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**Instruction Manual**

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**PC LOADER SOFTWARE  
FOR MAINTENANCE  
FOR HYBRID ULTRASONIC  
FLOWMETER  
<Duosonics>**

TYPE: FSH-1

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# 1. COPYRIGHT OF THIS SOFTWARE

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The copyright of this software belongs to Fuji Electric Systems Co., Ltd. No part of this software may be reproduced or transmitted in any form.

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## 2. OUTLINE

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Using this software, you can set, read and display relevant graphs of the hybrid ultrasonic flow meter on your PC with ease. Your data can be easily edited with Microsoft Excel because you can save your data in CSV file format.

Note: Microsoft Excel is the registered Trademark of the Microsoft Corporation in the United States.

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## 3. PC TO BE USED

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### 3.1. Computer

AT compatible-type with CPU Pentium IV 1 GHz/Celeron 1 GHz or more installed, display resolution of 1024 × 768, and use of small font recommended.

### 3.2. Memory capacity

128 MB or more (256 MB or more recommended) [52 MB memory or more for free space required]

### 3.3. Interface

RS232C port or RS485 port

### 3.4. OS

Microsoft Windows2000 Professional (SP6a or more) or Microsoft WindowsXP Professional (SP1 or more)

### 3.5. Communication cable

There are two types of interfaces for flow transmitter.

#### 3.5.1. When using communication port for maintenance (RS232C)

Use the following cable for communications between PC communication port and flow transmitter (control board CN6).

- Dedicated communication cable for digital controller  
Type: PDZL1001

#### 3.5.2. When using communication port open to users (RS232C/RS485)

Use the following cable for communications between PC communication port and flow transmitter (control board terminal box).

- PC loader communication cable  
Type: ZZP\*B TK4H6253

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## 4. INSTALLING OF SOFTWARE

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- (1) Insert the setup disk into the drive, and double-click “Duosonics\_ENG.msi”.



Fig. 1 <File Installation>

- (2) Setting wizard will start up. Click the [Next] button. Click the [Cancel] button to cancel the installation.

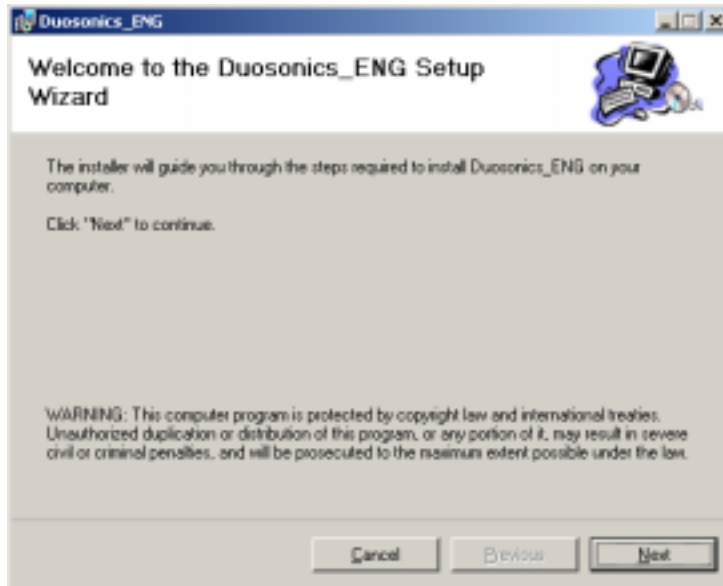


Fig. 2 <Setup wizard screen>

- (3) There is a query about selection of installation folder. Click the [Next] button to install the software in that folder. To specify a folder click the [Browse] button and select, or enter directly. To return to the previous screen, click the [Previous] button. Click the [Cancel] button to cancel the installation.

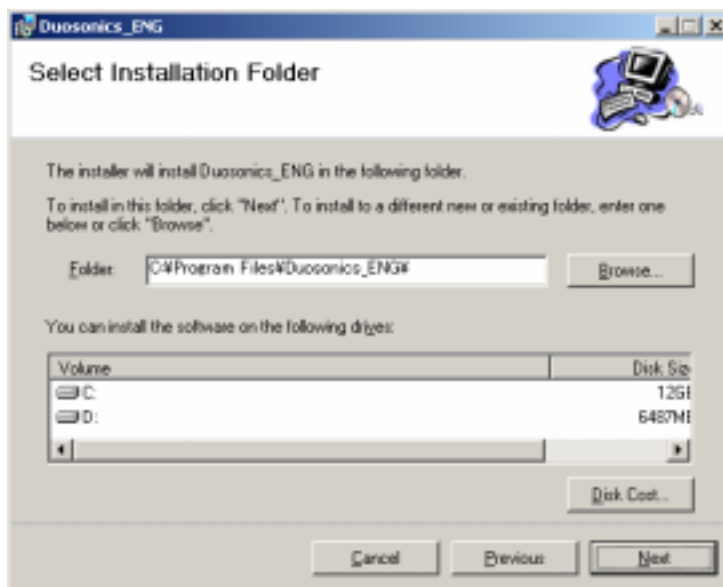


Fig. 3 <Select installation folder screen>

- (4) Screen is displayed to confirm installation. Click the [Next] button to execute the installation. Click the [Previous] button to return to the previous screen. Click the [Cancel] button to cancel the installation.

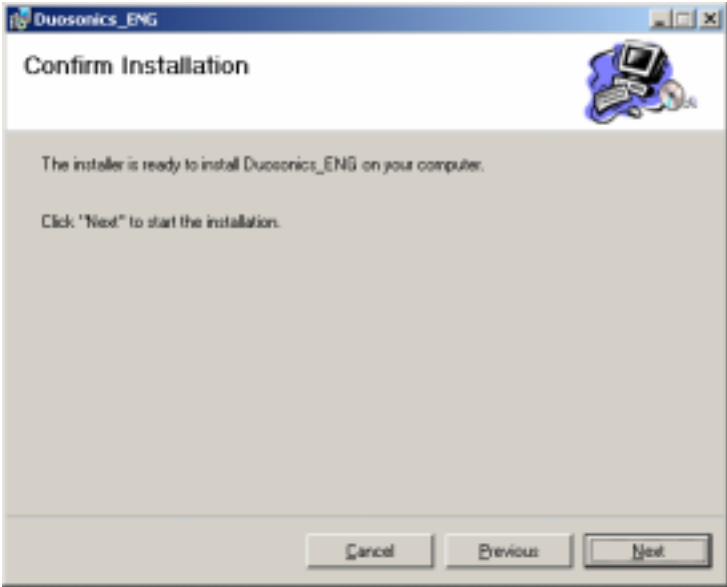


Fig. 4 <Installation confirmation screen>

- (5) Execution of Installation

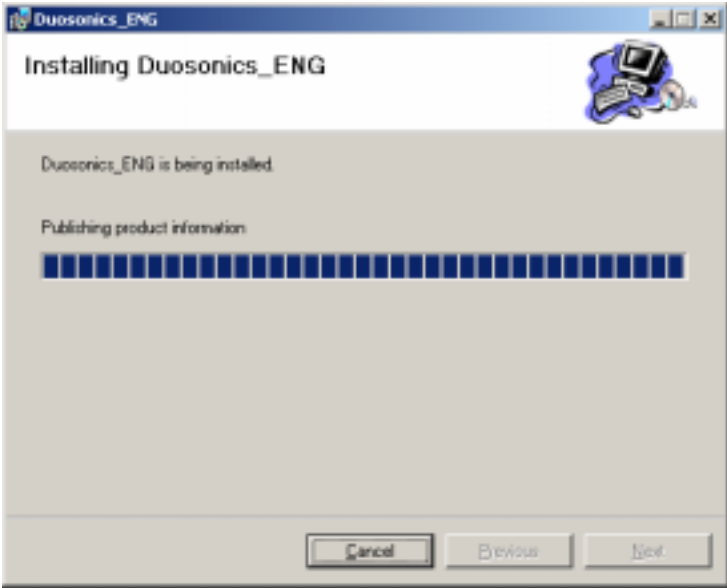


Fig. 5 <Installing screen>

(6) The Installation Complete screen is displayed. Click the [Close] button to exit the installation screen.

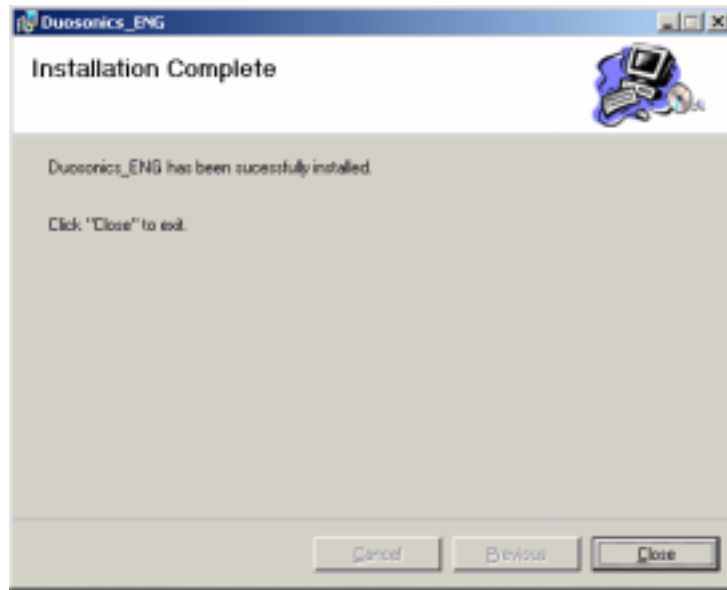


Fig. 6 <Installation complete screen>

(7) After installation, the start menu and the application (“Duosonics\_ENG”) that has been installed in the desktop are created.



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## 5. STARTUP METHOD

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Start “Duosonics\_ENG” from the start menu to start up the loader.

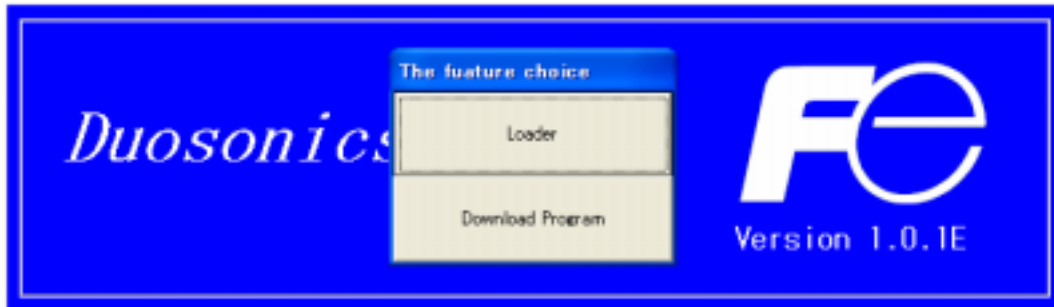


Fig. 7 <Start screen>

Click the [Loader] button to start up the loader.

Click the [Download Program] button to start up the download program application. Click the button to upgrade the software of the flow transmitter. Do not click it in ordinary cases.

Click the [Loader] button to start up the loader, and communication with the flow transmitter is carried out and the system name, measurement method, language, and unit information is acquired.

If error occurs during communications, an error message is displayed to continue communication, select [Continue]. To stop communication, select [Cancel] on the menu screen that appears, check the setting for “Communication.”

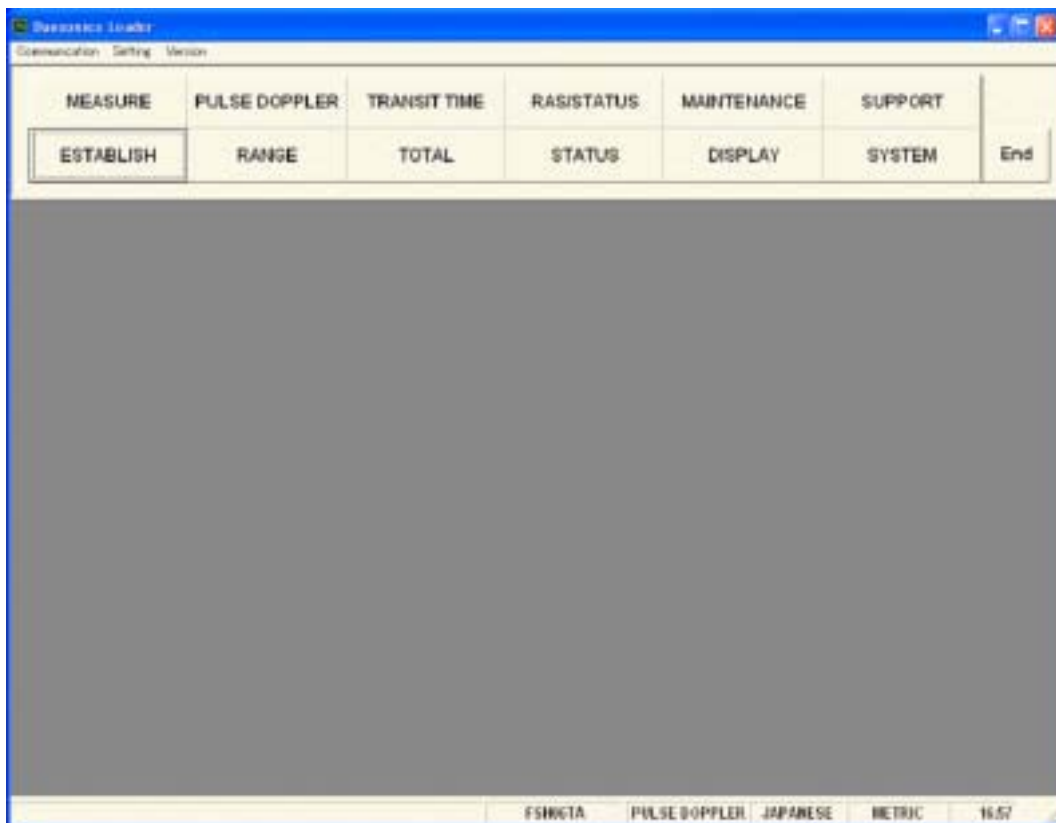


Fig. 8 <Menu screen>

Click the menu bar and each function button to execute a desired function.

