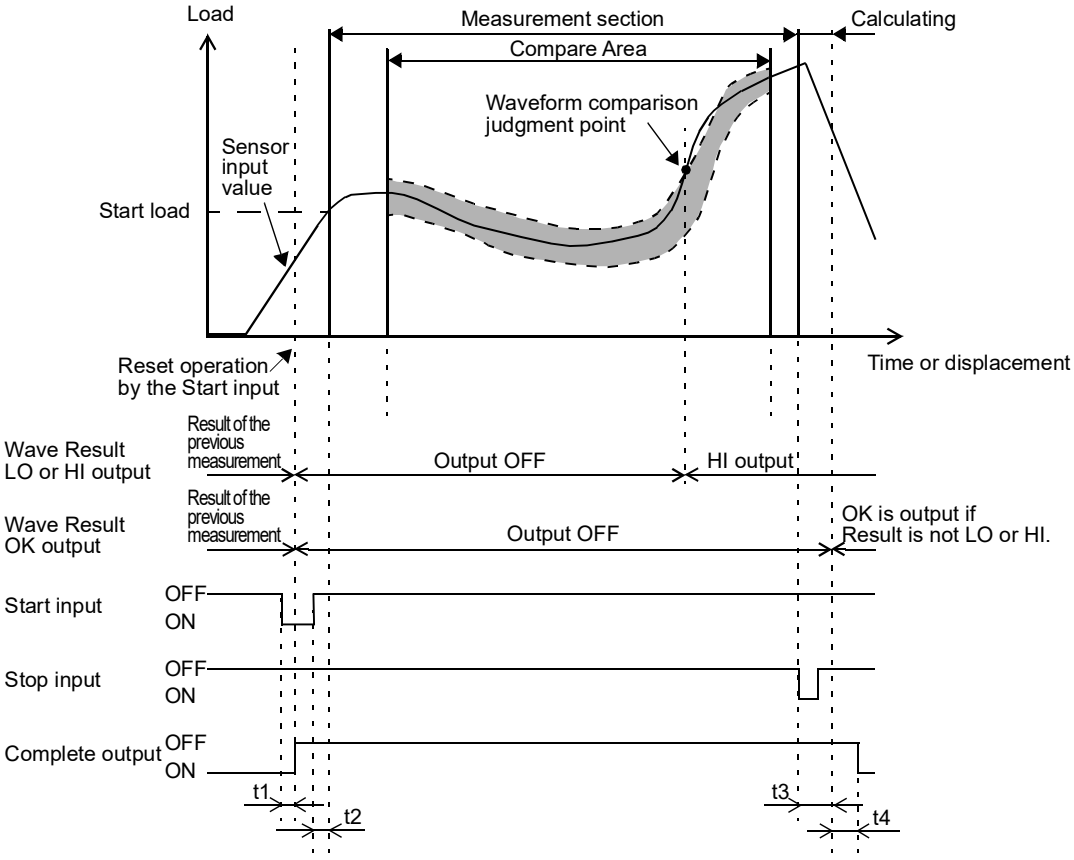
- Specify the start point and end point of the section by displacement.
- After completion of measurement, the waveform is scanned from the front, and each hold operation is performed by the set Section Start-End.
- Turning OFF → ON the external input signal “Start” releases the hold, and turns OFF all outputs but Run. (Reset operation by the Start input)
- Turning OFF → ON the Stop signal or taking data of 2048 points turns ON the Complete signal.
- All results are output after completion of measurement.
- The OK signal is output when it is confirmed that judgment has been made at all sections and the results are not HI or LO upon completion of measurement.
  OK will not result if judgment is not made for the Number of Use Sections.

  Example 1: Failure in hold detection when Relative Maximum, Relative Minimum, or Inflection Point hold is used.

  Example 2: Sections not changed for the Number of Use Sections.

■Example timing chart using the waveform comparison function

- Reference; Front (Relative Comparison not in use)



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started. It varies depending on the time of crossing the Start Load.

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms (However, there are differences between measurements.)

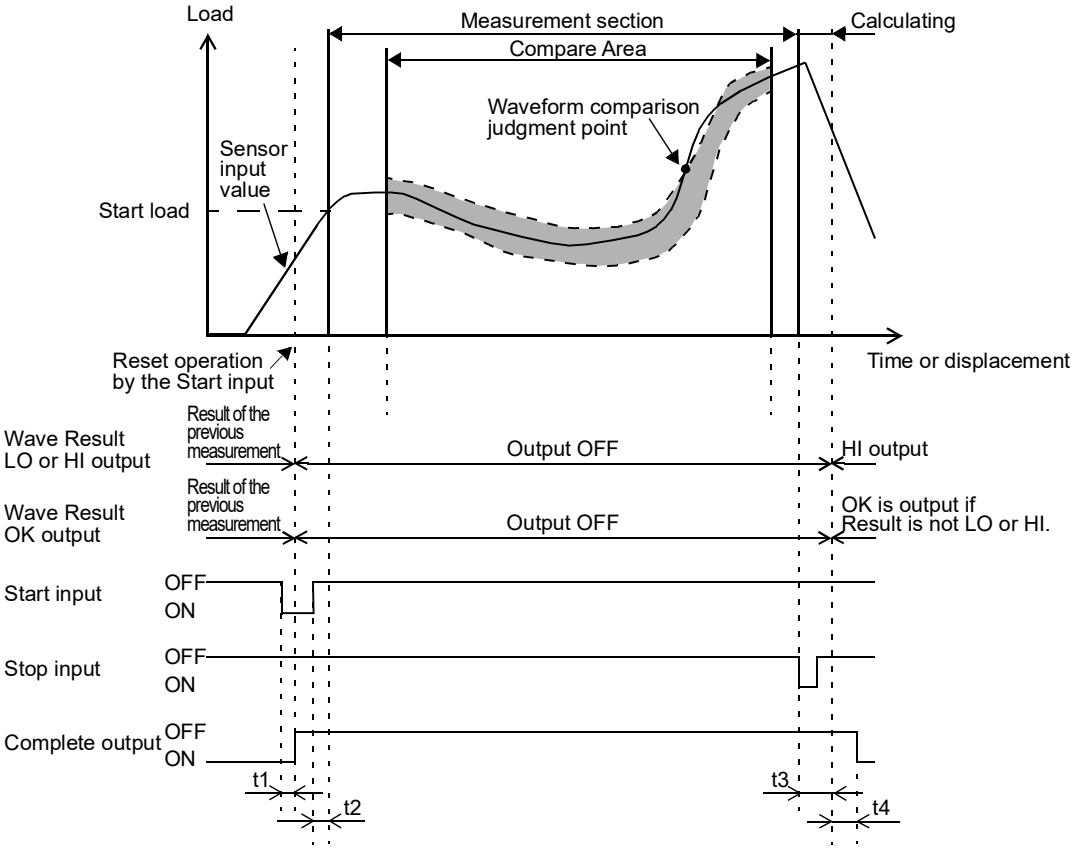
t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

- Turning OFF → ON the external input signal "Start" releases the hold, and turns OFF all outputs but Run. (Reset operation by the Start input)
- Turning OFF → ON the Stop signal or taking data of 2048 points turns ON the Complete signal.
- Once the judgment of output becomes LO or HI, the output is maintained.
- OK turns ON if the Compare Area is passed through during measurement and the result is not LO or HI after completion of measurement.

Point

If the measurement does not reach the Compare Area, all Wave Result outputs turn OFF.

- Reference; Back, or Relative Comparison in use



t1: Delay time between the instant when the Start input is turned ON and the instant when all outputs but Run are turned OFF ... Approx. 5ms

t2: Delay time between the instant when the Start input is turned OFF and the instant when the measurable section is started. It varies depending on the time of crossing the Start Load.

t3: Delay time between the instant when the measurement is stopped (the Stop input is turned ON) and the instant when the Result output is turned ON ... Approx. 50ms (However, there are differences between measurements.)

t4: Delay time between the instant when the Result output is turned ON and the instant when the Complete output is turned ON ... Approx. 30ms

- Turning OFF → ON the external input signal "Start" releases the hold, and turns OFF all outputs but Run. (Reset operation by the Start input)
- Turning OFF → ON the Stop signal or taking data of 2048 points turns ON the Complete signal.
- After completion of measurement, judgment is made by scanning the waveform from its front, and HI or LO or OK turns ON.
- OK turns ON if the Compare Area is passed through during measurement and the result is not LO or HI after completion of measurement.

Point

If the measurement does not reach the Compare Area, all Wave Result outputs turn OFF.

When Relative Comparison is used, if the measurement does not reach the Reference Point, no judgment is made. (All Wave Result outputs are OFF.)

5 COMMUNICATIONS

5-1. RS-232C

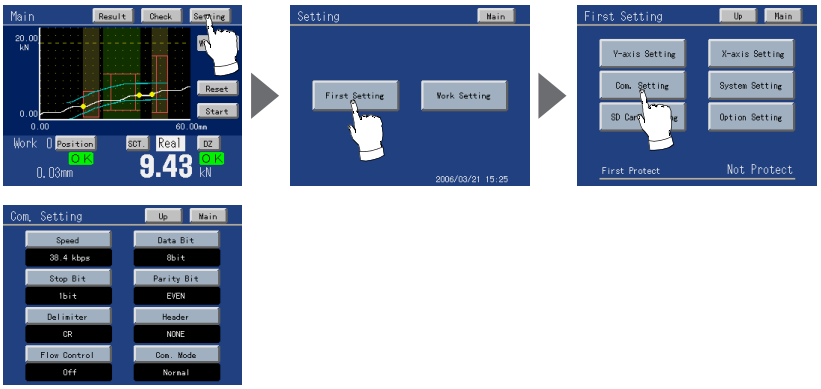
■Outline

- Results can be read.
- Hold results can be read.
- Measurement waveforms can be read.
- Comparison waveforms can be read and written.
- Set values can be read and written.
- Wave Nos. can be read and written.
- Hold results can be automatically output upon completion of measurement.
- The communication check function is included.

(See "■Communication establishment procedure"on page 21 (2-4.RS-232C Connection))

■RS-232C setting

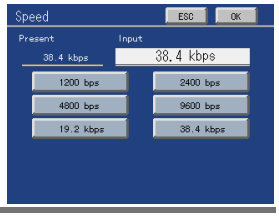
Make RS-232C communication settings by Communication Setting.



Operation

Main screen→Setting→First Setting→Com. Setting

- Transmission Speed

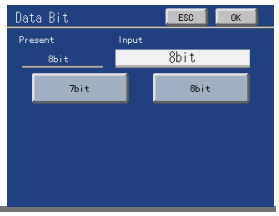


Setting range (1200, 2400, 4800, 9600, 19.2k, 38.4k bps)

Operation

Main screen→Setting→First Setting→Com. Setting→Speed

- Data Bit

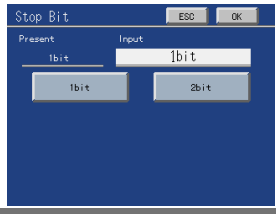


Setting range (7, 8 bit)

Operation

Main screen→Setting→First Setting→Com. Setting→Data Bit

- Stop Bit

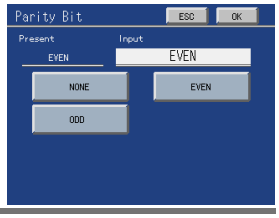


Setting range (1, 2 bit)

Operation

Main screen→Setting→First Setting→Com. Setting→Stop Bit

- Parity Bit



Setting range (None, Even, Odd)

Operation

Main screen→Setting→First Setting→Com. Setting→Parity Bit

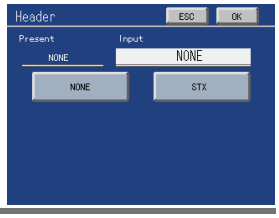
- Delimiter

Setting range (CR, CR+LF)

Operation

Main screen→Setting→First Setting→Com. Setting→Delimiter

- Header

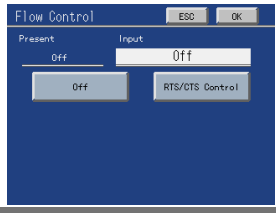


Setting range (None, STX)

Operation

Main screen→Setting→First Setting→Com. Setting→Header

- Flow Control

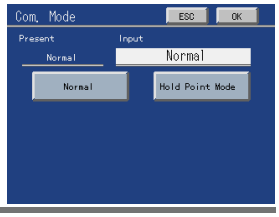


Setting range (Off, RTS/CTS Control)

Operation

Main screen→Setting→First Setting→Com. Setting→Flow Control

- Communication Mode



Setting range (Normal, Hold Point Mode)

Operation

Main screen→Setting→First Setting→Com. Setting→Com. Mode

■Communication method (when the Communication Mode is Normal)

By transmitting commands from the host, operations corresponding to the commands are executed.

-List of items that can be communicated

Item group		Set value, operation, display item	Read	Write	Cal.	Reference
Main		Load (display)	○	×	×	Display read command
		DPM (display)	○	×	×	Display read command
		Work No. (display)	○	×	×	Display read command
		Measurement status display	○	×	×	Display read command
		Waveform update check	○	×	×	Waveform update check/ equipment ID read command
		Measurement waveform	○	×	×	Waveform read command
		Equipment ID	○	×	×	Waveform update check/ equipment ID read command
Result		Result (display)	○	×	×	Hold result read command
		Result	○	×	×	Result read command
		Wave No.	○	○	×	Wave No. read/wave No. write command
First Setting	Y-axis Setting	Input Select	○	○	×	Set value read/ set value write command
		Unit	○	○	×	Set value read/ set value write command
		Decimal Place	○	○	×	Set value read/ set value write command
		Zero Cal.	○	×	○	Set value read/ Zero cal. command
		Equiv. Cal. (rated output)	○	○	×	Set value read/ set value write command
		Equiv. Cal. (rated capacity)	○	○	×	Set value read/ set value write command
		Actual Cal.	×	×	○	Actual cal. command
		Overload	○	○	×	Set value read/ set value write command
		Increment	○	○	×	Set value read/ set value write command
		Analog Filter	○	○	×	Set value read/ set value write command
		Digital Filter	○	○	×	Set value read/ set value write command
		DZ Limit	○	○	×	Set value read/ set value write command

Item group		Set value, operation, display item	Read	Write	Cal.	Reference
First Setting	X-axis Setting	Time/DPM Change	○	○	×	Set value read/ set value write command
		Phase Select	○	○	×	Set value read/ set value write command
		Wave Reference	○	○	×	Set value read/ set value write command
		Unit	○	○	×	Set value read/ set value write command
		Decimal Place	○	○	×	Set value read/ set value write command
		Zero Cal.	○	×	○	Set value read/ Zero cal. command
		Equiv. Cal. (number of pulses)	○	○	×	Set value read/ set value write command
		Equiv. Cal. (displacement value)	○	○	×	Set value read/ set value write command
		Actual Cal.	×	×	○	Actual Cal. command
		Measure Length	○	○	×	Set value read/ set value write command
		DPM Positioning	○	○	×	Set value read/ set value write command
		Digital Filter	○	○	×	Set value read/ set value write command
	Communication Setting	Speed	○	○	×	Set value read/ set value write command
		Data Bit	○	○	×	Set value read/ set value write command
		Parity Bit	○	○	×	Set value read/ set value write command
		Stop Bit	○	○	×	Set value read/ set value write command
		Delimiter	○	○	×	Set value read/ set value write command
		Header	○	○	×	Set value read/ set value write command
		Flow Control	○	○	×	Set value read/ set value write command
		Com. Mode	○	○	×	Set value read/ set value write command

Item group		Set value, operation, display item	Read	Write	Cal.	Reference
First Setting	System Setting	Backlight (ON Time)	○	○	×	Set value read/ set value write command
		Backlight (bright→dark)	○	○	×	Set value read/ set value write command
		Language	○	○	×	Set value read/ set value write command
		Work Protect	○	○	×	Set value read/ set value write command
		First Protect	○	○	×	Set value read/ set value write command
		Time Adjust	○	○	×	Time read/ time write command
	Option Setting					
Settings by work [Work 0 to 15]	Work Setting	Work No. (for RS-232C communications)	○	○	×	Set value read/ set value write command
	Measurement Start Condition Setting	Start Condition	○	○	×	Set value read/ set value write command
		Start Level	○	○	×	Set value read/ set value write command
		Stop Condition	○	○	×	Set value read/ set value write command
		Stop Level	○	○	×	Set value read/ set value write command
	Display Range Setting	Y Start Point	○	○	×	Set value read/ set value write command
		Y End Point	○	○	×	Set value read/ set value write command
		X Start Point	○	○	×	Set value read/ set value write command
		X End Point	○	○	×	Set value read/ set value write command

Item group		Set value, operation, display item	Read	Write	Cal.	Reference
Settings by work [Work 0 to 15]	Hold Setting	Change of Sct. (common to all work)	○	○	×	Set value read/ set value write command
		Use Sct.	○	○	×	Set value read/ set value write command
		Sct. No. (for RS-232C communications)	○	○	×	Set value read/ set value write command
	Section 1 to 5	Use Hold	○	○	×	Set value read/ set value write command
		Sct. Start-End (start point)	○	○	×	Set value read/ set value write command
		Sct. Start-End (end point)	○	○	×	Set value read/ set value write command
		Load HI/LO Limit (HI limit)	○	○	×	Set value read/ set value write command
		Load HI/LO Limit (LO limit)	○	○	×	Set value read/ set value write command
		DPM HI/LO Limit (HI limit)	○	○	×	Set value read/ set value write command
		DPM HI/LO Limit (LO limit)	○	○	×	Set value read/ set value write command
		Start Load	○	○	×	Set value read/ set value write command
		Load Difference	○	○	×	Set value read/ set value write command
		Rate	○	○	×	Set value read/ set value write command
		Ordinal	○	○	×	Set value read/ set value write command
		Interval AB (A)	○	○	×	Set value read/ set value write command
		Interval AB (B)	○	○	×	Set value read/ set value write command
	Waveform Comparison Setting	Relative	○	○	×	Set value read/ set value write command
		Compare Area (start point)	○	○	×	Set value read/ set value write command
		Compare Area (end point)	○	○	×	Set value read/ set value write command
		Compare Margin	○	○	×	Set value read/ set value write command
		Relative Point (X-axis)	○	○	×	Set value read/ set value write command
		Relative Point (Y-axis)	○	○	×	Set value read/ set value write command
		Comparison Wave	○	○	×	Waveform read/ Waveform write command

- Set value read command (First Setting)

Example: Reading Input Selection, Y-axis Setting, First Setting

Host
(Transmission to the F388A)

R	0	1	0	0	Delimiter

Item No. (See the list of set value commands.)
Input Selection in the example
Item group (See the list of set value commands.)
Y-axis Setting in the example

F388A's return
(In normal processing)

(STX)	R	0	1	0	0	+	0	0	0	0	0	0	1	Delimiter

Data of the specified set value
Command received by the F388A
Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
Header (If there is no header, no data will result.)

