HIOKI

Instruction Manual

PW Communicator

- ✓ This manual explains the free software (PW Communicator) for the HIOKI Power Meter series only.
- ✓ Please refer to the Instruction Manual for your Power Meter for details regarding communication settings.
- ✓ All reasonable care has been taken in the production of this manual, but if you find any points which are unclear or in error, please contact your supplier or the International Sales and Marketing Department at HIOKI headquarters.
- ✓ In the interest of product development, the contents of this manual may be subject to revision without notice.
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- ✓ Be sure to review the Instruction Manual for your Power Meter before using the software.

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1. Introduction

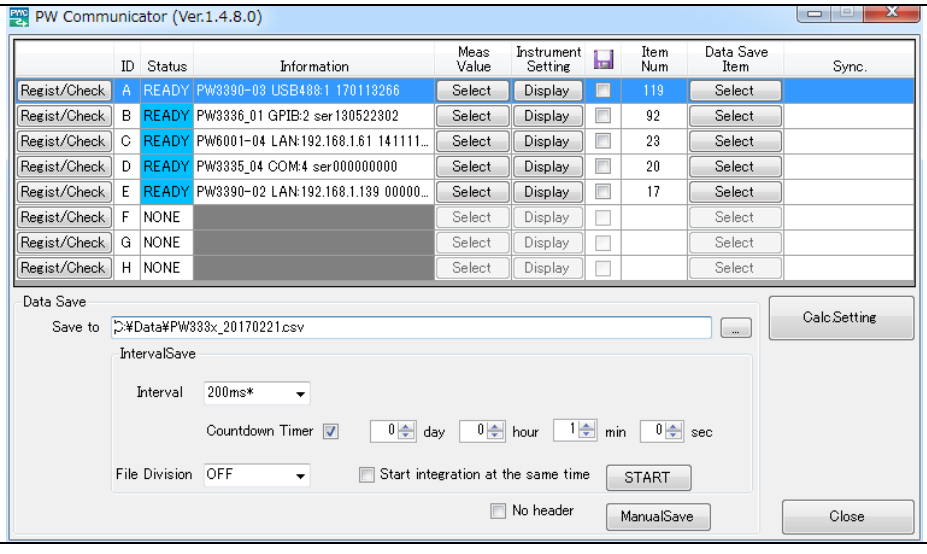
“PW Communicator” is application software exclusively used for the HIOKI Power Meter series.
This software allows you to view the measurement data and also save them in the CSV format through communication with up to eight Power Meters via a LAN, GP-IB, USB,or RS-232C(COM port).

Supported Models and Communication Interfaces

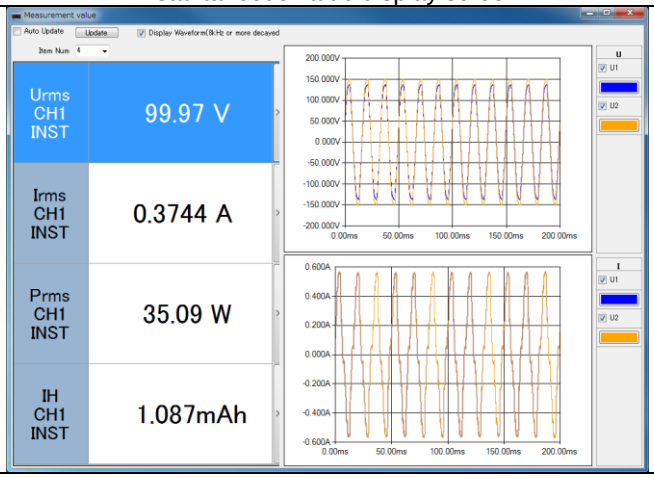
Power Meter	Power Meter’s Communication interface			
	LAN	GP-IB	USB	RS-232C
PW3335, -02,-03	○	-	-	○
PW3335-01	○	○	-	-
PW3335-04	○	○	-	○
PW3336, -02	○	-	-	○
PW3336-01, -03	○	○	-	○
PW3337, -02	○	-	-	○
PW3337-01, -03	○	○	-	○
PW3390-01,-02,-03	○	-	○	○
PW6001	○	○	-	○

Hereafter in this manual, the Power Meter may also be referred to as the “instrument”, and “PW Communicator” as the “software”.

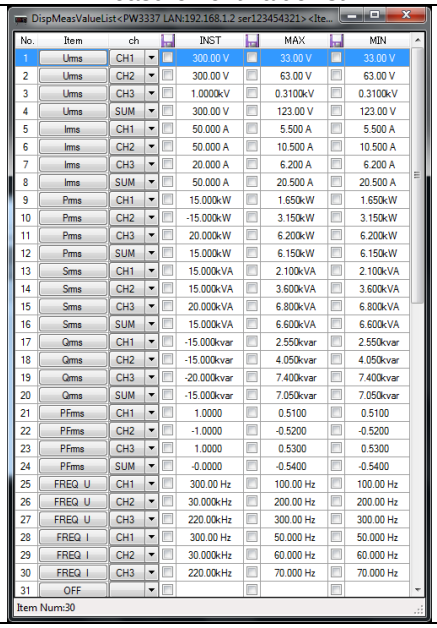
Main screen



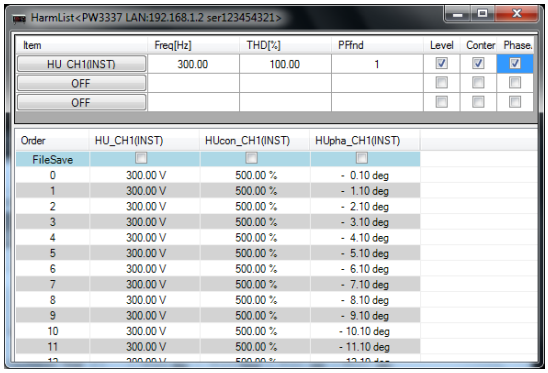
Instantaneous value display screen



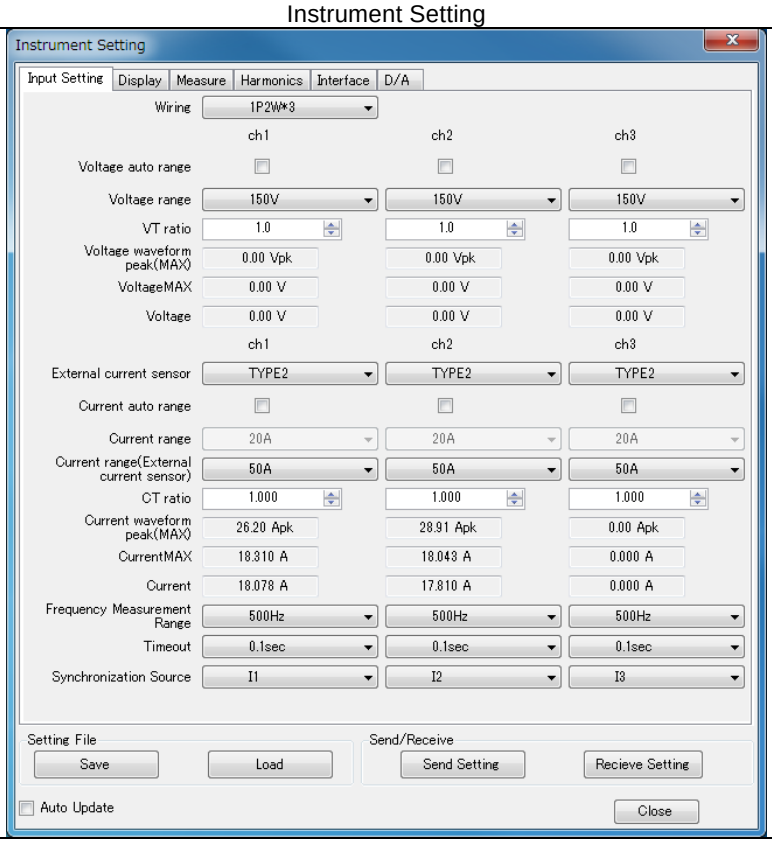
Measurement value list



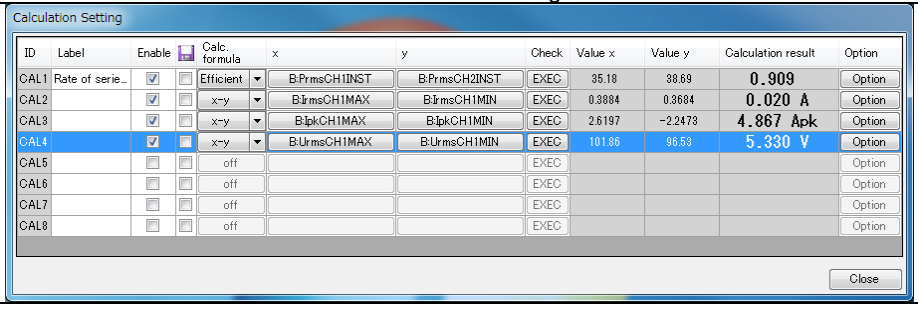
Harmonic display screen



Instrument Setting



Calculation Setting



1.1 Operating Precautions Including Reproduction and Copyright

- Copyright
  All rights, including copyrights of the execution file and documents of this program, belong to Hioki E.E. Corporation.
- Conditions of use
  Any sales of this software bundled with for-profit software or printed books without permission of the owner of the copyright are prohibited. In addition, reverse engineering and modification of the software without permission of the owner of the copyright are also prohibited.
- User's responsibility
  This is free software. It can be used for any purpose under the user's own responsibility.
  We do not assume any responsibility for any damage caused by this software.
  We also do not assume any responsibility for any software failures or adverse effects of this software.
  We do not accept any inquiries or requests concerning this software.
  This software is subject to change without prior notice.

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1.2 System Configuration Requirements

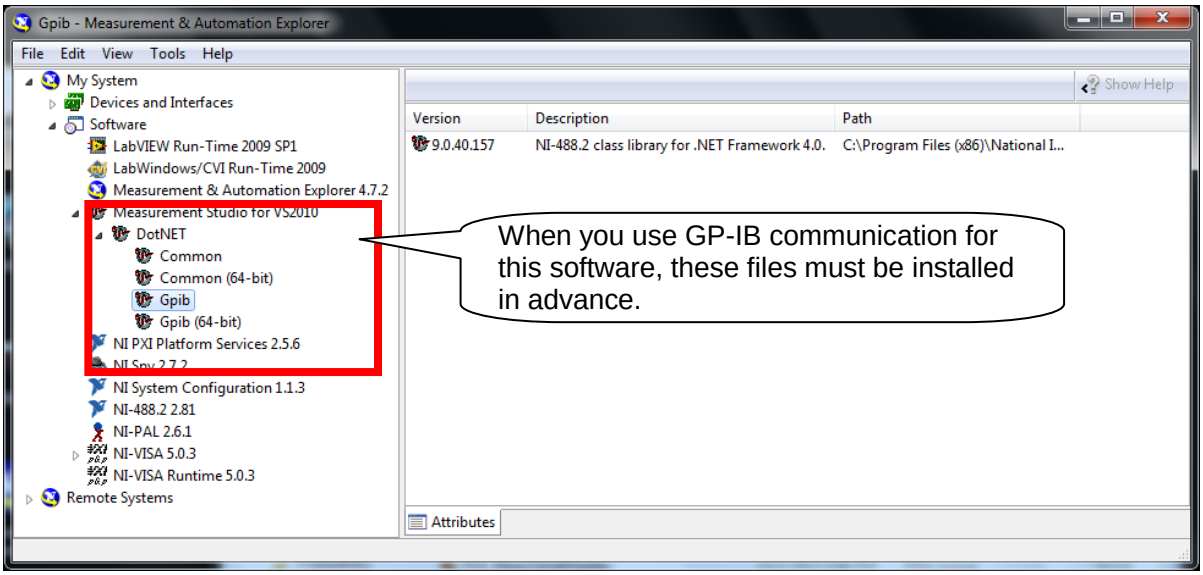
The following systems must be installed on your computer to use PW Communicator.

Computer	PC/AT compatible machine (DOS/V machine)
Operating system	· Windows 7 SP1 or above (32-/64-bit edition)
	· Windows 8 (32-/64-bit edition)
	· Windows 10 (32-/64-bit edition)
	Microsoft .NET Framework4 must be installed in the above operating systems in advance.
	(In a non-English environment, language pack according to the environment is necessary)
CPU	1.0 GHz or above (2.0 GHz or above is recommended)
Memory	1.0 GB or above (2.0 GB or above is recommended)
	Note: 2.0 GB or above for Windows 64-bit edition
Hard disk	Free space of 128 MB or more (at the time of startup)
Display	Resolution of 1,024×768 dots or above, 65,536 colors or more
Communication interface (one or more of the following)	
LAN	Ethernet(TCP/IP)
GP-IB	Only the products manufactured by National Instruments Corporation are acceptable (The GP-IB driver manufactured by National Instruments (class library compatible with .NET4.0, ni-488.2 3.1.2 later) must be installed in advance)
USB	Install the supplied driver (USB488h) to use the USB interface.
RS-232C	9600/38400 bps *PW6001: 9600/19200/38400/57600/115200/230400 bps

For the connection procedure between the instrument and computer, refer to the Instruction Manual for the instrument.

NOTE

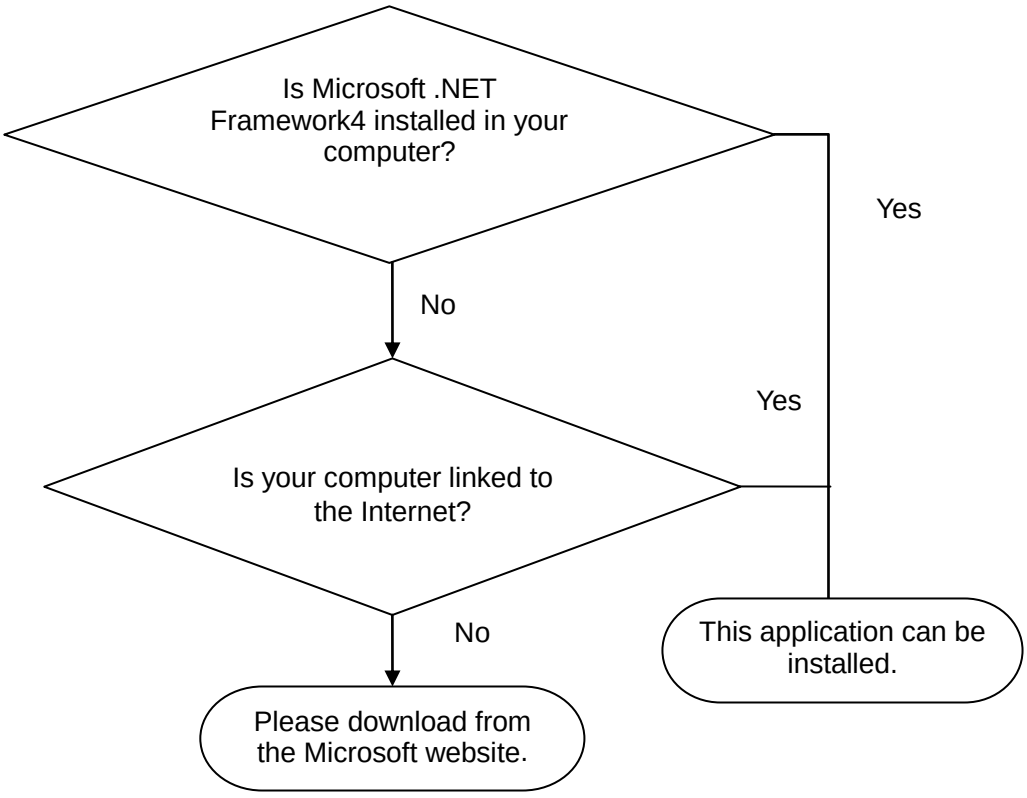
When you use GP-IB communication, the GP-IB driver (class library compatible with .NET4.0) manufactured by National Instruments must be installed in advance. You can check this on “Measurement & Automation Explorer”, which is installed when you use a product manufactured by National Instruments.



The supplied USB driver (USB488h) must be installed in order to use the USB interface. The driver can be downloaded from Hioki’s website (https://www.hioki.co.jp).

2. Installation

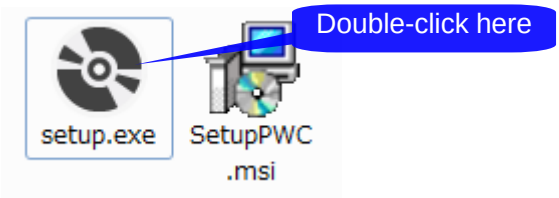
Before installing this software, it is required that Microsoft .NET Framework4 be installed in advance.
If it is not installed, it can automatically be installed before the installation of this software, as long as your computer is currently linked to the Internet.
If it is not installed and your computer is not linked to the Internet, this software cannot be installed.
It can be downloaded from the Microsoft website.



Note

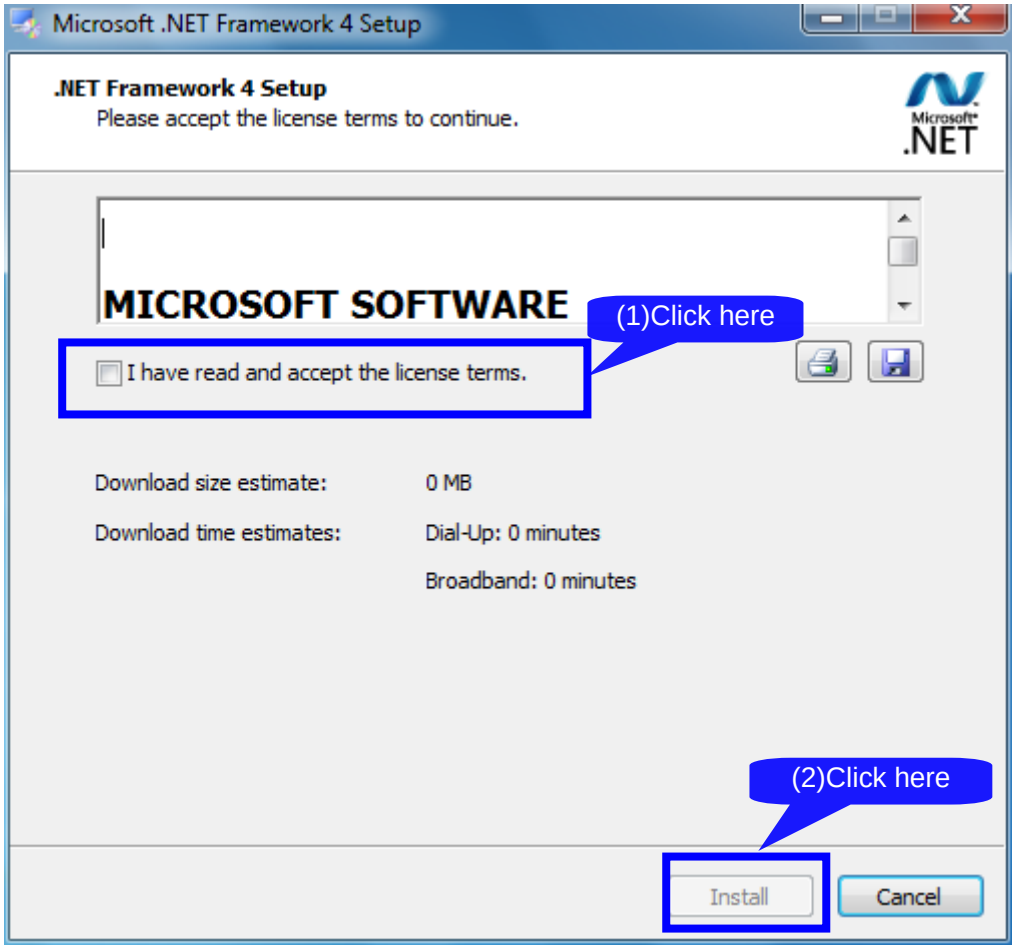
- Install the software with the Administrator privilege.
- Installation may not be possible if other applications are currently running. Before installation, exit all other applications, if possible. Especially when antivirus software is currently running, installation may be prohibited even if the software is not affected by a virus. In such a case, change the settings of the antivirus software to permit installation.

Example: When installing the software on Windows7
Note: A different message may appear, depending on the operating system.
1 Exit all the applications currently running.
2 Double-click [setup.exe] (setup file) (the extension may not be displayed depending on the setting of your computer). Double-clicking it starts up the installer.

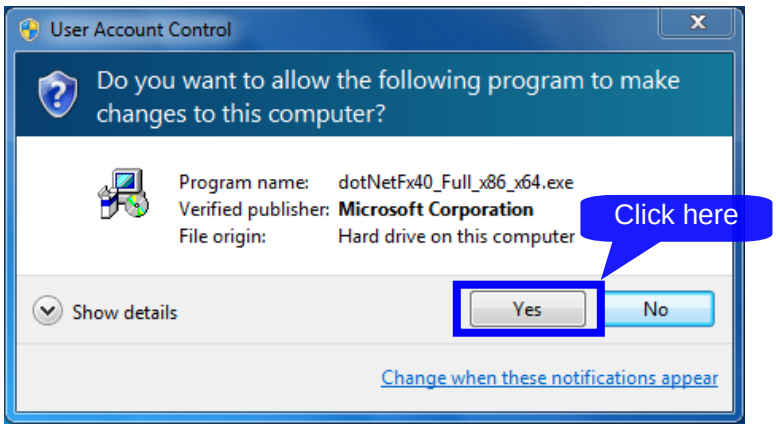


■ If Microsoft .NET Framework4 is not installed on your computer

If Microsoft .NET Framework4 is not installed on your computer, the following screen appears. Check your computer is linked to the Internet and then install the software.

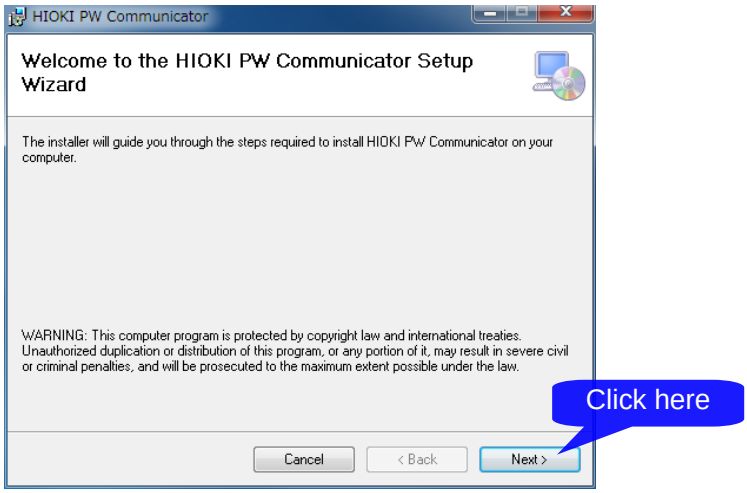


When a dialog box requiring you to permit the continued program installation appears, click [Yes] to proceed to the next step.