## 5.1. Communications

Click “Communication” on the menu bar on the Menu screen, and the following setup screen appears.

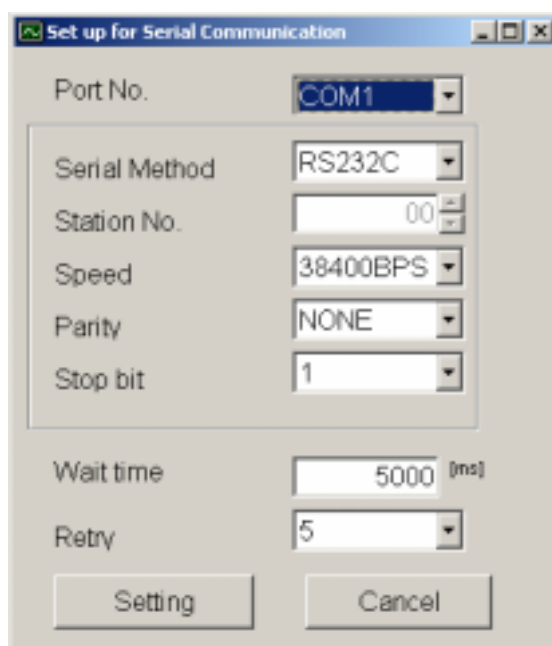


Fig. 9 <Serial communication setup screen>

Click the [Setting] button, and setting content is reflected; communications are executed with the flow transmitter and information related to system name, measurement method, language and unit is obtained. Click the [Cancel] button to invalidate the setting.

Table 1 <Measurement and Detailed Setting>

Item	Content
Port No.	Select either from COM1, COM2, COM3, COM4 and COM5.
Serial Method	Select either RS232C or RS485.
Station No.	Select one from 01 to 31. If communication method is RS232C, no selection is allowed (fixed with 00).
Speed	Select one from 9600BPS, 19200BPS and 38400BPS.
Parity	Select one from NONE, EVEN and ODD.
Stop Bit	Select either 1-bit or 2-bit.
Wait time	Specify in the range from 1 to 65535. (Unit: msec)
Retry	Specify in the range from 0 to 5.

## 5.2. Setting

Click “Setting” on the menu bar on the Menu screen, and either “Save setting” or “Read setting” can be selected.

### 5.2.1. Save setting

Click “Save setting”, and the following screen appears. Specify saving location and file name, and setting content is saved by clicking [Save] button. Click the [Cancel] button not to save the setting. File format is ini file.

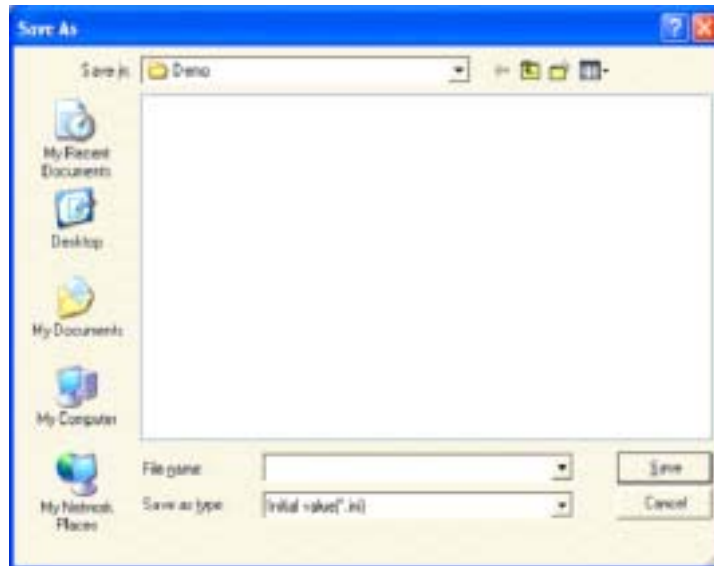


Fig. 10 <Save setting: select save file screen>

\* Note: Please be careful not to rewrite the setting file for loader (Hybrid USF.ini).

### 5.2.2. Read setting

Click “Read setting”, and the following screen appears. Specify the location and the name of the file saved previously. Click the [Open] button to read the setting. Click the [Cancel] button not to read the setting. File format is ini file.

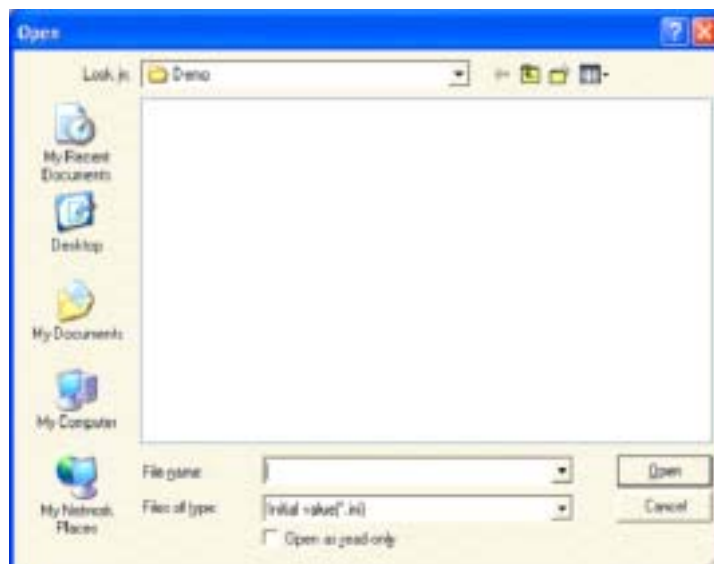


Fig. 11 <Read setting: select read file screen>

## 5.3. Version

Click “Version” on the menu bar on the Menu screen, and the following screen appears.

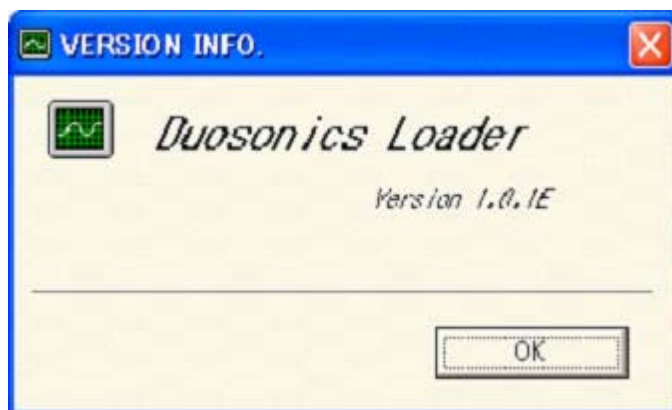


Fig. 12 <Version screen>

Click the [OK] button to close the screen.

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## 6. STRUCTURE OF FUNCTION

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Functions with loader are as follows:

Table 2 <Function>

Function	Outline
ESTABLISH	Sets piping specifications, sensor type, etc.
RANGE	Sets range-related matters.
TOTAL	Sets total-related matters.
STATUS	Sets status output-related matters.
DISPLAY	Sets LCD display-related matters.
SYSTEM	Sets system related to language, etc.
MEASURE	Displays trend of flow rate, etc.
PULSE DOPPLER	Displays graphs on Pulse Doppler detailed setting and operation information and flow rate distribution, etc.
TRANSIT TIME	Displays graphs on detailed setting of transit time difference, operation information and received waveform, etc.
RAS/STATUS	Reads status, or RAS, or performs detailed RAS setting.
MAINTENANCE	Executes AO adjustment, AO and DO tests, etc.
SUPPORT	Reads all the settings, and makes system mode setting.

## 7. ESTABLISH SETTING

Click the “ESTABLISH” button on the Menu screen, and the following screen appears.

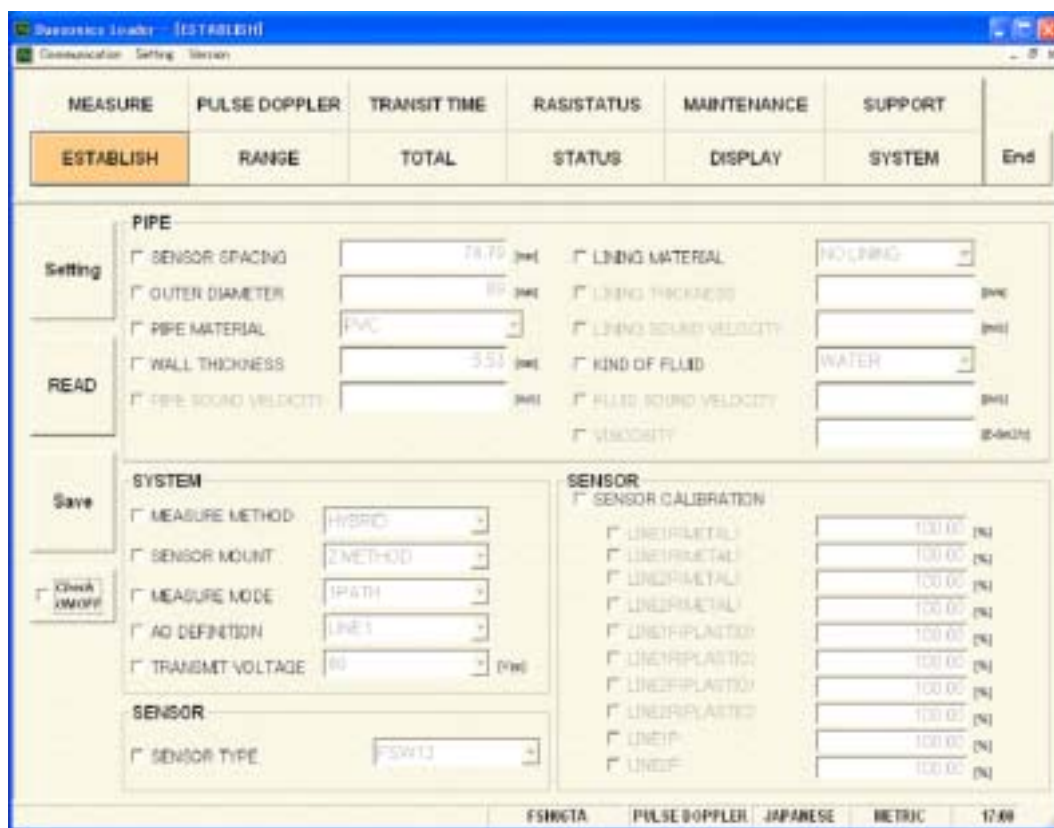


Fig. 13 <Establish setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (). If “Other” is selected as pipe material, pipe sound velocity becomes valid. If “Other” is selected as fluid type, fluid sound velocity and dynamic viscous coefficient become valid.

- [Setting].....Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [READ] .....Reads the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [Save] .....Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF].....Set the check box to ON to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 3 &lt;Piping Specifications&gt;

Item	Content
OUTER DIAMETER	Enter in the range from 10.00 to 6200.00 mm.
PIPE MATERIAL	Select from carbon steel, stainless steel, PVC, Copper, Cast iron, aluminum, FRP, ductile iron, peek, PVDF, acrylic and others.
PIPE SOUND VELOCITY	Enter in the range from 1000 to 3700 m/s (if piping material is "Others").
WALL THICKNESS	Enter in the range from 0.10 to 100.00 mm.
LINING MATERIAL	Select from no lining, tar epoxy, mortar, rubber, Teflon, pyrex, glass, PVC and others.
LINING SOUND VELOCITY	Enter in the range from 1000 to 3700 m/s (if lining material is "Others").
LINING THICKNESS	Enter in the range from 0.01 to 100.00 mm (if lining material is other than "No Lining").
KIND OF FLUID	Select for water, seawater, dist. water, ammonia, alcohol, benzene, bromide, ethanol, glycol, kerosene, milk, methanol, toluol, lube oil, fuel oil, petrol and others.
FLUID S.V.	Enter in the range from 500 to 2500 m/s (if fluid type is "Others").
VISCOSITY	Enter in the range from 0.0010 to $999.9999 \times 10^{-6}$ m <sup>2</sup> /s (if fluid type is "Others").
SENSOR SPACING	[Read] only is valid.

Table 4 &lt;System&gt;

Item	Content
MEASURE METHOD	Select from hybrid and transit time.
SENSOR MOUNT	Select from Z method and V method.
MEASURE MODE	Select from 1 path and 2 paths.
AO DEFINITION	Select from average, line 1 and line 2. Line 1 only when 1 path is selected as measurement mode.
TRANSMIT VOLTAGE	Select from 20, 40, 80 and 160Vpp.