- Set value read command (Work Setting)

Example: Reading Y-axis Start Point, Display Range Setting, Work No. 10, Work Setting

① Writing "10" to Work No.

Host
(Transmission to the F388A)

W	1	0	0	0	+	0	0	0	0	1	0	Delimiter

Data to write
The amount of data varies depending on the set value.
Item No. (See the list of set value commands.)
Work No. in the example
Item group (See the list of set value commands.)
Work Setting in the example

F388A's return
(In normal processing)

(STX)	W	1	0	0	0	+	0	0	0	0	1	0	Delimiter

Command received by the F388A
Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range
4: Attempt to write a set value through communications during measurement
5: Attempt to write while protecting
Header (If there is no header, no data will result.)

② Reading Y-axis Start Point after Work No. is written normally

Host
(Transmission to the F388A)

R	1	2	0	0	Delimiter

Item No. (See the list of set value commands.)
Y-axis Start Point in the example

Item group (See the list of set value commands.)
Display Range Setting in the example

F388A's return
(In normal processing)

(STX)	R	1	2	0	0	+	0	0	0	1	0	0	0	Delimiter

Data of the specified set value

Command received by the F388A

Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format

Header (If there is no header, no data will result.)

- Set value write command (First Setting)

Example: Writing 1:±20mA to Input Selection, Y-axis Setting, First Setting

Host
(Transmission to the F388A)

W	0	1	0	0	+	0	0	0	0	0	0	1	Delimiter

Data to write
"1" in the example

Item No. (See the list of set value commands.)
Input Selection in the example

Item group (See the list of set value commands.)
Y-axis Setting in the example

F388A's return
(In normal processing)

(STX)	W	0	1	0	0	+	0	0	0	0	0	0	1	Delimiter

Command received by the F388A

Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range
4: Attempt to write a set value through communications during measurement
5: Attempt to write while protecting

Header (If there is no header, no data will result.)

- Set value write command (Work Setting)

Example: Writing “1000” to Y-axis Start Point, Display Range Setting, Work No. 10, Work Setting

① Writing “10” to Work No.

Host
(Transmission to the F388A)

W	1	0	0	0	+	0	0	0	0	0	1	0	Delimiter

Data to write
“10” in the example
Item No. (See the list of set value commands.)
Work No. in the example
Item group (See the list of set value commands.)
Work Setting in the example

F388A’s return
(In normal processing)

(STX)	W	1	0	0	0	+	0	0	0	0	0	1	0	Delimiter

Command received by the F388A
Header (If there is no header, no data will result.)

F388A’s return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range
4: Attempt to write a set value through communications during measurement
5: Attempt to write while protecting
Header (If there is no header, no data will result.)

② Writing “1000” to Y-axis Start Point after Work No. is written normally

Host
(Transmission to the F388A)

W	1	2	0	0	+	0	0	0	1	0	0	0	Delimiter

Data to write
“1000” in the example
Item No. (See the list of set value commands.)
Y-axis Start Point in the example
Item group (See the list of set value commands.)
Display Range Setting in the example

F388A’s return
(In normal processing)

(STX)	W	1	2	0	0	+	0	0	0	1	0	0	0	Delimiter

Command received by the F388A
Header (If there is no header, no data will result.)

F388A’s return
(In abnormal condition)

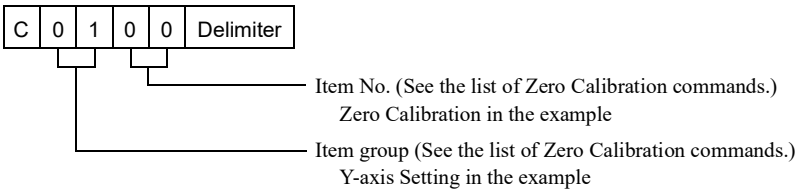
(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range
4: Attempt to write a set value through communications during measurement
5: Attempt to write while protecting
Header (If there is no header, no data will result.)

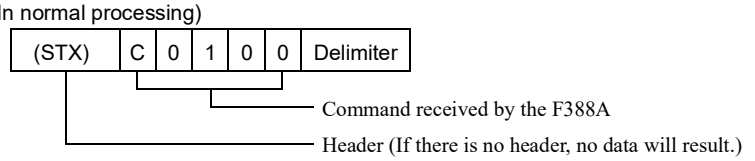
- Zero calibration command

Example: To perform zero calibration (load)

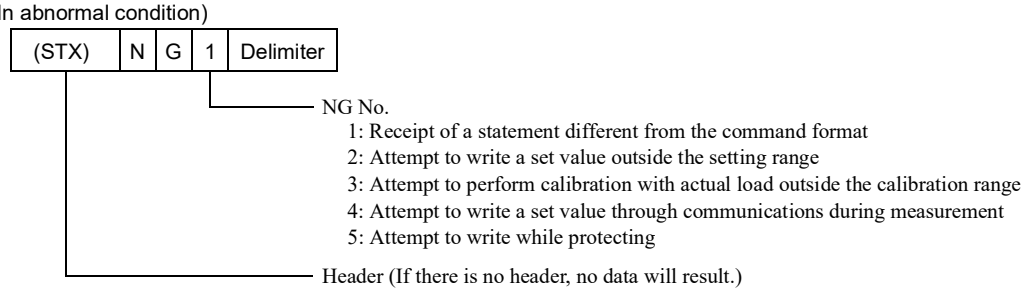
Host
(Transmission to the F388A)



F388A's return
(In normal processing)



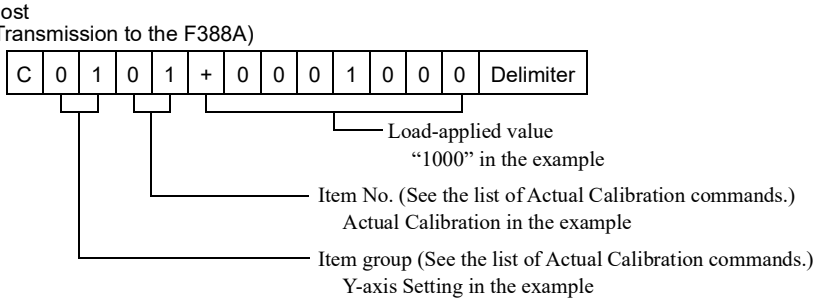
F388A's return
(In abnormal condition)



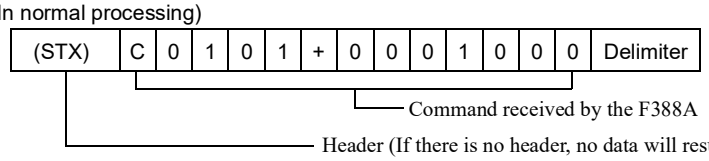
- Actual load calibration command

Example: To perform actual load calibration (load)

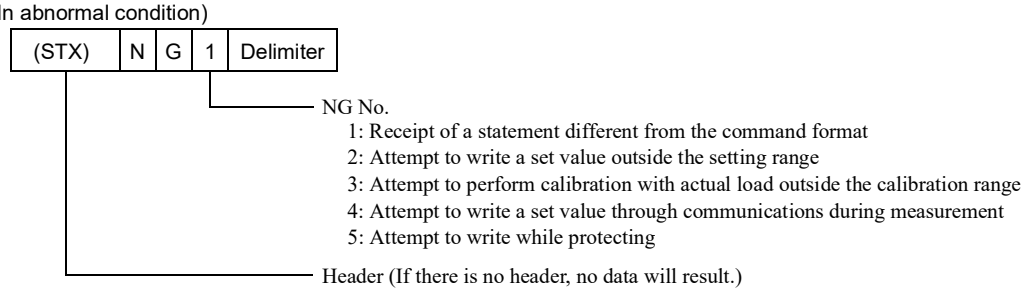
Host
(Transmission to the F388A)



F388A's return
(In normal processing)



F388A's return
(In abnormal condition)



- Hold result read command

Example: Reading the hold results of Section 1 to 3.

① Check to see if measurement is finished

If "1" is read to Waveform update, go to step ②, and if "1" is not read, repeat step ①.
(For transmitting the SAMPLE command continuously, do it at intervals of 100ms or more.)

Host
(Transmission to the F388A)

S	A	M	P	L	E	Delimiter

F388A's return
(In normal processing)

(STX)	S	A	M	P	L	E	1	1	3	8	1	5	0	Delimiter

- 0: Undefined
- 8 1 5: Equipment ID
  - * Equipment ID is a parameter.
- 1 3: Work No. used for measurement
- 1: Waveform update
  - 0: Not made
  - 1: Made
    (If an update is made, this bit changes from 0 to 1 only once upon reading.)
- (STX): Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

- 1: NG No.
  - 1: Receipt of a statement different from the command format
- (STX): Header (If there is no header, no data will result.)

Chapter 5

COMMUNICATIONS

② Read the hold results.

Host
(Transmission to the F388A)

H	L	D	SP	1	-	3	Delimiter

Last Section No. to read (1 to 5)
1 to 5: Section
Specify so that the last ≧ the first.

Hyphen (2dH)

First Section No. to read (1 to 5)
1 to 5: Section
If the first section = the last section,
only the specified section can be read.

Space (20H)

F388A's return
(In normal processing)

(STX)	H	L	D	SP	1	-	3	,

Command received by the F388A

Data of the specified first section

-	0	0	.	1	0	0	,	1	,	-	0	1	.	0	2	2	,	2	,

Load
-9999 to +9999
(with a decimal point)

Load result
-: Section not in use
1: OK
2: HI
3: LO
4: H/L
5: NG

Displacement or Time*

Displacement result
-: Section not in use
or X-axis; time
1: OK
2: HI
3: LO
4: H/L
5: NG

* Displacement (Front): 0 to 10235 (with a decimal point)
Displacement (Back): -10235 to 0 (with a decimal point)
Time: +00000 to +51175 (with a decimal point)
The unit of time differs according to Measurement Length, X-axis Setting.
0.5s: Unit ms
1.0s: Unit ms
2.0s: Unit ms
5.0s: Unit ms
10.00s: Unit s

2nd data

-	0	0	.	2	0	0	,	2	,	-	0	5	.	0	1	2	,	2	,

3rd data

-	-	-	-	-	-	-	,	-	,	-	-	-	-	-	-	-	,	-	,	Delimiter

If there is no hold point in the specified section, hyphens (2dH) enter into Load and Displacement (Time), and if "Always" is set in the specified section, hyphens (2dH) also enter into Load and Displacement (Time).

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range

Header (If there is no header, no data will result.)

- Result read command

① Check to see if measurement is finished

If "1" is read to Waveform update, go to step ②, and if "1" is not read, repeat step ①.

(For transmitting the SAMPLE command continuously, do it at intervals of 100ms or more.)

Host
(Transmission to the F388A)

S	A	M	P	L	E	Delimiter

F388A's return
(In normal processing)

(STX)	S	A	M	P	L	E	1	1	3	8	1	5	0	Delimiter

- 0 → Undefined
- 5, 1 → Equipment ID
  * Equipment ID is a parameter.
- 3 → Work No. used for measurement
- 1 → Waveform update
  0: Not made
  1: Made
  (If an update is made, this bit changes from 0 to 1 only once upon reading.)
- (STX) → Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

- 1 → NG No.
  1: Receipt of a statement different from the command format
- (STX) → Header (If there is no header, no data will result.)

② Read the measurement results.

Host
(Transmission to the F388A)

R	E	S	U	L	T	Delimiter

F388A's return
(In normal processing)

							Displacement Load			Displacement Load			Displacement Load			Displacement Load		
(STX)	R	E	S	U	L	T	4	4	,	1	3	,	2	4	,	3	1	,

Command received by the F388A
Total result
Section1 Judgment
Section2 Judgment
Section3 Judgment
Header (If there is no header, no data will result.)

Displacement Load			Displacement Load			Displacement Load		
3	3	,	1	3	,	2	4	Delimiter

Section4 Judgment
Section5 Judgment
Waveform Comparison Judgment

Load result
-: Section not in use
1: OK
2: HI
3: LO
4: H/L
5: NG

Displacement result
-: Section not in use or X-axis; time
1: OK
2: HI
3: LO
4: H/L
5: NG

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
Header (If there is no header, no data will result.)

- Waveform update check/equipment ID read command

Host
(Transmission to the F388A)

S	A	M	P	L	E	Delimiter

F388A's return
(In normal processing)

(STX)	S	A	M	P	L	E	1	1	3	8	1	5	0	Delimiter

Undefined
Equipment ID
* Equipment ID is a parameter.
Work No. used for measurement
Waveform update
0: Not made
1: Made
(If an update is made, this bit changes from 0 to 1 only once upon reading.)
Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
Header (If there is no header, no data will result.)

- Waveform read command

Example: Reading a measurement waveform.

① Check to see if measurement is finished

If "1" is read to Waveform update, go to step ②, and if "1" is not read, repeat step ①.

(For transmitting the SAMPLE command continuously, do it at intervals of 100ms or more.)

Host
(Transmission to the F388A)

S	A	M	P	L	E	Delimiter

F388A's return
(In normal processing)

(STX)	S	A	M	P	L	E	1	1	3	8	1	5	0	Delimiter

- Undefined
- Equipment ID
  * Equipment ID is a parameter.
- Work No. used for measurement
- Waveform update
  0: Not made
  1: Made
  (If an update is made, this bit changes from 0 to 1 only once upon reading.)
- Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

- NG No.
  1: Receipt of a statement different from the command format
- Header (If there is no header, no data will result.)

② Reading the measurement range

Host
(Transmission to the F388A)

W	A	V	Delimiter

F388A's return
(In normal processing)

(STX)	W	A	V	SP	0	0	0	0	-	2	0	4	7	Delimiter

- Start of the range (Data No.): When the X-axis represents time/displacement (Front): fixed at 0000; displacement (Back): 0000 to 2047
- End of the range (Data No.): When the X-axis represents time/displacement (Front): 0000 to 2047; displacement (Back): fixed at 2047
- Hyphen(2dH)
- Space (20H)
- Command received by the F388A
- Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

- NG No.
  1: Receipt of a statement different from the command format
- Header (If there is no header, no data will result.)

