
**User's
Manual**

**Model 761922
Harmonic Analysis Software
for the WT1600/WT2000**

Foreword

Thank you for purchasing the Harmonic Analysis Software (Model 761922). This user's manual lists precautions that must be taken during use, and contains useful information about the functions, and operating procedures of the software. To ensure correct use, please read this manual thoroughly before beginning operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation. For information about the handling precautions, functions, and operating procedures of the WT1600 Digital Power Meter (model 760101), WT2000 series digital power meters (the WT2010 model 253101, and the WT2030 models 253102 and 253103) and the handling and operating procedures for Windows, see the manuals for those products.

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1.1 Explanation of Functions

This software application (761922) measures harmonic currents of electrical equipment according to an applicable IEC standard, (see section 1.3 for an overview) and displays/saves the results of evaluations made according to the standard.

Applicable Measurement Instruments

This software can be used with Yokogawa's WT1600 Digital Power Meter (model 760101) and three of the WT2000 series of digital power meters (the WT2010 model 25301, or the WT2030 models 253102 and 253103). For information about the handling precautions, functions, and operating procedures of the WT1600 or WT2000 series digital power meters, see the manuals that came with those instruments.

Product	User's Manual Name	User's Manual No.
WT1600 (760101)	WT600 Digital Power Meter	IM760101-01E
WT2010 (253101)	WT2010 Digital Power Meter	IM253101-01E
WT2030 (253102) (253103)	WT2030 Digital Power Meter	IM253102-01E

Applicable Standard

The applicable standard of this software application is IEC 61000-3-2 (Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)) Edition 2:2000 consolidated with amendment 1:2001, abbreviated as IEC 61000-3-2 Edition 2.1, and EN61000-3-2 Amendment 14. For an overview of the standard, see section 1.3.

Retrieving and Loading of Measured Data/Waveform Data to Be Evaluated

Setting WT Measurement Conditions

This software application can be used to enter the same harmonic measurement conditions that you can enter using the front panel keys of the WT.

Retrieving Measured Data from the WT Connected On-Line (On-Line Mode)

The measured data to be evaluated against the standard can be retrieved into your PC via the GP-IB or Ethernet (WT1600 only) interface while making harmonic measurements on the WT.

Loading Measured Data Already Saved (Off-Line Mode)

The measured data retrieved by the software can be saved. The saved measured data/waveform data can be loaded to be evaluated against the standard.

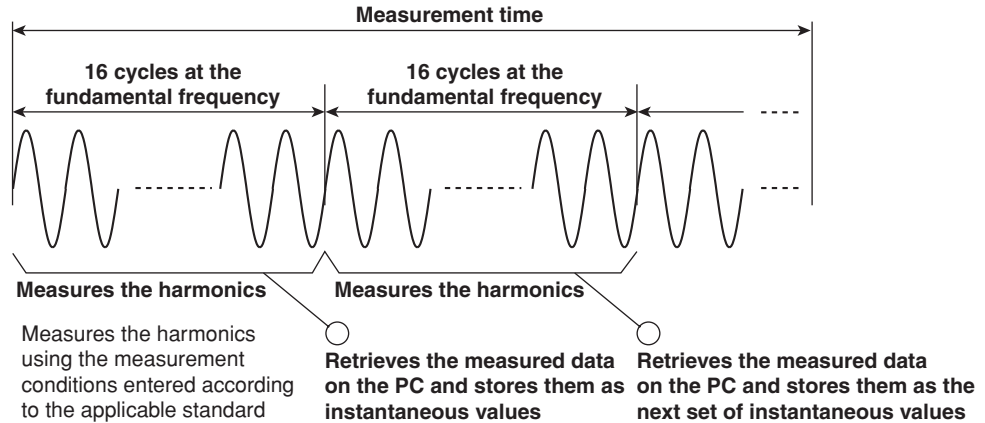
Measurement Modes

Three measurement modes are available. The type of data retrieved and the operation vary depending on the measurement mode.

Harmonic Measurement Mode

- **When in On-Line Mode**

Measurement and evaluation of harmonics conforming to IEC 61000-3-2 Edition 2.1 can be made while making harmonic measurements on the WT.



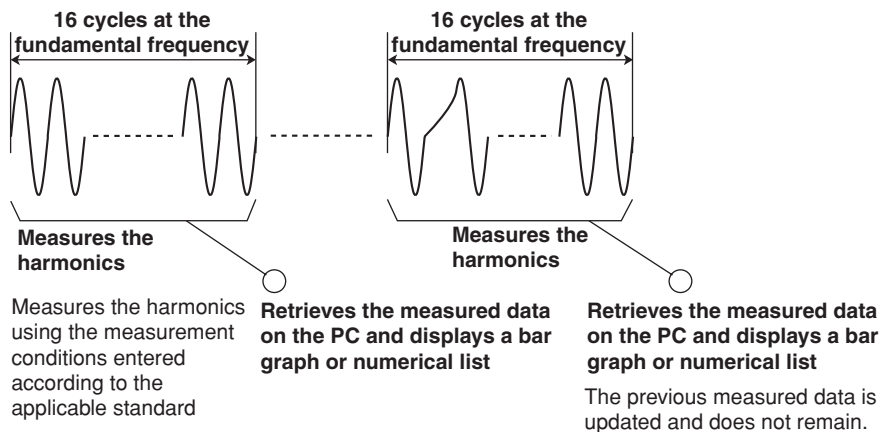
One set of harmonic measurement data (handled as instantaneous values by the software) consists of 16 cycles of measured data of the harmonic signal. The instantaneous values, the mean value, and the maximum value of the measured data retrieved within the measurement time (see next page) can be evaluated to determine whether they are within the limits of the standard.

- **When in Off-Line Mode**

Evaluation can be made on the loaded measurement data according to the method complying with IEC 61000-3-2 Edition 2.1.

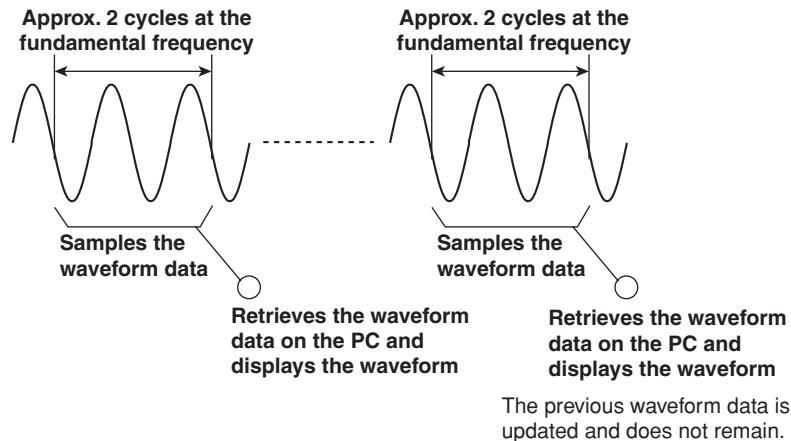
Harmonic Monitor Mode

This mode can be selected only when in On-Line mode. Harmonic fluctuation can be monitored on bar graphs and a numerical list while making harmonic measurements on the WT. This mode is used to monitor the conditions of the harmonics and does not evaluate against the standard as in Harmonic Measurement Mode. When the next measured data is retrieved, the previous measured data is updated and does not remain.



Waveform Monitor Mode

This mode can be selected only when in On-Line mode. The measured waveform can be monitored while making harmonic measurements on the WT. This mode is used to monitor the conditions of the waveform and does not evaluate against the standard as in Harmonic Measurement Mode. When the next waveform data is retrieved, the previous waveform data is updated and does not remain.

**Setting the Standard and Measurement Environment**

Sets the classification of the equipment under test (EUT) as defined in IEC 61000-3-2 Edition 2.1 and evaluation conditions within each class.

Setting the Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics is set in units of 1 s in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Setting the Title/Comment of Reports

A title or a comment of a report can be entered and saved or printed along with the harmonic measurement data. When printing, you can select whether to use color or black and white.

Starting/Stopping Measurements

Harmonic measurement on the WT can be started from your PC when in On-Line mode. The measurement cannot be started when in Off-Line mode.

When in Harmonic Measurement Mode

When harmonic measurement on the WT is started from the PC, the harmonics data measured on the WT is retrieved and stored on the PC. The next data is retrieved and stored as next data. All the data retrieved within the measurement time are stored. When the specified measurement time elapses, the measurement automatically stops as well as the data retrieval. You can also abort the measurement and data retrieval from the PC before the specified measurement time elapses.

When in Harmonic Monitor or Waveform Monitor Mode

When harmonic measurement on the WT is started from the PC, the harmonics data or waveform data measured on the WT is retrieved and stored on the PC. When the next data is retrieved, the previous data is updated and does not remain. These modes are used to monitor the conditions of the harmonics and waveforms and do not evaluate against the standard as in Harmonic Measurement Mode. To stop the measurement and data retrieval in these modes, press the Stop button.

Displaying the Evaluation Results and Measured Data/Waveform Data

The result of the evaluation as to whether the harmonic current data up to order 40 is within the limits of IEC 61000-3-2 Edition 2.1 and the corresponding measured data can be displayed. Various displays below are possible only when in Harmonic Measurement mode.

Display of the Evaluation Result within the Entire Measurement Time

Evaluation can be made as to whether all of the harmonic measurement data in the measurement time are within the limits according to the settings specified in "Setting the Standard and Measurement Environment" (as described earlier), and the results can be displayed collectively.

Bar Graph Display of Harmonic Current/Voltage

Bar graphs of the harmonic measurement data and the standard limits can be displayed for each order. Moreover, the evaluation as to whether harmonic current data is within the limits can be displayed using different colors. The harmonic current data to be evaluated is the mean value, the maximum value, and instantaneous values (one set of harmonic measurement data) of the measured data within the measured time. Both harmonic current and voltage can be displayed for each input element of the WT.

List Display of Harmonic Current/Voltage

A list of the harmonic measurement data and the standard limits can be displayed for each order. Moreover, the evaluation as to whether harmonic current data is within the limits can be displayed using different colors. The harmonic current data to be evaluated is the mean value, the maximum value, and instantaneous values (individual measurement data) of the measured data within the measured time. Both harmonic current and voltage can be displayed for each input element of the WT.

Fluctuation Graph Display of Harmonic Current

Graphs of the harmonic current fluctuation over time can be displayed for each order. The lists can be displayed for each input element of the WT.

Waveform Display of Voltage/Current

The waveform immediately after the end of the measurement can be displayed. Approximately 2 cycles of waveform is displayed using the WT2000, or approximately 4 cycles on the WT1600. You can place the cursor on the current waveform and read the phase difference (phase angle) from the first zero-crossing point of the voltage waveform and the current value of the phase. The list can be displayed for each input element of the WT.

Fluctuation Graph Display of Voltage/Current/Active Power

Graphs of the fluctuation of the rms value of the voltage and current as well as the active power that is determined from the measured fundamental frequency and all harmonics can be displayed. The list can be displayed for each input element of the WT.

Bar Graph Display of the Phase Angle of the Harmonic Current

Bar graphs of the phase angle of the harmonic current with respect to the fundamental signal for each order can be displayed. The list can be displayed for each input element of the WT.

List Display of the Phase Angle of the Harmonic Current

A list of the phase angle of the harmonic current with respect to the fundamental signal for each order can be displayed. The list can be displayed for each input element of the WT.

Saving and Loading Setup Information, Measured Data, and Waveform Data

Saving and Loading Setup Information

Setup information such as the measurement mode, standard and measurement environment settings, measurement time, display format of bar graph and numerical list, title/comment of reports (one-page reports containing the bar graph/numerical list of the measured data and evaluation results) specified by the software can be saved. The setup information saved to a file can also be loaded.

Saving and Loading Measured Data/Waveform Data

The harmonic measurement data or waveform data retrieved from the WT in Harmonic Measurement mode into the PC using the software can be saved to a file. In this case, the harmonic measurement conditions of the WT specified using the software and the same data as the setup information described above are also saved. The harmonic measurement data, waveform data, harmonic measurement conditions, and setup information saved to a file can also be loaded.

Saving the Measured Data or Waveform Data in CSV Format

The harmonic measurement data or waveform data retrieved from the WT into the PC using the software can be saved to a file in CSV format. The software cannot load the data saved to a CSV file. Software applications installed on the PC that support files in CSV format can open the data.

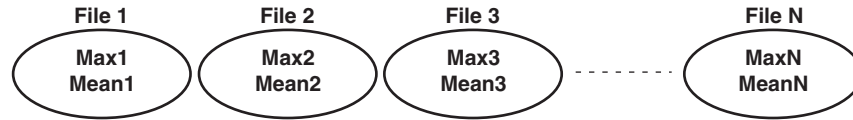
Saving and Printing Screen Images and Reports

Screen images and reports can be saved to files in BMP format or printed.

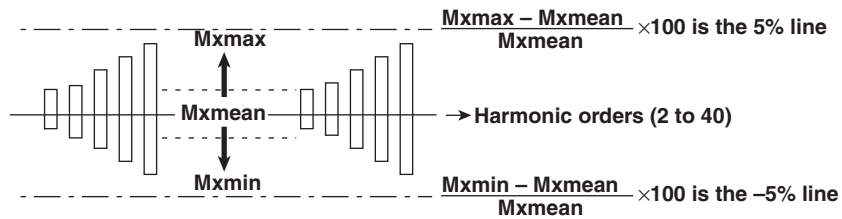
- The active window among the displayed graph and list windows can be saved in BMP format or printed.
- A list or bar graph of the harmonic measurement data can be saved in BMP format or printed as a report. A title or comment can be attached to a report (see "Setting the Title/Comment of Reports" on page 1-3).

Repeatability of Measured Data

The maximum value and mean value in the harmonics measurement data saved to files can be compared, and the difference in the measured data can be displayed on a bar graph or numerical list for each order. This function can be used to evaluate whether the difference between data measured under the same measurement conditions when harmonics are measured using the same product or same product model is within 5% as defined in the standard (confirmation of repeatability).



Comparison Using Maximum Values



$Mxmean = (Max1 + Max2 + Max3 + \dots + MaxN)/N$

(Mxmean: The value derived by summing the maximum values of each file (Max1, Max2, Max3, ... MaxN) and dividing by the number of summed values (N). The value can be determined for each order.)

$Mxmax = [Max1, Max2, Max3, \dots, MaxN]_{max}$

(Mxmax: The maximum value among the maximum values of each file. The value can be determined for each order.)

$Mxmin = [Max1, Max2, Max3, \dots, MaxN]_{min}$

(Mxmin: The minimum value among the maximum values of each file. The value can be determined for each order.)

Comparison Using Mean Values

Comparison using mean values is obtained by replacing Mxmean, Mxmax, and Mxmin with Mnmean, Mnmax, and Mnmin, respectively in the figure of the comparison using maximum values.

$Mnmean = (Mean1 + Mean2 + Mean3 + \dots + MeanN)/N$

(Mnmean: The value derived by summing the mean values of each file (Mean1, Mean2, Mean3, ... MeanN) and dividing by the number of summed values (N). The value can be determined for each order.)

$Mnmax = [Mean1, Mean2, Mean3, \dots, MeanN]_{max}$

(Mnmax: The maximum value among the mean values of each file. The value can be determined for each order.)

$Mnmin = [Mean1, Mean2, Mean3, \dots, MeanN]_{min}$

(Mnmin: The minimum value among the mean values of each file. The value can be determined for each order.)

1.2 System Requirements

Hardware

PC

A PC with a Celeron 500 MHz CPU or higher.

Internal Memory

128 MB or more.

Hard Disk

Free space of 10 MB or more.

GP-IB Interface Card or Board

(Not Required When Connecting to the WT1600 via Ethernet)

A GP-IB card or board made by National Instruments (version 1.60 or later) must be installed in the PC.

Ethernet Communication Port (WT1600 Only)

A 10BASE-T/100BASE-TX compatible Ethernet communications port is required for connecting to the WT1600 via Ethernet.

Disk Drive

One CD-ROM drive. The drive is used to install the software.

Display

A display compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional. A resolution of 1024×768 dots or higher analog RGB with 65,536 colors or more recommended.

Mouse or Pointing Device

A mouse or pointing device compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional.

Printer

A printer compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional. A printer driver compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional is required. A color printer is recommended.

OS

Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional is required.

WT Digital Power Meter

WT2000 Series

The WT2010 or WT2030 Digital Power Meter with firmware (ROM) version 1.41 or later, a GP-IB interface, and the harmonic analysis function.

WT1600

The WT1600 Digital Power Meter with firmware (ROM) version 2.07 or later, and a GP-IB or Ethernet interface.

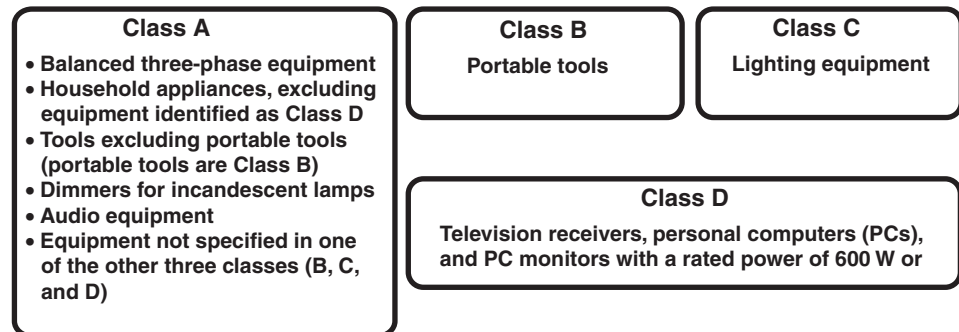
1.3 Applicable Standard (IEC 61000-3-2 Edition 2.1)

The applicable standard of this software application is IEC 61000-3-2 (Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)) Edition 2:2000 consolidated with amendment 1:2001, abbreviated as IEC 61000-3-2 Edition 2.1, and EN61000-3-2 Amendment 14. This section gives an overview of the standard. For further details, see the actual text of the applicable standard.

Scope and Classification

The limits for harmonic current emissions (IEC61000-3-2) are applicable to electrical and electronic equipment having an input current of up to 16 A per phase and connected to public low-voltage distribution systems. Classification is made depending on the type of equipment. IEC 61000-3-2 Edition 2.1 does not define the limits for some types of equipment. For details, see the applicable standard.

-Electrical and electronic equipment having an input current up to 16 A per phase-



Limits

The limits are specified for each class. IEC 61000-3-2 assumes a phase voltage of 220 V, 230 V, and 240 V for specifying the limits. For equipment of differing rated voltage, conversion may be necessary. For the conversion equation, see "Conversion of Limits" (page 1-10).

Limits for Class A Equipment

Harmonic order n	Maximum permissible harmonic current [A]
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \times (15/n)$
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \times (8/n)$

Limits for Class B Equipment

Limits for Class A equipment $\times 1.5$

Limits for Class C Equipment

Classification is made according to the active power of the equipment shown below. For single-phase equipment, the classification is made using the active power of the single-phase power. For multi-phase equipment, the classification is made using the sum of the active powers all phases (three phases if three-phase).

• Equipment with active input power exceeding 25 W

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency [%]
2	2
3	$30 \times \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$ (Odd harmonics only)	3

* λ is the power factor (circuit power factor).

For the fundamental current and power factor, use the measured values under maximum load conditions of the equipment.

• Equipment with active input power less than or equal to 25 W

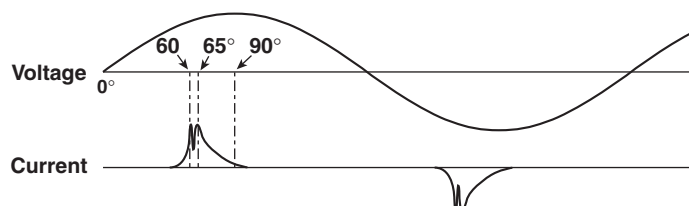
Shall meet one of the two conditions below.

- Does not exceed the power ratio limits of Class D.
- The third and fifth harmonics shall not exceed the limits given in the table below. Moreover, the relationship of the fundamental voltage waveform and the input current waveform shall be as shown in the figure below.

Harmonic order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency [%]
3	86
5	61

The relationship of the fundamental supply voltage waveform and the input current waveform is as follows, where the zero crossing of the fundamental supply voltage is assumed to be at 0° (degrees).

- Beginning of the current flow: Before or at 60°
- Last current peak: Before or at 65°
- End of the current flow: 90° or after



Limits for Class D Equipment

Shall meet the maximum permissible harmonic current (power ratio limit) per watt and the maximum permissible current given in the next table. The concept of power (active power) of single- or multi-phase equipment is the same as Class C.

Harmonic order n	Maximum permissible harmonic current per watt [mA/W] (Power ratio limit)	Maximum permissible harmonic current (Odd harmonics only) [A]
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.43
11	0.35	0.33
$13 \leq n \leq 39$ (Odd harmonics only)	$3.85/n$	Same as class A.

Conversion of Limits

IEC 61000-3-2 assumes a phase voltage of 220 V, 230 V, and 240 V for specifying the limits. For equipment of differing rated voltage, conversion may be necessary. Convert the limits of all the classes using the following equations and apply them. However, conversion to a phase voltage of 220 V or 240 V is not necessary.

Phase voltage

$$\text{Converted limit} = \text{Limit of each class} \times \frac{230}{\text{Rated voltage of the equipment}}$$

Line voltage of three-phase

$$\text{Converted limit} = \text{Limit of each class} \times \frac{400}{\text{Rated voltage of the equipment}}$$

Specifications of Supply Source, Measurement Equipment, Test Conditions, and Application Method of Limits.

This section lists only the items. For detailed specifications, see the applicable standard.

Power Supply

- Supply voltage and frequency range.
- Permissible range of harmonics contained in the supply voltage.
- Voltage peak value and phase offset between the waveform zero crossing and the peak value.
- Internal impedance of the supply source.
- Angle between the fundamental voltage on each pair of phases in the case of a three-phase source.

Measurement Equipment

- Error of the measurement equipment.
- Input impedance of the measurement equipment.
- Time constant of the internal processing when measuring harmonics.

Test Conditions

- Test conditions for television/audio equipment and lighting equipment.
- Test conditions for general equipment not specified in the applicable standard. For example, performing tests by setting the equipment to a condition that produces the maximum total harmonic current (THC).
- Specification of the repeatability of the measurement results.
- Specification of the observation time (measurement time) to achieve the repeatability of the measurement results.

Application Method of Limits

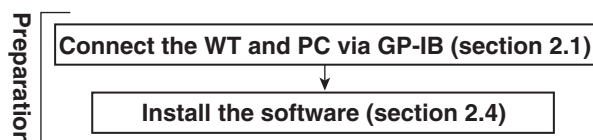
- Derivation of the fundamental current and power factor (circuit power factor) of class C equipment.
- Derivation of the power (active power) used by class D equipment
- Specifications when comparing the harmonic current limits and measured values for each order.
 - Compare the specified limit and the mean value of the harmonic current within the measurement time and evaluate.
 - Compare the value that is 1.5 times the specified limit and the maximum value of the harmonic current within the measurement time and evaluate.
- Relaxation of the specification

If the total partial odd harmonic currents (POHC) of order above and including 21 is less than the specified POHC limit, the average of the odd harmonic currents of order above and including 21 is permitted to be 1.5 times the specified limits.

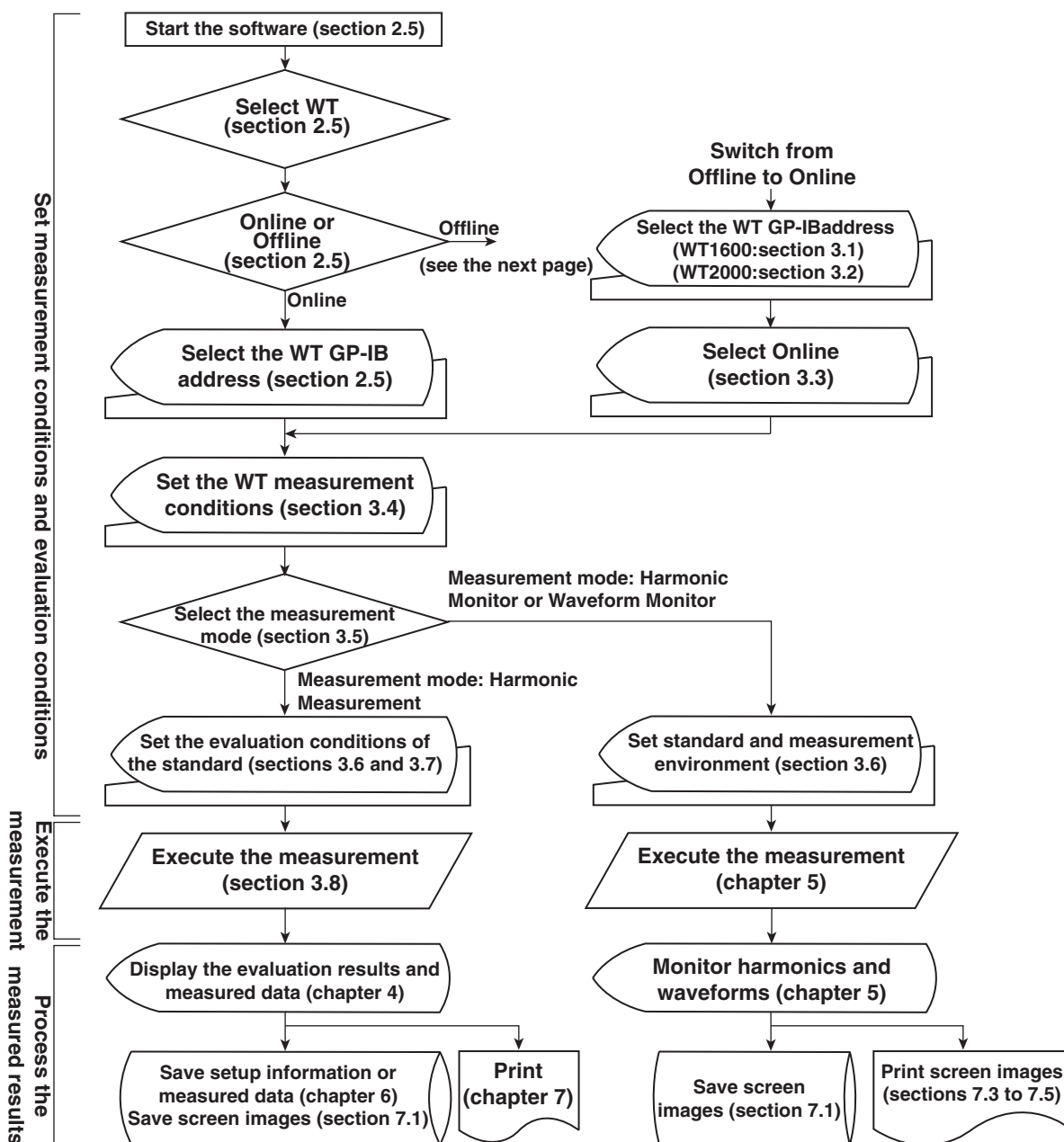
1.4 Flow of Operation (GP-IB)

To display and evaluate harmonic measurement data using this software, the WT Digital Power Meter and PC must be connected via the GP-IB interface, the software must be installed, WT measurement conditions must be set, and evaluation conditions of the applicable standard must be set. Follow the steps below.

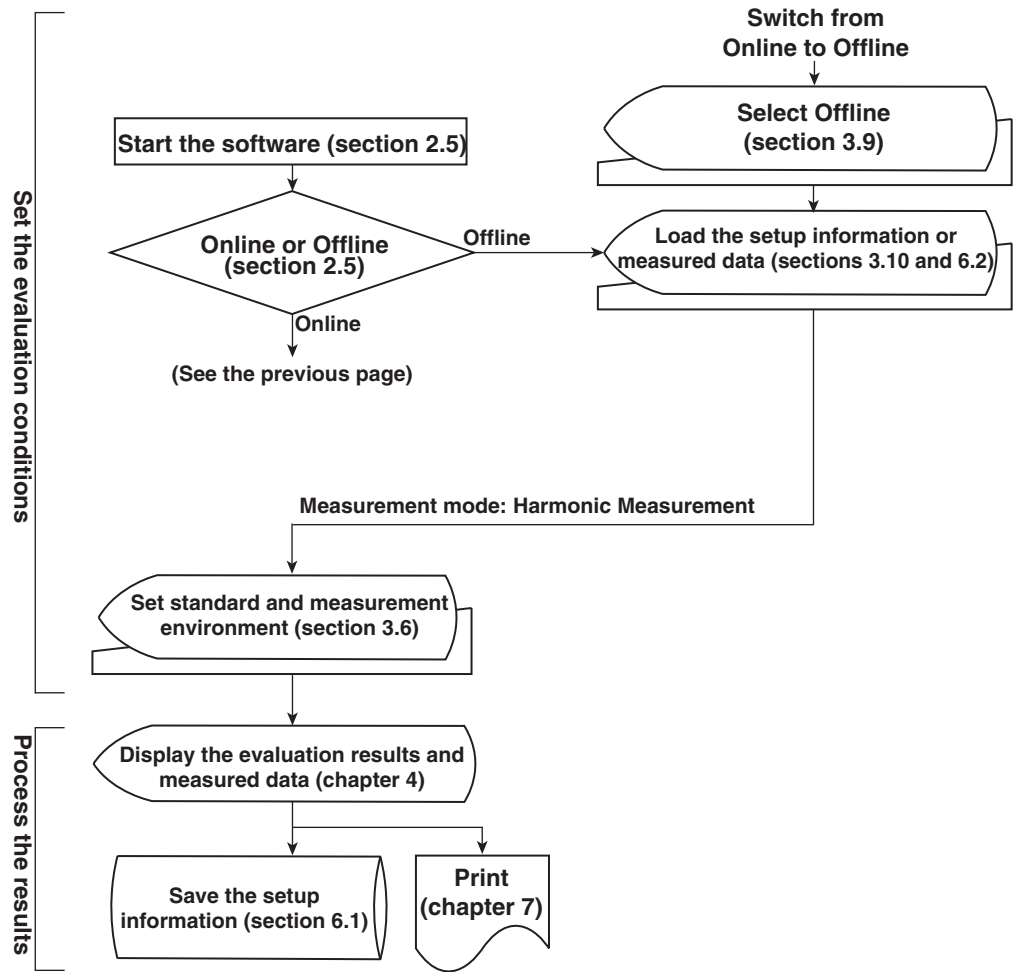
Preparation Flow Chart



On-Line Mode Flow Chart



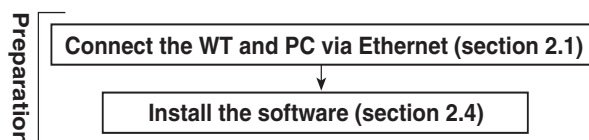
Off-Line Mode Flow Chart



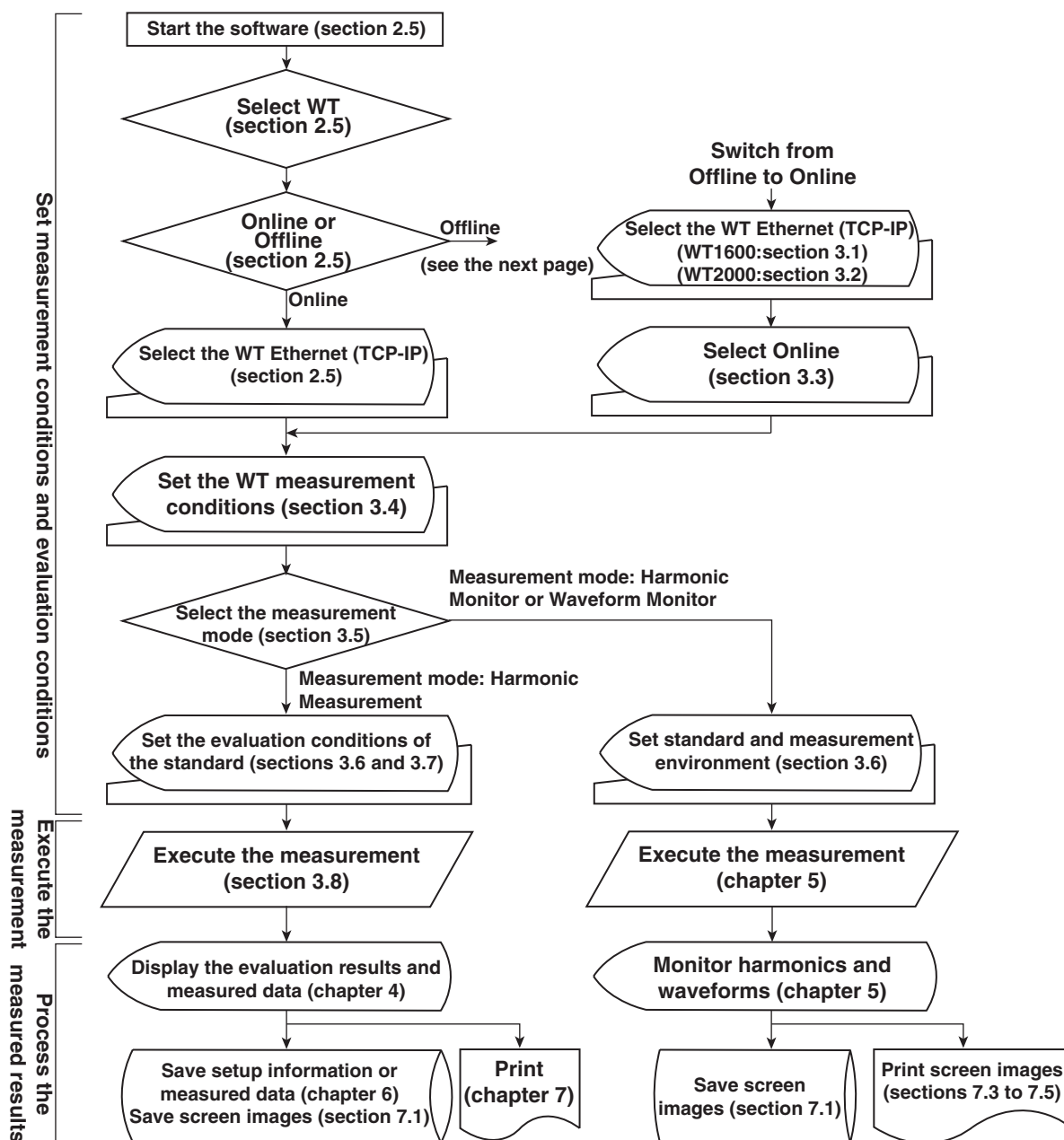
1.5 Flow of Operation (Ethernet : WT1600 Option)

To display and evaluate harmonic measurement data using this software, the WT Digital Power Meter and PC must be connected via the GP-IB interface, the software must be installed, WT measurement conditions must be set, and evaluation conditions of the applicable standard must be set. Follow the steps below.