Table 5 &lt;Sensor&gt;

Item	Content	
SENSOR TYPE	Select from FLW11, FLW41, FLW12, FLD12, FLD22, FLW32, FLW51, FSW12, FSW21, FSW40 and FSW50.	
SENSOR CALIB.	LINE 1F (METAL)	Enter in the range from 0.00 to 300.00.
	LINE 1R (METAL)	Enter in the range from 0.00 to 300.00.
	LINE 1F (PLASTIC)	Enter in the range from 0.00 to 300.00.
	LINE 1R (PLASTIC)	Enter in the range from 0.00 to 300.00.
	LINE 1P	Enter in the range from 0.00 to 300.00.
	LINE 2F (METAL)	Enter in the range from 0.00 to 300.00.
	LINE 2R (METAL)	Enter in the range from 0.00 to 300.00.
	LINE 2F (PLASTIC)	Enter in the range from 0.00 to 300.00.
	LINE 2R (PLASTIC)	Enter in the range from 0.00 to 300.00.
	LINE 2P	Enter in the range from 0.00 to 300.00.

## 8. RANGE SETTING

Click the “RANGE” button on the Menu screen, and the following screen appears.

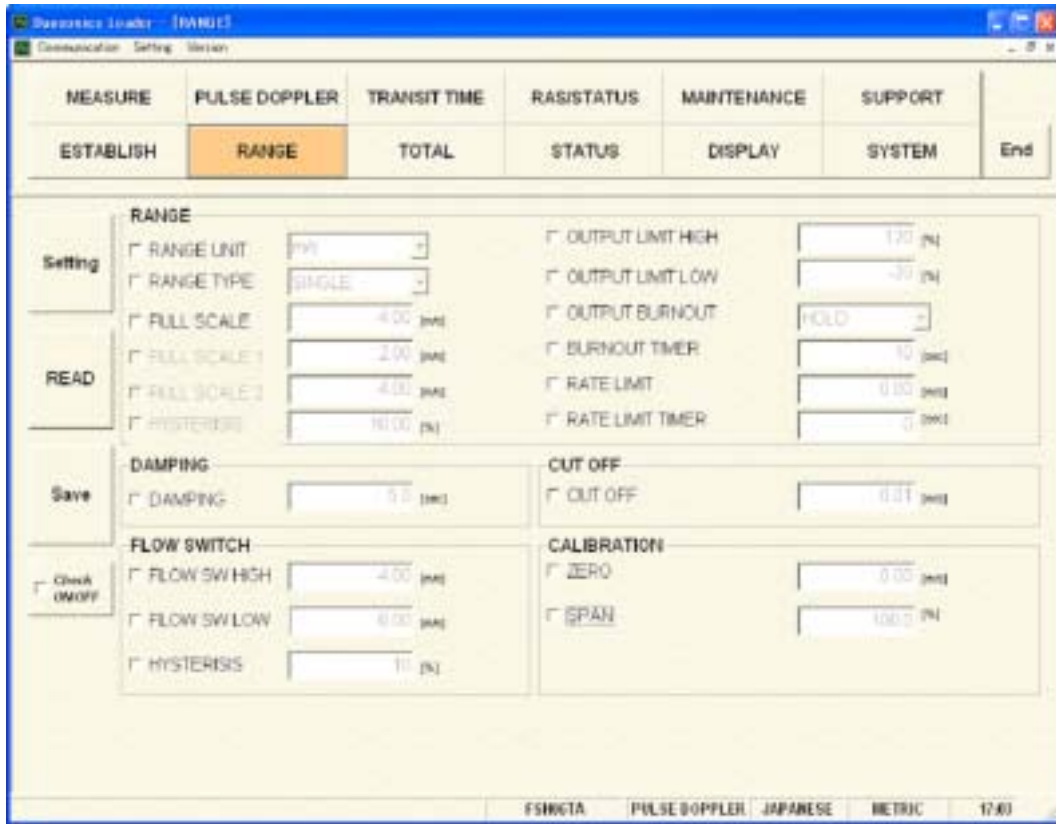


Fig. 14 <Range setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (.

- Type: in case of single range;  
 Display Valid..... Full scale  
 Display Invalid..... Full scale 1, full scale 2 and histeresis
- Type: in case of automatic 2-range, forward and reverse range, forward and reverse automatic 2-range  
 Display Valid..... Full scale 1, full scale 2 and histeresis  
 Display Invalid..... Full scale  
 [Setting]..... Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.  
 [READ] ..... Reads the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.  
 [Save] ..... Reflects the setting sent by pressing the [Setting] button on the flow transmitter.  
 [Check ON/OFF]..... Set the check box to ON to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 6 &lt;Range Setting&gt;

Item	Content
RANGE UNIT	Select from m/s, L/s, L/min, L/h, L/d, kL/d, ML/d, m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h, m <sup>3</sup> /d, km <sup>3</sup> /d, Mm <sup>3</sup> /d, BBL/s, BBL/min, BBL/h, BBL/d, kBBL/d, MBBL/d [ft/s, ft <sup>3</sup> /s, ft <sup>3</sup> /h, ft <sup>3</sup> /d, kft/d, Mft <sup>3</sup> /d, gal/s, gal/min, gal/h, gal/d, kgal/d, Mgal/d, BBL/s, BBL/min, BBL/h, BBL/d, kBBL/d, MBBL/d] * Of which [ ]: unit is in case of inch system.
RANGE TYPE	Select from SINGLE, AUTO 2, BI-DIR, BI-DIR AUTO 2.
FULL SCALE	Enter 0, $\pm 0.3$ to 32 m/s fitting value (comply with range unit).
FULL SCALE 1	Enter 0, $\pm 0.3$ to 32 m/s fitting value (comply with range unit).
FULL SCALE 2	Enter 0, $\pm 0.3$ to 32 m/s fitting value (comply with range unit).
HYSTERESIS	Enter in the range of 0 to 20%.
OUTPUT LIMIT LOW	Enter in the range of -20 to 0%.
OUTPUT LIMIT HIGH	Enter in the range of 100 to 120%.
OUTPUT BURNOUT	Select from NOT USED, HOLD, UPPER, LOWER, ZERO.
BURNOUT TIMER	Enter in the range of 0 to 900sec.
RATE LIMIT	Enter 0 to 5 m/s fitting value (comply with range unit).
RATE LIMIT TIMER	Enter in the range of 0 to 900 sec.

Table 7 &lt;Damping&gt;

Item	Content
DAMPING	Enter in the range of 0.0 to 100.0 sec.

Table 8 &lt;Low Flow Rate Cut&gt;

Item	Content
CUT OFF	Enter 0 to 5 m/s fitting value (comply with range unit).

Table 9 &lt;High and Low Limit Switch&gt;

Item	Content
FLOW SW LOW	Enter 0 to 32 m/s fitting value (comply with range unit).
FLOW SW HIGH	Enter 0 to 32 m/s fitting value (comply with range unit).
HYSTERESIS	Enter in the range of 0 to 20%.

Table 10 &lt;Output Correction&gt;

Item	Content
ZERO	Enter 0 to 5 m/s fitting value (comply with range unit).
SPAN	Enter in the range of 0 to 200%.



## 9. TOTAL SETTING

Click the “TOTAL” button on the Menu screen, and the following screen appears.

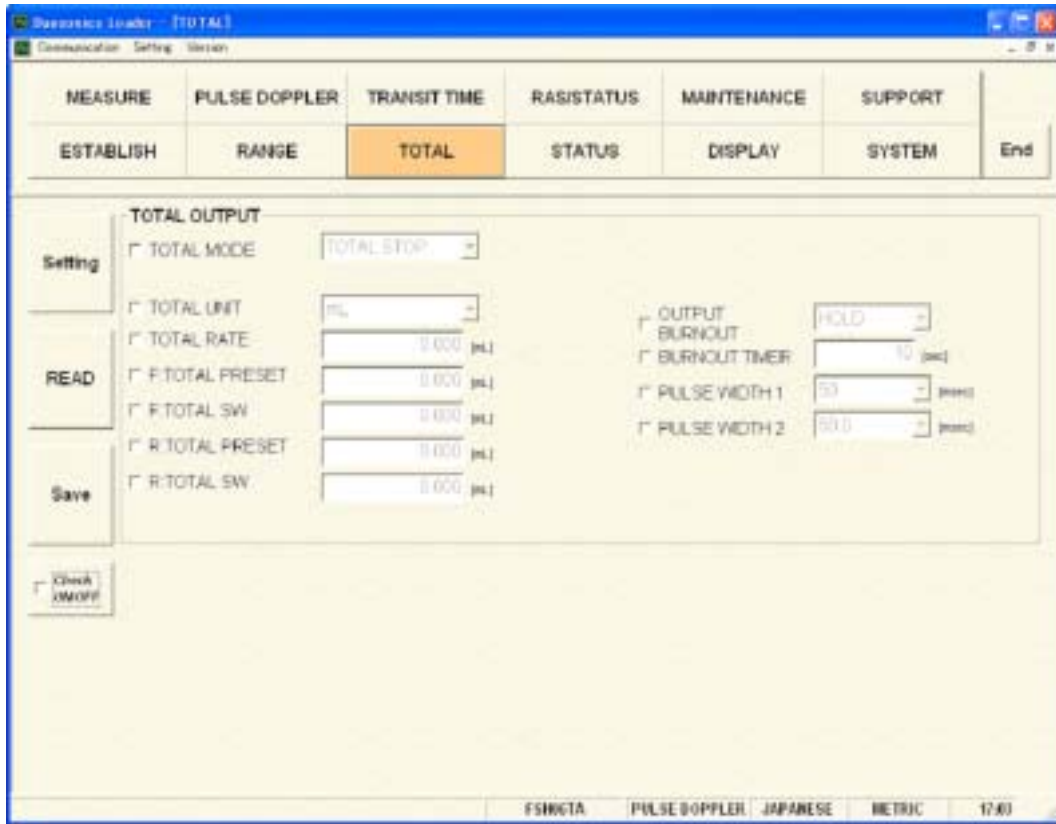


Fig. 15 <Total setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (.

- [Setting]..... Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting. Note that only when “STOP” mode is selected, the setting of other items is reflected.
- [READ] ..... Reads the setting of the selected item (check box set to ON ()), reflecting the response value together with the unit on the setting.
- [Save] ..... Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF]..... Set the check box to ON () to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 11 <Total Setting>

Item	Content
TOTAL MODE	Select from TOTAL STOP, TOTAL RUN, TOTAL RESET.
TOTAL UNIT	Select from mL, L, m <sup>3</sup> , km <sup>3</sup> , Mm <sup>3</sup> , mBBL, BBL and kBBL, [ft <sup>3</sup> , kft <sup>3</sup> , Mft <sup>3</sup> , kgal, gal, mBBL, BBL, kBBL and ACRf] * Of which [ ]: unit is in case of inch system.
TOTAL RATE	Enter in the range of 0 to 999999.999.
F: TOTAL PRESET	Enter in the range of 0 to 9999999999.999.
F: TOTAL SW	Enter in the range of 0 to 9999999999.999.
R: TOTAL PRESET	Enter in the range of 0 to 9999999999.999.
R: TOTAL SW	Enter in the range of 0 to 9999999999.999.
OUTPUT BURNOUT	Select from NOT USED and HOLD.
BURNOUT TIMER	Enter in the range of 0 to 900 sec.
PULSE WIDTH 1	Select from 50 msec, 100 msec and 200msec.
PULSE WIDTH 2	Select from 0.5 msec, 1 msec, 2 msec, 5 msec, 10 msec, 20 msec, 50 msec, 100 msec, 200 msec.

Note) When unit is changed, each unit indication of constant, F: total preset, F: total switch, R: total preset, R: total switch are changed if [Read] is executed.

Note) When setting is changed, it should be executed with the mode stop.

## 10. STATUS OUTPUT SETTING

Click the “STATUS” button on the Menu screen, and the following screen appears.

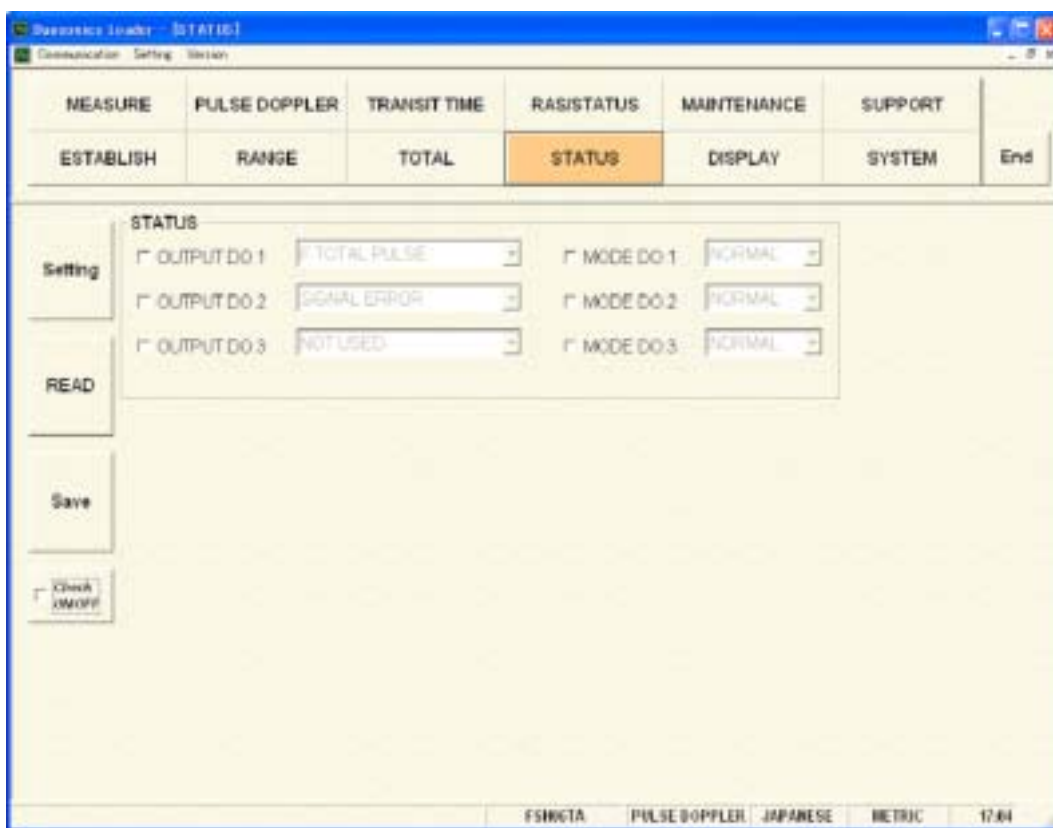


Fig. 16 <Status output setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (.