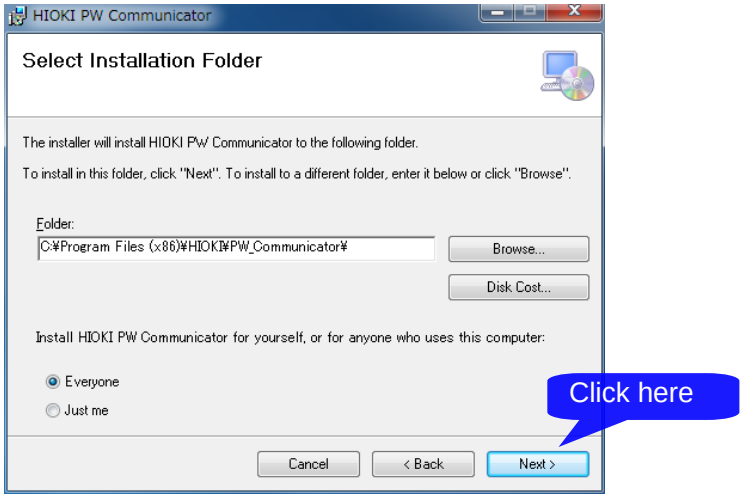


When a message prompting you to restart the system appears, click [Yes] to restart the system. After the system has restarted, the installation will automatically be continued.

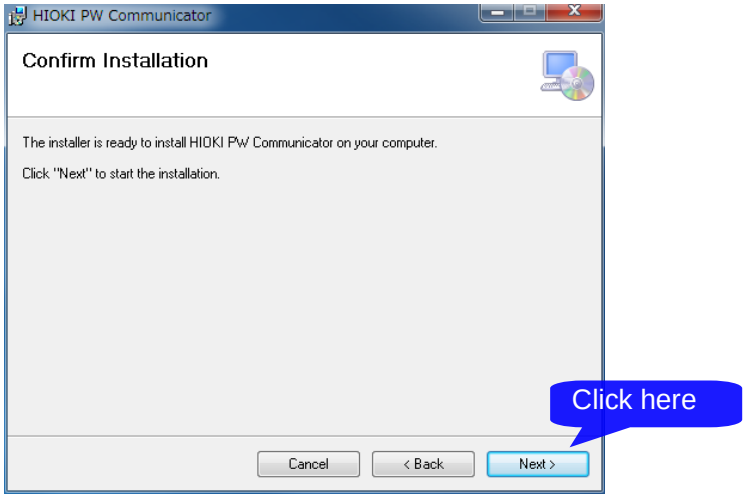
When the “PW Communicator” setup wizard appears, click [Next>] and check the installation destination.



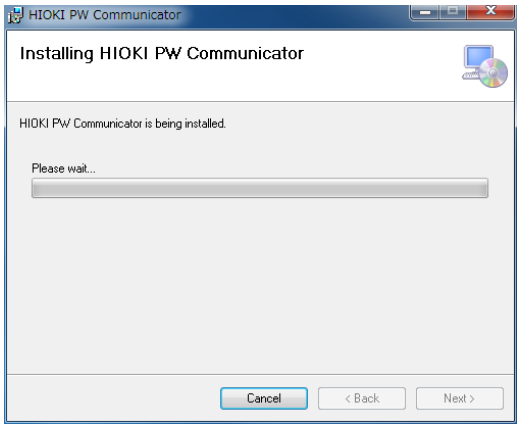
Specify the installation destination.
If you wish to change the installation destination, click [Browse…], and then change to the relevant folder. Normally, it is not necessary to change it.
If it is not necessary to change the installation destination, click [Next>].



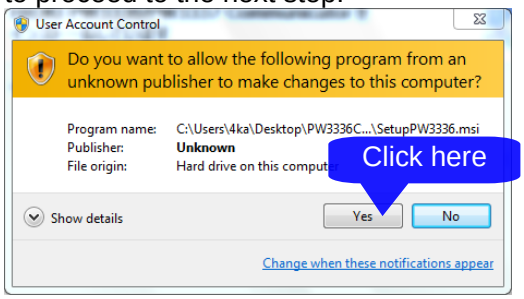
Click [Next]



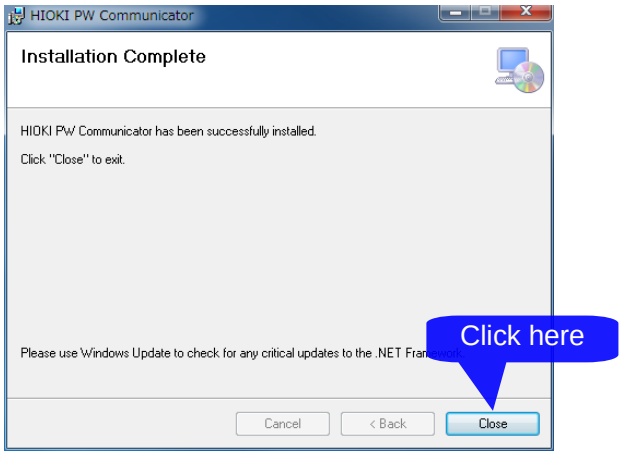
Installation starts.



When a dialog box requiring you to permit the continued program installation appears, click [Yes] to proceed to the next step.



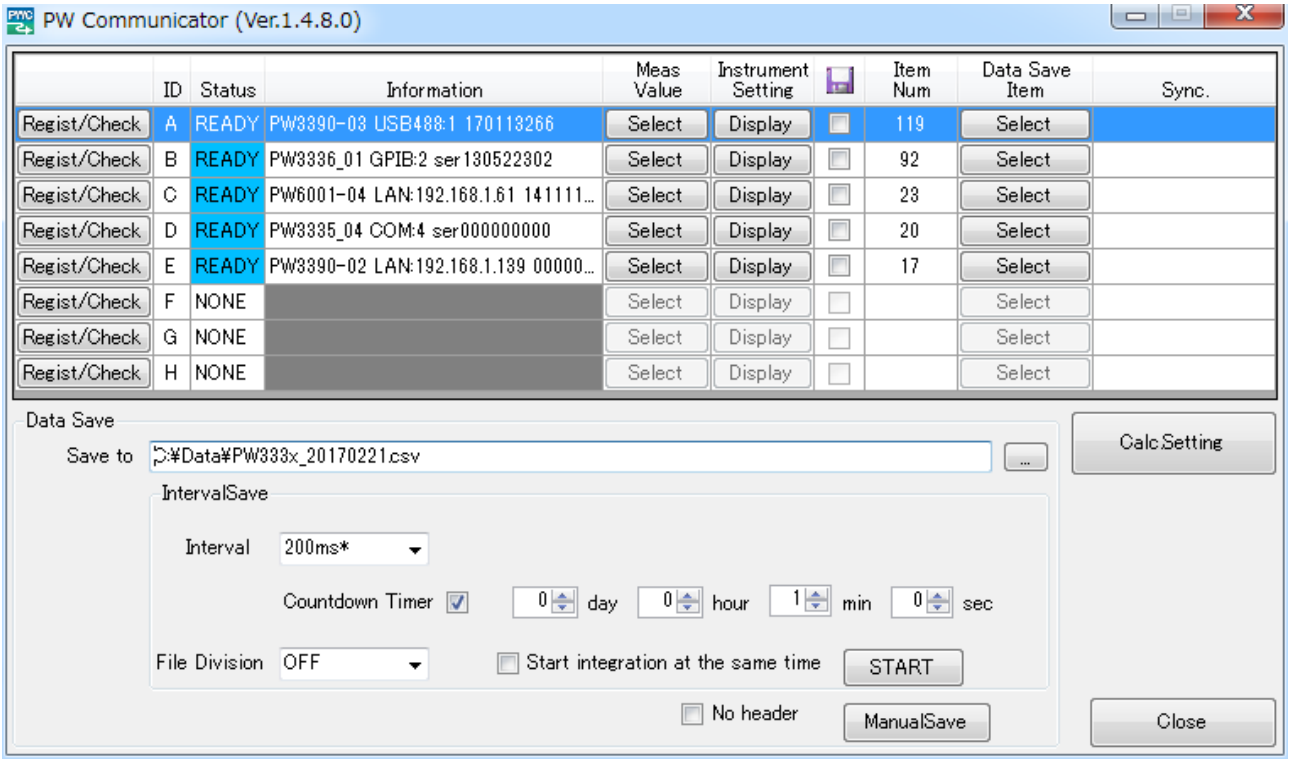
Once the installation is completed, click [Close].



3. Basic Usage

3.1 Startup Procedure

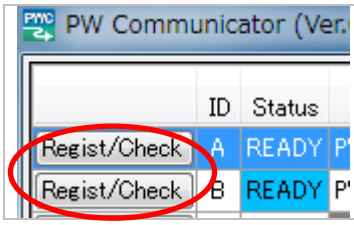
From the [START] menu, select [Program] - [HIOKI] - [PW Communicator] - [PW Communicator] to start up the application. The main screen will be displayed.



Main screen

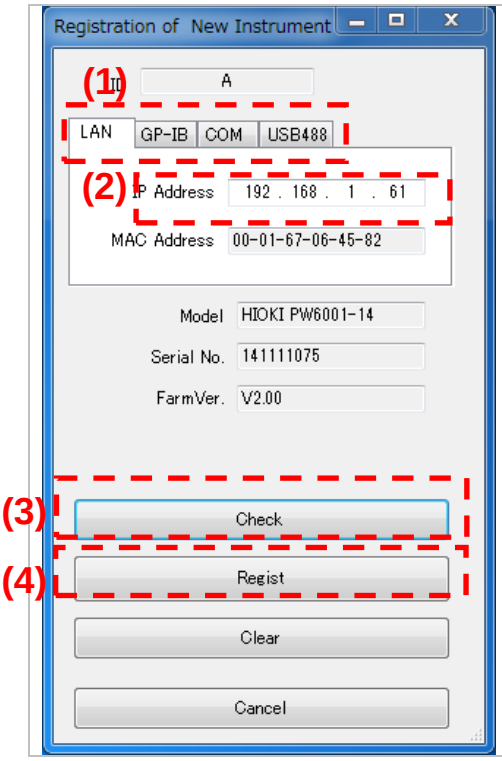
3.2 Connection Settings with the Instrument

First, connect the communication line between the Instruments and computer.



Clicking [Regist/Check] opens the [Registration of New Instrument] dialog box.

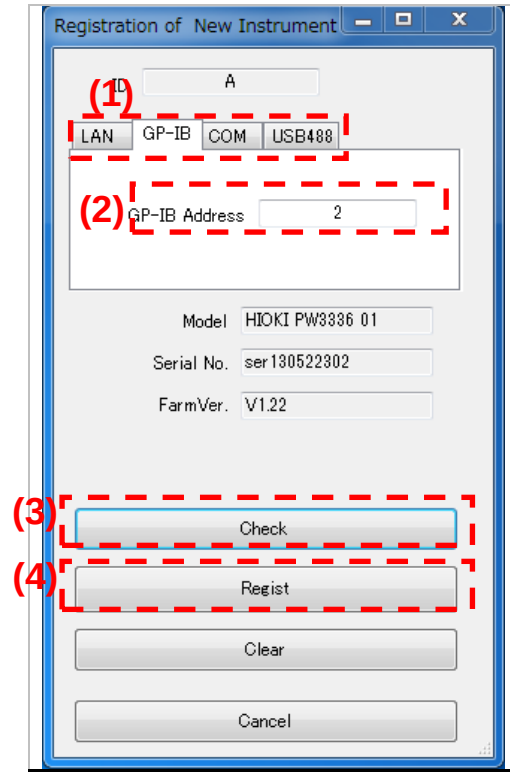
■ When connecting using a LAN interface
When connecting to a computer using a LAN interface, specify the IP address of the Instrument.



(1) Select the [LAN] tab in the [Registration of New Instrument] dialog box.
(2) Enter the IP address of the Instrument to be connected in the [IP Address] fields.
(3) When you press [Check], communication will be performed with the specified instrument. When communication is performed successfully, the MAC address, model number, serial number, and firmware version are displayed.
(4) When you press [Regist], the confirmation dialog box will be closed and the connected instrument will then be registered on the main screen.

Note: For how to check the IP address of the instrument, refer to the Instruction Manual for the instrument.

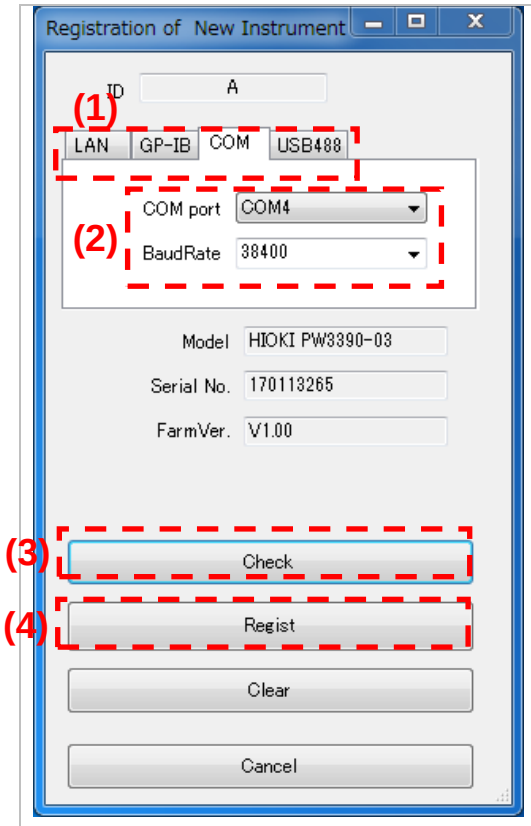
■ When connecting using a GP-IB interface
When connecting to a computer using a GP-IB interface, specify the GP-IB address of the Instrument.



(1) Select the [GP-IB] tab in the [Registration of New Instrument] dialog box.
(2) Enter the GP-IB address of the Instrument to be connected in the [GP-IB Address] field.
(3) When you press [Check], communication will be performed with the specified instrument. When communication is performed successfully, the model number, serial number, and firmware version are displayed.
(4) When you press [Regist], the confirmation dialog box will be closed and the connected instrument will then be registered on the main screen.

Note: For how to check the GP-IB address of the instrument, refer to the Instruction Manual for the instrument.

- When connecting using a RS-232C interface (COM port)
  When connecting to a computer using the RS-232C (COM port) interface, specify the COM port address and baud rate of the Instrument.

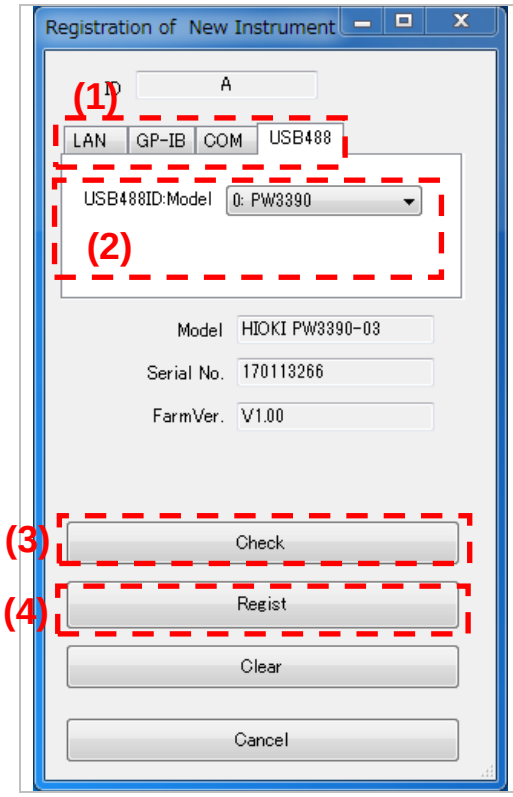


(1) Select the [COM] tab in the [Registration of New Instrument] dialog box.
(2) Select the COM port number*1 and baud rate setting*2 to be connected with the Instrument in the [COM port] and [BaudRate] fields.
(3) When you press [Check], communication will be performed with the specified instrument. When communication is performed successfully, the model number, serial number, and firmware version are displayed.
(4) When you press [Regist], the confirmation dialog box will be closed and the connected instrument will then be registered on the main screen.

*1: The COM port list displays all the available COM ports when the [Registration of New Instrument] dialog box opens. If the COM port you wish to use is not in the list, close the [Registration of New Instrument] dialog box, and then open it again.

*2: Be sure that the baud rate setting conforms to that of the instrument. For how to check the baud rate setting of the instrument, refer to the Instruction Manual for the instrument.

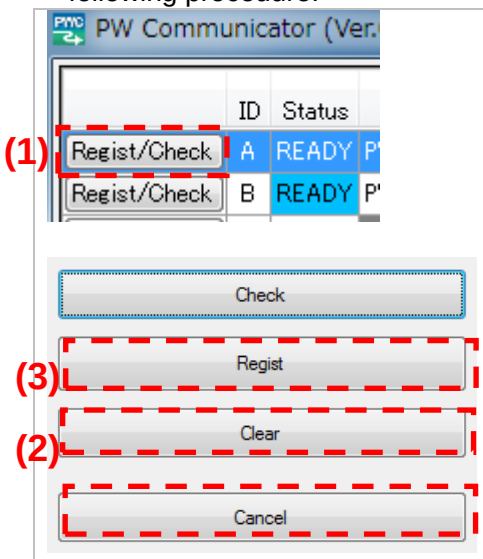
- When connecting using a USB
  When connecting to a computer using the USB (USB488) interface, specify the instrument from the list.



(1) Select the [USB488] tab in the [Registration of New Instrument] dialog box.
(2) Select the instrument to which you wish to connect in the [USB488ID:Model] field.
(3) Click the [Check] button to attempt to connect to the specified instrument. If the application is able to communicate with the instrument, the instrument's model number, serial number, and firmware version will be displayed.
(4) Click the [Regist] button to close the dialog box and add the instrument to the main screen.

*1: The [USB488ID:Model] list displays instruments that are available when the [Registration of New Instrument] dialog box opens. If the instrument you wish to use does not appear in the list, close and then reopen the dialog box.

- To delete previously registered data
  A destination instrument previously registered on the main screen can be deleted according to the following procedure.



(1) Press [Regist/Check] for the destination computer you wish to delete on the main screen. The [Registration of New Instrument] dialog box will be displayed.
(2) Pressing [Clear] clears all the communication settings in the dialog box.
(3) When you press [Regist], the [Regist New Instrument] dialog box will be closed and the information of the destination instrument on the main screen will be cleared.

If you press [Cancel], the confirmation dialog box will be closed without changing the information of the connection destination on the main screen.

NOTE

If connection fails, refer to the Instruction Manual for the instrument and check the cable connection and address settings.
Do not turn off the power to the instrument or disconnect cables while the screen displaying the measurement values is displayed or file saving is in progress. Otherwise, the application or instrument operation may become unstable.
Do not connect multiple computers to the same instrument. Otherwise, the application or instrument operation may become unstable.

3.3 Overview of Measurement Value Display

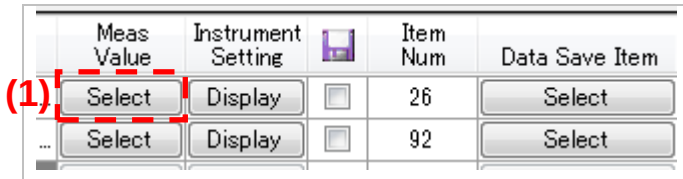
This software displays the following measurement values, and each screen allows the following display variations.

Meas value	Select the desired measurement items on the 4- to 32-split screen to view the measurement values and calculation values. The size of the display items can be changed to enlarge the display of the measurement values on the computer screen. The measured waveform can be displayed (only if a conditions are met).
DispmeasValueList (PW3335/PW3336/ PW3337 only)	Select the desired measurement items to view the measurement values and calculation values (up to 64 items). The instantaneous, maximum and minimum values are displayed side by side. The file output setting can be specified for each item individually.
Harm.List	0 (DC) or 1 to 50th order can be displayed by selecting the desired harmonic measurement items (PW6001,PW3390: 0th to 100th order). For the harmonic voltage and current, the frequency, THD, and power factor (fundamental wave) are displayed concurrently. The order range to be displayed can be customized (order range, or output of all orders within the range/even order/odd order).

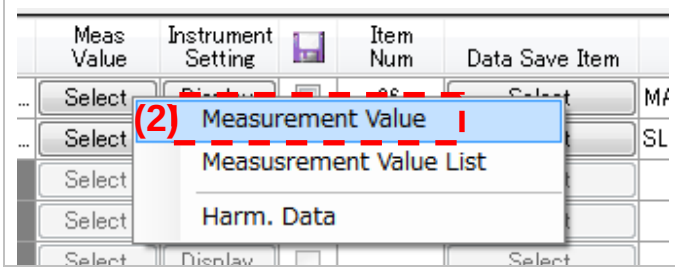
All the above screens can be displayed at the same time.
When multiple Instruments systems are connected, the measurement value screen can be displayed for each instrument individually.
However, if there are many items or screens to be displayed, an operational delay may occur depending on the communication status or the load applied by computer processing. In such a case, reduce the number of items or screens to be displayed.
For the PW6001, software operation may become unstable if waveforms from multiple PW6001 instruments are displayed. If you encounter this issue, turn off the waveform display.

3.4 Display of Measurement Values

This section describes how to display the Measurement Value screen.



(1) Press [Meas value] on the main screen.



(2) When menus are displayed, select the screen to be displayed.