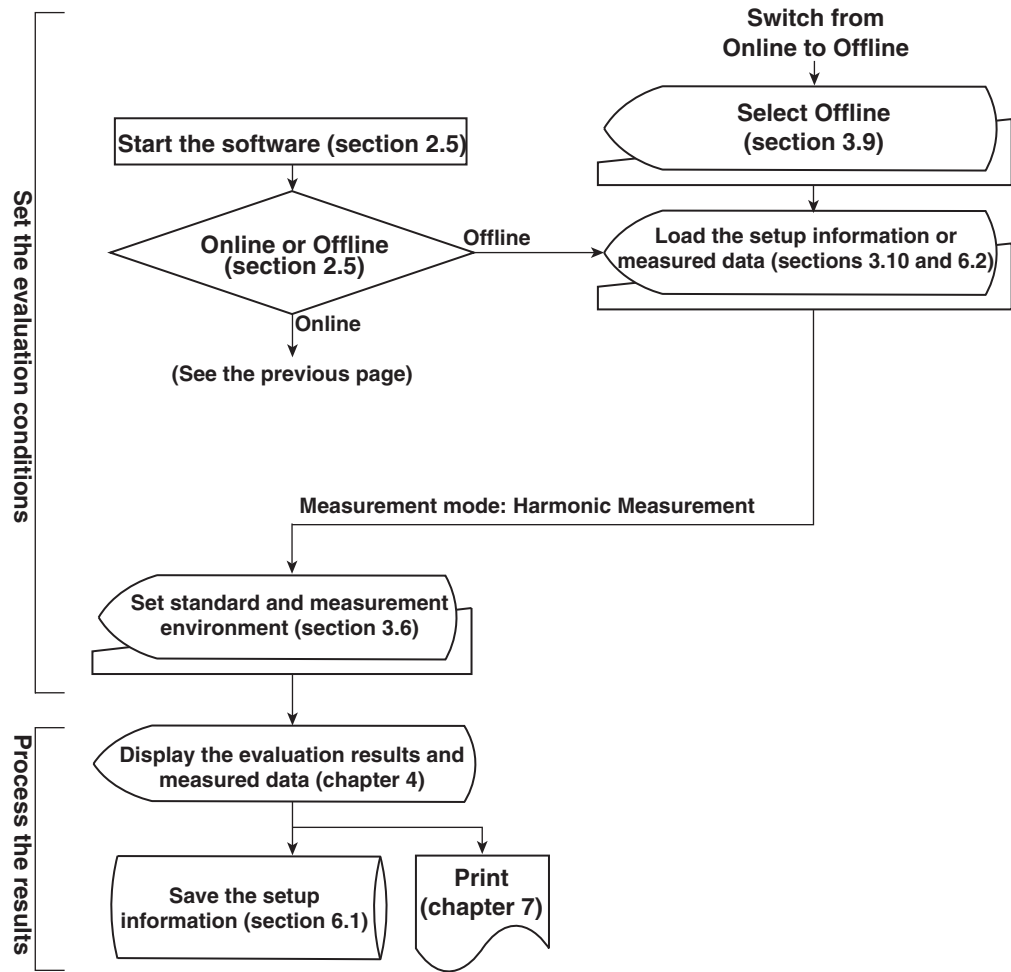
Preparation Flow Chart



On-Line Mode Flow Chart



Off-Line Mode Flow Chart



2.1 Connecting the WT Digital Power Meter and the PC

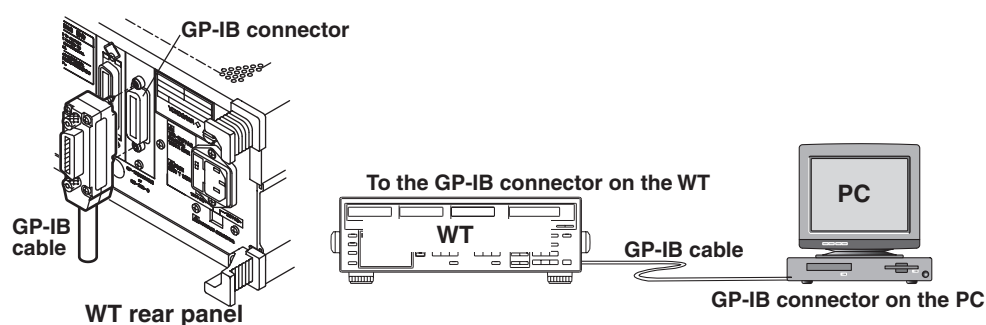
The WT digital power meter and PC are connected using the GP-IB or Ethernet (WT1600 option) interface. Connect the GP-IB or Ethernet cable with the power to both the WT digital power meter and the PC turned OFF.

Connecting the GP-IB Cable to the WT

Check that the power to the WT is turned OFF and connect the GP-IB cable to the GP-IB connector on the WT rear panel.

Connecting the GP-IB Cable to the PC

Check that the power to the PC is turned OFF and connect the other end of the GP-IB cable to the GP-IB connector on the PC.



Setting the GP-IB Address of the WT2000

Turn ON the power to the WT. After an opening message appears, the WT is ready to make measurements. Press the LOCAL key on the WT front panel. GP-IB communication settings can now be entered. Set the items as follows.

Mode

Addr A (Addressable mode A)

Address

Addr __

Select the GP-IB address in the range of 1 to 30. Do not select 0, because address 0 is reserved for use on the PC.

Terminator

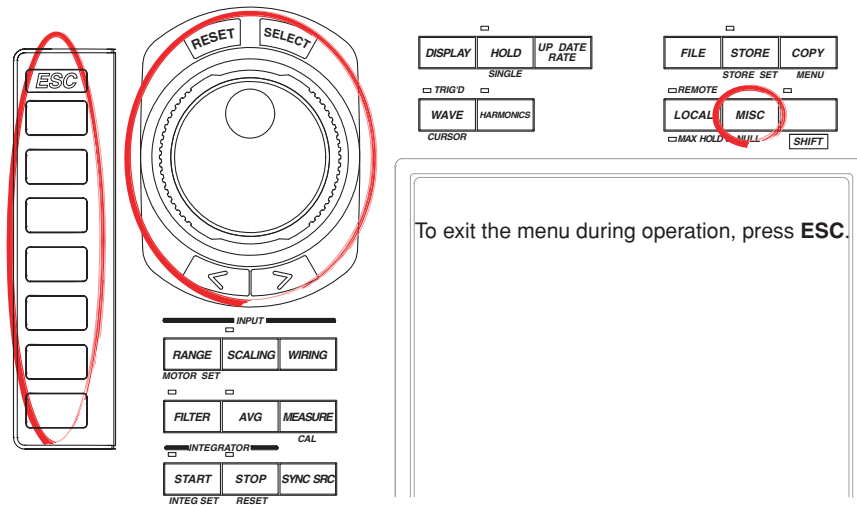
tErM Cr+LF

For the setup procedure, see the WT User's Manual.

2.1 Connecting the WT Digital Power Meter and the PC

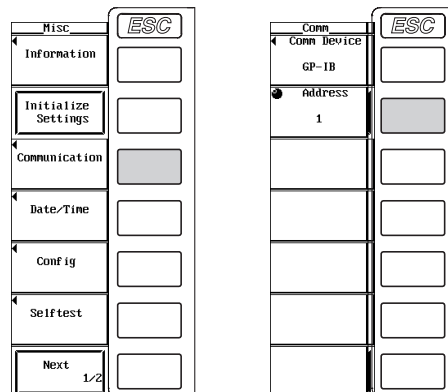
Setting GP-IB the Address of the WT1600

Keys



Procedure

1. Press **MISC** to display the Misc menu.
2. Press the **Communication** soft key.
3. Press the **Comm Device** soft key to display the GP-IB menu.
4. Turn the **jog shuttle** to set the address.



Explanation

Carry out the following settings when using a controller to set information that can be specified through key operation on the WT1600 or when outputting setting parameters or output waveform display data to the controller.

Setting the Address

Set the address of the WT1600 within the following range for the addressable mode.
0 to 30

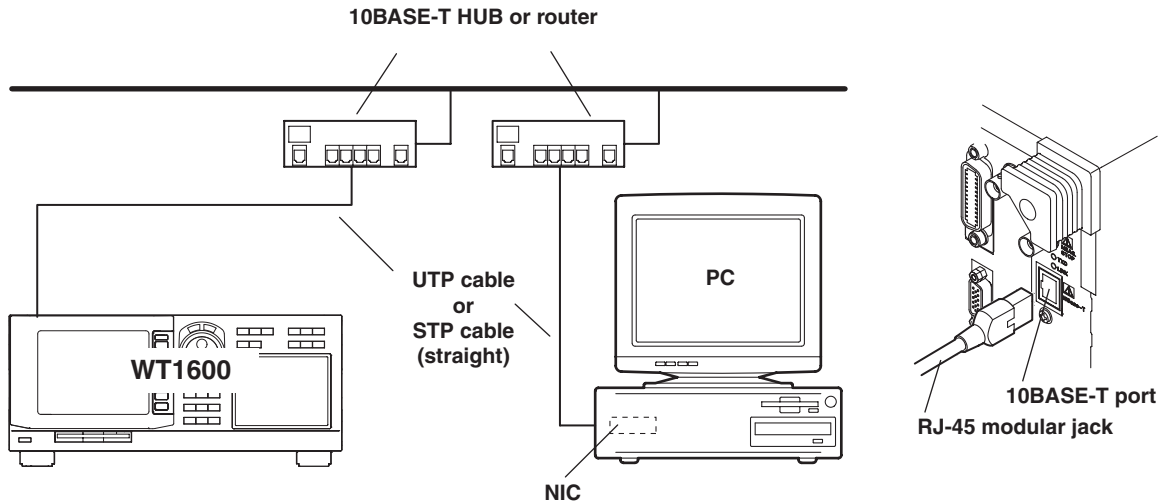
Each device that can be connected via GP-IB has a unique address within the GP-IB system. This address is used to distinguish the device from others. Therefore, when you connect the WT1600 to a PC, for example, make sure to assign a unique address to the WT1600.

Note

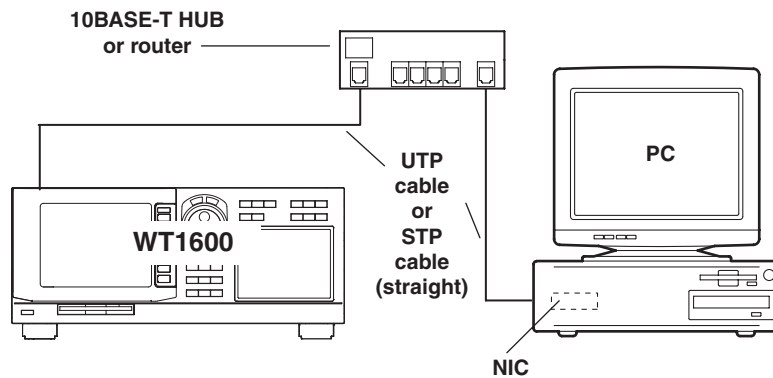
Do not change the address while the controller or other devices are using the GP-IB system.

Network Connection (WT1600 Option)

To connect to a network, connect a UTP (Unshielded Twisted-Pair) cable or an STP (Shielded Twisted-Pair) cable that is connected to a hub, for example, to the 10BASE-T port on the rear panel of the WT1600.

**One-to-One Connection (WT1600 Option)**

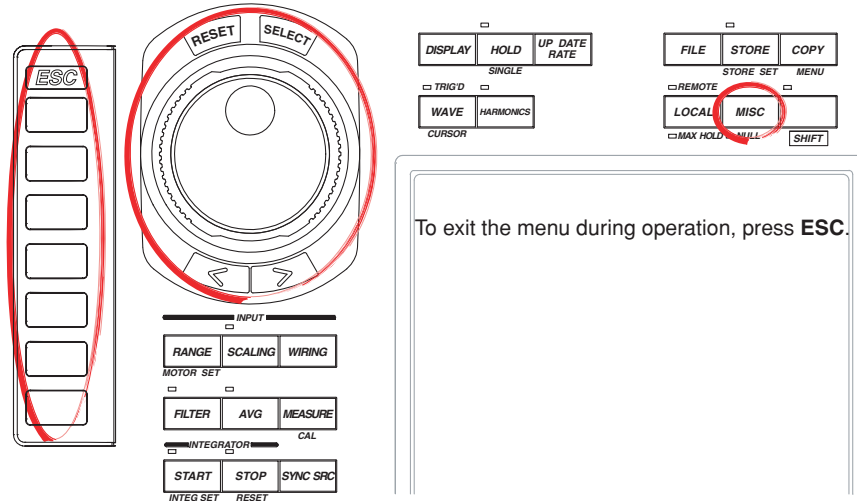
Even when connecting the WT1600 and a PC in a one-to-one configuration, connect them via a hub as shown below.

**Note**

- When connecting the WT1600 and a PC in a one-to-one configuration, use a 10BASE-T/100BASE-TX auto switching NIC or a 10BASE-T NIC on the PC side.
- Avoid connecting the WT1600 and a PC directly without going through a hub. Operations are not guaranteed for communications using direct connection.

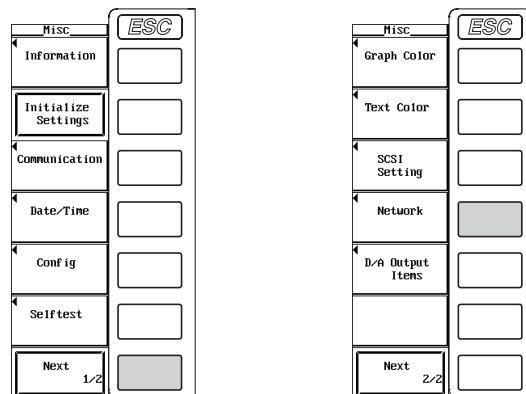
2.2 Setting the Ethernet Interface (TCP/IP)

Keys

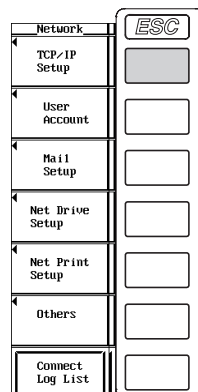


Procedure

1. Press **MISC** to display the Misc menu.
2. Press the **Next 1/2** soft key to display the Next 2/2 menu.
3. Press the **Network** soft key to display the Network menu.



4. Press the **TCP/IP Setup** soft key to display the TCP/IP Setup dialog box.



When Using Only DHCP

5. Turn the **jog shuttle** to select DHCP.
6. Press **SELECT** to select ON.
7. Turn the **jog shuttle** to select DNS.
8. Press **SELECT** to display the DNS selection box.
9. Turn the **jog shuttle** to select OFF.

The screenshot shows a window titled "TCP/IP Setup". At the top, "DHCP" is set to "ON" and "DNS" is set to "OFF". Below these are four input fields for IP Address, Net Mask, and Gate Way, each with four digit boxes. The IP Address field has a cursor in the first box. The Net Mask field is pre-filled with "255.255.255.". The Gate Way field is empty.

When Using Only DNS

5. Turn the **jog shuttle** to select DHCP.
6. Press **SELECT** to select OFF.

Entering the IP Address

7. Turn the **jog shuttle** to select IP Address.
8. Press **SELECT** to display the IP address entry box.
9. Turn the **jog shuttle** to enter the IP address of the WT1600.
10. Press **SELECT** or **ESC** to close the box.
11. Enter all four octets of the IP address.

Entering the Subnet Mask

Enter the subnet mask according to the system or network to which the WT1600 belongs. If the subnet mask is not required, proceed to "Entering the Default Gateway."

12. Turn the **jog shuttle** to select Net Mask.
13. Enter all four octets of the subnet mask of the network to which the WT1600 belongs in the same fashion as the IP address.

Entering the Default Gateway

Enter the default gateway according to the system or network to which the WT1600 belongs. If the default gateway is not required, proceed to "Turning ON the DNS."

14. Turn the **jog shuttle** to select Gate Way.
15. Enter all four octets of the default gateway of the network to which the WT1600 belongs in the same fashion as the IP address.

The screenshot shows the same "TCP/IP Setup" window. The "DHCP" option is now set to "ON" and "DNS" remains "OFF". A cursor is now positioned over the first digit box of the IP Address field.

2.2 Setting the Ethernet Interface (TCP/IP)

Turning ON the DNS

16. Turn the **jog shuttle** to select DNS.
17. Press **SELECT** to display the DNS selection box.
18. Turn the **jog shuttle** to select ON.
19. Press **SELECT** to confirm the DNS ON setting.

Entering the Domain Name

Enter the domain name of the system or network to which the WT1600 belongs.

20. Turn the **jog shuttle** to select Domain Name.
21. Press **SELECT** to display the keyboard.
22. Use the **keyboard** to enter the domain name of the network to which the WT1600 belongs.

Entering the Address of the Primary DNS Server

23. Turn the **jog shuttle** to select DNS Server1.
24. Enter all four octets of the primary DNS server address in the same fashion as the IP address.

Entering the Address of the Secondary DNS Server

Enter the information if the system or network to which the WT1600 belongs uses a secondary DNS server. If a secondary server is not used, proceed to "Entering the Primary Domain Suffix."

25. Turn the **jog shuttle** to select DNS Server2.
26. Enter all four octets of the secondary DNS server address in the same fashion as the IP address.

Entering the Primary Domain Suffix

Enter the information if a domain suffix is required.

27. Turn the **jog shuttle** to select Domain Suffix1.
28. Enter the primary domain suffix in the same fashion as the IP address.

Entering the Secondary Domain Suffix

Enter the information if a secondary domain suffix is present.

29. Turn the **jog shuttle** to select Domain Suffix2.
30. Enter the secondary domain suffix in the same fashion as the IP address.

TCP/IP Setup

DHCP OFF ON

IP Address 192.168.111.24

Net Mask 255.255.255.0

Gate Way 0.0.0.0

DNS ON

Domain Name

DNS Server1 0.0.0.0

DNS Server2 0.0.0.0

Domain Suffix1

Domain Suffix2

When Using Both DHCP and DNS

5. Turn the **jog shuttle** to select DHCP.
6. Press **SELECT** to select ON.
7. Turn the **jog shuttle** to select DNS.
8. Press **SELECT** to display the DNS selection box.
9. Turn the **jog shuttle** to select ON or Auto.
 If you selected ON, you must enter information according to “Entering the Domain Name” through “Entering the Secondary Domain Suffix” on the previous page.
 If you selected Auto, the entry information from “Entering the Domain Name” to “Entering the Secondary Domain Suffix” is automatically set by the DHCP server. Therefore, you do not have to enter the information.

The screenshot shows the 'TCP/IP Setup' menu. At the top, 'DHCP' is set to 'ON'. Below it, 'IP Address' is '0.0.0.0', 'Net Mask' is '255.255.255.0', and 'Gate Way' is '0.0.0.0'. The 'DNS' menu is open, showing 'OFF', 'ON', and 'Auto' options. The 'ON' and 'Auto' options are selected, and their corresponding IP address fields are visible.

Explanation

To use the Ethernet communication functions of the WT1600, DHCP, IP address, IP address, subnet mask, default gateway, and DNS must be specified. Consult your system or network administrator in setting these parameters.

DHCP (Dynamic Host Configuration Protocol)

- The IP address, subnet mask, default gateway, and DNS can be automatically specified by using DHCP.
- To use DHCP, the network must have a DHCP server.
- Consult your network administrator to see if DHCP can be used.
- If you use DHCP, a different IP address may be assigned every time the WT1600 is powered up. You must be careful when using the FTP server function of the WT1600.

IP Address (Internet Protocol Address)

- Enter the IP address assigned to the WT1600. The default setting is “0.0.0.0.”
- The IP address is used to uniquely identify a device on the Internet when using TCP/IP. The address is a 32-bit value expressed using four octets (each 0 to 255), each separated by a period as in [192.168.111.24].
- A unique IP address must be obtained from the network administrator.
- If DHCP can be used, the address is automatically assigned.

2.2 Setting the Ethernet Interface (TCP/IP)

Subnet Mask

- Enter the mask value used when determining the subnet network address from the IP address. The default setting is “255.255.255.0.”
- Consult your network administrator for the appropriate value. You may not need to set the value.
- If DHCP can be used, the subnet mask is automatically assigned.

Default Gateway

- Enter the IP address of the default gateway that is used when communicating with other devices on a different segment (network unit). The default setting is “0.0.0.0.”
- Consult your network administrator for the appropriate value. You may not need to set the value.
- If DHCP can be used, the default gateway is automatically assigned.

DNS (Domain Name System)

DNS is a system used to associate names used on the Internet called host names and domain names to IP addresses. Given AAA.BBBBB.com, AAA is the host name and BBBBB.com is the domain name. Instead of using the IP address, which is a sequence of numbers, host name and domain name can be used to access the network.

- Enter the domain name, the DNS server address, and the domain suffix. If DHCP can be used, these values are automatically assigned.
- When accessing a network drive or a network printer from the WT1600, a name can be used to access the destination rather than an IP address.

- **Entering the domain name**

- Enter the network domain name that the WT1600 belongs to.
- Enter up to 30 characters.
- The characters that can be used are 0-9, A-Z, %, _ , () (parenthesis), - (minus sign).

- **Entering the DNS server address**

- Enter the IP address of the DNS server. The default setting is “0.0.0.0.”
- You can specify up to two DNS server addresses, primary and secondary. When the primary DNS server is down, the secondary DNS server is automatically looked up for the mapping of the host name/domain name and IP address.

- **Entering the Domain Suffix**

- When the IP address corresponding to the server name with the domain name specified in the previous section is not found, the system may be set up to search using a different domain name. Enter this alternate domain name as the domain suffix.
- You can specify up to two domain suffixes, primary and secondary.

Note

- If you changed settings related to the Ethernet network, the WT1600 must be power cycled.
- If the WT1600 is turned ON with the DHCP function enabled without an Ethernet cable connected, communications and file functions may not operate properly. In this case, turn DHCP OFF and power cycle the WT1600.

Configuring the TCP/IP Settings of the PC
 Communication parameters such as the IP address must be specified also on the PC side.
 Communication parameters are specified for each Ethernet NIC that is installed in the PC.
 Here, the settings of the NIC required for connecting your PC and the WT1600 are explained.

If the IP address and other parameters are to be assigned dynamically using the DHCP server, the following settings are not necessary.

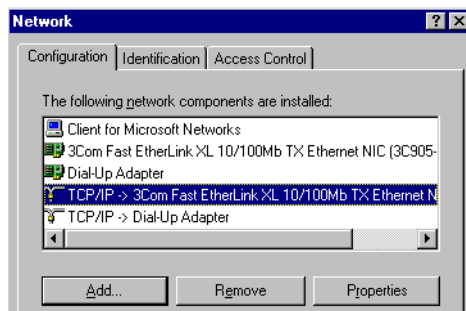
Select **Obtain an IP address automatically** under the **IP Address** tab of the **TCP/IP Properties** dialog box.

For example, if you are connecting a PC and the WT1600 to an independent Ethernet network, you can specify parameters as indicated in the next table. For details on the parameters, consult your system or network administrator.

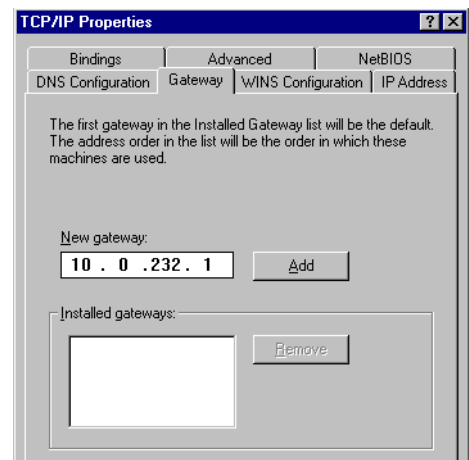
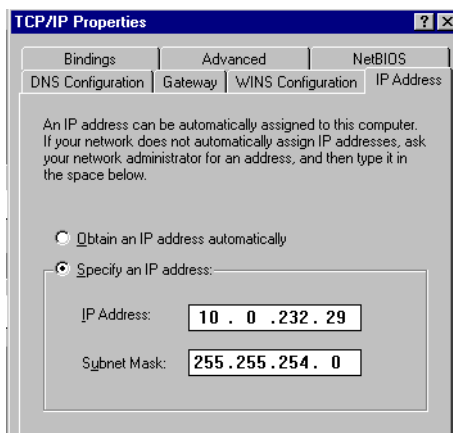
Parameter	Value	Notes
IP address	(Example) 192.168.21.128	IP address for the PC
Subnet mask	(Example) 255.255.255.0	Set the same value as the subnet mask that was specified for the WT1600.
Gateway	None	
DNS	Not used	
WINS	Not used	

The following procedure describes the steps for Windows 95/98. If you are using Windows NT/2000 Pro carry out equivalent steps according to your operating system.

1. Select **Start > Settings > Control Panel**. The Control Panel opens.
2. Double-click the **Network** icon to display the **Network** dialog box.
3. Select **TCP/IP** corresponding to the Ethernet NIC that is connected to your PC and click **Properties**. The **TCP/IP Properties** dialog box appears.

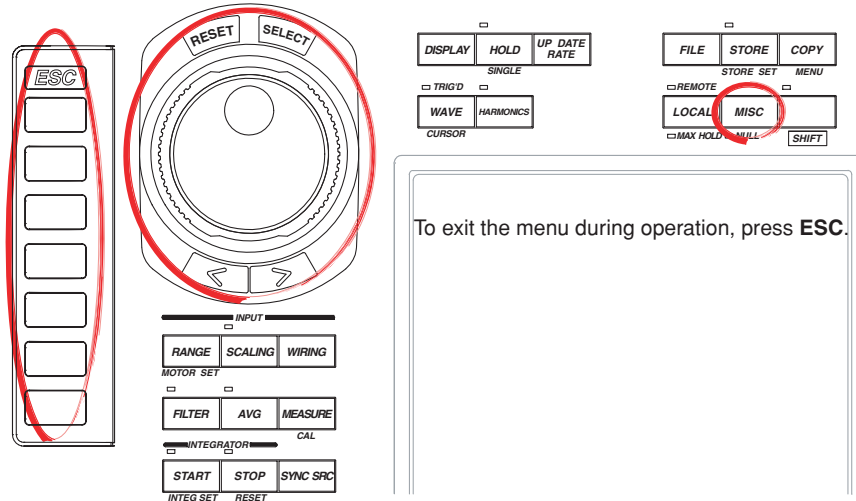


4. Set the parameters such as the IP address according to the table above and click **OK**.



2.3 Ethernet Control Settings

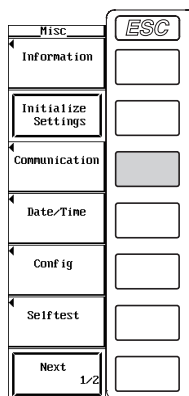
Keys



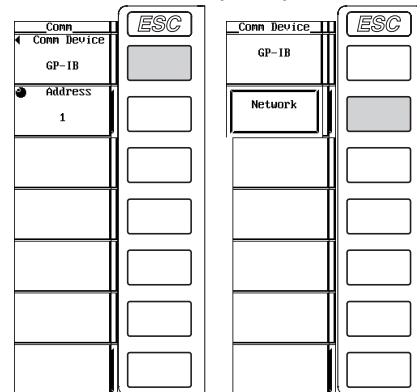
procedure

Select the communications interface to be used for controlling the WT.

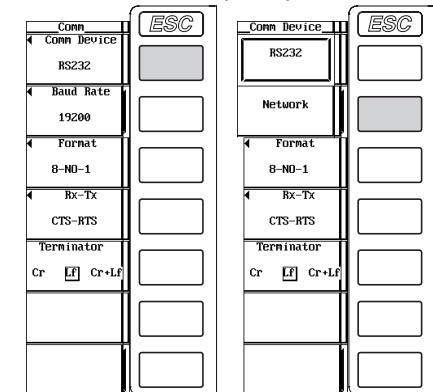
1. Press **MISC** to display the Misc menu.
2. Press the **Communication** soft key to display the Comm menu.
3. Press the **Comm Device** soft key to display the Comm Device menu.
4. Press the **Network** soft key. Doing so selects Ethernet as the interface for controlling the WT.



For Suffix Code -C1 (GP-IB)



For Suffix Code -C2 (Serial)



Note

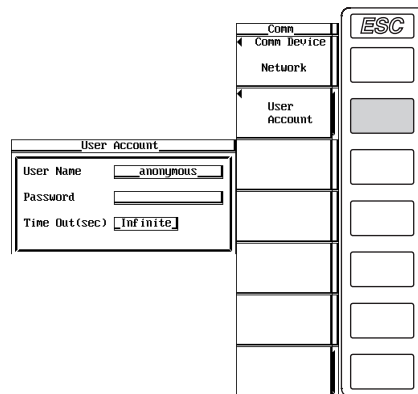
Only the communications interfaces selected under Device are available. If commands are sent using an unselected communications interface, the command will not be received.

Setting the User Name and Password

5. Press the **User Account** soft key to display the User Account dialog box.
6. Turn the **jog shuttle** to select User Name.
7. Press **SELECT** to display the keyboard.
8. Use the **keyboard** to enter the user name.
9. Turn the **jog shuttle** to select Password. The password setting is entered twice.
10. Press **SELECT** to display the keyboard.
11. Use the **keyboard** to enter the password. Password is not required if the user name is anonymous.

Setting the Timeout Time

12. Turn the **jog shuttle** to select Time Out.
13. Press **SELECT** to display the timeout time selection box.
14. Turn the **jog shuttle** to set the timeout time.
15. Press **SELECT** or **ESC** to close the box.

**Entering TCP/IP Settings**

You must enter TCP/IP settings to control the WT from a PC using the Ethernet interface. For instructions on entering settings, see section 2.2 "Setting the Ethernet Interface (TCP/IP)".

2.3 Ethernet Control Settings

Explanation

You can control the WT from a PC using the Ethernet interface. To enable this function, you must confirm that your WT is running ROM version 2.07 or later, and that YOKOGAWA's dedicated software has been installed on the PC according to the instructions above.

Retail Software

WTViewer (Model 760122) version 2.00 or later.

A trial version is available and can be downloaded from the following URL.

<http://www.yokogawa.com/tm/Bu/760122/>

Free Software

Wirepuller version 1.02 or later.

Wirepuller can be downloaded from the following URL.

<http://www.yokogawa.com/tm/Bu/DLsoft/wire/>

Setting the User Name

- Enter the user name to allow access to the WT1600.
- Enter up to 15 characters.
- The characters that can be used are 0-9, A-Z, %, _, () (parenthesis), - (minus sign).
- If you specify anonymous, the WT1600 can be accessed from the outside (PC) without a password.

Setting the Password

- Enter the password for the user name to allow access to the WT1600.
- Enter up to 15 characters.
- The characters that can be used are 0-9, A-Z, %, _, () (parenthesis), - (minus sign).
- If the user name is set to anonymous, the WT1600 can be accessed from the outside (PC) without a password. The password setting is entered twice.

Setting the Timeout Time

The WT1600 closes the connection to the network if there is no access for a certain period of time (timeout time).

The available settings are 0 to 3600 s, or Infinite. The default value is Infinite.

Note

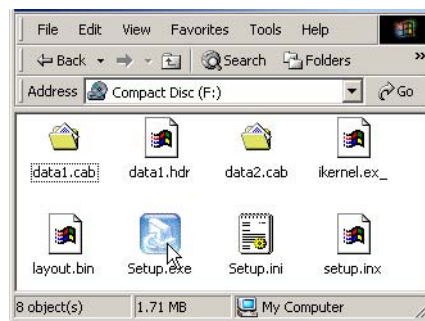
The settings will not take effect until the unit is turned OFF then back ON again.

2.4 Installing the Software

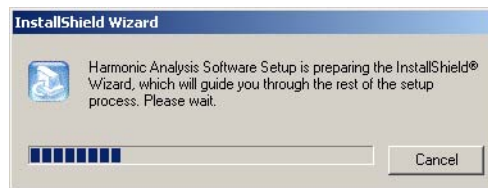
Procedure

The following procedures are for installing the software on Windows 2000 Professional. The screens shown in the figure may vary depending on the OS that is running on the PC.

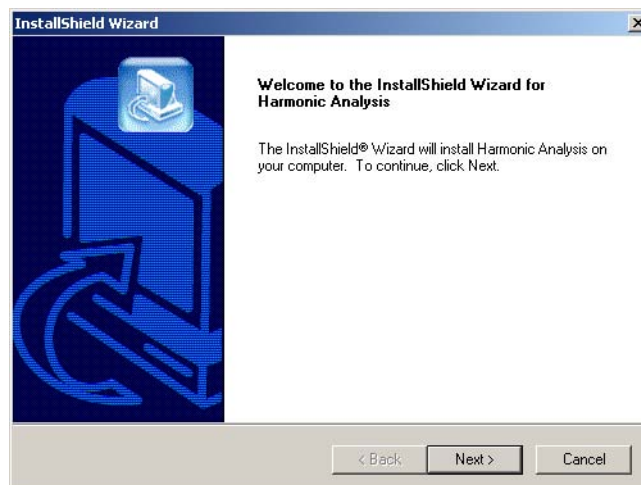
1. Start Windows.
When using Windows NT 4.0 or Windows 2000, set the user name to *Administrator* when starting up.
2. Place the installation CD-ROM containing the software into the CD-ROM drive.
3. Double-click **My Computer**, then the CD-ROM icon.
4. Double-click **Setup.exe**. InstallShield Wizard starts.



Start Screen of InstallShield Wizard

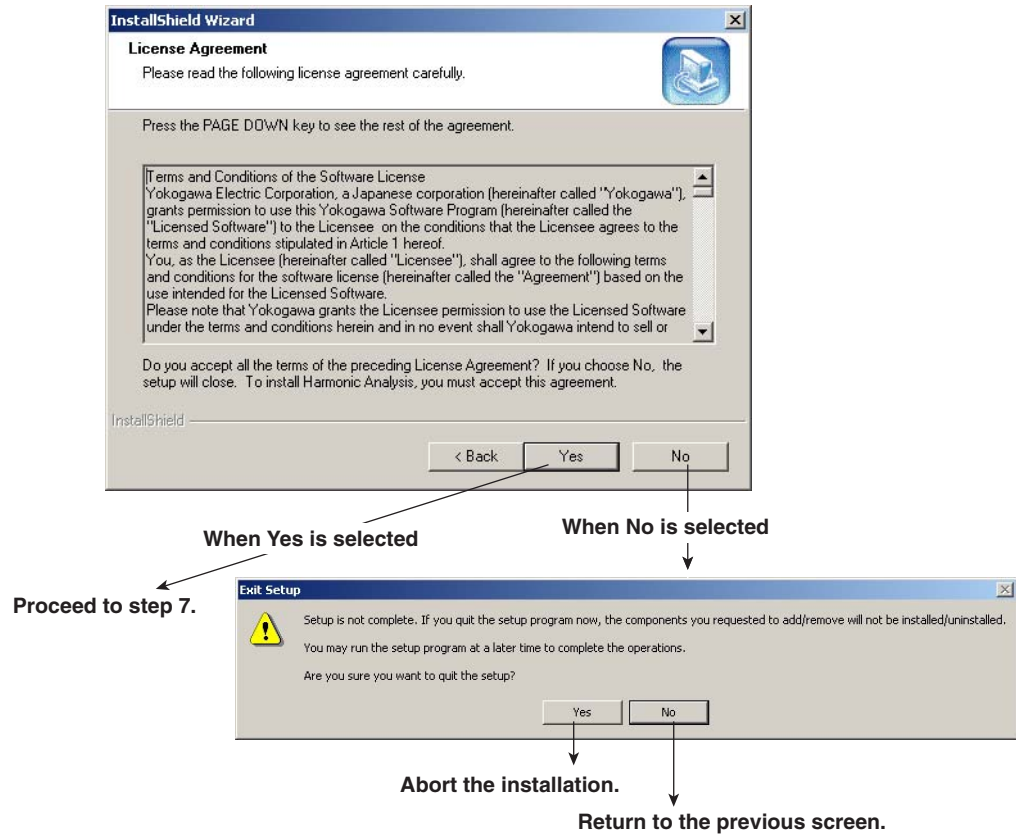


5. Click **Next**.

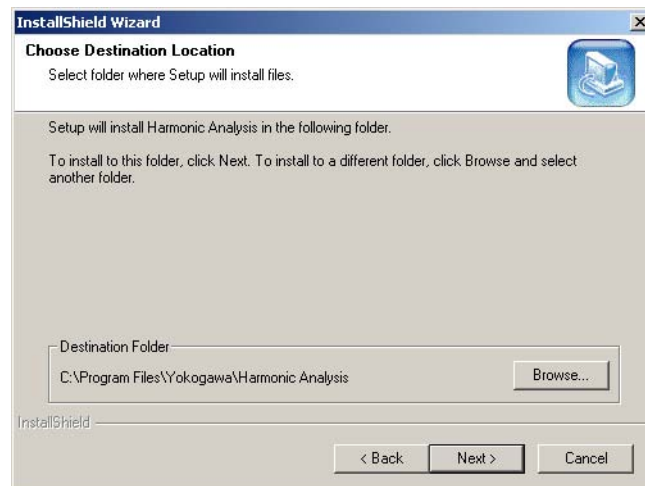


2.4 Installing the Software

- If you accept the terms of the license agreement, select **Yes**. If you do not, select **No**.

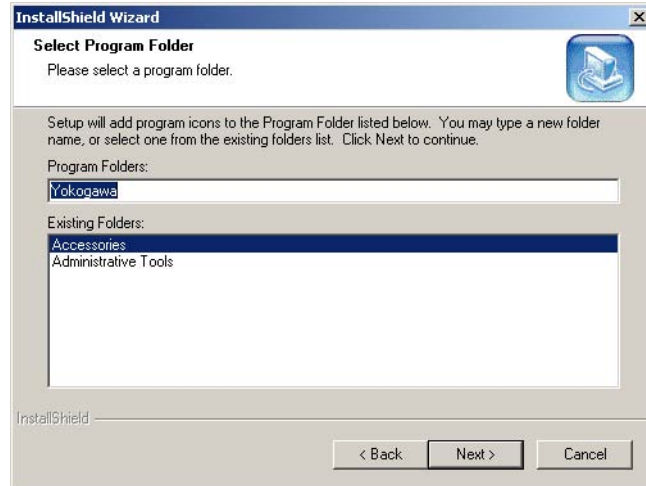


- Select the installation destination, and click **Next**.
If you click **Browse**, you can specify the installation destination. The default installation destination is set to "C:\Program Files\Yokogawa\Harmonic Analysis."