- [Setting]..... Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [READ] ..... Reads the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [Save] ..... Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF]..... Set the check box to ON to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 12 <Status output setting>

Item	Content
OUTPUT DO 1	Select from NOT USED, SIGNAL ERROR, F: TOTAL PULSE, R: TOTAL PULSE, F: TOTAL SW, R: TOTAL SW, F: TOTAL OVERFLOW, R: TOTAL OVERFLOW, FLOW SW HIGH, FLOW SW LOW, FULL SCALE 2, AO RANGE OVER, PULSE RANGE OVER, R: FLOW DIRECTION and DEVICE ERROR.
OUTPUT DO 2	Same as above
OUTPUT DO 3	Same as above
MODE DO 1	Select either NORMAL or REVERSE.
MODE DO 2	Same as above
MODE DO 3	Same as above

# 11. DISPLAY SETTING

Click the “DISPLAY” button on the Menu screen, and the following screen appears.

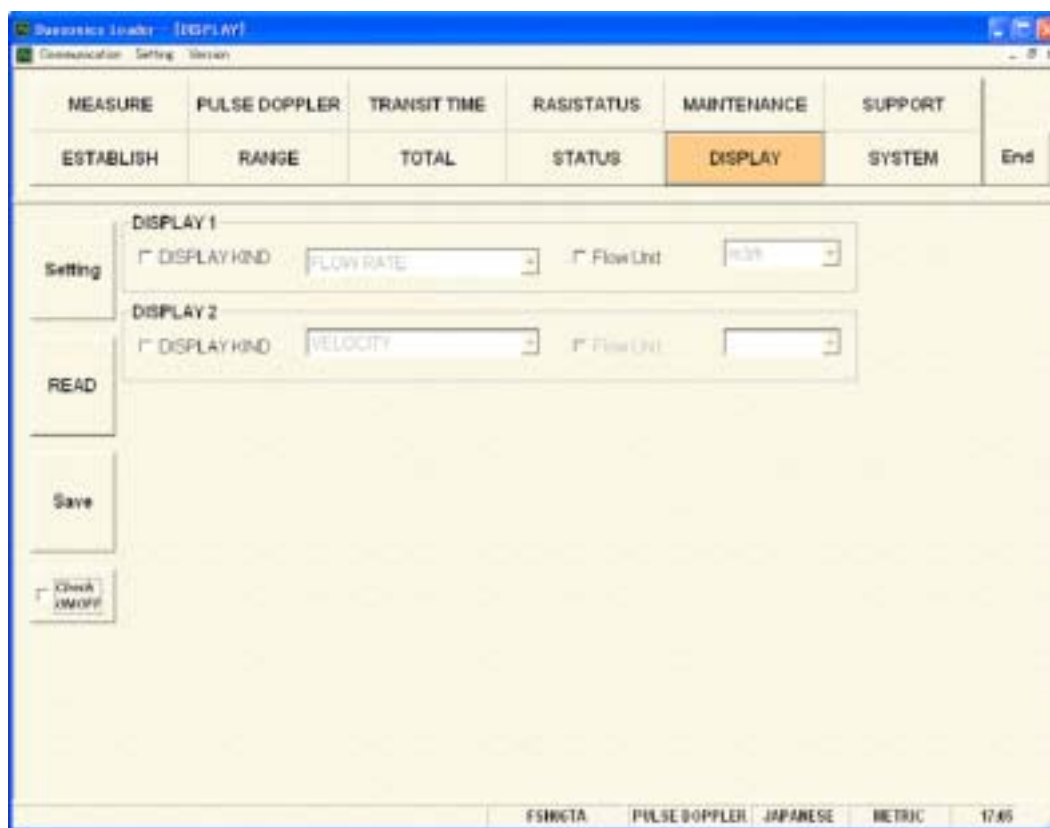


Fig. 17 <Display setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (). If “Flow rate” is select in the selection items, flow rate unit becomes valid.

- [Setting].....Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [READ].....Reads the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [Save].....Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF].....Set the check box to ON to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 13 <Display Setting>

Item		Content
DISPLAY 1	DISPLAY KIND	Select from VELOCITY, FLOW RATE, TOTAL FORWARD, TOTAL REVERSE, F: TOTAL PULSE, R: TOTAL PULSE, FLOW RATE (%).
	Flow Unit	Select from L/s, L/min, L/h, L/d, kL/d, ML/d, m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h, m <sup>3</sup> /d, km <sup>3</sup> /d, Mm <sup>3</sup> /d, BBL/min, BBL/h, BBL/d, kBBL/d, MBBL/d [ft/s, ft <sup>3</sup> /s, ft <sup>3</sup> /min, ft <sup>3</sup> /h, ft <sup>3</sup> /d, kft <sup>3</sup> /d Mft <sup>3</sup> /d, gal/s, gal/min, gal/h, gal/d, kgal/d, Mgal/d, BBL/s, BBL/h, BBL/d, kBBL/d, MBBL/d] * Of which [ ]: unit is in case of inch system.
DISPLAY 2	DISPLAY KIND	Same as the selection of DISPLAY 1
	Flow Unit	Same as the unit of DISPLAY 1

## 12. SYSTEM SETTING

Click the “SYSTEM” button on the Menu screen, and the following screen appears.

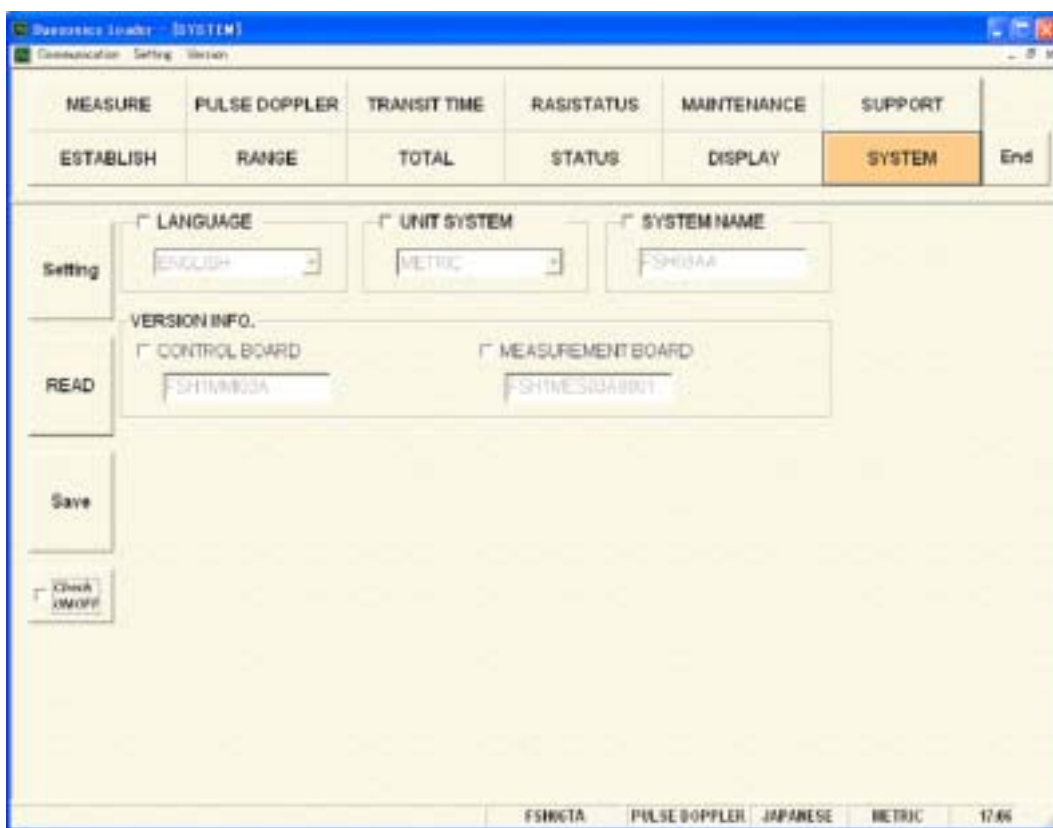


Fig. 18 <System setting screen>

To select an item to be set or read, set the relevant check box to ON (). Not to select (or to reset the selection), set the relevant check box to OFF (). However, system name and version information can only be read.

\* When changing unit, restart the loader to reflect the unit change.

- [Setting]..... Sends the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [READ] ..... Reads the setting of the selected item (check box set to ON ()), reflecting the response value on the setting.
- [Save] ..... Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF]..... Set the check box to ON to select all the items (to set all the check boxes to ON ()). Set the check box to OFF () to release the selection of all the items (to set all the check boxes to OFF ()).

Table 14 <System Setting>

Item	Content		
LANGUAGE	Language is available in JAPANESE, ENGLISH, GERMAN, FRENCH and SPANISH.		
UNIT SYSTEM	Select from METRIC and ENGLISH.		
SYSTEM NAME	Read only	Without flow velocity profile output	FSH###Y
VERSION INFO.	CONTROL BOARD	Read only	With flow velocity profile output
	MEASUREMENT BOARD	Read only	FSH###A

# 13. MEASUREMENT

Click the “MEASURE” button on the Menu screen, and the following screen appears.

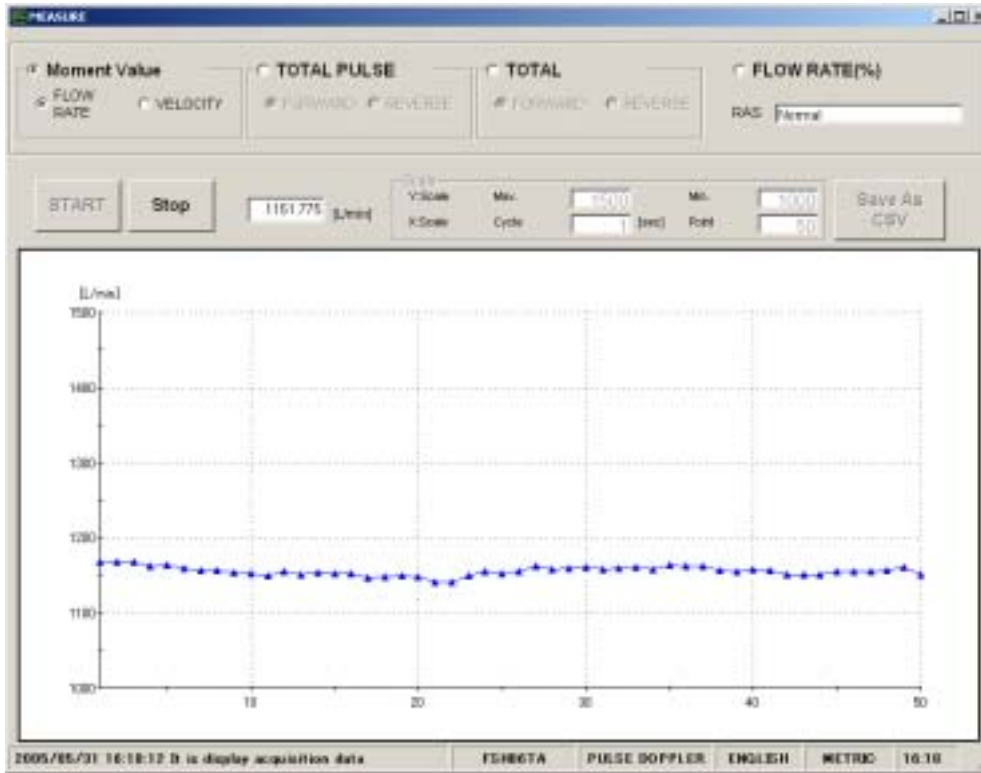


Fig. 19 <Measure screen>

Select one from instantaneous value, total pulse, total value, or flow rate % first. Next, in case of moment value, select either flow rate or flow velocity. In case of total pulse, select either normal direction or reverse direction. In case of total value, select either normal direction or reverse direction.

In case of trend, the read measurement value and RAS columns are updated in specified cycles. Also, it is displayed in trend (X axial displays collection time. The oldest is deleted and time is shifted to make the latest value to be seen when specified points are reached. The vertical axial it displays with Y scale specified. The grid line represents Pulse Doppler in blue and transit time difference in green.

- [Start].....Starts measuring.
- [Stop].....Stops measuring.
- [Save as CSV].....Saves the measurement result in a file in CSV format. Click the button, and you are prompted to enter the name of a file to which the data is to be saved. Specify the destination to save and enter the file name, and a CSV file is created.