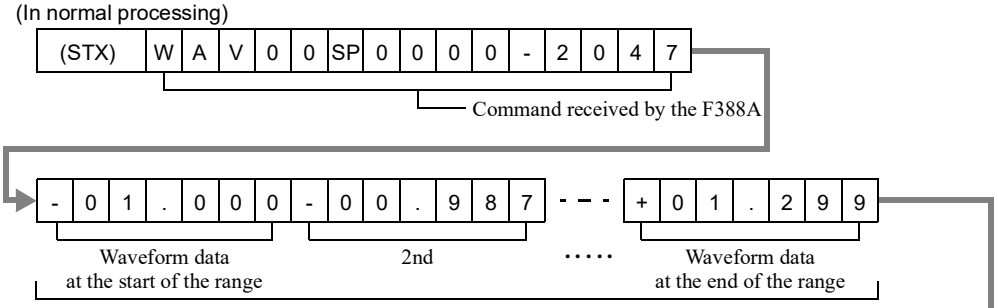
③ Reading the measurement waveform

Host
(Transmission to the F388A)

W	A	V	0	0	SP	0	0	0	0	-	2	0	4	7	Delimiter

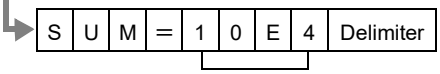
- Start of the range (Data No.) 0000 to 2047
- End of the range (Data No.) 0000 to 2047
  If the start of the range = the end of the range, only the specified point can be read.
- Hyphen(2dH)
- Space (20H)
- Load or displacement (time) selection
  0: Load
  1: Displacement (time)
- Waveform selection
  0: Measurement Waveform (reading only)
  1: Comparison Waveform (HI limit)
  2: Comparison Waveform (LO limit)
  3: Comparison Waveform used for measurement (HI limit)
  4: Comparison Waveform used for measurement (LO limit)
  * 3 and 4 are irrelevant to Work No. for RS-232C.

F388A's return
(In normal processing)



Waveform data

Amount of data:	Data for the specified range "the end of the range – the start of the range + 1" 2048 data in the example (2048 × 7 bytes) * If the same data No. is specified for the start and the end of the range, only one data is read.
0: Load:	-09999 to +09999 (with a decimal point)
1: Displacement (Front):	0 to 10235 (with a decimal point)
Displacement (Back):	-10235 to 0 (with a decimal point)
Time:	+00000 to +51175 (with a decimal point) The unit of time differs according to Measurement Length, X-axis Setting. 0.5s: Unit ms 1.0s: Unit ms 2.0s: Unit ms 5.0s: Unit ms 10.00s: Unit s

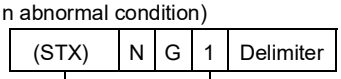


Checksum of the waveform data
All the read waveform data is totaled by ignoring respective decimal points, and the two low-order bytes of the result are expressed in 4-digit hexadecimal.

Example) Checksum of three waveform data

-01.00	+ (+31.25)	+ (+12.99)	=
-0100	+ (+3125)	+ (+1299)	= 4324 = 10E4H

F388A's return
(In abnormal condition)



NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range

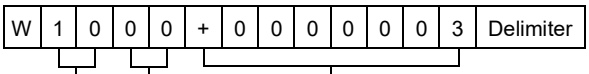
Header (If there is no header, no data will result.)

- Waveform write command

Example: Writing to Comparison Waveform (LO limit) of Work No. 3

① Writing "3" to Work No.

Host
(Transmission to the F388A)

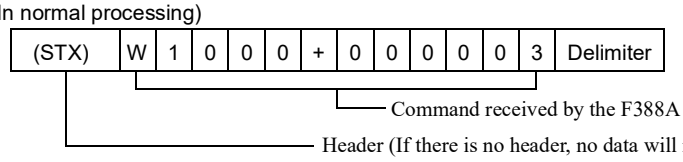


Data to write
"3" in the example

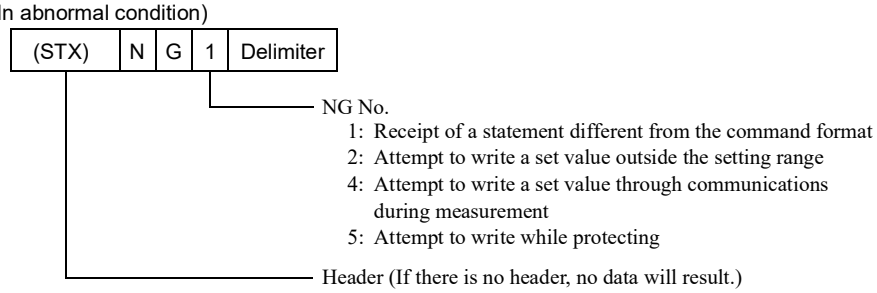
Item No. (See the list of set value commands.)
Work No. in the example

Item group (See the list of set value commands.)
Work Setting in the example

F388A's return
(In normal processing)

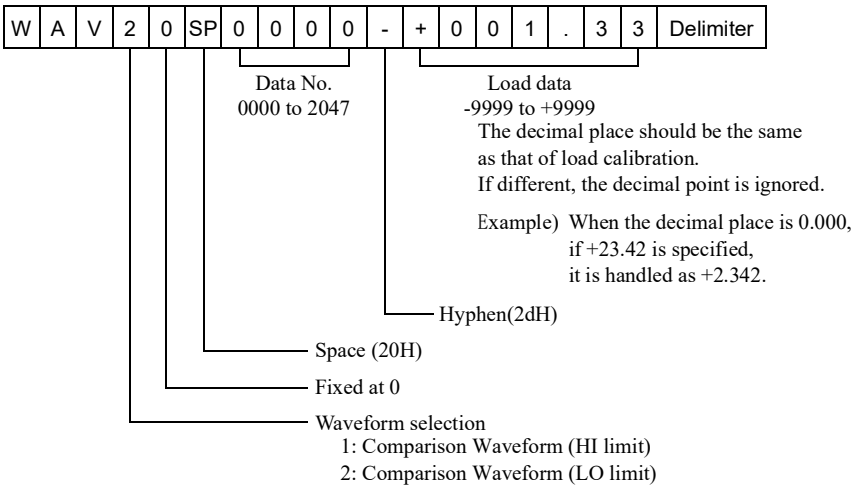


F388A's return
(In abnormal condition)

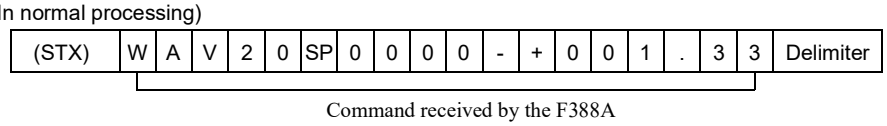


② Writing Comparison Waveform (LO limit)

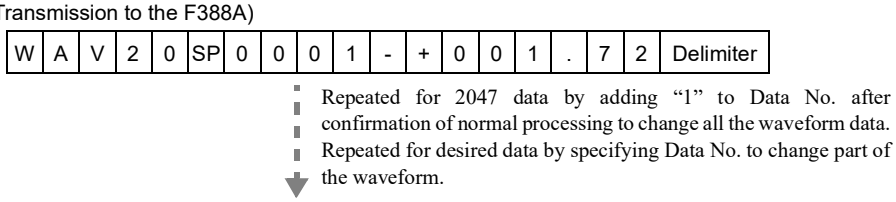
Host
(Transmission to the F388A)



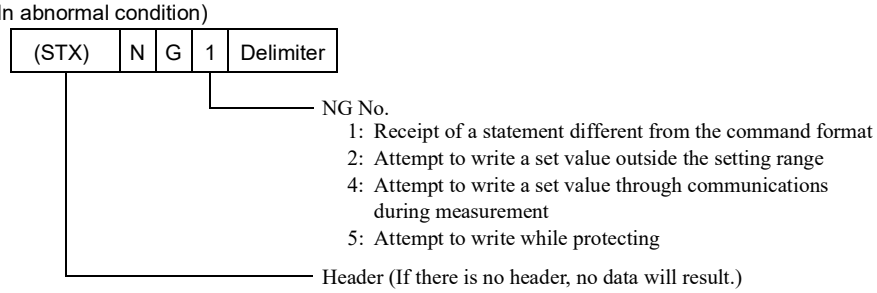
F388A's return
(In normal processing)



Host
(Transmission to the F388A)



F388A's return
(In abnormal condition)



- Wave No. read command

Host
(Transmission to the F388A)

A	Delimiter

F388A's return
(In normal processing)

(STX)	A	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	Delimiter

Alphanumeric characters and symbols from 1 to 20 digits
Setting range (20H to 7EH, 80H to FCH)

Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format

Header (If there is no header, no data will result.)

- Wave No. write command

Host
(Transmission to the F388A)

A	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	Delimiter

Alphanumeric characters and symbols from 1 to 20 digits
Setting range (20H to 7EH, 80H to FCH)

F388A's return
(In normal processing)

(STX)	A	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	Delimiter

Command received by the F388A

Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

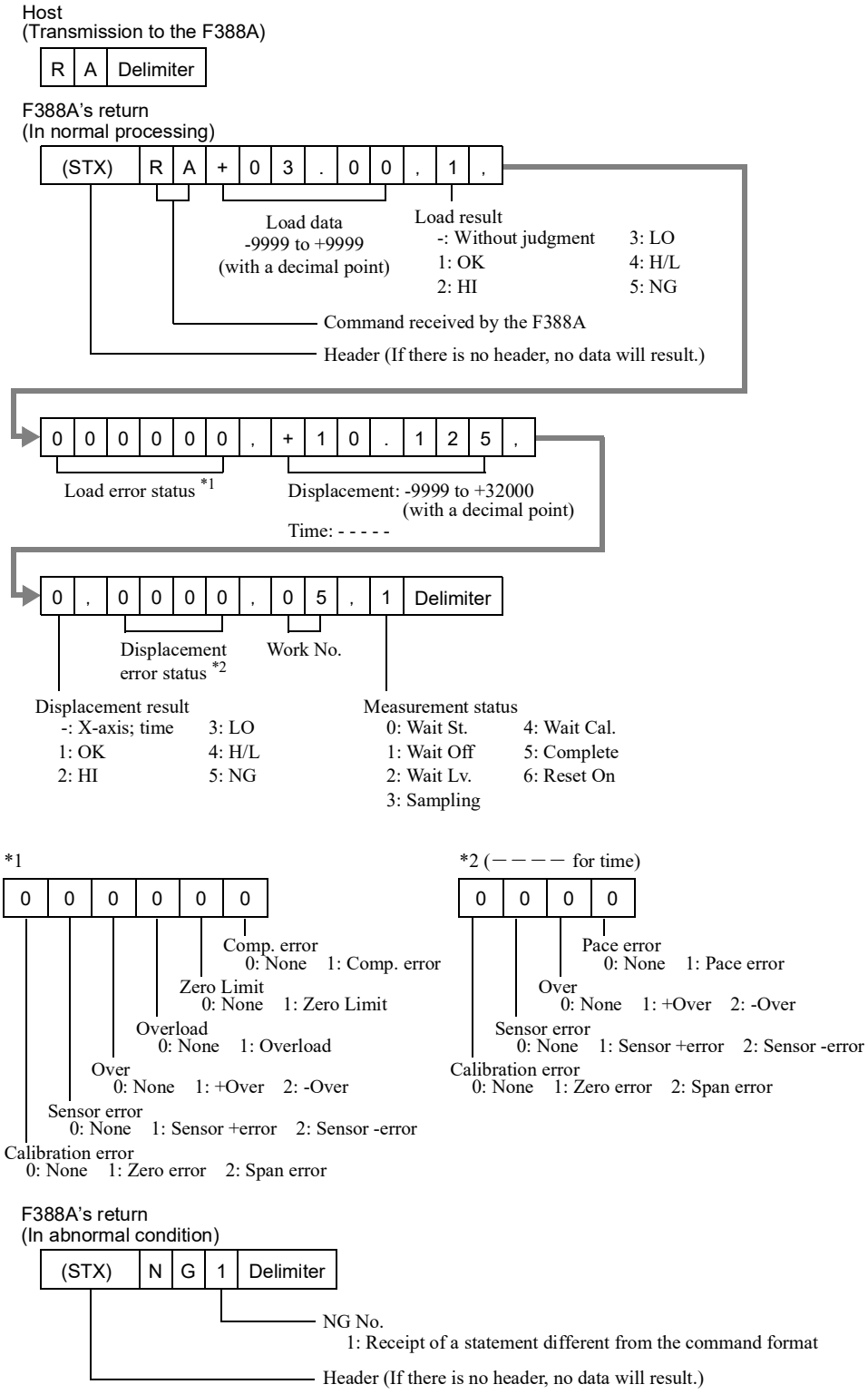
(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range

Header (If there is no header, no data will result.)

* The wave No. is accepted when the Start signal is turned from OFF to ON.

- Display read command



- Time read command

Host
(Transmission to the F388A)

T	I	M	E	Delimiter

F388A's return
(In normal processing)

(STX)	T	I	M	E	0	6	/	1	0	/	1	9	SP	2	3	:	3	0	:	3	0	Delimiter

Command received by the F388A
Year
Month
Day
Hour
Minute
Second
Colon (3aH)
Slash (2fH)
Header (If there is no header, no data will result.)

The example is 23:30:30 October 19, 2006.

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
Header (If there is no header, no data will result.)

- Time write command

Host
(Transmission to the F388A)

T	I	M	E	0	6	/	1	0	/	1	9	SP	2	3	:	3	0	:	3	0	Delimiter

Year
Month
Day
Hour
Minute
Second
Colon (3aH)
Slash (2fH)

The example is 23:30:30 October 19, 2006.

F388A's return
(In normal processing)

(STX)	T	I	M	E	0	6	/	1	0	/	1	9	SP	2	3	:	3	0	:	3	0	Delimiter

Command received by the F388A
Header (If there is no header, no data will result.)

F388A's return
(In abnormal condition)

(STX)	N	G	1	Delimiter

NG No.
1: Receipt of a statement different from the command format
2: Attempt to write a set value outside the setting range
4: Attempt to write a set value through communications during measurement
5: Attempt to write while protecting
Header (If there is no header, no data will result.)

- List of commands to read set values

Item group		Setting item	Command (transmission to the F388A)							
First Setting	Y-axis Setting	Input Select	R	0	1	0	0	Delimiter (CR,CR+LF)	R	0
		Unit	R	0	1	0	1	Delimiter (CR,CR+LF)	R	0
		Decimal Place	R	0	1	0	2	Delimiter (CR,CR+LF)	R	0
		Zero Calibration	R	0	1	0	3	Delimiter (CR,CR+LF)	R	0
		Equiv. Cal. (rated output)	R	0	1	0	4	Delimiter (CR,CR+LF)	R	0
		Equiv. Cal. (rated capacity)	R	0	1	0	5	Delimiter (CR,CR+LF)	R	0
		Overload	R	0	1	0	6	Delimiter (CR,CR+LF)	R	0
		Increment	R	0	1	0	7	Delimiter (CR,CR+LF)	R	0
		Analog Filter	R	0	1	0	8	Delimiter (CR,CR+LF)	R	0
		Digital Filter	R	0	1	0	9	Delimiter (CR,CR+LF)	R	0
		DZ Limit	R	0	1	1	0	Delimiter (CR,CR+LF)	R	0
	X-axis Setting	Time/DPM Change	R	0	2	0	0	Delimiter (CR,CR+LF)	R	0
		Phase Select	R	0	2	0	1	Delimiter (CR,CR+LF)	R	0
		Wave Reference	R	0	2	0	2	Delimiter (CR,CR+LF)	R	0
		Unit	R	0	2	0	3	Delimiter (CR,CR+LF)	R	0
		Decimal Place	R	0	2	0	4	Delimiter (CR,CR+LF)	R	0
		Zero Calibration	R	0	2	0	5	Delimiter (CR,CR+LF)	R	0
		Equiv. Cal. (number of pulses)	R	0	2	0	6	Delimiter (CR,CR+LF)	R	0
		Equiv. Cal. (displacement value)	R	0	2	0	7	Delimiter (CR,CR+LF)	R	0
		Measure Length	R	0	2	0	8	Delimiter (CR,CR+LF)	R	0
		DPM Positioning	R	0	2	0	9	Delimiter (CR,CR+LF)	R	0
		Digital Filter	R	0	2	1	1	Delimiter (CR,CR+LF)	R	0

Return (by the F388A)												Input range (display range)
1	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: ±10V 1: ±20mA
1	0	1	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	See"9-3 Unit setting list"on page 145.
1	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 0 1: 0.0 2: 0.00 3: 0.000
1	0	3	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-11.00 to 11.00 [V] -22.00 to 22.00 [mA]
1	0	4	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-99.99 to 99.99 [V] (0 is excluded) -99.99 to 99.99 [mA] (0 is excluded)
1	0	5	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999
1	0	6	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
1	0	7	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1 1: 2 2: 5 3: 10
1	0	8	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 10 1: 30 2: 100 3: 300 [Hz]
1	0	9	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0, 2 to 999 [Times]
1	1	0	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
2	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Time 1: Displacement
2	0	1	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: A/B-Phase 1: Only A-Phase
2	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Front 1: Back
2	0	3	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	See"9-3 Unit setting list"on page 145.
2	0	4	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 0 1: 0.0 2: 0.00 3: 0.000
2	0	5	±	10^6	10^5	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 1000000
2	0	6	±	10^6	10^5	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 1000000
2	0	7	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-99999 to 99999
2	0	8	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	Time/Displacement Change; Time 0: 0.5 1: 1.0 2: 2.0 3: 5.0 4: 10.0 [s] Time/Displacement Change; Displacement 0: 2000 1: 4000 2: 6000 3: 8000 4: 10000
2	0	9	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 32000
2	1	1	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0, 2 to 999 [Times]