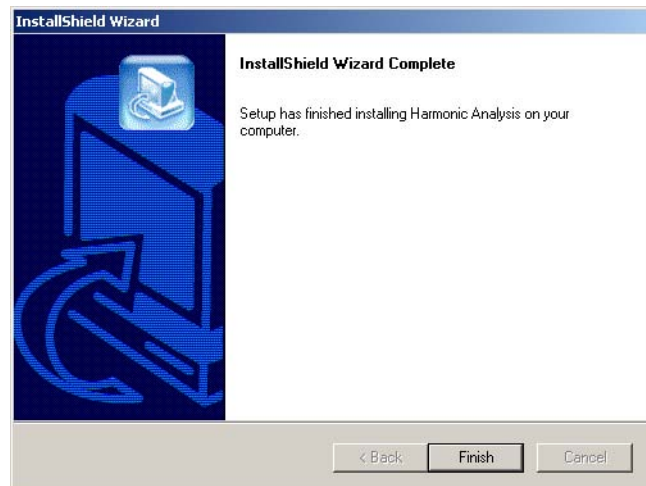


8. Select the program folder where the program icon is to be added and click **Next**. The installation starts.

The program icon (shortcut) of the software is added in the Programs menu within the Start menu. The destination is selected here. The default program folder is Yokogawa.



9. If the installation completes successfully, a message "Setup has finished installing" is displayed. Click **Finish**.



2.5 Starting and Exiting the Software

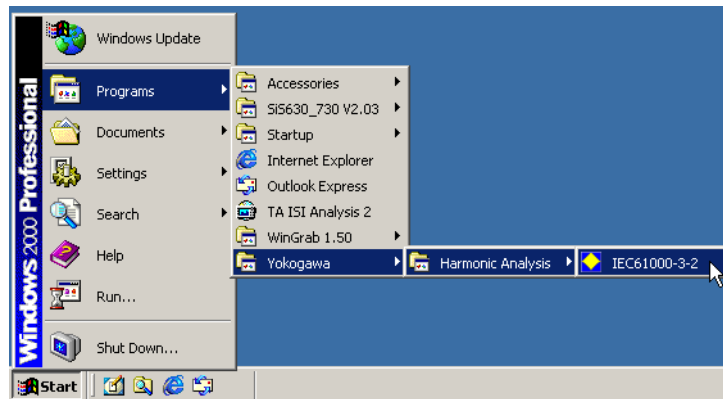
Procedure

Starting the Software

Starting the Software

1. From the **Start** menu, choose **Programs > Yokogawa > Harmonic Analysis > IEC61000-3-2**. The software starts.

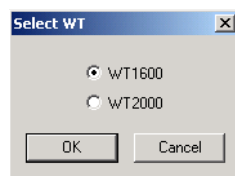
The procedure above applies when the default software installation destination and program folder are used. If you changed the installation destination or program folder at installation, select the corresponding location.



2. When you start the software, a dialog box appears for you to select the WT model.

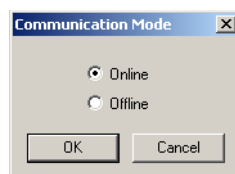
Selecting the WT Model

3. Select either WT2000 or WT1600.



Selecting the Communications Mode

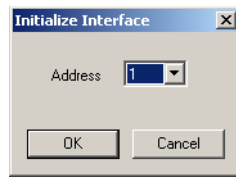
4. Select Online or Offline.



- If You Selected Online
If you selected the WT2000, proceed to step 5.
If you selected the WT1600, proceed to step 6.
- If you selected Offline, go to section 3.10.

Selecting the Communication Address

- In the Initialize Interface dialog box that is displayed, select the GP-IB address of the WT.

**Note**

GP-IB address 0 cannot be selected because it is reserved for use by the PC.

Select the GP-IB address and click **OK** to start communications with the WT. After automatically confirming that communications are possible, an acquisition data window appears. Setup and execution of measurements are now possible.

Acquisition Data Window

For a detailed description of the acquisition data window, see section 3.7.

Order	Voltage	Current	Phase	Freq
1	104.248 V	0.511 A	16.118	
2	0.028 V	0.006 A	127.021	50.023Hz
3	0.807 V	0.316 A	-179.977	Power
4	0.008 V	0.005 A	12.865	51.447 W
5	1.125 V	0.164 A	-15.805	V THD
6	0.008 V	0.005 A	-115.313	1.760 %
7	0.893 V	0.077 A	129.097	A THD
8	0.004 V	0.004 A	85.335	58.332 %
9	0.519 V	0.034 A	-75.822	THC
10	0.003 V	0.002 A	-106.739	0.3663 A
11	0.229 V	0.020 A	55.177	POHC
12	0.004 V	0.001 A	-0.591	0.0099 A
13	0.448 V	0.017 A	150.797	POHC Max
14	0.025 V	0.001 A	141.951	0.0100 A
15	0.267 V	0.011 A	15.537	
16	0.036 V	0.001 A	-55.169	
17	0.168 V	0.006 A	147.530	
18	0.021 V	0.001 A	83.951	
19	0.117 V	0.006 A	-118.516	
20	0.009 V	0.000 A	-138.508	
21	0.023 V	0.006 A	17.748	

Note

If the power to the WT is not ON or the WT is not ready to make measurements, an error occurs when communications are started after selecting the GP-IB address and clicking OK. A communications error also occurs if the GP-IB address is not correct or if there is no response from the WT.

Selecting the Communications Interface (WT1600 Only)

- Select GP-IB or Ethernet.

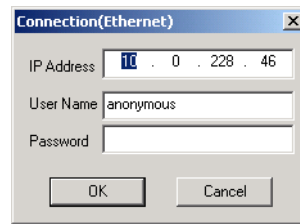


If you selected GP-IB, proceed to step 5.

If you selected Ethernet, proceed to step 7.

2.5 Starting and Exiting the Software

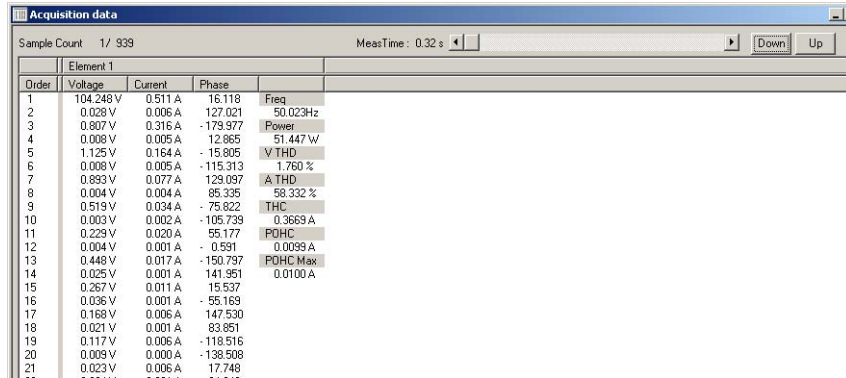
7. In the Connection dialog box, enter the IP address, user name, and password of the target WT.



Select the GP-IB address and click **OK** to start communications with the WT. After automatically confirming that communications are possible, an acquisition data window appears. Setup and execution of measurements are now possible.

Acquisition Data Window

For a detailed description of the acquisition data window, see section 3.7.




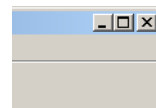
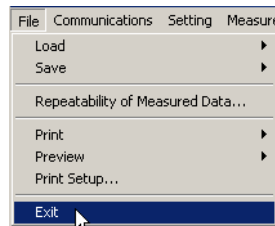
Order	Voltage	Current	Phase	Freq
1	104.249 V	0.511 A	-16.118	
2	0.028 V	0.006 A	127.021	50.023Hz
3	0.807 V	0.316 A	-179.977	Power
4	0.008 V	0.005 A	12.865	51.447 W
5	1.125 V	0.164 A	-15.805	V THD
6	0.008 V	0.005 A	-115.313	1.760 %
7	0.893 V	0.077 A	129.097	A THD
8	0.004 V	0.004 A	85.335	58.332 %
9	0.519 V	0.034 A	-75.822	THC
10	0.003 V	0.002 A	-105.739	0.3663 A
11	0.229 V	0.020 A	55.177	POHC
12	0.004 V	0.001 A	-0.591	0.0099 A
13	0.448 V	0.017 A	-150.797	POHC Max
14	0.025 V	0.001 A	141.951	0.0100 A
15	0.267 V	0.011 A	15.537	
16	0.036 V	0.001 A	-55.169	
17	0.168 V	0.006 A	147.530	
18	0.021 V	0.001 A	83.851	
19	0.117 V	0.006 A	-118.516	
20	0.009 V	0.000 A	-138.508	
21	0.023 V	0.006 A	17.748	

Note

If you enter settings in the Connection dialog box then click **OK** to begin communications, an error will occur if the power to the WT is not ON or if it is not ready to perform measurement. An error also occurs if the IP address, user name, or password is not correct, or if no response was received from the WT.

Exiting the Software

Choose **Exit** from the File menu or click the  button at the upper right corner of the Harmonic Analysis Software window. The software closes.



Explanation

A shortcut is located in the Programs folder of the Start menu. You can start the software by selecting the shortcut. The software is saved to the installation destination that was specified during installation described earlier.

Selecting the WT Model

Select WT2000 or WT1600.

- **WT1600**
When a communication mode is selected, you can download saved data or settings from a WT1600 that is online.
- **WT2000**
When a communication mode is selected, you can download saved data or settings from a WT2000 that is online.

Selecting the Communications Mode

You can select **Online** or **Offline**.

- **Online**
If Online is selected, you must select the GP-IB address of the target WT. (If you selected the WT1600, you must select a communication interface.)
- **Offline**
If Offline is selected, communications cannot be performed with the WT. However, you can load, display, and print measured data or settings that have been previously saved. Continue on to section 3.9.

Selecting the Communications Interface

- **GP-IB**
You must select the GP-IB address of the target WT1600.
- **Ethernet**
You must enter the IP address, user name, and password of the target WT1600.

Selecting the Communications Address

- **GP-IB**
 - You can select the GP-IB address of the target WT.
The selectable range is 1 to 30.
- **Ethernet**
 - Enter the IP address of the target WT.
You can enter an address from 0.0.0.0 to 255.255.255.255.
 - You can enter the user name and password of the target WT.
Characters That Can Be Used on the WT1600

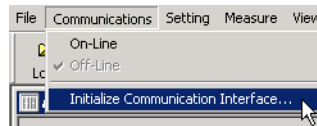
Starting Communication

When you select a communication address and click **OK**, communications with the WT are started.

3.1 Initialize Interface (WT1600)

Procedure

1. From the **Communications** menu, choose **Initialize Interface**. The Initialize Interface dialog box opens.



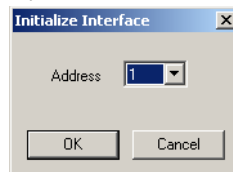
2. Select the communications interface.



If you selected GP-IB, proceed to step 3.

If you selected Ethernet, proceed to step 4.

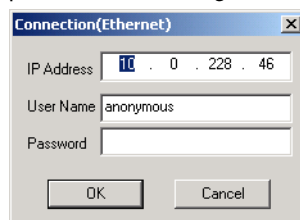
3. If you selected GP-IB in step 2, select the GP-IB address for the target WT.



Note

GP-IB address 0 cannot be selected, because it is reserved for use by the PC.

4. If you selected Ethernet in step 2, enter the IP address, user name, and password of the target WT.



Explanation

When changing the communication mode from Off-Line to On-Line, the GP-IB address of the target WT must be selected.

Selecting the Communications Address

GP-IB

- You can select the GP-IB address of the target WT.
The selectable range is 1 to 30.

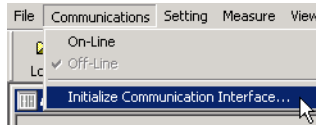
Ethernet

- Enter the IP address of the target WT.
You can enter an address from 0.0.0.0 to 255.255.255.255.
- Enter the user name and password of the target WT.
Characters That Can Be Set on the WT

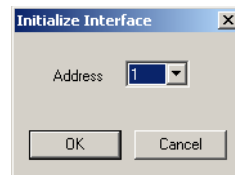
3.2 Initialize Interface (WT2000)

Procedure

1. From the **Communications** menu, choose **Initialize Interface**. The Initialize Interface dialog box opens.



2. Select the GP-IB address of the target WT.



Note

GP-IB address 0 cannot be selected, because it is reserved for use by the PC.

Explanation

When changing the communication mode from Off-Line to On-Line, the GP-IB address of the target WT must be selected.

Selecting the Address

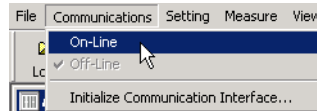
You can select the GP-IB address of the target WT.
The selectable range is 1 to 30.

3.3 Enabling On-Line Mode

Procedure

Use the following procedure after entering settings on the target instrument according to the procedures given in sections 3.1 and 3.2.

From the **Communications** menu, choose **On-Line**. Communications start with the target WT.



On the status bar of the window, check that Online is indicated.



Note

When starting communications, an error will occur if the power to the WT is not ON or the WT is not ready to perform measurement. An error also occurs if the GP-IB address, IP address, user name, or password is incorrect, or if no response was received from the target instrument.

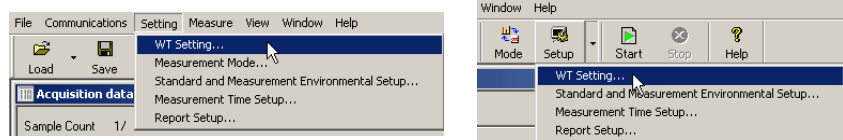
Explanation

When changing the communication mode from Offline to Online, select Online from the menu after entering settings on the target WT. When you select Online from the menu, communication with the target WT begins. When communication begins, harmonic measurement conditions of the WT are loaded into the software.

3.4 Setting the Measurement Conditions of the WT

Procedure

From the **Setting** menu, choose **WT Setting**. The WT Setting dialog box opens. You can also choose **WT Setting** from the **Setup** icon on the toolbar. You can set the measurement conditions of the target WT.




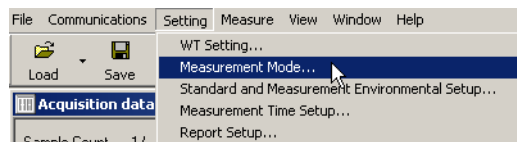
Explanation

The measurement conditions of the WT can be set from this software via the GP-IB or Ethernet interface (WT1600 option). For information about the settings, see “Setting Measurement Conditions of the WT” in chapter 8.

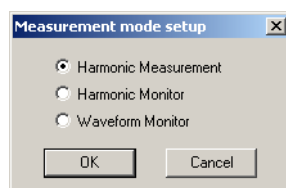
3.5 Setting the Measurement Mode to Harmonic Measurement

Procedure

1. From the **Setting** menu, choose **Measurement Mode**. The Measurement mode setup dialog box opens. You can also click  on the toolbar.



2. Choose **Harmonic Measurement**.
3. Click **OK**. The Acquisition data window opens.
For details on the Acquisition data window, see section 3.7.



Explanation

To retrieve harmonic measurement data from the WT and evaluate the data according to the IEC standard (see section 1.3), you must set the measurement mode to Harmonic Measurement. For a description of the function used to display the evaluation results and measured data, see chapter 4.

Measurement Mode

The following three measurement modes are available.

- **Harmonic Measurement Mode**
This mode is used to retrieve harmonics measurement data from the WT and evaluate the data according to the IEC standard (see section 1.3). When the communication mode is set to On-Line, evaluation can be made according to the IEC standard while making harmonic measurements on the WT. When the communication mode is set to Off-Line, evaluation can be made on the measurement data loaded from files according to the IEC standard.
- **Harmonic Monitor Mode**
Harmonic fluctuation can be monitored on bar graphs and numerical lists while making harmonic measurements on the WT. This mode can be selected only when in On-Line mode.
- **Waveform Monitor Mode**
The measured waveform can be monitored while making harmonic measurements on the WT. This mode can be selected only when in On-Line mode.

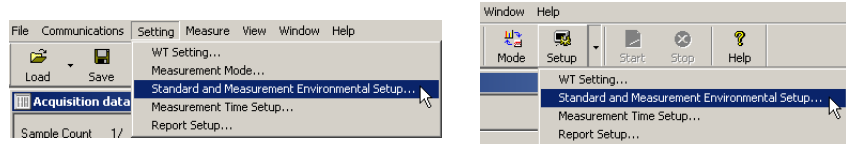
Note

When you switch the measurement mode, all the data retrieved and loaded up to that point are cleared. It is recommended that the data retrieved using Harmonic Measurement Mode be saved (see section 6.1) before changing the measurement mode.

3.6 Setting the Standard and Measurement Environment

Procedure

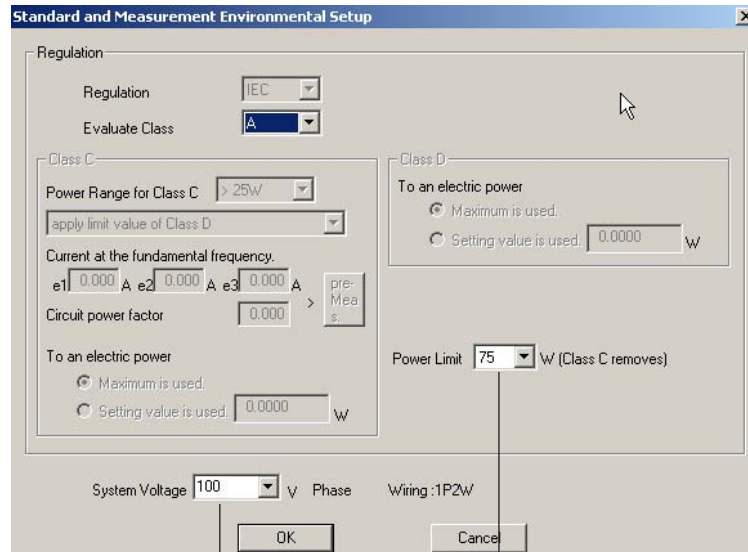
1. From the **Setting** menu, choose **Standard and Measurement Environmental Setup**. The Standard and Measurement Environmental Setup dialog box opens. You can also choose **Standard and Measurement Environmental Setup** from the **Setup** icon on the toolbar.



2. From the **Evaluate Class** list in the Standard and Measurement Environmental Setup dialog box, select the class of the EUT from A, B, C, and D according to the specifications in the applicable standard. The setup information varies depending on the selected class.

Setting Class A or Class B

Set the class according to the explanation in the figure below.



Select the supply voltage

Select the phase voltage or line voltage of the EUT. You can also enter the value. The limits are derived from to the specified system voltage.

Select the lower power limit for applying the limits

Select 50 W or 75 W. When the active power of the EUT is less than the selected power, the limits are not applied.

Setting Class C

Set the class according to the explanation in the figure below.

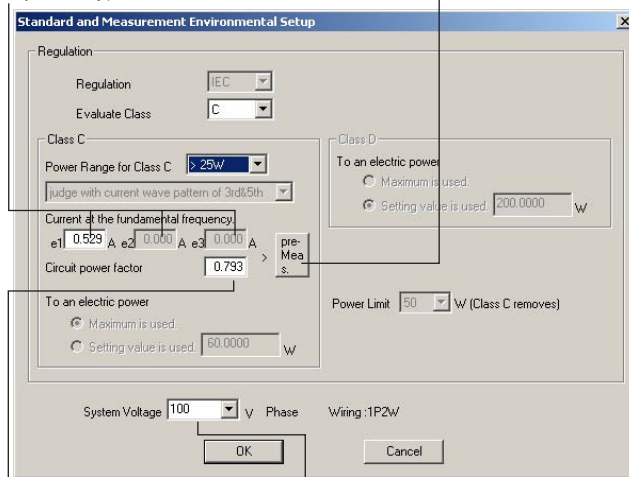
- **When the active power from the equipment exceeds 25 W (>25 W)**

Fundamental current

The measured current at the fundamental frequency is displayed for each input element of the WT (e1, e2, and e3 denote element 1, element 2, and element 3, respectively). You can also enter the

Measure the fundamental current and power factor

Set the load of the EUT to the maximum and click **Pre-Meas.** The fundamental current and power factor are measured, and the values are displayed.



Power factor

The measured power factor is displayed. You can also enter the

Set the supply voltage

Set the phase voltage or line voltage of the EUT. You can also enter the value. The limits are derived from the specified system voltage.

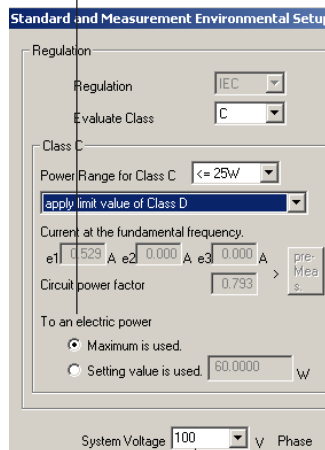
- **When the active power from the equipment is less than or equal to 25 W (<=25 W)**

You can select whether to evaluate by applying the power ratio limit of class D or to evaluate on the conditions of harmonic order 3 and 5.

Evaluating by applying the power ratio limits of Class D

Select the power

When applying the power ratio limits of Class D, select to use the maximum power measured by the EUT or a specified power value.



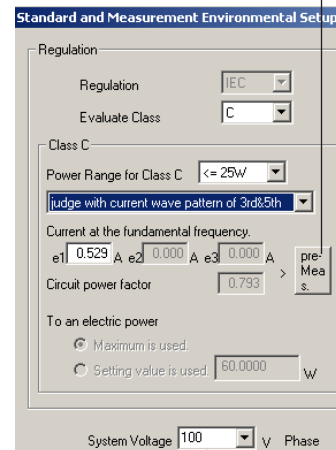
Select the supply voltage

Select the phase voltage or line voltage of the EUT. You can also enter the value. The limits are derived from to the specified system voltage.

Evaluating on the conditions of harmonic order 3 and 5

Measure the fundamental current

Set the load of the EUT to the maximum and click **Pre-Meas.** The fundamental current is measured, and the values are displayed.



Select the supply voltage

Select the phase voltage or line voltage of the EUT. You can also enter the value. The limits are derived from to the specified system voltage.

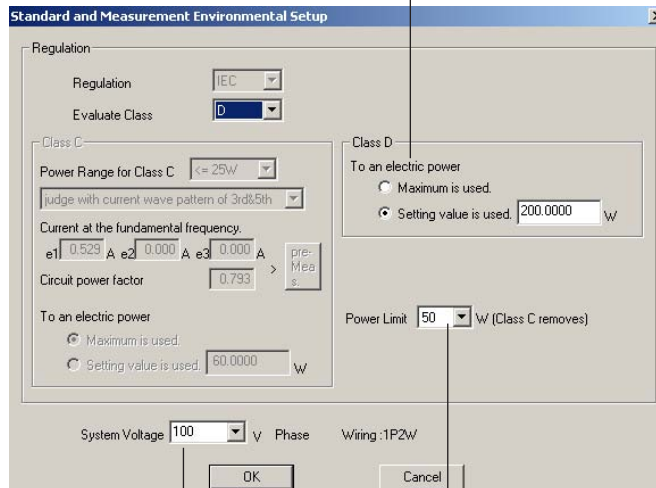
3.6 Setting the Standard and Measurement Environment

Setting Class D

Set the class according to the explanation in the figure below.

Select the power

When applying the power ratio limits of Class D, select to use the maximum power measured by the EUT or a specified power value.



Select the supply voltage

Select the phase voltage or line voltage of the EUT. You can also enter the value. The limits are derived from to the specified system voltage.

Select the lower power limit for applying the limits

Select 50 W or 75 W. When the active power of the EUT is less than the selected power, the limits are not applied.

Explanation

To retrieve harmonic measurement data from the WT and measure/evaluate the data according to the IEC standard (see section 1.3), you must select the class of the EUT according to the specifications of the applicable standard and set the evaluation conditions in each class. Here, the procedure for switching the evaluation conditions for each class is explained. For a description of the classification specified in the standard and the harmonic limits for each class, see section 1.3 or the applicable standard.

Standard (Regulation)

The software can make measurements and evaluations according to the IEC standard (see section 1.3). This item cannot be switched.

Class (Evaluate Class)

Select the class from A, B, C, and D, according to the classifications specified in the standard. The setup information varies depending on the class selected here.

Setting Class A

• Selecting the System Voltage

You can select the system voltage of the EUT or enter the value. If the wiring system is single-phase two-wire (1P2W), single-phase three-wire (1P3W), or three-phase four-wire (3P4W), select or enter the phase voltage; if the wiring system is three-phase three-wire (3P3W) or three-voltage three-current (3V3A), select or enter the line voltage. The limits are derived from the specified system voltage.

* Depending on the model, the "phase" is denoted as ϕ not P.

• Selecting the Lower Power Limit for Applying the Limits

Select 50 W or 75 W. When the active power of the EUT is less than the selected power, the limits are not applied.

Setting Class B

The setup information is the same as class A. The limits applied are 1.5 times the limits for class A.

Setting Class C When the Active Power of the EUT Exceeds 25 W (>25 W)

- **Selecting the System Voltage**

Same as class A.

- **Measuring the Fundamental Current and Power Factor**

Measure the fundamental current and the power factor of the EUT that are required for defining the limits. Make the measurement by setting the load of the EUT to the maximum.

- **Displaying the Current at the Fundamental Frequency**

The measured current at the fundamental frequency is displayed for each input element of the WT (e1, e2, and e3 denote element 1, element 2, and element 3, respectively). You can also enter the value.

- **Displaying the Power Factor**

The measured power factor is displayed. You can also enter the value.

Setting Class C When the Active Power of the EUT Is Less Than or Equal to 25 W (<=25 W)

The IEC standard specifies that either “the power ratio limits of class D” or “the conditions of harmonic order 3 and 5” are met.

- **Evaluating by Applying the Power Ratio Limits of Class D**

The same power ratio limit of class D is applied.

- **Selecting the System Voltage**

Same as class A.

- **Selecting the Power**

You can select to use the maximum power measured by the EUT or a specified power value.

- **Evaluating on the Conditions of Harmonic Order 3 and 5**

The IEC standard specifies the current ratio of harmonic order 3 and 5 to the fundamental frequency and the relationship between the fundamental current and the current waveform (see page 1-9).

- **Selecting the System Voltage**

Same as class A.

- **Measuring the Fundamental Current**

Measure the fundamental current of the EUT that is required for defining the limits. Make the measurement by setting the load of the EUT to the maximum.

- **Displaying the Current at the Fundamental Frequency**

The measured current at the fundamental frequency is displayed for each input element of the WT (e1, e2, and e3 denote element 1, element 2, and element 3, respectively). You can also enter the value.

Setting Class D

- **Selecting the System Voltage**

Same as class A.

- **Selecting the Power**

You can select to use the maximum power measured by the EUT or a specified power value.

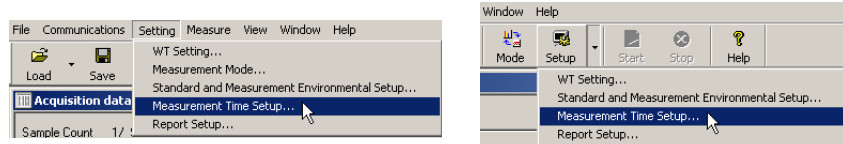
- **Selecting the Lower Power Limit for Applying the Limits**

Select 50 W or 75 W. When the active power of the EUT is less than the selected power, the limits are not applied.

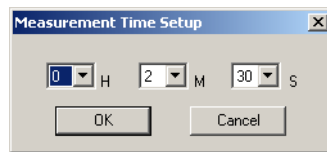
3.7 Setting the Measurement Time

Procedure

1. From the **Setting** menu, choose **Measurement Time Setup**. The Measurement Time Setup dialog box opens. You can also choose **Measurement Time Setup** from the **Setup** icon on the toolbar.



2. Set the measurement time.



Explanation

Measurement Time

The measurement time is the time between the start of the measurement to the end of the measurement. The time for measuring harmonics can be set in advance. The harmonics can be measured continuously for the specified time. The measurement time can be changed when equipment that emits harmonics that fluctuate over time is measured or when confirming that the emitted harmonics do not change even when the equipment is operated over extended time.

Selectable range: 0 H 0 M 1 S to 24 H 0 M 0 S in units of 1 s.

- An error occurs if a time exceeding 24 hours is specified.
- If the measurement time is set to 0 H 0 M 0 S and the measurement is started, measurement continues until you choose Stop from the Measure menu or click Stop on the toolbar.

Note


Depending on the characteristics of the PC onto which this software was installed, an error occurs if you specify a time longer than the amount of memory that can be reserved. In this case, you may be able to increase the available time by exiting other applications or by increasing the amount of memory available to the PC.

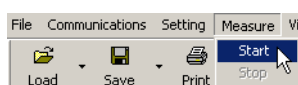
3.8 Starting and Stopping Measurements (Retrieving Measured Data/Waveform Data)

Procedure

To start measurements and retrieve measurement data, the communication mode must be set to On-Line and the measurement mode must be set to Harmonic Measurement.

Starting Measurements

From the **Measure** menu, choose **Start**. The retrieval of the harmonic measurement data measured on the WT starts. The retrieved measurement data is displayed in the Acquisition data window (see the explanation given later). You can also click  on the toolbar.




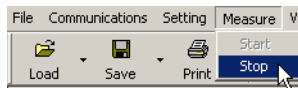
Stopping Measurements

- **Automatically Stopping Measurements**

When the specified measurement time elapses, measurements automatically stop.

- **Aborting Measurements**

From the **Measure** menu, choose **Stop**. If the WT is in the middle of measurement, measurement stops after the measurement correctly ends and the retrieval of waveform data is finished. You can also click  on the toolbar.



Explanation

Starting/Stopping Measurements

When in On-Line mode, measurement can be started. Measurement cannot be started in Off-Line mode. When measurement is started in Harmonic Measurement mode, the retrieval of the harmonic measurement data measured on the WT starts. When the specified measurement time elapses, measurement is automatically stopped. You can also abort the measurement before the specified measurement time elapses. The waveform data is retrieved immediately after the measurement stops. For a description of the function used to display the measured data and evaluation results, see chapter 4.

Note

When measurement is started in Harmonic Monitor or Waveform Monitor mode, the retrieval of the harmonic measurement data or waveform data measured on the WT starts. These modes are used to monitor the conditions of the harmonics and waveforms and do not evaluate against the standard as in Harmonic Measurement Mode. To stop the measurement and data retrieval in these modes, click Stop. For details, see chapter 5.

3.8 Starting and Stopping Measurements (Retrieving Measured Data/Waveform Data)

Displayed Contents of the Acquisition (Measurement) Data Window

Measurement (acquisition) data number

The measured data of harmonics per 16 cycles of the fundamental frequency is one set of harmonic measurement data (instantaneous values). The software retrieves this data and displays the data as measured data. This example indicates that 472 sets of data have been retrieved and the first measured data is being displayed.

Meas Time

Indicates the time when the measured data was retrieved. This example indicates the time (0.32 s) when the first measured data was retrieved.

Scroll bar

Drag the (slider) or click to select the measured data you wish to display. The Meas Time and the Sample Count number change in sync with the slider position.

Up/Down button

Click to select the displayed measured data one by one. The Meas Time, Sample Count number, and the slider position change in sync each time the Up/Down button is clicked.

WT input element

The displayed input elements vary depending on the wiring system configuration of the WT.

Order	Voltage	Current	Phase	
1	0.000 V	0.000 A	0.000	Freq
2	0.000 V	0.000 A	0.000	0.000Hz
3	0.000 V	0.000 A	0.000	Power
4	0.000 V	0.000 A	0.000	0.000 W
5	0.000 V	0.000 A	0.000	V THD
6	0.000 V	0.000 A	0.000	0.000 %
7	0.000 V	0.000 A	0.000	A THD
8	0.000 V	0.000 A	0.000	0.000 %
9	0.000 V	0.000 A	0.000	THC
10	0.000 V	0.000 A	0.000	0.0000 A
11	0.000 V	0.000 A	0.000	POHC
12	0.000 V	0.000 A	0.000	0.0000 A
13	0.000 V	0.000 A	0.000	POHC Max
14	0.000 V	0.000 A	0.000	0.0000 A
15	0.000 V	0.000 A	0.000	
16	0.000 V	0.000 A	0.000	
17	0.000 V	0.000 A	0.000	
18	0.000 V	0.000 A	0.000	
19	0.000 V	0.000 A	0.000	
20	0.000 V	0.000 A	0.000	
21	0.000 V	0.000 A	0.000	
22	0.000 V	0.000 A	0.000	
23	0.000 V	0.000 A	0.000	
24	0.000 V	0.000 A	0.000	
25	0.000 V	0.000 A	0.000	
26	0.000 V	0.000 A	0.000	
27	0.000 V	0.000 A	0.000	
28	0.000 V	0.000 A	0.000	
29	0.000 V	0.000 A	0.000	
30	0.000 V	0.000 A	0.000	
31	0.000 V	0.000 A	0.000	
32	0.000 V	0.000 A	0.000	
33	0.000 V	0.000 A	0.000	
34	0.000 V	0.000 A	0.000	
35	0.000 V	0.000 A	0.000	
36	0.000 V	0.000 A	0.000	
37	0.000 V	0.000 A	0.000	
38	0.000 V	0.000 A	0.000	
39	0.000 V	0.000 A	0.000	
40	0.000 V	0.000 A	0.000	

Fundamental frequency of the PLL source

Active power

Sum of all the active powers of orders 1 to 40

Harmonic distortion factor of voltage

Ratio of the total harmonic voltage with respect to the fundamental voltage

Harmonic distortion factor of current

Ratio of the total harmonic current with respect to the fundamental current

Total harmonic current

Sum of harmonic currents of orders 2 to 40 (rms value)

Sum of odd harmonic currents of order above and including 21

This example indicates the value of the first measured data

Sum of odd harmonic currents of order above and including 21 (maximum value)

This example displays the maximum value among the 472 sets of measured data.

Indicates Online or Offline

For Help, press F1 | 61 seconds progress... | WT1600 Measure Time : 00:02:30 | Online

Model of WT Under Operation | Preset measurement time

Time elapsed since the start of measurement (displayed during measurement)

Phase angle of the current of each order with respect to the fundamental current
However, the phase angle displayed on the 1st order line (9.974° in this example) is the phase angle of the fundamental current with respect to the fundamental voltage.

Current value of each order (rms value)

Voltage value of each order (rms value)

Harmonic orders (orders 1 to 40)

3.9 Switching to Off-Line Mode (Switching from On-Line Mode to Off-Line Mode)

Procedure

From the **Communications** menu, choose **Off-Line**. Communications with the target digital power meter is disconnected and a message “Communication with GPIB was ended” appears.



On the status bar of the window, check that Offline is indicated.



Explanation

When the communication mode is changed from On-Line to Off-Line, communications with the target digital power meter is disconnected. You can also make evaluations according to the IEC standard (see section 1.3) by loading measured data already saved to a file in Off-Line mode. For a description of the function used to display the evaluation results and measured data, see chapter 4.

Note

To change the communication mode from Off-Line back to On-Line, follow the procedures given in sections 3.1, 3.2 and 3.3.

3.10 Loading Setup Information, Measured Data, and Waveform Data

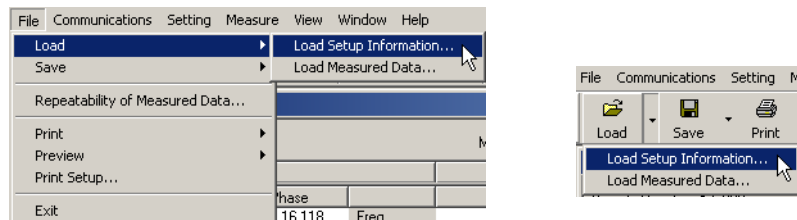
Procedure

Note

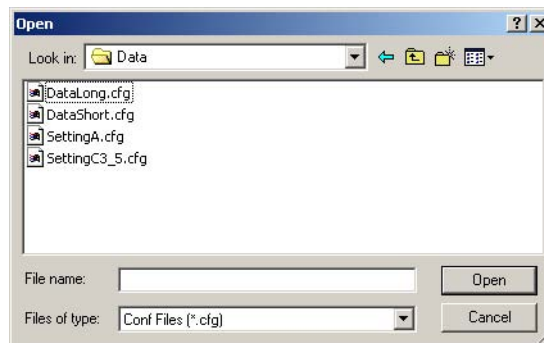
- Setup information, measured data, and waveform data cannot be loaded when the measurement mode is set to Harmonic Monitor or Waveform Monitor.
- If an error occurs while loading the setup information, the settings are reset to their default values.
- If an error occurs while loading setup information, measured data, or waveform data, the data may not be loaded properly. Check the file name and extension, and load the data again.
- Setup information, measured data, and waveform data cannot be loaded while measurement is in progress.