NOTE

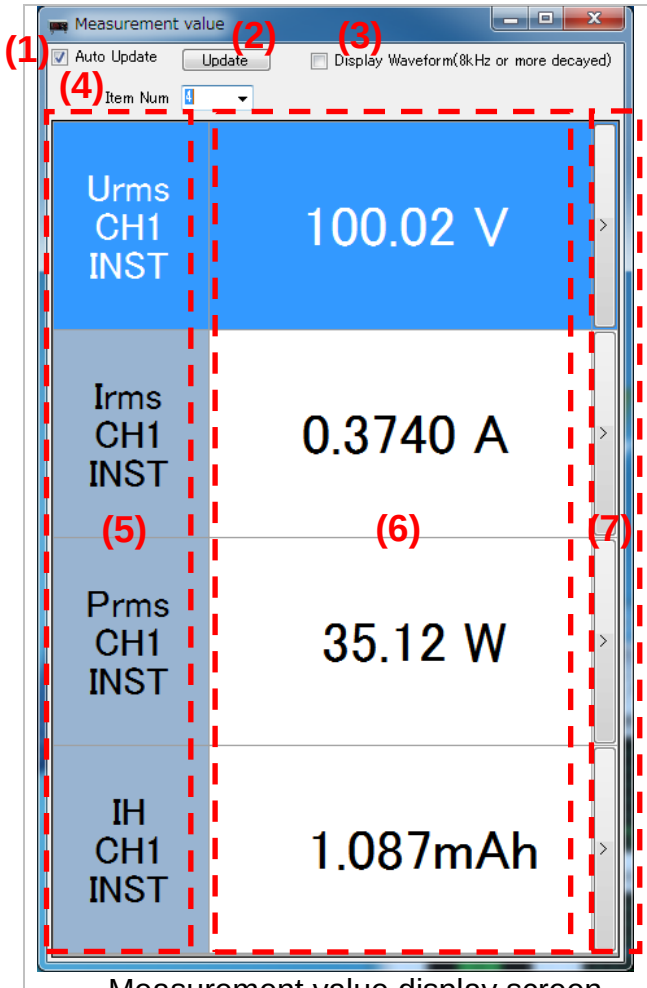
- While any of the measurement value display screens above is displayed or file output is in progress, communication is being performed with the relevant instrument.

- Do not turn off the power to the instrument or disconnect cables while the screen displaying the measurement values is displayed or file saving is in progress. Otherwise, the software or instrument operation may become unstable.
- While the file saving item selection screen is displayed, the measurement screen cannot be displayed.
- This software sends the HOLD command to the instrument during acquisition of the measurement data to change the HOLD state of the instrument.(*1)
- The screen of the measuring instrument which is the communication target becomes the measurement screen.(PW3390)
- As the instrument to be communicated with is set to the remote mode, any operation on the instrument panel is disabled. To use the panel of the instrument, stop the communication with the software (close all the measurement screens and stop the saving operation), and then cancel the remote mode by pressing the [SHIFT] key on the instrument (PW3335/PW3336/PW3337 only).

*1: The PW3335/PW3336/PW3337 will change the hold state if the number of items to be communicated on the Main screen is greater than 80, or if harmonic data is targeted for communication. If the hold state is changed, auto-range operation may cease to function.
The PW6001/PW3390 will change the hold state if the number of items to be communicated on the Main screen is greater than 32, if elapsed time data is targeted for communication, if harmonic data is targeted for communication, or if multiple Instruments systems are connected.

3.5 Measurement Value Display Screen

The configuration of the measurement value display screen is as follows.

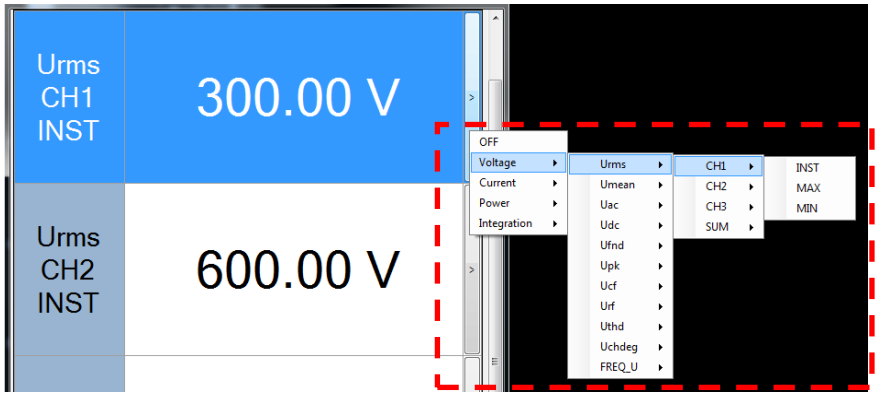


Measurement value display screen

(1)	**[Auto Update] checkbox** When this checkbox is checked, the measurement values and waveform graphs are automatically updated.
(2)	**[Update] button** Measurement values and waveform graphs can be updated manually.
(3)	**[Display Waveform] checkbox** When the checkbox is checked, the waveform graph is displayed (only if conditions are met). When this checkbox is checked, automatic updating turns OFF.
(4)	**Item Num** Select the number of items to be displayed concurrently. The display area is split depending on the number of specified items, and the screen configuration changes accordingly.
(5)	**Measurement item name display area** Displays the name and channel of the displayed measurement item, as well as the instantaneous (INST), maximum (MAX), and minimum (MIN) values.
(6)	**Measurement value display area** Displays the measurement values.
(7)	**Item selection buttons** Allows you to select the measurement item to be displayed.

Selecting the display items

When you press the item selection button located to the right of the relevant item selection display area, menus are displayed.
From the menus, select the measurement item (e.g., channel, rectifier) to be displayed.



The following operations are available from the menus that appear when you right-click the mouse on the measurement value display screen.

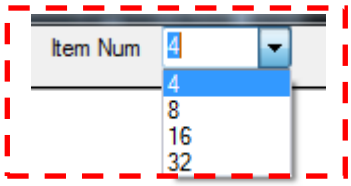
AllOff	Turns OFF all the display items.
Reset	Returns the display items to the default statuses in the application.

NOTE

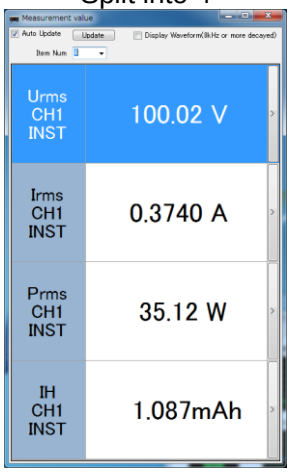
For details on the measurement items (including the rectifier, etc.), refer to the Instruction Manual of the instrument.
The display menus, such as Channel, may differ depending on the measurement item.
(Example: For “TIME” (integration time), channel selection menu is not displayed.)

Selecting the number of display items

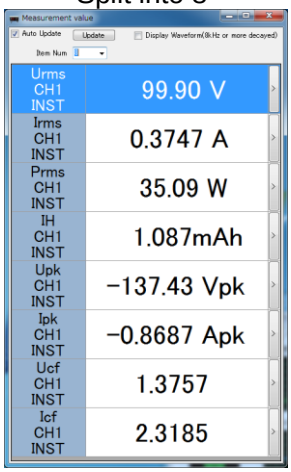
You can select the number of items to be displayed in the measurement value display item area from the selection list for the number of displayed items.
The size of the displayed item is automatically adjusted according to the number of the selected display items and the size of the screen.



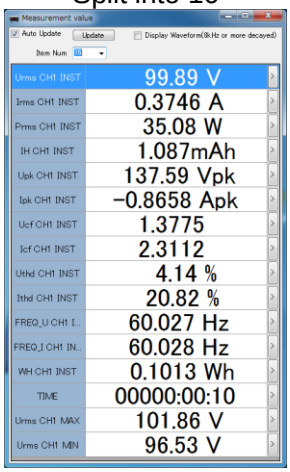
Split into 4



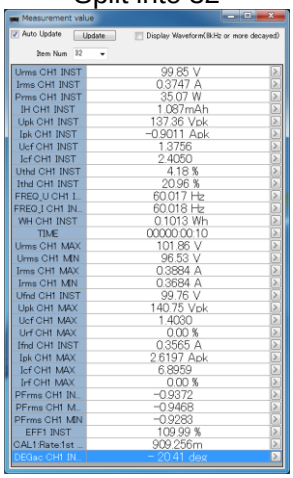
Split into 8



Split into 16

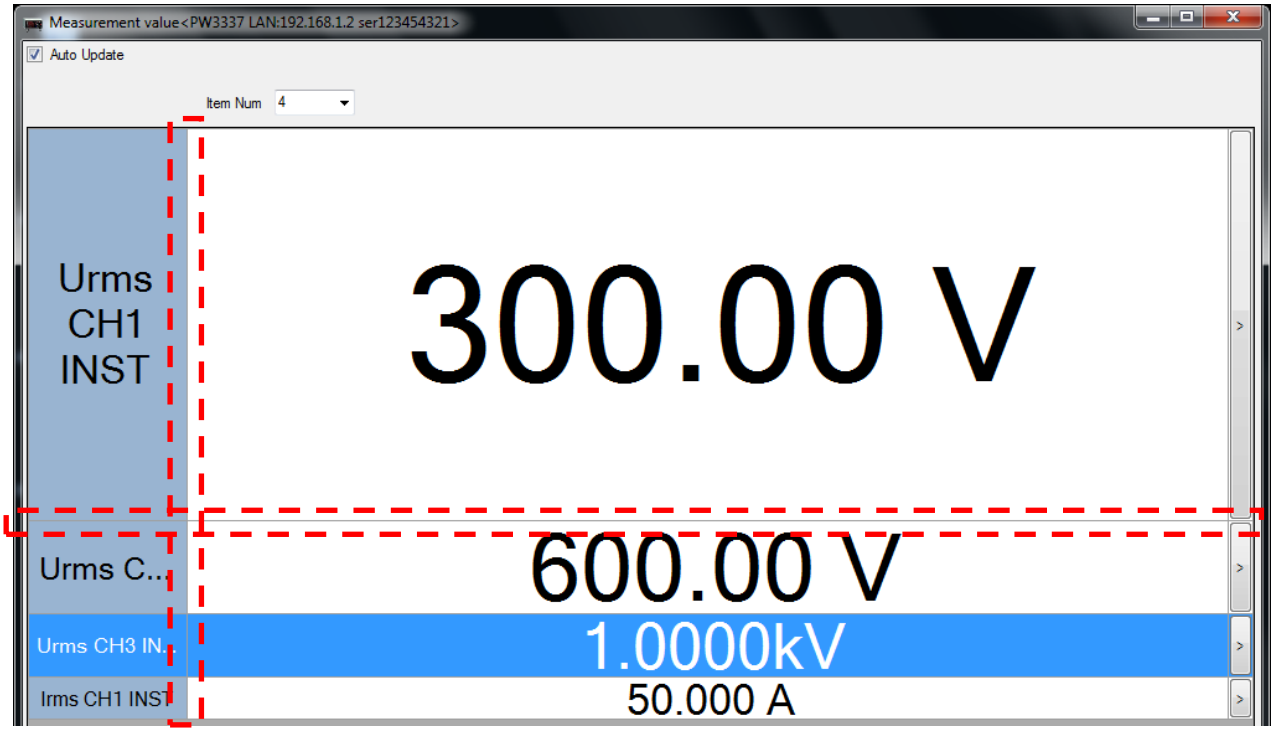


Split into 32



Screen configuration for each split setting of the measurement value display

- Adjusting the size of each display item
  The size of the measurement value display area for each item can be changed individually by dragging the border (the line enclosed with red dotted lines in the figure below) with the mouse. It is also possible to enlarge the display of a specific measurement value as below.

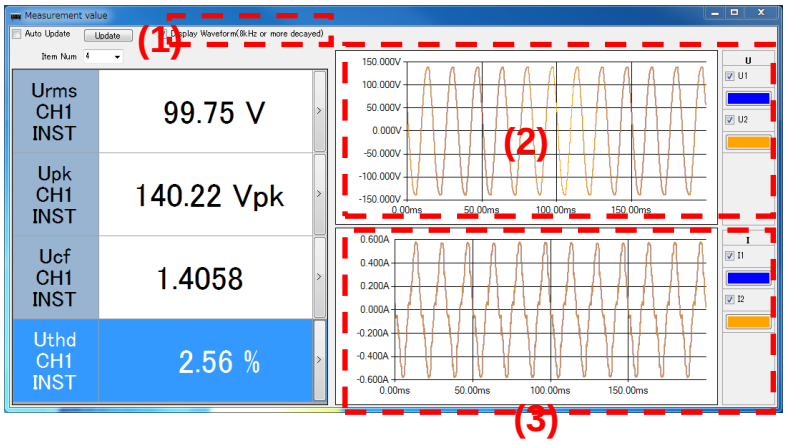


Measurement value display (after the size of the measurement value display area has been adjusted)

When you reopen the measured value display screen, then the display goes back to the initial state.

Display Waveform (only if a connection are met)

When this checkbox is checked, voltage and current waveforms input to the power meter can be displayed.



(1) **[Display Waveform] checkbox**
Measurement values and waveform graphs can be updated manually.
When this checkbox is checked, automatic updating turns OFF.

(2) **Voltage waveform display area**
Voltage waveforms are displayed.

(3) **Current waveform display area**
Current waveforms are displayed.

NOTE

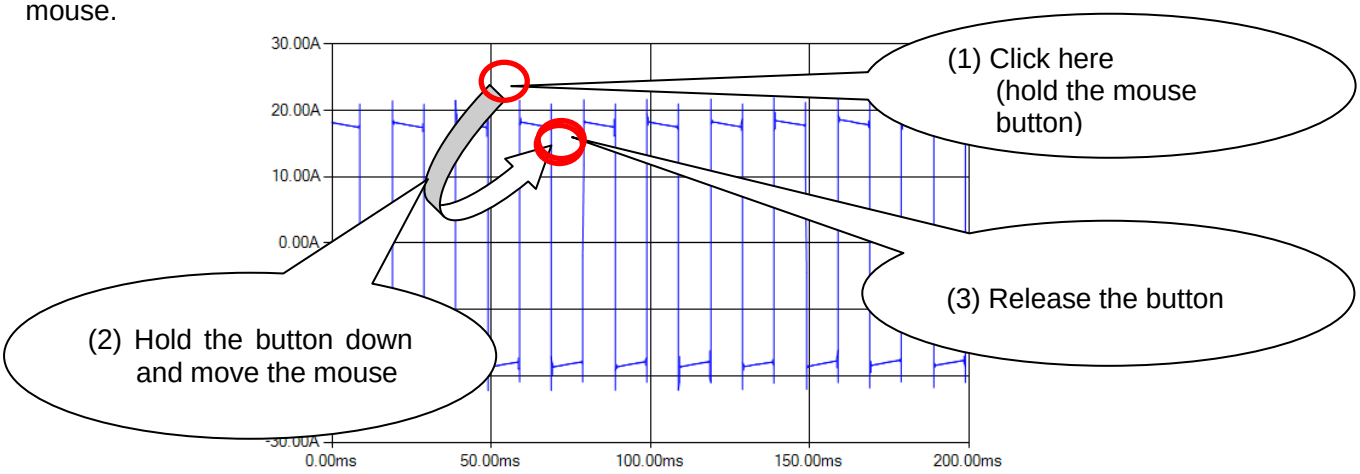
For the PW3335/PW3336/PW3337, voltage and current waveforms are filtering-processed thinned waveforms. A frequency band of 8 kHz or more is decayed in the waveform.
These are also thinned waveforms, and the peak values of the voltage and current in the value display area and peak values of the displayed waveforms may differ.
The number of data on the horizontal axes depends on the width of the window for the harmonics analysis of the PW3335/PW3336/PW3337) (178.57 ms to 222.22 ms). For more details, refer to Harmonic Measurement Specifications in the Instruction Manual for the PW3335/PW3336/PW3337.
For the PW3390, the horizontal axis data count is 500 points. If the waveform recording length is greater than 500, the waveform will be compressed to 500 points using the maximum and minimum values. For example, if the waveform recording length is 10k, the first point on the displayed graph will be displayed by connecting the maximum and minimum values for points 1 to 20.
For the PW6001, the horizontal axis data count is 1k points. If the waveform recording length is greater than 1k, the waveform will be compressed to 1k points using the maximum and minimum values. For example, if the waveform recording length is 10k, the first point on the displayed graph will be displayed by connecting the maximum and minimum values for points 1 to 10.
For the PW6001, the maximum sampling speed for motor analog waveforms is 50 kHz. If the sampling speed is faster than 50 kHz, motor analog waveforms will be displayed by means of interpolation using the same value for multiple points. For example, when displaying a motor analog waveform with a sampling speed of 100 kHz, the graph's first and second points will be displayed using the value recorded for the first point.

○Waveform display possible conditions

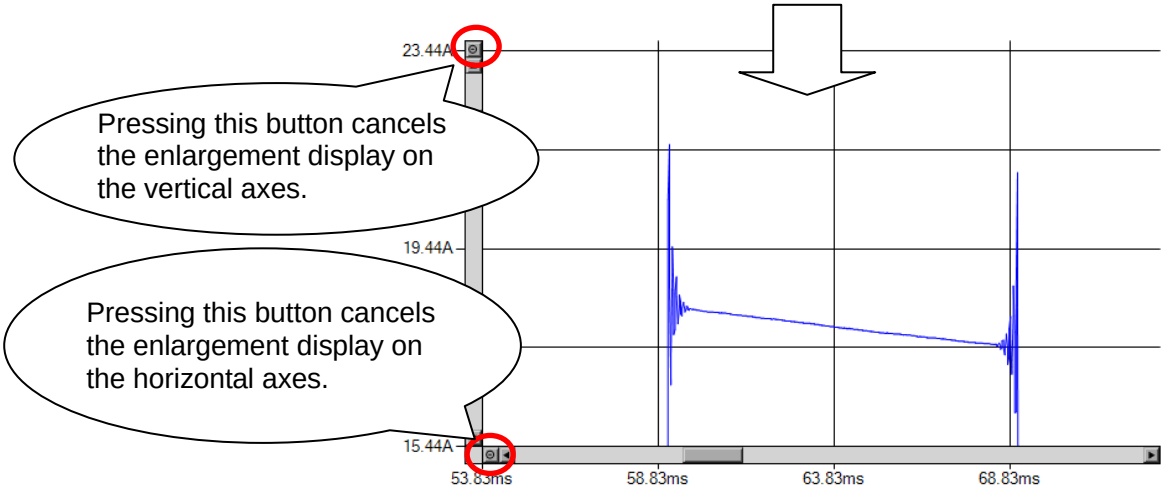
Instrument	Communication interface			
	LAN	GP-IB	USB	RS-232C
PW3335	○	○	-	×
PW3336/PW3337	○	○	-	×
PW3390	○	-	○	×
PW6001	○	×	-	×

Enlarged display of waveforms

An area can be enlarged and displayed by dragging and specifying the desired area with the mouse.



Waveforms before magnification



Waveforms after magnification

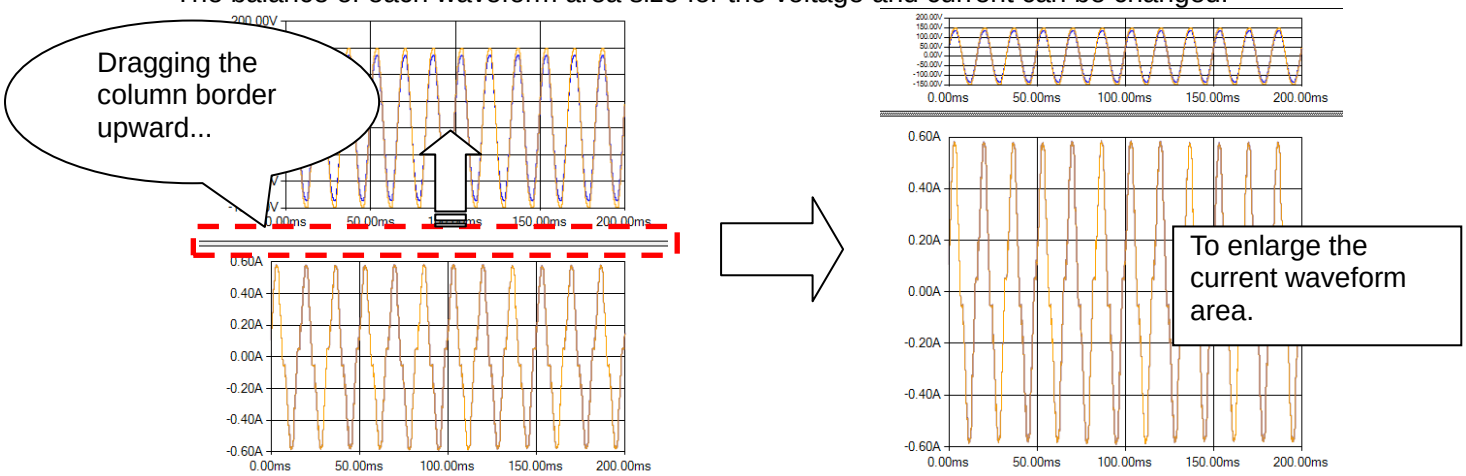
Scroll bars appear on the vertical or horizontal axes when magnified waveforms are displayed. Using a scroll bar allows you to scroll in any direction with the expanded magnification.

NOTE

For the PW6001,PW3390, compressed points cannot be displayed, even when the display is zoomed in.

- Change of the balance of the waveform area size

  The balance of each waveform area size for the voltage and current can be changed.

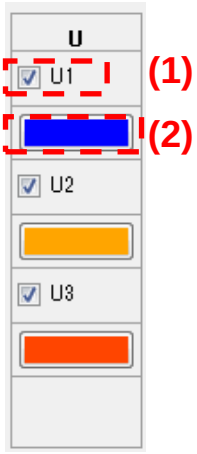


Before changing the balance

After changing the balance

- Change of the waveform colors and display on/off

  The display colors for each channel voltage and current can be changed, and the display on/off for each channel can be set.



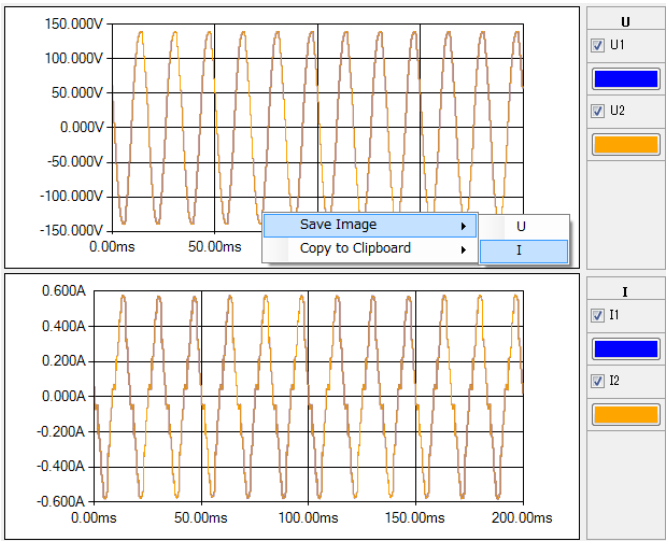
(1) Waveform display of voltage (CH1) can be turned on/off.

(2) Display color of voltage (CH1) can be changed.