Item group		Setting item	Command (transmission to the F388A)							
First Setting	Commu-nication Setting	Speed	R	0	3	0	0	Delimiter (CR,CR+LF)	R	0
		Data Bit	R	0	3	0	1	Delimiter (CR,CR+LF)	R	0
		Parity Bit	R	0	3	0	2	Delimiter (CR,CR+LF)	R	0
		Stop Bit	R	0	3	0	3	Delimiter (CR,CR+LF)	R	0
		Delimiter	R	0	3	0	4	Delimiter (CR,CR+LF)	R	0
		Header	R	0	3	0	5	Delimiter (CR,CR+LF)	R	0
		Flow Control	R	0	3	0	6	Delimiter (CR,CR+LF)	R	0
	System Setting	Backlight (ON Time)	R	0	4	0	0	Delimiter (CR,CR+LF)	R	0
		Language	R	0	4	0	1	Delimiter (CR,CR+LF)	R	0
		Work Protect	R	0	4	0	2	Delimiter (CR,CR+LF)	R	0
		First Protect	R	0	4	0	3	Delimiter (CR,CR+LF)	R	0
		Undefined	R	0	4	0	4	Delimiter (CR,CR+LF)	R	0
		Backlight (bright→dark)	R	0	4	0	5	Delimiter (CR,CR+LF)	R	0
	OptionSetting									
Settings by work [Work 0 to 15]	Work Setting	Work No. (for RS-232C)	R	1	0	0	0	Delimiter (CR,CR+LF)	R	1
	Measurement Start Condition Setting	Start Condition	R	1	1	0	0	Delimiter (CR,CR+LF)	R	1
		Start Level	R	1	1	0	1	Delimiter (CR,CR+LF)	R	1
		Stop Condition	R	1	1	0	2	Delimiter (CR,CR+LF)	R	1
		Stop Level	R	1	1	0	3	Delimiter (CR,CR+LF)	R	1

Return (by the F388A)												Input range (display range)
3	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1200 1: 2400 2: 4800 3: 9600 4: 19.2k 5: 38.4k [bps]
3	0	1	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 7 1: 8 [bit]
3	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: None 1: Even 2: Odd
3	0	3	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1 1: 2 [bit]
3	0	4	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: CR 1: CR+LF
3	0	5	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: None 1: STX
3	0	6	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Off 1: RTS/CTS Control
4	0	0	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 99 [minute]
4	0	1	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Japanese 1: English
4	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Not Protect 1: Protect
4	0	3	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Not Protect 1: Protect
4	0	4	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	100 to 170
4	0	5	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 99 [minute]
0	0	0	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 15
1	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Only External Input 1: External Input + Load 2: External Input + Displacement (2 can be set only when the X-axis of the waveform represents displacement.)
1	0	1	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	External Input + Load : -9999 to +9999 External Input + Displacement : -9999 to +32000
1	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Only Forced-Stop 1: Load 2: Time 3: Displacement 4: Displacement Stop (3 and 4 can be set only when the X-axis of the waveform represents displacement.)
1	0	3	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Load: -9999 to +9999 Time: 0.1 to 10.0[second] Displacement: -9999 to +32000 Displacement Stop : 0.1 to 10.0[second]

Item group		Setting item	Command (transmission to the F388A)							
Settings by work [Work 0 to 15]	Display Range Setting	Y Start Point	R	1	2	0	0	Delimiter (CR,CR+LF)	R	1
		Y End Point	R	1	2	0	1	Delimiter (CR,CR+LF)	R	1
		X Start Point	R	1	2	0	2	Delimiter (CR,CR+LF)	R	1
		X End Point	R	1	2	0	3	Delimiter (CR,CR+LF)	R	1
	Hold Setting	Change of Sct. (common to all work)	R	1	3	0	0	Delimiter (CR,CR+LF)	R	1
		Use Sct.	R	1	3	0	1	Delimiter (CR,CR+LF)	R	1
		Sct. No. (for RS-232C communications)	R	1	3	0	2	Delimiter (CR,CR+LF)	R	1
	Section 1 to 5	Use Hold	R	1	3	0	3	Delimiter (CR,CR+LF)	R	1
		Sct. Start-End (start point)	R	1	3	0	4	Delimiter (CR,CR+LF)	R	1
		Sct. Start-End (end point)	R	1	3	0	5	Delimiter (CR,CR+LF)	R	1

Return (by the F388A)												Input range (display range)
2	0	0	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-10000 to 10000
2	0	1	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	Y-axis Start Point + 0: 25 1: 50 2: 100 3: 200 4: 300 5: 400 6: 500 7: 1000 8: 2000 9: 3000 10: 4000 11: 5000 12: 10000 13: 20000
2	0	2	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2000 (× Measurement Length/2000) Displacement (Back) -2000 to 0 (× Measurement Length/2000)
2	0	3	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) X-axis Start Point + 0: 25 1: 50 2: 100 3: 200 4: 400 5: 600 6: 800 7: 1000 8: 1200 9: 1400 10: 1600 11: 1800 12: 2000 13: 2200 (× Measurement Length/2000) Displacement (Back) X-axis Start Point + 0: 25 1: 50 2: 100 3: 200 4: 400 5: 600 6: 800 7: 1000 8: 1200 9: 1400 10: 1600 11: 1800 12: 2000 13: 2200 (× Measurement Length/2000)
3	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: External Input 1: Setting (0 can be set only when the time or displacement (Front))
3	0	1	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	1 to 5
3	0	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Sct1 1: Sct2 2: Sct3 3: Sct4 4: Sct5
3	0	3	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Always 1: Sample 2: Peak 3: Bottom 4: Peak to Peak 5: Relative Maximum 6: Relative Minimum 7: Inflection Point 8: Average 9: End Displacement
3	0	4	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000)
3	0	5	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000)

Item group		Setting item	Command (transmission to the F388A)							
Settings by work [Work 0 to 15]	Section 1 to 5	Load HI/LO Limit (HI limit)	R	1	3	0	6	Delimiter (CR,CR+LF)	R	1
		Load HI/LO Limit (LO limit)	R	1	3	0	7	Delimiter (CR,CR+LF)	R	1
		DPM HI/LO Limit (HI limit)	R	1	3	0	8	Delimiter (CR,CR+LF)	R	1
		DPM HI/LO Limit (LO limit)	R	1	3	0	9	Delimiter (CR,CR+LF)	R	1
		Start Load	R	1	3	1	0	Delimiter (CR,CR+LF)	R	1
		Load Difference	R	1	3	1	1	Delimiter (CR,CR+LF)	R	1
		Rate	R	1	3	1	2	Delimiter (CR,CR+LF)	R	1
		Ordinal	R	1	3	1	3	Delimiter (CR,CR+LF)	R	1
		Interval AB (A)	R	1	3	1	4	Delimiter (CR,CR+LF)	R	1
		Interval AB (B)	R	1	3	1	5	Delimiter (CR,CR+LF)	R	1
	Waveform Comparison Setting	Relative	R	1	4	0	0	Delimiter (CR,CR+LF)	R	1
		Compare Area (start point)	R	1	4	0	1	Delimiter (CR,CR+LF)	R	1
		Compare Area (end point)	R	1	4	0	2	Delimiter (CR,CR+LF)	R	1
		Compare Margin	R	1	4	0	3	Delimiter (CR,CR+LF)	R	1
		Relative Point (X-axis)	R	1	4	0	4	Delimiter (CR,CR+LF)	R	1
		Relative Point (Y-axis)	R	1	4	0	5	Delimiter (CR,CR+LF)	R	1

Return (by the F388A)												Input range (display range)
3	0	6	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to +9999
3	0	7	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to +9999
3	0	8	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000) * When End Displacement in Use Hold is selected; -9999 to 32000
3	0	9	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000) * When End Displacement in Use Hold is selected; -9999 to 32000
3	1	0	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999
3	1	1	±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 19998
3	1	2	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1/4 1: 1/2 2: 3/4 3: 1 4: 1.25 5: 1.5 6: 1.75 7: 2 8:3 9: 4 [times]
3	1	3	±	0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	1 to 15 [times]
3	1	4	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 999 (× Measurement Length/2000)
3	1	5	±	0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 999 (× Measurement Length/2000)
4	0	0	±	0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Off 1: On
4	0	1	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) Displacement (Back) -2047 to 0 (× Measurement Length/2000)
4	0	2	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) Displacement (Back) -2047 to 0 (× Measurement Length/2000)
4	0	3	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
4	0	4	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) Displacement (Back) -2047 to 0 (× Measurement Length/2000)
4	0	5	±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999

- List of commands to write set values

Item group		Setting item	Command					
First Setting	Y-axis Setting	Input Select	W	0	1	0	0	±
		Unit	W	0	1	0	1	±
		Decimal Place	W	0	1	0	2	±
		Equiv. Cal. (rated output)	W	0	1	0	4	±
		Equiv. Cal. (rated capacity)	W	0	1	0	5	±
		Overload	W	0	1	0	6	±
		Increment	W	0	1	0	7	±
		Analog Filter	W	0	1	0	8	±
		Digital Filter	W	0	1	0	9	±
		DZ Limit	W	0	1	1	0	±
	X-axis Setting	Time/DPM Change	W	0	2	0	0	±
		Phase Select	W	0	2	0	1	±
		Wave Reference	W	0	2	0	2	±
		Unit	W	0	2	0	3	±
		Decimal Place	W	0	2	0	4	±
		Equiv. Cal. (number of pulses)	W	0	2	0	6	±
		Equiv. Cal. (displacement value)	W	0	2	0	7	±
		Measure Length	W	0	2	0	8	±
		DPM Positioning	W	0	2	0	9	±
		Digital Filter	W	0	2	1	1	±

(transmission to the F388A)								Input range (display range)
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: ±10V 1: ±20mA
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	See "9-3 Unit setting list"on page 145.
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 0 1: 0.0 2: 0.00 3: 0.000
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-99.99 to 99.99 [V] (0 is excluded) -99.99 to 99.99 [mA] (0 is excluded)
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1 1: 2 2: 5 3: 10
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 10 1: 30 2: 100 3: 300 [Hz]
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0, 2 to 999 [Times]
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Time 1: Displacement
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: A/B-Phase 1: Only A-Phase
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Front 1: Back
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	See "9-3 Unit setting list"on page 145.
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 0 1: 0.0 2: 0.00 3: 0.000
10^6	10^5	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 1000000
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-99999 to 99999
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	Time/Displacement Change; Time 0: 0.5 1: 1.0 2: 2.0 3: 5.0 4: 10.0 [s] Time/Displacement Change; Displacement 0: 2000 1: 4000 2: 6000 3: 8000 4: 10000
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 32000
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0, 2 to 999 [Times]

Item group		Setting item	Command					
First Setting	Communication Setting	Speed	W	0	3	0	0	±
		Data Bit	W	0	3	0	1	±
		Parity Bit	W	0	3	0	2	±
		Stop Bit	W	0	3	0	3	±
		Delimiter	W	0	3	0	4	±
		Header	W	0	3	0	5	±
		Flow Control	W	0	3	0	6	±
		Com. Mode	W	0	3	0	7	±
	System Setting	Backlight (ON Time)	W	0	4	0	0	±
		Language	W	0	4	0	1	±
		Work Protect	W	0	4	0	2	±
		First Protect	W	0	4	0	3	±
		Undefined	W	0	4	0	4	±
		Backlight (bright→dark)	W	0	4	0	5	±
	Option Setting							
Settings by work [Work 0 to 15]	Work Setting	Work No. (for RS-232C communications)	W	1	0	0	0	±
	Measurement Start Condition Setting	Start Condition	W	1	1	0	0	±
		Start Level	W	1	1	0	1	±
		Stop Condition	W	1	1	0	2	±
		Stop Level	W	1	1	0	3	±

(transmission to the F388A)								Input range (display range)
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1200 1: 2400 2: 4800 3: 9600 4: 19.2k 5: 38.4k [bps]
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 7 1: 8 [bit]
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: None 1: Even 2: Odd
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1 1: 2 [bit]
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: CR 1: CR+LF
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: None 1: STX
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Off 1: RTS/CTS Control
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Normal 1: Hold Point Mode
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 99 [minute]
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Japanese 1: English
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Not Protect 1: Protect
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Not Protect 1: Protect
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	100 (Bright) to 170 (Dark)
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 99 [minute]
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	0 to 15
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Only External Input 1: External Input + Load 2: External Input + Displacement (2 can be set only when the X-axis of the waveform represents displacement.)
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	External Input + Load: -9999 to +9999 External Input + Displacement: -9999 to +32000
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Only Forced-Stop 1: Load 2: Time 3: Displacement 4: Displacement Stop (3 and 4 can be set only when the X-axis of the waveform represents displacement.)
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Load: -9999 to +9999 Time: 0.1 to 10.0 [second] Displacement: -9999 to +32000 Displacement Stop: 0.1 to 10.0 [second]

Item group		Setting item	Command					
Settings by work [Work 0 to 15]	Display Range Setting	Y Start Point	W	1	2	0	0	±
		Y End Point	W	1	2	0	1	±
		X Start Point	W	1	2	0	2	±
		X End Point	W	1	2	0	3	±
	Hold Setting	Change of Sct. (common to all work)	W	1	3	0	0	±
		Use Sct.	W	1	3	0	1	±
		Sct. No. (for RS-232C communications)	W	1	3	0	2	±
	Section 1 to 5	Use Hold	W	1	3	0	3	±
		Sct. Start-End (start point) Note1)	W	1	3	0	4	±
		Sct. Start-End (end point) Note1)	W	1	3	0	5	±
		Load HI/LO Limit (HI limit) Note1)	W	1	3	0	6	±
		Load HI/LO Limit (LO limit) Note1)	W	1	3	0	7	±

(transmission to the F388A)								Input range (display range)
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-10000 to 10000
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	Y-axis Start Point + 0: 25 1: 50 2: 100 3: 200 4: 300 5: 400 6: 500 7: 1000 8: 2000 9: 3000 10: 4000 11: 5000 12: 10000 13: 20000
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2000 (× Measurement Length/2000) Displacement (Back) -2000 to 0 (× Measurement Length/2000)
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) X-axis Start Point + 0: 25 1: 50 2: 100 3: 200 4: 400 5: 600 6: 800 7: 1000 8: 1200 9: 1400 10: 1600 11: 1800 12: 2000 13: 2200 (× Measurement Length/2000) Displacement (Back) X-axis Start Point + 0: -25 1: -50 2: -100 3: -200 4: -400 5: -600 6: -800 7: -1000 8: -1200 9: -1400 10: -1600 11: -1800 12: -2000 13: -2200 (× Measurement Length/2000)
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: External Input 1: Setting (0 can be set only when the time or displacement (Front))
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	1 to 5
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Sct1 1: Sct2 2: Sct3 3: Sct4 4: Sct5
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Always 1: Sample 2: Peak 3: Bottom 4: Peak to Peak 5: Relative Maximum 6: Relative Minimum 7: Inflection Point 8: Average 9: End Displacement
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) * However, End point of the previous section ≦Start point≦End point Displacement (Back) -2047 to 0 (× Measurement Length/2000) * However, End point of the previous section ≧Start point≧End point
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) * However, Start point≦End point ≦Start point of the next section Displacement (Back) -2047 to 0 (× Measurement Length/2000) * However, Start point≧End point ≧Start point of the next section
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to +9999 * Setting HI limit < LO limit is unacceptable.
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to +9999 * Setting HI limit < LO limit is unacceptable.

