FS10

LOADCELL MONITOR

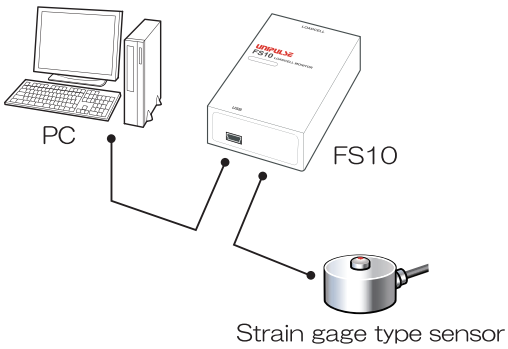
OPERATION MANUAL

01JAN2022REV.1.03

UNIPULSE

Introduction

Thank you for purchasing the FS10 loadcell monitor.
FS10 is a monitor for strain gage type sensors. The USB interface is installed in FS10, so the PC application software achieves data analysis easily for R&D.
Be sure to read this operation manual before use in order to take full advantage of the superb quality of the FS10 and to use it properly and safely. Use this product with accurate understanding of the contents.
Keep this operation manual in a safe place to be used for further reference.



Safety precautions

Be sure to read for safety.

Make sure that installation, maintenance, and inspection of the FS10 are performed by personnel with electrical knowledge.
In this manual, precautions for safe use of the FS10 are described separately as ⚠ Warning and ⚠ Caution in the following text. The precautions described in this text are important contents regarding safety. Use this product with accurate understanding of the contents.

⚠ Warning

Events that may cause death or severe injury to personnel in case of misuse.

⚠ Caution

Events that may cause injury to personnel or material damage in case of misuse.

⚠ Warning

Events that may cause death or severe injury to personnel in case of misuse.

Design warning

- Prepare a safety circuit outside the FS10 so that the entire system functions safely if the FS10 fails or malfunctions.
- Be sure to contact our sales representative before use if the FS10 will be used in the following situations:
  - In an environment not described in the operation manual;
  - In a way that causes substantial effects on medical devices, transportation equipment, entertainment devices, safety devices, etc.

Installation warning

- Do not disassemble, repair or alter the FS10. Fire or electric shock may occur.
- Do not install the product in the following environments:
  - Locations with corrosive gases or combustible gases;
  - Locations over which water, oil, or chemicals splash.

Wiring warning

- Do not connect a commercial power source directly to the sensor connector.
- When you perform connection to the ground terminal, please make sure that no power is applied.
- For connection to the sensor, check the signal names and pin assignment numbers, and then carry out wiring properly.

Startup/maintenance warning

- Use a power supply voltage and load within the specified and rated ranges.
- 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 disconnect the USB cable.

⚠ Caution

Events that may cause injury to personnel or material damage in case of misuse.

Installation precautions

- Do not install the product in the following environments:
  - Locations where temperature or humidity exceeds specifications;
  - Locations subject 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 excessive salt and metal powder;
  - Locations where the main unit is subject to direct vibration and shock.
- Perform adequate shielding if the product is used in the following locations:
  - Near power lines;
  - Locations subject to strong electric field and magnetic field;
  - Locations subject to noise such as static electricity and relays.
- Install the product 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 it is damaged.

Wiring precautions

- For sensors, use shielded cables.

Startup/maintenance precautions

- Be sure to have a time interval of five seconds or longer between turning the power on and off or between the USB cable plugging in and unplugging.
- Use only after warming up for 30 minutes or longer following the start of power supply.
- Protective performance of the FS10 may be lost if it is not used as specified.
- Cleaning
  - During cleaning, unplug the adapter from the outlet and the USB cable from the PC.
  - Do not wipe with a wet cloth, benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the FS10. When dirty, clean the product with a cloth soaked in diluted neutral detergent and squeezed and then wipe with a soft, dry cloth.

Transportation precautions

- Although the FS10 is considered to be sufficiently shock absorbing during delivery, reusing the same packaging materials may damage the product when a shock is encountered. When sending this product to us for repair and so on, pack it with sufficiently shock-absorbing materials.

Disposal precautions

- Dispose of as industrial waste.

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

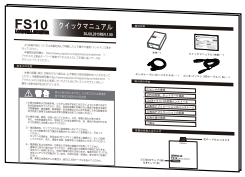
1-1. Main features of the FS10

- This is a simple loadcell monitor to check and fetch the data of the strain gauge sensor easily.
- The data logging, waveform drawing and various settings can be performed by the PC application software.
- The function to allow the interval logging.
- Up to 1000 files of waveform data can be fetched in CSV format on your PC.

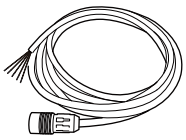
1-2. Package contents and accessories

The following items are included in the package box.
Be sure to check the contents before use.

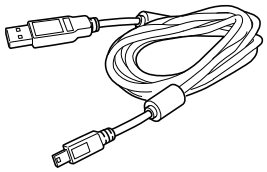
FS10 main unit・・・One unit



FS10 quick manual・・・One copy

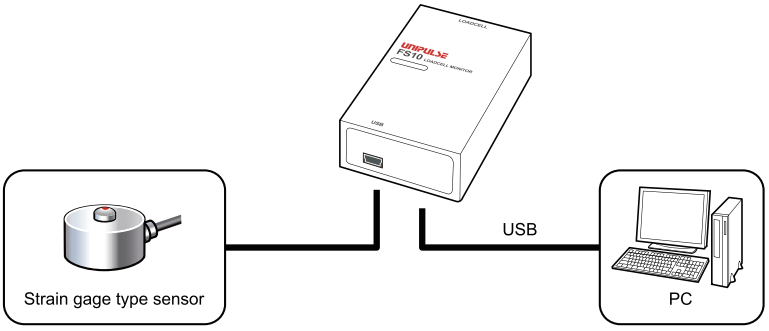


Sensor cable (1m)・・・One piece

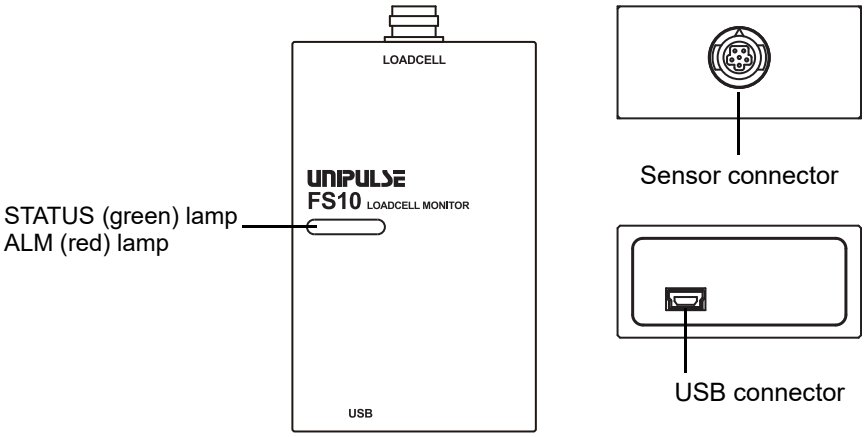


A-miniB
USB cable (1.8m)・・・One piece

1-3. Connection with other devices



1-4. Part names and functions



STATUS lamp (green)

Sensor operation status is indicated.

Near zero:	Slow flashes
HI/LO:	Fast flashes
OK:	Lights on

Refer to P.12 "■HI-LO limit comparison" for details.

ALM lamp (red)

Error status is indicated.

LOAD/OFL:	Fast flashes
Normal:	Lights off

Refer to P.31 "6-4.Error / Message" for details.

Sensor connector

This part is connected to the sensor with the cable included.

Refer to P.3 "■Connection of sensor" for connection.

USB connector

This part is connected to the PC with the USB cable included.

Refer to P.4 "■Connection of the USB cable" for connection.

2 Connection

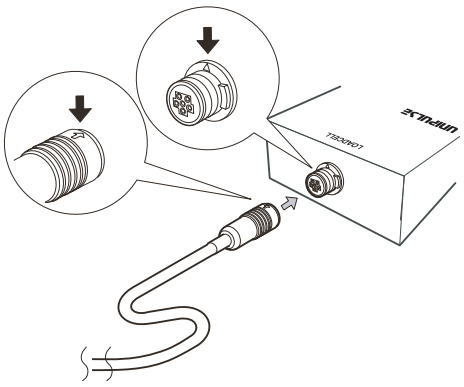
The following precautions are related to connection.
The precautions described in this text are important contents regarding safety.
Connect this product with accurate understanding of the contents.

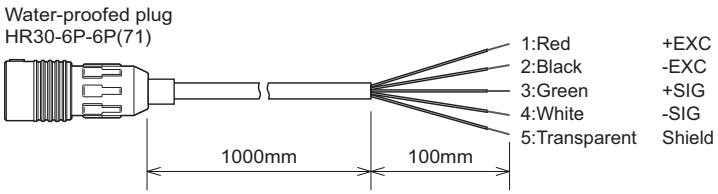
⚠ Warning
● Do not connect commercial power supply directly to the main unit.
● Be sure to check the wiring and so on carefully before turning the power on.

2-1. Connection procedure

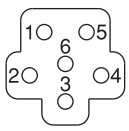
■Connection of sensor

The connection with the sensor can be easily performed with the dedicated cable included.
Connect the sensor while paying attention to the direction of the arrow on the connector.