Loading Setup Information

1. From the **File** menu, point to **Load** then choose **Load Setup Information**. The Open dialog box opens. You can also select **Load Setup Information** from the **Load** icon on the toolbar.



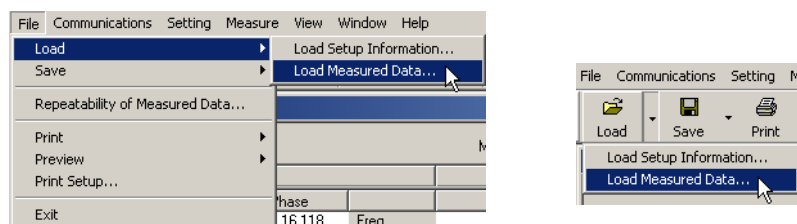
2. Select a file name and click **Open**. The setup information of the selected file is loaded.



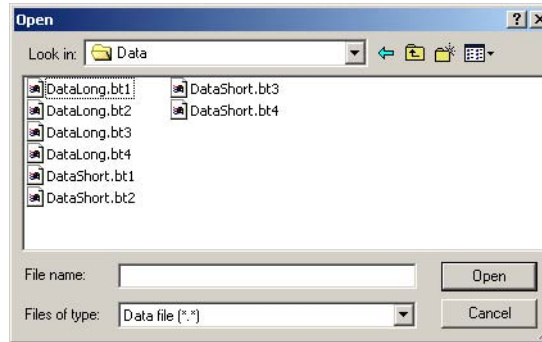
Loading Measured Data, Waveform Data, and Setup Information

Measured data, waveform data, and setup information can be loaded when the measurement mode is set to Harmonic Measurement.

1. From the **File** menu, point to **Load** then choose **Load Measured Data**. The Open dialog box opens. You can also select **Load Measured Data** from the **Load** icon on the toolbar.



2. Select a file name and click **Open**. The measured data, waveform data, or setup information of the selected file is loaded.



Explanation

Loading Setup Information

The setup information saved in section 6.1 can be loaded.

- The extension of the loaded file is .cfg.
- The details of the setup information are as follows.
 - Measurement mode (see section 3.5).
 - Standard and measurement environment settings (see section 3.6).

The measurement data retrieved from the WT or loaded from a file can be evaluated using the loaded evaluation conditions.

- Measurement time (see section 3.7).
- Display settings (chapters 4 and 5).
- Title/Comment of Reports (see section 7.2).

Reports of measurement data retrieved from the WT or loaded from a file can be saved or printed by attaching the loaded title or comment. For the saving and printing procedure, see chapter 7.

Loading Measured Data, Waveform Data, and Setup Information

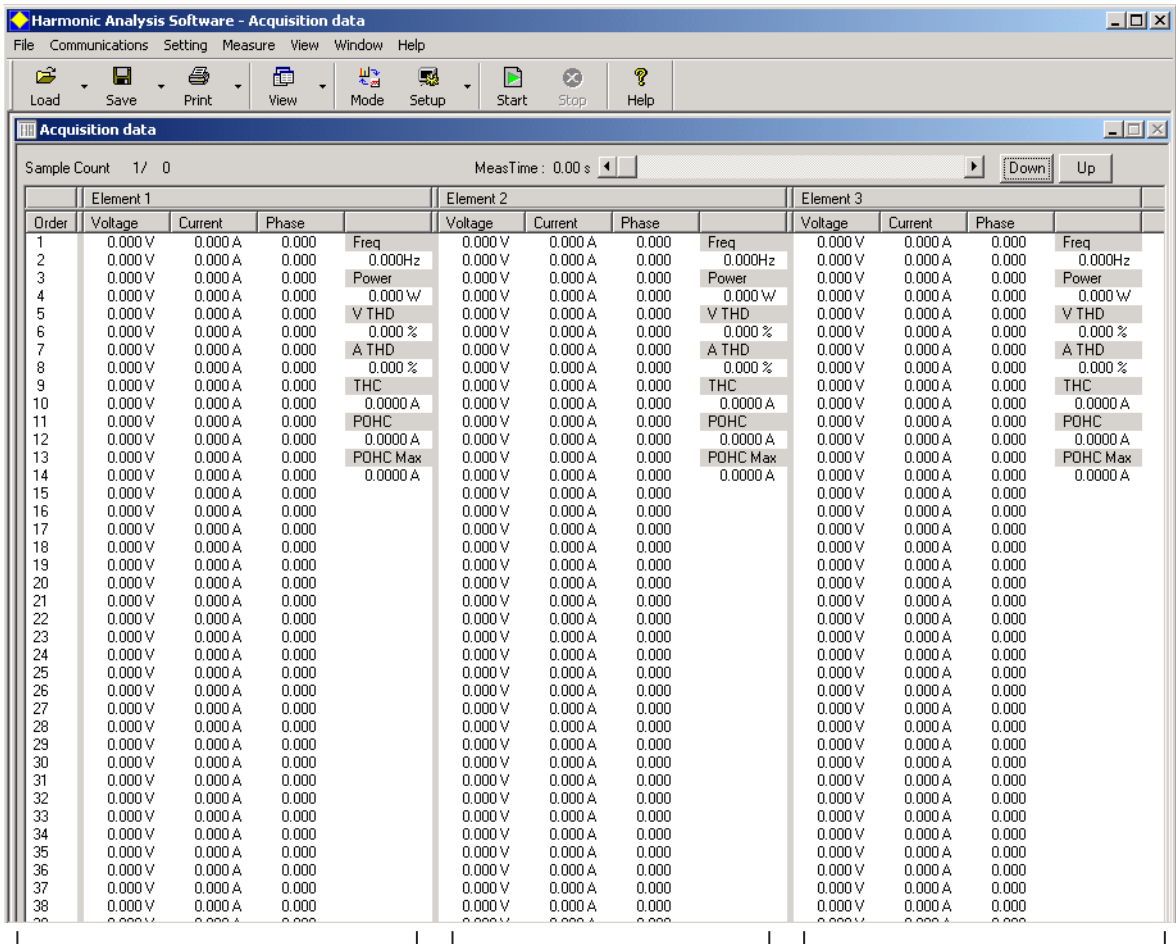
- The measurement data, waveform data, and setup information saved in section 6.1 can be loaded.
- Measured data can be loaded when the measurement mode is set to Harmonic Measurement.
- When one of the files with .bt1, .bt2, .bt3, and .bt4 extension is selected in the Open dialog box and loaded, the data of all the files with the same file name in the same directory is loaded. See the following table.

	Data Type	Extension
WT2000	Measured data of input element 1	.bt1
	Measured data of input element 2	.bt2
	Measured data of input element 3	.bt3
	Measured data common to all input elements	.bt4
	Waveform data of input element 1	.bw1
	Waveform data of input element 2	.bw2
	Waveform data of input element 3	.bw3

3.10 Loading Setup Information, Measured Data, and Waveform Data

Data Type	Extension
WT1600*	Measured data on the left side of the acquisition data window .bt1
	Measured data in the center of the acquisition data window .bt2
	Measured data on the right of the acquisition data window .bt3
	Measured data common to all input elements .bt4
	Waveform data on the left side of the acquisition data window .bw1
	Waveform data in the center of the acquisition data window .bw2
	Waveform data on the right side of the acquisition data window .bw3
	Harmonic measurement conditions of the WT .inf
	<ul style="list-style-type: none"> If the communication mode is On-Line, the harmonic measurement conditions of the loaded file are applied to "WT Setting" (chapter 8) of the software and transmitted to the WT. If the transmitted harmonic measurement conditions do not match the configuration of the WT, an error message appears. Check the configuration of the connected WT. If the communication mode is Off-Line, the harmonic measurement conditions of the loaded file are applied to "WT Setting" of the software, but not transmitted to the WT. If the mode is switched from Off-Line to On-Line, the harmonic measurement conditions is loaded from the WT into the software.
	Setup information of specifications, evaluation, etc. .cfg
	Same data as those described in "Setup Information" above.

* : For WT1600



Left side of the acquisition data window
Of the elements displayed here:
Measured Data .bt1
Waveform data .bw1

Center of the acquisition data window
Of the elements displayed here:
Measured Data .bt2
Waveform data .bw2

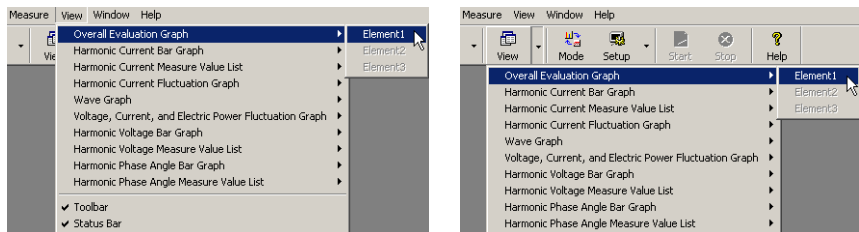
Right side of the acquisition data window
Of the elements displayed here:
Measured Data .bt3
Waveform data .bw3

4.1 Displaying the Evaluation Results over the Entire Measurement Time

Procedure

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The evaluation of whether the results are within the limits of the applicable standard are made by considering all the input elements specified in the WT wiring system. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1φ2W, indication on the front panel varies depending on the model) and one input element is used.

1. From the **View** menu, point to **Overall Evaluation Graph** then choose **Element1**. The Overall Evaluation Graph (Element 1) window opens. You can also choose **View > Overall Evaluation Graph > Element1** from the toolbar.



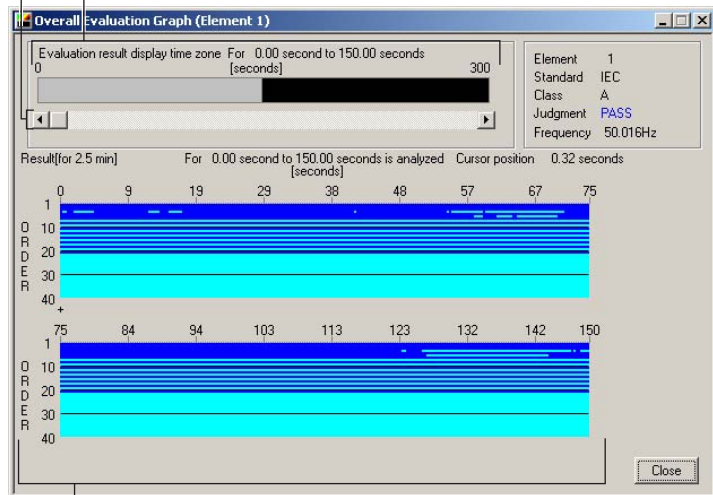
2. Use the scroll bar to set the time zone to be displayed. The evaluation graph of the specified time zone is displayed.

Scroll bar

Drag the (slider) or click to select the time zone you wish to display. The time zone of the evaluation graph changes in sync with the slider position. Active when the measurement time is greater than 150 s.

Display range bar

Displays the position of the time zone specified with the scroll bar with respect to the measurement time.



Evaluation graph

Of the measured date, the evaluation results over the time span of 150 s are displayed. The bars of each order are displayed using different colors depending on the result. If you change the time zone to be displayed using the display range bar, the time zone displayed on the evaluation graph changes accordingly. The time span of the evaluation graph, 150 s, does not change.

4.1 Displaying the Evaluation Results over the Entire Measurement Time




Explanation

Evaluation can be made as to whether all of the harmonic measurement data in the measurement time are within the limits according to the settings specified in section 3.6 “Setting the Standard and Measurement Environment,” and the results can be displayed collectively.

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The evaluation of whether the results are within the limits of the applicable standard are made by considering all the input elements specified in the WT wiring system.

• Overall Evaluation Graph Window

Scroll bar

Drag the  (slider) or click   to select the time zone you wish to display. The time zone of the evaluation graph changes in sync with the slider position. Active when the measurement time is greater than 150 s.

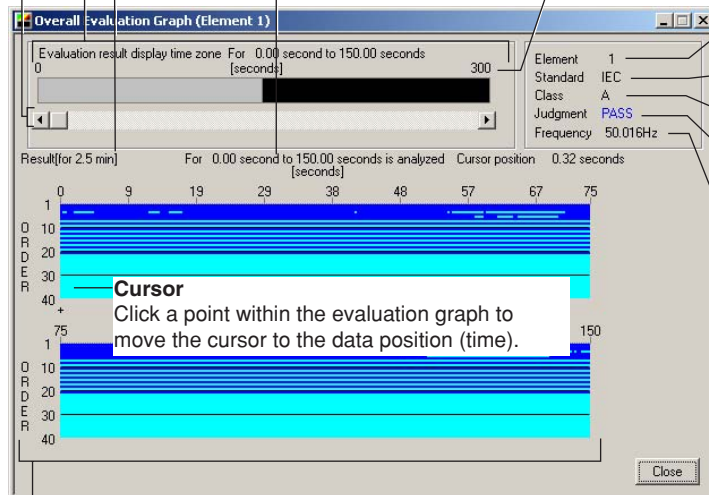
Display range bar

Displays the position of the time zone specified with the scroll bar with respect to the measurement time.

Measurement time (setting value)

Time zone of the evaluation graph

Measurement time



Number of the input element being displayed

In this example, input element 1 is being evaluated.

Applicable standard

This software can make evaluations according to the IEC standard.

Class

Indicates the class of equipment as specified by the applicable standard.

Judgment

If evaluation of all the data points over the measurement time is blue, bright green, turquoise, or aqua as described on the next page, PASS is indicated. If the evaluation of any data point is yellow, orange, pink, or red, FAIL is indicated.

Fundamental frequency of the PLL source (average)

Displays the average fundamental frequency of the PLL source of the measured data.

Evaluation graph

Of the measured data, the evaluation results over the time span of 150 s (2.5 minutes) are displayed. The bars of each order are displayed using different colors depending on the result. If you change the time zone to be displayed using the display range bar, the time zone displayed on the evaluation graph changes accordingly. The time span of the evaluation graph, 150 s, does not change.

Evaluation Colors

The meaning of the evaluation colors indicated in the evaluation graph is shown in the following table. Below are the conditions of Condition 1, Condition 2, and Relaxation Condition.

- **Condition 1**
The maximum harmonic current over the measurement time is within 1.5 times the specified limit. Evaluation is made on each order.
- **Condition 2**
The mean harmonic current over the measurement time is within the specified limit. Evaluation is made on each order.
- **Relaxation Condition**
If the maximum value of the sum of partial odd harmonic currents (POHC) of order above and including 21 is less than the specified POHC limit, the mean of the odd harmonic currents of order above and including 21 is permitted to be 1.5 times the specified limit.

Blue
Both Conditions 1 and 2 are met. Or, no applicable limits are specified.
(If no applicable limits are specified, white is displayed only for the bar graph display described in section 4.2.)

Bright green

- Condition 1 is met.
- Condition 2 is not met.
- Relaxation Condition is met.

Yellow

- Condition 1 is met.
- Condition 2 is not met.
- Relaxation Condition is not met.

Orange

- Condition 1 is not met.
- Condition 2 is met.

Pink

- Condition 1 is not met.
- Condition 2 is not met.
- Relaxation Condition is met.

Red
None of Condition 1, 2, and Relaxation Condition is met.

Turquoise
The measured data is less than the larger of the two values, 0.6% of the mean rms current and 5 mA.

Aqua

- None of Condition 1, 2, and Relaxation Condition is met.
- Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the evaluation colors.

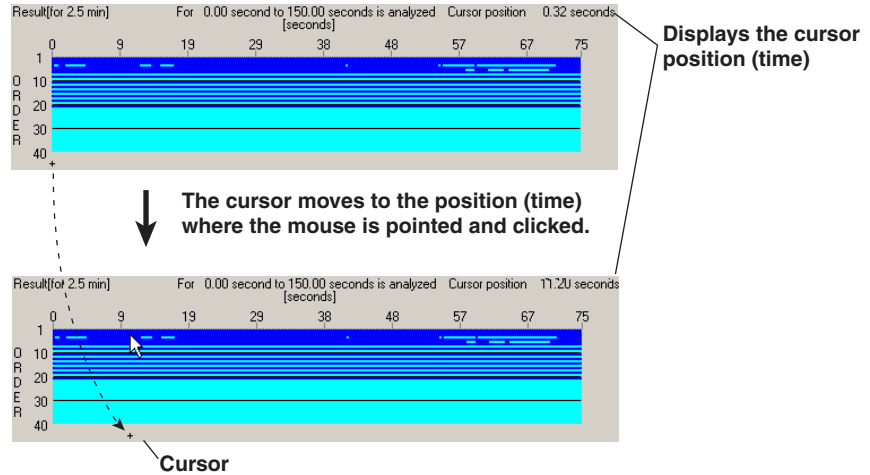
If the evaluation of all the data points over the measurement time is blue, bright green, turquoise, or aqua, Judgment on the Overall Evaluation Graph window indicates PASS. If the evaluation of any data point is yellow, orange, pink, or red, Judgment indicates FAIL.

4.1 Displaying the Evaluation Results over the Entire Measurement Time

Convenient Way of Using the Overall Evaluation Graph

You can select a section of the measured data of interest on the Overall Evaluation Graph and display the instantaneous values on a bar graph or in a list. Below is an example for displaying a bar graph of the harmonic current of input element 1.

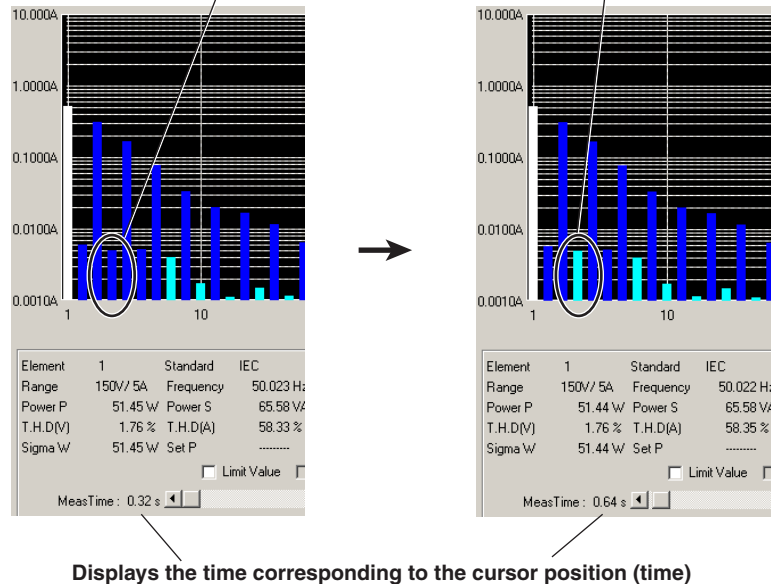
1. On the Overall Evaluation Graph, click the section of interest using the mouse. The cursor moves to the data position (time) that was clicked.



2. From the menu, choose **View > Harmonic Current Bar Graph > Instant Value > Element1**. The instantaneous values of the harmonic currents at the cursor position (time) are displayed on a bar graph.

For a detailed description of the bar graph, see section 4.2.

The section where the level of the harmonic component of order 4 differs and the Judgment changes from blue to turquoise



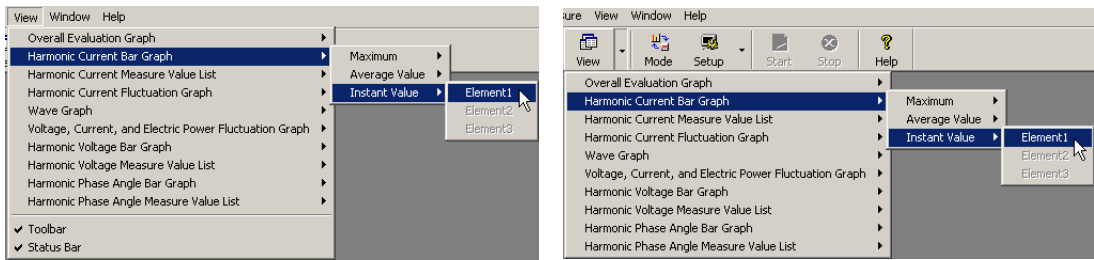
4.2 Displaying the Bar Graph of Harmonic Current/Voltage

Procedure

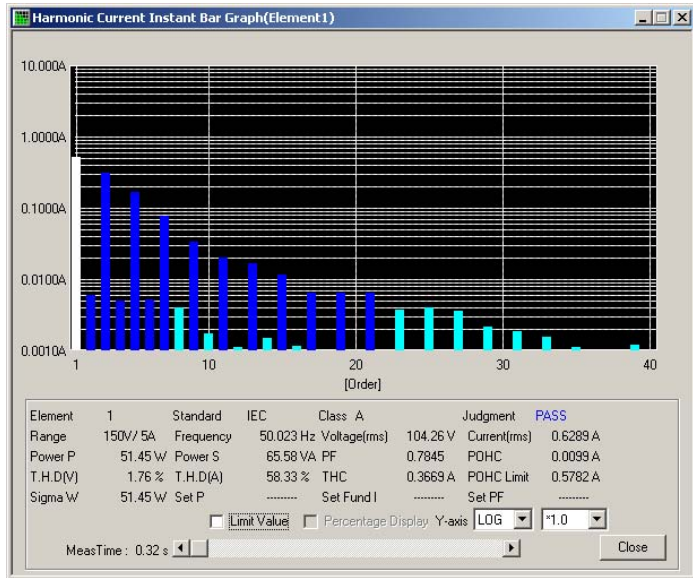
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The evaluation of whether the results are within the limits of the applicable standard are made by considering all the input elements specified in the WT wiring system. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1φ2W, indication on the front panel varies depending on the model) and one input element is used.

Displaying the Bar Graph of Harmonic Current

From the **View** menu, point to **Harmonic Current Bar Graph** then point to **Maximum**, **Average Value**, or **Instant Value**, and then choose **Element1**. The Harmonic Current Bar Graph (Element 1) window opens. You can also select **View > Harmonic Current Bar Graph > Maximum**, **Average Value**, or **Instant Value > Element1** from the toolbar.



Display Example: Harmonic Current Instant Bar Graph (Element 1)

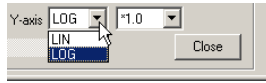


4.2 Displaying the Bar Graph of Harmonic Current/Voltage

Selecting the Y-Axis (Current Magnitude) Scale

- **Selecting the Type of Y-Axis Scale**

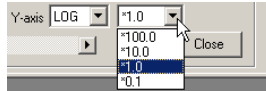
Select **LIN** (linear) or **LOG** (logarithmic).



- **Selecting the Magnification**

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.

When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



- **Enabling Percentage Display**

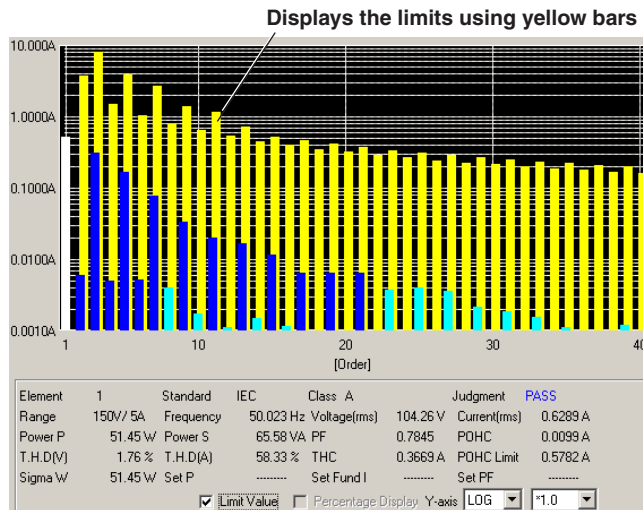
Select the **Percentage Display** check box. Y-axis scale, THC, POHC, POHC maximum and POHC limit are displayed in percentages. The relative harmonic content of current of each order can be displayed on bar graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

Note

The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits.

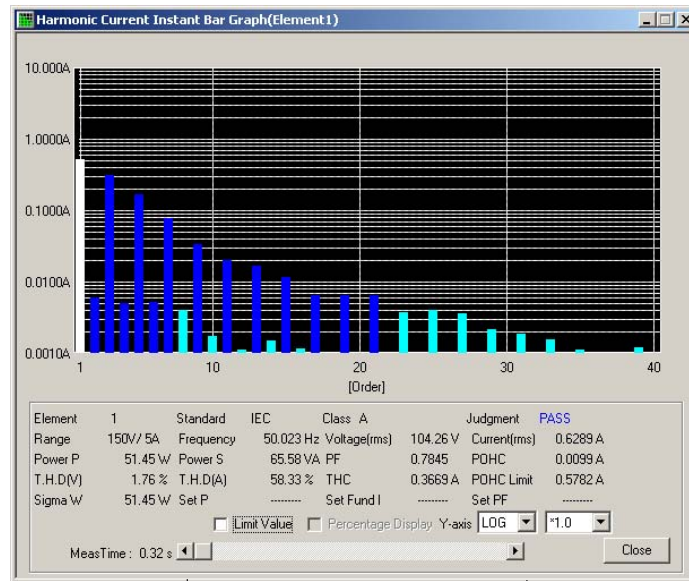
Displaying the Limits

Select the **Limit Value** check box. The limits specified in the applicable standard are displayed using yellow bars for each order.



Selecting the Instantaneous Values

On the Harmonic Current Instant Bar Graph window, use the scroll bar to select the instantaneous value to be displayed.

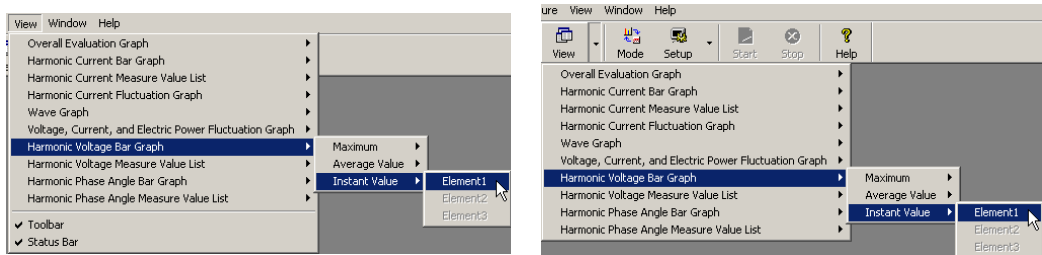


Scroll bar

Drag the (slider) or click to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Displaying the Bar Graph of Harmonic Voltage

From the **View** menu, point to **Harmonic Voltage Bar Graph** then point to **Maximum, Average Value, or Instant Value**, and then choose **Element1**. The Harmonic Voltage Bar Graph (Element 1) window opens. You can also select **View > Harmonic Voltage Bar Graph > Maximum, Average Value, or Instant Value > Element1** from the toolbar.



The operations on the Harmonic Voltage Bar Graph window are the same as the operations on the Harmonic Current Bar Graph window. However, because the voltage does not need to be compared and evaluated against the limit, operations for percentage display and limit display are not present. Judgment is not displayed.

4.2 Displaying the Bar Graph of Harmonic Current/Voltage

Explanation

Evaluation can be made as to whether all of the harmonic data in the measurement time are within the limits according to the settings specified in section 3.6 "Setting the Standard and Measurement Environment," and the results can be displayed on bar graphs.

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The evaluation of whether the results are within the limits of the applicable standard are made by considering all the input elements specified in the WT wiring system.

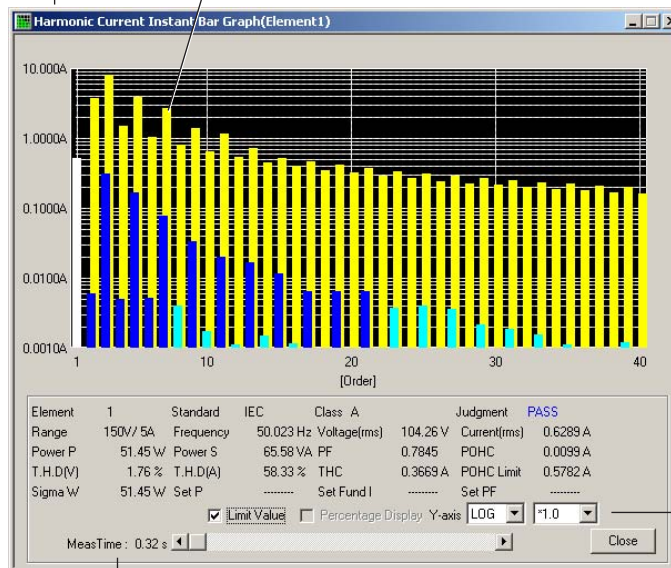
Here, explanation is given for the bar graph of harmonic current. In the case of the bar graph of harmonic voltage, read "harmonic current" as "harmonic voltage" in the following explanation. However, because the voltage does not need to be compared and evaluated against the limit, the explanation of percentage display and limit display are not applicable.

Harmonic Current Bar Graph Window

Window title

The title is "Harmonic Current Maximum Bar Graph" when the window displays the maximum values of the harmonic current, "Harmonic Current Average Bar Graph" when the window displays the averages, and "Harmonic Current Instant Bar Graph" when the instantaneous values.

Displays the limits using yellow bars



Select the Y-axis scale

Scroll bar (not displayed for maximum and average.)

Drag the (slider) or click to select the instantaneous value you wish to display. Meas Time changes in sync with the slider

Meas Time (not displayed for maximum and average.)

Indicates the time when the measured data was retrieved. This example indicates the time (0.32 s) when the first measured data was retrieved.

- **Element**
Number of the input element being displayed. In this example, input element 1 is being displayed.
- **Standard**
Applicable standard. This software can make evaluations according to the IEC standard.
- **Class**
Class of equipment under evaluation Indicates the class of equipment as specified by the applicable standard.
- **Judgment**
If evaluation of all the data points over the measurement time is blue, bright green, turquoise, or aqua as described on page 4-3, PASS is indicated. If the evaluation of any data point is yellow, orange, pink, or red, FAIL is indicated.

- **Range**

Measurement range selected in the WT configuration (see chapter 8).

- **Frequency**

Fundamental frequency of the PLL source.

- In the case of the Harmonic Current Maximum Bar Graph (or list), the frequency at which the harmonic current measurement data is maximum within the measurement time (fundamental frequency of the PLL source) is indicated.
- In the case of the Harmonic Current Average Bar Graph (or list), the average value of all frequencies (fundamental frequency of the PLL source) within the measurement time is indicated.
- In the case of the Harmonic Current Instant Bar Graph (or list), the frequency of the individual measurement data point within the measurement time (fundamental frequency of the PLL source) is indicated.

- **Voltage (rms)**

$$\sqrt{\sum_{k=1}^{40} U(k)^2}$$

U(k): rms voltage of each order, k: harmonic order

- **Current (rms)**

$$\sqrt{\sum_{k=1}^{40} I(k)^2}$$

I(k): rms current of each order, k: harmonic order

- **Power P**

$$\sum_{k=1}^{40} P(k)$$

P(k): active power of each order, k: harmonic order

- **Power S**

Voltage (rms) × current (rms)

- **PF**

$$\frac{\text{Active power}}{\text{Apparent power}} \times 100$$

For multi-phase equipment, the power factor is derived from the active power and apparent power of all phases. The computing equation of the active power and apparent power of all phases varies depending on the wiring system (see the next page).

- **V THD**

$$\frac{\sqrt{\sum_{k=2}^{40} U(k)^2}}{U(1)} \times 100$$

U(k): rms voltage of each order, k: harmonic order, U(1): rms voltage of the fundamental signal

- **A THD**

$$\frac{\sqrt{\sum_{k=2}^{40} I(k)^2}}{I(1)} \times 100$$

I(K): rms current of each order, k: harmonic order, I(1): rms current of the fundamental signal

- **THC**

$$\sqrt{\sum_{k=2}^{40} I(k)^2}$$

I(k): rms current of each order, k: harmonic order

- **POHC**

Displayed on Instant Bar Graph (or list).

$$\sqrt{\sum_{k=21, 23}^{39} I(k)^2}$$

I(k): rms current of odd harmonics above and including order 21, k: harmonic order, odd value above and including 21

4.2 Displaying the Bar Graph of Harmonic Current/Voltage

- **POHC Max**

Displayed on Maximum and Average Bar Graphs (or lists). POHC maximum derived from individual measured data points within the measurement time. If this value is less than the POHC Limit, the relaxation condition (see page 4-3) is applied.

- **POHC Limit**

$$\sqrt{\sum_{k=21, 23}^{39} I_L(k)^2}$$

$I_L(k)$: Limits of even harmonics above and including 21 as specified by the applicable standard

k: harmonic order, odd value above and including 21

- **Sigma W**

The computing equation of the active power of all phases, Sigma W, varies depending on the wiring system.

WT2000

Wiring System	Sigma W Equation	Apparent Power of All Phases
1P2W (1 ϕ 2W)	Active power of each input element	Apparent power of each input element
1P3W (1 ϕ 3W)	$W1+W3$	$VA1+VA3$
3P3W(3 ϕ 3W)	$W1+W3$	$(VA1+VA3) \times \sqrt{3}/2$
3V3A	$W1+W3$	$(VA1+VA2+VA3) \times \sqrt{3}/3$
3P4W(3 ϕ 4W)	$W1+W2+W3$	$VA1+VA2+VA3$

* $W1$, $W2$, and $W3$ are active powers of input elements 1, 2, and 3, respectively (see the active power section on the previous page). $VA1$, $VA2$, and $VA3$ are apparent powers of input elements 1, 2, and 3, respectively.

WT1600

Wiring System	Sigma W Equation	Apparent Power of All Phases
1P2W	Active power of each input element	Apparent power of each input element
1P3W	$W1+W2$	$VA1+VA2$
3P3W	$W1+W2$	$(VA1+VA2) \times \sqrt{3}/2$
3V3A	$W1+W2$	$(VA1+VA2+VA3) \times \sqrt{3}/3$
3P4W	$W1+W2+W3$	$VA1+VA2+VA3$

* $W1$, $W2$, and $W3$ are the active power values displayed in the corresponding position in the acquisition data window. $VA1$, $VA2$, and $VA3$ are the apparent power values displayed in the corresponding position in the acquisition data window.

Note

- When applying the power ratio limit on Class C or D multi-phase equipment, the harmonic current per watt derived from the total active power (Sigma W) of all phases (three phases if three-phase) and the power ratio limit are compared and evaluated.
- Equipment whose Sigma W exceeds 600 W is considered Class A equipment under the standard. Use caution because the software makes evaluations using the class selected in standard and measurement environment settings (see section 3.6).

- **Set P, Set Fund I, and Set PF**

For Set P, the power value (see section 3.6) specified in advance is displayed when making Class C or D evaluations.

For Set Fund I and Set PF, the fundamental current and power factor values (see section 3.6) specified in advance are displayed respectively when making Class C evaluations.

Note

If the Percentage Display check box is selected, the Y-axis scale, THC, POHC, POHC maximum and POHC limit are displayed in percentages.

Displaying the Limits

- If the Limit Value check box is selected, the limits specified in the applicable standard are displayed using yellow bars for each order.
- The limits are applied only to harmonic current.

- When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, bars of magnitude corresponding to the current values converted from the relative harmonic content of order 3 and 5 with the fundamental current specified in advance (see section 3.6) taken to be 100% are displayed.

Bar Graph Type and Displayed Contents

Three types of harmonic current bar graphs are available: maximum bar graph, average bar graph, and instantaneous bar graph. The meanings of the displayed items which vary depending on the bar graph are explained below.

• Items Displayed on the Maximum Bar Graph

- Bar displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement are compared, and the maximum value is displayed.
- Items displayed at the bottom section of the bar graph
The items described on pages 4-8 and 4-10 are displayed.
For each item, the values derived from individual measured data points (instantaneous values) within the measurement are compared, and the maximum value is displayed.
- Limit bar
Yellow bars that are 1.5 times the magnitude of the limits specified by the applicable standard are displayed.

• Items Displayed on the Average Bar Graph

- Bar displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement are averaged, and the average value is displayed.
- Measurement items displayed at the bottom section of the bar graph
The items described on pages 4-8 and 4-10 are displayed.
For each item, the values derived from individual measured data points (instantaneous values) within the measurement are averaged, and the average value is displayed.
- Limit bar
Yellow bars that correspond to the magnitude of the limits specified by the applicable standard are displayed.