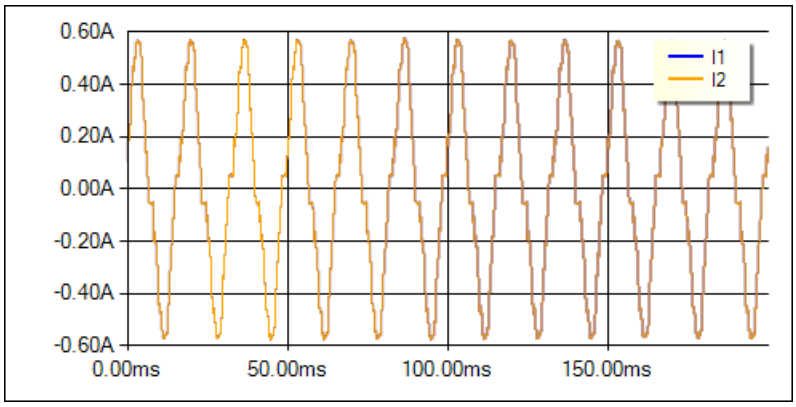
Display colors and display on/off for other channels and current can be changed as well.

Saving waveform images

The waveforms of the voltage and current displayed on the screen can be saved from the menu by right-clicking in any waveform display area. Legends are added to the saved image.
Waveform data can also be copied to the clipboard.



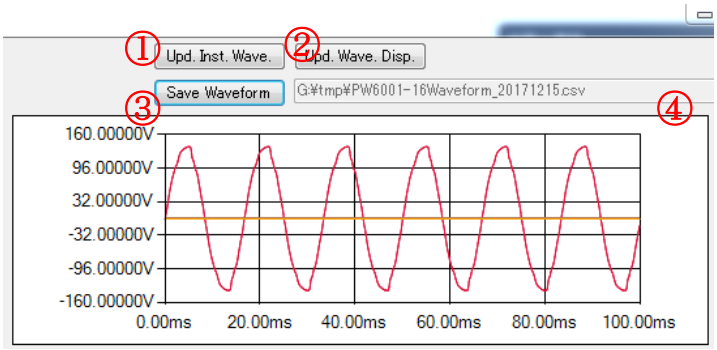
Displayed menu by right-clicking



Example of a saved waveform (with legends)

Saving waveform data

You can save waveform data for which the display has been enabled in the CSV format.



Measurement Value Display screen
(waveform display area)

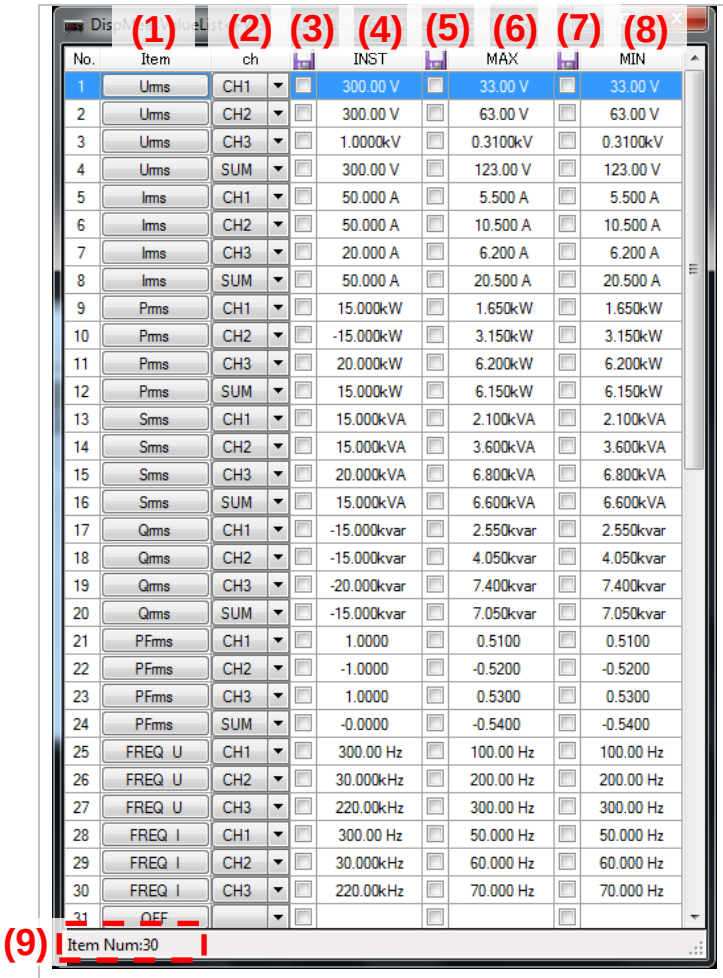
①	**Update Instrument Waveform button** Updates the waveform data from a connected PW6001 instrument operating in single trigger mode. Since this button doesn't update the waveform being displayed by the instrument's software, you can check the waveform on the PW6001 and transfer it to this software using the Update Waveform Display button. This button is disabled when not connected to a PW6001 instrument.
②	**Update Waveform Display button** Acquires waveform data from the connected power meter and updates this software's display with it.
③	**Save Waveform button** Saves waveform data acquired for the enabled parameter as a CSV file.
④	**File save location** Displays the location where the waveform data's CSV file will be saved.

NOTE

・For the PW6001, the maximum and minimum values will be output for each parameter when the storage mode is set to P-P.

3.6 Measurement Value List Display Screen (PW3335/PW3336/PW3337)

The configuration of the measurement value list display screen is as follows.

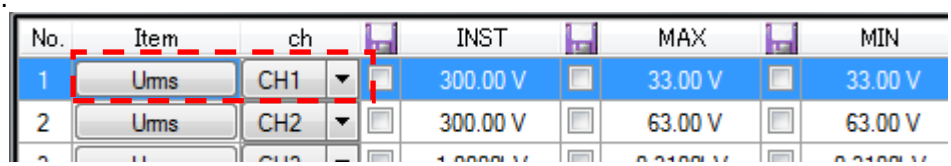


Measurement value list screen

(1)	**Display item selection button** Allows you to select the measurement items to be displayed.
(2)	**Channel selection button** Allows you to select the channels to be displayed.
(3) (5) (7)	**File output check** The values of the measurement items checked in the relevant checkboxes are output in a file (interval saving, manual saving).
(4) (6) (8)	**Measurement value display area** Displays the measurement values (instantaneous, maximum, and minimum values). For an item that has no measurement value, the field remains blank or is indicated as "---". Only the instantaneous value is displayed for the results of the calculation setting.
(9)	**Number of display items** Displays the number of measurement items displayed in the measurement value list. Use this information as a reference when a communication delay occurs.

■ Selecting the display items

The display items can be selected using the display item selection buttons and channel selection buttons.



The following operations are available from the menus that appear when you right-click the mouse on the measurement value display screen.

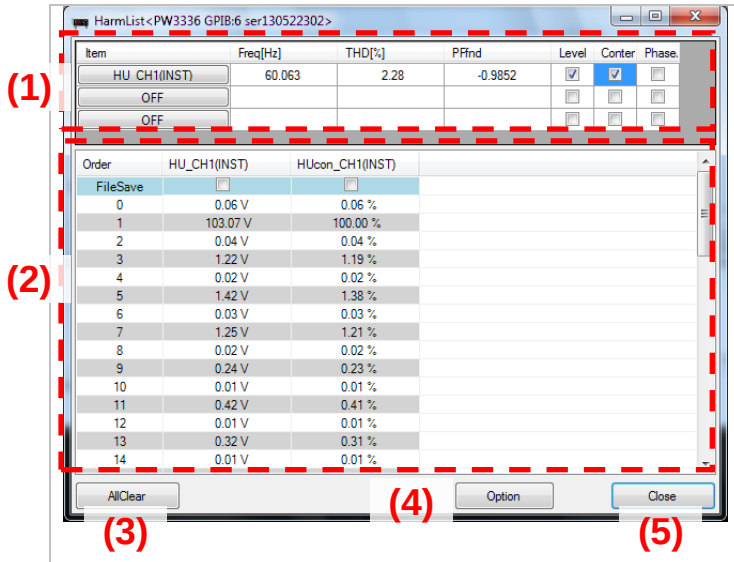
All Item	Disp Off	Turns OFF all the display items.
	Clear Save Check	Turns OFF the file output of all items.
Selected Items	Disp Off	Turns OFF the display of the selected item(s).
	Clear Save Check	Turns OFF the file output of the selected item(s).
Reset		Returns the display items to their default statuses in the application.

NOTE

For details on the measurement items (including the rectifier, etc.), refer to the Instruction Manual of the instrument.
The display menus, such as channel, may differ depending on the measurement item, or the Instrument.
(Example: For “TIME” (integration time), channel selection menu is not displayed.)
The screen display of each measurement item and file output (saving) setting are controlled separately. Even when the display of all items is set to OFF, if the saving setting is set to ON, the relevant measurement items will be included in the output file.
Measured value display area turns red to a communication error occurs.

3.7 Harmonic Data Display Screen

The configuration of the harmonic data display screen is as follows.

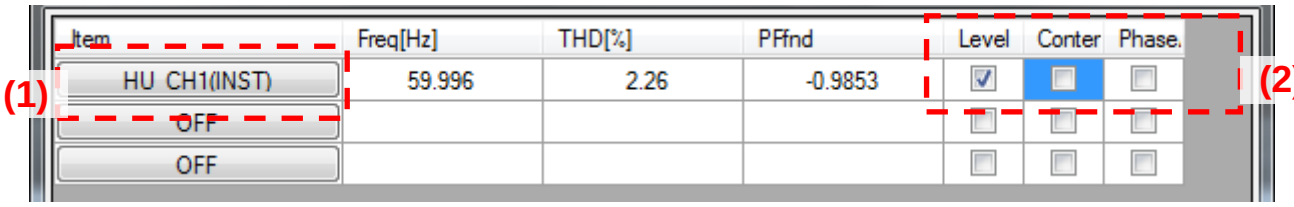


Harmonic data display screen

(1)	**Display item selection area** Allows you to select the harmonic measurement items to be displayed.
(2)	**Harmonic order data display area** Displays each set of order data for the harmonic data selected in the display item selection area. The order to be displayed can be changed with the [Option] button (4).
(3)	**[AllClear] button** Turns OFF all the display and saving settings of the harmonic data
(4)	**[Option] button** Allows you to change the order range to be displayed in the harmonic display area.
(5)	**[Close] button** Closes the harmonic display screen.

Selecting the harmonic display items

The display items can be selected using the display item selection buttons (1).
The items checked in the relevant checkboxes in the display item selection area are displayed in the harmonic data display area.
More than one item can be selected at the same time.

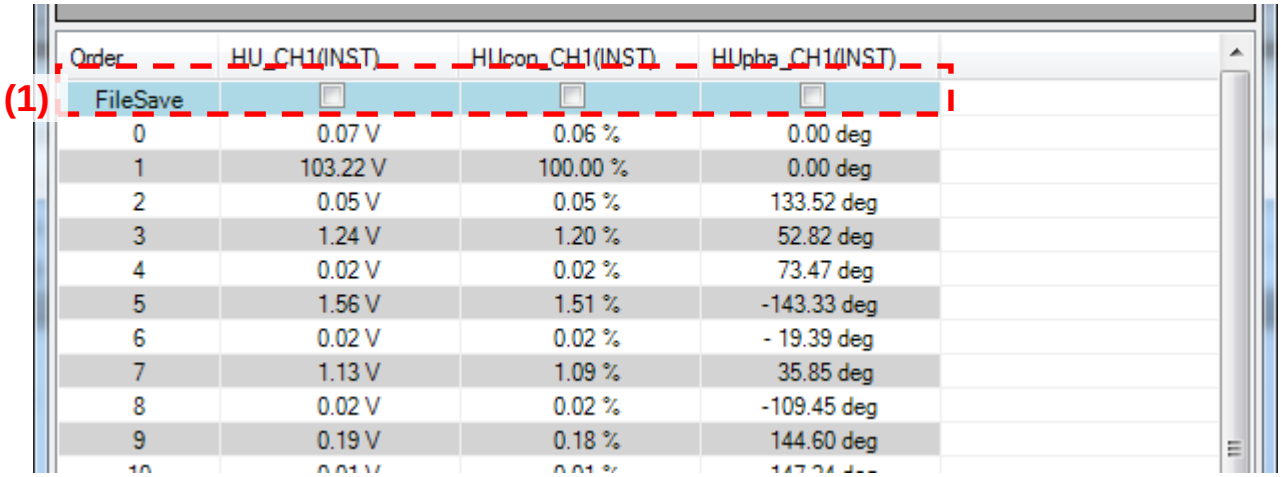


NOTE

When the harmonic voltage or current is selected, the measurement values of the frequency, THD, and power factor (fundamental wave) are displayed. (PW3390: the frequency,RMS value,and THD)
As the harmonic measurement items require data communication for each order, be aware that a larger amount of data is transferred through the communication.
The measured value display area will turn red in the event of a communications error.

Harmonic order data display area

Displays each set of order data for the harmonics selected in the display item selection area.

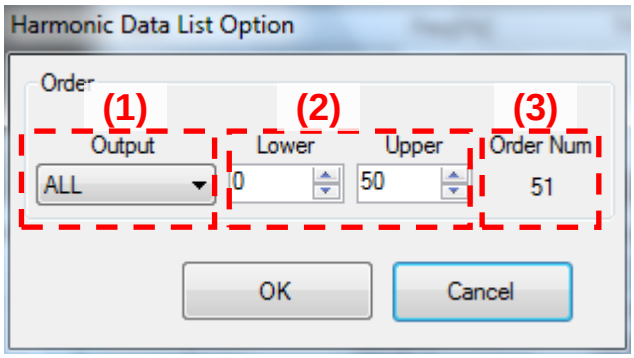


NOTE

The items checked in the relevant file saving checkboxes (1) are saved during file output (interval saving, manual saving). All orders currently displayed are saved.

Specifying the harmonic display order range

The order range to be displayed can be specified by pressing the [Option] button.



Harmonic data display option dialog box

(1)	**Output order setting area** Allows you to select from all orders, even order, and odd order.
(2)	**Maximum/minimum order setting area** Allows you to specify the maximum/minimum order to be output within the range from 0 to 50. (PW6001,PW3390: 0th to 100th order)
(3)	**Display area for the number of orders** Displays the number of orders specified for output in the current settings.

NOTE

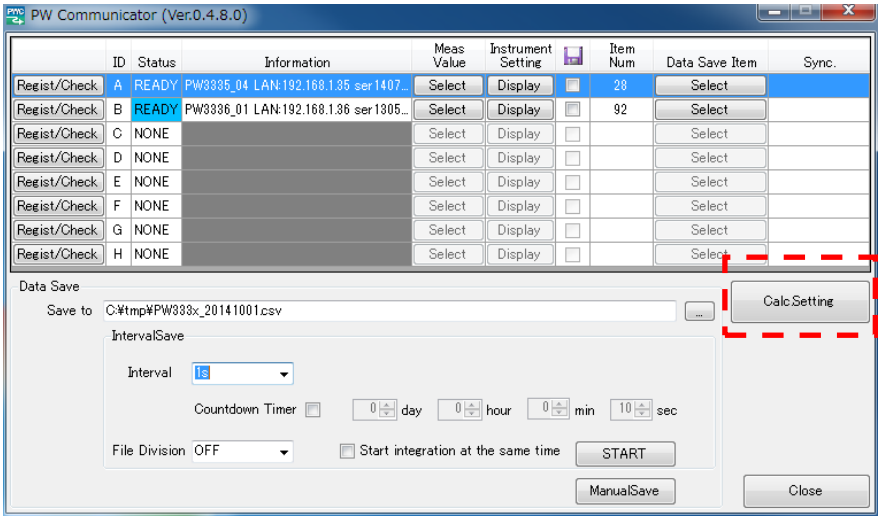
- The specified order range also applies to the file output setting of the harmonic data (interval saving, manual saving).
- For the PW6001, the maximum and minimum values will be output for each parameter when the storage mode is set to P-P.

3.8 Calculation Setting

Efficiency calculations and four arithmetic operations can be processed for the measurements of multiple registered instruments in this software. These calculation results can be output to a file or displayed on the screen.

■ Displaying the calculation setting screen

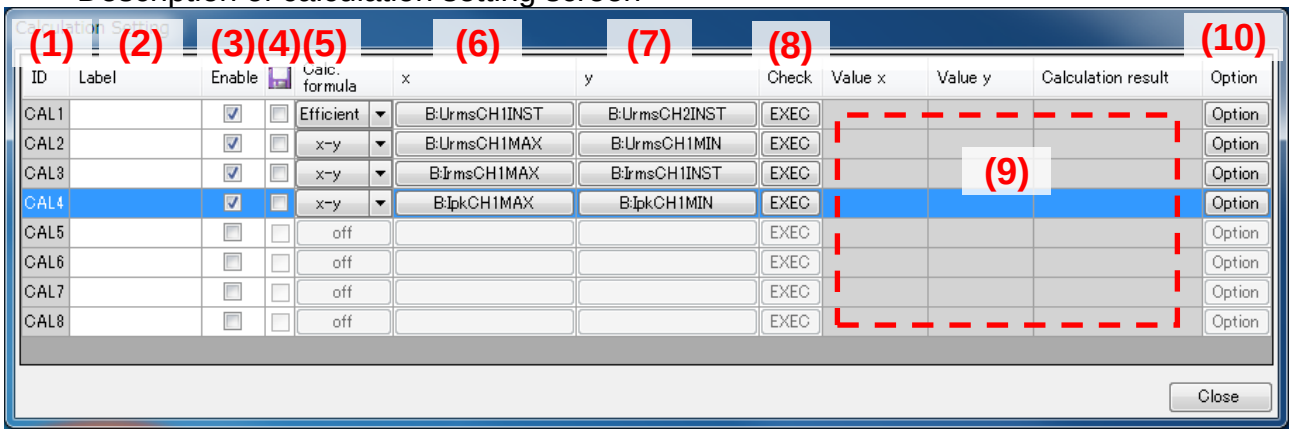
Pressing the [Calc. Setting] button displays the calculation setting screen.



NOTE

Other window operations such as measurement value display cannot be performed while the calculation setting screen is displayed.

■ Description of calculation setting screen



Calculation setting screen

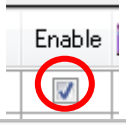
(1)	ID	IDs are identification numbers for the calculation contents.
(2)	Label	Arbitrary character strings can be input for the descriptions of the calculations. This is used for displaying the selection menu on the measurement value display screen and outputting files.
(3)	[Enable]checkbox	Calculation is not executed while the checkbox is not checked.
(4)	[File Save]checkbox	Check the checkbox for the file output.
(5)	Calculation formula	Select the calculation formula. For more details, refer to the next section.
(6)(7)	Operand (x, y)	Sets the operand.
(8)	[Check] button	Calculation results can be checked by pressing this button.

(9)	Checked values display field	Pressing the [EXEC] button displays each value of the operand (x, y) and calculation results.
(10)	Options (detail settings)	The number of digits in the calculation results and unit character strings can be specified.

Calculation contents settings

Set the operation contents according to the following procedure.

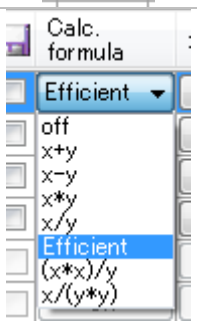
(1)



Enabling the calculation

Select the [Enable] checkbox.

(2)

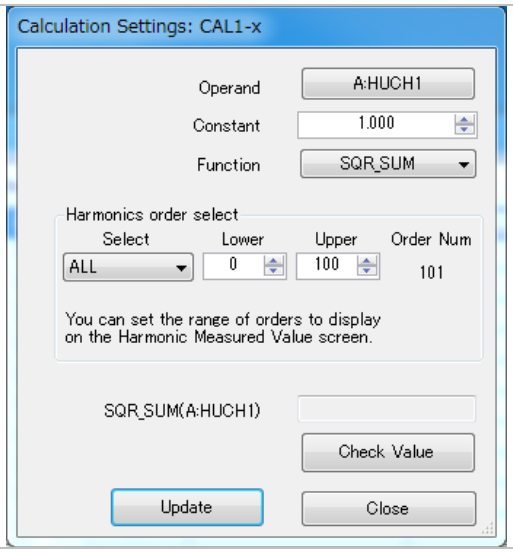


Calculation formula selection

The following operations can be selected using the buttons of the Calc. formula.

off	No calculation is executed.
x+y	Addition
x-y	Subtraction
x*y	Multiplication
x/y	Division
Efficient	Efficiency operation ((x/y)*100)
(x*x)/y	
x/(y*y)	

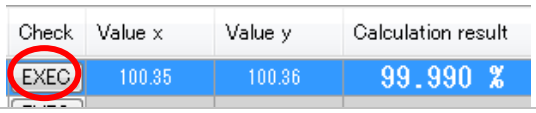
(3)



Operand setting

Set the operand on the Operand Settings screen that is shown when you click the x or y operand button. For more information, see the description of how to set the operand on the following page.

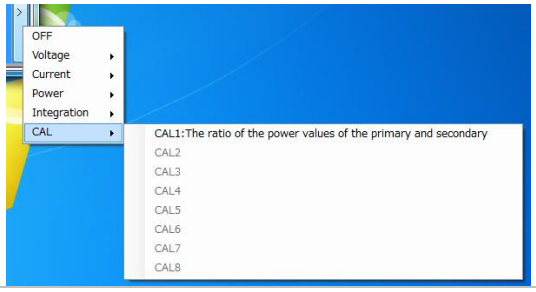
(4)



Check the calculation contents

Pressing the [EXEC] button displays the value of the operand (x, y) and calculation results in the checked values display field.

(5)



Display in the measurement value display screen

Calculation results can be selected from the [CAL] menu of the display selection menu.

Calculation results can be displayed in the measurement value list screen as well.

NOTE

Only the instantaneous value is displayed for the calculation results in the measurement value list screen.

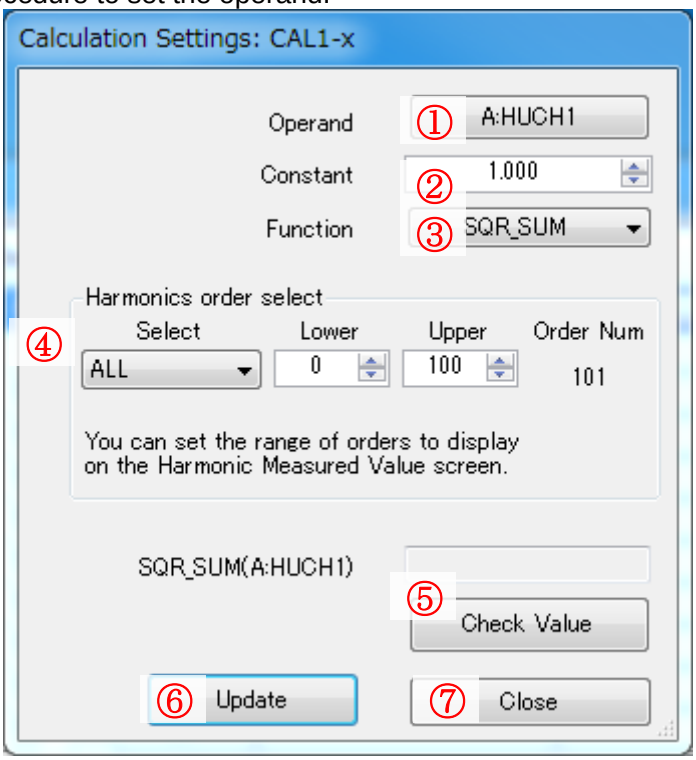
An invalid calculation cannot be selected in the measurement value display screen or the measurement value list screen.