● Pin assignment

Pin-out	Pin number	Wire color	Signal name
	1	Red	+EXC
	2	Black	-EXC
	3	Green	+SIG
	4	White	-SIG
	5	Transparent	SHIELD
	6	—	N.C.

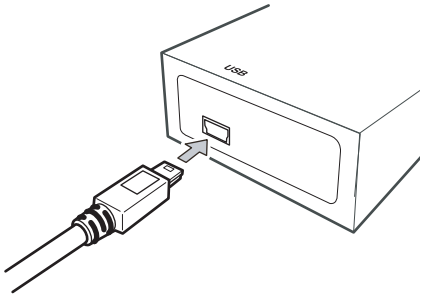
End point style is peeled and insulator and soldered. Recommend to using the terminal block.
Thickness of the cable: AWG26, outside diameter ϕ 3.0
Compatible connector: HR30-6P-6P (manufactured by HIROSE ELECTRIC CO., LTD.)
(Model without optional connector: CN90)

■Connection of the USB cable

The USB cable included enables easy connection to the PC.

Do not connect the USB cable if FS10 is being connected with the PC for the first time. Refer to P.5 "3-2.PC preparation" for connection procedures.

Once the USB cable is connected, the FS10 turns on due to power supply from the USB cable, and ALM (red) lamp or STATUS (green) lamp operates.



3 Setting Procedures

3-1. USB interface

■Communication specifications

Communication standard	USB Ver.2.0 compliant, full speed (12Mbps)
Connector	mini-B TYPE

3-2. PC preparation

Please make sure to install USB drive and PC application prior to connecting FS10 to the PC for the first time.

■PC operating environment

OS	Windows7/10/11 Japanese-language edition, English-language edition, The simplified chinese edition
Display	800×640 pixels or more
USB port	One empty port (USB2.0 or above)
USB driver	Virtual COM Port(VCP) Drivers by FTDI Ltd.
Memory	2GB or above
Hard disk	15GB free space or more

■USB driver installation

Online network to perform automatic installation of driver.

Please go online network.

The driver automatically downloaded and installed via the network when FS10 connected to PC with the USB cable.

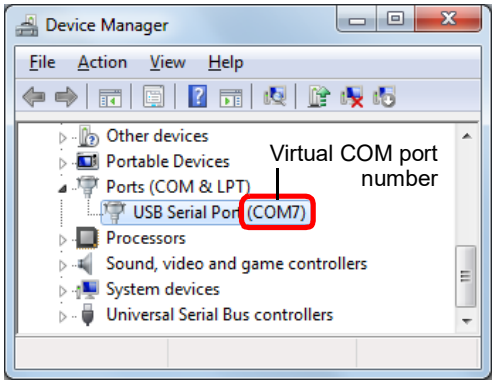
In case of failing driver installation or not starting of PC application software, you delete the USB driver and reconnect to PC. Please try again.

If it doesn't automatically perform installation, see the homepage of FTDI.

Guide	http://www.ftdichip.com/Support/Documents/InstallGuides.htm
Driver	http://www.ftdichip.com/Drivers/VCP.htm

■Check of virtual COM port

Please check the virtual COM port number which the FS10 is connected from the device manager of PC.



Point

If the COM port number of the FS10 cannot be determined due to multiple USB Serial Ports and so on, unplug the USB cable once and confirm that one COM port is removed from the list of ports (COM and LPT). When the USB cable is reconnected to the previous connector, the number of COM ports displayed in the list increases. This number represents the COM port number of the FS10.

■Installation of the dedicated PC application

Setting up the FS10 by the PC application software and use it for data management and data analysis. Please download and install it from the Unipulse homepage. To download the application, user registration (free) is required.
https://www.unipulse.tokyo/en/product/fs10/

Download the compressed file to the PC from the download page

▼

Extract the compressed file on the PC and start up the installer

▼

Follow the procedure and complete the installation

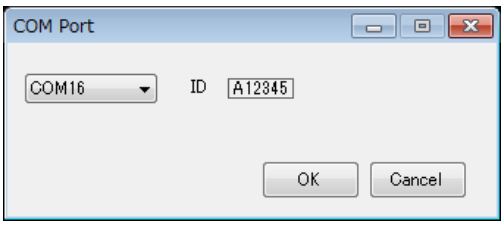
■Startup of PC application

Double-click the shortcut of the FS10 on the desktop or click "UNIPULSE" -> "FS10" -> FS10 from the Start menu.

Shortcut

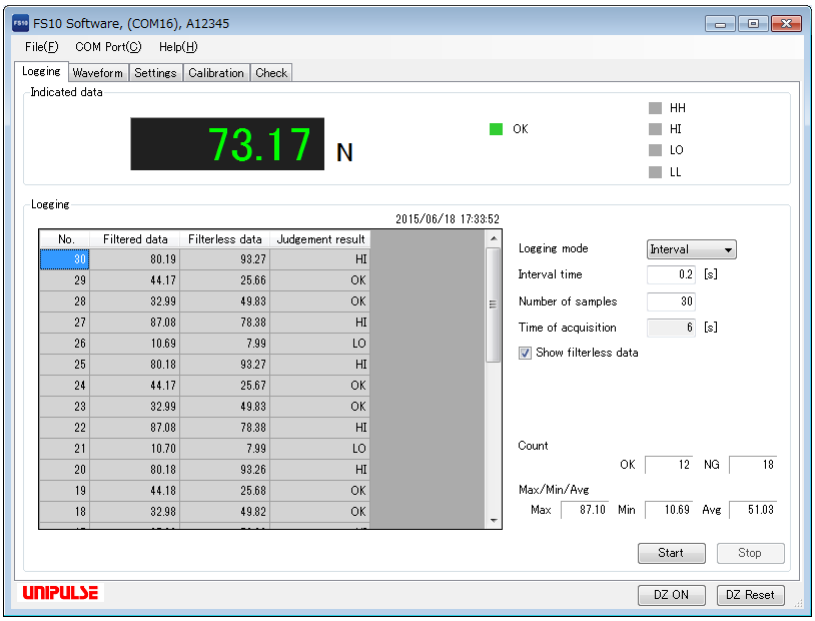
■COM Port selection

The COM Port selection screen will appear when the product is started up for the first time after the FS10 software has been installed. Once the COM Port is selected and the “OK” button is clicked, connection with the FS10 is made and the Main screen will appear.



3-3. Logging tab

Logging of receiving data is performed.



■Indicated data

Data and status of the FS10 are displayed in this tab. (Filtered data)

■Logging mode

<Setting value>

Fixed: Logging is performed at a sampling interval of the FS10.
Set the count of data in “Number of samples”.

Interval: Logging of the data from the FS10 is performed at a specified time interval. Specify the time interval in “Interval time”, and set the count of data in “Number of samples”.

■Interval time

A logging interval when the logging mode is “Interval” is specified.

<Setting value> 0.1 to 999.9 [s]

■Number of samples

The number of data samples to be logged is specified.

<Setting value> 1 to 10000

■Time of acquisition

Time of data acquisition which is automatically calculated by the following equations is displayed.

“Time of acquisition” = “Number of samples”/1200 (in Fixed mode)
“Time of acquisition” = “Number of samples” × “Interval time” (in Interval mode)

■Show filterless data

The data not filter-processed inside the FS10 is displayed in a list.

■Start

Logging starts when the “Start” button is clicked. Data is displayed in a list during logging.
The data in the first row of the list is the latest data.

No.:	Sequence number of receiving data (1, 2, ・・・, n “Number of samples”)
Filtered data:	Data processed by removing noise and fluctuation of “Filterless data” with low pass filter and moving average.
Filterless data:	Data processed by A/D converting input from sensor and correcting with calibration Coefficient.
Judgment result:	Result based on comparison between the “Filtered data” and threshold value (“HH”, “HI”, “LO”, “LL”).

A dialog for specifying a file name to save the acquired data is displayed when logging is complete.

■Stop

Click the “Stop” button to stop logging. A dialog for specifying a file name to save the acquired data is displayed until the “Stop” button is clicked even if logging is stopped with the “Stop” button.

■Count

OK:	The count of data when “Judgement result” is “OK” is displayed.
NG:	The count of data when “Judgement result” is other than “OK” is displayed.

■Max/Min/Avg

The logged maximum/minimum/average value of “Filtered data” is displayed.

■File menu

- SaveAs

The logging data being displayed will be saved in a file.(CSV format)
A file name is set in the file save dialog.

- Save

The logging data being displayed will be overwritten on the file specified in Save As.

- Print

The screen hard copy will be printed.

- Exit

The software will be ended.

■DZ ON (Digital zero)

This function zeros the indicated value.