• Items Displayed on the Instantaneous Bar Graph

- Bar displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement time are displayed.
- Measurement items displayed at the bottom section of the bar graph
The items described on pages 4-8 and 4-10 are displayed.
Values derived from individual measured data points within the measurement time are displayed.
- Limit bar
Yellow bars that are 1.5 times the magnitude of the limits specified by the applicable standard are displayed.
- Instantaneous values
You can use the scroll bar to select the instantaneous values to be displayed.

Selecting the Y-Axis (Current Magnitude) Scale

• Type of Y-Axis Scale

You can select LIN (linear) or LOG (logarithmic).

• Selecting the Magnification

When the type of scale is LIN, you can select *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, or *0.1.

When the type of scale is LOG, you can select *100.0, *10.0, *1.0, or *0.1.

4.2 Displaying the Bar Graph of Harmonic Current/Voltage








- When set to *1.0, the maximum value of the Y-axis LIN scale is the value of the measurement range selected in the WT configuration (see chapter 8). The maximum value of the LOG scale is one digit above the measurement range, value that is 10 to an integer power.
- If Auto range is selected in the WT configuration, the maximum value of the LIN or LOG scale is determined using the same principle described above using the measurement range of the WT that was used when measurement was made as a reference.
- **Percentage Display**

If the Percentage Display check box is selected, the Y-axis scale, THC, POHC, POHC maximum and POHC limit can be displayed in percentages. The relative harmonic content of current of each order can be displayed on bar graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

 - When the magnification of the Y-axis scale is *1.0, the maximum scale of Y-axis is 100.00%.
 - The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits (see section 1.3).
 - The percentage display is applied only to harmonic current.
 - When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, bars corresponding to the magnitude of the values are displayed.

Color of Bars

The bar graph that is displayed for each order is displayed using a length converted from the magnitude of the measured data. The meaning of the colors is indicated in the following table.

 Blue	Limit not exceeded.
 Bright green (applies only to average bar graph)	When the same conditions of bright green on page 4-3 applies.
 Red	Limit exceeded.
 White	No applicable limit is specified. (The bar graph of the fundamental frequency and orders that are not applicable is displayed in white.)
 Yellow	Limit specified by the applicable standard.
 Turquoise	The measured data is less than the larger of the two values, 0.6% of the mean rms current and 5 mA.
 Aqua	<ul style="list-style-type: none">• Limit exceeded.• Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Bar graphs of harmonic voltage are displayed in white. Harmonic voltage does not need to be compared and evaluated against the limit.

Mutual Relationship of Graphs and Lists

When using the scroll bar to select the time of acquisition and displaying the measured data on a graph window or list window displaying a certain instantaneous value, the other graph window or list window also shows the measured data at the same time of acquisition.

4.3 Displaying the List of Harmonic Current/Voltage

Enabling Percentage Display

Select the **Percentage Display** check box. Measured value, limit, THC, POHC, POHC maximum and POHC limit are displayed in percentages. The relative harmonic content of current of each order can be displayed in the Measure and Limit columns with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

Note




The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits.

Selecting the Instantaneous Value

On the Harmonic Current Measure Value List window, you can use the scroll bar to select the instantaneous values to be displayed.

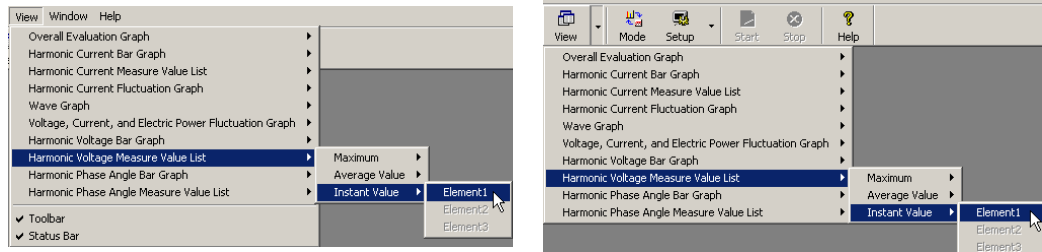
Order	Measure [A]	Limit [A]	Margin [%]
1	0.5108		
2	0.0060	3.7260	99.8
3	0.3155	7.9350	96.0
4	0.0051	1.4835	99.7
5	0.1641	3.9330	95.8
6	0.0052	1.0350	99.5
7	0.0766	2.6565	97.1
8	0.0040	0.7935	99.5
9	0.0336	1.3800	97.6
10	0.0018	0.6348	99.7
11	0.0198	1.1385	98.3
12	0.0011	0.5290	99.8
13	0.0169	0.7245	97.7
14	0.0015	0.4534	99.7
15	0.0114	0.5175	97.8
16	0.0012	0.3967	99.7
17	0.0064	0.4566	98.6
18	0.0010	0.3527	99.7
19	0.0064	0.4086	98.4
20	0.0004	0.3174	99.9
21	0.0063	0.3696	98.3
22	0.0006	0.2885	99.8
23	0.0037	0.3375	98.9
24	0.0007	0.2645	99.8
25	0.0040	0.3105	98.7
26	0.0002	0.2442	99.9
27	0.0036	0.2875	98.7
28	0.0005	0.2267	99.8
29	0.0022	0.2677	99.2
30	0.0006	0.2116	99.7
31	0.0019	0.2504	99.2
32	0.0004	0.1984	99.8
33	0.0016	0.2352	99.3
34	0.0003	0.1867	99.8
35	0.0011	0.2218	99.5
36	0.0003	0.1763	99.8
37	0.0010	0.2098	99.5
38	0.0003	0.1671	99.8
39	0.0012	0.1990	99.4
40	0.0002	0.1587	99.8

Scroll bar

Drag the  (slider) or click   to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Displaying the List of Harmonic Voltage

From the **View** menu, point to **Harmonic Voltage Measure Value List** then point to **Maximum**, **Average Value**, or **Instant Value**, and then choose **Element1**. The Harmonic Voltage List (Element 1) window opens. You can also select **View > Harmonic Voltage Measure Value List > Maximum**, **Average Value**, or **Instant Value > Element1** from the toolbar.



The operations on the Harmonic Voltage List window are the same as the operations on the Harmonic Current List window. However, because the voltage does not need to be compared and evaluated against the limit, operations for percentage display are not present. Judgment, limit, and margin are not displayed.

4.3 Displaying the List of Harmonic Current/Voltage

Explanation

Evaluation can be made as to whether all of the harmonic data in the measurement time are within the limits according to the settings specified in section 3.6 “Setting the Standard and Measurement Environment,” and the results can be displayed in a list.

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The evaluation of whether the results are within the limits of the applicable standard are made by considering all the input elements specified in the WT wiring system.

Here, explanation is given for the list of harmonic current. In the case of the list of harmonic voltage, read “harmonic current” as “harmonic voltage” in the following explanation. However, because the voltage does not need to be compared and evaluated against the limit, the explanation of judgment, percentage display, limit, and margin are not applicable.

Harmonic Current List Window

Window title

The title is "Harmonic Current Maximum List" when the window displays the maximum values of the harmonic current, "Harmonic Current Average List" when the window displays the averages, and "Harmonic Current Instant List" when the instantaneous values.

Order	Measure [A]	Limit [A]	Margin [%]
1	0.5108		
2	0.0060	3.7260	99.8
3	0.3155	7.9350	96.0
4	0.0051	1.4835	99.7
5	0.1641	3.9330	95.8
6	0.0052	1.0350	99.5
7	0.0766	2.6565	97.1
8	0.0040	0.7935	99.5
9	0.0336	1.3800	97.6
10	0.0018	0.6348	99.7
11	0.0198	1.1385	98.3
12	0.0011	0.5290	99.8
13	0.0169	0.7245	97.7
14	0.0015	0.4534	99.7
15	0.0114	0.5175	97.8
16	0.0012	0.3967	99.7
17	0.0064	0.4566	98.6
18	0.0010	0.3527	99.7
19	0.0064	0.4086	98.4
20	0.0034	0.3174	99.3
21	0.0063	0.3696	98.3
22	0.0006	0.2885	99.8
23	0.0037	0.3375	99.9
24	0.0007	0.2645	99.8
25	0.0040	0.3105	99.7
26	0.0002	0.2442	99.9
27	0.0036	0.2875	99.7
28	0.0005	0.2267	99.8
29	0.0022	0.2677	99.2
30	0.0006	0.2116	99.7
31	0.0019	0.2504	99.2
32	0.0004	0.1994	99.8
33	0.0016	0.2352	99.3
34	0.0003	0.1867	99.8
35	0.0011	0.2218	99.5
36	0.0003	0.1763	99.8
37	0.0010	0.2098	99.5
38	0.0003	0.1671	99.8
39	0.0012	0.1990	99.4
40	0.0002	0.1587	99.8

Scroll bar (not displayed for maximum and average.)

Drag the (slider) or click to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Meas Time (not displayed for maximum and average.)

Indicates the time when the measured data was retrieved. This example indicates the time (0.32 s) when the first measured data was retrieved.

For a description of the items from Element to Set PF in the list window, see the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/Voltage” (page 4-8).

Limit

- The limits specified in the applicable standard are displayed in a list for each order.
- The limits are applied only to harmonic current.
- If the Percentage Display check box is selected, the relative harmonic content of the limit of each order can be displayed with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.
- When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, the current value converted from the relative harmonic content of order 3 and 5 with the fundamental current specified in advance (see section 3.6) taken to be 100% is displayed.

Margin

Indicates the margin to the limit. For each order, the margin is derived from the following equation using the limits and measured values displayed in the list.

$$\frac{\text{Limit} - \text{measured value}}{\text{Limit}} \times 100$$

List Type and Displayed Contents

Three types of harmonic current lists are available: maximum list, average list, and instantaneous list. The meanings of the displayed items which vary depending on the list are explained below.

- **Items Displayed on the Maximum List**

- Measured value displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement are compared, and the maximum value is displayed.
- Items displayed in the right column of the list
The items described on pages 4-8 and 4-10 are displayed.
For each item, the values derived from individual measured data points (instantaneous values) within the measurement are compared, and the maximum value is displayed.
- Limit
Indicates values that are 1.5 times the limits specified by the applicable standard.

- **Items Displayed on the Average List**

- Measured value displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement are averaged, and the average value is displayed.
- Items displayed in the right column of the list
The items described on pages 4-8 and 4-10 are displayed.
For each item, the values derived from individual measured data points (instantaneous values) within the measurement are averaged, and the average value is displayed.
- Limit
Indicates the limits specified by the applicable standard.

4.3 Displaying the List of Harmonic Current/Voltage

- **Items Displayed on the Instantaneous List**

- Measured value displayed for each order
For each order, the individual measured data points (instantaneous values) within the measurement time are displayed.
- Items displayed in the right column of the list
The items described on pages 4-8 and 4-10 are displayed.
Values derived from individual measured data points within the measurement time are displayed.
- Limit
Indicates values that are 1.5 times the limits specified by the applicable standard.
- Instantaneous values
You can use the scroll bar to select the instantaneous values to be displayed.







Percentage Display

If the Percentage Display check box is selected, the THC, POHC, POHC maximum and POHC limit can be displayed in percentages. The relative harmonic content of the measured value or limit of each order can be displayed with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

- The Percentage Display check box becomes selectable under given conditions.
The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits (see section 1.3).
- The percentage display is applied only to harmonic current.
- When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, the values are displayed.

Color of Measured Values

The meaning of the colors of the measured values displayed for each order is indicated in the following table.

 Blue	Limit not exceeded.
 Bright green (applies only to average list)	When the same conditions of bright green on page 4-3 applies.
 Red	Limit exceeded.
 Black	No applicable limit is specified. (The measured value of the fundamental frequency and orders that are not applicable is displayed in black.)
 Turquoise	The measured data is less than the larger of the two values, 0.6% of the mean rms current and 5 mA.
 Aqua	<ul style="list-style-type: none">• Limit exceeded.• Excluded from applying the limits because the maximum active power is less than the minimum power (75 W or 50 W) for applying the limits.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

The measured value of harmonic voltage are displayed in black. Harmonic voltage does not need to be compared and evaluated against the limit.

Mutual Relationship of Graphs and Lists

See the explanation in section 4.2, "Displaying the Bar Graph of Harmonic Current/Voltage" (page 4-12).

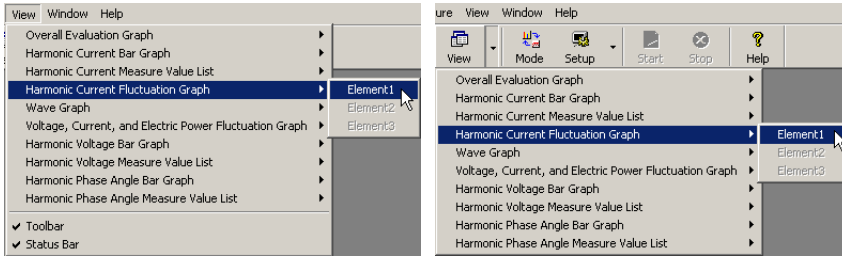
4.4 Displaying the Bar Graph of the Harmonic Current Fluctuation

Procedure

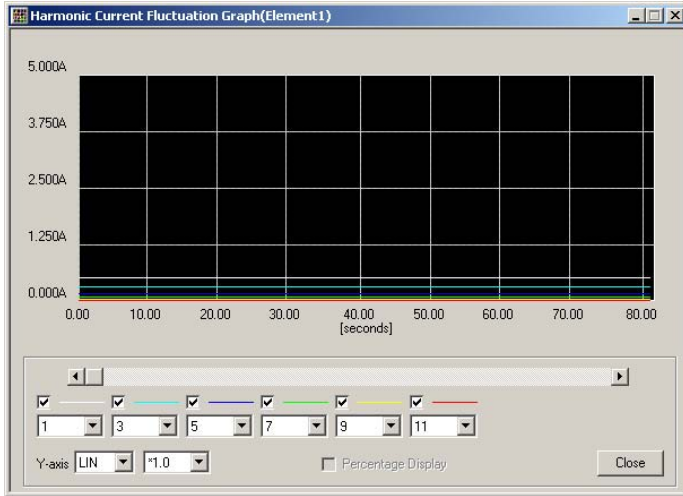
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1φ2W, indication on the front panel varies depending on the model) and one input element is used.

Displaying the Harmonic Current Change Graph Window

From the **View** menu, point to **Harmonic Current Fluctuation Graph** then choose **Element1**. The Harmonic Current Fluctuation Graph (Element 1) window opens. You can also choose **View > Harmonic Current Fluctuation Graph > Element1** from the toolbar.

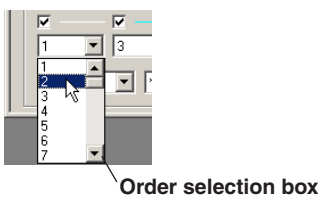


Display Example: Harmonic Current Fluctuation Graph (Element 1)



Selecting the Order of Current to Be Displayed

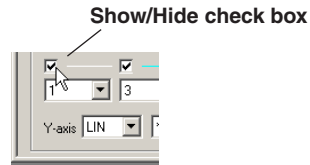
From the order selection box, select a value from 1 to 40 or THC. The maximum number of graph lines that can be displayed is 6.



4.4 Displaying the Bar Graph of the Harmonic Current Fluctuation

Showing/Hiding the Graph

Use the show/hide check box to select whether to show or hide the graph.



Selecting the Y-Axis (Current Magnitude) Scale

- **Selecting the Type of Y-Axis Scale**

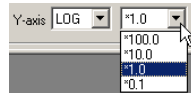
Select **LIN** (linear) or **LOG** (logarithmic).



- **Selecting the Magnification**

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.

When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



- **Enabling Percentage Display**

Select the **Percentage Display** check box. The Y-axis scale is displayed in percentages. The relative harmonic content of current of each order can be displayed on graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

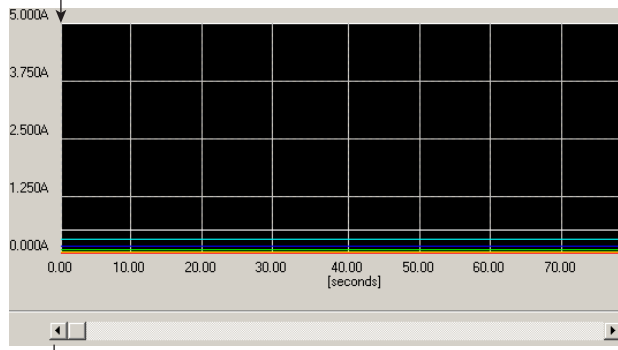
Note

The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits.

Selecting the Time Zone

Use the scroll bar to set the time zone to be displayed. The harmonic current fluctuation graph of the specified time zone is displayed.

The left end position (time) corresponds to the cursor position (time, see page 4-4) of the Overall Evaluation Graph.



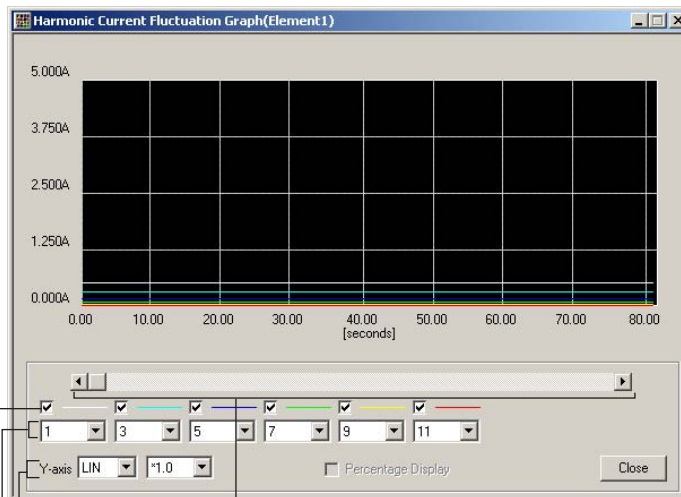
Scroll bar

Drag the (slider) or click to select the time zone you wish to display. The time zone of the graph changes in sync with the slider position.

Explanation

The harmonic current fluctuation over time can be displayed on graphs. The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The bar graph can be displayed for each input element of the WT.

Harmonic Current Fluctuation Graph Window



Select the Y-axis scale

Scroll bar

Drag the (slider) or click to select the time zone you wish to display. The time zone of the graph changes in sync with the slider position.

Order selection box

Show/Hide check box

4.4 Displaying the Bar Graph of the Harmonic Current Fluctuation

Selecting the Order

The maximum number of graph lines that can be displayed is 6. For each graph, you can select which order of harmonic current to be displayed.

Selectable range: 1 to 40 or THC

Selecting Show/Hide

You can select whether to show or hide each graph.

Selecting the Y-Axis (Current Magnitude) Scale

- **Type of Y-Axis Scale**

You can select LIN (linear) or LOG (logarithmic).

- **Selecting the Magnification**

When the type of scale is LIN, you can select *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, or *0.1.

When the scale type is LOG, you can select *100.0, *10.0, *1.0, or *0.1.

- When set to *1.0, the maximum value of the Y-axis LIN scale is the value of the measurement range selected in the WT configuration (see chapter 8). The maximum value of the LOG scale is one digit above the measurement range, and is a value that is an integer power of 10.
- If Auto range is selected in the WT configuration, the maximum value of the LIN or LOG scale is determined based on the same principle described above using the measurement range of the WT that was used when measurement was made as a reference.

- **Percentage Display**

If you select the Percentage Display check box, the Y-axis scale can be displayed in percentages. The change in the relative harmonic content of current of each order can be displayed on graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

- When the magnification of the Y-axis scale is *1.0, the maximum scale of Y-axis is 100.00%.
- The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits (see section 1.3).

Color

The colors of the 6 graphs are as follows:

White, turquoise, blue, bright green, yellow, and red.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Mutual Relationship between the Harmonic Current Change Graph and Measured Value Judging Graph (see section 4.1)

The left end position (time) of the Harmonic Current Change Graph corresponds to the cursor position (time, see page 4-4) of the Measured Value Judging Graph. If you move the cursor on the Measured Value Judging Graph, the time at the cursor position becomes the time at the left end of the Harmonic Current Change Graph.

4.5 Displaying the Voltage/Current Waveforms

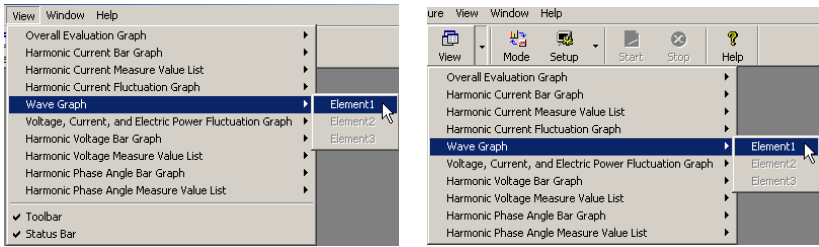
Procedure

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1φ2W, indication on the front panel varies depending on the model) and one input element is used.

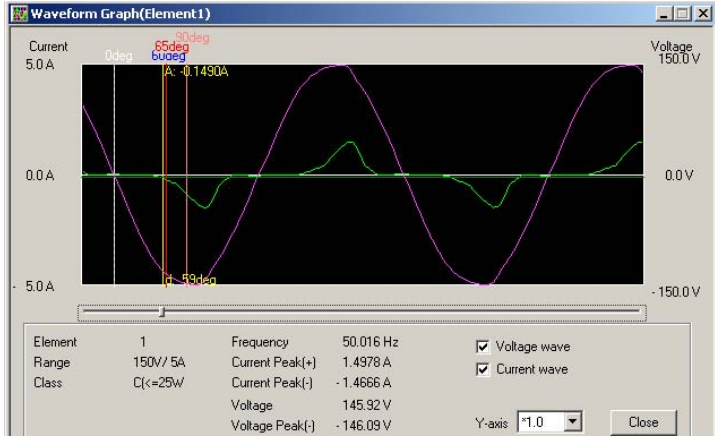
The waveform data retrieved immediately before the measurement was stopped in Harmonic Measurement Mode (see section 3.5) is displayed as voltage or current waveform on the waveform graph.

Displaying Waveforms

From the **View** menu, point to **Wave Graph** then choose **Element1**. The Waveform Graph (Element 1) window opens. You can also choose **View > Wave Graph > Element1** from the toolbar.

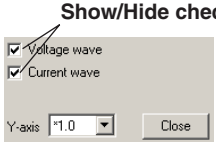


Display Example: Wave Graph (Element 1)



Showing/Hiding Waveforms

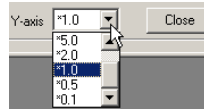
Use the show/hide check box to select whether to show or hide the waveform. The selection can be made for the voltage and current individually.



4.5 Displaying the Voltage/Current Waveforms

Selecting the Magnification of the Y-Axis (Voltage or Current Magnitude) Scale

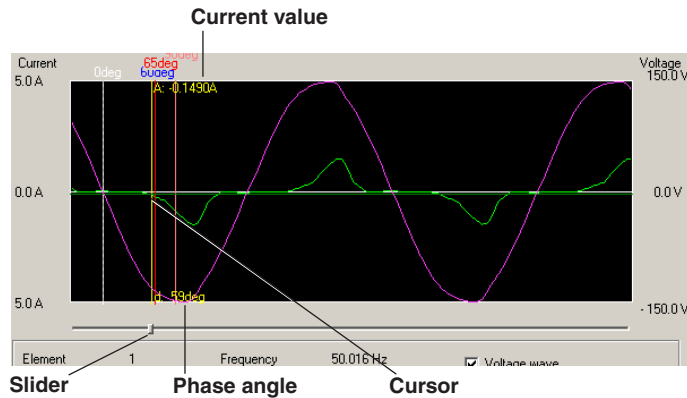
Select a value from *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, and *0.1.



Displaying the Current Value and Phase Angle Using the Cursor

Drag the slider with the mouse to move the cursor. The current value and phase angle at the new cursor position are displayed.

The phase angle is the phase difference with respect to the first zero crossing of the voltage waveform as 0 degrees within the waveform display area.



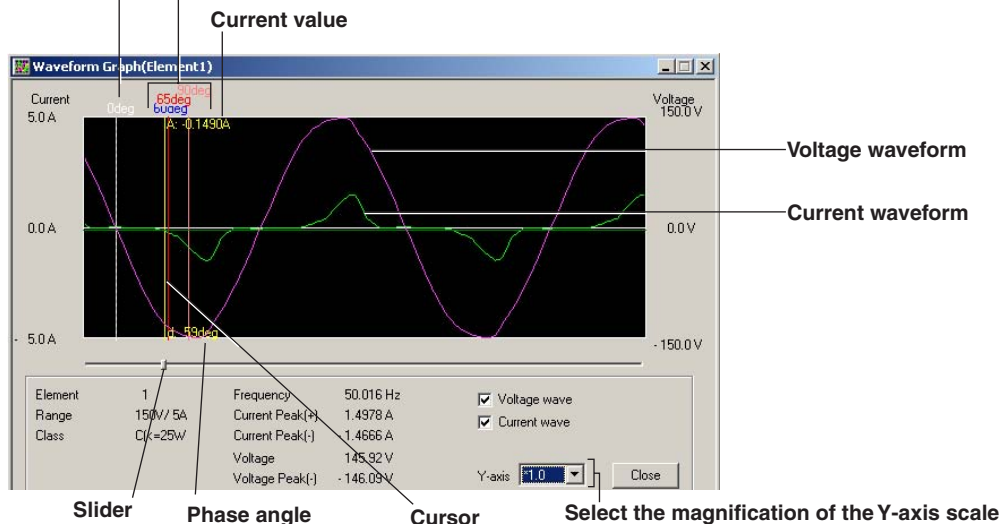
Explanation

The waveform data retrieved immediately before the measurement was stopped in Harmonic Measurement Mode (see section 3.5) is displayed as voltage or current waveform on the waveform graph. The bar graph can be displayed for each input element of the WT. The data is also different from the data displayed in Harmonic Monitor or Waveform Monitor Mode. When evaluating Class C equipment with active input power less than or equal to 25 W using the limits of the harmonics of order 3 and 5, view the waveform data here and check whether the relationship of the voltage and current waveforms is within the limits.

Waveform Graph

First zero crossing point of the voltage waveform

Indicates the position of the phase angles of 60, 65, and 90 degrees, which are used in the evaluation of Class C equipment with active input power less than or equal to 25 W.



- **Element**
Number of the input element under evaluation. In this example, input element 1 is being displayed.
- **Range**
Measurement range selected in the WT configuration (see chapter 8).
- **Class**
Class of the applicable standard.
- **Frequency**
The average value of all frequencies (frequency of the fundamental signal of the PLL source) within the measurement time.
- **Current Peak (+)**
Maximum positive value of the current waveform displayed.
- **Current Peak (-)**
Maximum negative value of the current waveform displayed.
- **Voltage Peak (+)**
Maximum positive value of the voltage waveform displayed.
- **Voltage Peak (-)**
Maximum negative value of the voltage waveform displayed.

Selecting Show/Hide

You can select whether to show or hide the voltage and current individually.

Selecting the Magnification of the Y-Axis (Voltage or Current Magnitude) Scale

- The scale type is fixed to LIN (linear). LOG (logarithmic) scale is not supported.
- You can select the magnification from *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, and *0.1.

Displaying the Current Value and Phase Angle Using the Cursor

When evaluating Class C equipment with active input power less than or equal to 25 W using the limits of the harmonics of order 3 and 5, you can check whether the relationship of the voltage and current waveforms is within the limits.

- You can display the current value and phase angle at the new cursor position.
- The phase angle is the phase difference with respect to the first zero crossing of the voltage waveform (0 degrees) within the waveform display area.
- Fixed vertical lines are displayed at the phase angles 60, 65, and 90 degrees used in the evaluation. You can check the evaluation conditions (see section 1.3) by viewing the fixed lines and the current waveform.

Note

If the PLL frequency differs from the voltage frequency being displayed, for the element, the display may be incorrect since the phase angle value is displayed according to the PLL frequency. Measurements should be taken only when the PLL frequency and voltage frequency are the same.

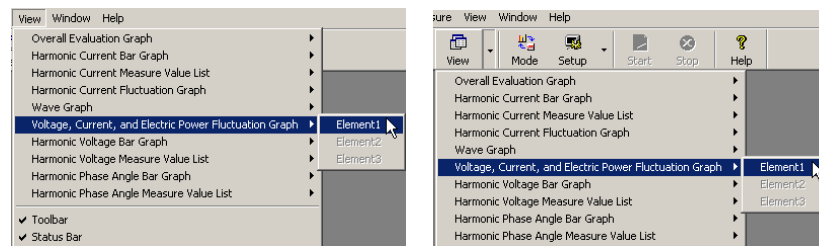
4.6 Displaying the Graph of Voltage, Current, and Power

Procedure

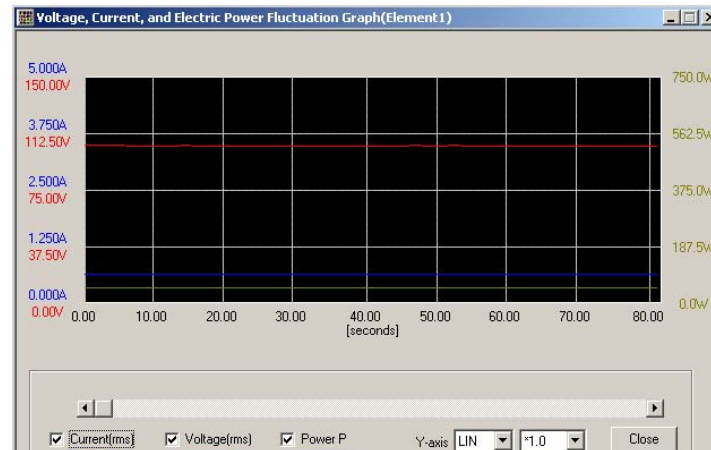
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

Displaying the Voltage, Current, and Power Fluctuation Graph

From the **View** menu, point to **Voltage, Current, and Electric Power Fluctuation Graph**, and then choose **Element1**. The Voltage, Current, Electric Power Fluctuation Graph (Element 1) window opens. You can also choose **View > Voltage, Current, and Electric Power Fluctuation Graph > Element1** from the toolbar.



Display Example: Voltage, Current, and Electric Power Fluctuation Graph (Element 1)



Showing/Hiding the Graph

Use the show/hide check box to select whether to show or hide the waveform. Selection can be made for voltage (rms), current (rms), and active power individually.



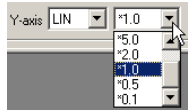
Selecting the Y-Axis (Current Magnitude) Scale

- **Selecting the Type of Y-Axis Scale**
Select **LIN** (linear) or **LOG** (logarithmic).



- **Selecting the Magnification**

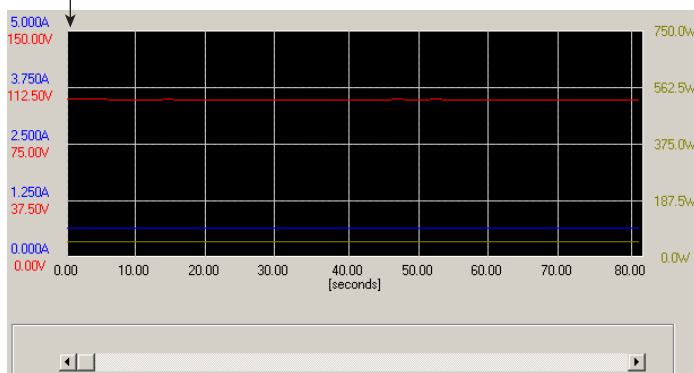
When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.
When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.






Selecting the Time Zone

Use the scroll bar to set the time zone to be displayed. The voltage, current, and electric power fluctuation graph of the specified time zone is displayed.

The left end position (time) corresponds to the cursor position (time, see page 4-4) of the Overall Evaluation Graph.



Scroll bar

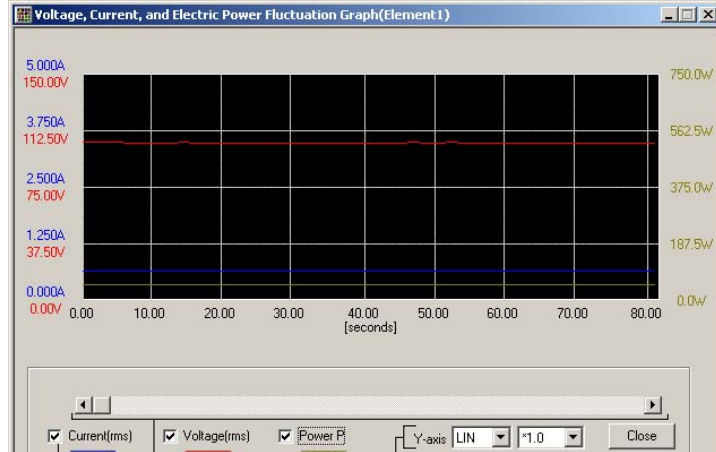
Drag the  (slider) or click   to select the time zone you wish to display. The time zone of the graph changes in sync with the slider position.

4.6 Displaying the Graph of Voltage, Current, and Power

Explanation




The fluctuation of the voltage, current, and power data over time can be displayed on graphs. The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The bar graph can be displayed for each input element of the WT.

Voltage, Current, and Electric Power Fluctuation Graph Window



Select the Y-axis scale

Scroll bar

Drag the  (slider) or click   to select the time zone you wish to display. The time zone of the graph changes in sync with the slider position.

Show/Hide check box

Selecting Show/Hide

You can select whether to show or hide the voltage (rms), current (rms), and active power individually.

Selecting the Y-Axis (Current Magnitude) Scale

• Type of Y-Axis Scale

You can select LIN (linear) or LOG (logarithmic).

• Selecting the Magnification

When the type of scale is LIN, you can select *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, or *0.1.

When the scale type is LOG, you can select *100.0, *10.0, *1.0, or *0.1.

- When set to *1.0, the maximum value of the Y-axis LIN scale is the value of the measurement range selected in the WT configuration (see chapter 8). The maximum value of the LOG scale is one digit above the measurement range, and is a value that is an integer power of 10.
- If Auto range is selected in the WT configuration, the maximum value of the LIN or LOG scale is determined based on the same principle described above using the measurement range of the WT that was used when measurement was made as a reference.

Color

The colors of the voltage (rms), current (rms), and active power graphs are as follows:

■ blue: current (rms), ■ red: voltage (rms), ■ dark yellow: active power

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

Mutual Relationship between the Voltage, Current, and Electric Power Fluctuation Graph and Overall Evaluation Graph (See Section 4.1)

The left end position (time) of the Voltage, Current, and Electric Power Fluctuation Graph corresponds to the cursor position (time, see page 4-4) of the Overall Evaluation Graph. If you move the cursor on the Overall Evaluation Graph, the time at the cursor position becomes the time at the left end of the Voltage, Current, and Electric Power Fluctuation Graph.

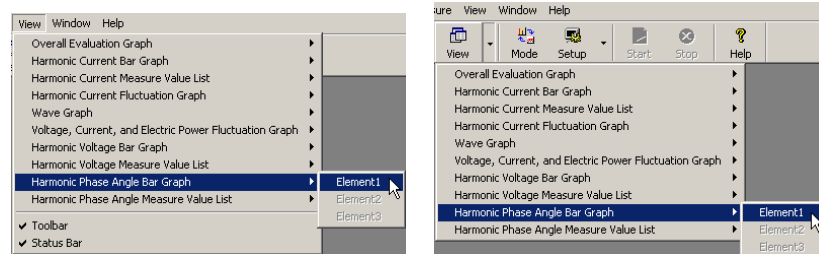
4.7 Displaying the Bar Graph of the Harmonic Phase Angle

Procedure

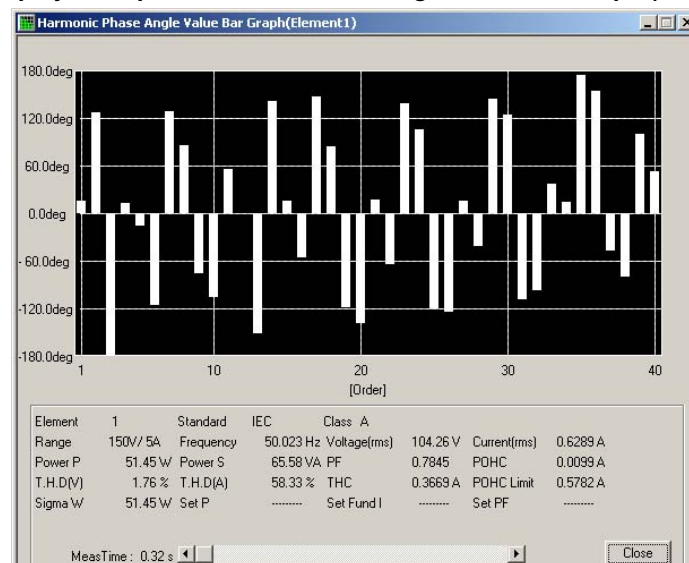
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

Displaying the Bar Graph of the Harmonic Phase Angle

From the **View** menu, point to **Harmonic Phase Angle Bar Graph** then choose **Element1**. The Harmonic Phase Angle Bar Graph (Element 1) window opens. You can also choose **View > Harmonic Phase Angle Bar Graph > Element1** from the toolbar.