Item group		Setting item	Command					
Settings by work [Work 0 to 15]	Section 1 to 5	DPM HI/LO Limit (HI limit) Note1)	W	1	3	0	8	±
		DPM HI/LO Limit (LO limit) Note1)	W	1	3	0	9	±
		Start Load	W	1	3	1	0	±
		Load Difference	W	1	3	1	1	±
		Rate	W	1	3	1	2	±
		Ordinal	W	1	3	1	3	±
		Interval AB (A)	W	1	3	1	4	±
		Interval AB (B)	W	1	3	1	5	±
	Waveform Comparison Setting	Relative	W	1	4	0	0	±
		Compare Area (start point) Note1)	W	1	4	0	1	±
		Compare Area (end point) Note1)	W	1	4	0	2	±
		Compare Margin	W	1	4	0	3	±
		Relative Point (X-axis)	W	1	4	0	4	±
		Relative Point (Y-axis)	W	1	4	0	5	±

(transmission to the F388A)								Input range (display range)
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000) * When End Displacement in Use Hold is selected; -9999 to 32000 * Setting HI limit < LO limit is unacceptable.
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Waveform Reference; Front 0 to 2047 (× Measurement Length/2000) Waveform Reference; Back -2047 to 0 (× Measurement Length/2000) * When End Displacement in Use Hold is selected; -9999 to 32000 * Setting HI limit < LO limit is unacceptable.
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999
0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 19998
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: 1/4 1: 1/2 2: 3/4 3: 1 4: 1.25 5: 1.5 6: 1.75 7: 2 8: 3 9: 4 [Times]
0	0	0	0	0	10^1	10^0	Delimiter (CR,CR+LF)	1 to 15 [Times]
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 999 (× Measurement Length/2000)
0	0	0	0	10^2	10^1	10^0	Delimiter (CR,CR+LF)	1 to 999 (× Measurement Length/2000)
0	0	0	0	0	0	10^0	Delimiter (CR,CR+LF)	0: Off 1: On
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) * Setting Start point > End point is unacceptable. Displacement (Back) -2047 to 0 (× Measurement Length/2000) * Setting Start point < End point is unacceptable.
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) * Setting Start point > End point is unacceptable. Displacement (Back) -2047 to 0 (× Measurement Length/2000) * Setting Start point < End point is unacceptable.
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	0 to 9999
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	Time or displacement (Front) 0 to 2047 (× Measurement Length/2000) Displacement (Back) -2047 to 0 (× Measurement Length/2000)
0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR,CR+LF)	-9999 to 9999

Point

Note1)

Please change other set values beforehand so that the setting range becomes the maximum when a set value to which other settings influence the setting range is written in.

Example 1 When you write the Load HI Limit value in.

Please write -9999 in the Load LO Limit value beforehand.

Example 2 When you change the Section Start-End.

Please write 2047(Time or Displacement (Front)) and -2047(Displacement (Back)) in at the start point and the end point in all sections beforehand in order of End Point of Section 5, Start Point of Section 5, End Point of Section 4, …… End Point of Section 1 and Start Point of Section 1.
Please write in the value to be set in order of Start Point of Section 1, End Point of Section 1, Start Point of Section 2, …… Start Point of Section 5 and End Point of Section 5.

- List of zero calibration commands

Item group		Setting item	Command (transmission to the F388A)					
First Setting	Y-axis Setting	Zero Calibration	C	0	1	0	0	Delimiter (CR, CR+LF)
	X-axis Setting	Zero Calibration	C	0	2	0	0	Delimiter (CR, CR+LF)

- List of actual load calibration commands

Item group		Setting item					
First Setting	Y-axis Setting	Actual Load Calibration	C	0	1	0	1
	X-axis Setting	Actual Load Calibration	C	0	2	0	1

Command (transmission to the F388A)								
±	0	0	0	10^3	10^2	10^1	10^0	Delimiter (CR, CR+LF)
±	0	0	10^4	10^3	10^2	10^1	10^0	Delimiter (CR, CR+LF)

Input range

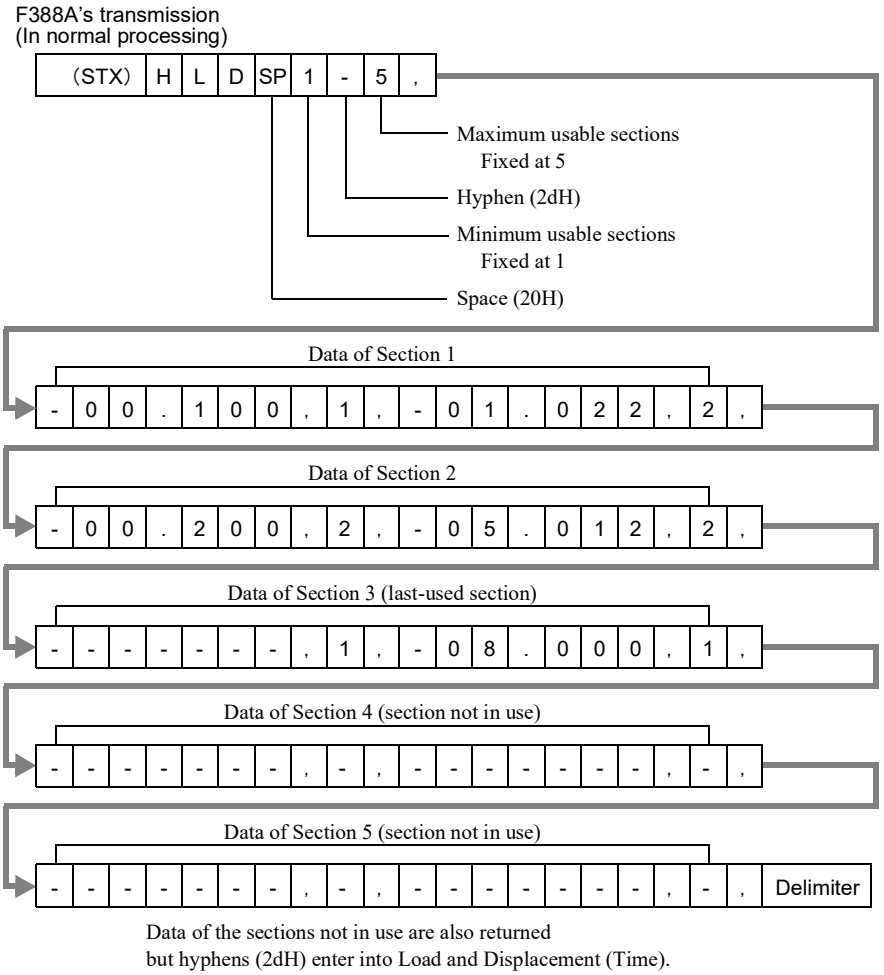
Actual Load Calibration (Y-axis Setting): -9999 to 9999

Actual Load Calibration (X-axis Setting): -9999 to 32000

■Communication method (when the Communication Mode is Hold Point Mode)

After completion of measurement, the Hold Result of each section is automatically transmitted to the host.

Example: When the hold function is used in Section 1 to 3 of a measurement waveform



* The format of section data is the same as that for reading hold results.

■Cautions

- Work No. for RS-232C communications

Once Work No. is written, it will be reflected afterward throughout reading and writing of settings by work. This work No. is just for RS-232C communications. The F388A's work is not changed. Also, the Work No. display in Work Setting is not changed.

- About Section No. for RS-232C communications

Once Section No. is written (with the currently-specified Work No.), it will be reflected afterward throughout reading and writing of hold settings. This section No. is just for RS-232C communications. The F388A's section is not changed. Also, the Section display in Hold Setting is not changed.

- About communications during measurement

During measurement, writing or calibration cannot be carried out through communications, where only reading can be carried out.

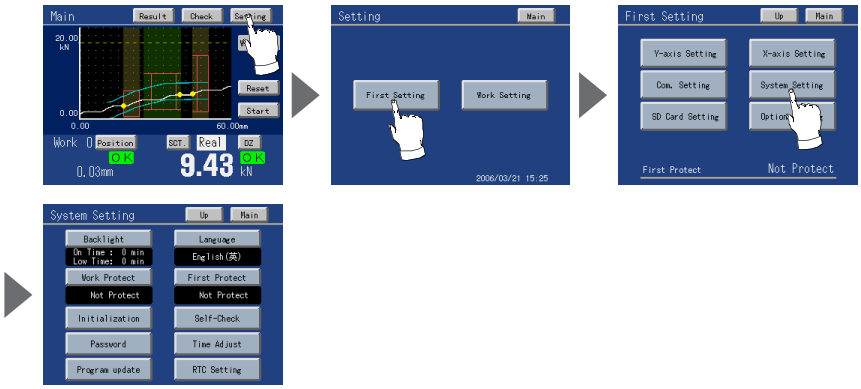
・About messages

Unless otherwise noted, all the messages are in ASCII code.

6 SYSTEM SETTINGS

6-1. System setting

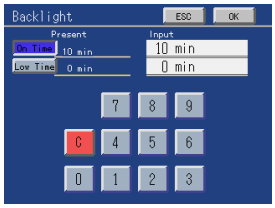
Select language and adjust contrast, etc., by System Setting.



Operation

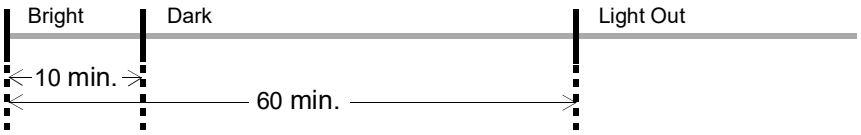
Main screen→Setting→First Setting→System Setting

- Backlight



This function changes the brightness of the backlight when touch screen has not been used for certain period of time.
The ON time (lighting time of the backlight) and the Low time (bright →dark switching time of the backlight) are set up.
When you use it in the state which a display is always in sight, set the ON time to 0 minutes.
When you want the backlight always bright, set 0 minutes for both the ON time and the Low time.
The backlight is turned bright by touching the panel when the backlight is turned off or it is dark.

Ex.) Set 60 minutes to ON time, 10 minutes to Low time.）

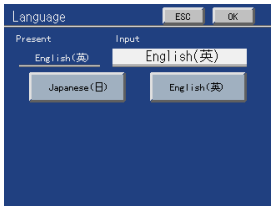


Setting range (0 to 99 minutes) (with both time)

Operation

Main screen→Setting→First Setting→System Setting→Backlight

- Language



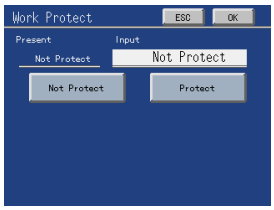
Select language.

Setting range (Japanese (日), English (英))

Operation

Main screen→Setting→First Setting→System Setting→Language

- Work Setting Parameter Protection



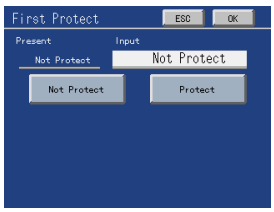
Set whether or not work setting parameters can be changed.

Setting range (Not Protect, Protect)

Operation

Main screen→Setting→First Setting→System Setting→Work Protect

- First Setting Parameter Protection



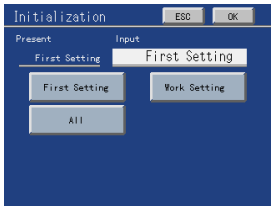
Set whether or not first setting parameters can be changed.

Setting range (Not Protect, Protect)

Operation

Main screen→Setting→First Setting→System Setting→First Protect

- Initialization



Parameters are brought back to factory defaults.

Setting range

First Setting: All the set values of the first setting parameters other than the equipment's specific settings

Work Setting: All work setting parameters

All: First Setting + Work Setting

(The F388A's specific settings are the set values marked with * in "9-2 Setting item list" on p.140.)

Operation

Main screen→Setting→First Setting→System Setting→Initialization

- Self-Check

Make self-checks.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check

① LCD Check

Check that the display is free from defects in color and indication.

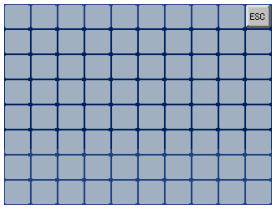
The screen changes as red → green → blue → horizontal stripes → vertical stripes.
Touching the screen restores the original screen.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→LCD Check

② KEY Check

Check that the touch panel is free from unrecognizable places. When touched, each square changes to yellow. Pressing ESC at the upper right of the screen restores the original screen.

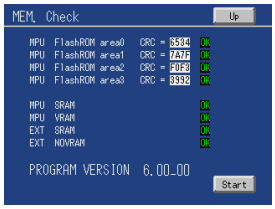


Operation

Main screen→Setting→First Setting→System Setting→Self-Check→KEY Check

③ MEM. Check

Check that the memory is free from defects. The results are displayed in a short time after Start at the lower right of the screen is pressed. Also, check the version here.

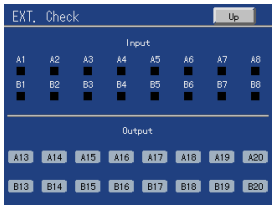


Operation

Main screen→Setting→First Setting→System Setting→Self-Check→MEM. Check

④ EXT. Check

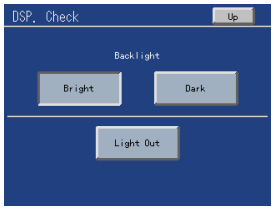
Check that the external input/output signals operate.
On outputs, pressed pins turn ON.
On inputs, ON-recognized pins turn yellow.



Operation

Main screen→Setting→First Setting→System Setting→Self-Check→EXT. Check

⑤ DSP. Check



Check the backlight and status indicator lamp.

The backlight turns bright by pressing Bright, and turns dark by pressing Dark.

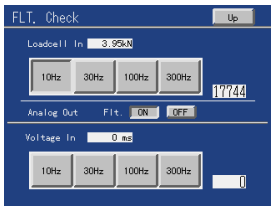
The backlight goes out when LightOut is pressed, and after that, it recovers when the screen is touched.

The status indicator lamp lights in green and red alternately.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→DSP. Check

⑥ FLT. Check



Check the filter circuit.

- Analog Filter

Voltage/current input (Load input):

When the input is changed from 0V to 10V or 0mA to 10mA (step input), use the following alues as a guide for normal.

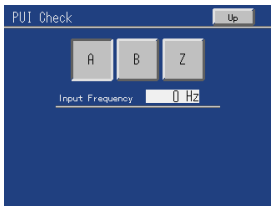
10Hz: 66±2

30Hz: 23±2

100Hz: 7±1

300Hz: 3±1

⑦ PUI Check

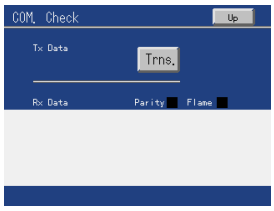


Check that the encoder input is recognized.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→PUI Check

⑧ COM. Check



Check that RS-232C reception and transmission are in proper operation.

Press the Trns. Key, the same statement as in display read is transmitted, and the received data is displayed in the Rx Data section. Also, in the case of a parity error/framing error, the Parity/ Frame lamp turns red.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→COM. Check

⑨ SDC Check

Check the operation of the SD memory card.

Selectable range (Start, Err Clear)

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→SDC Check

⑩ ETN Check (Only when the Ethernet I/F option is mounted)

The SDRAM, DPRAM, and LAN controller are checked.

If there is no error, OK is displayed, and if there is any error, NG is displayed.Also, the software version of the Ethernet I/F option is displayed.

* Communication status is not checked. The IC is simply checked.

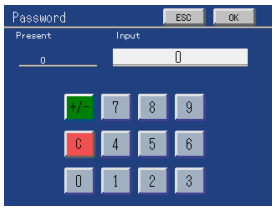
Selectable range (Start)

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→ETN Check

- Password

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

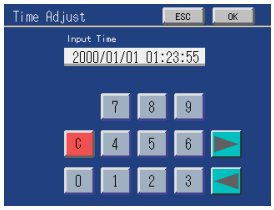


Setting range (0 to 9999)

Operation

Main screen→Setting→First Setting→System Setting→Password

- Time Adjust



Set the present time displayed on the Setting screen.

Setting range

(2000/01/01 00:00:00 to 2079/12/31 23:59:59)

Operation

Main screen→Setting→First Setting→System Setting→Time Adjust

1. Press ▶ / ◀ on the numeric keypad to flash the place you want to set.

Each time you press ▶ / ◀, the flashing place changes as 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

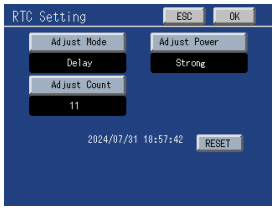
2. Input a numeric value.

Input all of Year/Month/Day/Hour/Minute/Second in two digits.

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

3. Press OK .

- RTC Setting



The way of the clock running can be corrected.

Operation

Main screen→Setting→First Setting→System Setting→RTC Setting

① Adjust Mode
Setting range (Not Adjust, Forward, Delay)

Operation

Main screen→Setting→First Setting→System Setting→RTC Setting→Adjust Mode

② Adjust Power
Setting range (Weak, Strong)

Operation

Main screen→Setting→First Setting→System Setting→RTC Setting→Adjust Power

③ Adjust Count
Setting range (0 to 63)

Operation

Main screen→Setting→First Setting→System Setting→RTC Setting→Adjust Count

After setting each item of Adjust Mode/Adjust Power/Adjust Count, the settings will be active by pressing OK.