Point

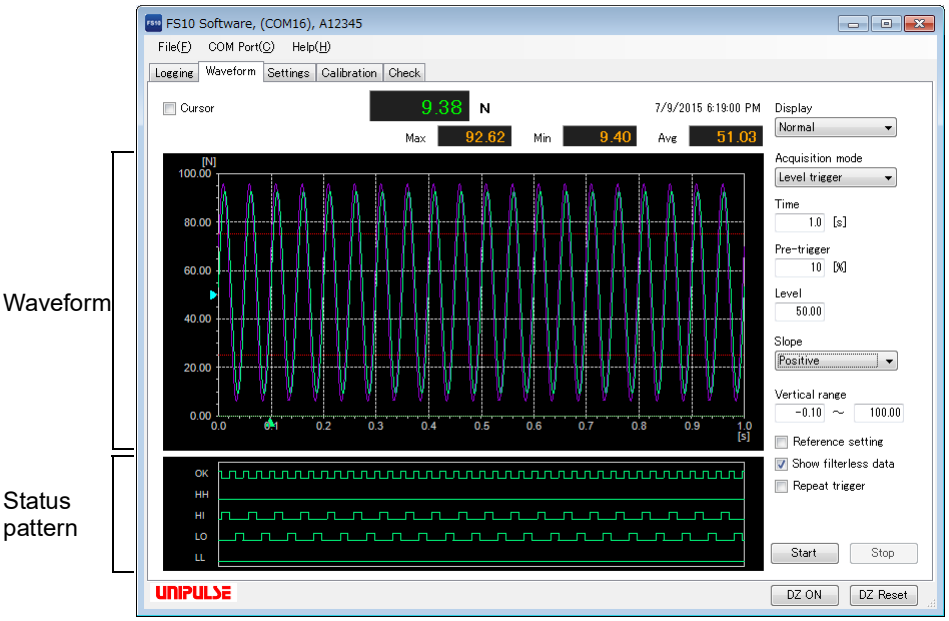
- The digital zero function is reset when the power is turned OFF.
- If the digital offset is set, even if Digital Zero is executed, zero will not result. (Indicated value = -Setting value of digital offset)

■DZ reset (Digital zero reset)

The condition previous to correction by digital zero is restored.

3-4. Waveform tab

Data is displayed as a waveform. The waveform is displayed in the upper part. The status pattern is displayed in the lower part.



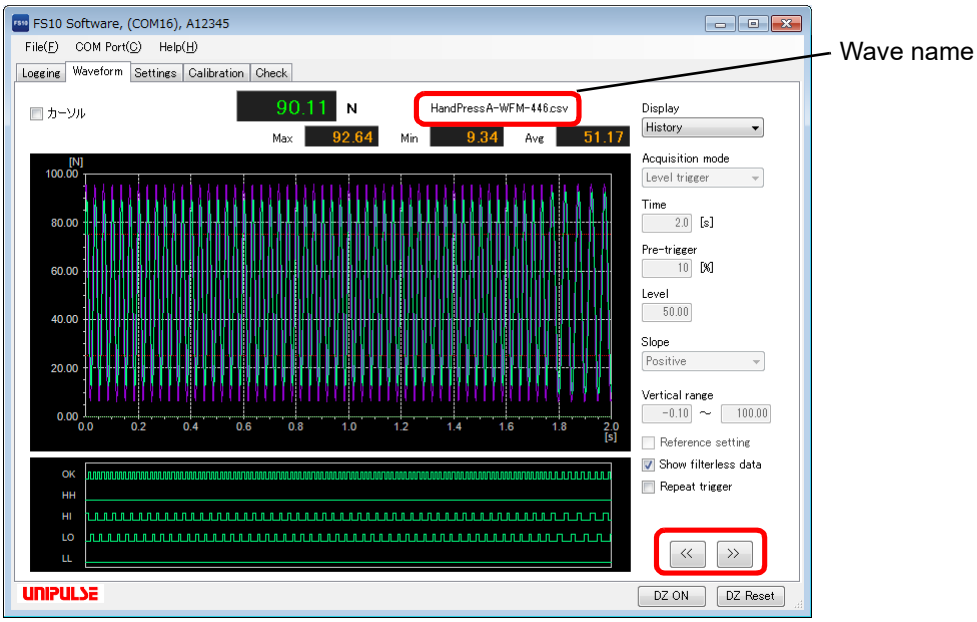
■Display mode

<Setting value>

Normal: The acquired data is drawn.

History: The data previously acquired is drawn. A single file can be drawn from a maximum of 1,000 waveform files automatically saved. Waveform files can be selected with the button in the right bottom of the screen.(<<:Prev, >>:Next)
The file name of the waveform being displayed is displayed on the analog waveform.

The file name being displayed is “HandPressA-WFM-007.csv”. “HandPressA” part can be arbitrarily set by user. Setting can be changed in the “Calibration” tab. “007” is a consecutive number. The range of consecutive numbers is 000 to 999. If the number exceeds 999, it will be overwritten from 000.



■Waveform mode

<Setting value>

Single: Graph display starts as soon as the “Start” button is clicked and continues up to acquisition time of waveform data (“Time”).

Continuous: Graph display starts as soon as the “Start” button is clicked and restarts once acquisition time of waveform data (“Time”) has elapsed.
This operation is repeated until the “Stop” button is clicked.

Level trigger: Data acquisition starts when the “Start” button is clicked and filtered data crosses the value specified in “Level” in the specified direction of “Slope”; it continues up to acquisition time of waveform data.
Graph is displayed after position of Level crossing has been adjusted to the position specified in percentage from the left on the X-axis. This position is specified in “Pre-trigger”.

■Time

Data acquisition time is set.

<Setting value> 0.1 to 1000.0 [s]

■Pre-trigger

The time before trigger point when “Waveform mode” is “Level trigger” is set in percentage.

<Setting value> 0 to 99 [%]

■Level

The threshold value to start data acquisition when “Waveform mode” is “Level trigger” is specified.

<Setting value> -99999 to 99999

■Slope

The slope where filtered data crosses “Level” when “Waveform mode” is “Level trigger” is specified.

<Setting value> Either / Positive / Negative

■Vertical range

The range of vertical axis of waveform data to be displayed is specified.

<Setting value> -99999 to 99999

■Reference setting

The waveform being displayed can be specified as reference. The color of waveform being displayed changes from green to light blue when checked. Later, the acquired waveforms will be overwritten.

■Show filterless data

The data not filter-processed inside the FS10 is displayed while each datum is superimposed in purple.

■Repeat trigger

"Repeat trigger" can be selected when "Level trigger" is selected as "Waveform mode". When "Repeat trigger" is selected, status will return to trigger standby after waveforms have been acquired. Therefore, waveform acquisition will be repeated.

■Cursor

A cursor is displayed on the graph. The cursor can be moved by dragging.

■Start

Acquisition of waveform data starts when the "Start" button is clicked.

■Stop

Data acquisition stops when the "Stop" button is clicked.

■File menu

- SaveAs

The waveform data being displayed will be saved in a file. (CSV format)
A file name is set in the file save dialog.

- Save

The waveform data being displayed will be overwritten on the file specified in Save As.

- Recall

The waveform data saved in the file will be displayed.

- Print

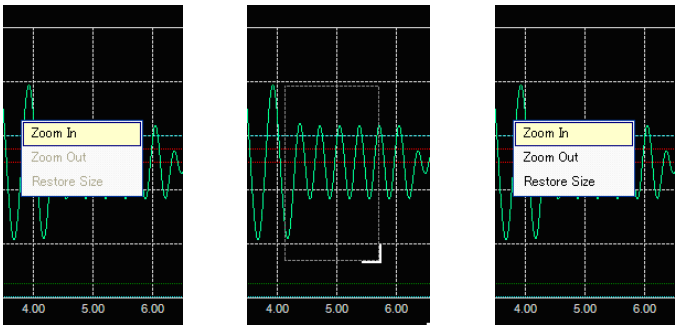
The screen hard copy will be printed.

- Exit

The software will be ended.

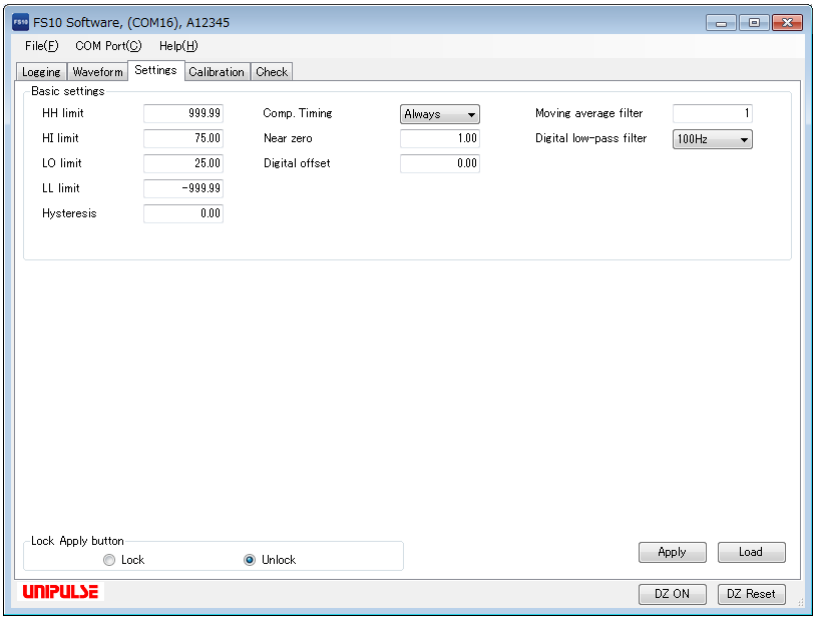
■Zoom-in display and scroll

Right-click with the mouse on the graph and select "Zoom In".
A zoom-in range can be specified with the mouse.
Select "Zoom Out" to return to the previous zoom-in status, and "Restore Size" to return to the status before zoom-in.
Graph scrolls up and down from side to side when the graph is dragged during zoom-in display.



3-5. Setting tab

Various parameters of the FS10 are set in this tab.