Display Example: Harmonic Phase Angle Value Bar Graph (Element 1)






Selecting the Instantaneous Value

On the Harmonic Phase Angle Value Bar Graph window, you can use the scroll bar to select the instantaneous values to be displayed.



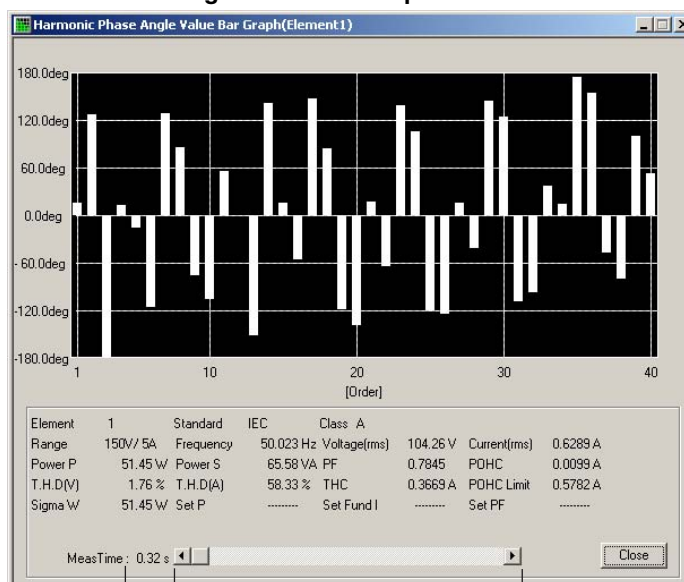
Scroll bar

Drag the  (slider) or click   to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Explanation

You can display the bar graph of the harmonic phase angle. The phase angle is not used to evaluate whether the limits of the applicable standard are met.

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The bar graph can be displayed for each input element of the WT.

Harmonic Phase Angle Value Bar Graph Window**Scroll bar**

Drag the (slider) or click to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Meas Time

Indicates the time when the measured data was retrieved. This example indicates the time (0.32 s) when the first measured data was retrieved.

- Bar graphs of the phase angle of the harmonic current with respect to the fundamental current for each order can be displayed. However, the phase angle with respect to the fundamental voltage is displayed on the bar graph for the fundamental current.
 - When the harmonic phase is leading the fundamental current, a positive phase angle is indicated; when the harmonic phase is lagging the fundamental current, a negative phase angle is indicated.
 - When the fundamental current is leading the fundamental voltage, a negative phase angle is indicated; when the fundamental current is lagging the fundamental voltage, a positive phase angle is indicated.
- For a description of the items from Element to Set PF in the bar graph window, see the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/ Voltage” (page 4-8). However, because the phase angle does not need to be compared and evaluated against the limit, the Judgment item is not present.
- Bar graphs of phase angle are displayed in white.

Mutual Relationship of Graphs and Lists

See the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/ Voltage” (page 4-12).

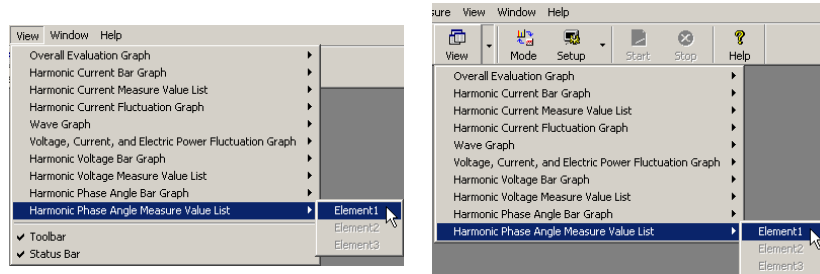
4.8 Displaying the List of the Harmonic Phase Angle

Procedure

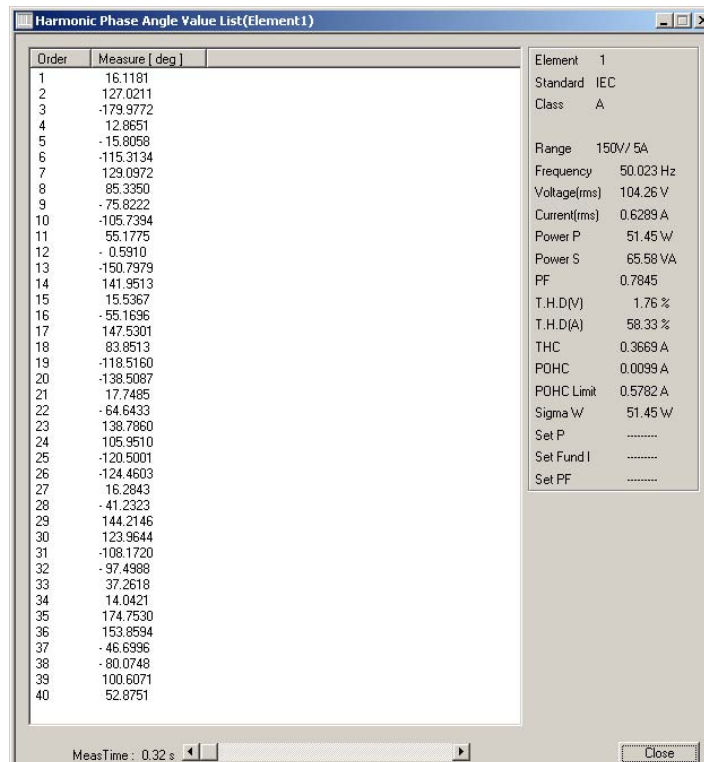
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

Displaying the List of the Harmonic Phase Angle

From the **View** menu, point to **Harmonic Phase Angle Measure Value List** then choose **Element1**. The Harmonic Phase Angle Value List (Element 1) window opens. You can also choose **View > Harmonic Phase Angle Measure Value List > Element1** from the toolbar.



Display Example: Harmonic Phase Angle Measure Value List (Element 1)






Selecting the Instantaneous Value

On the Harmonic Phase Angle Measure Value List window, you can use the scroll bar to select the instantaneous values to be displayed.



Scroll bar

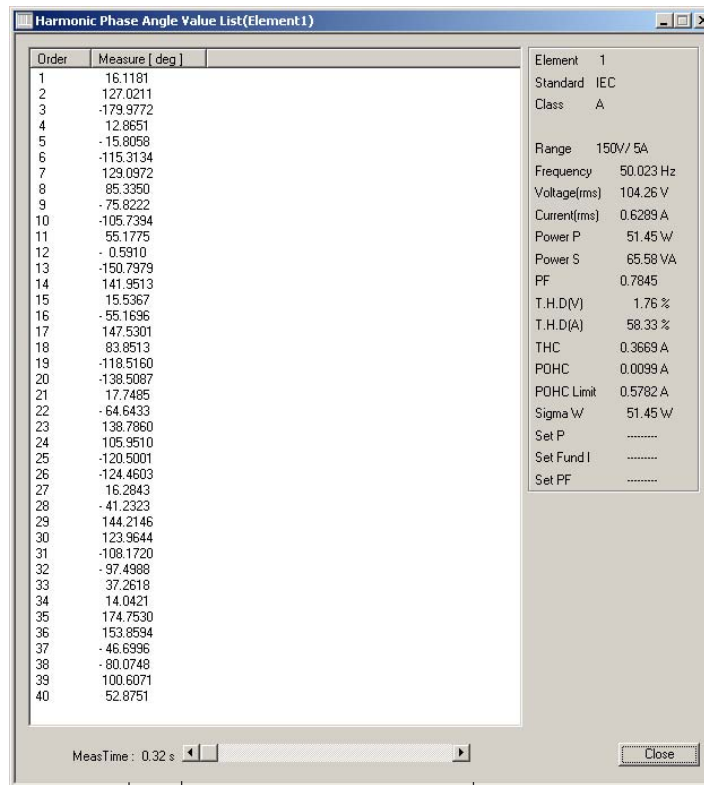
Drag the  (slider) or click   to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Explanation




A List of the harmonic phase angles can be displayed. The phase angle is not used to evaluate whether the limits of the applicable standard are met.

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The list can be displayed for each input element of the WT.

Harmonic Phase Angle Measure Value List Window



Scroll bar

Drag the  (slider) or click   to select the instantaneous value you wish to display. Meas Time changes in sync with the slider position.

Meas Time

Indicates the time when the measured data was retrieved. This example indicates the time (0.32 s) when the first measured data was retrieved.

4.8 Displaying the List of the Harmonic Phase Angle

- A list of the phase angle of the harmonic current with respect to the fundamental current for each order can be displayed. However, the phase angle with respect to the fundamental voltage is displayed in the list for the fundamental current.
- When the harmonic phase is leading the fundamental current, a positive phase angle is indicated; when the harmonic phase is lagging the fundamental current, a negative phase angle is indicated.
- When the fundamental current is leading the fundamental voltage, a negative phase angle is indicated; when the fundamental current is lagging the fundamental voltage, a positive phase angle is indicated.
- For a description of the items from Element to Set PF in the list window, see the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/Voltage” (page 4-8). However, because the phase angle does not need to be compared and evaluated against the limit, the Judgment item is not present.

Mutual Relationship of Graphs and Lists

See the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/Voltage” (page 4-12).


5.1 Monitoring Harmonics

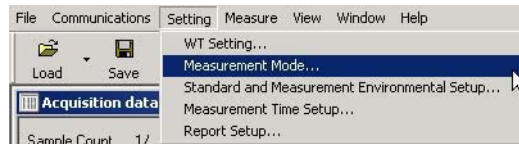
Procedure

The input element on which harmonic monitor is performed varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

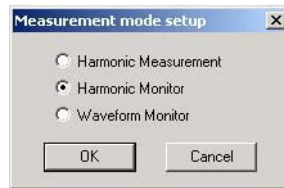
To select the Harmonic Monitor mode used to monitor the fluctuation of the harmonics while making measurements on the WT, you must set the communication mode to On-Line (see section 3.3).

Selecting the Harmonic Monitor Mode

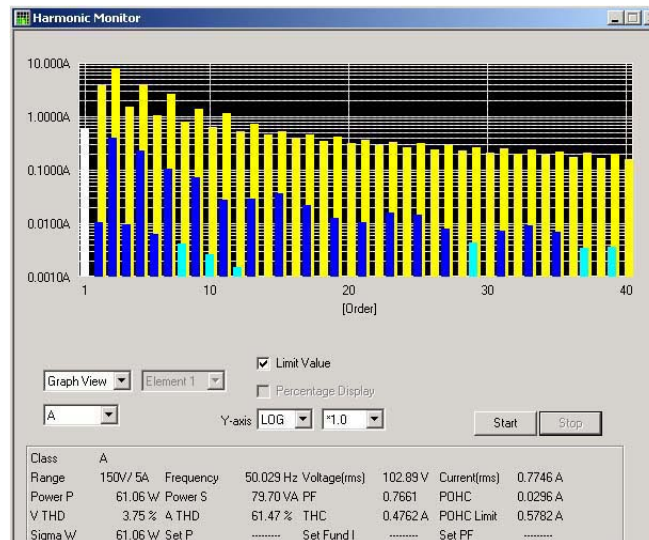
- From the Setting menu, choose Measurement Mode. The Measurement mode setup dialog box opens. You can also click  on the toolbar.



- Choose **Harmonic Monitor**. The Harmonic Monitor window opens.



Display Example: Harmonic Monitor Window



Note

When you switch the measurement mode, all the data retrieved and loaded up to that point are cleared. It is recommended that the data retrieved using Harmonic Measurement Mode be saved (see section 6.1) before changing the measurement mode.

Selecting the Monitored Contents

- **Selecting Bar or List**

Select **Graph View** (bar graph) or **List View** (list).



- **Selecting Current, Voltage, or Phase Angle**

Select **A** (current), **V** (voltage), or **Deg** (phase angle).



- **Selecting the Input Element**

Select the input element to be monitored.

The input element on which harmonic monitor is performed varies depending on the wiring system configuration of the WT (see chapter 8) that you are using.



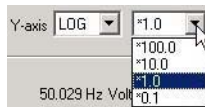
- **Selecting the Type of Y-Axis Scale**

Select **LIN** (linear) or **LOG** (logarithmic).



- **Selecting the Magnification of the Y-Axis Scale**

When the type of scale is LIN, select ***100.0**, ***10.0**, ***5.0**, ***2.0**, ***1.0**, ***0.5**, or ***0.1**.
When the type of scale is LOG, select ***100.0**, ***10.0**, ***1.0**, or ***0.1**.



- **Setting the Y-Axis Scale to Percentage Display**

Select the **Percentage Display** check box. The Y-axis scale is displayed in percentages. The relative harmonic content of current of each order can be displayed on graphs with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.

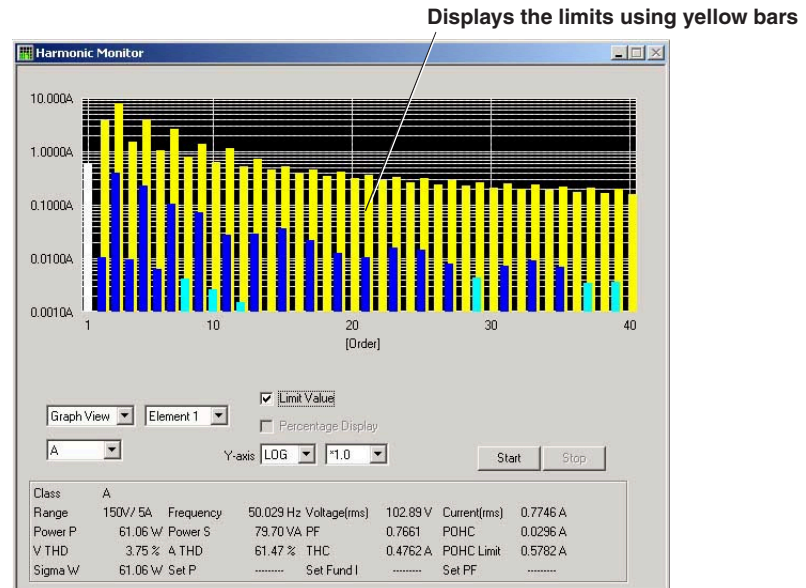
Note

The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits.

- **Displaying the Limits**

Select the **Limit Value** check box. The limits specified in the applicable standard are displayed using yellow bars for each order.

The operation of the limit display is selectable only when the monitored item is current.



Starting/Stopping the Monitor Operation

- **Starting the Monitor Operation**

Click **Start**. The monitor operation starts.

- **Stopping the Monitor Operation**

Click **Stop**. The monitor operation stops.

5.1 Monitoring Harmonics

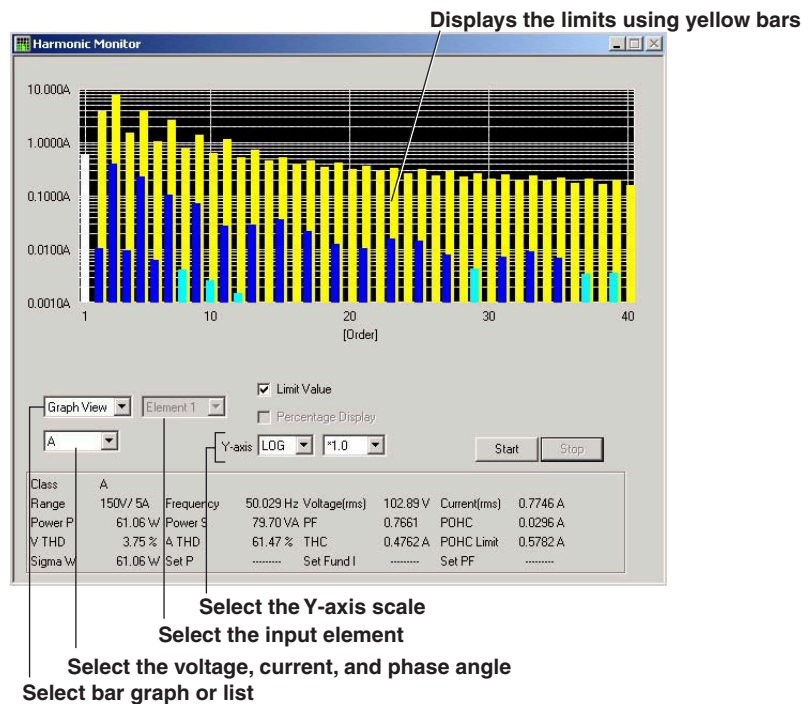
Explanation

The Harmonic Monitor mode is selectable only when in On-Line mode. Harmonic fluctuation can be monitored on bar graphs and numerical lists while making harmonic measurements on the WT. This mode is used to monitor the conditions of the harmonics and does not evaluate against the standard as in Harmonic Measurement Mode. When the next measured data is retrieved, the previous measured data is updated and does not remain.

The input element on which harmonic monitor is performed varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The harmonics can be monitored for each input element of WT.

Harmonic Monitor Window

The figure below shows a bar graph example.



- You can monitor the bar graph or list of the voltage, current, or phase angle for each order.
 - When monitoring the current, the limits of the applicable standard can be displayed. When monitoring the voltage or phase angle, the limits are not displayed, because the voltage or phase angle does not need to be compared against the limits.
 - The concept of the phase angle reference is the same as the explanation given in section 4.7, “Displaying the Bar Graph of the Harmonic Phase Angle” (page 4-31)
- For a description of the items from Class to Set PF in the window, see the explanation in section 4.2, “Displaying the Bar Graph of Harmonic Current/Voltage” (page 4-8). However, Standard, Judgment, and Element items are not present.

Displaying the Limits

Comparison and evaluation are not made against the limits in Harmonic Monitor mode. The limits specified by the applicable standard are displayed for reference. Since the harmonic data monitored in the Harmonic Monitor mode is an instantaneous value, the values (list) and yellow bars (bar graph) of the limits are 1.5 times the actual limits.

- If the Limit Value check box is selected, the limits are displayed using values or yellow bars for each order.
- The limits are displayed only for harmonic current.
- When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, bars of magnitude corresponding to the current values converted from the relative harmonic content of order 3 and 5 with the fundamental current specified in advance (see section 3.6) taken to be 100% are displayed.

Selecting the Y-Axis (Current Magnitude) Scale

• Type of Y-Axis Scale

You can select LIN (linear) or LOG (logarithmic).

• Selecting the Magnification

When the type of scale is LIN, you can select *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, or *0.1.

When the scale type is LOG, you can select *100.0, *10.0, *1.0, or *0.1.

- When set to *1.0, the maximum value of the Y-axis LIN scale is the value of the measurement range selected in the WT configuration (see chapter 8). The maximum value of the LOG scale is one digit above the measurement range, and is a value that is an integer power of 10.
 - If Auto range is selected in the WT configuration, the maximum value of the LIN or LOG scale is determined based on the same principle described above using the measurement range of the WT that was used when measurement was made as a reference.
- #### • Percentage Display
- If you select the Percentage Display check box, the Y-axis scale, THC, and POHC can be displayed in percentages. The relative harmonic content of current of each order can be displayed on bar graphs or lists with the specified fundamental current (fundamental current specified in advance when making Class C evaluation, see section 3.6) taken to be 100%.
- When the magnification of the Y-axis scale is *1.0, the maximum scale of Y-axis is 100.00%.
 - The Percentage Display check box becomes selectable under given conditions. The Percentage Display check box becomes selectable when the EUT is of Class C, and ratios are used to evaluate the limits (see section 1.3).
 - The percentage display is applied only to harmonic current.
 - When limits are specified by the relative harmonic content of order 3 and 5 such as the limits for Class C equipment with active input power less than or equal to 25 W, bars corresponding to the magnitude of the values are displayed on the bar graph or the values are displayed in the list.

5.1 Monitoring Harmonics

Color of Bars

See the explanation in section 4.2, "Displaying the Bar Graph of Harmonic Current/Voltage" (page 4-12). Bright green is not available.

Color of Measured Values Displayed in the List

See the explanation in section 4.3, "List Display of Harmonic Current/Voltage" (page 4-18). Bright green is not available.

Color of Phase Angles

Bar graphs of phase angle are displayed in white. The values displayed in the list are black.


5.2 Monitoring Waveforms

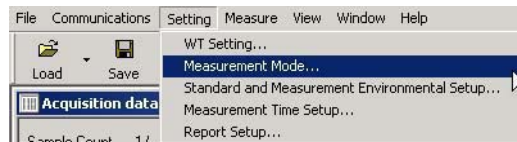
Procedure

The input element on which waveform monitor is performed varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

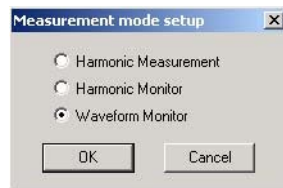
To select the Waveform Monitor mode used to monitor the waveforms while making measurements on the WT, you must set the communication mode to On-Line (see section 3.3).

Selecting the Waveform Monitor Mode

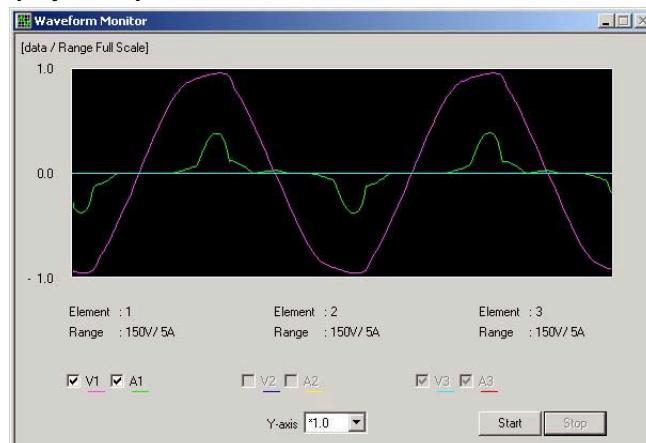
1. From the Setting menu, choose Measurement Mode. The Measurement mode setup dialog box opens. You can also click  on the toolbar.



2. Choose **Waveform Monitor**. The Waveform Monitor window opens.



Display Example: Waveform Monitor Window



Note

When you switch the measurement mode, all the data retrieved and loaded up to that point is cleared. It is recommended that the data retrieved using Harmonic Measurement Mode be saved (see section 6.1) before changing the measurement mode.

5.2 Monitoring Waveforms

Showing/Hiding Waveforms

Use the show/hide check box to select whether to show or hide the waveform. The selection can be made for the voltage and current individually.

Show/Hide check box



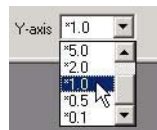
Voltage (V1) and current (A1) of input element 1

Voltage (V2) and current (A2) of input element 2

Voltage (V3) and current (A3) of input element 3

Selecting the Magnification of the Y-Axis (Voltage or Current Magnitude) Scale

Select a value from *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, and *0.1.



Starting/Stopping the Monitor Operation

- **Starting the Monitor Operation**

Click **Start**. The monitor operation starts.

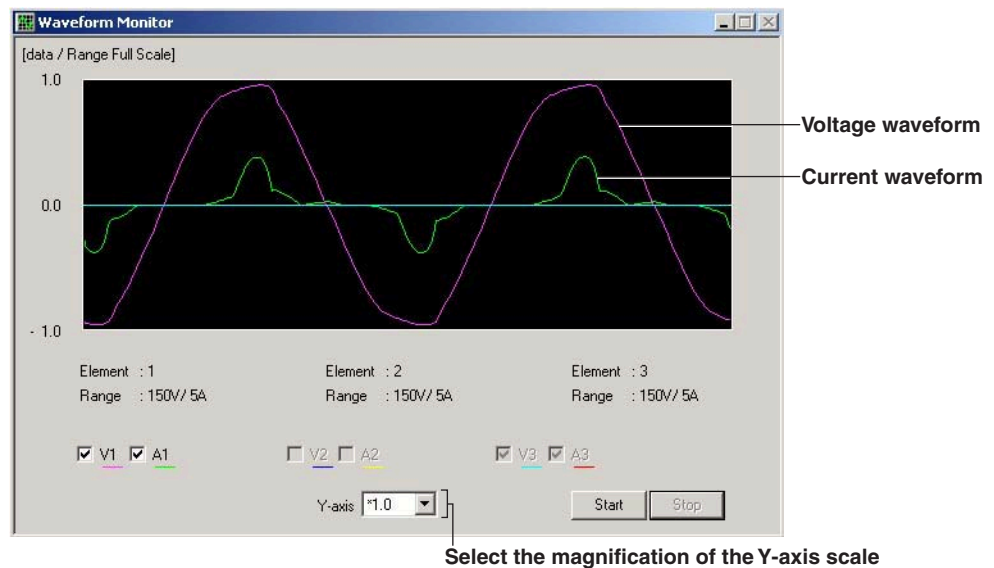
- **Stopping the Monitor Operation**

Click **Stop**. The monitor operation stops.

Explanation

The Waveform Monitor mode is selectable only when in On-Line mode. The measured waveform can be monitored while making harmonic measurements on the WT. This mode is used to monitor the conditions of the waveform and does not evaluate against the standard as in Harmonic Measurement Mode. When the next waveform data is retrieved, the previous waveform data is updated and does not remain.

The input element on which waveform monitor is performed varies depending on the wiring system configuration of the WT (see chapter 8) that you are using. The waveforms of relevant input elements can be monitored simultaneously.

Waveform Monitor Window

- **Element**
The number of the input element under observation. In this example, input element 1 is under observation.
- **Range**
Measurement range selected in the WT configuration (see chapter 8).

Selecting Show/Hide

You can select whether to show or hide the voltage and current individually for each input element.

Selecting the Magnification of the Y-Axis (Voltage or Current Magnitude) Scale

- The scale type is fixed to LIN (linear). LOG (logarithmic) scale is not supported.
- You can select the magnification from *100.0, *10.0, *5.0, *2.0, *1.0, *0.5, and *0.1.
- Waveforms are displayed with the measurement range selected in the WT Setting (chapter 8) is taken to be the maximum value (1.0) of the Y-axis scale

Color

The colors of the voltage/current waveforms for each element are as follows.

WT2000

Element	Voltage	Current
Input element 1	■ Pink	■ Bright green
Input element 2	■ Blue	■ Yellow
Input element 3	■ Turquoise	■ Red

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

WT1600

The element under evaluation changes depending on the WT wiring system setting.

6.1 Saving Setup Information, Measured Data, and Waveform Data

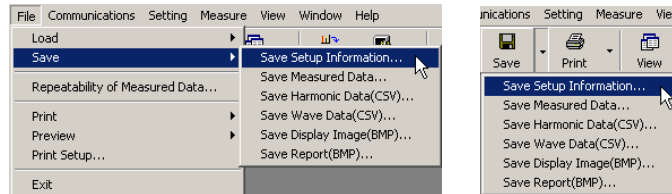
Procedure

Note

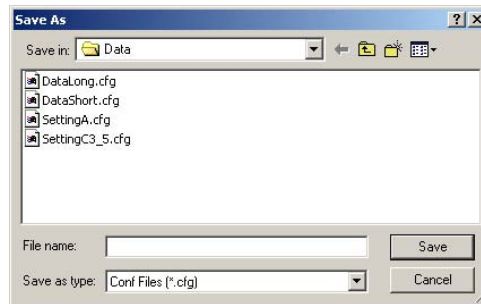
- Setup information, measured data, or waveform data cannot be saved when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when no setup information, measured data, or waveform data is present.
- Setup information, measured data, and waveform data cannot be saved while measurement is in progress.

Saving Setup Information

1. From the **File** menu, point to **Save**, then choose **Save Setup Information**. The Save As dialog box opens. You can also select **Save Setup Information** from the **Save** icon on the toolbar.



2. After setting the **Save in** box, enter the name of the file you wish to save in the **File name** entry box.
3. Click **Save**. The setup information is saved.

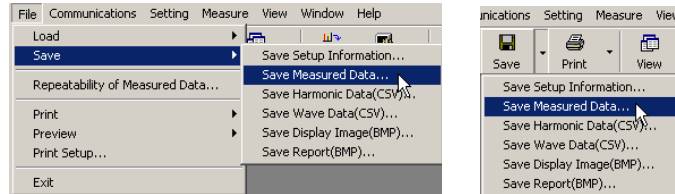


6.1 Saving Setup Information, Measured Data, and Waveform Data

Saving Measured Data, Waveform Data, or Setup Information

When the measurement mode is set to Harmonic Measurement and the measured data or waveform data has been retrieved (or loaded), the measured data or waveform data can be saved.

1. From the **File** menu, point to **Save**, then choose **Save Measure Data**. The Save As dialog box opens. You can also select **Save Measure Data** from the **Save** icon on the toolbar.



2. After setting the **Save in** box, enter the name of the file you wish to save in the **File name** entry box.
3. Click **Save**. Measured data, waveform data, or setup information is saved.



Explanation**Saving Setup Information**

Various setup information configured using the software including the measurement mode (see section 3.5), standard and measurement environment settings (see section 3.6), measurement time (see section 3.7), display settings (chapters 4 and 5), title/comment of reports (see section 7.2) can be saved to a file.

File Name, Extension, and Data Size

The file name can be any legal file name as defined by the PC that you are using.

- Extension: .cfg
- Data size: Approx. 3 KB

Saving Measured Data, Waveform Data, or Setup Information

- The harmonic measurement data or waveform data retrieved from the WT in Harmonic Measurement mode into the PC using the software can be saved to a file. In this case, the harmonic measurement conditions of the WT specified using the software and setup information described above are also saved.
- When the measurement mode is set to Harmonic Measurement and the measured data or waveform data has been retrieved (or loaded), the measured data or waveform data can be saved.

File Name, Extension, and Data Size

- The file name can be any legal file name as defined by the PC that you are using.
- When the save operation is executed, all the files with the extensions shown in the following table are created using the same file name. Even when only the measured data or waveform data of input element 1 is present, the files with extensions .bt1 to 4, .bw1 to 3, .inf, and .cfg are created. However, in such case, data corresponding to zero is saved in the .bt2 to 4 and .bw2 to 3 files.

Data Type	Extension	Data Size (Bytes)
Measured data of input element 1	.bt1	Approx. 240 K (when the measurement time is 2 min. 30 s)
Measured data of input element 2	.bt2	Approx. 240 K (when the measurement time is 2 min. 30 s)
Measured data of input element 3	.bt3	Approx. 240 K (when the measurement time is 2 min. 30 s)
Measured data common to all input elements	.bt4	Approx. 12 K (when the measurement time is 2 min. 30 s)
Waveform data of input element 1 Data displayed as voltage/current waveforms (see section 4.5).	.bw1	Approx. 8K
Waveform data of input element 2 Data displayed as voltage/current waveforms.	.bw2	Approx. 8K
Waveform data of input element 3 Data displayed as voltage/current waveforms.	.bw3	Approx. 8K
Harmonic measurement conditions of the WT For details on the measurement conditions, see chapter 8.	.inf	Approx. 1K
Setup information of specifications, evaluation, etc. Same data as those described in "Saving Setup Information" above.	.cfg	Approx. 3K

6.2 Loading Setup Information, Measured Data, and Waveform Data

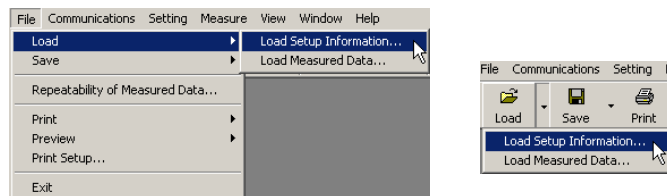
Procedure

Note

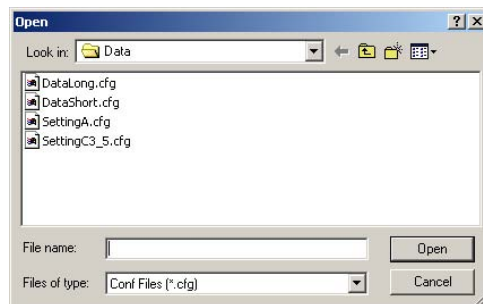
- Setup information, measured data, and waveform data cannot be loaded when the measurement mode is set to Harmonic Monitor or Waveform Monitor.
- If an error occurs while loading the setup information, the settings are reset to their default values.
- If an error occurs while loading setup information, measured data, or waveform data, the data may not be loaded properly. Check the file name and extension, and load the data again.
- Setup information, measured data, and waveform data cannot be loaded while measurement is in progress.

Loading Setup Information

1. From the **File** menu, point to **Load** then choose **Load Setup Information**. The Open dialog box opens. You can also select **Load Setup Information** from the **Load** icon on the toolbar.



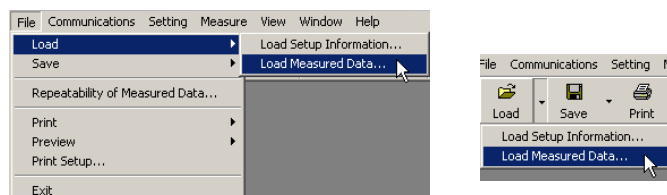
2. Select a file name and click **Open**. The setup information of the selected file is loaded.



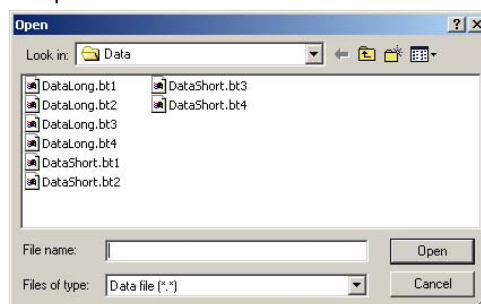
Loading Measured Data, Waveform Data, and Setup Information

Measured data, waveform data, and setup information can be loaded when the measurement mode is set to Harmonic Measurement.

1. From the **File** menu, point to **Load**, and then choose **Load Measure Data**. The Open dialog box opens. You can also select **Load Measure Data** from the **Load** icon on the toolbar.



- Select a file name and click **Open**. The measured data, waveform data, or setup information of the selected file is loaded.



Explanation

Loading Setup Information

The setup information saved in section 6.1 can be loaded.

- The extension of the loaded file is .cfg.
- The contents of the setup information are as follows:
 - Measurement mode (see section 3.5).
 - Standard and measurement environment settings (see section 3.6).
- Measurement time (see section 3.7).
- Display settings (chapters 4 and 5).
- Title/Comment of Reports (see section 7.2).

The measurement data retrieved from the WT or loaded from a file can be evaluated using the loaded evaluation conditions.

Reports of measurement data retrieved from the WT or loaded from a file can be saved or printed by attaching the loaded title or comment. For the saving and printing procedure, see chapter 7.

Loading Measured Data, Waveform Data, and Setup Information

- The measurement data, waveform data, and setup information saved in section 6.1 can be loaded.
- Measured data can be loaded when the measurement mode is set to Harmonic Measurement.
- When one of the files with .bt1, .bt2, .bt3, and .bt4 extension is selected in the Open dialog box and loaded, the data of all the files with the same file name in the same directory is loaded. See the following table.

	Data Type	Extension
WT2000	Measured data of input element 1	.bt1
	Measured data of input element 2	.bt2
	Measured data of input element 3	.bt3
	Measured data common to all input elements	.bt4
	Waveform data of input element 1	.bw1
	Waveform data of input element 2	.bw2
	Waveform data of input element 3	.bw3

6.2 Loading Setup Information, Measured Data, and Waveform Data

Data Type	Extension
WT1600*	Measured data on the left side of the acquisition data window .bt1
	Measured data in the center of the acquisition data window .bt2
	Measured data on the right of the acquisition data window .bt3
	Measured data common to all input elements .bt4
	Waveform data on the left side of the acquisition data window .bw1
	Waveform data in the center of the acquisition data window .bw2
	Waveform data on the right side of the acquisition data window .bw3
	Harmonic measurement conditions of the WT .inf
	<ul style="list-style-type: none"> If the communication mode is On-Line, the harmonic measurement conditions of the loaded file are applied to "WT Setting" (chapter 8) of the software and transmitted to the WT. If the transmitted harmonic measurement conditions do not match the configuration of the WT, an error message appears. Check the configuration of the connected WT. If the communication mode is Off-Line, the harmonic measurement conditions of the loaded file are applied to "WT Setting" of the software, but not transmitted to the WT. If the mode is switched from Off-Line to On-Line, the harmonic measurement conditions is loaded from the WT into the software.
	Setup information of specifications, evaluation, etc. .cfg
	Same data as those described in "Setup Information" above.