There is no updating of calculated values when the calculation is disabled while selecting the measured value list screen and measured value display screen.

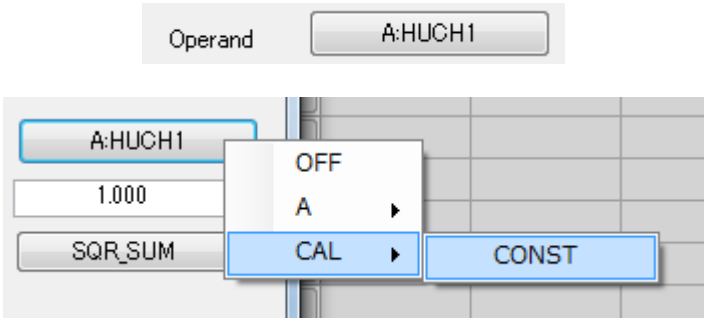
This instrument's hold state will be canceled when executing the calculation contents check.

Setting the operand

Use the following procedure to set the operand.



①



Selecting the operand

Click the operand button and select an operand from the menu that is displayed. In addition to measurement values, you can select calculation results (CALn) with numbers lower than the current number.

Selecting "Equipment calculation - CONST" allows you to set a constant.

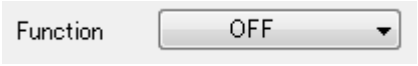
②

Setting a constant

This field lets you set a constant within the range of ±1000.000. If you select a parameter other than CONST, the value of that parameter (or if the function is set to a value other than OFF, the value after calculating the function) will be multiplied by the constant.

Selecting CONST causes the constant's value (or if a function is set, the value after calculating the function) to be used as the value.

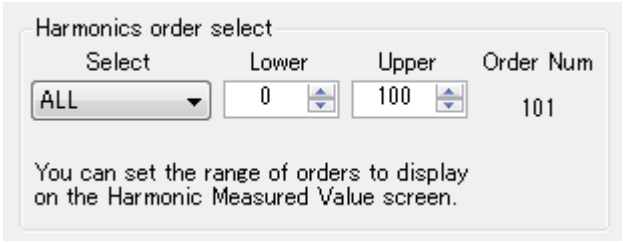
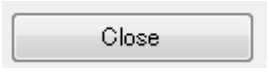
③



Setting a function

You can select from the following functions using the Function button.

OFF	None
ABS	Absolute value *1
EXP	Exponent *1
LOG	Logarithm *1
LOG10	Common logarithm *1
NEG	Negative *1
SQR	Square *1
SQR_SUM	Sum of squares *2
SQRT	Square root *1
SUM	Sum *3
SIN	Trigonometric functions *4
COS	Trigonometric functions *4
TAN	Trigonometric functions *4
ASIN	Inverse trigonometric functions *4
ACOS	Inverse trigonometric

		functions *4
		ATAN: Inverse trigonometric functions *4
		SINH: Hyperbolic functions *4
		COSH: Hyperbolic functions *4
		TANH: Hyperbolic functions *4
④		**Setting the range of harmonic orders** This field is valid when a harmonic measurement parameter is selected as the target parameter. You can set the range of orders that can be specified when selecting a harmonic measurement parameter and then specifying SQR_SUM as the function. The order range will serve as the display range on the Harmonic Measurement Value screen. For example, if you set the display on the Harmonic Measurement Value screen to 0 to 13, you won't be able to specify the 14th or higher orders as calculation items.
⑤		**Checking values** Click the "Check Value" button to display the formula and value.
⑥		**Updating settings** Applies the settings on the Calculation Settings screen to equipment calculations.
⑦		**Closing the window** Click the "Close" button to close the Calculation Settings screen. You can cancel the settings for the Calculation Settings screen by closing the screen before clicking the Update button.

*1: When a harmonic measurement parameter is specified, calculations are performed for the 1st order measurement value (if the 1st order measurement value is outside the order range, the lowest order value in the range).

*2: When a harmonic measurement parameter is specified, the sum of squares value for the specified order range is calculated. For example, if the order range has been set to odd orders from 1 to 5, the calculation would be (k1*K1) + (k3*k3) + (k5*k5), where kn indicates the nth order measurement value.
If a non-harmonic measurement parameter is specified, the sum of squares value is used.

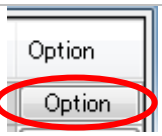
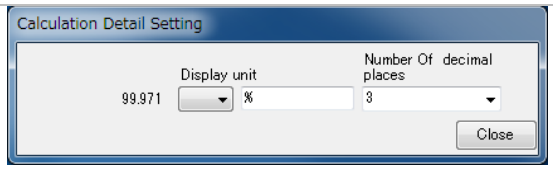
*3: When a harmonic measurement parameter is specified, the sum across the specified order range is calculated. For example, if the order range has been set to odd orders from 1 to 5, the calculation would be k1 + k3 + k5,where kn indicates the nth order measurement value.

If a non-harmonic measurement parameter is specified, the value is used without modification.

*4: Accuracy is expressed in degrees, not radians. Measurement values for parameters such as phase angle can be entered without modification.

Calculation and other settings

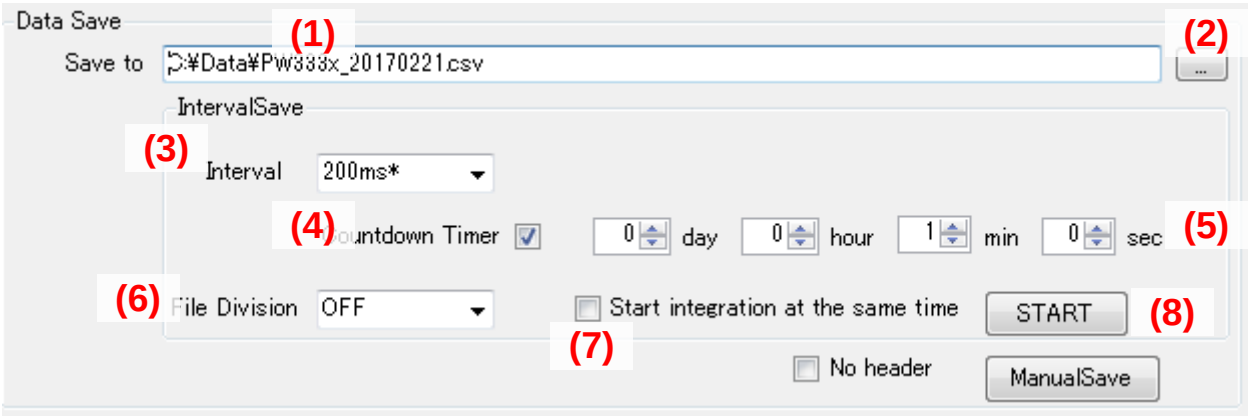
Set the operation contents according to the following procedure.

<table>
<tr>
<td>(1)</td>
<td> 
</td>
<td>Detailed setting screen display
Pressing the [Option] button displays the setting screen of the number of digits and unit character strings.</td>
</tr>
<tr>
<td>(2)</td>
<td> 
</td>
<td>Number of digits and unit character string settings
The following can be set in the detailed setting screen.
<table>
<tr><td>Display unit</td><td>Display units can be selected from the following: m(milli), k(kilo), M(mega), G(giga), N/A(blank)</td></tr>
<tr><td>Unit character strings</td><td>Unit character strings followed immediately by the calculation results can be set.</td></tr>
<tr><td>Number of decimal places</td><td>The number of digits of the calculation results can be specified.</td></tr>
</table></td>
</tr>
<tr>
<td>(3)</td>
<td> </td>
<td>File output settings
Select the [File Save] checkbox when saving the calculation results to a file.</td>
</tr>
</table>

3.9 File Output (Interval Saving)

The selected measurement data can be obtained from the instrument and saved on the computer as a CSV file at the specified interval. With the Countdown Timer function, the saving operation can be completed automatically at the specified timing.
When multiple instruments systems are connected, the measurement data can be obtained from the specified instruments systems concurrently and saved in the same file.

The interval saving can be specified in the Data Save area on the main screen.



Data Save area on the main screen

- Specifying the save destination and file name

Click the button (2), and then specify the save destination and file name.
It is also possible to directly edit the field (1).

For interval saving, whenever the [START] (8)button is pressed, a new file is created for saving the measurement values. For this file, an identification number (e.g., "_001") is added to the specified file name.

Example: When "C:\Data\Pw333x_20131001.csv" is specified
For the first interval saving, the file is saved in the following file:
C\Data\Pw333x_20131001.csv
Subsequently, whenever a measurement is started, the save files are created sequentially as follows:
C:\Data\Pw333x_20131001_001.csv
C:\Data\Pw333x_20131001_002.csv
…

- Specifying the interval

The interval for obtaining and saving the measurement values can be specified in the field (3).
It can be selected from 50ms,100ms, 200ms, 500ms, 1s, 5s, 10s, 15s, 30s, 1min, 5min, 10min, 15min, and 60min.

NOTE

It may not be possible to save the data at the specified interval, depending on the number of measurement items to be transferred through the communication and the communication status. If the saving operation is delayed from the specified interval, reduce the number of measurement items to be displayed or saved.
When using functionality for synchronizing multiple instruments (described below), shorter interval times make delays in save operation more likely due to the need to perform processing to detect synchronization for each instrument.
When the interval is set to 50 ms/100 ms, the application will only be able to update the data quickly enough if the following conditions are satisfied:

Only one PW6001 or PW3390 is registered with PWCommunicator.
The LAN, GPIB, or USB interface is being used for the connection.
The waveform display is disabled.

Even when no delay occurs, there may be some time lag due to the clock accuracy of the computer. There are some fluctuations in the laptime of the saved measurement data in milliseconds.

In the following circumstances, the application will not be able update the data at the specified interval. In this case, an asterisk ("*") will be displayed in the interval setting field. Performing interval saving under these conditions will cause multiple instances of the same value to be saved in the CSV file since data updates will not occur quickly enough to keep pace with the save timing.

Save interval	Delay condition	Data update speed under delay condition
50ms/100ms	Multiple instruments have been registered with PWCommunicator.	200ms
	One or more instruments other than the PW6001 or PW3390 have been registered.	
200ms	Synchronized measurement using multiple instruments (master/slave measurement), described below, is being used.	500ms
50ms～500ms	One or more instruments are connected via the RS232C (COM) port.	1sec
	A waveform is being displayed.	

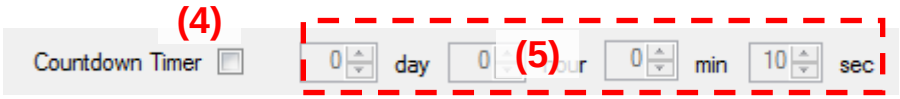
This software sends the HOLD command to the instrument during acquisition of the measurement data to change the HOLD status of the instrument.

As the instrument currently in a communication state enters the remote mode, any operation on the instrument panel is disabled (PW3335/PW3336/PW3337 only). To use the panel of the instrument, stop the communication with the software (close all the measurement screens and stop the saving operation), and then cancel the remote mode by pressing the [SHIFT] key on the instrument.

The screen of the measuring instrument which is the communication target becomes the measurement screen(PW3390).

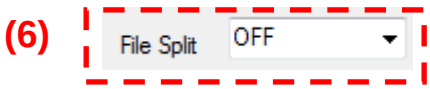
■ Countdown timer operation

When the checkbox (4) below is checked, the countdown timer function is enabled.
When interval saving is executed, a countdown for the time set in the fields (5) starts. When the counter reaches 0, the interval saving will automatically be stopped.



■ Specifying the file division

If the field (6) below is set to an item other than "OFF", the save destination is changed to a new file after data are saved the specified number of times in the current file.



The name of a newly created file is assigned in the same manner as that when interval saving is newly started (an identification number (e.g., "_002") is attached to the file name specified in (1) above).

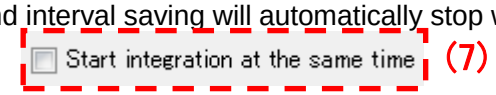
Example: When "C:\Data\Pw333x_20131001.csv" is specified
For the first interval saving, the file is saved in the following file:
C:\Data\Pw333x_20131001.csv

Subsequently, for each specified number of times, the save files are created sequentially as follows:

C:\Data\Pw333x_20131001_001.csv
C:\Data\Pw333x_20131001_002.csv
…

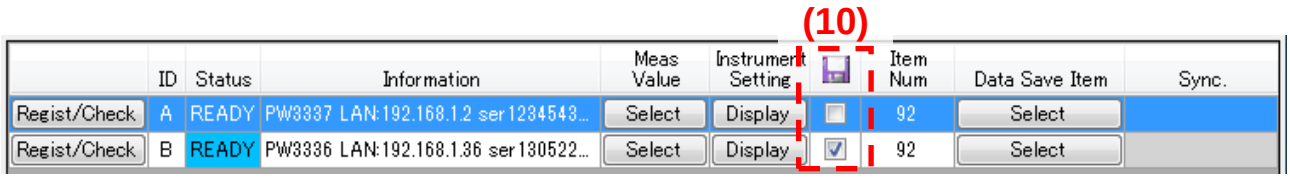
- Integration link

When checkbox (7) is selected, the power meter's integrated values will be reset and integration operation started when interval saving starts. When interval saving completes, integration operation on the power meter will also stop. When interval saving is performed, the countdown configured with (5) will start, and interval saving will automatically stop when 0 is reached.



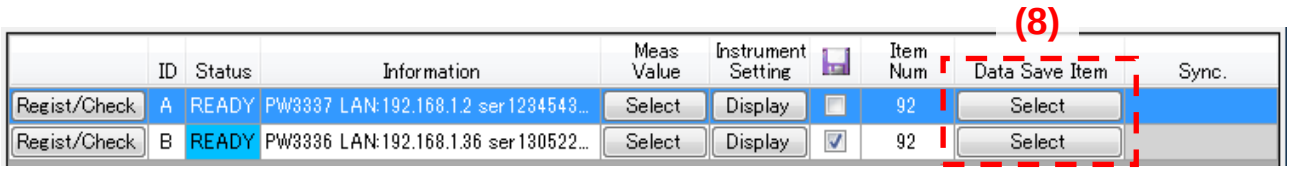
- Specifying the instrument to be saved

The data of the instruments checked in the relevant checkboxes are saved. Whether or not to save the data of an instrument can be selected individually.



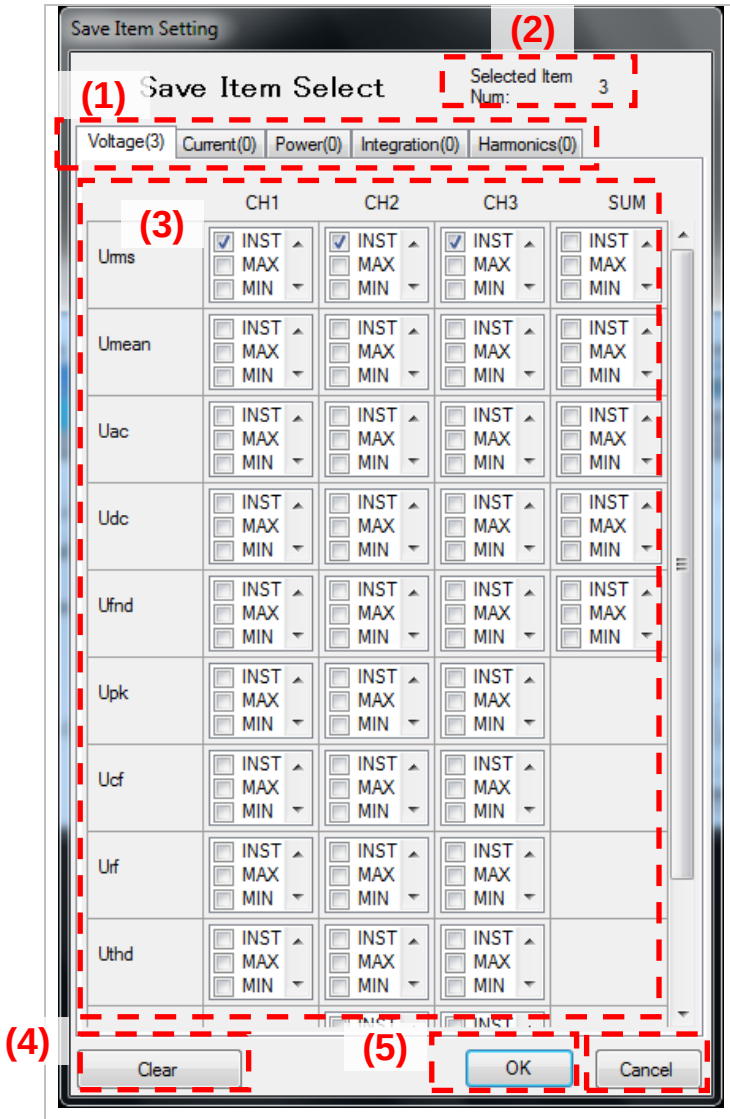
Specifying the saving items

The items to be saved can be selected on the measurement value list screen or saving item setting screen.



Pressing one of the buttons indicated as (8) (saving item selection button) displays the saving item setting screen.

However, those buttons cannot be selected during file saving. If you wish to change the saving items, complete the file saving operation.
The save order range for harmonics can be specified with the option dialog box on the Harmonic Data Display screen.



Saving item setting screen

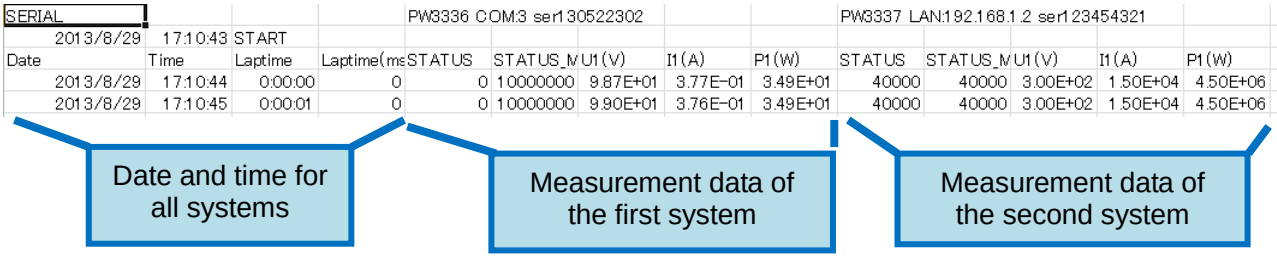
(1)	**Measurement item group selection area** Allows you to select the group of the measurement items.
(2)	**Display for the number of selected items** Displays the number of items to be saved.
(3)	**Saving item selection area** The measurement items checked in the relevant checkboxes are output in a file (interval saving, manual saving).
(4)	**[Clear] button** When this button is pressed, all items in the displayed tab are excluded from the items to be saved.
(5)	**[OK] (confirmation) button** When this button is pressed, any changes made in the saving settings are applied to the next file output, and then the saving item setting screen is closed.
(6)	**[Cancel] button** When this button is pressed, the saving item setting screen is closed without making any changes to the saving settings.

NOTE

For the data in the harmonic tab, when one item is selected as the saving target, all the specified data of each order are saved. When the order output is set to 0 to 50th order, there are 51 more data to be saved per harmonic item. Be aware that a communication or saving delay is more likely to occur.

Format of the save file

The CSV file created during interval saving is saved in the following format.
In the following file, Urms1, Irms1, and P1 are obtained and saved from each of the two Instrument systems.



SERIAL				PW3336 COM:3 ser130522302					PW3337 LAN:192.168.1.2 ser123454321				
2013/8/29	17:10:43	START											
Date	Time	Laptime	Laptime(ms	STATUS	STATUS_M	U1(V)	I1(A)	P1(W)	STATUS	STATUS_M	U1(V)	I1(A)	P1(W)
2013/8/29	17:10:44	0:00:00	0	0	10000000	9.87E+01	3.77E-01	3.49E+01	40000	40000	3.00E+02	1.50E+04	4.50E+06
2013/8/29	17:10:45	0:00:01	0	0	10000000	9.90E+01	3.76E-01	3.49E+01	40000	40000	3.00E+02	1.50E+04	4.50E+06

Date and time for all systems

Measurement data of the first system

Measurement data of the second system

The first row contains information such as the instrument ID and serial number for which communication is performed.
The second row contains the date and time the measurement has started.
The third row is the header information.

NOTE

- The following special values are used for items for which the measured value could not be acquired from the instrument due to a communications error or for which a condition such as over-peak or over-range occurred on the instrument:
-

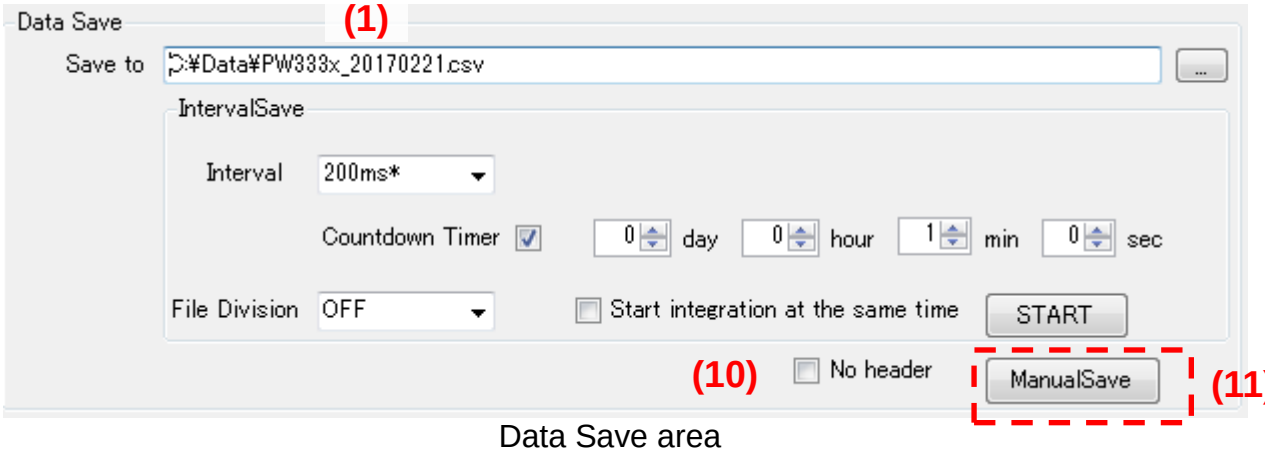
Error (PW3335/PW3336/PW3337)	Measured value string
Communications error	”789.00E+9”
Over-range on instrument	”999.99E+9”
Scaling error on instrument	”888.88E+9”
No measurement data on instrument	”777.77E+9”

Error (PW3390)	Measured value string
Communications error	”789.00E+9”
Over-range on instrument No measurement data on instrument	” +9999.9E+99”

Error (PW6001)	Measured value string
Communications error	”789.00E+9”
Over-range on instrument No measurement data on instrument	” +99999.9E+99”

3.10 File Output (Manual Saving)

The measurement data can be obtained at the specified timing and the measurement values can also be saved on the computer as a CSV file.