■HI-LO limit comparison

< Comparison conditions >

- HH

  ON condition: Indicated value > HH limit value

  OFF condition: Indicated value ≦ HH limit value

- HI

  ON condition: Indicated value > HI limit value

  OFF condition: Indicated value ≦ HI limit value

- LO

  ON condition: Indicated value < LO limit value

  OFF condition: Indicated value ≧ LO limit value

- LL

  ON condition: Indicated value < LL limit value

  OFF condition: Indicated value ≧ LL limit value

- OK

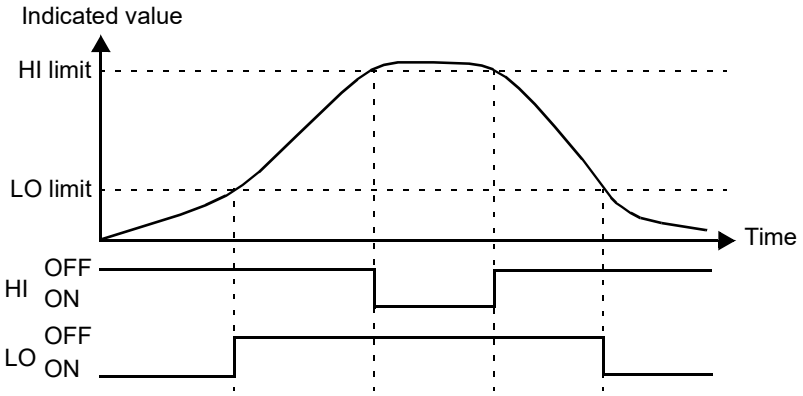
  ON condition: HH, HI, LO and LL are OFF.

  OFF condition: When either of HH, HI, LO or LL is ON.

Point

- Comparison conditions is a case where a setup of comparison timing is "always".
- STATUS lamp (green) turns on when "OK" is ON.
  STATUS lamp (green) flushes fast when "HH", "HI", "LO" or "LL" are ON.

< The example of HI/LO limit output of operation >



■Hysteresis

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

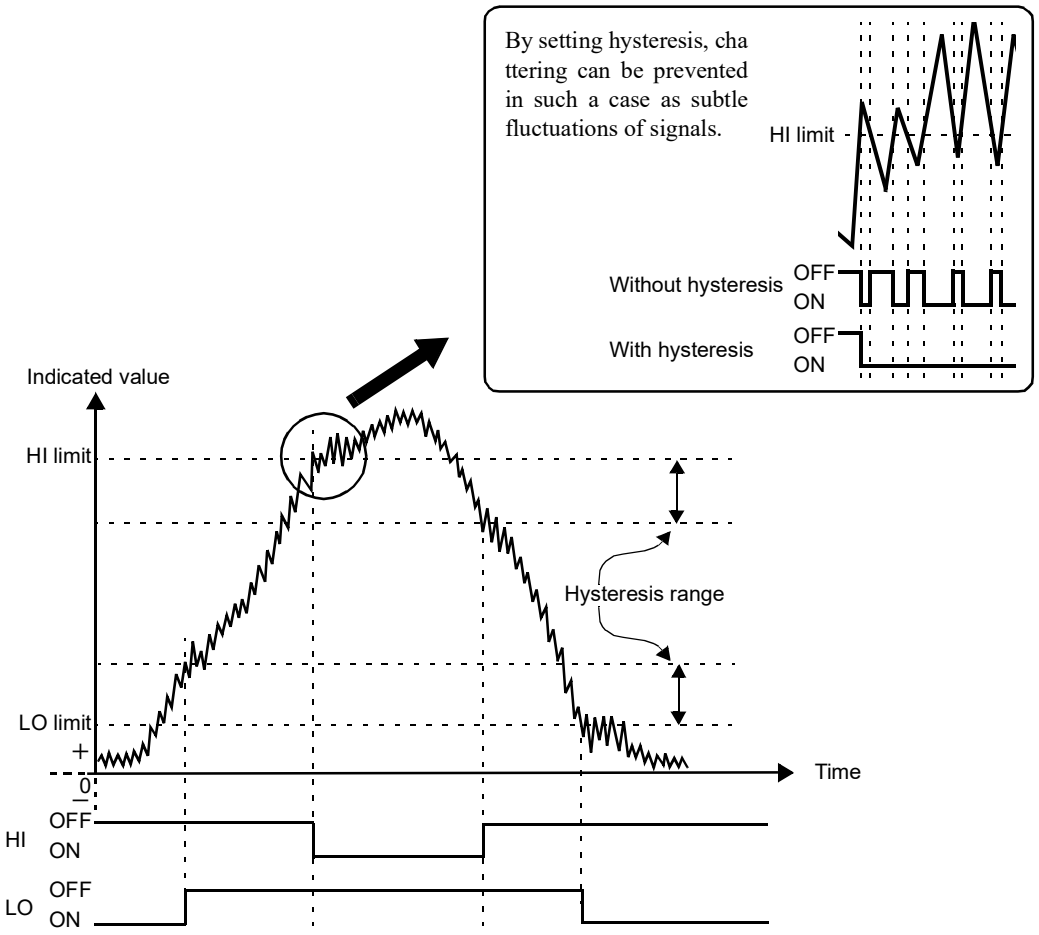
< Comparison conditions >

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

Point

Hysteresis setting is the same for HH/HI/LO/LL limit.

< The example of hysteresis operation >



■Near zero

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

ON condition: | indicated value | ≦ near zero setting value
OFF condition: | indicated value | > near zero setting value

Point

- Near zero ON/OFF is closely related to the Comparison timing.
  Refer to P.14 "■Comparison timing".
- STATUS lamp (green) flushes slowly when Near zero is ON.

■Comparison timing

Set the operating condition of HI-LO limit comparison.

Always: Comparison is always performed.
NZ: Comparison is performed when near zero is OFF.

■Digital offset

This function subtracts a set value from the indicated value. If you make digital offset , the value which is obtained by subtracting the set value from the indicated value will be displayed. This is convenient when you cannot obtain zero by unloading the equipment for some reason or when you want to give offset.

(Indicated value to be displayed) = (Actual indicated value) - (Digital offset setting value)

■Moving average filter

This function restrains the indicated value from fluctuating by moving-averaging the A/Dconverted data. The moving average times can be selected in the range of OFF (1 time) - 512 times. With an increasing number of moving average times, the indicated value becomes more stable, while the response becomes slower. On the other hand, with a decreasing number of moving average times, the response becomes faster, while the indicated value becomes easier to fluctuate.

■Digital low pass filter

This low pass filter cancels undesired noise components by filtering the A/D-converted data. Set the cutoff frequency like a low pass filter in an analog circuit. The cutoff frequency can be selected from OFF, 2, 4, 6, 8, 10, 30, 50, 100Hz. Select an optimum value according to the type of measurement and setting environment.

■Load

The setting values are read from the FS10 and displayed on the screen.

■Apply

The setting values on the screen are set to the FS10.
In Lock status, the “Apply” button is disabled.

■File menu

- SaveAs

The setting values being displayed will be saved in a file. (.prm format)
A file name is set in the file save dialog.

- Save

The setting values being displayed will be overwritten on the file specified in Save As.

- Open

The setting values saved in the file will be displayed.

- Print

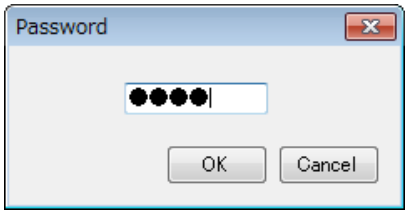
The screen hard copy will be printed.

- Exit

The software will be ended.

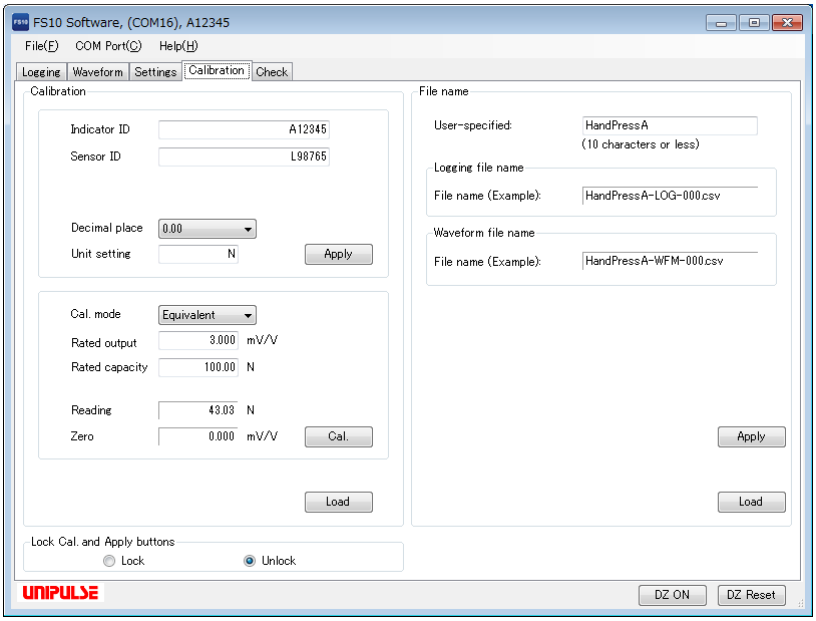
■Lock / Unlock

The status of “Lock”/“Unlock” is switched. In Lock status, the “Apply” button is disabled; in Unlock status, the “Apply” button is enabled.
When the “Unlock” button is clicked in Lock status, a password dialog will be displayed. When the “OK” button is clicked after the password input becomes Unlock. The status returns to “Lock” when the “Cancel” button is clicked.



3-6. Calibration tab

Calibration settings, ID settings and more are set in this tab.
Perform either actual load calibration or equivalent input calibration.