By pressing ESC, each item of Adjust Mode/Adjust Power/Adjust Count will set back to the original value.

<Guide of the settings>

Example 1) In case the clock gains 3 sec. in one day

Adjust Mode ⇒ Delay
Adjust Power ⇒ Strong
Adjust Count ⇒ 11

Example 2) In case the clock gains 1 sec. in one day

Adjust Mode	⇒	Forward		Adjust Mode	⇒	Forward
Adjust Power	⇒	Strong	or	Adjust Power	⇒	Weak
Adjust Count	⇒	4		Adjust Count	⇒	23

Example 3) In case the clock gains 1 sec. in 10 days

Adjust Mode ⇒ Delay
Adjust Power ⇒ Weak
Adjust Count ⇒ 2

- Program update

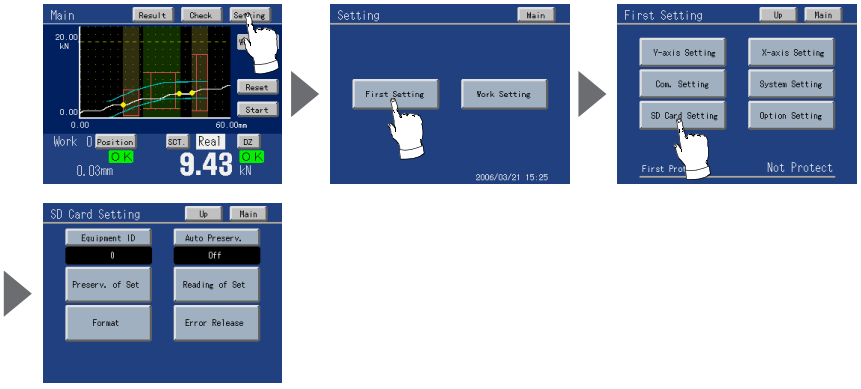
It is used for a program update. Do not operate it.

7 SD MEMORY CARD

7-1. SD card slot

■Outline

- Set values and comparison waveform data can be preserved on an SD memory card.
- Settings can be reconstructed by reading the set values and comparison waveform data having been preserved on an SD memory card.
- Measurement waveform data and judgment points can be automatically preserved on an SD memory card upon completion of measurement.
- A wave No. can be set on each waveform.

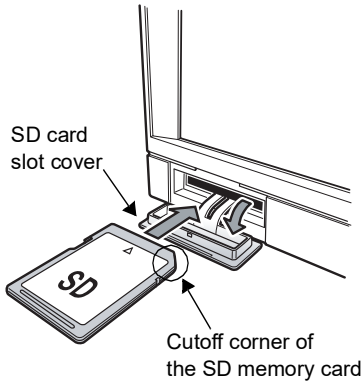


Operation

Main screen→Setting→First Setting→SD Card Setting

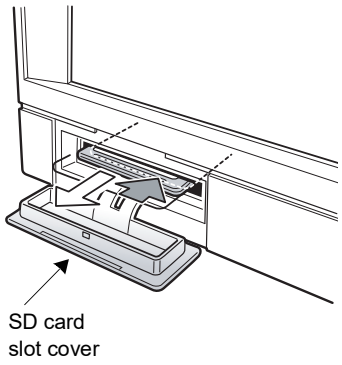
■SD memory card insertion

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.



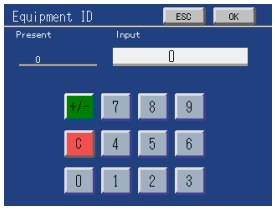
■SD memory card ejection

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.



■Settings

- Equipment ID



By setting its ID, an F388A can be controlled to differentiate from other F388As.

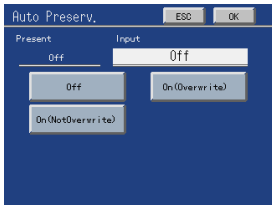
* Same as the equipment ID of the Ethernet option.

Setting range (0 to 999)

Operation

Main screen→Setting→First Setting→SD Card Setting→Equipment ID

- Measurement Waveform Preservation by the Automatic Operation



This setting is to automatically preserve the present measurement waveform data and judgment point data on an SD memory card upon completion of measurement.

Setting range

Off

On (Overwrite): The oldest file is erased and the present waveform is preserved,when SD memory card is full.

On (Not Overwrite): It does not overwrite, when SD memory card is full.

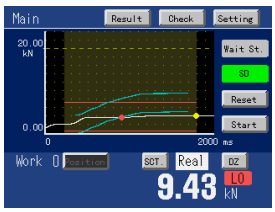
* Setting “On” disables preservation and reading of set values, and formatting of an SD memory card.

Operation

Main screen→Setting→First Setting→SD Card Setting→Auto Preserv.

If "On" is set, "SD" appears under the status display on the main screen, and upon completion of measurement, it changes to SD Busy.

Also, in the case of an error, the corresponding error number is displayed.



Point

- It takes about 1s to write a measurement waveform on average.
  (It varies depending on conditions.)
- When Measurement Waveform Preservation by the Automatic Operation is “On (Overwrite)” and SD memory card is full, present waveform is preserved by overwriting on the oldest file.In this case, it is possible to take about several seconds to write in the waveform.
- Approximately 80 waveforms can be stored in 1MB.
- Usable SD memory card is maximum up to 2GB only.
- Measurement can be made in writing a waveform on an SD memory card, but upon termination of the measurement, if the writing of the previous measurement waveform is not completed, the next measurement cannot be started until the writing of the previous measurement waveform is completed. (The SD OK signal turns OFF. Do not start the next measurement while it is OFF. It is reset by starting measurement being saved in time.）

■Setting a wave No. on a measurement waveform

Setting a wave No. allows control of the waveform stored on an SD memory card by number. Set the wave No. through communication (RS-232C, CC-Link, or Ethernet). (For the setting method, see "5-1.RS-232C"on p.79.)
The wave No. of the measurement waveform can be confirmed on the Result screen.

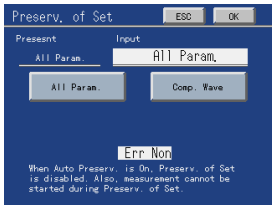
* At power-on, the wave No. is set at 0. “Wave No.:” is not displayed until a new wave No. is set and measurement is made.

Operation

Main screen→Result

■Preservation of set values on an SD memory card

1. Press [Preserv. of Set].



Select “All Parameter” to preserve first setting parameters, work setting (Work 0 to 15) parameters, and comparison waveform data (Work 0 to 15) on an SD memory card, and select “Comparison Wave” to preserve only comparison waveform data (Work 0 to 15) on an SD memory card.

Setting range (All Parameter, Comparison Wave)

Operation

Main screen→Setting→First Setting→SD Card Setting→Preserv. of Set

2. Press [OK] to start preservation.

Files created on an SD memory card

When waveforms and set values are preserved, the following files are created on an SD memory card.

F388SETT.388 (Set values other than comparison waveforms)
F3COMP00.388 (Comparison waveforms)
] All parameters

F388DXXX.388 (Measurement waveforms) (XXX : 000 to 199)

Measurement waveform data are sequentially written in this file.

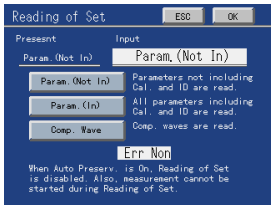
When the volume of the file in which the data are to be written exceeds approx. 10MB, the measurement waveform data are written in a new file.

Point

These are UNIPULSE’s original data.
To convert them into CSV files, dedicated PC software “FILE CONVERTER” is required.
Download it from our homepage.

■Reading of set values from an SD memory card

1. Press [Reading of Set].



Setting range

Param. (Not In): The F388A's specific settings remain, but all the other parameters are restored.

Param. (In): The F388A's specific settings do not remain, and all the parameters are restored.

Comparison Wave: Only comparison waveform data are reconstructed.

(The F388A's specific settings are the set values marked with * in "9-2 Setting item list" on p.140.)

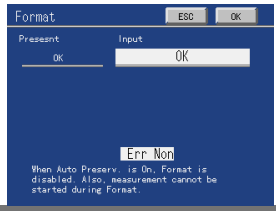
Operation

Main screen→Setting→First Setting→SD Card Setting→Reading of Set

2. Press [OK] to start reading.

■Format of an SD memory card

1. Press [Format].



Operation

Main screen→Setting→First Setting→SD Card Setting→Format

2. To format, press [OK].

⚠ CAUTION

- Format an SD memory card on the F388A or with dedicated formatting software. Formatting it in other ways disables writing of measurement waveforms at an average of approximately 1s because the SD memory card processing speed becomes slow due to an inappropriate format for the F388A. In that case, reformat it on the F388A 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.

■Error messages

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 F388A 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 F388A.
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.
Error BS	This error is displayed when a measurement waveform is not written in time and the measurement start input OFF→ON is ignored. It is reset by starting measurement with the error cleared or being saved in time.
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.

■Error Release

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.
Also, the SD memory card error cannot be released with [Reset] on the Main screen.

1. Press [Error Release].

Setting range

Only Release: Processing resumes if the SD memory card is in normal condition when the error is released during Measurement Waveform Preservation by the Automatic Operation.

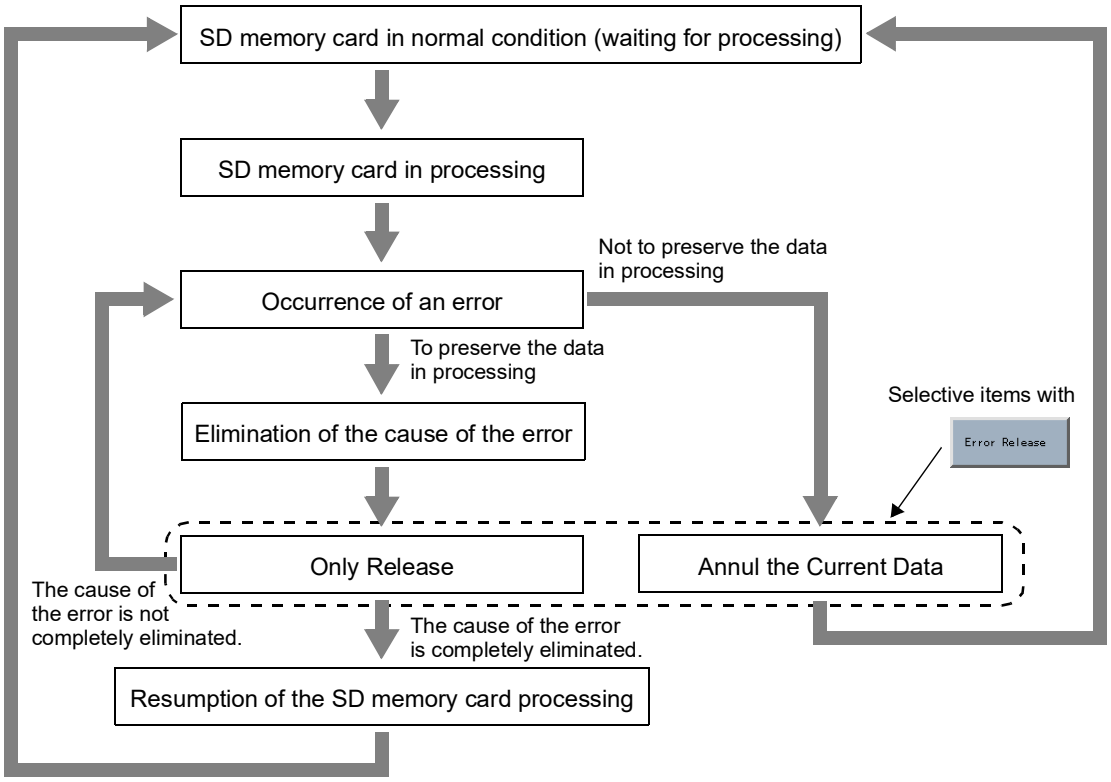
Annul Data: The data that are about to be written on the present SD memory card are annulled to release the error when it occurs during Measurement Waveform Preservation by the Automatic Operation.

Operation

Main screen→Setting→First Setting→SD Card Setting→Error Release

2. Press [OK] to release the present error.

- SD memory card error release flow during Measurement Waveform Preservation by the Automatic Operation



Point

The data in processing can also be annulled to release the error by turning the power off and then on again, or setting Measurement Waveform Preservation by the Automatic Operation to Off.

■SD memory card self-check

1. Go to the SDC Check screen under Self-check.

Operation

Main screen→Setting→First Setting→System Setting→Self-Check→SDC Check

2. Press Start .

SD memory card writing and reading are checked.
If there is any error, the error is displayed.

8 SPECIFICATIONS

8-1. Specifications

■Sensor input section

- Sensor input for load (①Voltage input, ②Current input)

Signal input range	①-10 to 10V	②-20 to 20mA
Input resistance	①1MΩor more	②Approx.250Ω
Accuracy	Nonlinearity;	within 0.02% FS ±1 digit (at 10V/20mA input)
	Zero drift;	①Within 0.2mV/℃ RTI
		②Within 0.4μA/℃ RTI
	Gain drift;	within 0.01%/℃
Analog filter	Selectable from 10, 30, 100, and 300Hz. Low-pass filter (-6dB/oct)	
A/D converter	Rate;	4000 times/sec.
	Resolution;	24 bits (binary)
	Effective resolution;	①Approx. 1/30000 to 10V
		②Approx. 1/30000 to 20mA
Analog voltage output	Output level;	①Approx. 0.6V per 1V input
		②Approx. 0.15V per 1mA input
	Load resistance;	2kΩ or more

- Sensor input for displacement

Maximum input frequency	50kHz	
Internal counting range	Approx. 1000000	
Adaptable sensor	Output;	Incremental type 2-phase output (A/B signal output) Also capable of single-phase output (A-phase input used. All pulses are counted as in the plus direction.)
	Output stage circuit specification;	open collector (NPN type, Vceo=30V or more, Ic=30mA or more)

■Display section

Display	3.5-inch TFT color LCD module	
	Display area	71W×53H [mm]
	Dot configuration	320×240 [dot]
Indicated value	Load	-9999 to +9999
	Displacement	-9999 to +32000
	Decimal point;	The decimal place is to be input together with a value at the time of calibration. 0.000, 0.00, 0.0, 0
Number of display times	Fixed at 3 times/sec	

■Setting section

Setting method	Setting by analog type touch panel operation	
Preservation of set values	Initial settings;	NOV RAM (nonvolatile RAM)
	Other settings;	Lithium-battery-backed-upC-MOS RAM (The preservation period is approx. 5 years or more, which varies depending on the operating condition and preservation environment.)

* For the categories of parameters, see "9-2.Setting item list" on p.140.

■Interface

RS-232C communication interface

Start/stop system	
Baud rate	1200, 2400, 4800, 9600, 19200, 38400 bps
Data bit	7, 8 bit
Parity bit	None, Even, Odd
Stop bit	1, 2 bit
Delimiter	CR, CR+LF
Header	None, STX
Flow Control	Off, RTS/CTS control

All parameters can be read and written.
All comparison waveforms can be read and written.
Measurement waveforms and judgment points can be read.

■Input/output section

Input signals	16 points	
	Input type;	plus common/minus common shared

To connect a transistor, connect NPN output type (sink type) for plus common and PNP output type (source type) for minus common.

ON voltage;	12V or more
OFF voltage;	3V or less
At 24V load;	approx. 5mA
Isolation;	photocoupler

Output signals	16 points Output type; sink type/source type selectable. (Source type is optional [ISC].) Output transistor ON at signal ON. To connect an input unit like a PLC, connect plus common for sink type, and minus common for source type. Rated voltage; 30V Rated current; 30mA Isolation; photocoupler

■SD memory card

SD card slot [SDC]	All parameters can be preserved and reconstructed. All comparison waveforms can be preserved and reconstructed. Measurement waveforms and judgment points can automatically be preserved. * An SD memory card of 1GB is attached. Approx. 80 waveforms can be preserved by 1MB. * Usable SD memory card is maximum up to 2GB only.

■Options

CC-Link interface [CCL]	Directly linkable with a Mitsubishi (multipurpose) sequencer. All parameters can be read and written. Judgment points can be read.
Ethernet interface [ETN]	Applicable standards IEEE802.3u (100 Base-TX) IEEE802.3 (10 Base-T) Supported protocols TCP/IP, ICMP All parameters can be read and written. All comparison waveforms can be read and written. Measurement waveforms and judgment points can be read.