* : For WT1600

Order	Element 1				Element 2				Element 3			
	Voltage	Current	Phase	Freq	Voltage	Current	Phase	Freq	Voltage	Current	Phase	Freq
1	0.000 V	0.000 A	0.000	0.000 Hz	0.000 V	0.000 A	0.000	0.000 Hz	0.000 V	0.000 A	0.000	0.000 Hz
2	0.000 V	0.000 A	0.000	0.000 Hz	0.000 V	0.000 A	0.000	0.000 Hz	0.000 V	0.000 A	0.000	0.000 Hz
3	0.000 V	0.000 A	0.000	0.000 W	0.000 V	0.000 A	0.000	0.000 W	0.000 V	0.000 A	0.000	0.000 W
4	0.000 V	0.000 A	0.000	0.000 %	0.000 V	0.000 A	0.000	0.000 %	0.000 V	0.000 A	0.000	0.000 %
5	0.000 V	0.000 A	0.000	0.000 %	0.000 V	0.000 A	0.000	0.000 %	0.000 V	0.000 A	0.000	0.000 %
6	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
7	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
8	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
9	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
10	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
11	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
12	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
13	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
14	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
15	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
16	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
17	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
18	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
19	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
20	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
21	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
22	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
23	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
24	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
25	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
26	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
27	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
28	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
29	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
30	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
31	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
32	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
33	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
34	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
35	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
36	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
37	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A
38	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A	0.000 V	0.000 A	0.000	0.000 A

Left side of the acquisition data window
Of the elements displayed here:
Measured Data .bt1
Waveform data .bw1

Center of the acquisition data window
Of the elements displayed here:
Measured Data .bt2
Waveform data .bw2

Right side of the acquisition data window
Of the elements displayed here:
Measured Data .bt3
Waveform data .bw3

6.3 Saving Harmonic Measurement Data in CSV Format

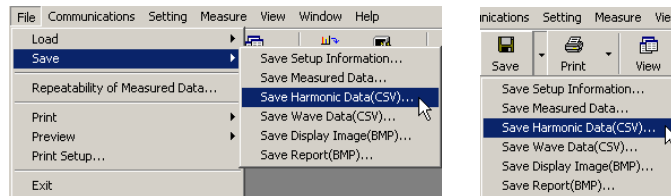
Procedure

When the measurement mode is set to Harmonic Measurement and the measurement data has been retrieved (or loaded), the harmonic measurement data can be saved in CSV format.

Note

- Harmonic measurement data cannot be saved in CSV format when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when no measured data is present.
- Harmonic measurement data cannot be saved in CSV format when measurement is in progress.

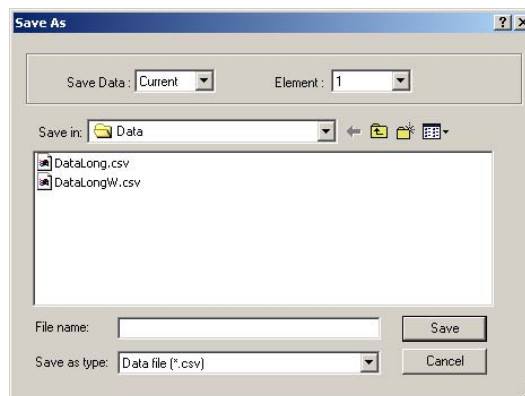
1. From the **File** menu, point to **Save**, then choose **Save Harmonic Data (CSV)**. The Save As dialog box opens. You can also select **Save Harmonic Data (CSV)** from the **Save** icon on the toolbar.



Selecting the Data to Be Saved

2. Select **Current** or **Voltage**.
3. Select the **Element** (input element).

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, input element to be saved also varies.
4. After selecting a folder in the **Save in** box, enter the name of the file you wish to save in the **File name** box.
5. Click **Save**. The harmonic measurement data is saved in CSV format.



6.3 Saving Harmonic Measurement Data in CSV Format

Explanation

When the measurement mode is set to Harmonic Measurement and the measurement data has been retrieved (or loaded), the harmonic measurement data can be saved in CSV format. A file in CSV format can be opened using a spreadsheet application (such as Microsoft Excel) on your PC.

File Name, Extension, and Data Size

The file name can be any legal file name as defined by the PC that you are using.

- Extension: .csv
- Data size: Approx. 190 K (when the measurement time is 2 min. 30 s)

Example When the Harmonic Measurement Data Saved in CSV Format Is Opened Using Excel

Data being measured
Current in this example.

Date/Time the file was saved Input element being measured
Element 1 in this example.

	A	B	C	D	E	Order	H	I
1	DATE : Mon	Current	Element 1					
2		1	2	3	4	5	6	7
3	1	0.5108	0.006	0.3155	0.0051	0.1641	0.0052	0.0766
4	2	0.5108	0.0057	0.3155	0.005	0.1643	0.0052	0.0769
5	3	0.5108	0.0059	0.3155	0.0048	0.1643	0.0051	0.0768
6	4	0.5107	0.0059	0.3154	0.0052	0.1641	0.0053	0.0766
7	5	0.5106	0.0062	0.3153	0.0051	0.164	0.0053	0.0767
8	6	0.5105	0.0058	0.3153	0.005	0.1639	0.0052	0.0764
9	7	0.5107	0.0058	0.3153	0.0049	0.1639	0.0052	0.0764
10	8	0.5105	0.0059	0.3153	0.0048	0.164	0.0051	0.0766
11	9	0.5105	0.0057	0.3152	0.0047	0.1638	0.005	0.0763
12	10	0.5103	0.006				0.0051	0.0765
13	11	0.5103	0.0057				0.0052	0.0765
14	12	0.5101	0.0059	0.315	0.0048	0.164	0.005	0.0766
15	13	0.5102	0.0056	0.3151	0.0047	0.164	0.0051	0.0766
16	14	0.5103	0.0058	0.3151	0.0049	0.1638	0.0051	0.0763
17	15	0.5102	0.006	0.315	0.005	0.1638	0.0052	0.0764
18	16	0.5102	0.0058	0.315	0.0051	0.1638	0.0052	0.0764
19	17	0.5103	0.006	0.3151	0.0054	0.1637	0.0054	0.0763
20	18	0.5101	0.0063	0.315	0.0058	0.1637	0.0057	0.0764
21	19	0.5101	0.0061	0.315	0.0057	0.1636	0.0057	0.0763
22	20	0.5103	0.006	0.3151	0.0055	0.1635	0.0055	0.0761
23	21	0.5101	0.0061	0.3149	0.0052	0.1634	0.0053	0.076
24	22	0.51	0.006	0.3149	0.0055	0.1633	0.0055	0.0759
25	23	0.5102	0.0061	0.315	0.0055	0.1634	0.0055	0.0758
26	24	0.5101	0.0063	0.315	0.0056	0.1633	0.0056	0.0758
27	25	0.5102	0.006	0.3151	0.0056	0.1636	0.0056	0.0762
28	26	0.5103	0.0061	0.3151	0.0056	0.1635	0.0055	0.076
29	27	0.5101	0.0063	0.315	0.0057	0.1635	0.0056	0.0761

Harmonic measurement values

Sample Count number

6.4 Saving Waveform Data in CSV Format

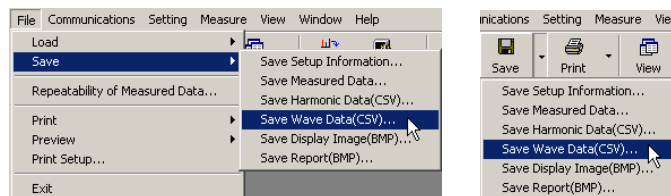
Procedure

When the measurement mode is set to Harmonic Measurement and the waveform data has been retrieved (or loaded), the waveform data can be saved in CSV format.

Note

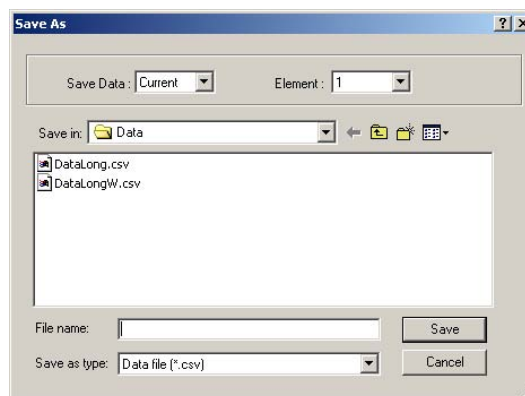
- Waveform data cannot be saved in CSV format when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when waveform data in Harmonic Measurement Mode is not present.
- Waveform data cannot be saved in CSV format when measurement is in progress.

1. From the **File** menu, point to **Save**, then choose **Save Wave Data (CSV)**. The Save As dialog box opens. You can also select **Save Wave Data** from the **Save** icon on the toolbar.



Selecting the Data to Be Saved

2. Select **Current** or **Voltage**.
3. Select the **Element** (input element).
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, input element to be saved also varies.
4. After selecting a folder in the **Save in** box, enter the name of the file you wish to save in the **File name** box.
5. Click **Save**. The waveform data is saved in CSV format.



6.4 Saving Waveform Data in CSV Format

Explanation

When the measurement mode is set to Harmonic Measurement and the waveform data has been retrieved (or loaded), the waveform data can be saved in CSV format. A file in CSV format can be opened using a spreadsheet application (such as Microsoft Excel) on your PC.

- The data that is saved is the waveform data that is retrieved immediately after the measurement is finished with the measurement mode set to Harmonic Measurement.
- Approximately 2 periods of the waveform data are saved using 1024 data points.

File Name, Extension, and Data Size

The file name can be any legal file name as defined by the PC that you are using.

- Extension: .csv
- Data size: Approx. 18 KB

Example When the Waveform Data Saved in CSV Format Is Opened Using Excel

Data being measured
Current in this example.

Date/Time the file was saved Input element being measured
Element 1 in this example.

	A	B	C	D	E	F	G	H
1	DATE : Mo	Current	Element 1					
2	1	0.1951						
3	2	0.17793						
4	3	0.16182						
5	4	0.14411						
6	5	0.12425						
7	6	0.10439						
8	7	0.08775						
9	8	0.07165						
10	9	0.05662						
11	10	0.04535						
12	11	0.0373						
13	12	0.03086						
14	13	0.02925						
15	14	0.02925						
16	15	0.03032						
17	16	0.033						
18	17	0.03461						
19	18	0.03461						
20	19	0.03461						
21	20	0.03515						
22	21	0.03461						
23	22	0.03461						
24	23	0.03837						
25	24	0.03944						
26	25	0.04105						
27	26	0.04159						
28	27	0.04105						
29	28	0.04159						

Waveform data values
Current in this example.

Number of waveform data points (up to 1024)

6.5 Checking the Repeatability of the Measured Data

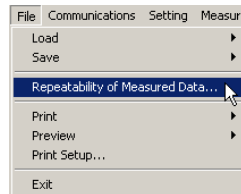
Procedure

Note

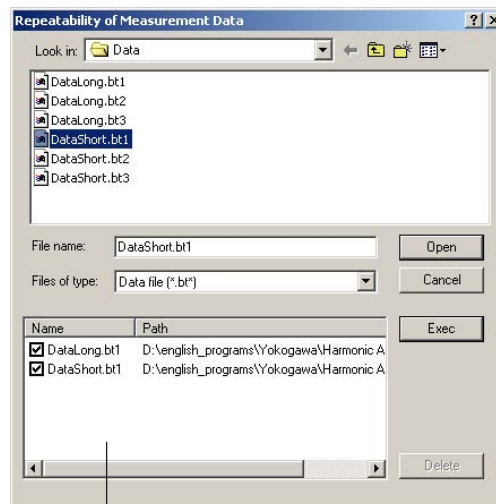
You cannot check the repeatability of the waveform data while measurement is in progress.

Selecting the Files to Be Compared

1. From the **File** menu, choose **Repeatability of Measured Data**. The Repeatability of Measurement Data dialog box opens.



2. Click the file to be compared or enter the name of the file to be compared in the File name box.
3. Click **Open**. The file shown in the File name text box is displayed in the list of files to be compared.
4. Repeat steps 2 and 3 to select all the files to be compared.
5. Click **Exec**. Repeatability of Measurement Data window opens.
 - For multi-phase equipment, it is recommended that files of the same input element (same phase) be selected and the data be compared. The repeatability cannot be evaluated correctly when using measured data of different phases.
 - Even if only one file is selected, the Repeatability of Measurement Data window will open. In this case, no comparison is made.



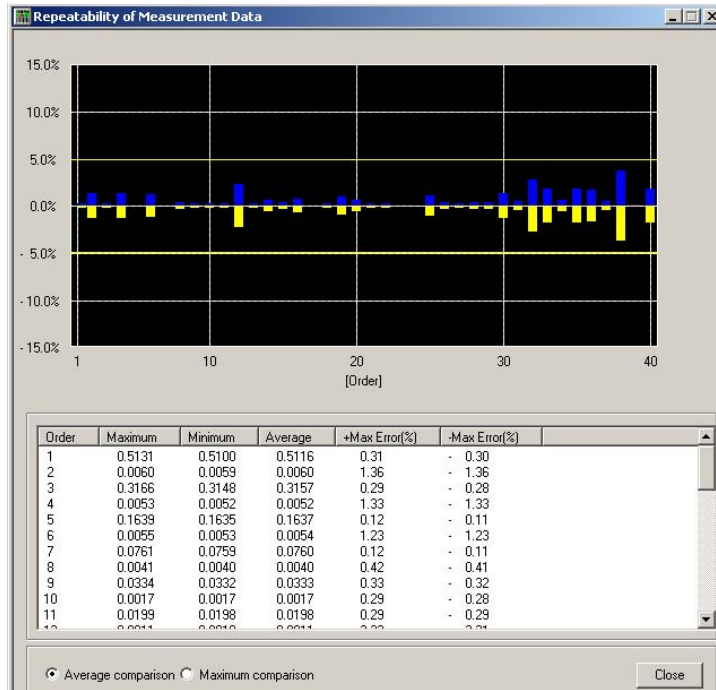
Files to be compared

6.5 Checking the Repeatability of the Measured Data

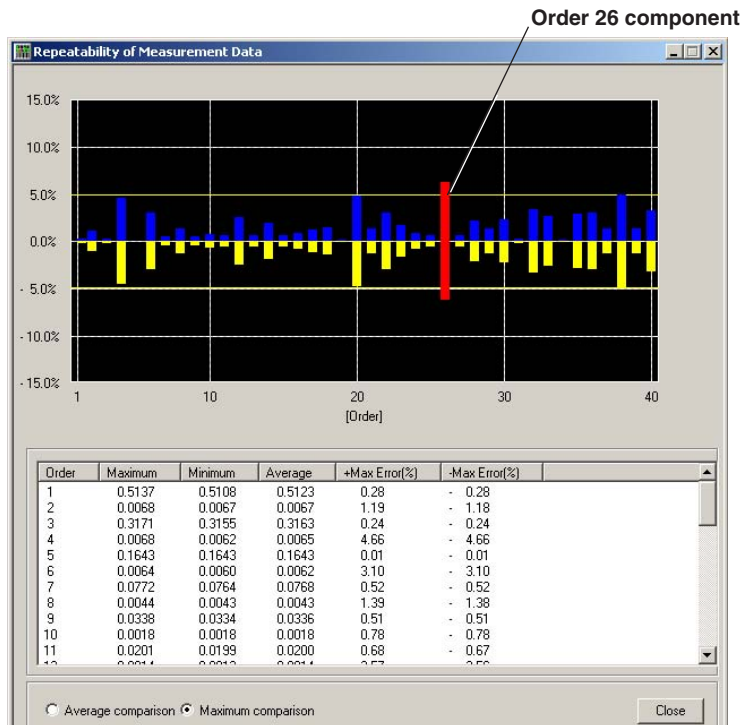
Evaluating the Repeatability

- Select **Average comparison** or **Maximum comparison**. The result of the comparison using the selected values is displayed on the bar graph and list.

Example of Average Comparison: The difference in all harmonics is within 5%.



Example of Maximum Comparison: The difference at order 26 exceeds 5%.

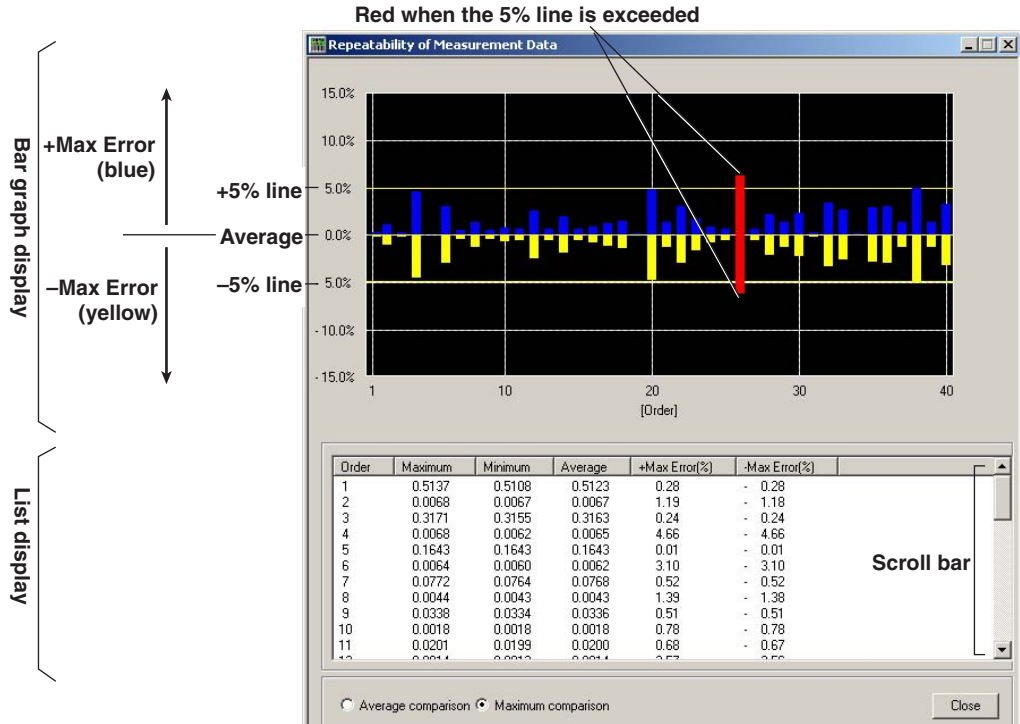


Explanation

The maximum value and mean value in the harmonics measurement data saved to files can be compared, and the difference in the measured data can be displayed on a bar graph and list for each order. This function can be used to evaluate whether the difference between data measured under the same measurement conditions when harmonics are measured using the same product or same product model is within 5% as defined in the standard (confirmation of repeatability).

Repeatability of Measurement Data Window

The following figure shows an example when maximum values are compared.



• **When Maximum Values Are Compared**

Maximum (Mxmax)

Maximum value among the maximum values of each order

Minimum (Mxmin)

Minimum value among the maximum values of each order

Average (Mxmean)

Average of the maximum values of each order of the selected file

+Max Error

Ratio (%) of the difference between Mxmax and Mxmean of each order

$$\frac{Mxmax - Mxmean}{Mxmean} \times 100$$

-Max Error

Ratio (%) of the difference between Mxmin and Mxmean of each order

$$\frac{Mxmin - Mxmean}{Mxmean} \times 100$$

6.5 Checking the Repeatability of the Measured Data

- **When Using Average Values Are Compared**

- **Maximum (Mnmax)**

- Maximum value among the average values of each order

- **Minimum (Mnmin)**

- Minimum value among the average values of each order

- **Average (Mnmean)**

- Average of the average values of each order of the selected file

- **+Max Error**

- Ratio (%) of the difference between Mnmax and Mnmean of each order

$$\frac{\text{Mnmax} - \text{Mnmean}}{\text{Mnmean}} \times 100$$

- **-Max Error**

- Ratio (%) of the difference between Mnmin and Mnmean of each order

$$\frac{\text{Mnmin} - \text{Mnmean}}{\text{Mnmean}} \times 100$$

Color

- **Bar Graph**

The bar graph that is displayed for each order is displayed using a length converted from the +Max Error or -Max Error. The meaning of the colors is indicated in the following table.

- **Blue**

- Difference (error) less than the +5% line for +Max Error.

- **Yellow**

- Difference (error) less than the -5% line for -Max Error.

- **Red**

- Difference (error) greater than the +5% line for +Max Error.

- Difference (error) greater than the -5% line for -Max Error.

* The names of the sample colors of Microsoft Word or Excel are used for the names of the colors.

- **List**

The maximum, minimum, average, +maximum error, and -maximum error for each order are displayed using values in black.

Number of Files That Can Be Compared

To evaluate the repeatability of the measured data, multiple files must be selected.
Number of files that can be compared: 2 to 10

Note

- For multi-phase equipment, it is recommended that files of the same input element (same phase) be selected and the data be compared. The repeatability cannot be evaluated correctly when using measured data of different phases.
 - Even if only one file is selected, the Repeatability of Measurement Data window will open. In this case, no comparison is made.
 - To evaluate the repeatability, check that the measured data saved to the file to be compared was measured under the following conditions.
 - Same DUT (not the same model, but the same equipment).
 - Same test conditions.
 - Same test equipment.
 - Same atmospheric conditions (when the DUT is affected by them).
-

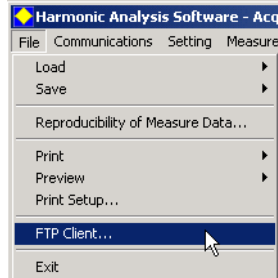
6.6 FTP Client Function

Procedure

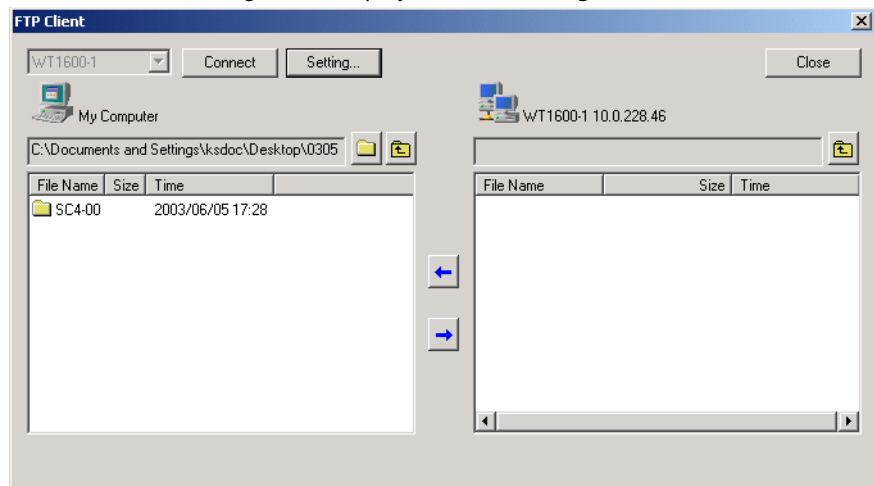
By connecting to the FTP client (WT1600), data that is stored in the WT's internal hard disk or floppy disk can be saved directly on the PC.

Setup the FTP server function on the WT1600. For details, see the WT1600 User's Manual (IM 760101-01E).

1. Choose **File > FTP Client** from the menu bar.

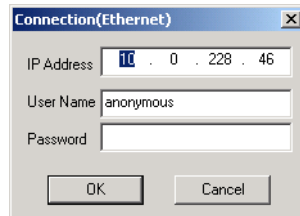


2. The FTP Client dialog box is displayed. Click **Setting**.



When connecting with the GP-IB interface.

3. Enter the IP address, user name, and password of the target WT.





When Connecting with the Ethernet Interface (WT1600 Option)

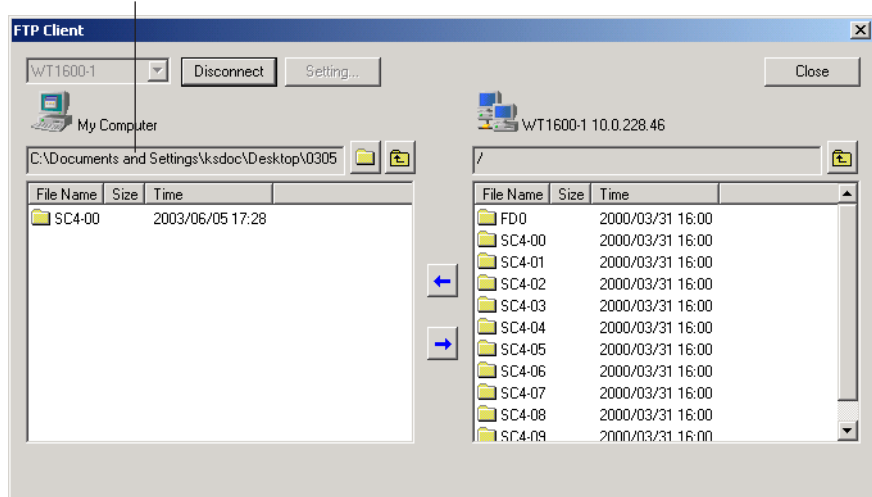
4. Proceed to step 5.
5. Click **Connect**. A server connection is opened with the WT.



6.6 FTP Client Function

- When saving data on the PC that was saved on the WT, select the data you wish to save and click . When saving data on the WT that was saved on the PC, select the data you wish to save and click .

Specifying a Save Destination for Measured Data

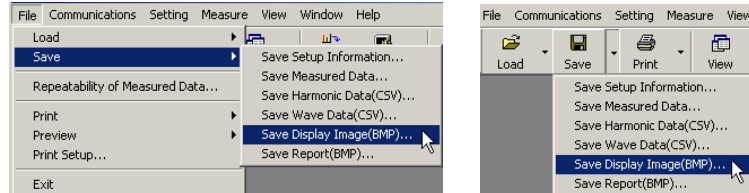


To cut the server connection, click the **Disconnect** button.

7.1 Saving Screen Image Data in BMP Format

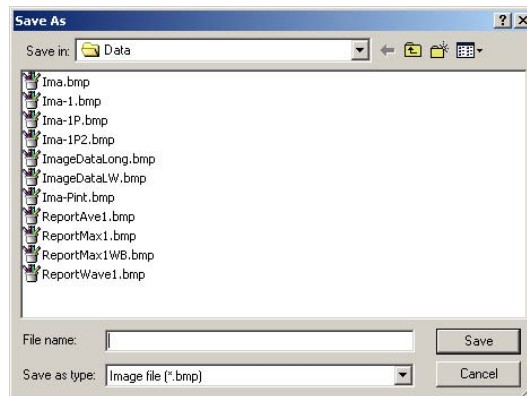
Procedure

1. From the **File** menu, point to **Save**, then choose **Save Display Image (BMP)**. The Save As dialog box opens. You can also select **Save Display Image** from the **Save** icon on the toolbar.



2. After selecting a folder in the **Save in** box, enter the name of the file you wish to save in the **File name** box.
3. Click **Save**. The screen image data that is present when Save is clicked is saved to a file in BMP format.

If you attempt to save the file using an existing file name, an overwrite warning message appears. In this case, the screen image data that is present when Yes is clicked is saved to a file in BMP format.



7.1 Saving Screen Image Data in BMP Format

Explanation

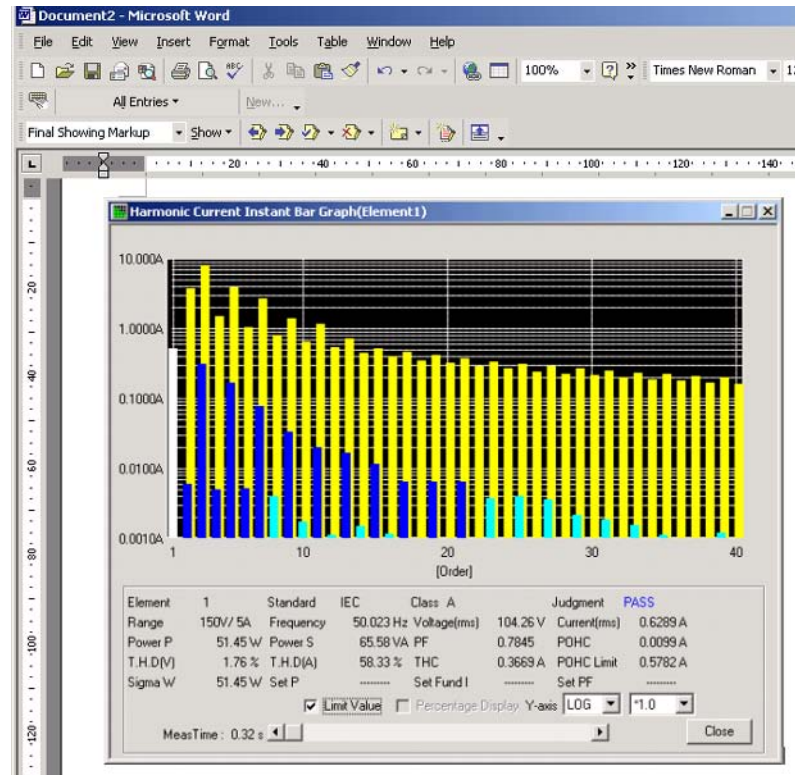
The screen image data of an active window such as acquisition data, bar graph, list, and waveform windows can be saved to a file in BMP format.

File Name, Extension, and Data Size

The file name can be any legal file name as defined by the PC that you are using.

- Extension: .bmp
- Data size: Approx. 2.5 MB maximum. The data size varies depending on the window being saved and the display setting of your PC.

Example When the Saved Screen Image Data Is Inserted in a Word Processor Application (Such as Microsoft Word)



Note

You may not be able to open the BMP file saved using the software depending on the image processing software.

7.2 Setting Titles/Comments of Reports and Saving Reports in BMP Format

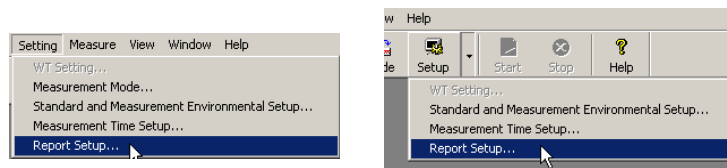
Procedure

Note

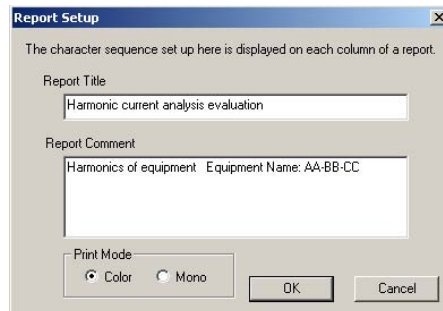
- Reports cannot be saved in BMP format when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when no measured data or waveform data is present.
- You cannot set the title/comment of reports or save reports to BMP format while measurement is in progress.

Setting the Title/Comment of Reports

1. From the **Setting** menu, choose **Report Setup**. The Report Setup dialog box opens. You can also choose **Report Setup** from the **Setup** icon on the toolbar.



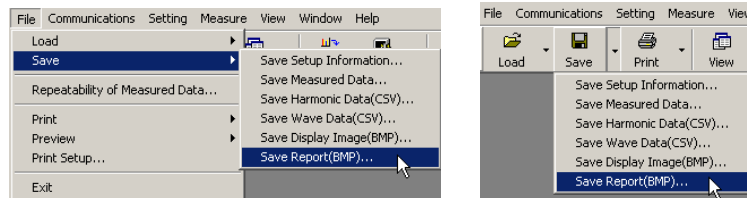
2. Enter appropriate text in the **Report Title** and **Report Comment** text boxes.
3. Select **Color** or **Mono** for the print mode.
4. Click **OK**.



Saving Reports in BMP Format

When the measurement mode is set to Harmonic Measurement and the measurement data has been retrieved (or loaded), reports can be saved in BMP format.

1. From the **File** menu, point to **Save**, then choose **Save Report (BMP)**. The Save Report File dialog box opens. You can also select **Save Report** from the **Save** icon on the toolbar.

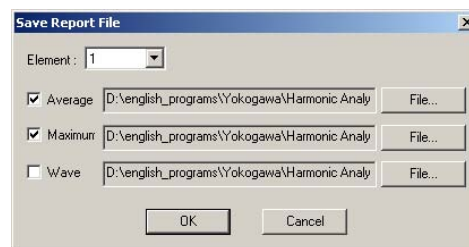


7.2 Setting Titles/Comments of Reports and Saving Reports in BMP Format

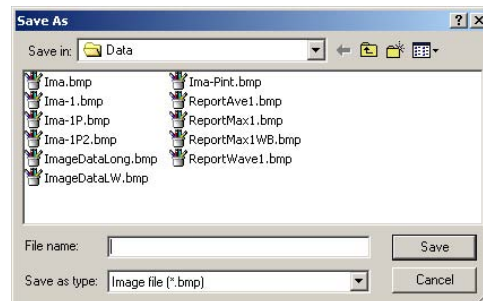
- **Selecting the Data for Creating the Report and Setting the Save Destination of the Report**

2. Select the **Element** (input element).

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be saved also varies.
3. Select the **Average**, **Maximum**, or **Wave** check box to select the data for creating the report.
 - You can select multiple items.
 - The Wave check box becomes selectable only for Class C equipment with active input power less than or equal to 25 W, because the waveform data is used for evaluation only in this case.
4. Check the save destination of the report selected in step 3. To change the save destination, click **File** on the same line. The Save As dialog box opens.

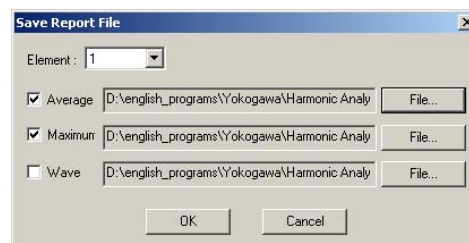


5. After selecting a folder in the **Save in** box, enter the name of the file you wish to save in the **File name** box.
6. Click **Save**. The screen returns to the Save Report File dialog box.
7. Repeat steps 4 to 6 to set the save destination of all reports to be created.



- **Executing the Save Operation**

8. Click **OK**.



Explanation

Reports can be created and saved to BMP format using the data measured by the software.

Setting the Title/Comment of Reports

As necessary, you can enter a title and comment of the report that are saved along with the report when the report is saved to BMP format.

- **Number of Characters That Can Be Entered**

See the table below.

Item	Number of Characters That Can Be Entered
Title	Up to 50 characters.
Comment	Up to 50 characters.

- **Print Mode**

You can select whether to print the report in color or in black and white. To print the bar graph using different colors, it is recommended that the printing be done in color. For a description of the print preview and print procedure, see sections 7.4 and 7.5, respectively.

Saving the Report in BMP Format

When the measurement mode is set to Harmonic Measurement and the measurement data has been retrieved (or loaded), reports can be saved in BMP format.

- **Selecting the Data for Creating Reports**

Reports can be created for each input element. The print preview (see section 7.4) of the report can be displayed using the software. The saved report can also be inserted into a word processing (such as Microsoft Word) document to be displayed or printed (see sections 7.3 to 7.5).

- You can select average, maximum, and/or waveform data for creating the report.
 - You can select multiple items.
 - The Wave check box becomes selectable only for Class C equipment with active input power less than or equal to 25 W, because the waveform data is used for evaluation only in this case.
 - * Average: Average of the individual data points (instantaneous values) within the measurement time for each order.
 - Maximum: The maximum value among the individual data points (instantaneous values) within the measurement time for each order.
- The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be saved also varies.

- **Saving the Report**

The title/comment (see above) entered in advance can be saved along with the report. When saving the average, maximum, and wave reports, assign a separate name for each report.