Table 15 <Measurement and Detailed Setting>

Item	Content	
Moment Value	Select either FLOW RATE or VELOCITY.	
TOTAL PULSE	Select either FORWARD or REVERSE.	
TOTAL	Select either FORWARD or REVERSE.	
FLOW RATE %	-	
SCALE	Y: Scale	Enter Max and Min.
	X: Scale	Enter Cycle and Point.

# 14. PULSE DOPPLER MEASUREMENT

Click the “PULSE DOPPLER” button on the Menu screen, and the following screen appears. Click detailed setting tab, flow speed distribution tab and/or operation information tab when necessary.

## 14.1. Detailed setting

### ⚠ CAUTION

- Do not change the setting by yourself. Otherwise measurement may be disabled.
- Make the detailed setting only when a problem should arise in flow rate measurement with factory default settings. The setting need not be made in other cases.

Click “Detailed setting”, and the following screen appears.

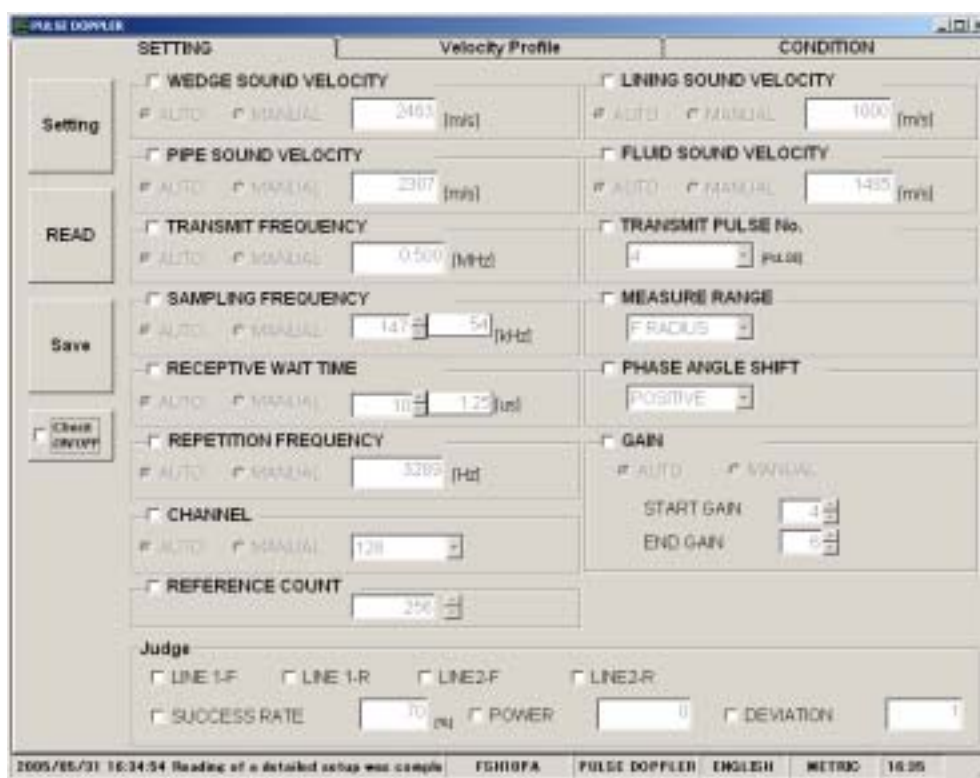


Fig. 20 <Detail setting screen>

To select an item to be set or read, set the relevant check box to ON (☑). Not to select (or to reset the selection), set the relevant check box to OFF (☐). As to judgment, it can obtain with setting success ratio set, power and deviation while setting ON with check box of setting lateral-line. However, when read it, disregard selection of multiple lateral-lines.

- [Setting]..... Sends the setting of the selected item (check box set to ON (☑)), reflecting the response value on the setting.
- [READ] ..... Reads the setting of the selected item (check box set to ON (☑)), reflecting the response value on the setting.
- [Save] ..... Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF]..... Set the check box to ON to select all the items (to set all the check boxes to ON (☑)). Set the check box to OFF (☐) to release the selection of all the items (to set all the check boxes to OFF (☐)).

Table 16 &lt;Pulse and Doppler Measurement Detailed Setting&gt;

Item	Content
WEDGE SOUND VELOCITY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 1000 to 3700 m/s.
PIPE SOUND VELOCITY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 1000 to 3700 m/s.
LINING SOUND VELOCITY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 1000 to 3700 m/s.
FLUID SOUND VELOCITY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 500 to 2500 m/s.
TRANSMIT FREQUENCY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 0.1 to 5 MHz.
SAMPLING FREQUENCY	With selection of AUTO/MANUAL, in case of MANUAL, select numeric at right side column.
RECEPTIVE WAIT TIME	With selection of AUTO/MANUAL, in case of MANUAL, select numeric at right side column.
REPETITION FREQUENCY	With selection of AUTO/MANUAL, in case of MANUAL, input right side column in the range of numeric 100 to 8000 Hz.
CHANNEL	With selection of AUTO/MANUAL, in case of MANUAL, select from numeric 16, 32, 48, 64, 80, 96, 112 and 128 at right side column.
REFERENCE COUNT	Select numeric.
TRANSMIT PULSE NO.	Select from 0, 1, 2, 4, 8, 16, 32 and 64.
MEASUREMENT RANGE	Select from F RADIUS, N RADIUS and DIAMETER.
PHASE ANGLE SHIFT	Select from NORMAL 1, NORMAL 2, POSITIVE and NEGATIVE.
GAIN	With selection of AUTO/MANUAL, in case of MANUAL, select numeric 0 to 18 in each column of START GAIN/END GAIN.

Table 17 &lt;Pulse and Doppler Measurement Judgment Setting&gt;

Item	Content
SUCCESS RATIO	Enter in the range of 0 to 100%.
POWER	Enter in the range of 0.00 to 100.00.
DEVIATION	Enter in the range of 0.00 to 1.00.



## 14.2. Flow velocity profile

Click “Velocity Profile”, and the following screen appears.

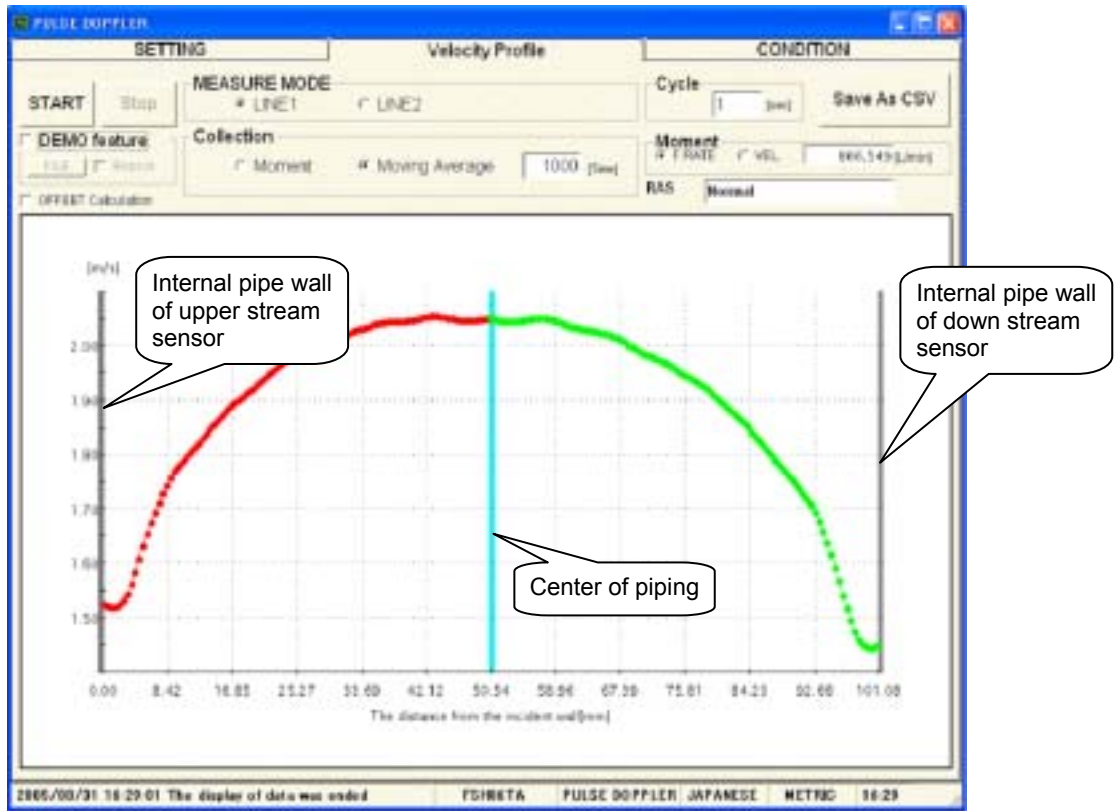


Fig. 21 <Flow Rate Distribution screen>

Select either Moment or Moving Average first and then enter the range for reading from 1 to 60 sec. If Moving-average is selected, set the number of times. Then, select either Line 1 or Line 2. The line displays flow velocity distribution measured by upper flow side sensor in green, and flow speed distribution measured by down flow side sensor in red.

### Collection

- Moment..... Displays data by each read
- Moving Average..... Displays data in moving average with the number of times set by channel in each read data.

### Moment

- Flow velocity/flow rate..... Displays flow velocity or flow rate with each read
- RAS ..... Displaying RAS with each read

- Demonstration function ..... Displays read flow velocity distribution with [Save As CSV] file  
Displays repeatedly by setting check box to ON (☑)

- Offset calculation..... Displays flow velocity profile detected by the sensor on the upper stream side and that on the lower stream side overlapped at the center of the piping.

- [Start]..... Starts reading in indicated cycle.
- [Stop]..... Stops reading.
- [Save As CSV] ..... Saves measurement results in file with CSV format. Click the button, and you are prompted to enter the file name to which the data is to be saved.

# 14.3. Operation Information

Click “CONDITION”, and the following screen appears.



Fig. 22 <Operation Information screen>

Select either Line 1 or Line 2 first.

- [READ] .....Reads operation information in batch.
- [Save As CSV].....Saves the measurement result in a CSV format file. Click the button, and you are prompted to enter the name of a file to which the data is to be saved. Specify the destination to save and enter the file name, and a CSV file is created.

Table 18 &lt;Operation Information&gt;

“Y” becomes “1” with Line 1 and “2” with Line 2.

Item	Content
WEDGE SOUND VELOCITY	m/s [ft/s]
WEDGE ANGLE	°
PIPE SOUND VELOCITY	m/s [ft/s]
ANGLE IN PIPE	°
LINING SOUND VELOCITY	m/s [ft/s]
ANGLE IN LINING	°
FLUID SOUND VELOCITY	m/s [ft/s]
WEDGE TEMPERATURE	°C [°F] displaying with “-” in case of measurement abnormal
ANGLE IN FLUID	°
TRANSMIT FREQUENCY	MHz
SAMPLING FREQUENCY	kHz
RECEPTIVE WAIT TIME	μs
REPETITION FREQUENCY	Hz
TRANSMIT PULSE No.	
REFERENCE COUNT	
No. OF CHANNELS	
MEASURE RANGE	F RADIUS, N RADIUS, DIAMETER
PHASE ANGLE SHIFT	NORMAL1, POSITIVE, NEGATIVE
START GAIN	
END GAIN	
START DIST.	mm [inch]
CHANNEL WIDTH	mm [inch]
START CHANNEL	0 to 128
END CHANNEL	0 to 128
VELOCITY COEFF.	
MEASURE MODE1-F: POWER	[10 <sup>4</sup> ]
MEASURE MODE1-F: DEVIATION	
MEASURE MODE1-F: SUCCESS RATE	[%]
MEASURE MODE1-R: POWER	[10 <sup>4</sup> ]
MEASURE MODE1-R: DEVIATION	
MEASURE MODE1-R: SUCCESS RATE	[%]

# 15. TRANSIT TIME DIFFERENCE MEASUREMENT

Click the [TRANSIT TIME] button on the Menu screen, and the following screen appears. Click detailed setting tab, receiving waveform tab and operation information tab when necessary.

## 15.1. Detailed Setting

### ⚠ CAUTION

- Do not change the setting by yourself. Otherwise measurement may be disabled.
- Make the detailed setting only when a problem should arise in flow rate measurement with factory default settings. The setting need not be made in other cases.

Click “SETTING”, and the following screen appears.