■Load

The setting values are read from the FS10 and displayed on the screen.

■Apply

The setting values on the screen are set to the FS10.
In Lock status, the “Apply” button is disabled.

■Equivalent input calibration

1) Set the Decimal place
2) Set the Unit
3) Click the "Apply" button
4) Cal mode is selected to "Zero"
5) Click the "Cal." button (no load)
6) Reading value will be zero
7) Cal mode is selected to "Equivalent"
8) Set the Rated output
9) Set the Rated value
10) Click the "Cal." button

■Span (Actual load) calibration

1) Set the Decimal place
2) Set the Unit
3) Click the "Apply" button
4) Cal mode is selected to "Zero"
5) Click the "Cal." button (no load)
6) Reading value will be zero
7) Cal mode is selected to "Span"
8) Apply an actual load on sensor
9) Set the Rated value (load value of "8)")
10) Click the "Cal." button

■File menu

- SaveAs

The setting values being displayed will be saved in a file. (.prm format)
A file name is set in the file save dialog.

- Save

The setting values being displayed will be overwritten on the file specified in Save As.

- Open

The setting values saved in the file will be displayed.
Calibration cannot be performed automatically when file opened. So set up the calibration on as required.

- Print

The screen hard copy will be printed.

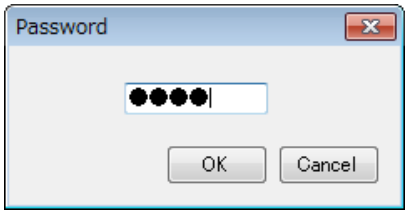
- Exit

The software will be ended.

■Lock / Unlock

The status of “Lock”/“Unlock” is switched. In Lock status, the “Apply” and "Cal" button are disabled; in Unlock status, the “Apply” and "Cal" button are enabled.

When the “Unlock” button is clicked in Lock status, a password dialog will be displayed. When the “OK” button is clicked after the password input becomes Unlock. The status returns to “Lock” when the “Cancel” button is clicked.



3-7. Check tab

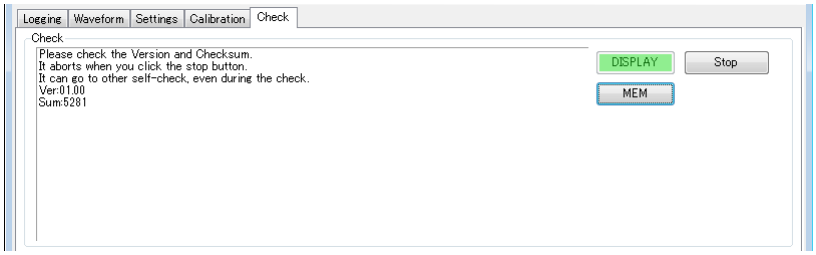
Self-check and parameters of the FS10 are initialized.

■DISPLAY

It is also a function that performs version and checksum of software, and check of lamp lighting.

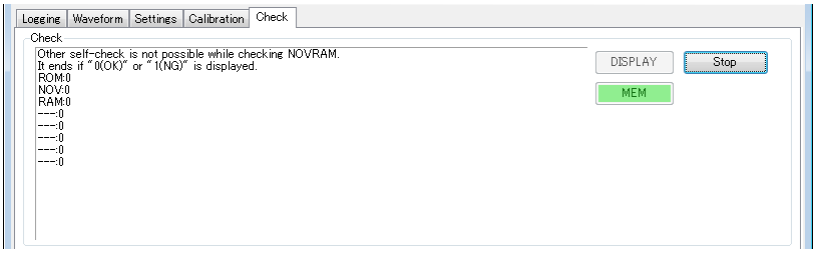
All light off -> light on (green) -> light on (red) -> all light on -> all light off

Check the Version and checksum which is displayed on window.



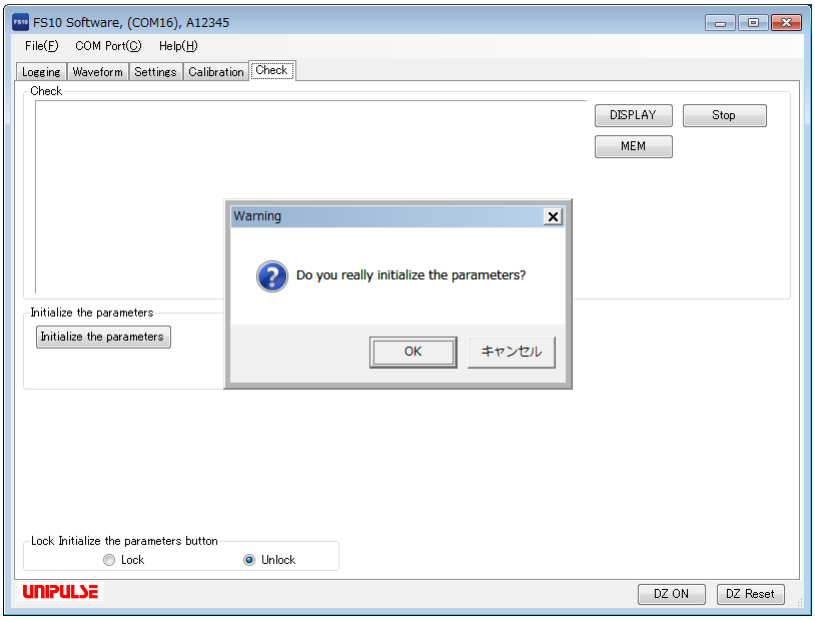
■MEM

It is also a function that performs check of internal memories.



■Initialize the parameter

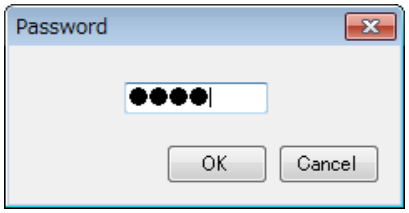
When the “Initialize the parameter” button is clicked, the parameters of the FS10 (excluding calibration values) will be initialized.



■Lock / Unlock

The status of “Lock”/“Unlock” is switched. In Lock status, the “Initialize the parameters" button is disabled; in Unlock status, the “Initialize the parameters" button is enabled.

When the “Unlock” button is clicked in Lock status, a password dialog will be displayed. When the “OK” button is clicked after the password input becomes Unlock. The status returns to “Lock” when the “Cancel” button is clicked.



3-8. Launch multiple software and connect more than one FS10 unit

To connect more than one FS10 unit to one PC, FS10 software needs to be launched as many as the number of FS10 unit. In order to avoid setting files and waveform files to be mixed up, different folders need to be specified for each software as storage destinations. There are two ways to specify the folder destination; (1) Specify a folder when launching the software or (2) Specify a folder for a shortcut.

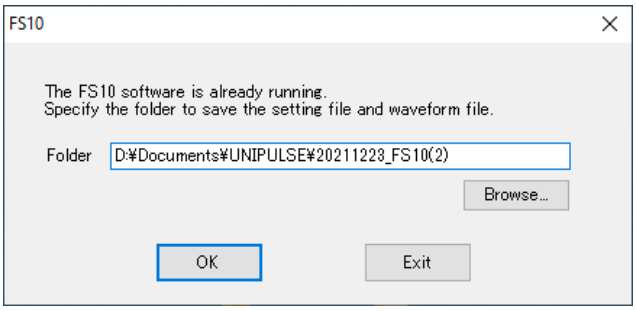
Point

- Normally, a file will be saved at "¥Documents¥UNIPULSE¥FS10" folder. Thus, another folder other than this needs to be specified.
- This software does not support synchronization and measurement between multiple units.

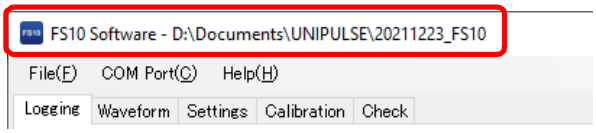
■Specify a folder when launching the software

When FS10 software is newly launched while another FS10 software is already running, the following screen will appear.

To prevent folder from duplication, [¥Documents¥UNIPULSE¥"date"_FS10] folder is specified as the storage destination by default. Note: (2), (3) and so on are added to the end of the folder path if a folder with the same name already exists.) To save files at a desired folder, click "Browse" button and select a destination folder.



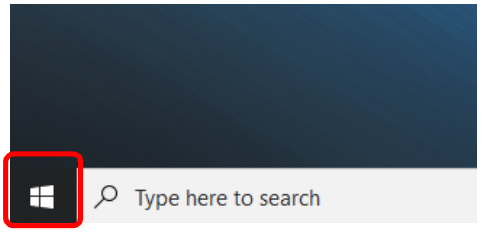
Once you click “OK” button, FS10 software is launched, and folder path of the storage destination is displayed.



In this method, a folder needs to be specified every time the software is launched. If a same folder is used every time and you wish to skip the procedures when launching, try the following method.