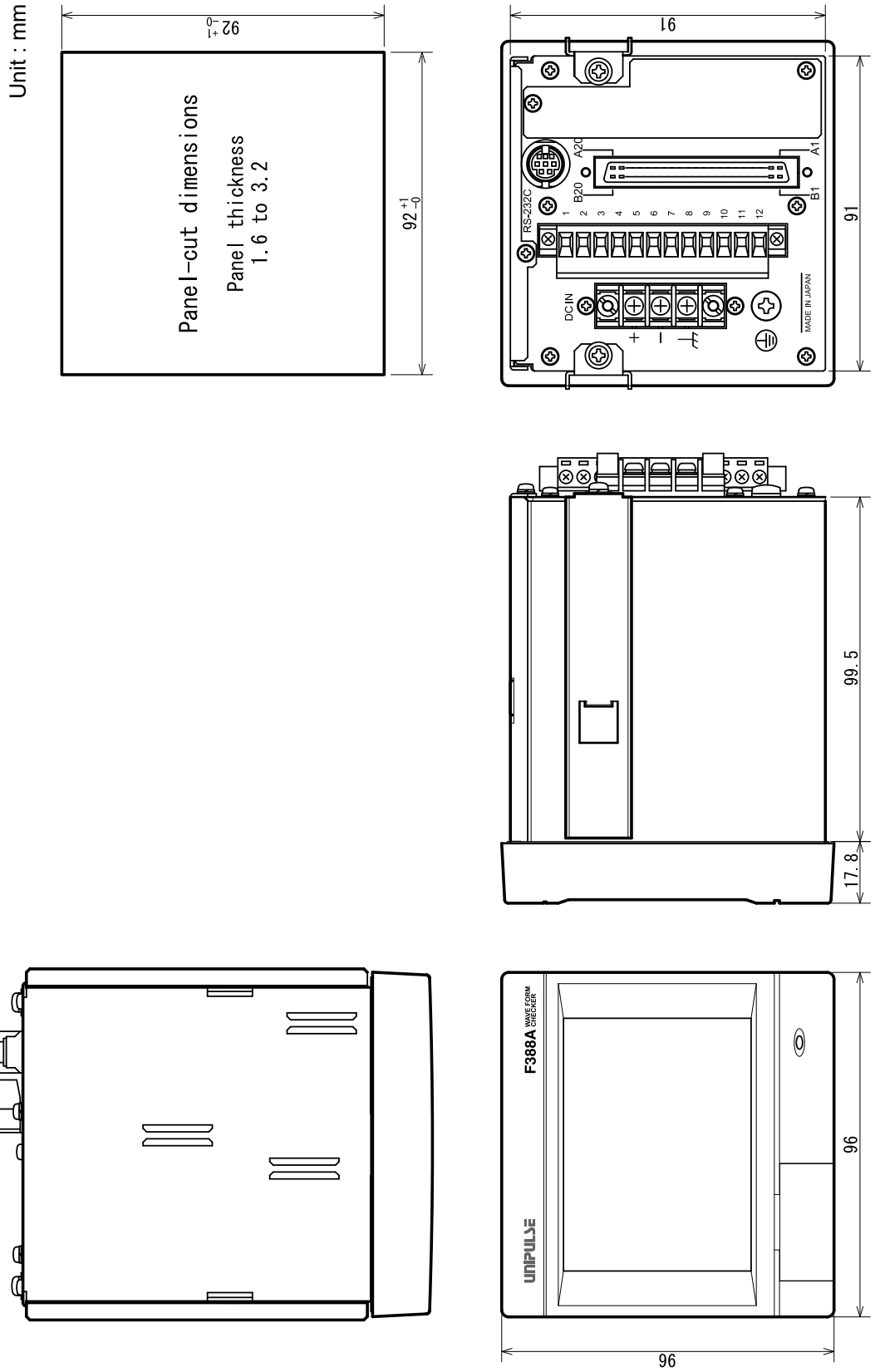
Point

One of the CC-Link interface and Ethernet interface functions can be mounted.

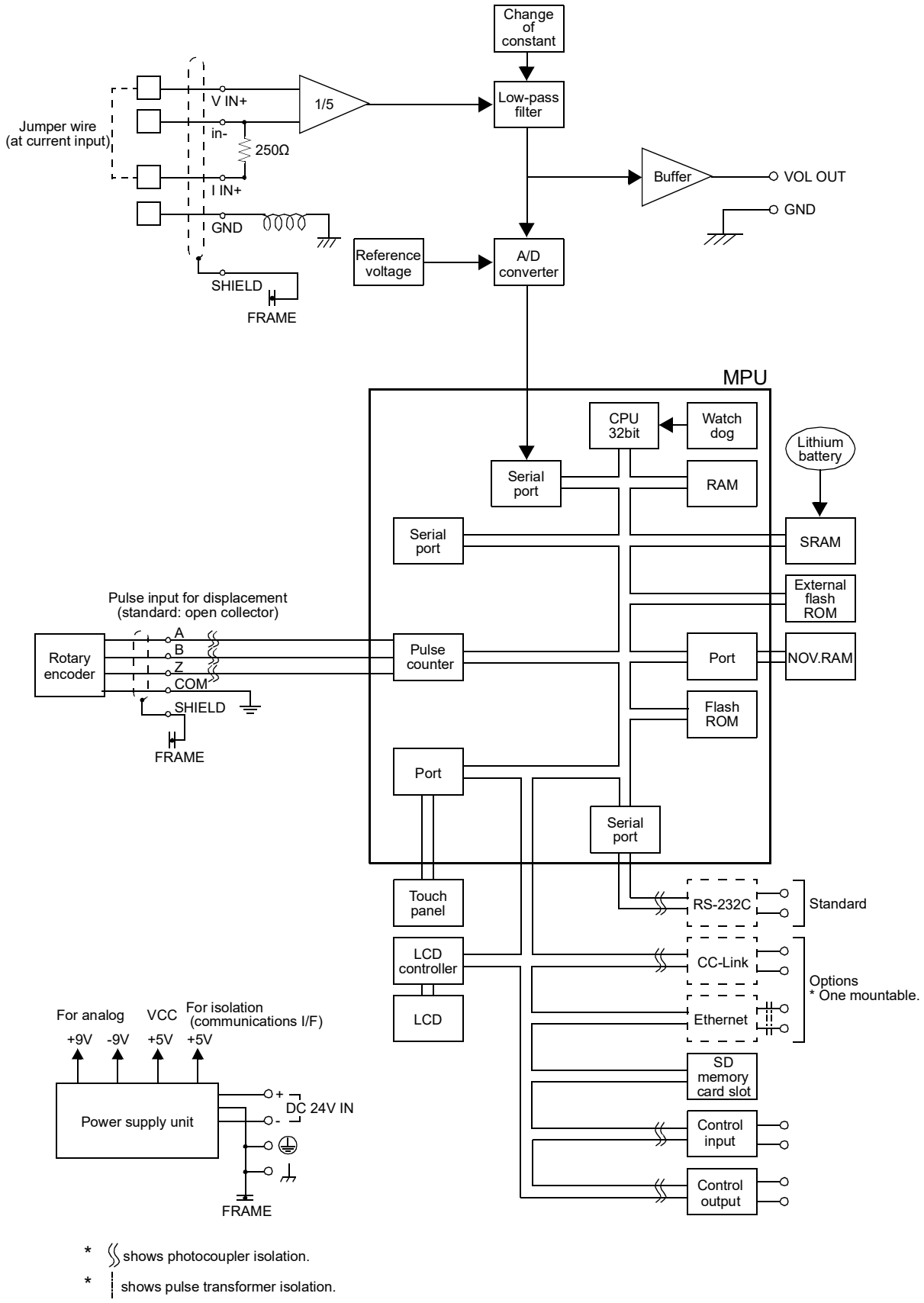
■General performance

Power supply voltage	DC24V (±15%)
Power consumption	20W max
Inrush current (Typ)	2A, 10msec (at ordinary temperature, cold-start)
Operating conditions	Temperature; Operating temperature range -10℃ to +40℃ Storage temperature range -20℃ to +60℃ Humidity; 85%RH or less (non-condensing)
Outside dimensions	96W×96H×117.3D [mm] (not including projections)
Panel-cut dimensions	92^{+1}_{-0}×92^{+1}_{-0} [mm]
Panel thickness	1.6 to 3.2 [mm]
Weight	Approx. 1.0kg

8-2. Outside dimensions



8-3. Block diagram

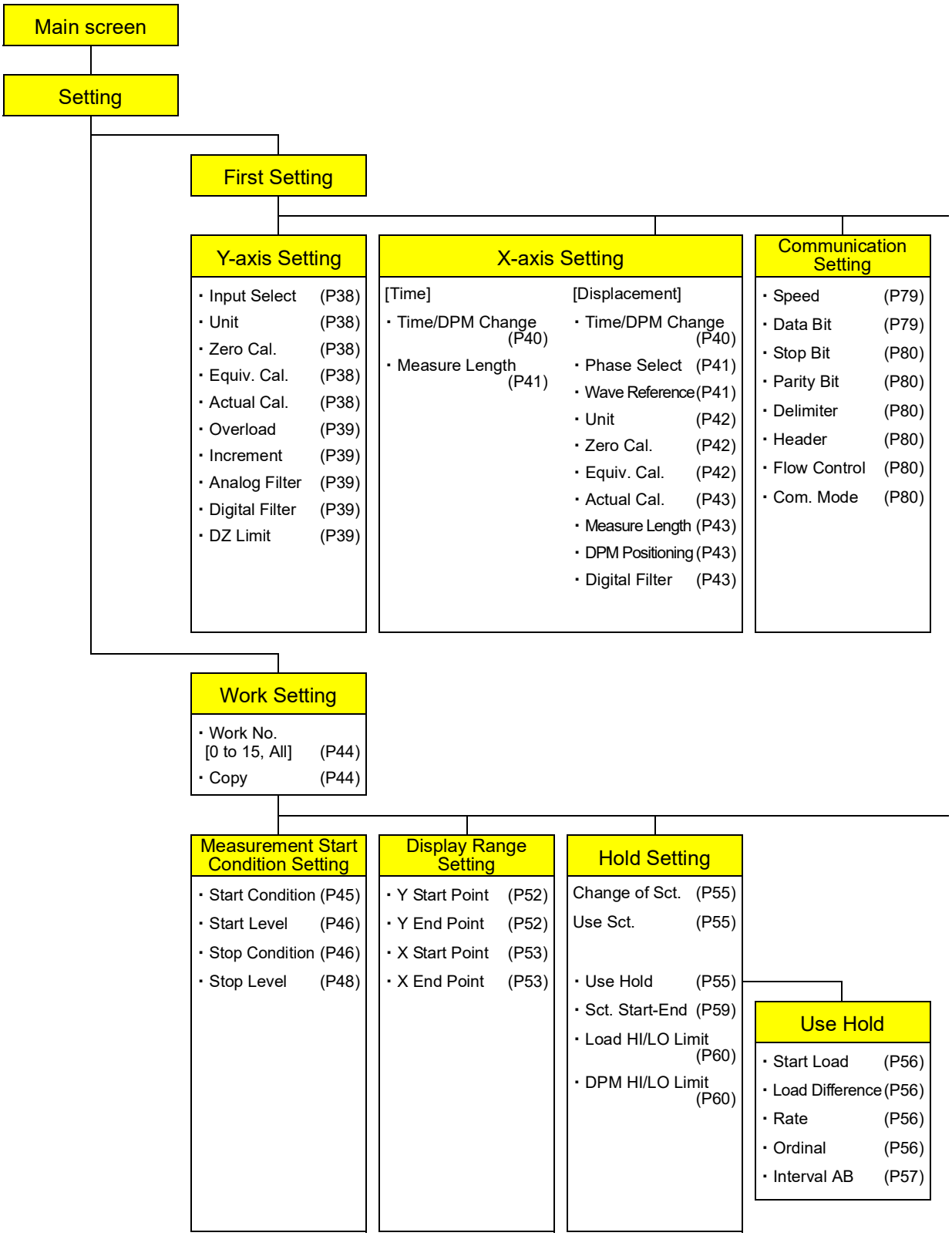


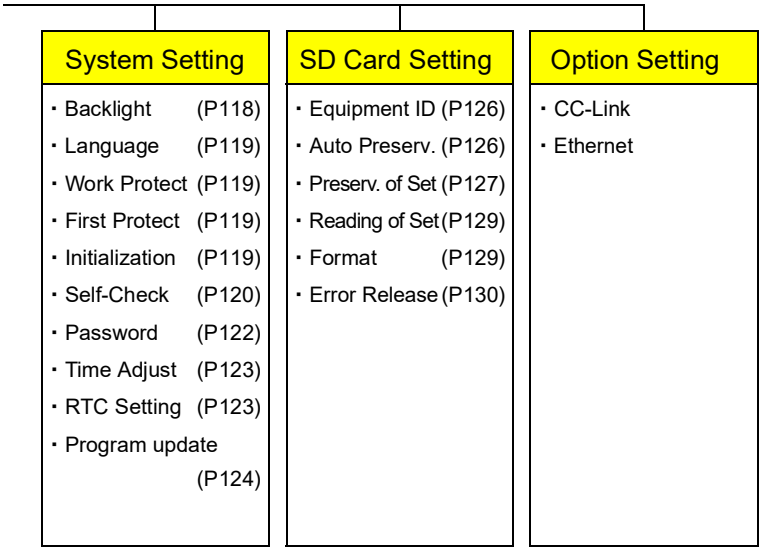
* shows photocoupler isolation.

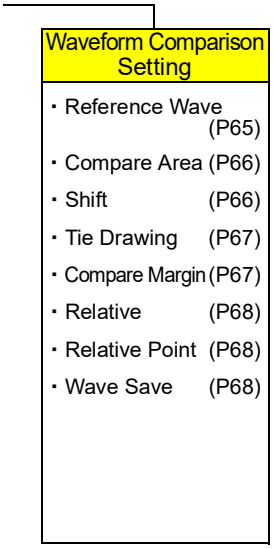
* shows pulse transformer isolation.

9 SUPPLEMENTS

9-1. Setting tree




System Setting
・Backlight (P118)
・Language (P119)
・Work Protect (P119)
・First Protect (P119)
・Initialization (P119)
・Self-Check (P120)
・Password (P122)
・Time Adjust (P123)
・RTC Setting (P123)
・Program update (P124)
SD Card Setting
・Equipment ID (P126)
・Auto Preserv. (P126)
・Preserv. of Set (P127)
・Reading of Set (P129)
・Format (P129)
・Error Release (P130)
Option Setting
・CC-Link
・Ethernet


Waveform Comparison Setting
・Reference Wave (P65)
・Compare Area (P66)
・Shift (P66)
・Tie Drawing (P67)
・Compare Margin (P67)
・Relative (P68)
・Relative Point (P68)
・Wave Save (P68)

9-2. Setting item list

■First Setting

Item	Set value	Input range (display range)	Initial value	Memory *2
Y-axis Setting	Input Select *1	0 : ±10V 1 : ±20mA	±10V	N
	Unit *1	See "9-3 Unit setting list" on p.145	kN	N
	Zero Cal. *1	Voltage input: -11.00 to 11.00 [V] Current input: -22.00 to 22.00 [mA]	0.00V 0.00mA	N
	Equiv. Cal. *1 (rated output)	Voltage input: -99.99 to 99.99 [V] (0 is excluded) Current input: -99.99 to 99.99 [mA] (0 is excluded)	10.00V 10.00mA	N
	Equiv. Cal. *1 (rated capacity)	-9999 to 9999	50.00kN	N
	Actual Cal. *1 (Load value)	-9999 to 9999	50.00kN	N
	Overload	0 to 9999	99.99kN	N
	Increment *1	0 : 1 1 : 2 2 : 5 3 : 10	0.01kN	N
	Analog Filter	0 : 10 1 : 30 2 : 100 3 : 300 [Hz]	300Hz	N
	Digital Filter	0, 2 to 999 [Times]	0 Times	N
	DZ Limit	0 to 9999	99.99kN	N
X-axis Setting	Time/DPM Change	0: Time 1: Displacement	Time	N
	Phase Select	A/B-Phase 1: Only A-Phase	A/B-Phase	N
	Wave Reference	0: Front 1: Back	Front	N
	Unit *1	See "9-3 Unit setting list" on p.145	mm	N
	Zero Cal. *1	0 to 1000000	0	N
	Equiv. Cal. *1 (number of pulses)	1 to 1000000	1000	N
	Equiv. Cal *1 (displacement value)	-99999 to 99999 *3	10.00mm	N
	Actual Cal. *1 (displacement value)	-9999 to 32000	10.00mm	N
	Measure Length	Time/Displacement Change: Time 0 : 0.5 1 : 1.0 2 : 2.0 3 : 5.0 4 : 10.0 [s] Time/Displacement Change: Displacement 0 : 2000 1 : 4000 2 : 6000 3 : 8000 4 : 10000	2.0s 60.00mm	N
	DPM Positioning	-9999 to 32000	0.00mm	N
	Digital Filter	0, 2 to 999 [Times]	0 Times	N

*1: Function-specific set values (calibration values, etc.); currently set values remain even if initialization is executed.