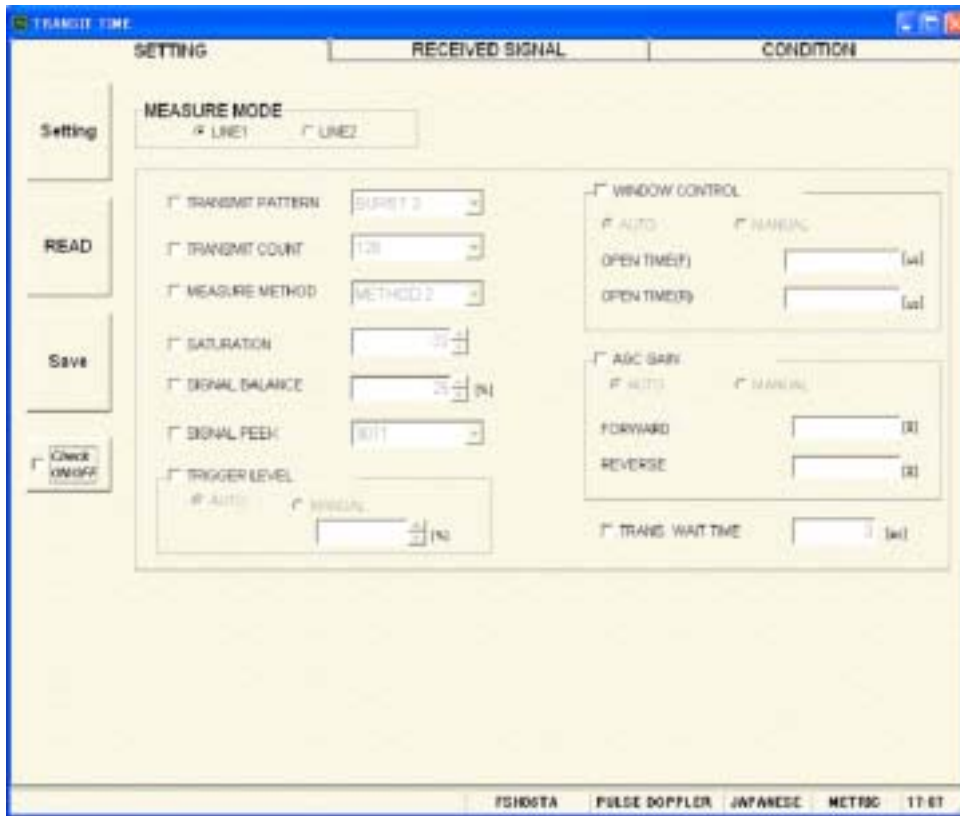


Fig. 23 <Detailed information screen>

Select either Line 1 or Line 2 first. As to selected Lateral-line, select the items to be set and read. Set the check box items to be set to . Set the check box of the items not to be selected to reset the selection to OFF. .

- [Setting].....Sends the setting of the selected item (check box set to ON ), reflecting the response value on the setting.
- [READ].....Reads the setting of the selected item (check box set to ON ), reflecting the response value on the setting.
- [Save].....Reflects the setting sent by pressing the [Setting] button on the flow transmitter.
- [Check ON/OFF].....Set the check box to ON to select all the items (to set all the check boxes to ON ). Set the check box to OFF  to release the selection of all the items (to set all the check boxes to OFF ).

Table 19 &lt;Detailed Setting&gt;

Item	Content
TRANSMIT PATTERN	Select from BURST 1, BURST 2, BURST 3, BURST 4, BURST 5, CHIRP 4 and CHIRP 8.
TRANSMIT COUNT	Select from 8, 16, 32, 64, 128 and 256.
MEASURE METHOD	Select from METHOD 1, METHOD 2 and METHOD 3.
SATURATION	Enter in the range of numeric 0 to 256.
SIGNAL BALANCE	Enter in the range of numeric 0 to 100%.
SIGNAL PEEK	Select from 2048, 3071, 4096 and 5120.
TRIGGER LEVEL	With selection of AUTO/MANUAL, in case of MANUAL, input range of numeric 10.00 to 90.00% at right column.
WINDOW CONTROL	With selection of AUTO/MANUAL, in case of MANUAL, input range of numeric 1 to 16383 in each column of OPEN TIME (F)/OPEN TIME (R).
AGC GAIN	With selection of AUTO/MANUAL, in case of MANUAL, input range of numeric 0.00 to 100.00% in each column of FORWARD/REVERSE.
TRANS. WAIT TIME	Enter in the range of numeric 1 to 30 msec.

## 15.2. Received Signal

Click “RECEIVED SIGNAL”, and the following screen appears.

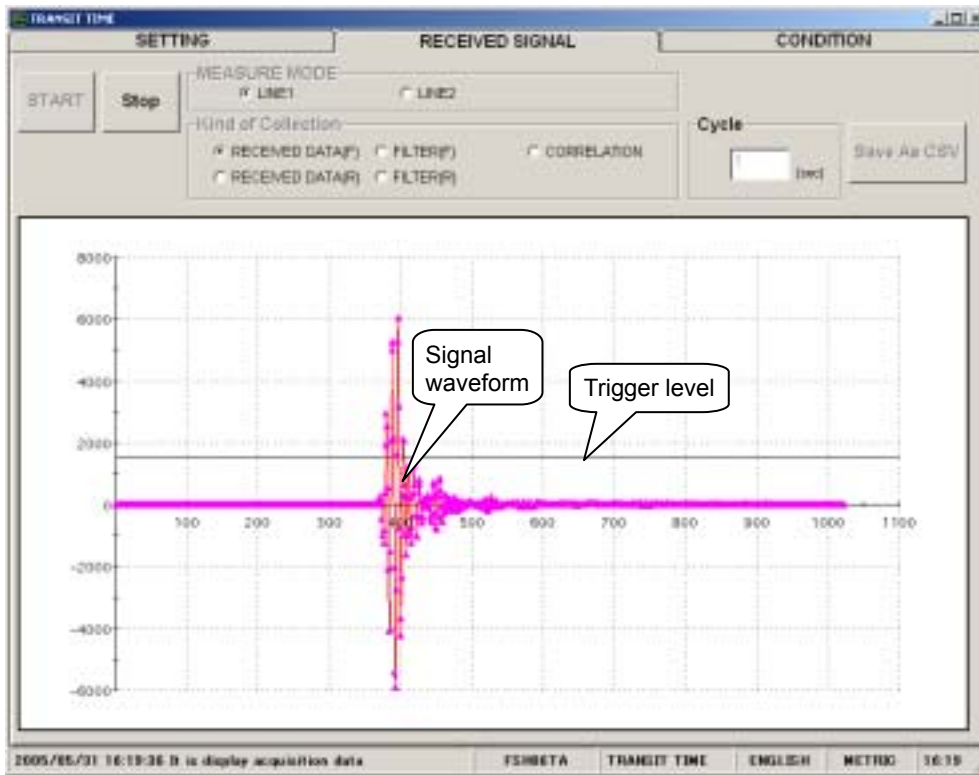


Fig. 24 <Received signal screen>

Select either Line 1 or Line 2 first. Then, select one from forward direction received wave, reverse direction received wave, forward direction filter, reverse direction filter and correlation waveform. Depending on measurement method (method 1, method 2 and method 3), items which can be selected vary as shown below. Trigger level is also displayed.

Left-click the mouse while pressing the shift key to specify the screen range, and the selected range is magnified. Press the R key to return to original status.

- Method 1: One from forward direction, reverse direction and correlation waveform can be selected.
- Method 2: One from forward direction, reverse direction, forward direction filter and reverse direction filter can be selected.
- Method 3: One from forward direction, reverse direction, forward direction filter and reverse direction filter can be selected.

[Start] .....Starts reading in idicated cycle.

[Stop].....Stops reading

[Save As CSV] .....Saves the measurement result in a file in CSV format. Click the button, and you are prompted to enter the name of a file to which the data is to be saved. Specify the destination to save and enter the file name, and a CSV file is created.

# 15.3. Operation Information

Click “CONDITION”, and the following screen appears.

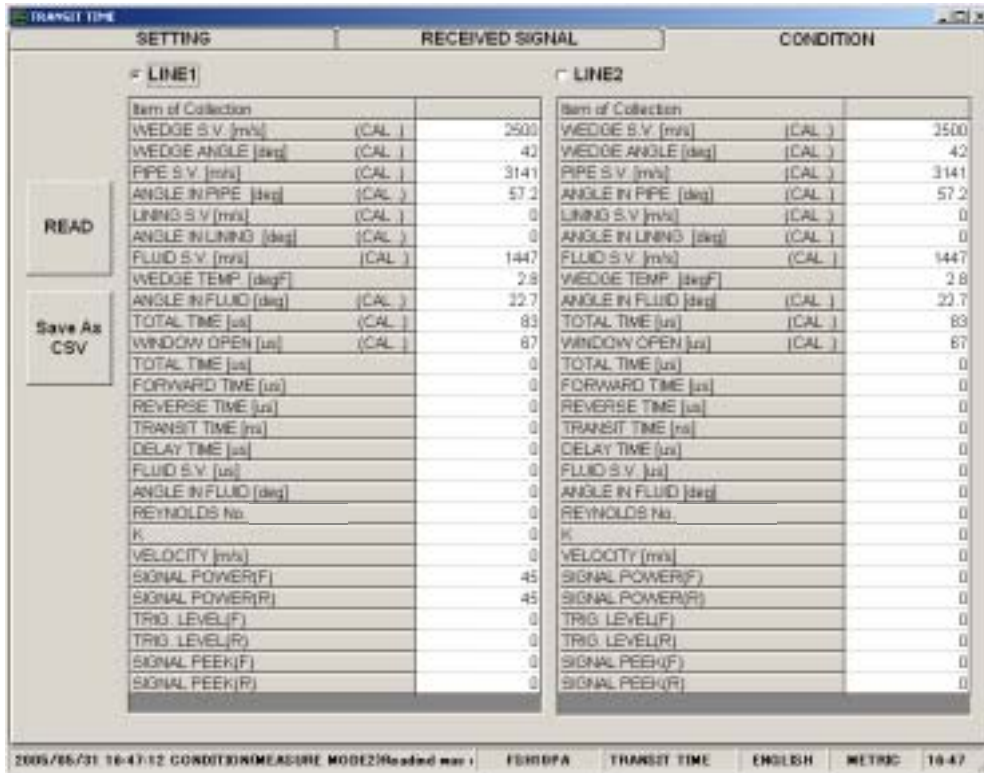


Fig. 25 <Operation Information screen>

Select either Line 1 or Line 2 first.

[Read]..... Reads operation information in a batch.

[Save As CSV]..... Saves Operation Information in file with CSV format. Click the button, and you are prompted to enter the name of a file to which the data is to be saved. Specify the destination to save and enter the file name, and a CSV file is created.

Table 20 &lt;Operation Information&gt;

Item	Content
WEDGE SOUND VELOCITY	m/s [ft/s]
WEDGE ANGLE	°
PIPE SOUND VELOCITY	m/s [ft/s]
ANGLE IN PIPE	°
LINING SOUND VELOCITY	m/s [ft/s]
ANGLE IN LINING	°
FLUID SOUND VELOCITY	m/s [ft/s]
WEDGE TEMPERATURE	°C [°F] displaying with “-” in case of measurement abnormal
ANGLE IN FLUID	°
TOTAL TIME	μs
WINDOW OPEN	μs
TOTAL TIME	μs
FORWARD TIME	μs
RESERVE TIME	μs
TRANSIT TIME	ns
DELAY TIME	μs
FLUID SOUND VELOCITY	μs
ANGLE IN FLUID	°
REINOLDS No.	
K	
VELOCITY	m/s [ft/s]
SIGNAL POWER (F)	
SIGNAL POWER (R)	
TRIG. LEVEL (F)	
TRIG. LEVEL (R)	
SIGNAL PEEK (F)	
SIGNAL PEEK (R)	



## 16. RAS/STATUS

Click the [RAS/STATUS] button on the menu screen. Click the [RAS] tab, [STATUS] tab, or [RAS Detail Setting] tab as required.

### 16.1. RAS

Click the [RAS] tab, and the following screen appears.

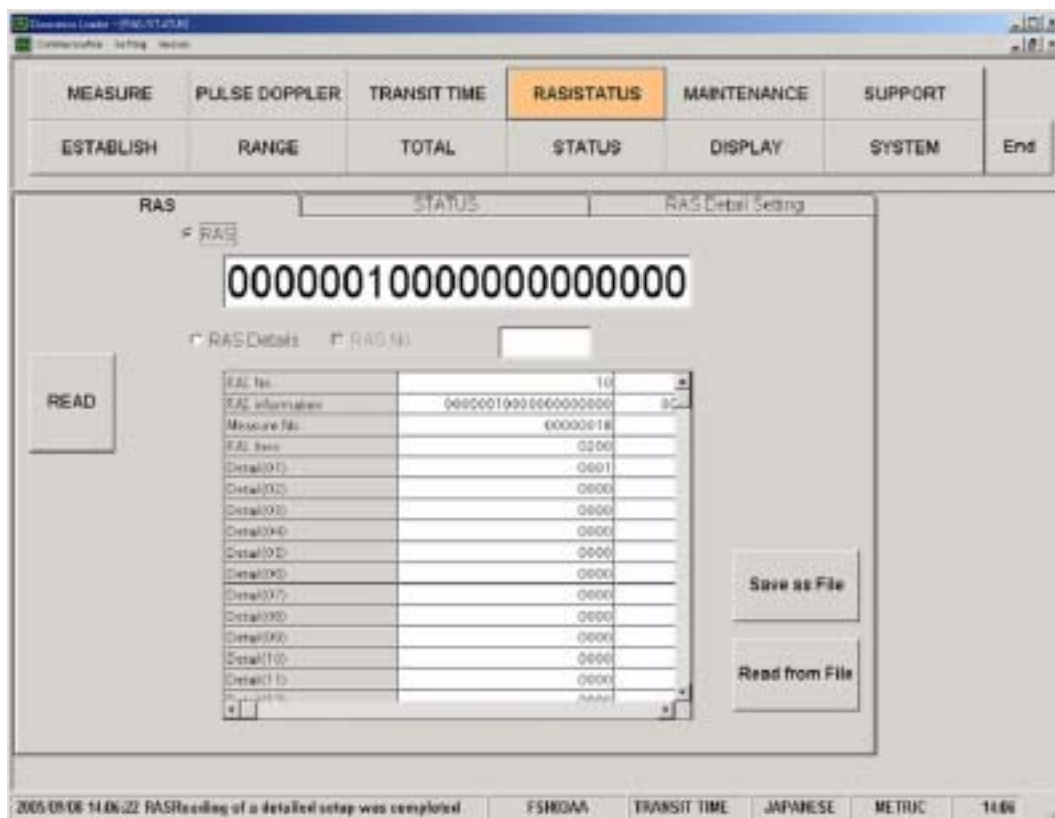


Fig. 26 <RAS screen>

The latest RAS and detailed RAS information can be displayed on the RAS screen.