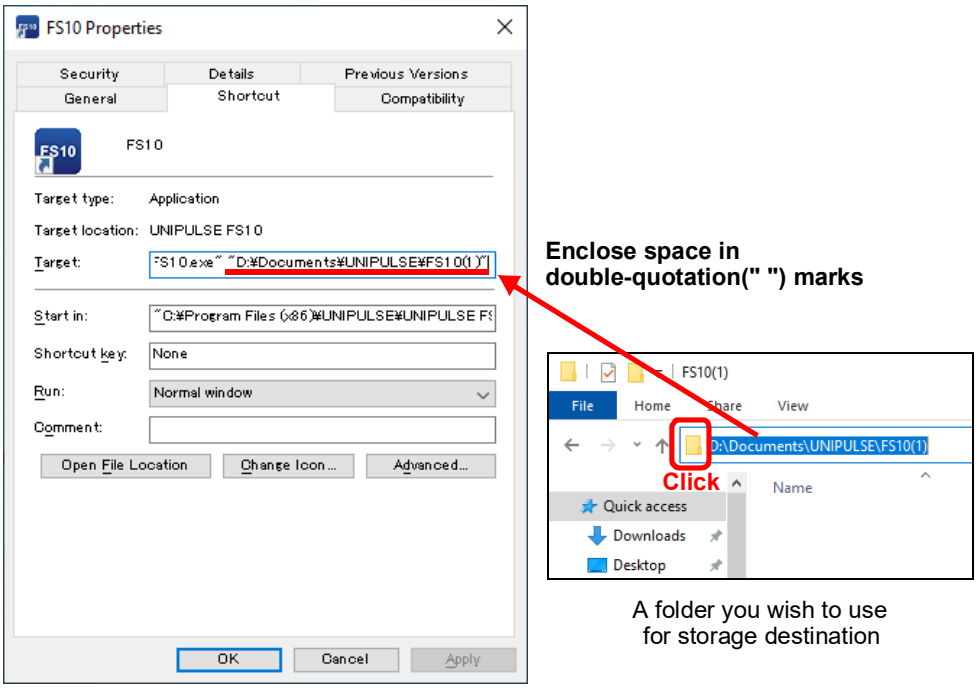
■Specify a folder for a shortcut

1. Click the Windows logo and display start menu.
(The illustration below is for Windows 10)

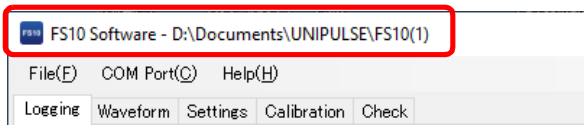


2. Find "UNIPULSE" -> "FS10" and drag and drop the item to Desktop; a shortcut of FS10 software will be created.

3. Right click the shortcut and select "Properties". Enter a folder path of the storage destination in "Target" field. Note: If a space is included in the folder path, enclose the space in double-quotation marks.



4. It is successful if the folder path is displayed at the title bar when launching the shortcut.



5. Repeat STEP "1." to "3." as many as the numbers of FS10 units. Rename the shortcuts appropriately to make them easy to distinguish.

4 USB Interface

The USB is an interface to read the indicated value of the FS10 and to write parameters into the FS10. This interface is convenient to process controls, totals, records, etc., by connecting the FS10 to PC. Moreover, set values can be read and written by specific PC software, and also input signal can be shown in wave form and logging.

■Communication specifications

Baud rate	460.8k bps
Start bit	1 bit
Character length	8 bit
Stop bit	1 bit
Parity bit	none
Delimiter	CR
Code	ASCII

■Communication mode

The following mode is switched by the command from the host computer.

Send/receive

This mode performs communication by a command from the host computer.
In this mode, you can read out the indicated value, status, set values and write in set values.

Continuous transmission mode

This mode continuously transmits the indicated values and the status.
Those are transmitted by 1200 times/sec..

■Communication format

- Continuous transmission switching

	0	1	2
Host	C	X	CR
FS10	No data returned		

- Continuous transmission format

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FS10	G	S	,	F	F	F	F	,	±	1	2	3	.	4	5	,

Filterless data
(Sign, decimal place, 5-digit)

	16	17	18	19	20	21	22	23
	±	1	2	3	.	4	5	CR

Filtered data
(Sign, decimal place, 5-digit)

	B3	B2	B1	B0
Status 4 (4bit):	+LOAD	-LOAD	OFL2	OFL1
Status 3 (4bit):	OK	—	—	—
Status 2 (4bit):	—	—	D.P.	D.P.
Status 1 (4bit):	HH	HI	LO	LL

Point

Commands from the host can be received in the continuous transmission mode as well.
Yet, do not send any commands to request data from FS10 as the requested data may overlap with the data transmitted in the continuous transmission mode.

- Send/receive mode switching

	0	1	2
Host	C	Y	CR
FS10	No data returned		

- Read the filtered data

	0	1	2
Host	R	A	CR

	0	1	2	3	4	5	6	7	8	9
FS10	R	A	+	1	2	3	.	4	5	CR

Filtered data
(Sign, decimal place, 5-digit)

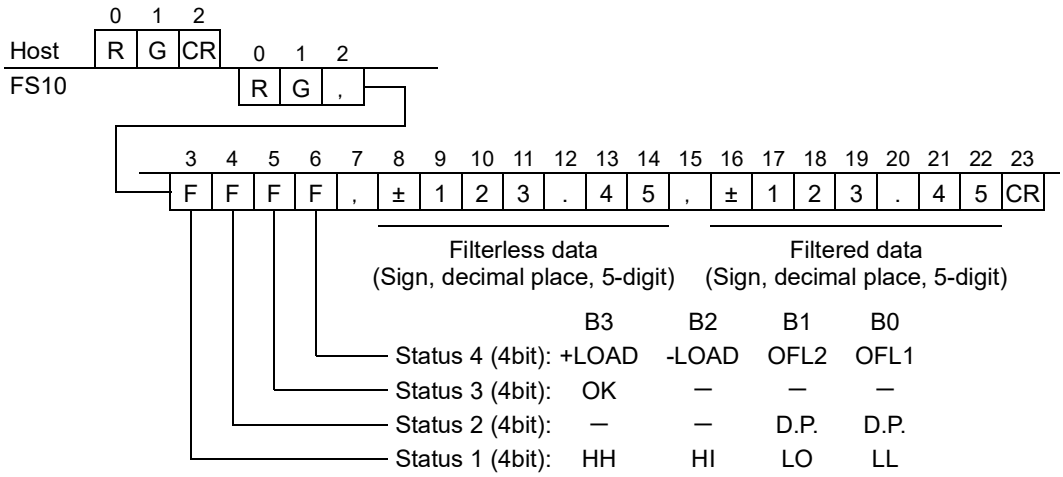
- Read the filterless data

	0	1	2
Host	R	B	CR

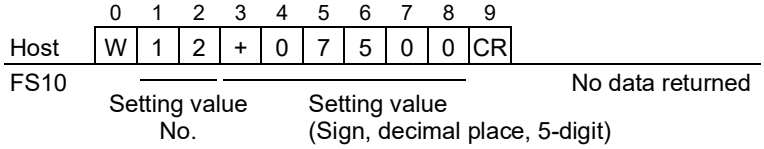
	0	1	2	3	4	5	6	7	8	9
FS10	R	B	+	1	2	3	.	4	5	CR

Filterless data
(Sign, decimal place, 5-digit)

- Read all

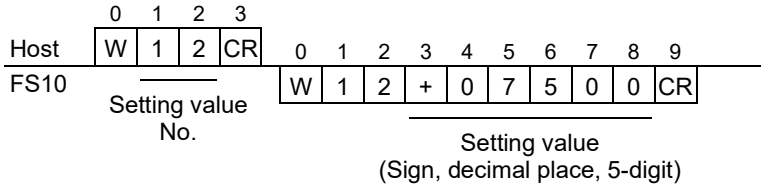


- Write the setting value



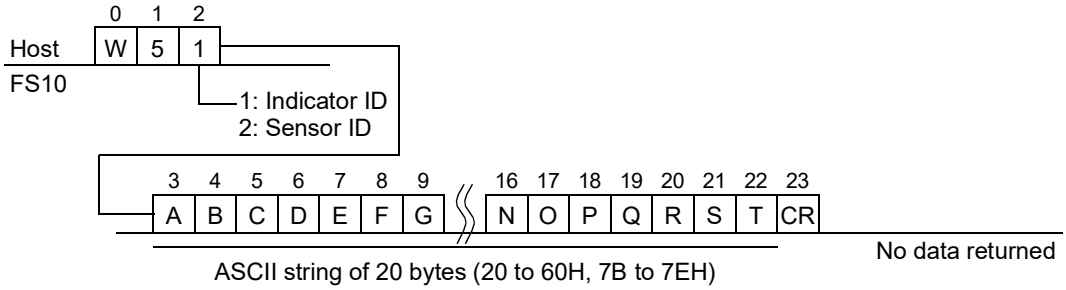
For setting value No., refer to P.26 "■Setting value communication formats".

- Read the setting value

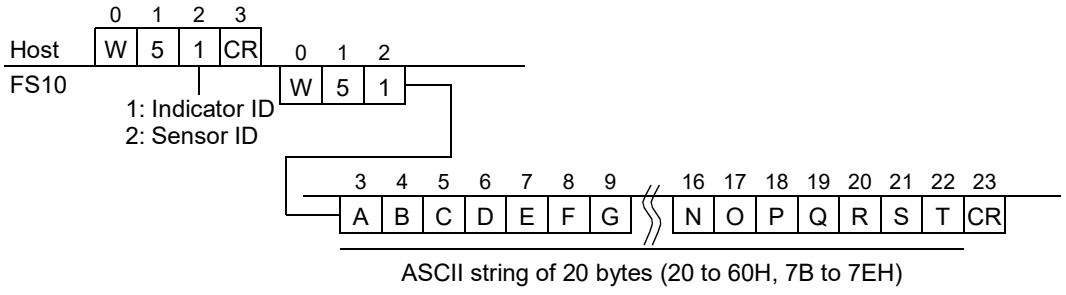


For setting value No., refer to P.26 "■Setting value communication formats".