Data Save area

Pressing the button (11) above executes manual saving.
The save destination and saving items are the same as those for interval saving.

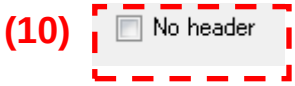
However, the data are output to the file specified in (1) above. (No identification number is added.)

NOTE

When manual saving is executed, if the file to be saved is currently being used for another application, a different file (added with an identification number for its file name) will be created and the measurement values will be saved in the file, in the same manner as for interval saving.

■ Header suppression

When (10) is selected, headers will not be added when appending data to an existing file during manual saving. This option allows files to be created in a format similar to that generated by interval saving when a series of manual saves are performed.



NOTE

If you continue to save data manually after changing the parameters being saved, the measured values being saved will differ from the information contained in the header.

If you change the parameters being saved, either deselect the [No header] checkbox or save the data to a new file with a different filename.

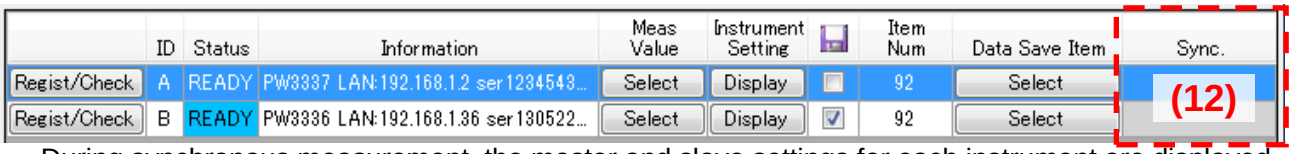
3.11 Synchronous Settings When Multiple Systems Are Connected

With this software, communication can be performed with a maximum of eight Instruments systems concurrently.

This section describes how to use the software when connecting to multiple instruments that have been connected with synchronization cables to perform synchronized measurement.

3.11.1 Synchronous Settings (for the PW3335/PW3336/PW3337)

You can perform synchronized measurement by connecting instruments (PW3335/PW3336/PW3337) with the 9165 Connection Cable (a BNC cable).



During synchronous measurement, the master and slave settings for each instrument are displayed in (12) above.

3.11.2 Synchronous Settings (for the PW3390)

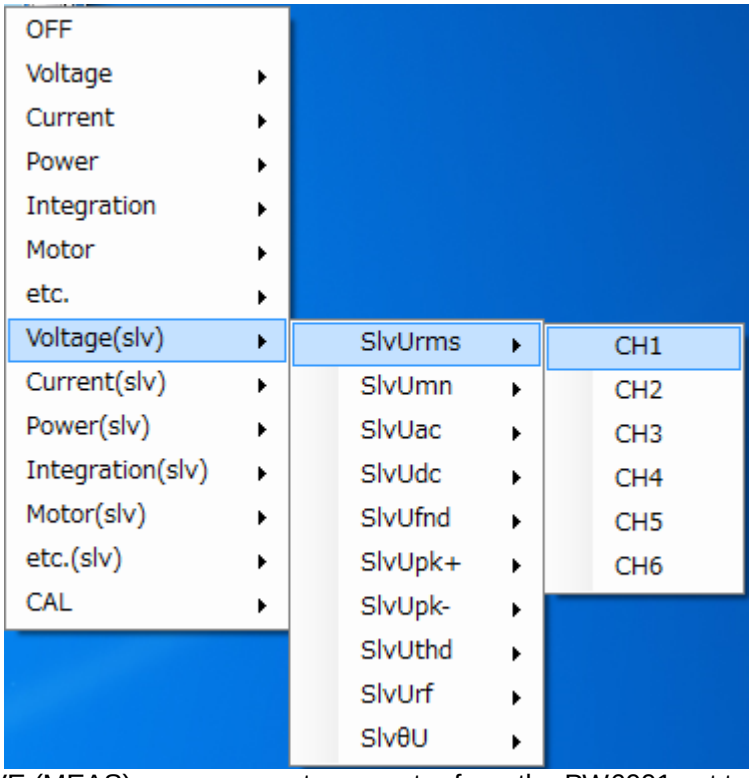
You can perform synchronized measurement by connecting instruments (PW3390) with the 9683 Connection Cable.
To acquire data that has been synchronized across multiple instruments, it is necessary to set the synchronization event for both the master and the slave instrument to HOLD.

Field (12) indicates the master (MASTER_H) or slave (SLAVE_H) setting for each instrument when performing synchronized measurement (when there is at least one PW3390 with synchronization set to slave and synchronization events set to HOLD). Only instruments whose synchronization events parameter is set to HOLD are shown.

3.11.3 Synchronous Settings (for the PW6001)

When two PW6001 instruments are connected with a cable such as the L6000 Optical Connection Cable, simultaneous measurement can be performed by the connected instruments.

You can acquire synchronized measurement data by acquiring measured values from the SLAVE (MEAS) instrument via the PW6001 set to MASTER (MEAS) (by choosing a parameter followed by “(slv)” in the master instrument’s measurement parameter menu [see screenshot below]).
You can acquire synchronized measurement data by acquiring measured values from the SLAVE (MEAS) instrument via the PW6001 set to MASTER (MEAS) (by choosing a parameter followed by “(slv)” in the master instrument’s measurement parameter menu [see screenshot below]).
Slave instrument measured values cannot be specified from the master instrument’s measurement parameter menu when the PW6001’s synchronization setting is set to waveform synchronization mode (MASTER [WAVE], SLAVE [WAVE]) or OFF.
The synchronization setting field for PW6001 instruments will display nothing, regardless of the instrument’s setting.



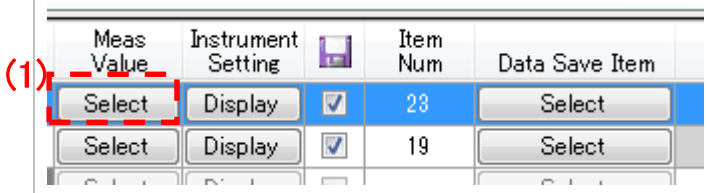
Specifying a SLAVE (MEAS) measurement parameter from the PW6001 set to MASTER (MEAS)

NOTE

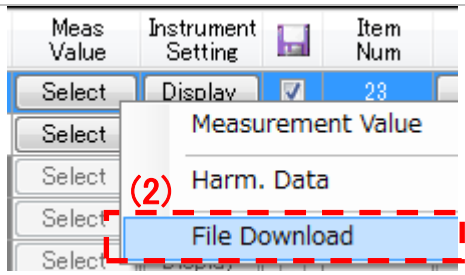
- For more information about synchronization functionality, see the instrument's user manual.
- When using the synchronous function, be sure to connect the target instrument using the synchronous cable.
- If synchronism is not necessary for the measurement data, you can turn OFF all the synchronous settings for the instrument and obtain the measurement data without using the synchronous function.
- While using the integration function, the synchronous setting of the instrument cannot be changed. When changing the synchronous setting of the instrument, reset the integration of the instrument.
- This software sends the HOLD command to the instrument during acquisition of the measurement data. When the instrument whose synchronous setting is set to "MASTER(_H)" or "SLAVE(_H)" is currently registered in the connection list, the HOLD command is only sent to the master unit, while no HOLD command is sent to the slave unit.
- You will not be able to select the measured value display if the synchronization setting field indicates the following:
    - Multiple instruments set as MASTER(_H)
    - One or more SLAVE (_H) instruments but no MASTER(_H) instrument
- The MASTER (_H) and SLAVE (_H) instruments must be the same model.(The PW3335, PW3336, and PW3337 are considered to be the same model.)
- When using the PW3335/PW3336/PW3337, it may take time to acquire measured values due to synchronization processing.
- Although this software normally acquires measured values at an interval of 50 ms to 200 ms, measured values are acquired at an interval of 500 ms when synchronizing multiple instruments (when MASTER [_H] and SLAVE [_H] instruments are shown in the synchronization setting field). An asterisk ("*") will appear in the interval time setting field when settings do not allow acquisition of measured values while synchronizing multiple instruments.

3.12 Functionality for Downloading Files

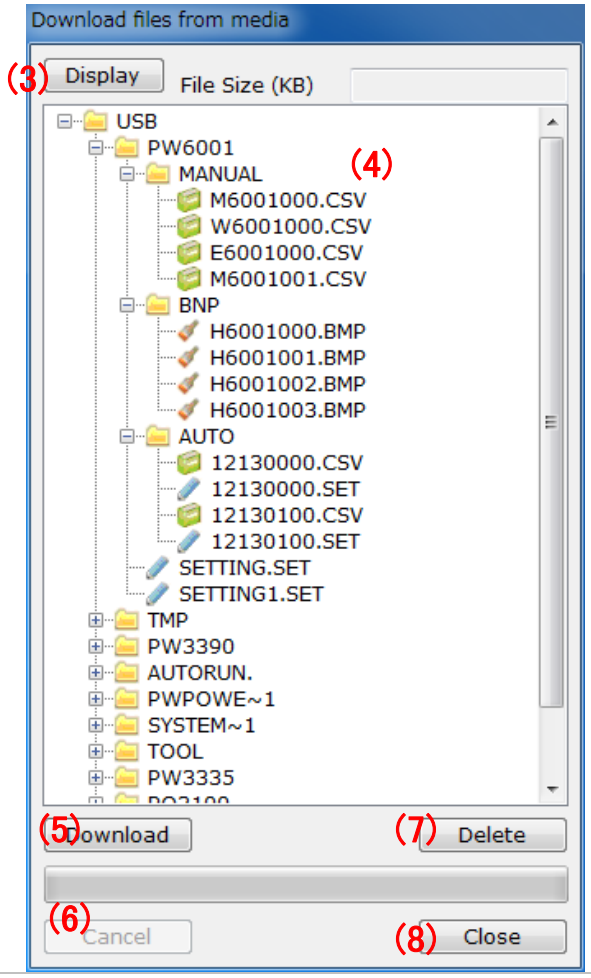
You can use this application to download files from the power meter's media (CF card or USB flash drive) to a computer. (Supported models: PW3390 [LAN, USB], PW6001 [LAN])



(1) Click the Meas Value "Select" button on the main screen.



(2) On the displayed menu, select "File Download" to display the Download Files screen. (The "File Download" command is only shown when connected to a supported instrument model.)



(3) Click the "Display" button to display a list of folders and files on the media.
(4) Select the folder(s) or file(s) you wish to download from the list.
(5) Click the "Download" button to display a dialog box asking you to choose the location in which to save the folder(s) or file(s) and their names. Select the desired location.
(6) A progress bar will be displayed to indicate download progress. Click the "Cancel" button to cancel the download.
(7) Click the "Delete" button to delete the selected folder(s) or file(s).
(8) Click the "Close" button to close the Download Files screen.

NOTE

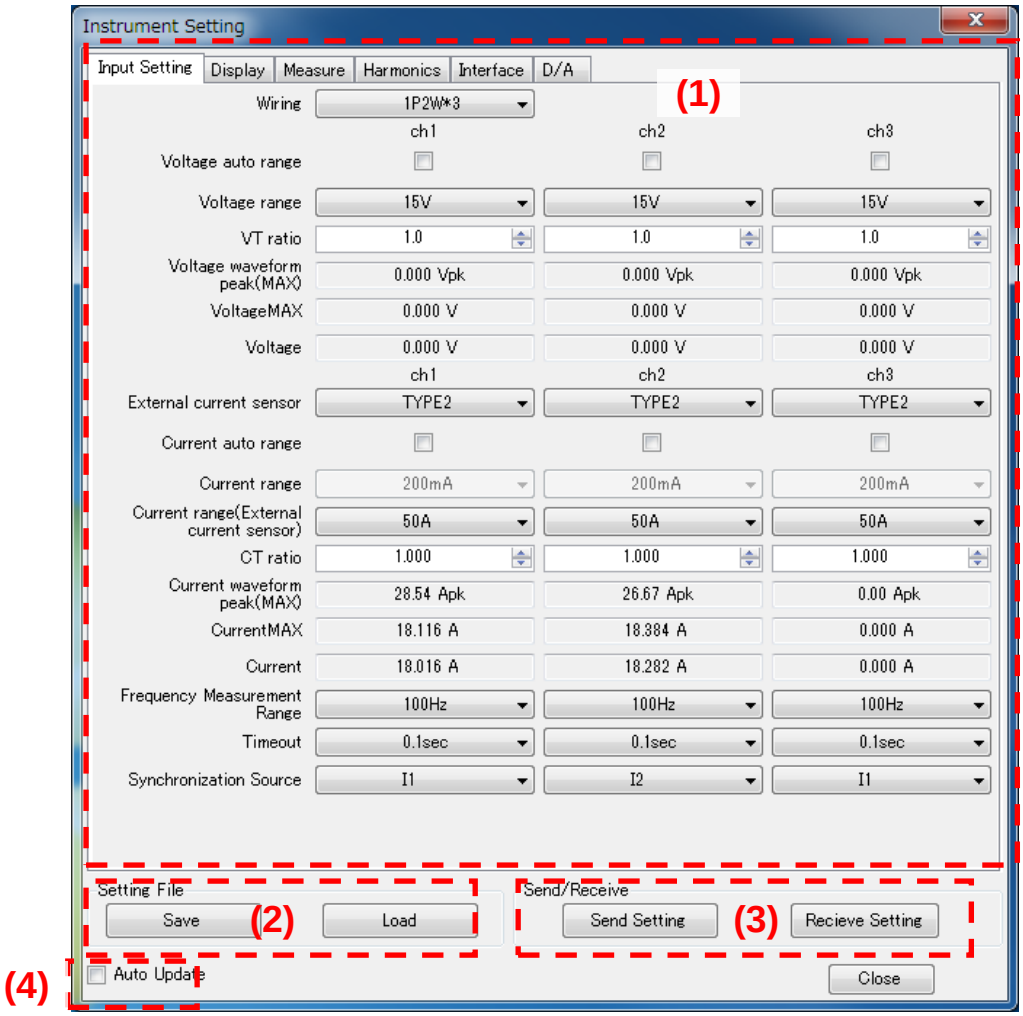
- The following limits apply to the display of files stored on instrument media.
  - A single folder can contain up to 90 files and up to 215 folders. Files and folders in excess of those numbers will not be displayed.
  - Filenames containing double-byte characters cannot be displayed.
  - When connected to the PW3390, it is not possible to access files below the folder level (i.e. files stored two levels or further down in the file hierarchy).

3.13 Instrument Setting Function

The setting states of the connected instrument can be obtained and displayed. Setting contents changed in this software can be sent to the Instrument, and the setting files can be saved to the computer.

Setting screen

Pressing the instrument setting button of a setting object on the main screen displays the following screen:



Instrument setting screen

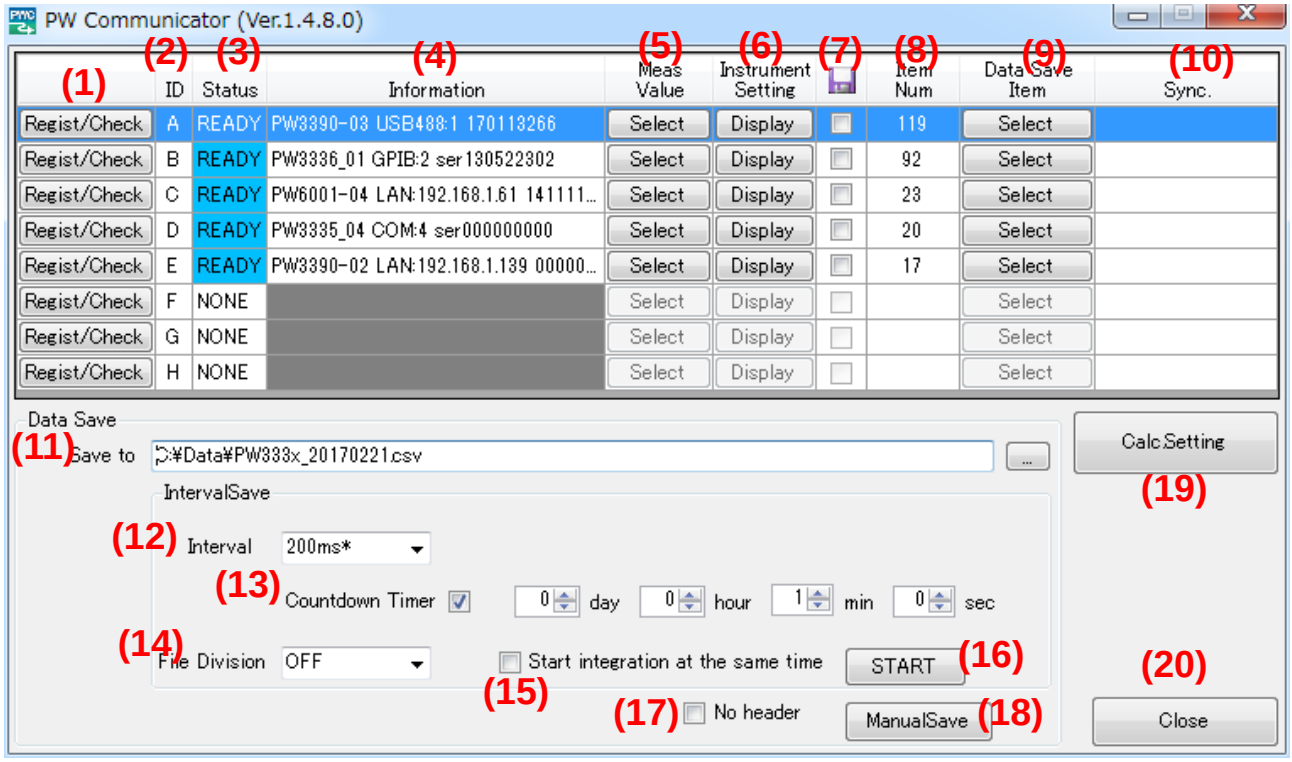
(1)	Setting display area	Setting contents are displayed. The display contents may differ depending on the Instrument. Display contents can be switched by switching the tabs at the top of the instrument setting screen. Invalid setting items are grayed-out and no changes can be made to any settings in the setting display area, i.e., when the wire connections are other than 1P2W (1-phase, 2-wire) and the range setting is shared with CH1.
(2)	Setting files Saving and Loading	Pressing the [Save] button saves the setting contents in a file in text format that is displayed on the software screen. The saved file can be loaded by pressing the [Load] button. Settings are not transmitted or applied to the instrument at the time the saved file is loaded. Click the [Send Setting] button in order to reflect the settings to the instrument.
(3)	Transmission and reception of settings	Pressing the [Send Setting] button transmits and applies the displayed settings to the instrument. Invalid settings such as grayed-out settings are not transmitted. Pressing the [Receive Setting] button receives the settings from the instrument and displays them on the software screen.
(4)	Automatic updating	Checking the checkbox automatically updates the peak and maximum values of the voltage and current on the [Input Setting] tab.

NOTE

- When selecting a range, use the peak and maximum values of the voltage and current on the [Input Setting] tab as a reference.
- The contents of the hardware settings screen are not updated automatically. To update the information shown on the screen, press the [Receive Setting] button.
- No setting changes such as input settings are available during the instrument integration(for the PW3335/PW3336/PW3337, when the instrument's RUN lamp is lit up or flashing; for the PW6001,PW3390, when the instrument's START lamp is lit up)
- Reset the integration by resetting the instrument or the hardware settings screen.

3.14 Main Screen

With this software, communication can be performed with a maximum of eight instruments systems concurrently.
On the main screen, the connection list for the instrument that is the connection destination is displayed.
The file output can also be executed from the main screen.



Main screen

	Name	Description
(1)	[Regist/Check] button	Allows you to select the instrument to be connected or check the connection status. This is the button that is used first.
(2)	ID	ID for identifying the instrument registered in the connection list.
(3)	Status	Displays the communication status of the instrument registered in the connection list. READY Communication can be performed. BUSY Communication is currently being performed. ERROR A communication error is currently activated.
(4)	Information	Displays the model name, serial number, and other information of the instrument to be connected when it is registered in the connection list. This information is also output to a CSV file. When this field is clicked for an already registered instrument, the data can be edited as desired.
(5)	[Meas Value] button	Allows you to display the measurement values. Select one from the following menus.

	Name	Description
		Measurement Value Measurement Value List (PW3335/PW3336/PW3337) Harm. Data For more details, refer to the description of each screen.
(6)	[Instrument Setting] button	Allows you to change the settings of the instrument to be connected.
(7)	Checkbox for saved data output	The data of the instrument checked with the relevant checkbox is output to a CSV file. Even when the saving settings are specified for each measurement item on the measurement value list screen or saving item selection screen, unless these checkboxes are checked, the data will not be output to the CSV file. This can be used for switching the ON/OFF setting of the overall measurement items of the specified instrument.
(8)	Item Num	Displays the number of measurement items to be obtained from the instrument through the communication. The larger this number is, the longer it takes to communicate with the instrument. Due to this, a delay is more likely to occur during measurement value display or file output. In order to resolve the delay problem, reduce the number of selected items in each screen so that a smaller value is set in this field.
(9)	Saving item selection	Allows you to select the measurement items to be output in a file. For more details, refer to 3.9 File Output (Interval Saving).
(10)	Sync	Allows you to display the synchronous settings of the instrument.(For the PW3335/PW3336/PW3337/PW3390) For more details, refer to “13. Synchronous Settings When Multiple Systems Are Connected.
(11)	Save to	Allows you to specify the file for outputting the measurement values.
(12)	Interval	Allows you to specify the interval for interval saving.
(13)	Countdown Timer	Allows you to specify the timer operation during interval saving.
(14)	File division	Allows you to specify the file division method during interval saving.
(15)	Start integration at the same time	Allows you to link the instrument’s integration operation to interval saving start/stop operation.
(16)	Interval saving start button	Pressing this button starts interval saving. While interval saving is in progress, this button changes to the [Abort] button.
(17)	No Header	Selecting this checkbox will suppress the header when appending data to an existing file during manual saving.
(18)	[ManualSave] button	Pressing this button executes manual saving.
(19)	[Calc. Setting] button	Allows you to obtain the calculated values for the destination instrument.
(20)	[Close] button	Closes the main screen after closing the screen displaying measurement values or stopping the file output.