*2: [NOV RAM : N (Nonvolatile memory)] [SRAM : S (Built-in lithium battery backup memory)]

*3: Calibration can be made within this range, but the usable range is -9999 to 32000.

Item	Set value	Input range (display range)	Initial value	Memory *2
SD Card Setting	Equipment ID*1	0 to 999	0	N
	Auto Preserv.	0: Off 1: On (Overwrite) 2: On (Not Overwrite)	Off	N
	Preserv. of Set	0 : All Parameter 1 : Comparison Waveform	All Parameter	
	Reading of Set	0 : All Parameter (Not Include) 1 : All Parameter (Include) 2 : Comparison Waveform	All Parameter (Not Include)	
	Format			
	Error Release	0 : Only Release 1 : Annul the Current Data	Only Release	
Communication Setting	Speed	0 : 1200 1 : 2400 2 : 4800 3 : 9600 4 : 19.2k 5 : 38.4k [bps]	19.2kbps	N
	Data Bit	0 : 7 1 : 8 [bit]	8bit	N
	Stop Bit	0 : 1 1 : 2 [bit]	1bit	N
	Parity Bit	0 : None 1 : Even 2 : Odd	Even	N
	Delimiter	0 : CR 1 : CR+LF	CR	N
	Header	0 : None 1 : STX	None	N
	Flow Control	0 : Off 1 : RTS/CTS Control	Off	N
	Com. Mode	0 : Normal 1 : Hold Point Mode	Normal	N
System Setting	Backlight (ON Time) (bright→dark)	0 to 9999	10 minutes (ON Time) 0 minutes (bright→dark)	N
	Language*1	0 : Japanese 1 : English	Japanese	N
	Work Protect	0 : Not Protect 1 : Protect	Not Protect	N
	First Protect	0 : Not Protect 1 : Protect	Not Protect	N
	Initialization	0 : First Setting Parameter 1 : Work Setting Parameter 2 : All Parameter		
	Self-Check			
	Password	0 to 9999	0	
	Time Adjust*1	2001/01/01 00:00:00 to 2079/12/31 23:59:59	2001/01/01 00:00:00	S
	RTC Setting			S
	Adjust Mode	0 : Not Adjust 1 : Forward 2 : Delay	Not Adjust	
	Adjust Power	0 : Weak 1 : Strong	Weak	
	Adjust Count	0 to 63	0	
	Program update			

*1: Function-specific set values (calibration values, etc.); currently set values remain even if initialization is executed.

*2: [NOV RAM : N] [SRAM : S]

■Settings by work [Work 0 to 15, All]

Item	Set value	Input range (display range)	Initial value	Memory *2
Settings by work	Work No.	0 to 15	0	
	Copy No.	0 to 15	0	
Measurement Start Condition Setting	Start Condition	0 : Only External Input 1 : External Input + Load 2 : External Input + Displacement (2 can be set only when the X-axis of the waveform represents displacement.)	External Input + Load	S
	Start Level	External Input + Load : -9999 to +9999 External Input + Displacement : -9999 to +32000	1.00kN	S
	Stop Condition	0 : Only Forced-Stop 1 : Load 2 : Time 3 : Displacement 4 : Displacement Stop (3 and 4 can be set only when the X-axis of the waveform represents displacement.)	Only Forced-Stop	S
	Stop Level	Load : -9999 to +9999 Time : 0.1 to 10.0 [second] Displacement : -9999 to +32000 Displacement Stop : 0.1 to 10.0 [second]	1.00mm	S

*2: [NOV RAM : N] [SRAM : S]

Item	Set value	Input range (display range)	Initial value	Memory *2
Display Range Setting	Y Start Point	-10000 to 10000	0.00kN	S
	Y End Point	Y-axis Start Point + 0 : 25 1 : 50 2 : 100 3 : 200 4 : 300 5 : 400 6 : 500 7 : 1000 8 : 2000 9 : 3000 10 : 4000 11 : 5000 12 : 10000 13 : 20000	20.00kN	S
	X Start Point	Time or displacement (Front) 0 to 2000 × Measurement Length/2000 Displacement (Back) -2000 to 0 × Measurement Length/2000	0ms	S
	X End Point	Time or displacement (Front) X-axis Start Point + 0 : 25 1 : 50 2 : 100 3 : 200 4 : 400 5 : 600 6 : 800 7 : 1000 8 : 1200 9 : 1400 10 : 1600 11 : 1800 12 : 2000 13 : 2200 × Measurement Length/2000 Displacement (Back) X-axis Start Point + 0 : -25 1 : -50 2 : -100 3 : -200 4 : -400 5 : -600 6 : -800 7 : -1000 8 : -1200 9 : -1400 10 : -1600 11 : -1800 12 : -2000 13 : -2200 × Measurement Length/2000	2000ms	S
Hold Setting	Change of Sct. (common to all work)	0 : External Input 1 : Setting (0 can be set only when the time or displacement (Front))	Setting	S
	Use Sct.	1 to 5	1	S
	Sct. No. (for RS-232C communications)	0 : Sct1 1 : Sct2 2 : Sct3 3 : Sct4 4 : Sct5		S
Section 1 to 5	Use Hold	0 : Always 1 : Sample 2 : Peak 3 : Bottom 4 : Peak to Peak 5 : Relative Maximum 6 : Relative Minimum 7 : Inflection Point 8 : Average 9 : End Displacement	Always	S
	Sct. Start-End (start point,end point)	Time or displacement (Front) 0 to 2047 × Measurement Length/2000 Displacement (Back) -2047 to 0 × Measurement Length/2000	0 to 2047ms	S

*2: [NOV RAM : N] [SRAM : S]

Item	Set value	Input range (display range)	Initial value	Memory *2
Section 1 to 5	Load HI/LO Limit (HI limit, LO limit)	-9999 to +9999	-99.99 to 99.99kN	S
	DPM HI/LO Limit (HI limit, LO limit)	Waveform Reference; Front 0 to 2047 × Measurement Length/2000 Waveform Reference; Back -2047 to 0 × Measurement Length/2000 * When End Displacement in Use Hold is selected; -9999 to 32000	0 to 61.41mm	S
	Start Load	-9999 to 9999	1.00kN	S
	Load Difference	1 to 19998	1.00kN	S
	Rate	0 : 1/4 1 : 1/2 2 : 3/4 3 : 1 4 : 1.25 5 : 1.5 6 : 1.75 7 : 2 8 : 3 9 : 4 [Times]	3/4 Times	S
	Ordinal	1 to 15 [Times]	1 Times	S
	Interval AB (Inflection PointA, Inflection PointB)	1 to 999 × Measurement Length/2000	100ms, 100ms	S
Waveform Comparison Setting	Reference Wave			
	Compare Area (start point,end point)	Time or displacement (Front) 0 to 2047 × Measurement Length/2000 Displacement (Back) -2047 to 0 × Measurement Length/2000	0 to 2047ms	S
	Shift	Range; Time or displacement (Front) 0 to 2047 × Measurement Length/2000 Displacement (Back) -2047 to 0 × Measurement Length/2000 Amount of movement : -19998 to +19998	0 to 2047ms 0.00kN	
	Tie Drawing			
	Compare Margin	0 to 9999	0kN	S
	Relative (common to all work)	0 : Off 1 : On	Off	S
	Relative Point	X-axis : Time or displacement (Front) 0 to 2047 × Measurement Length/2000 Displacement (Back) -2047 to 0 × Measurement Length/2000 Y-axis : -9999 to 9999	X-axis : 0ms Y-axis : 0.00kN	S
	Wave Save			

*2: [NOV RAM : N] [SRAM : S]

9-3. Unit setting list

* Numbers are values in the RS-232C input range.
  Also, “0” results in no unit.

Weight		Force		Pressure		Length		Angle		Other			
1	µg	11	µN	28	µPa	45	µm	52	rad	55	g/cm^3	89	l/s
2	mg	12	mN	29	mPa	46	mm	53	°	56	kg/m^3	90	l/min
3	g	13	N	30	Pa	47	cm	54	deg	57	t/m^3	91	l/h
4	kg	14	kN	31	hPa	48	m			58	g/l	92	µA
5	Mg	15	MN	32	kPa	49	km			59	g/ml	93	mA
6	t	16	µNm	33	MPa	50	in			60	mg/m	94	A
7	lb	17	mNm	34	GPa	51	ft			61	kg/m	95	kA
8	dyne	18	Nm	35	N/m^2					62	kgm/s	96	µV
9	kdyne	19	kNm	36	µbar					63	kgm^2/s	97	mV
10	oz	20	MNm	37	mbar					64	kgm^2	98	V
		21	ftlb	38	bar					65	mPas	99	kV
		22	inlb	39	mmHg					66	Pas	100	Ω
		23	inoz	40	inH_2O					67	m^2/s	101	kΩ
		24	Ncm	41	ftH_2O					68	mm/s	102	MΩ
		25	gcm	42	psia					69	m/s	103	W
		26	kgcm	43	psig					70	mm/min	104	kW
		27	kgm	44	atom					71	cm/min	105	MW
										72	m/min	106	VA
										73	m/h	107	℃
										74	km/h	108	℉
										75	m/s^2	109	J
										76	rpm	110	kJ
										77	Hz	111	MJ
										78	kHz	112	%RH
										79	MHz	113	l
										80	kg/s	114	m^3
										81	t/s	115	%
										82	kg/min	116	‰
										83	t/min	117	ppm
										84	kg/h		
										85	t/h		
										86	m^3/s		
										87	m^3/min		
										88	m^3/h		

9-4. Error messages

■Load errors

Error	Description
Zero Err	The sensor input signal in performing zero calibration is outside the zero calibration range. Check that unwanted force is not applied to the sensor and that there is no break in the cables and there is no mistake in wiring, and then perform zero calibration again.
Span Err	[During actual load calibration] The sensor input signal is outside the actual load calibration range. Or, the same value as the zero calibration value is input. Check that load in the actual load calibration range is applied to the sensor and that there is no break in the cables and there is no mistake in wiring, and then perform calibration again. [During equivalent input calibration] The values input to the rated output and display value are outside the equivalent input calibration range. Or, "0" is input. Check that they are not different from the data sheet of the sensor, and then perform calibration again.
Sensor +	The sensor input signal is beyond the signal input range. It is considered that excessive force is applied to the sensor. Remove the load. If such overload cannot be identified and the error cannot still be removed, break(s) in the cables, mistake(s) in wiring, or sensor failure is considered.
Sensor -	The sensor input signal is below the signal input range. It is considered that reversely-directed force is applied to the sensor. Check around the sensor. If such reversely-directed force cannot be identified and the error cannot still be removed, break(s) in the cables, mistake(s) in wiring, or sensor failure is considered.
+ OVER	A signal equivalent to a display value beyond +9999 is input. It is considered that unexpectedly excessive load is applied to the sensor. Perform calibration by setting so that the maximum value of measurement will not go beyond +9999.
- OVER	A signal equivalent to a display value below -9999 is input. It is considered that unexpectedly excessive reversely-directed load is applied to the sensor. Perform calibration by setting so that the minimum value of measurement will not drop below -9999.
OVERLOAD	A signal equivalent to a display value beyond the overload set value is input. It is considered that excessive force is applied to the sensor. Remove the load.
DZ Limit	The digital-zeroed load (|load subjected to digital zero - zero calibration load|) is beyond the range of the digital zero limit set value. It is considered that the sensor's zero point has deviated due to deterioration from aging, etc. Return the input signal to the setting range or increase the digital zero limit set value, and then perform digital zero again and input the Reset signal.
Comp Err	When the setting of Relative Comparison in Waveform Comparison Setting is "On," measurement has not been carried out to the set Reference Point of Relative Comparison. Carry out measurement to the Reference Point of Relative Comparison.

■Displacement errors

Error	Description
ZeroErr	The sensor input signal in performing zero calibration is outside the zero calibration range. Check that unwanted force is not applied to the sensor and that there is no break in the cables and there is no mistake in wiring, and then perform zero calibration again.
SpanErr	[During actual load calibration] The sensor input signal is outside the actual load calibration range. Or, the same value as the zero calibration value is input. Check that load in the actual load calibration range is applied to the sensor and that there is no break in the cables and there is no mistake in wiring, and then perform calibration again. [During equivalent input calibration] The values input to the rated output and display value are outside the equivalent input calibration range. Or, "0" is input. Check that they are not different from the data sheet of the sensor, and then perform calibration again.
Sensor+	The sensor output pulse count is beyond the F388A internal count range. Set so that the sensor output pulse count will not go beyond the internal count range. Also, input the DPM Positioning signal at an appropriate time because inputting the DPM Positioning signal clears the internal count to zero.
Sensor-	The sensor output pulse count is below the F388A internal count range. Set so that the sensor output pulse count will not drop below the internal count range. Also, input the DPM Positioning signal at an appropriate time because inputting the DPM Positioning signal clears the internal count to zero.
+ OVER	A signal equivalent to a display value beyond +32000 is input. It is considered that the displacement is moving beyond the maximum expected displacement. Perform calibration by setting so that the maximum value of measurement will not go beyond +32000.
- OVER	A signal equivalent to a display value below -9999 is input. It is considered that the displacement is moving below the displacement expected in the reverse direction. Perform calibration by setting so that the minimum value of measurement will not drop below -9999.
PaceErr	The displacement pace is too fast to perform sampling in time, and 10 or more measurement points of data are skipped. Adjust the displacement pace so that it will become 10 pieces of data/4000sps or less. One piece of data corresponds to the Measurement Length/2000.

■Error release

- Common to load errors and displacement errors

Error	Error release
Zero Err	Perform zero calibration within the zero calibration range.
Span Err	Perform actual load calibration within the actual load calibration range. Or, perform equivalent input calibration within the equivalent input calibration range.
Sensor + Sensor -	Bring the sensor input into the signal input range/internal count range.
+ OVER - OVER	Load : Make the load indicated value -9999 to +9999. Displacement : Make the displacement indicated value -9999 to +32000.

- Load errors

Error	Error release
OVERLOAD	After the indicated value falls within the set Overload value, turn OFF → ON the Reset input, or press Reset on the Main screen.
DZ Limit Comp Err	Turn OFF → ON the Reset input, or press Reset on the Main screen. Or, turn the power off and then on again.

- Displacement error

Error	Error release
PaceErr	Turn OFF → ON the Reset input, or press Reset on the Main screen. Or, turn the power off and then on again.

9-5. Troubleshooting

Items	Questions	Answers
Sensor	Does the indicated value display change according to the unit of the sensor used?	The indicated value is not converted according to unit change. After change, perform actual load calibration or equivalent input calibration.
Wiring and connection	About the cables to be connected to the terminal block	The analog input/output terminals are screw type. Directly connect individual cables. For details, see "2-2 Sensor connection" on p.10. For connection to the power input terminals, use 6mm or less crimp contacts.
	The power cannot be turned on.	Check to see if the power cord is connected properly. Connect the power cord properly.
		Check to see if the power supply is in the specified range. Use a power supply in the specified range, and make proper connection confirming plus and minus.
Setting and operation	How can the decimal place be changed?	The decimal place of HI limit, LO limit, etc., are in conjunction with the decimal place set at the time of actual load calibration or equivalent input calibration. Perform calibration again, and change the decimal place.
	No result/value is output, or a result/value is abnormal.	Check to see if the output cable is connected properly. Connect the output cable properly referring to the equivalent circuit diagram.
		Check to see if the power is on. External input/output signals require external power supply. Turn on the power.
	Are the set data erased when the power is turned off?	The set data are not erased even if the power is turned off.
	Are the set data erased if no power is applied for a long time?	The F388A preserves the settings for approx. 5 years with the power off. However, the preservation period may become short depending on the operating condition and installation environment.
	If any number other than the selectable items is selected in setting, what happens?	The maximum possible value in the setting range is set. Example) If "5" is selected for the item the setting range of which is "0," "1" and "2," "2" is set.
RS-232C	RS-232C communications cannot be carried out.	Check to see if the communication cable is connected properly. Turn off the power, and then connect the communication cable properly.
		Check to see if the communication cable in use is proper. Check the wiring, and connect the communication cable properly.
		Check to see if the communication conditions between the F388A and equipment connected are in agreement. Check the communication conditions, and make the settings consistent with the equipment connected.
	Is any special program needed for communications with a PC?	Programming is necessary. Create software to exchange commands by timing as required.
Option	Can two or more options be mounted?	The following items can be mounted. (Four at the maximum) - Communications (CC-Link, Ethernet) - I/O (Source type)

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