(1) Latest RAS

Click the [RAS] option and then the [READ] button, and the latest RAS information\*<sup>1</sup> (20 digits consisting of 0 and/or 1) is displayed.

(2) RAS details

Click the [RAS Details] option and then the [READ] button, and all the RAS data is read. Up to 300 items out of the latest RAS detail information can be displayed. Scroll the scroll bar to display older items. If [RAS No.] is selected, RAS of the selected No. only is read.

[Save as File] button ..... Saves the displayed RAS detail data in a file.

[Read from File] button ..... Displays RAS detail data in the selected file as a table.

## 16.2. Status

Click the [STATUS] tab to display the following screen.

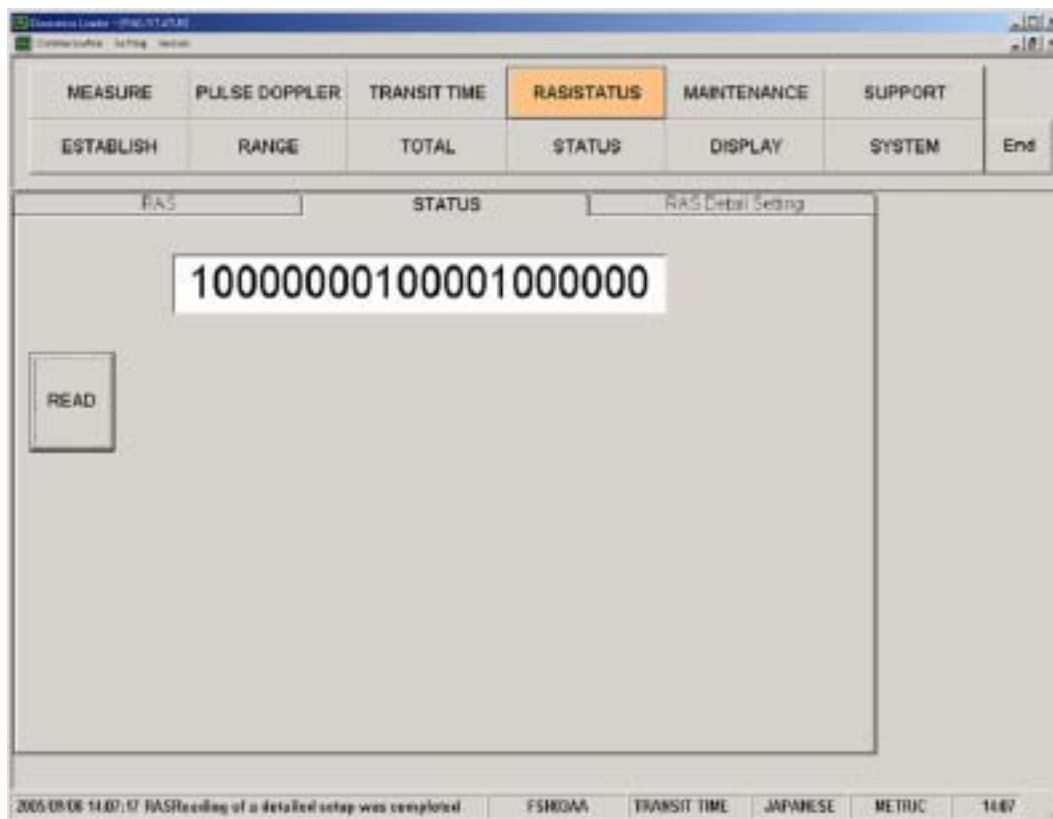


Fig. 27 <Status screen>

[READ] button.....Display the status\*<sup>2</sup> (20 digits consisting of 0 and/or 1).

## 16.3. RAS detail setting

Click the [RAS Detail Setting] tab to display the following screen.

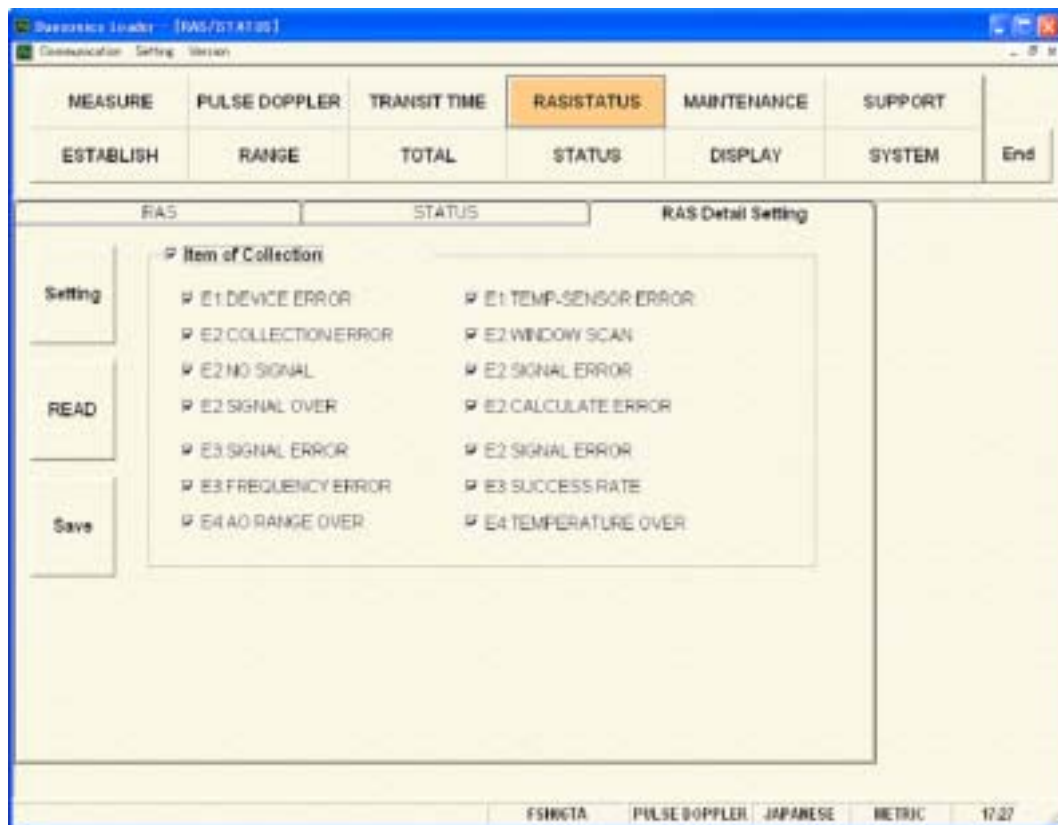


Fig. 28 <RAS detail setting screen>

Set the RAS collection method as follows.

### (1) Item of collection

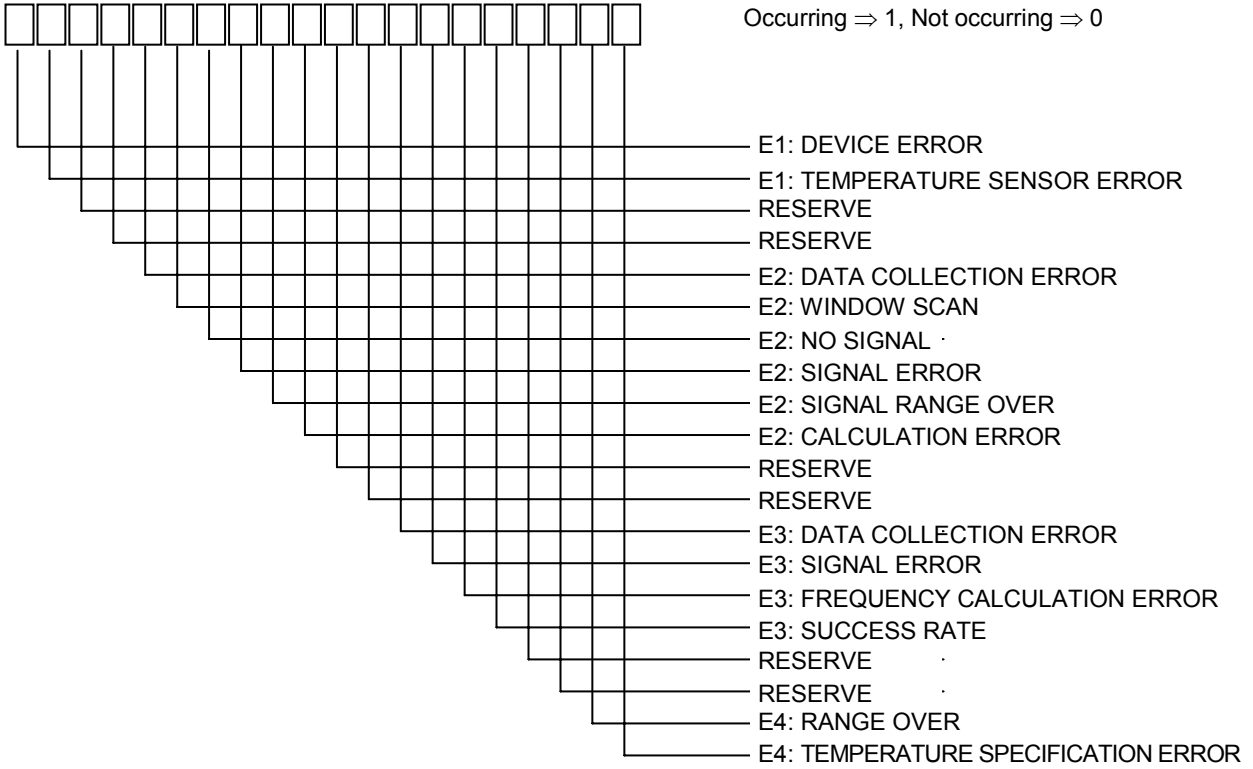
Check the check box for Item of Collection to ON (). Then select items to be collected by checking the relevant check box to ON (). Leave the check box for the item not to be collected blank ().

[Setting] button ..... Sends the items to be collected (check box set to ON []), and reflects the response value to the check box of the relevant item.

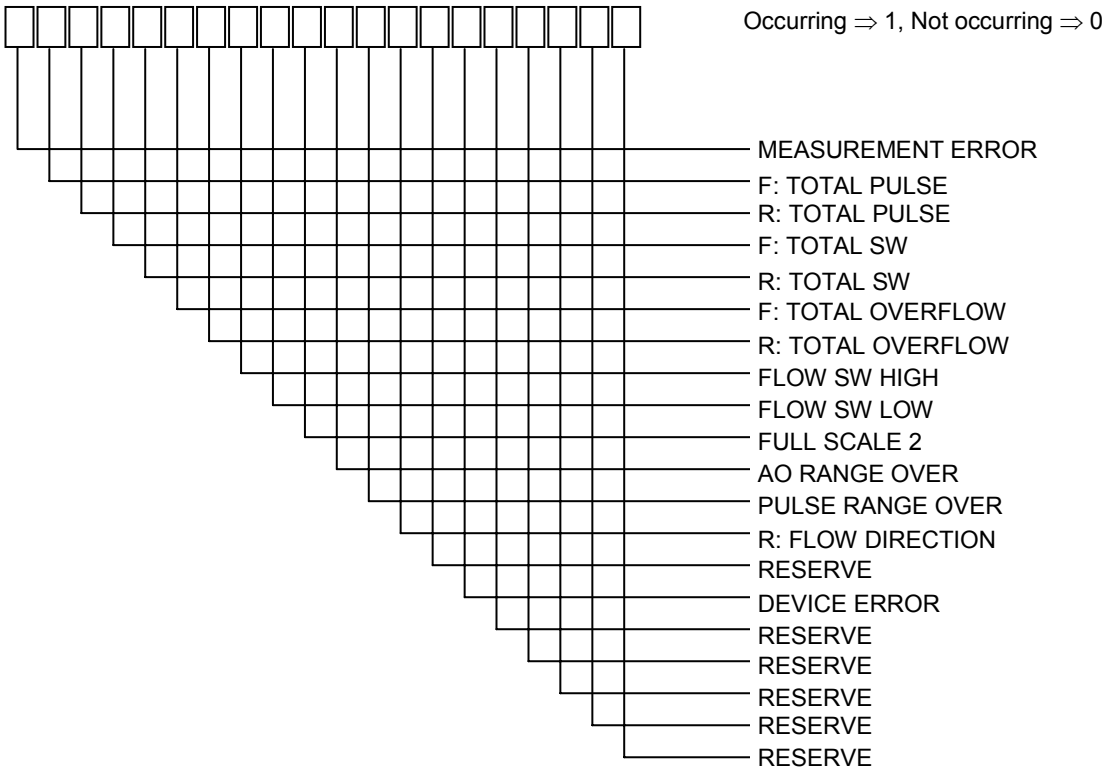
[Read] button ..... Reflects the current RAS items of collection to the check box.