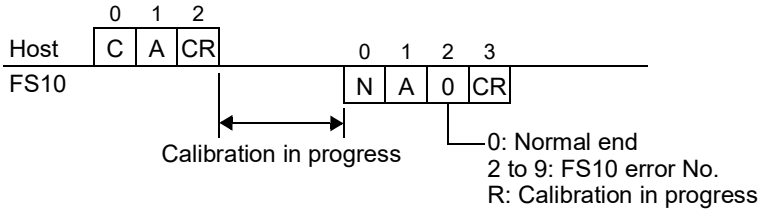
- Write the indicator ID/ sensor ID



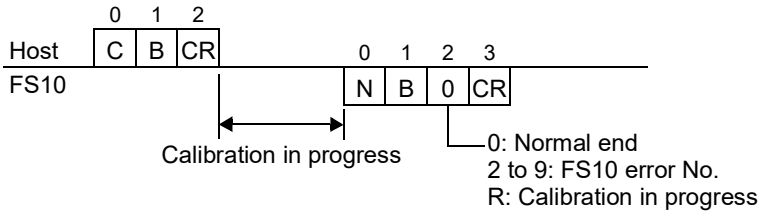
- Read the indicator ID/ sensor ID



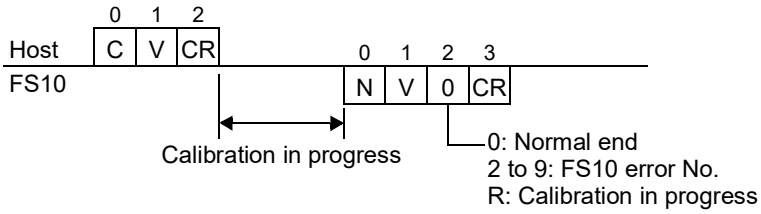
- Zero calibration



- Actual load calibration



- Equivalent input calibration

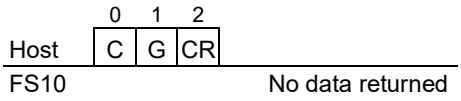


Attention

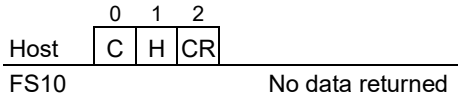
Please set up capacity value before sending the command of actual load calibration.

Please set up rated output value and capacity value before sending the command of equivalent input calibration.

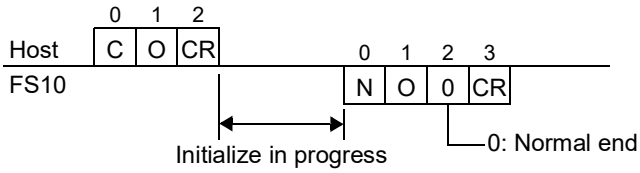
- Digital zero



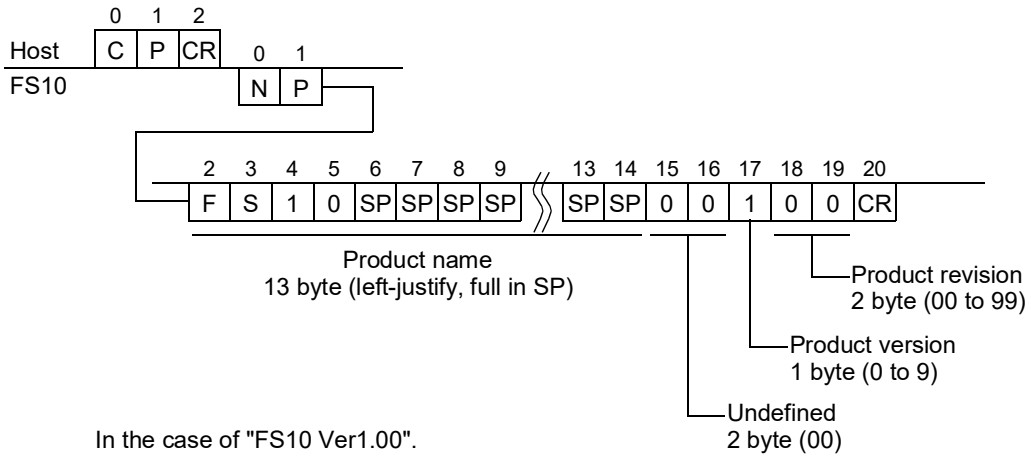
- Digital zero reset



- Initialize (Except the calibrated value)



- Read the product information



In the case of "FS10 Ver1.00".

■Setting value communication formats

HH limit

W	1	1	±						CR

HI limit

W	1	2	±						CR

LO limit

W	1	3	±						CR

LL limit

W	1	4	±						CR

Hysteresis

W	1	5	0	0					CR

Digital offset

W	1	6	±						CR

Near zero

W	1	7	0						CR

HI-LO limit comparison mode

W	1	8	0	0	0	0	0		CR

Moving average filter

W	2	1	0	0	0				CR

Digital low-pass filter

W	2	2	0	0	0	0	0		CR

Decimal place

W	2	3	0	0	0	0	0		CR

Rated value

W	4	1	±						CR

Rated output

W	4	2	±	0					CR

Zero calibration point

W	4	4	±	0					CR

(Write-inhibited)

Setting value No.

Setting value up to 5 digits
(An unused digit is 0.)

sign: The setting value with a sign
0: The setting value without a sign

5 Specifications

5-1. Specifications

■Analog section

Excitation voltage	DC5V±10% Output current within 30mA
Signal input range	-3.0 to +3.0mV/V
Non-linearity	Within 0.02%FS (at 3mV/V input)
Zero drift	Within 0.5μV/ ℃
Gain drift	Within 0.01%/℃
A/D conversion speed	1200 times/sec.
Resolution	24 bits (binary) Approx. 1/30000 against 3mV/V

■Display section

Status displayu	LED (red):	Error status
	LED (green):	Sensor operating state

■USB interface

Communication standard	Compliant with USB Ver.2.0, Full speed (12Mbps)
Virtual COM port	Used in the dedicated PC application
Connector	mini-B TYPE

■General performance

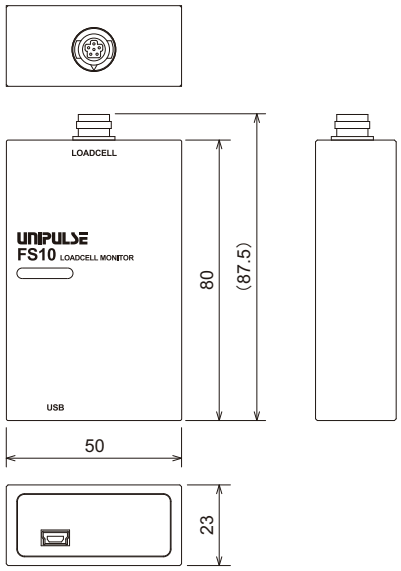
Power supply voltage	DC5V (USB bus power) USB2.0 or above		
Power consumption	1W typ.		
Operation conditions	Temperature:	Operation temperature range	-10 to +40℃
		Storage temperature range	-40 to +80℃
	Humidity:	85%RH or less (non-condensing)	
Dimensions	50(W) × 23(H) × 80(D) mm (projections excluded)		
Weight	Approx.120g		

■Accessories

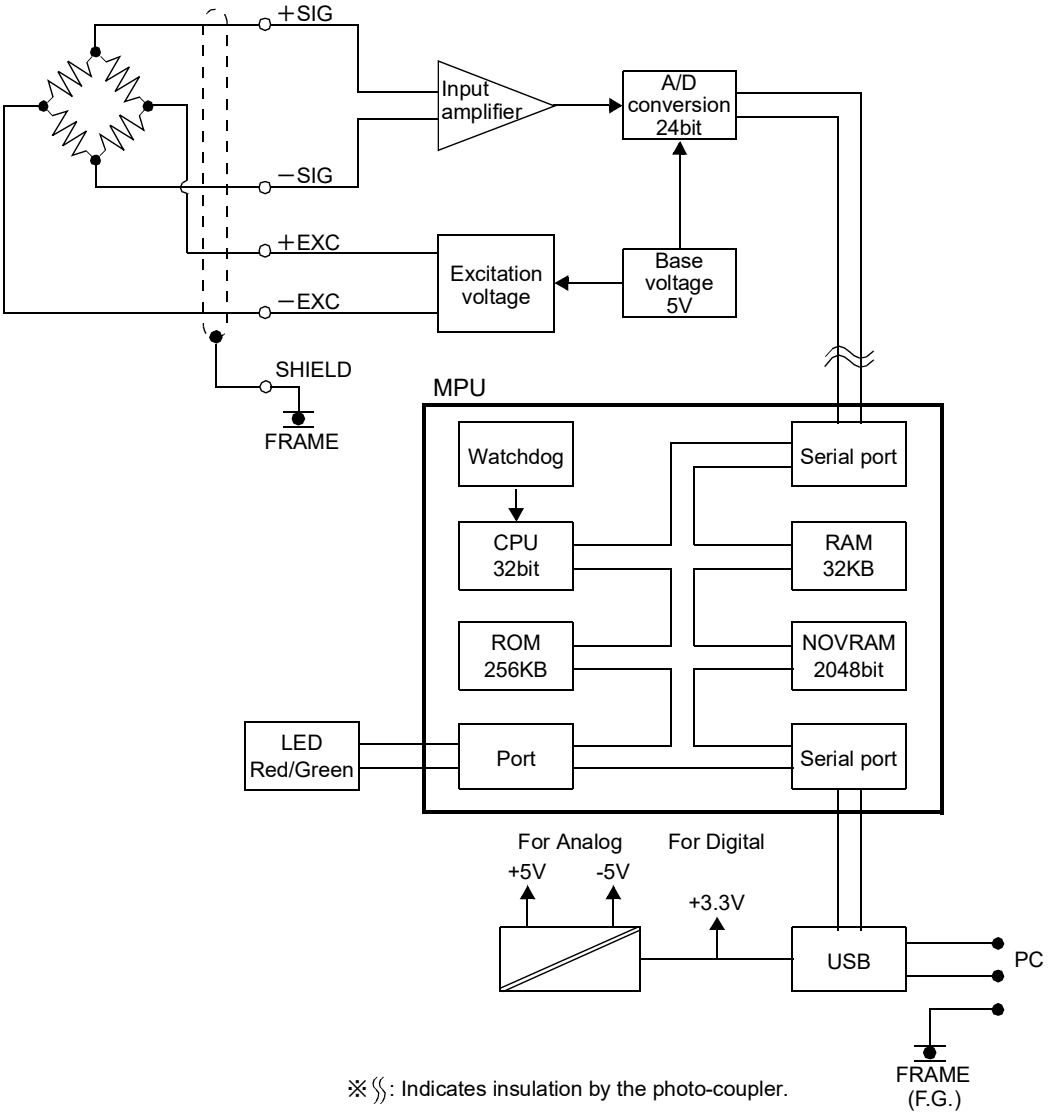
- Sensor cable (with a connector at one-end 1m) 1
- A-miniB USB connection cable (1.8m) 1
- Quick manual 1