3.15 Other

- Startup option

The following option can be specified when launching the application from the command line, for example at startup:

Example: By specifying
"C:\Program Files\HIOKI\PW_Communicator\PW_Communicator.exe" -AUTO_START
, you can automatically start interval saving immediately after the application is launched.

Option	Description
-AUTO_START	Starts interval saving immediately after the application is launched. Specifying an invalid instrument or an invalid location in which to save files will result in an error.

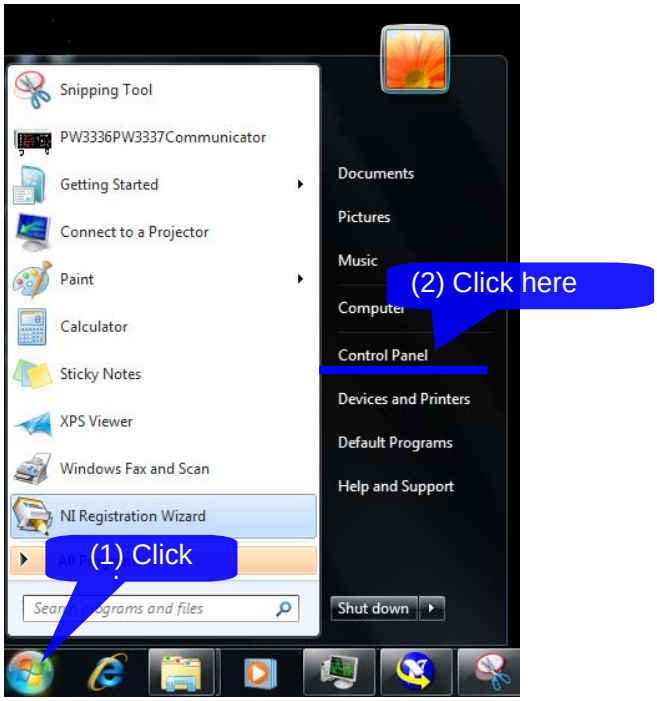
4. Uninstallation

4.1 Uninstalling PW Communicator

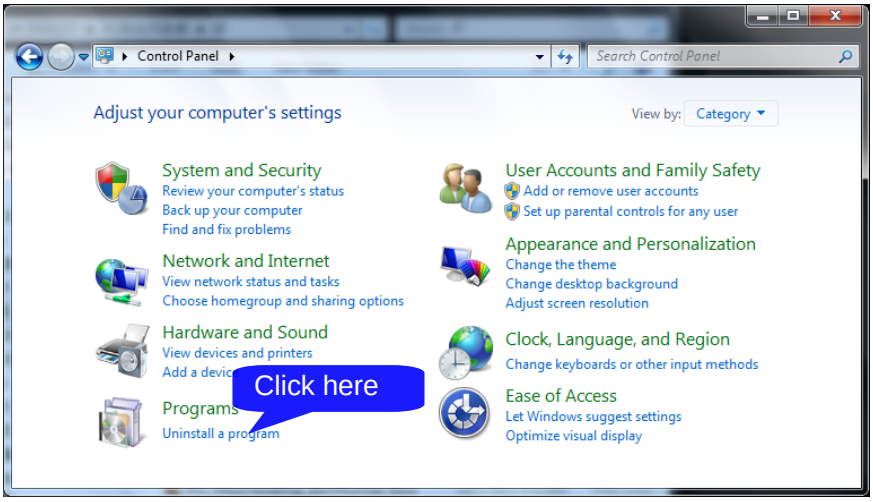
If this software is no longer necessary, uninstall it according to the following procedure.

■ For Windows 7

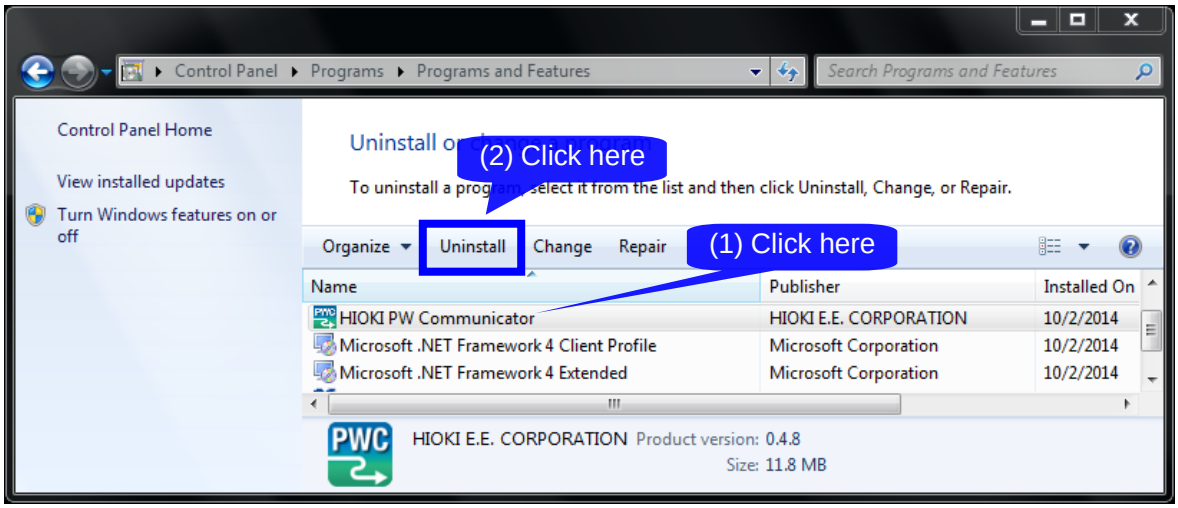
1 From the [Start] menu of Windows, click [Control Panel].



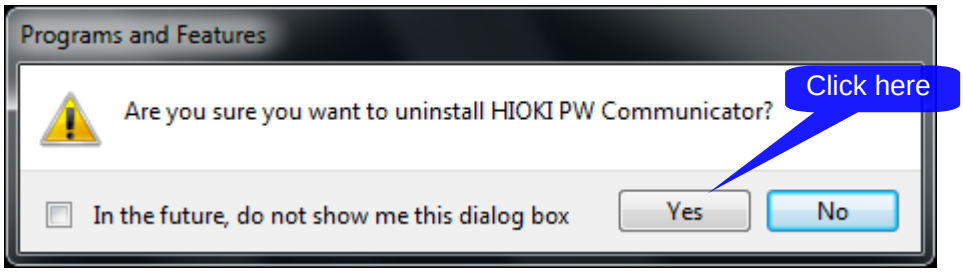
2 Click [Uninstall a program].



3 Select [PW Communicator] from the list of the currently installed programs, and then click [Uninstall].

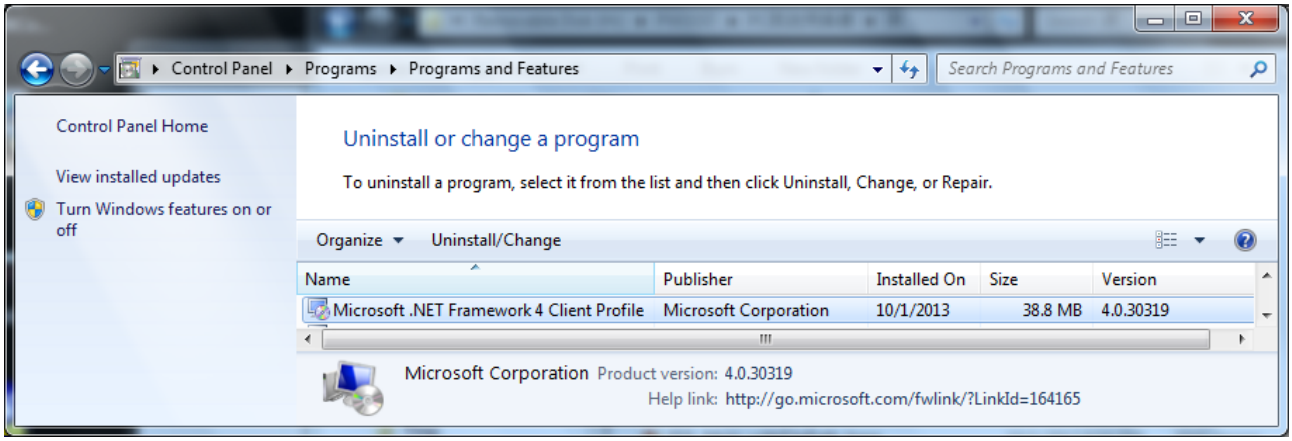


When a dialog box that requires you to permit the continued program uninstallation appears, click [Yes] to proceed to the next step.



- Uninstalling Microsoft .NET Framework4

  In the same manner as “Uninstalling PW Communicator ”, select [Microsoft .NET Framework4] and uninstall it.



.NET Framework is also used by other application software. Please uninstall only if it is no longer needed completely.

5. Specifications

5.1 General Specifications

Applicable model	PW3335/PW3336/PW3337 Power Meter PW3390 Power Analyzer PW6001 Power Analyzer	
Operation environment	Personal computer compatible with the following conditions	
	Computer	PC/AT compatible machine (DOS/V machine)
	Operating system	・ Windows 7 SP1 or above (32-/64-bit edition) ・ Windows 8 (32-/64-bit edition) ・ Windows 10 (32-/64-bit edition) Microsoft .NET Framework4 must be installed in the above operating systems in advance.
	CPU	1.0 GHz or higher (2.0 GHz or above is recommended)
	Memory	1.0 GB or higher (2.0 GB or above is recommended)
		Note: 2.0 GB or higher for Windows 64-bit edition
	Hard disk	Free space of 128 MB or more (at the time of startup)
	Display	Resolution of 1,024×768 dots or above, 65,536 colors or more
	Communication interface	Any one or more of the following must be available: Ethernet (TPC/IP), GP-IB, USB(488),and RS-232C(COM Port). Only the GP-IB interface manufactured by National Instruments Corporation is acceptable. The GP-IB driver of .NET4.0 or above must be installed in advance.(NI-488.2 3.1.2 or later) The supplied driver must be installed in order to use the USB interface.
Number of systems that can be connected concurrently		8

5.2 Functional Specifications

Display function	By connecting with the Instrument, the measurement values are displayed on the monitor
Value	Selected measurement value is displayed
Number of display items	Selectable from 4, 8, 16, and 32
Waveform display	Waveforms of the voltage and current in each channel can be displayed. (For the PW3335/PW3336/PW3337, the waveform has been attenuated in a frequency range of 8 kHz or more. Details depend on the width of the window for the harmonics analysis of the instrument.) (For the PW6001, waveforms are displayed after being compressed to 1k points. When the sampling speed is faster than 50 kHz, motor analog waveforms are displayed using interpolation.) (For the PW3390, waveforms are displayed after being compressed to 500 points.) Any part of the waveform can be enlarged.
Value list (For the PW3335/ PW3336/PW3337)	Instantaneous, maximum and minimum values are displayed at the same time
Number of display items	Maximum of 64 items
Harmonic	Harmonic data are displayed
Available data	Instantaneous, maximum, and minimum values for harmonic voltage, current, and power Data from 0 (DC) to 50th order for the selected harmonic data (PW6001,PW3390: 0th to 100th order)

Measurement value saving function	
Overview	By connecting with the instrument, the specified measurement values are saved in a file
Operation	· Manual saving at the specified timing · Interval saving that allows automatic saving at the specified interval
Output format	CSV
Selectable interval time	Selectable from 50ms, 100ms, 200ms, 500ms, 1s, 5s, 10s, 15s, 30s, 1min, 5min, 10min, 15min, and 60min Actual saving interval may differ depending on the communication status and the number of items to be communicated
	The items to be saved are selectable from all the measurement values

Calculation (Inter-device arithmetic) function	
Overview	Measurement values of multiple connected instruments can be calculated. Calculation results can be displayed on the value display and value list screen, and the results can be output to a file.
Binary expression	32
Binary expression type	Addition, Subtraction, Multiplication, Division, Efficiency operation, (x*x)/y, x/(y*y)
Unary calculation	Constant multiplication and unary calculations can be used in expressions.
Unary calculations	Absolute value, exponent, natural logarithm, common logarithm, negative, square, sum of squares (harmonic), square root, sum (harmonic), trigonometric functions, inverse trigonometric functions, hyperbolic function

Instrument setting function	
Overview	Allows you to retrieve and change the settings of the instrument through interface communication. Allows you to save settings to a setting file and to read from a setting file.

Other

Startup option　Allows you to specify application operation using command line options.

6. Appendix

6.1 List of Measurement Items

6.1.1 List of Measurement Items (PW3336/PW3337)

Measurement items	Rectifier	Notation on instrument		Notation in software
Voltage (U)	RMS value	V	AC DC	Urms
	Voltage average value rectifier		AC DC Umn	Umean
	DC measurement		DC	Udc
	AC measurement		AC	Uac
	Harmonic (fundamental wave)		FND	Ufnd
Current (I)	RMS value	A	AC DC	Irms
	Voltage average value rectifier		AC DC Umn	Imean
	DC measurement		DC	Idc
	AC measurement		AC	Iac
	Harmonic (fundamental wave)		FND	Ifnd
Active power (P)	RMS value	W	AC DC	Prms
	Voltage average value rectifier		AC DC Umn	Pmean
	DC measurement		DC	Pdc
	AC measurement		AC	Pac
	Harmonic (fundamental wave)		FND	Pfnd
Apparent power (S)	RMS value	VA	AC DC	Srms
	Voltage average value rectifier		AC DC Umn	Smean
	AC measurement		AC	Sac

Measurement items	Rectifier	Notation on instrument		Notation in software
	Harmonic (fundamental wave)		**FND**	Sfnd
Reactive power (Q)	RMS value	**var**	**AC DC**	Qrms
	Voltage average value rectifier		**AC DC Umn**	Qmean
	AC measurement		**AC**	Qac
	Harmonic (fundamental wave)		**FND**	Qfnd
Power factor (λ)	RMS value	**PF**	**AC DC**	PFrms
	Voltage average value rectifier		**AC DC Umn**	PFmean
	AC measurement		**AC**	PFac
	Harmonic (fundamental wave)		**FND**	PFfnd
Phase angle (φ)	AC measurement	**°**	**AC**	DEGac
	Harmonic (fundamental wave)		**FND**	DEGfnd
Voltage frequency (f)		**V Hz**		FREQ_U
Current frequency (f)		**A Hz**		FREQ_I
Positive current integration		**Ah +**	**DC**	IH+dc
Negative current integration		**Ah -**	**DC**	ID-dc
Current integration sum	RMS value	**Ah**	**AC DC**	IH
	Voltage average value rectifier		**AC DC Umn**	IH mean
	DC measurement		**DC**	IH dc
Positive active power integration	RMS value	**Wh +**	**AC DC**	WH+
	Voltage average value rectifier		**AC DC Umn**	WH+mean
	DC measurement		**DC**	WH+dc
Negative active power integration	RMS value	**Wh -**	**AC DC**	WH-
	Voltage average value rectifier		**AC DC Umn**	WH-mean
	DC measurement		**DC**	WH-dc
Active power integration sum	RMS value	**Wh**	**AC DC**	WH
	Voltage average value rectifier		**AC DC Umn**	WH mean
	DC measurement		**DC**	WH dc
Integration time		**TIME**		TIME
Voltage waveform peak value (Upk)		**V pk**		Upk

Measurement items	Rectifier	Notation on instrument		Notation in software
Current waveform peak value (Ipk)		**A pk**		Ipk
Efficiency (η)		**η1 %**		EFF1
Efficiency (η)		**η2 %**		EFF2
Voltage crest factor (Ucf)		**CF V**		Ucf
Current crest factor (Icf)		**CF A**		Icf
Time average current (T.AV I)	RMS value	**T.AV A**	**AC DC**	I.TAV
	Voltage average value rectifier		**AC DC Umn**	I.TAVmn
	DC measurement		**DC**	I.TAVdc
Time average active power (T.AV P)	RMS value	**T.AV W**	**AC DC**	P.TAV
	Voltage average value rectifier		**AC DC Umn**	P.TAVmn
	DC measurement		**DC**	P.TAVdc
Voltage ripple factor (Urf)		**RF V %**		Urf
Current ripple factor (Irf)		**RF A %**		Irf
Total harmonic voltage distortion rate (Uthd)		**THD V %**		Uthd
Total harmonic current distortion rate (Ithd)		**THD A %**		Ithd
Inter-channel voltage fundamental wave phase difference (θU2-1)		**θ V ° CH1 CH2**		Uchdeg (CH2)
Inter-channel voltage fundamental wave phase difference (θU3-1)		**θ V ° CH1 CH3**		Uchdeg (CH3)
Inter-channel current fundamental wave phase difference (θ2-1)		**θ A ° CH1 CH2**		Ichdeg (CH2)
Inter-channel current fundamental wave phase difference (θ3-1)		**θ A ° CH1 CH3**		Ichdeg (CH3)
Harmonic voltage RMS value (Uk)		**HRM V LEVEL**		HU
Harmonic current RMS value (Ik)		**HRM A LEVEL**		HI
Harmonic active power (Pk)		**HRM W LEVEL**		HP
Harmonic voltage content percentage (UHDk)		**HRM V % HD%**		HUcon
Harmonic current content percentage (IHDk)		**HRM A % HD%**		HIcon
Harmonic active power content percentage (PHDk)		**HRM W % HD%**		HPcon
Harmonic voltage phase angle (ΘUk)		**No display**		HUpha
Harmonic current phase angle (ΘIk)		**No display**		HIpha
Harmonic voltage/current phase difference (Θk)		**No display**		HPpha

6.1.2 List of Measurement Items (PW3335)

Measurement items	Rectifier	Notation on instrument		Notation in software
Voltage (U)	RMS value	V	AC DC	Urms
	Voltage average value rectifier		AC DC Umn	Umean
	DC measurement		DC	Udc
	AC measurement		AC	Uac
	Harmonic (fundamental wave)		FND	Ufnd
Current (I)	RMS value	A	AC DC	Irms
	Voltage average value rectifier		AC DC Umn	Imean
	DC measurement		DC	Idc
	AC measurement		AC	Iac
	Harmonic (fundamental wave)		FND	Ifnd
Active power (P)	RMS value	W	AC DC	Prms
	Voltage average value rectifier		AC DC Umn	Pmean
	DC measurement		DC	Pdc
	AC measurement		AC	Pac
	Harmonic (fundamental wave)		FND	Pfnd
Apparent power (S)	RMS value	VA	AC DC	Srms
	Voltage average value rectifier		AC DC Umn	Smean
	AC measurement		AC	Sac
	Harmonic (fundamental wave)		FND	Sfnd
Reactive power (Q)	RMS value	var	AC DC	Qrms
	Voltage average value rectifier		AC DC Umn	Qmean
	AC measurement		AC	Qac
	Harmonic (fundamental wave)		FND	Qfnd
Power factor (λ)	RMS value	PF	AC DC	PFrms

Measurement items		Rectifier	Notation on instrument			Notation in software
		Voltage average value rectifier			AC DC Umn	PFmean
		AC measurement			AC	PFac
		Harmonic (fundamental wave)			FND	PFfnd
Phase angle (ϕ)		AC measurement	°		AC	DEGac
		Harmonic (fundamental wave)			FND	DEGfnd
Voltage frequency (f)			V Hz			FREQ_U
Current frequency (f)			A Hz			FREQ_I
Positive current integration	TOTAL (All range)	DC measurement	Ah +	TOTAL	DC	IH+dc TOTAL
	200mA range			200mA		IH+dc 200mA
	500mA range			500mA		IH+dc 500mA
	1A range			1A		IH+dc 1A
	2A range			2A		IH+dc 2A
	5A range			5A		IH+dc 5A
	10A range			10A		IH+dc 10A
	20A range			20A		IH+dc 20A
	B(Backup)			B		IH+dc Backup
Negative current integration	TOTAL (All range)	DC measurement	Ah -	TOTAL	DC	IH-dc TOTAL
	200mA range			200mA		IH-dc 200mA
	500mA range			500mA		IH-dc 500mA
	1A range			1A		IH-dc 1A
	2A range			2A		IH-dc 2A
	5A range			5A		IH-dc 5A
	10A range			10A		IH-dc 10A
	20A range			20A		IH-dc 20A
	B(Backup)			B		IH-dc Backup
Current integration sum	TOTAL (All range)	RMS value	Ah	TOTAL	AC DC	IH TOTAL
		Voltage average value rectifier			AC DC Umn	IH mean TOTAL
		DC measurement			DC	IH dc TOTAL
	200mA range	DC measurement		200mA	DC	IH dc 200mA
	500mA range	DC measurement		500mA	DC	IH dc 500mA
	1A range	DC measurement		1A	DC	IH dc 1A
	2A range	DC measurement		2A	DC	IH dc 2A
	5A range	DC measurement		5A	DC	IH dc 5A

Measurement items		Rectifier	Notation on instrument			Notation in software
	10A range	DC measurement		**10A**	**DC**	IH dc 10A
	20A range	DC measurement		**20A**	**DC**	IH dc 20A
	B(Backup)	DC measurement		**B**	**DC**	IH dc Backup
Positive active power integration	TOTAL (All range)	RMS value	**Wh +**	**TOTAL**	**AC DC**	WH+ TOTAL
		Voltage average value rectifier			**AC DC Umn**	WH+mean TOTAL
		DC measurement			**DC**	WH+dc TOTAL
	200mA range	RMS value		**200mA**	**AC DC**	WH+ 200mA
		Voltage average value rectifier			**AC DC Umn**	WH+mean 200mA
		DC measurement			**DC**	WH+dc 200mA
	500mA range	RMS value		**500mA**	**AC DC**	WH+ 500mA
		Voltage average value rectifier			**AC DC Umn**	WH+mean 500mA
		DC measurement			**DC**	WH+dc 500mA
	1A range	RMS value		**1A**	**AC DC**	WH+ 1A
		Voltage average value rectifier			**AC DC Umn**	WH+mean 1A
		DC measurement			**DC**	WH+dc 1A
	2A range	RMS value		**2A**	**AC DC**	WH+ 2A
		Voltage average value rectifier			**AC DC Umn**	WH+mean 2A
		DC measurement			**DC**	WH+dc 2A
	5A range	RMS value		**5A**	**AC DC**	WH+ 5A
		Voltage average value rectifier			**AC DC Umn**	WH+mean 5A
		DC measurement			**DC**	WH+dc 5A
	10A range	RMS value		**10A**	**AC DC**	WH+ 10A
		Voltage average value rectifier			**AC DC Umn**	WH+mean 10A
		DC measurement			**DC**	WH+dc 10A
	20A range	RMS value		**20A**	**AC DC**	WH+ 20A
		Voltage average value rectifier			**AC DC Umn**	WH+mean 20A
		DC measurement			**DC**	WH+dc 20A
	B(Backup)	RMS value		**B**	**AC DC**	WH+ Backup