[Save] button..... Reflects the item of collection sent by clicking the [Setting] button to the flow transmitter.

**\*1) Composition of RAS information**



**\*2) Composition of Status**



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## 17. MAINTENANCE

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Click the “MAINTENANCE” button on the Menu screen, and the following screen appears.

Note) If [Setting] and [Read] are executed on this screen, the instrument is in the Maintenance mode for flow rate measurement. Be sure to reset the Maintenance mode of flow meter by clicking the [Release] button.

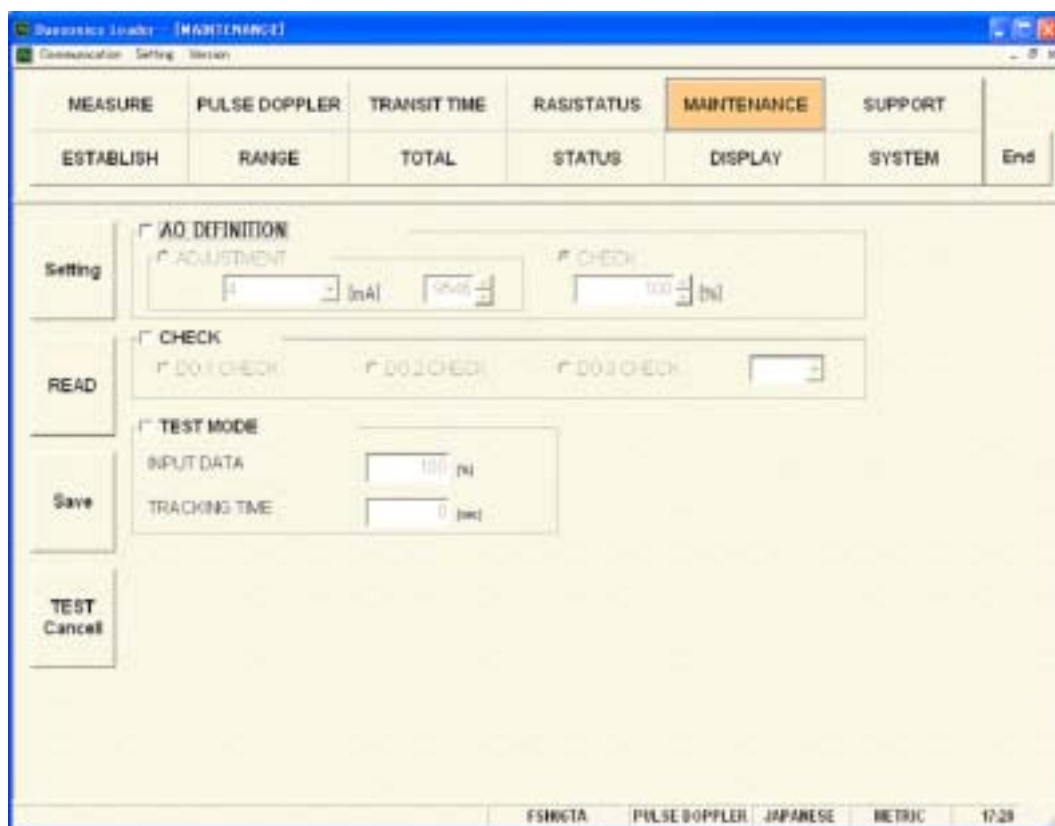


Fig. 29 <Maintenance screen>

### (1) Analog output

There are two options: 4 to 20 mA adjustment and confirmation. Select one by pressing the option button.

- Adjustment

(1) Select either “4 mA” or “20 mA”, read current setting at right column by clicking the [READ] button once. Then, set value (1 to 65535) at right column and click the [Setting] button, and then click the [Save] button. When setting is completed, setting value is redisplayed at right column. Click the [READ] button, and selected setting values of “4 mA” and “20 mA” appear on the right column.

- Confirmation

(2) Selecting a value in the range from -20 to 120, and click the [Setting] button, when setting is completed, and setting value is redisplayed: Click the [READ] button, and the setting value appears.

### (2) DO output

Select one from the following option buttons: DO1 output confirmation, DO2 output confirmation and DO3 output confirmation.

- DO1 output confirmation

(1) Set [DO1 Output Confirmation] check box to ON. Then select either ON or OFF from setting combo box, and click the [Setting] button to change the selected value of DO1 output. Click the [READ] button, and the setting value appears.

- DO2 output confirmation
  - (2) Set [DO2 Output Confirmation] check box to ON. Then select either ON or OFF from setting combo box, and click the [Setting] button to change to the selected value of DO2 output. Click the [READ] button, and the setting value appears.
- DO3 output confirmation
  - (3) Set [DO3 Output Confirmation] check box to ON. Then select either ON or OFF from setting combo box, and click the [Setting] button to change the selected value of DO3 output. Click the [READ] button, and setting value is displayed.

**(3) Test mode**

Set input data and tracking time and click the [Setting] button, and you can enter the test mode. Click the [Read] button to read the values in each column of the test mode.

[Release] button .....Resets analog output, each DO output and Test mode.

\* Note: Make sure to press the [Release] button when maintenance is completed.

# 18. SUPPORT

Click the [SUPPORT] button, and the following screen appears.

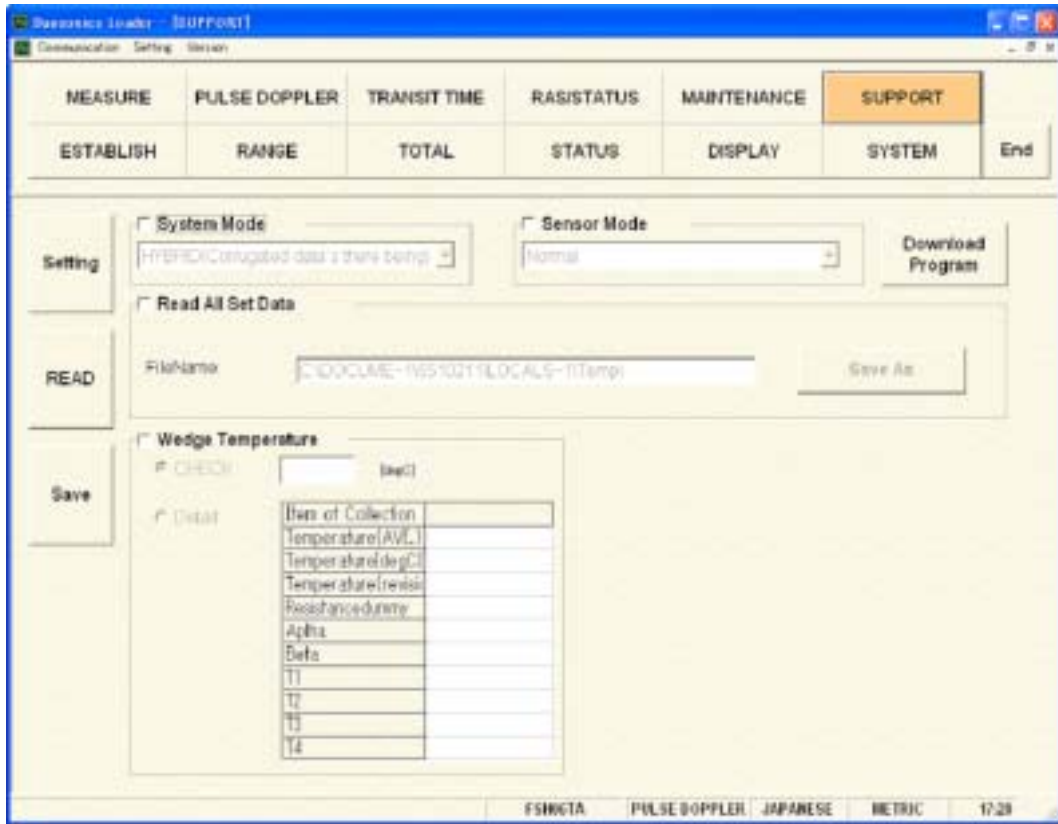


Fig. 30 <Support screen>

Set the check box of the items to be selected for setting or reading to ON (☑). Leave the check box of the items not to be selected blank (☐). Reading only is allowed with the items for Read All Set Data and Wedge Temperature.

- [Setting] button..... Transmits the settings of selected items (check box set to ON [☑]), and reflects the response value to the settings.
- [READ] button..... Reads the setting of selected items (check box set to ON [☑]), and reflects the response value to the setting.
- [Save] button..... Reflects the setting transmitted by clicking the [Setting] button to the flow transmitter.

Table 21 <System setting>

Item		Description
System mode		Select from hybrid (with waveform data) and hybrid (without waveform data). Application: By changing the system mode to hybrid (with waveform data) when adjusting the flow transmitter without flow velocity profile output, check of flow velocity profile and signal waveform is allowed. *Be sure to restore the original setting after the adjustment.
Sensor mode		Select from Normal, Sensor F, and Sensor R. Application: Select the sensor mode when carrying out delivery test of the sensor unit at the factory. Select Normal.
Read all set data		Select Read All Set Data to read all the settings of the flow transmitter. Click the [Save As] button, and you are prompted to enter the name of the file to which the data is to be saved. Enter the destination to save and file name. Click the [Read] button and a file in CSV format is created.
Wedge temperature	Check	Displays the temperature measured with the temperature sensor.
	Detail	Displays the temperature measured with the temperature sensor and the internal constant.



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## 19. END

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Click the [End] button on the Menu screen, and the following screen appears.

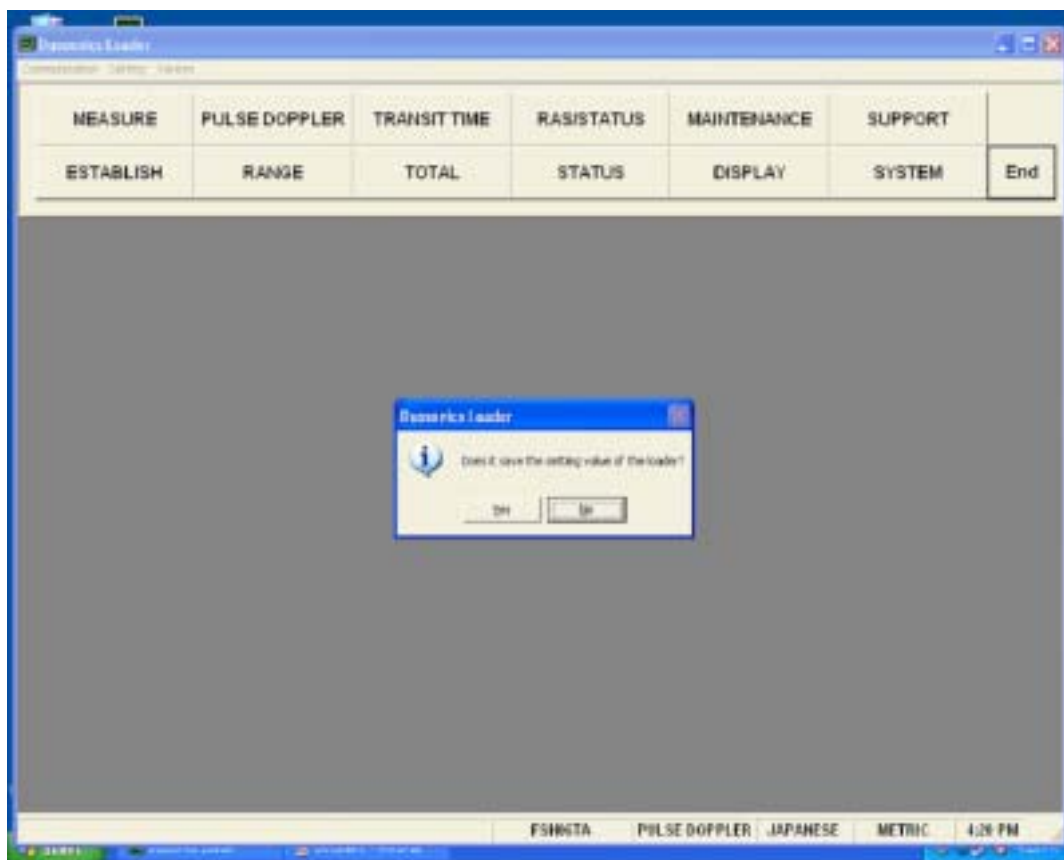


Fig. 31 <Menu screen>

Click either the [End] button or the  button, and a message asking you whether you want to save the loader setting appears. To save setting value, select “Yes”. On the file designation window that appears, select a file, and the setting is saved in the file. Then the loader is terminated. Not to save setting value, select “No”, and the loader is terminated without saving the setting.

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## 20. UNINSTALLING OF SOFTWARE

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Select “Addition and Deletion of Application” from “Control Panel” of Windows, and click [Change and Deletion] to uninstall the software.





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## **Fuji Electric Systems Co., Ltd.**

### **Head Office**

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,  
Shinagawa-ku, Tokyo 141-0032, Japan  
<http://www.fesys.co.jp/eng>

### **Instrumentation Div.**

#### **International Sales Dept.**

No.1, Fuji-machi, Hino-city, Tokyo 191-8502, Japan  
Phone: 81-42-585-6201, 6202 Fax: 81-42-585-6187  
<http://www.fic-net.jp/eng>

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