5-2. Dimensions

[unit : mm]



5-3. FS10 block diagram



※⟆: Indicates insulation by the photo-coupler.

6 Appendices

6-1. List of setting values

■Basic settings

Setting value name	Setting range	Initial value
HH limit	-99999 to +99999	+99999
HI limit	-99999 to +99999	+7500
LO limit	-99999 to +99999	+2500
LL limit	-99999 to +99999	-99999
Hysteresis	0 to 9999	0
Digital offset	-99999 to +99999	0
oving average filter	1 to 512	1 (OFF)
Digital low-pass filter	0: OFF/ 1: 2Hz/ 2: 4Hz/ 3: 6Hz/ 4: 8Hz/ 5: 10Hz/ 6: 30Hz/ 7: 50Hz/ 8: 100Hz	0: OFF
Comparison timing	0: All time/ 1:NZ	0: All time
Near zero	0 to 9999	100

■Calibration settings

Setting value name	Setting range	Initial value
Indicator ID	0H to 60H, 7BH to 7EH ASCII string of 20 bytes	All 20H
Sensor ID	0H to 60H, 7BH to 7EH ASCII string of 20 bytes	All 20H
Decimal place	0: 0/ 1: 0.0/ 2: 0.00/ 3: 0.000	2: 0.00
Unit	ASCII string of 6 bytes or less	—
Cal. mode	Zero / Span / Equivalent	—
Rated output	-3.200 to +3.200 mV/V	+3.000 mV/V
Rated value	-99999 to +99999	+10000
Reading value	-99999 to +99999 (display range)	—
Zero calibration point	-3.000 to +3.000 mV/V (display range)	0.000

* Settings Lock password : 1269
Calibration Lock password : 9621
Initialize Lock password : 1239

6-2. Logging and the waveform file format

The format in CSV text file is as follows.

Row 1 : File identification, file format version

Row 2, 3 : Date, Time, Indicator ID, Sensor ID, Unit setting, Decimal place, HH, HI, LO, LL

Row 4, 5 : Logging mode, Interval time, Number of samples、

Row 6, 7 : Waveform mode, Setup time, Result time, Vertical range min, Vertical range max, Filterless mode, Pre-trigger, Trigger level, Slope

From row 9 : Measurement data

Number, Time, Filtered data, Filterless data, Status, Judgement result

Row n-1, n : OK count, NG count, Max value, Min value, Avg value

File example (Bold represents fixed value and italic represents actual measurement value or setting value.)

row	列									
	1	2	3	4	5	6	7	8	9	10
1	**FS10 Waveform Fil**	*1*								
2	**Date**	**Time**	**Indicator ID**	**Sensor ID**	**Unit setting**	**Decimal place**	**HH**	**HI**	**LO**	**LL**
3	*2015/1/1*	*10:25:11*	*A12345*	*L98765*	*N*	*2*	*999.99*	*75*	*25*	*-999.99*
4	**Logging mode**	**Interval time**	**Number Of samples**							
5	*Fixed*	*1/1200*	*2401*							
6	**Waveform mode**	**Setup time**	**Result time**	**Vertical range min**	**Vertical range ma**	**Filterless mode**	**Pre-trigger**	**Trigger level**	**Slope**	
7	*Level trigger*	*2*	*2*	*-0.01*	*0.01*	*0*	*50*	*0*	*Positive*	
8										
9	**No.**	**Time**	**Filtered Data**	**Filterless Data**	**Status**	**Judgement result**				
10	1	*10:25:11.000*	*0.05*	*0.05*	*2*	*LO*				
11	2	*10:25:11.001*	*0.05*	*0.04*	*2*	*LO*				
12	3	*10:25:11.002*	*0.04*	*0.04*	*2*	*LO*				
:	:	:	:	:	:	:				
:	:	:	:	:	:	:				
n-4	2400	*10:25:12.999*	*-0.01*	*-0.01*	*2*	*LO*				
n-3	2401	*10:25:13.000*	*0*	*0*	*2*	*LO*				
n-2										
n-1	**OK Count**	**NG Count**	**Max Value**	**Min Value**	**Avg Value**					
n	*21*	*2380*	*32.45*	*-0.04*	*11.12*					

6-3. The setting value file format

The format is a file of a text format and is as follows.

[HEADER]	[HEADER]
DEVICE=FS10 Setting File	File identification
VERSION=1.0	Version
[BASIC]	[Basic settings]
HH=999.99	HH limit
HI=75.00	HI limit
LO=25.00	LO limit
LL=-999.99	LL limit
HYSTERESIS=0.00	Hysteresis
DIGITAL_OFFSET=0.00	Digital offset
MOVINGAVE=1	Moving average filter
LOWPASS=8	Low-pass filter
COMPARISON_TIMING=0	Comparison timing
NEAR_ZERO=1.00	Near zero
[CAL]	[Calibration]
DECIMALPOINT=2	Decimal place
UNIT=kN	Unit
RATED OUTPUT=1.000	Rated output
RATED VALUE=100.00	Rated value
CAL ZERO=-0.030	Zero calibration point

6-4. Error / Message

■Indicated value error

Display	Error description	Explanation
-LOAD	Below the signal input range -3mV/V	The input electric signal greatly exceeds the signal input range. This also occurs when an excessive load is applied to the sensor or the input terminal is opened due to a break in the cabling, etc..
+LOAD	Beyond the signal input range +3mV/V	
OFL1	Below -99999	This occurs when a larger load than expected is applied to the sensor or calibration is performed below the measurement range. Check the calibration and measuring object.
OFL2	Beyond 99999	

Point

ALM lamp (red) flushes fast when LOAD or OFL .

■Pop-up

Display	Error description	Explanation
Calibration error (2)	Beyond the zero calibration range in the positive direction	The signal input range is greatly exceeded when zero calibration is performed. Check for an excessive load applied to the sensor and for breaks.
Calibration error (3)	Beyond the zero calibration range in the negative direction	
Calibration error (6)	Below the span calibration range	Check the load for being too light in weight when actual load calibration is performed.
Calibration error (7)	Beyond the span calibration range in the negative direction	The signal input range is greatly exceeded when span calibration is performed. Check for an excessive load applied to the sensor and for breaks.
Calibration error (8)	Beyond the zero calibration range in the positive direction	
Calibration error (Running)	Calibration in progress	These are not errors. They indicate that calibration is in execution.
Data set error	Setting error	The FS10 main unit does not accept the setting transmitted from the PC application. Check the version information of the installed software.
Communication timeout	Communication error	Communication error due to detached USB cable, and so forth. Check the connected USB cable.
Too much zoom in	Zoom error	An interval between start point and end point in zoom operation is smaller than anticipated. Redo zoom operation.
Waveform file is invalid	Waveform format error	A File that does not match with Waveform File format has been read. Check the file that you are trying to load.
Setting file is invalid	Setting format error	A File that does not match with Setting File format has been read. Check the file that you are trying to load.

6-5. Uninstall

The uninstall procedure is as follows.

Start menu -> All Programs -> UNIPULSE -> FS10 -> Uninstall FS10.

Unipulse Corporation

International Sales Department

9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
Tel: +81-3-3639-6120 Fax: +81-3-3639-6130

www.unipulse.tokyo/en/

□	Head Office:	9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
□	Nagoya Sales Office:	TOMITA Bldg. 2-5 Ushijima-cho, Nishi-ku, Nagoya 451-0046
□	Osaka Sales Office:	Sumitomo Seimei Shin Osaka Kita Bldg. 4-1-14 Miyahara, Yodogawa-ku, Osaka 532-0003
□	Hiroshima Sales Office:	Hiroshima Dai-ichi Seimei OS Bldg. 1-2-21 Matoba-cho, Minami-ku, Hiroshima 732-0824
□	Saitama Factory:	1-3 Sengendainishi, Koshigaya, Saitama 343-0041