Measurement items		Rectifier	Notation on instrument			Notation in software
		Voltage average value rectifier			**AC DC Umn**	WH+mean Backup
		DC measurement			**DC**	WH+dc Backup
Negative active power integration	TOTAL (All range)	RMS value	**Wh -**	**TOTAL**	**AC DC**	WH- TOTAL
		Voltage average value rectifier			**AC DC Umn**	WH-mean TOTAL
		DC measurement			**DC**	WH-dc TOTAL
	200mA range	RMS value		**200mA**	**AC DC**	WH- 200mA
		Voltage average value rectifier			**AC DC Umn**	WH-mean 200mA
		DC measurement			**DC**	WH-dc 200mA
	500mA range	RMS value		**500mA**	**AC DC**	WH- 500mA
		Voltage average value rectifier			**AC DC Umn**	WH-mean 500mA
		DC measurement			**DC**	WH-dc 500mA
	1A range	RMS value		**1A**	**AC DC**	WH- 1A
		Voltage average value rectifier			**AC DC Umn**	WH-mean 1A
		DC measurement			**DC**	WH-dc 1A
	2A range	RMS value		**2A**	**AC DC**	WH- 2A
		Voltage average value rectifier			**AC DC Umn**	WH-mean 2A
		DC measurement			**DC**	WH-dc 2A
	5A range	RMS value		**5A**	**AC DC**	WH- 5A
		Voltage average value rectifier			**AC DC Umn**	WH-mean 5A
		DC measurement			**DC**	WH-dc 5A
	10A range	RMS value		**10A**	**AC DC**	WH- 10A
		Voltage average value rectifier			**AC DC Umn**	WH-mean 10A
		DC measurement			**DC**	WH-dc 10A
	20A range	RMS value		**20A**	**AC DC**	WH- 20A
		Voltage average value rectifier			**AC DC Umn**	WH-mean 20A
		DC measurement			**DC**	WH-dc 20A
	B(Backup)	RMS value		**B**	**AC DC**	WH- Backup
		Voltage average value rectifier			**AC DC Umn**	WH-mean Backup

Measurement items		Rectifier	Notation on instrument			Notation in software
		DC measurement			**DC**	WH-dc Backup
Active power integration sum	TOTAL (All range)	RMS value	**Wh**	**TOTAL**	**AC DC**	WH TOTAL
		Voltage average value rectifier			**AC DC Umn**	WH mean TOTAL
		DC measurement			**DC**	WH dc TOTAL
	200mA range	RMS value		**200mA**	**AC DC**	WH 200mA
		Voltage average value rectifier			**AC DC Umn**	WH mean 200mA
		DC measurement			**DC**	WH dc 200mA
	500mA range	RMS value		**500mA**	**AC DC**	WH 500mA
		Voltage average value rectifier			**AC DC Umn**	WH mean 500mA
		DC measurement			**DC**	WH dc 500mA
	1A range	RMS value		**1A**	**AC DC**	WH 1A
		Voltage average value rectifier			**AC DC Umn**	WH mean 1A
		DC measurement			**DC**	WH dc 1A
	2A range	RMS value		**2A**	**AC DC**	WH 2A
		Voltage average value rectifier			**AC DC Umn**	WH mean 2A
		DC measurement			**DC**	WH dc 2A
	5A range	RMS value		**5A**	**AC DC**	WH 5A
		Voltage average value rectifier			**AC DC Umn**	WH mean 5A
		DC measurement			**DC**	WH dc 5A
	10A range	RMS value		**10A**	**AC DC**	WH 10A
		Voltage average value rectifier			**AC DC Umn**	WH mean 10A
		DC measurement			**DC**	WH dc 10A
	20A range	RMS value		**20A**	**AC DC**	WH 20A
		Voltage average value rectifier			**AC DC Umn**	WH mean 20A
		DC measurement			**DC**	WH dc 20A
	B(Backup)	RMS value		**B**	**AC DC**	WH Backup
		Voltage average value rectifier			**AC DC Umn**	WH mean Backup
		DC measurement			**DC**	WH dc Backup

Measurement items		Rectifier	Notation on instrument			Notation in software
Integration time	TOTAL (All range)	DC measurement	TIME	TOTAL	DC	TIME TOTAL
	200mA range			200mA		TIME 200mA
	500mA range			500mA		TIME 500mA
	1A range			1A		TIME 1A
	2A range			2A		TIME 2A
	5A range			5A		TIME 5A
	10A range			10A		TIME 10A
	20A range			20A		TIME 20A
	B(Backup)			B		TIME Backup
Voltage waveform peak value (Upk)			V pk			Upk
Current waveform peak value (Ipk)			A pk			Ipk
Maximum Current Ratio(MCR)			MCR			MCR
Voltage crest factor (Ucf)			CF V			Ucf
Current crest factor (Icf)			CF A			Icf
Time average current (T.AV I)	TOTAL (All range)	RMS value	T.AV A	TOTAL	AC DC	I.TAV TOTAL
		Voltage average value rectifier			AC DC Umn	I.TAVmn TOTAL
		DC measurement			DC	I.TAVdc TOTAL
	200mA range	DC measurement		200mA	DC	I.TAVdc 200mA
	500mA range	DC measurement		500mA	DC	I.TAVdc 500mA
	1A range	DC measurement		1A	DC	I.TAVdc 1A
	2A range	DC measurement		2A	DC	I.TAVdc 2A
	5A range	DC measurement		5A	DC	I.TAVdc 5A
	10A range	DC measurement		10A	DC	I.TAVdc 10A
	20A range	DC measurement		20A	DC	I.TAVdc 20A
	B(Backup)	DC measurement		B	DC	I.TAVdc Backup
Time average active power (T.AV P)	TOTAL (All range)	RMS value	T.AV W	TOTAL	AC DC	P.TAV TOTAL
		Voltage average value rectifier			AC DC Umn	P.TAVmn TOTAL
		DC measurement			DC	P.TAVdc TOTAL
	200mA range	RMS value		200mA	AC DC	P.TAV 200mA
		Voltage average value rectifier			AC DC Umn	P.TAVmn 200mA
		DC measurement			DC	P.TAVdc 200mA
	500mA range	RMS value		500mA	AC DC	P.TAV 500mA
		Voltage average value rectifier			AC DC Umn	P.TAVmn 500mA

Measurement items		Rectifier	Notation on instrument			Notation in software
		DC measurement			**DC**	P.TAVdc 500mA
	1A range	RMS value		**1A**	**AC DC**	P.TAV 1A
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn 1A
		DC measurement			**DC**	P.TAVdc 1A
	2A range	RMS value		**2A**	**AC DC**	P.TAV 2A
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn 2A
		DC measurement			**DC**	P.TAVdc 2A
	5A range	RMS value		**5A**	**AC DC**	P.TAV 5A
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn 5A
		DC measurement			**DC**	P.TAVdc 5A
	10A range	RMS value		**10A**	**AC DC**	P.TAV 10A
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn 10A
		DC measurement			**DC**	P.TAVdc 10A
	20A range	RMS value		**20A**	**AC DC**	P.TAV 20A
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn 20A
		DC measurement			**DC**	P.TAVdc 20A
	B(Backup)	RMS value		**B**	**AC DC**	P.TAV Backup
		Voltage average value rectifier			**AC DC Umn**	P.TAVmn Backup
		DC measurement			**DC**	P.TAVdc Backup
Voltage ripple factor (Urf)			**RF V %**			Urf
Current ripple factor (Irf)			**RF A %**			Irf
Total harmonic voltage distortion rate (Uthd)			**THD V %**			Uthd
Total harmonic current distortion rate (Ithd)			**THD A %**			Ithd
Harmonic voltage RMS value (Uk)			**HRM V LEVEL**			HU
Harmonic current RMS value (Ik)			**HRM A LEVEL**			HI
Harmonic active power (Pk)			**HRM W LEVEL**			HP
Harmonic voltage content percentage (UHDk)			**HRM V % HD%**			HUcon
Harmonic current content percentage (IHDk)			**HRM A % HD%**			HIcon
Harmonic active power content percentage (PHDk)			**HRM W % HD%**			HPcon
Harmonic voltage phase angle (ΘUk)			**No display**			HUpha
Harmonic current phase angle (ΘIk)			**No display**			HIpha
Harmonic voltage/current phase difference (Θk)			**No display**			HPpha

6.1.3 List of Measurement Items (PW3390)

Measurement items		Notation on instrument	Notation in software(CSV)
Status(logical sum of each CH)			Status
Frequency		f	FREQ
Voltage	RMS value	Urms	Urms
	Mean value rectification RMS equivalent	Umn	Umn
	AC component	Uac	Uac
	Simple average	Udc	Udc
	Fundamental wave component	Ufnd	Ufnd
	Waveform peak +	Upk+	PUpk
	Waveform peak -	Upk-	MUpk
	Total harmonic distortion	Uthd	Uthd
	Ripple factor	Urf	Urf
	Unbalance rate	Uunb	Uunb
Current	RMS value	Irms	Irms
	Mean value rectification RMS equivalent	Imn	Imn
	AC component	Iac	Iac
	Simple average	Idc	Idc
	Fundamental wave component	Ifnd	Ifnd
	Waveform peak +	Ipk+	PIpk
	Waveform peak -	Ipk-	MIpk
	Total harmonic distortion	Ithd	Ithd
	Ripple factor	Irf	Irf
	Unbalance rate	Iunb	Iunb
Active power		P	P
Apparent power		S	S
Reactive power		Q	Q
Power factor		λ	PF
Phase angle	Voltage phase angle	θU	θU
	Current phase angle	θI	θI
	Power phase angle	φ	DEG
Integration	Positive-direction current magnitude	Ih+	PIh
	Negative-direction current magnitude	Ih-	MIh
	Sum of positive- and negative- direction current magnitude	Ih	Ih
	Positive-direction power magnitude	WP+	PWP
	Negative-direction power magnitude	WP-	MWP
	Sum of positive- and negative- direction power magnitude	WP	WP

Measurement items		Notation on instrument	Notation in software(CSV)
Efficiency		η	Eff
Loss		Loss	Loss
Motor	CH A	CH A	CH A
	CH B	CH B	CH B
	Motor power	Pm	Pm
	Slip	Slip	Slip
Integration time(hr:min:sec)		Elapsed Time	Etime
Integration time(msec)			
Harmonic voltage RMS value CHn (n=1～4)		Uk	HUnL000~HUnL100
Harmonic voltage phase angle CHn (n=1～4)		θUk	HUnP000~HUnP100
Harmonic current RMS value CHn (n=1～4)		Ik	HInL000~HInL100
Harmonic current phase angle CHn (n=1～4)		θIk	HInP000~HInP100
Harmonic active power CHn (n=1～4)		Pk	HPnL000~HPnL100
Harmonic voltage/current phase angle CHn(n=1～4)		θk	HPnP000~HPnP100
Harmonic voltage content percentage CHn (n=1～4)		HDUk	HUnD000~HUnD100
Harmonic current content percentage CHn (n=1～4)		HDIk	HInD000~HInD100
Harmonic power content percentage CHn (n=1～4)		HDPk	HPnD000~HPnD100

NOTE

- The order used when the software outputs parameters to files differs from the order used when the instrument saves parameters as a CSV file.

6.1.4 List of Measurement Items (PW6001)

Measurement items		Notation on instrument	Notation in software(CSV)
Status(logical sum of each CH)			Status
Voltage	RMS value	Urms	Urms
	Mean value rectification RMS equivalent	Umn	Umn
	AC component	Uac	Uac
	Simple average	Udc	Udc
	Fundamental wave component	Ufnd	Ufnd
	Waveform peak +	Upk+	PUpk
	Waveform peak -	Upk-	MUpk
	Total harmonic distortion	Uthd	Uthd
	Ripple factor	Urf	Urf
	Unbalance rate	Uunb	Uunb
Phase angle	Voltage phase angle	θU	Udeg
Current	RMS value	Irms	Irms
	Mean value rectification RMS equivalent	Imn	Imn
	AC component	Iac	Iac
	Simple average	Idc	Idc
	Fundamental wave component	Ifnd	Ifnd
	Waveform peak +	Ipk+	Pipk
	Waveform peak -	Ipk-	Mipk
	Total harmonic distortion	Ithd	Ithd
	Ripple factor	Irf	Irf
	Unbalance rate	Iunb	Iunb
Phase angle	Current phase angle	θI	Ideg
Active power		P	P
Fundamental wave active power		Pfnd	Pfnd
Apparent power		S	S
Fundamental wave apparent power		Sfnd	Sfnd
Reactive power		Q	Q
Fundamental wave reactive power		Qfnd	Qfnd
Power factor		λ	PF
Fundamental wave power factor		λfnd	PFfnd
Phase angle	Power phase angle	φ	DEG
Integration	Positive-direction current magnitude	Ih+	PIH
	Negative-direction current magnitude	Ih-	MIH
	Sum of positive- and negative- direction current magnitude	Ih	IH
	Positive-direction power magnitude	WP+	PWP

Measurement items		Notation on instrument	Notation in software(CSV)
	Negative-direction power magnitude	WP-	MWP
	Sum of positive- and negative- direction power magnitude	WP	WP
Motor	Torque	Tq	Tq
	RPM	Spd	Spd
	Motor power	Pm	Pm
	Slip	Slip	Slip
	Free input during independent input mode operation	CH	CH
Frequency		f	FREQ
Efficiency		η	Eff
Loss		Loss	Loss
Integration time(hr:min:sec)		Elapsed Time	Etime
Integration time(msec)			Etime(ms)
Harmonic voltage RMS value CH1		Uk	HU1L000~HU1L100
Harmonic voltage RMS value CHn			HUnL000~HUnL100
Harmonic voltage RMS value CH6			HU6L000~HU6L100
Harmonic voltage content percentage CH1		HDUk	HU1D000~HU1D100
Harmonic voltage content percentage CHn			HUnD000~HUnD100
Harmonic voltage content percentage CH6			HU6D000~HU6D100
Harmonic voltage phase angle CH1		θUk	HU1P000~HU1P100
Harmonic voltage phase angle CHn			HUnP000~HUnP100
Harmonic voltage phase angle CH6			HU6P000~HU6P100
Harmonic current RMS value CH1		Ik	HI1L000~HI1L100
Harmonic current RMS value CHn			HInL000~HInL100
Harmonic current RMS value CH6			HI6L000~HI6L100
Harmonic current content percentage CH1		HDIk	HI1D000~HI1D100
Harmonic current content percentage CHn			HInD000~HInD100
Harmonic current content percentage CH6			HI6D000~HI6D100
Harmonic current phase angle CH1		θIk	HI1P000~HI1P100
Harmonic current phase angle CHn			HInP000~HInP100
Harmonic current phase angle CH6			HI6P000~HI6P100
Harmonic active power CH1		Pk	HP1L000~HP1L100
Harmonic active power CHn			HPnL000~HPnL100
Harmonic active power CH6			HP456L000~HP456L100
Harmonic power content percentage CH1		HDPk	HP1D000~HP1D100
Harmonic power content percentage CHn			HPnD000~HPnD100
Harmonic power content percentage CH6			HP456D000~HP456D100
Harmonic voltage/current phase angle CH1		θk	HP1P000~HP1P100
Harmonic voltage/current phase angle CHn			HPnP000~HPnP100
Harmonic voltage/current phase angle CH6			HP456P000~HP456P100

NOTE

- The order used when the software outputs parameters to files differs from the order used when the instrument saves parameters as a CSV file.

6.2 Description of Measurement Status Data

The measurement status information output to CSV files indicates occurrence of errors during measurement, for example when the range is exceeded. The status field consists of a string of eight 32-bit values expressed in hexadecimal notation (for example, “00000007”). By checking the status of each bit, you can check the measurement status. The meaning of each bit varies with instrument model. In addition, the first 0 may be omitted for some models of instrument.

・If the status information is “00000007” for a PW3336 or PW3337, the status information contains 4 bits of information for each character.

1st character ”0”	2nd character ”0”	3rd character ”0”	4th character ”0”	5th character ”0”	6th character ”0”	7th character ”0”	7th character ”7”
Bit31-28	Bit27-24	Bit23-20	Bit19-16	Bit15-12	Bit11-8	Bit7-4	Bit3-0

In addition, bits and characters are related as follows:

	Bit31	Bit30	Bit29	Bit28
	Bit27	Bit26	Bit25	Bit24
	Bit23	Bit22	Bit21	Bit20
	Bit19	Bit18	Bit17	Bit16
	Bit15	Bit14	Bit13	Bit12
	Bit11	Bit10	Bit9	Bit8
	Bit7	Bit6	Bit5	Bit4
	Bit3	Bit2	Bit1	Bit0
“F”	1	1	1	1
“E”	1	1	1	0
“D”	1	1	0	1
“C”	1	1	0	0
“B”	1	0	1	1
“A”	1	0	1	0
“9”	1	0	0	1
“8”	1	0	0	0
“7”	0	1	1	1
“6”	0	1	1	0
“5”	0	1	0	1
“4”	0	1	0	0
“3”	0	0	1	1
“2”	0	0	1	0
“1”	0	0	0	1
“0”	0	0	0	0

In this example, characters 1 through 7 are all “0,” while the 8th character is “7.” Consequently, bits 2, 1, and 0 have the value 1, while all other bits have the value 0.

The status table for the PW3336 and PW3337 on the following page indicates the following errors:

Bit2	PU3	CH3 voltage peak exceeded
Bit1	PU2	CH2 voltage peak exceeded
Bit0	PU1	CH1 voltage peak exceeded

Based on this information, a measurement status of “0000007” for a PW3336 or PW3337 indicates that the voltage peak was exceeded by the voltage on channels 1 through 3.

6.2.1 Description of Measurement Status Data (PW3336/PW3337)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24
-	HM3	HM2	HM1	-	-	-	-
Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
-	-	-	-	-	SY3	SY2	SY1
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	-	-	-	-	-
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	PI3	PI2	PI1	-	PU3	PU2	PU1

Bit	Abbreviation	Detail
Bit30～28	HMx	Harmonic wave measurement synchronization error
Bit18～16	SYx	Respective channels synchronization error
Bit6～4	PIx	Respective channels peak exceeded
Bit2～0	PUx	Respective channels voltage peak exceeded

（x is the channel number）

6.2.2 Description of Measurement Status Data (PW3335)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24
-	-	-	HM	-	-	-	RP
Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
-	-	-	CP	-	-	-	SY
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	RI	-	-	-	RU
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	PI	-	-	-	PU

Bit	Abbreviation	Detail
Bit28	HM	Harmonic wave measurement synchronization error
Bit24	RP	Active power exceeded
Bit20	CP	Instrument protection mode activated
Bit16	SY	Synchronization error
Bit12	RI	Current range exceeded
Bit8	RU	Voltage range exceeded
Bit4	PI	Current peak exceeded
Bit0	PU	Voltage peak exceeded

6.2.3 Description of Measurement Status Data (PW3390)

Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
HM4	HM3	HM2	HM1	MRB	MRA	MPB	MPA
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
ULM	UDP	UCU	HUL	UL4	UL3	UL2	UL1
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
RI4	RI3	RI2	RI1	RU4	RU3	RU2	RU1
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PI4	PI3	PI2	PI1	PU4	PU3	PU2	PU1

Bit	Abbreviation	Detail
Bit31～28	HMx	Harmonic parameter invalid（when the Harmonic synchronization is off, etc.）
Bit27～26	MRx	Motor analysis function A, B range over
Bit25～24	MPx	Motor analysis function A, B peak over
Bit23	ULM	Motor analysis function A, B synchronization unlock
Bit22	UDP	Uncalculable（when the measuremnt data becomes significantly invalid immediately after a range change, etc.）
Bit21	UCU	Uncalculable（when the measuremnt data becomes invalid immediately after a range change, etc.）
Bit20	HUL	Harmonic synchronization unlock
Bit19～16	ULx	Respective channels synchronization unlock
Bit15～12	RIx	Respective channels current range over
Bit11～8	RUx	Respective channels voltage range over
Bit7～4	PIx	Respective channels current peak over
Bit3～0	PUx	Respective channels voltage peak over

（x is the channel number）

6.2.4 Description of Measurement Status Data (PW6001)

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24
	UCU	ZD	ZC	ZB	ZA	RB	RA
Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
					UCU	ZM	RM
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	UCU	ZP	ZI	ZU	DP	DI	DU
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
				RI	RU	PI	PU

Bit	Abbreviation	Detail
Bit30	UCU	Calculation unavailable (measured data is immediately after change resulting in invalid)
Bit29	ZD	CHD with forced zero-cross
Bit28	ZC	CHC with forced zero-cross
Bit27	ZB	CHB with forced zero-cross
Bit26	ZA	CHA with forced zero-cross
Bit25	RB	CHB range exceeded
Bit24	RA	CHA range exceeded
Bit21	UCUB	CHB calculation unavailable (measured data is immediately after change resulting in invalid)
Bit20	ZMB	CHB motor synchronization source with forced zero-cross
Bit19	RMB	CHB range exceeded when input is set to analog
Bit18	UCUA	CHA calculation unavailable (measured data is immediately after change resulting in invalid)
Bit17	ZMA	CHA motor synchronization source with forced zero-cross
Bit16	RMA	CHA range exceeded when input is set to analog
Bit14	UCU	CH1 through CH6 Calculation unavailable (measured data is immediately after change resulting in invalid) on one channel
Bit13	ZP	CH1 through CH6 forced zero-cross occurred in power calculation (synchronization source) for one channel
Bit12	ZI	CH1 through CH6 Current frequency with forced zero-cross on one channel
Bit11	ZU	CH1 through CH6 Voltage frequency with forced zero-cross on one channel
Bit10	DP	CH1 through CH6 data not updated for power calculation (synchronization source) for one channel
Bit9	DI	CH1 through CH6 current frequency data not updated for one channel
Bit8	DU	CH1 through CH6 Voltage frequency data not updated for one channel
Bit3	RI	CH1 through CH6 Current range exceeded on one channel
Bit2	RU	CH1 through CH6 Voltage range exceeded on one channel
Bit1	PI	CH1 through CH6 Current peak exceeded on one channel
Bit0	PU	CH1 through CH6 Voltage peak exceeded on one channel

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