- **File Name, Extension, and Data Size**

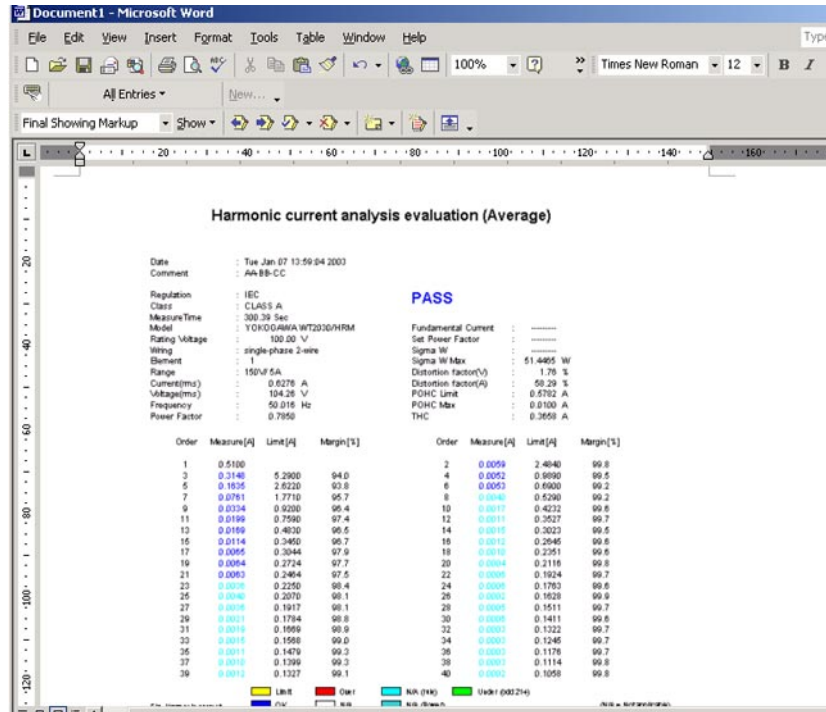
The file name can be any legal file name as defined by the PC that you are using.

- Extension: .bmp
- Data size: Approx. 2.5 MB maximum. The data size varies depending on the window being saved and the display setting of your PC.

7.2 Setting Titles/Comments of Reports and Saving Reports in BMP Format

Example When the Saved Report (Average) Is Loaded to a Word Processor Application (Such as Microsoft Word)

For a description of the items displayed within the report, see the explanation in section 4.2, "Displaying the Bar Graph of Harmonic Current/Voltage" (page 4-8).



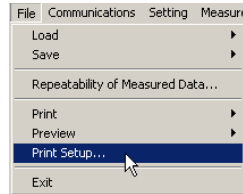
Note

You may not be able to open the BMP file saved using the software depending on the image processing software.

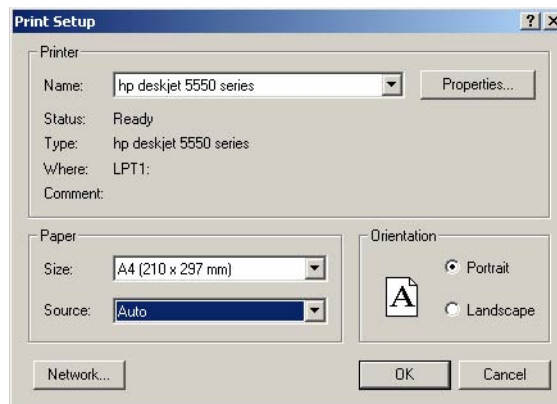
7.3 Setting the Printer

Procedure

1. From the **File** menu, choose **Print Setup**. The Print Setup dialog box opens.



2. Enter appropriate settings for **Printer**, **Size**, **Source**, and **Orientation**.
3. Click **OK**.



Note

Always use A4-sized paper when printing. Depending on the printer, some portions of the document may not be printed on the page if paper smaller than A4 is used.

Explanation

Set the printer according to the environment of the system that you are using.

7.4 Previewing the Printout

Procedure

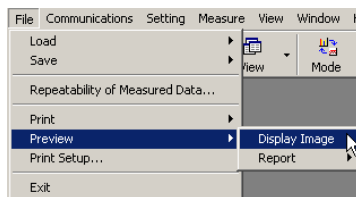
Note

- Print preview of reports cannot be displayed when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when no measured data or waveform data is present.
- Print preview of reports cannot be displayed when measurement is in progress.

Displaying the Print Preview of the Screen Image

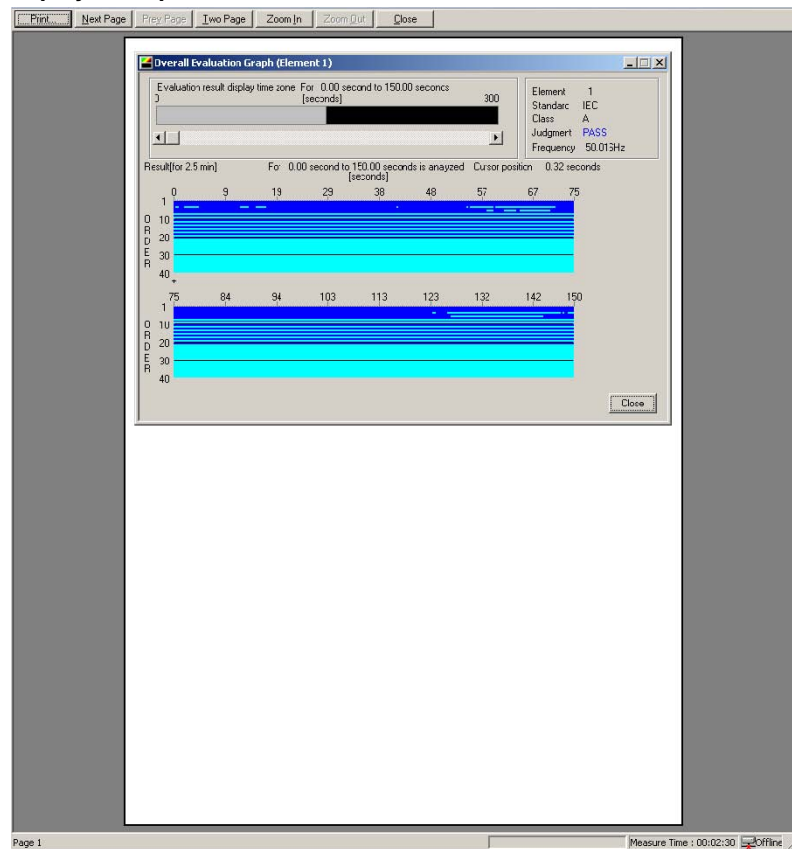
1. From the **File** menu, point to **Preview** and then choose **Display Image**. The screen image that is present when Display Image is selected is previewed.

The screen image data of an active window such as acquisition data, bar graph, list, and waveform windows is previewed.



2. You can perform various operations such as **Next Page/Prev Page**, **One Page/Two Page**, and **Zoom In/Zoom Out**. Click **Print** to print the image (see section 7.5).

Display Example: Print Preview Window

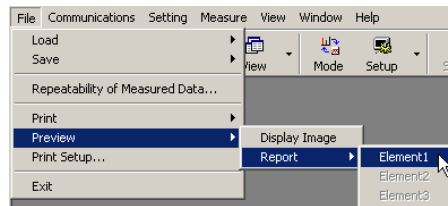


Displaying the Print Preview of Reports

The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be previewed also varies. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1φ2W, indication on the front panel varies depending on the model) and one input element is used.

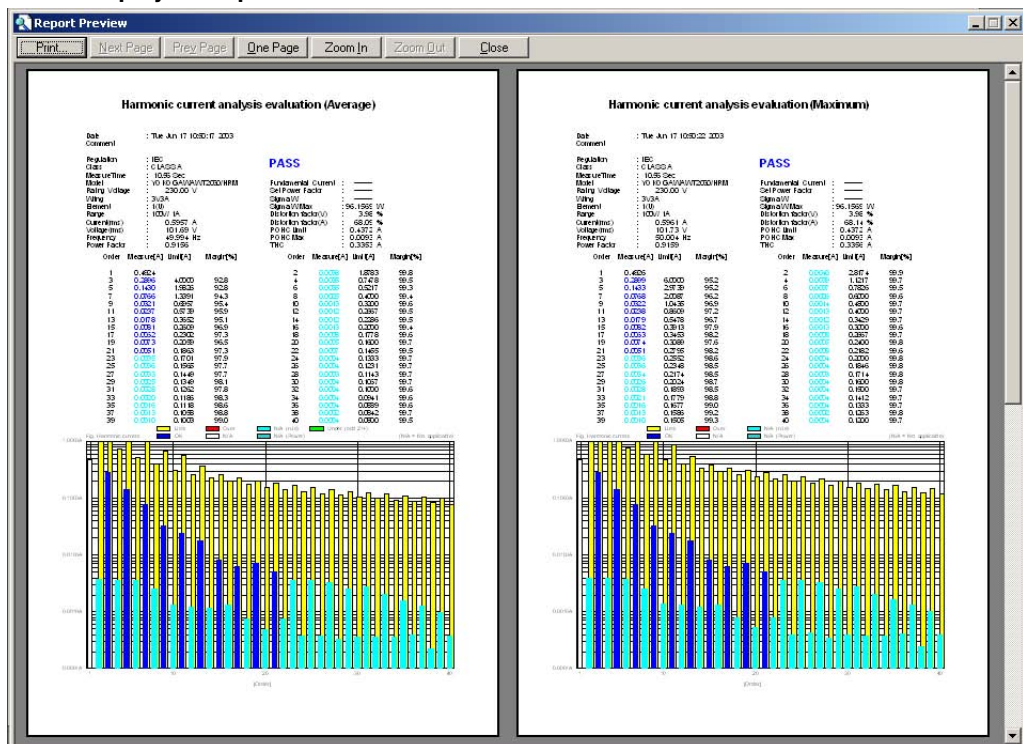
When the measurement mode is set to Harmonic Measurement and the measured data or waveform data has been retrieved (or loaded), the print preview of the report can be displayed.

1. Choose **File > Preview > Report > Element1**. The report is previewed on the Report Preview window.



2. You can perform various operations such as **Next Page/Prev Page, One Page/Two Page, and Zoom In/Zoom Out**. Click **Print** to print the image (see section 7.5).

Display Example: Print Preview Window



Explanation

You can preview the print image on the screen. Perform various operations on the print preview window according to the PC environment that you are using.

Print Preview of the Screen Image

The screen image data of an active window such as acquisition data, bar graph, list, and waveform windows is previewed.

Print Preview of Reports

When the measurement mode is set to Harmonic Measurement and the measured data or waveform data has been retrieved (or loaded), the report can be previewed.

- The report that uses the average and maximum data can be previewed for each input element.
 - * Average: Average of the individual data points (instantaneous values) within the measurement time for each order.
 - Maximum: The maximum value among the individual data points (instantaneous values) within the measurement time for each order.
- For Class C equipment, the limit that was used is also displayed.
- For Class C equipment with an active input power less than or equal to 25 W, waveforms as described in section 4.5 are also previewed, if waveforms are being used for evaluation.
- The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be previewed also varies.

Selecting Color/Mono for Reports

The print mode is selected in the title/comment setting of reports (see section 7.2). If Color is selected there, the preview is displayed in color. If Mono is selected, the preview is displayed in black and white.

7.5 Printing

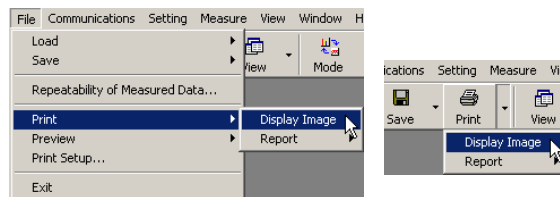
Procedure

Note

- Printing of reports cannot be displayed when the measurement mode is set to Harmonic Monitor or Waveform Monitor or when no measured data or waveform data is present.
- Reports cannot be printed when measurement is in progress.

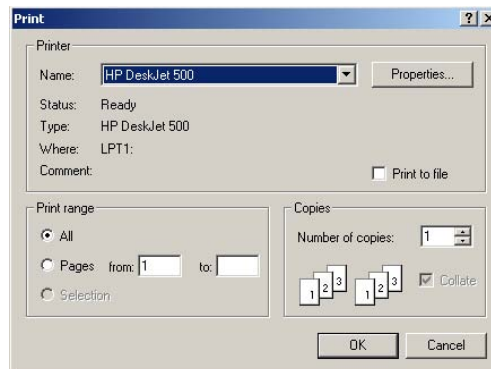
Printing Screen Images

1. From the **File** menu, point to **Print** and then choose **Display Image**. The Print dialog box opens. You can also choose **Display Image** from the **Print** icon on the toolbar.

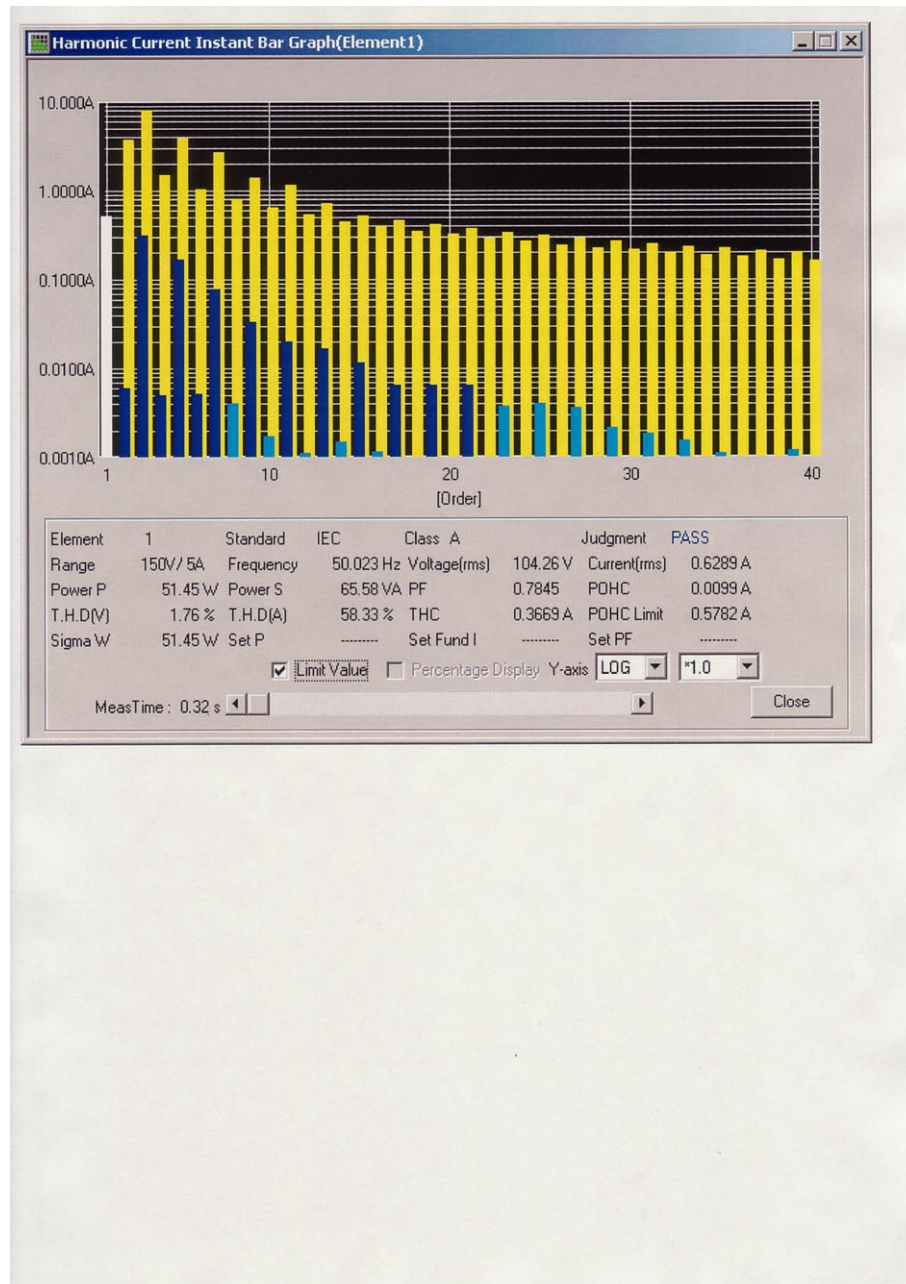


2. Set the **Printer**, **Print range**, and **Copies**.
3. Click **OK**. The screen image that was present when Display Image was selected in step 1 is printed.

The screen image data of an active window such as acquisition data, bar graph, list, and waveform windows is printed.



Print Example

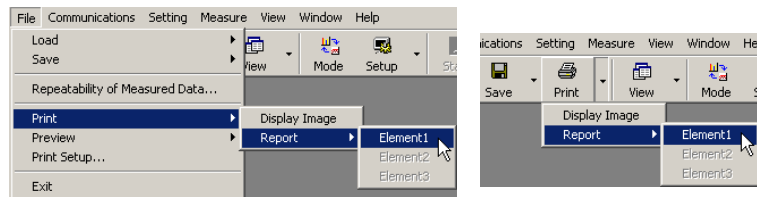


Printing Reports

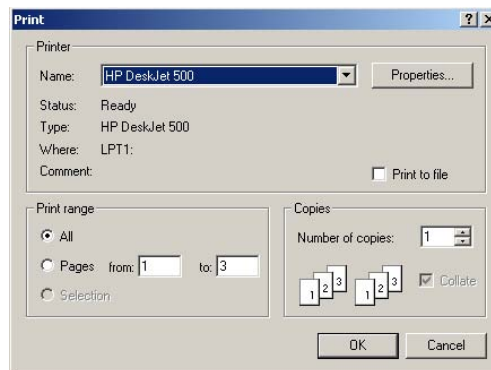
The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be printed also varies. Below a procedure is given in which the wiring system of the WT2000 is set to single-phase two-wire (1P2W or 1 ϕ 2W, indication on the front panel varies depending on the model) and one input element is used.

When the measurement mode is set to Harmonic Measurement Mode and the measurement data has been acquired (or loaded), the report can be printed.

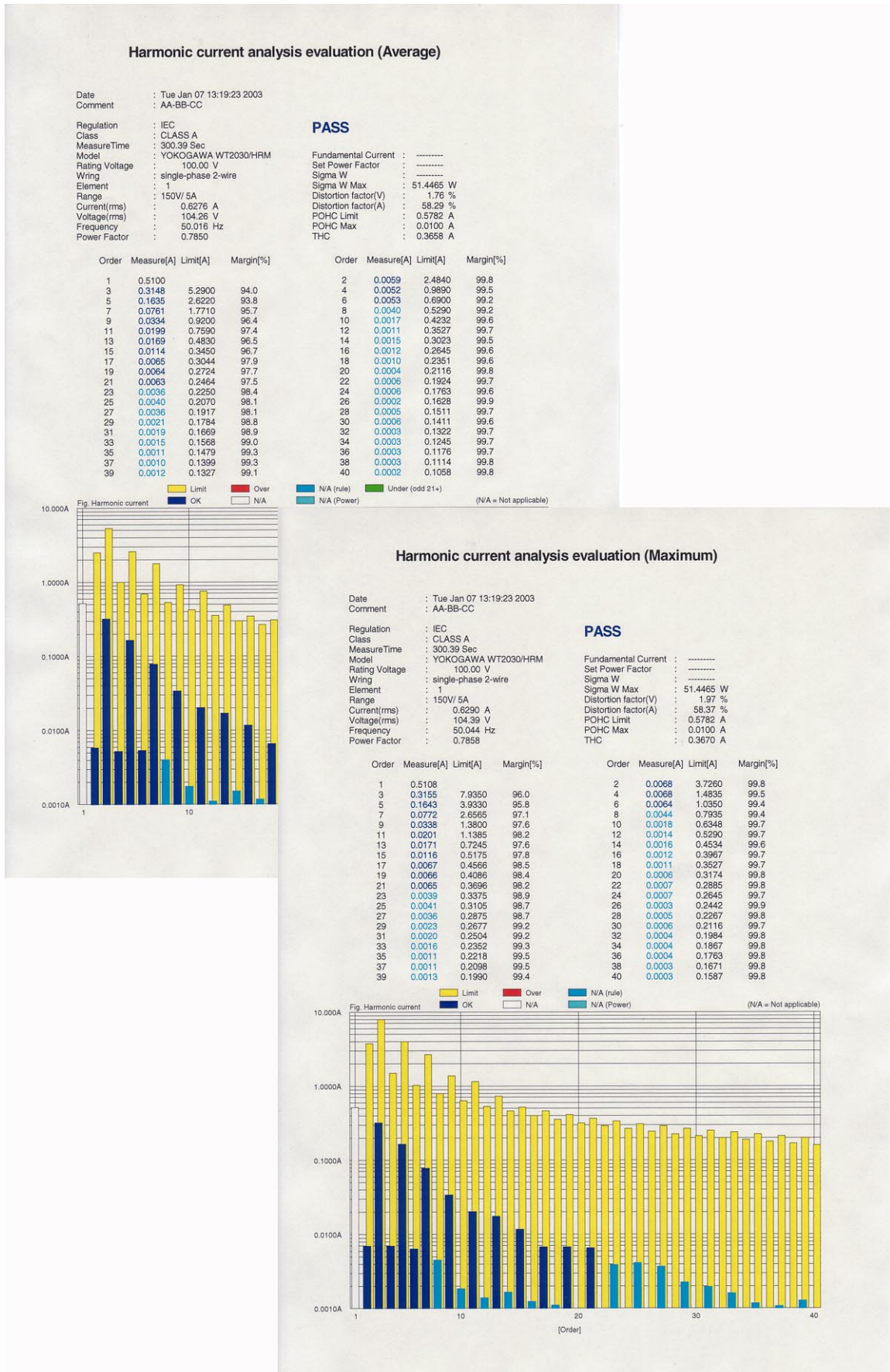
1. Choose **File > Print > Report > Element1**. The Print dialog box opens. You can also choose **Print > Report > Element1** from the toolbar.



2. Set the **Printer**, **Print range**, and **Copies**.
3. Click **OK**. The reports that use the average and maximum data are printed on separate pages.



Print Example



Explanation

Set the printer according to the environment of the system that you are using.

Printing Screen Images

The screen image data of an active window such as acquisition data, bar graph, list, and waveform windows is printed.

Printing Reports

When the measurement mode is set to Harmonic Measurement and the measured data has been retrieved (or loaded), the report can be printed.

- The report that uses the average and maximum data can be printed for each input element.
 - * Average: Average of the individual data points (instantaneous values) within the measurement time for each order.
 - Maximum: The maximum value among the individual data points (instantaneous values) within the measurement time for each order.
- For Class C equipment, the limit that was used is also printed.
- For Class C equipment with an active input power less than or equal to 25 W, waveforms as described in section 4.5 are also printed, if waveforms are being used for evaluation.
- The input element on which harmonic measurement is made varies depending on the wiring system configuration of the WT that you are using (see chapter 8). Therefore, the selectable input element to be printed also varies.

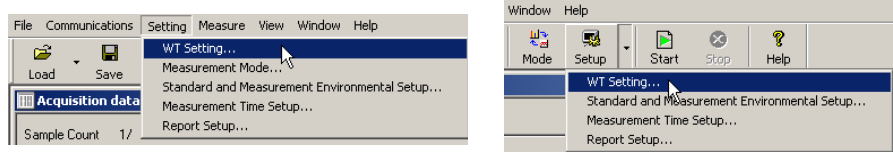
Selecting Color/Mono for Reports

The print mode is selected in the title/comment setting of reports (see section 7.2). If Color is selected there, the report is printed in color. If Mono is selected, the report is printed in black and white.

8.1 Setting the Measurement Conditions of the WT2010/WT2030

Procedure

1. Select WT2000 in the WT selection area, and when online, choose **Setting > WT Setting**. You can also choose **WT Setting** from the **Setup** icon on the toolbar. You can set the measurement conditions of the target WT.



2. Set the measurement conditions of the WT on the WT Setting dialog box. When an item is changed on the dialog box, the corresponding measurement condition of the WT is changed.

PLL source

Select the signal source of the fundamental period used as a reference for determining the harmonic orders.

Display format

Select Value (measured value) or Cont (relative harmonic content)

Display format of the phase angle
Select 360° or 180° format.

Crest factor
Fixed to 3.

Wiring system
Select the wiring system of the measurement circuit.

Frequency filter
Select On or Off.

Display items
Select for each display A through D.

Measurement range of voltage/current
Set for each element.

- Select the voltage range and current range.
- Select scaling On or Off.
- Set the PT ratio, CT ratio, and scaling factor.
- Set the scaling value of the external shunt.

Note

- When taking measurements with this software, the antialiasing filter cutoff frequency is fixed at 5.5 kHz.
- The exponential average of the 1.5 second time constant (when the fundamental frequency is 50/60 Hz) is calculated internally by the software. (the exponential average function on the WT2000/WT1600 is turned OFF).

8.1 Setting the Measurement Conditions of the WT2010/WT2030

Explanation

The measurement conditions of the WT2010 or WT2030 can be set from the software via the GP-IB interface.

- For a description of the setting of the conditions used when retrieving the measured harmonic data into the PC, see chapter 3. For a description of the procedure of displaying the retrieved measurement data and waveform data, see chapters 4 and 5, respectively.
- The menu used to select the input element of the target data varies depending on the wiring system specified here when displaying or saving measured data/waveform data or creating, saving, or printing (see chapter 7) reports.
- When an item is changed on the dialog box, the corresponding measurement condition of the WT is changed.
- The software starts communications with the target instrument when the software is started, the communication mode is set to On-Line mode, and the GP-IB address is selected. At this point, the software loads the measurement conditions of the WT and applies the conditions to the settings shown on the WT Setting dialog box. If communication fails and the measurement conditions of the WT cannot be retrieved, the settings shown on the WT Setting dialog box become factory default settings of the WT.

For the setting details and setup procedure on the WT of the following parameters, see the referenced sections in the WT2010 User's Manual IM253101-01E or the WT2030 User's Manual IM253102-01E.

Parameter	Reference Section in the User's Manual
PLL source	Section 9.1
Display format	Section 9.1
Display format of the phase angle	Section 5.6
Wiring system (Since the WT2010 is a digital power meter for single-phase circuits, only the single-phase, two-wire system (1 ϕ 2W) is supported on the WT2010.)	Section 3.2
Frequency filter	Section 9.1
Display items	Section 9.2
Measurement range of voltage/current	Section 4.2
Line filter	Section 4.1
Averaging	Section 7.5

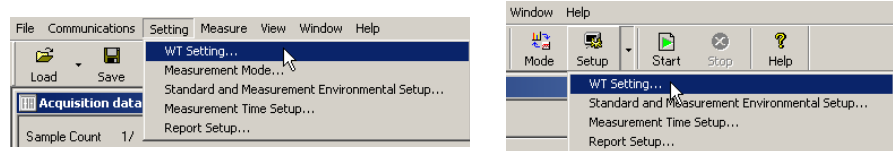
Note

- When set to On-Line mode, the crest factor of the WT is fixed to 3. If Off-Line mode is selected or the software is closed, the crest factor returns to the original setting.
 - If the crest factor is changed to 6 from the front panel of the WT when in On-Line mode, the measurement is executed using a crest factor of 6. Errors increase if measurement is made with the crest factor set to 6. Do not change the crest factor to 6.
-

8.2 Setting the Measurement Conditions of the WT1600

Procedure

1. Select WT1600 in the WT selection area, and when online, choose **Setting > WT Setting**. You can also choose **WT Setting** from the **Setup** icon on the toolbar. You can set the measurement conditions of the target WT.



2. Set the measurement conditions of the WT on the WT Setting dialog box. When an item is changed on the dialog box, the corresponding measurement condition of the WT is changed.

PLL source

Select the signal source of the fundamental period used as a reference for determining the harmonic orders.

Display Format

Selecting the Display Format

Wiring System

Select the wiring system pattern or wiring system for the circuit under test.

Measured Items

Select the wiring unit for the item to undergo harmonic measurement.

Display Detail Settings

Detailed settings for the selected display format.

Measuring range for voltage and current

Set for each input element.

- Voltage and current range selection.
- Turn scaling ON or OFF.
- Set the PT ratio, CT ratio, and the scaling factor.
- Set the scaling value for the external shunt.
- Select the current input method.
- Select a zero cross filter of 500 Hz or OFF.
- Copy filter to the same wiring unit.
- Copy range to the same wiring unit.
- Copy scaling to the same wiring unit.

Note

- When the wiring system is pattern 1 (when all are 1P2W), filter, range, and scaling copy applies to all other elements.
- In range copy, when you copy a 5A input element set to the 10 mA–50 mA current range, 50 A input elements are set to their smallest range of 1 A–50 A.
- In range copy, when you copy a 50 A input element set to the 10 A–50 A current range, 5 A input elements are set to their highest range starting on 5A.
- When taking measurements with this software, the antialiasing filter cutoff frequency is fixed at 5.5 kHz.
- The exponential average of the 1.5 second time constant (when the fundamental frequency is 50/60 Hz) is calculated internally by the software. (the exponential average function on the WT2000/WT1600 is turned OFF).

8.2 Setting the Measurement Conditions of the WT1600

Display Detail Settings

• Numeric

Select the number of display items, or the list display

Click to display the combo box, then select.

When Single List or Dual List is selected, select the measurement functions and elements here.

Select the Sigma List order.

Item No.	Function	Element	Order
1	U	1	Total
2	I	1	Total
3	P	1	Total
4	S	1	Total
5	Q	1	Total
6	U	1	1
7	I	1	1
8	P	1	1
9	S	1	1
10	Q	1	1
11	PF	1	1
12	Angle	1	1
13	AngleU	1	2

List No.	Function	Element	List No.	Function	Element
1	U	1	2	I	1

Order: 1

• Bar

Set the number of screen divisions.

Set the display range for the order.

Set the measurement function and element of the bar graph to be displayed.

Item No.	Function	Element
1	U	1
2	I	1
3	P	1

• Vector

Set the zoom factor.

Turn numeric data ON or OFF.

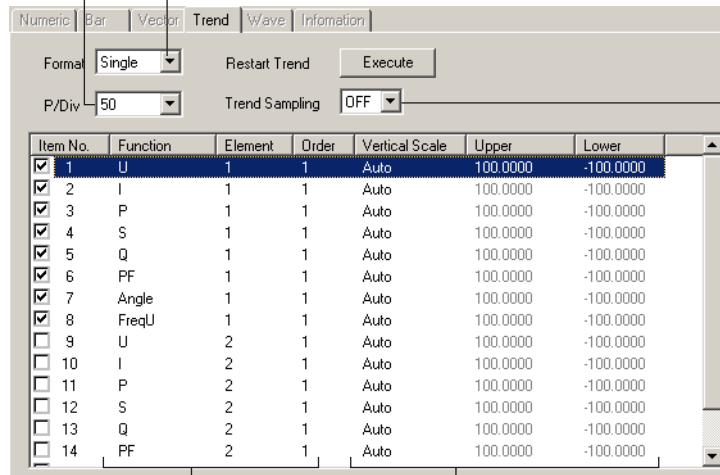
U: 1.000

I: 1.000

• **Trend**

Set the time axis.

Set the number of screen divisions.



Select whether or not to sample trend data.

If you select Manual, you can change the Upper and Lower settings.

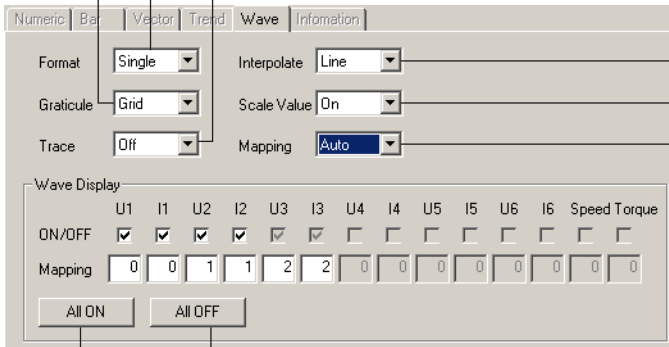
Click to display a combo box.

• **Wave**

Set the graticule.

Set the number of screen divisions.

Select whether or not to display waveform labels.



Select whether or not to interpolate the display.

Select whether or not to display scale values.

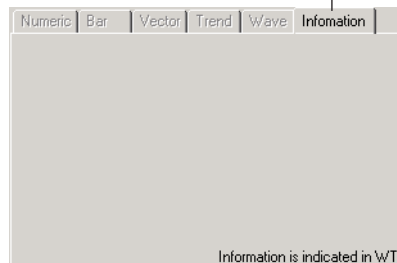
Select the method for dividing up the waveform.

Clear all check boxes.

Select all check boxes.

• **Information**

Display a table of WT screen settings.



8.2 Setting the Measurement Conditions of the WT1600

Explanation

You can enter WT1600 measurement conditions from this software using the GP-IB or Ethernet interface.

- For a description of the setting of the conditions used when retrieving the measured harmonic data into the PC, see chapter 3. For a description of the procedure of displaying the retrieved measurement data and waveform data, see chapters 4 and 5, respectively.
- The menu used to select the input element of the target data varies depending on the wiring system specified here when displaying or saving measured data/waveform data or creating, saving, or printing (see chapter 7) reports.
- When an item is changed on the dialog box, the corresponding measurement condition of the WT is changed.
- When you start the software, set the communication mode to online, and select the communication address, the software opens communication with the target instrument. At this point, the software loads the measurement conditions of the WT and applies the conditions to the settings shown on the WT Setting dialog box. If communication fails and the measurement conditions of the WT cannot be retrieved, the settings shown on the WT Setting dialog box become factory default settings of the WT.

For the setting details and setup procedure on the WT of the following parameters, see the referenced sections in the WT2010 User's Manual IM253101-01E or the WT2030 User's Manual IM253102-01E.

Parameter	Reference Section in the User's Manual
PLL source	Section 7.4
Display format	Section 4.1
Wiring system	Section 5.1
Frequency filter	Section 5.5
Display items	Section 7.2
Measurement range of voltage/current	Section 5.2
Line filter	Section 5.5
Averaging	Section 5.6

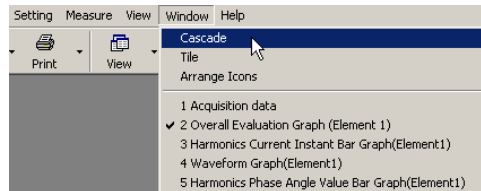
9.1 Cascading/Tiling Graph and List Windows

Procedure

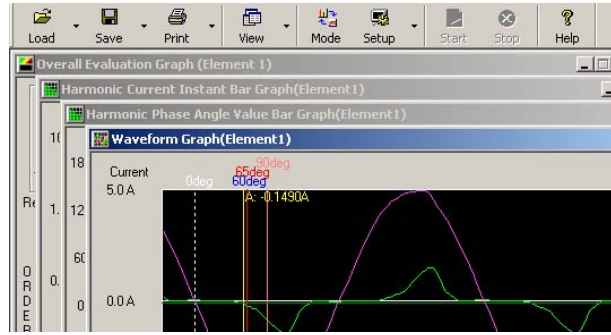
Cascading and tiling window functions are convenient for arranging the display.

Cascading Windows

From the **Window** menu, choose **Cascade**. Windows are cascaded so that the titles of all displayed windows can be seen.

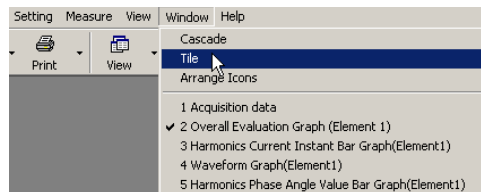


Display Example



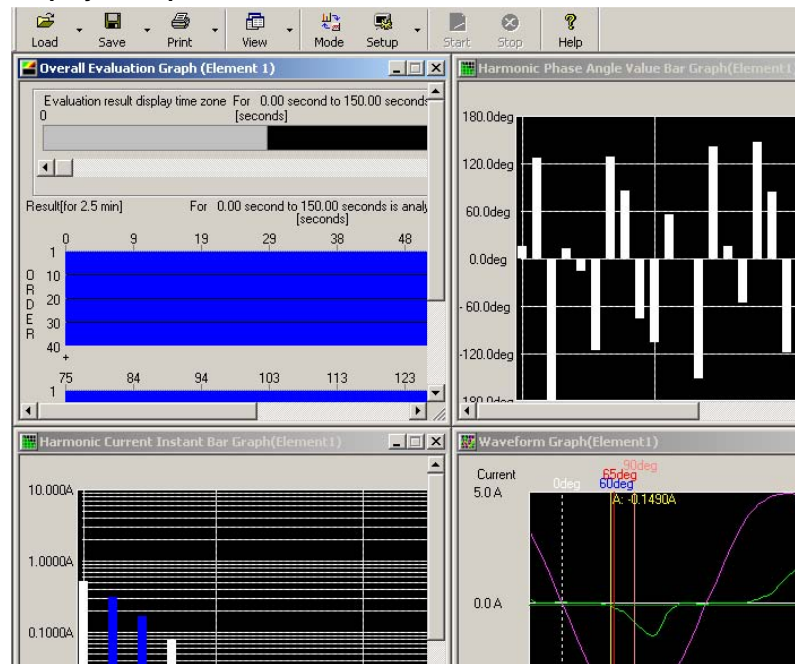
Tiling Windows

From the **Window** menu, choose **Tile**. All the displayed windows are tiled so that the windows do not overlap each other.



9.1 Cascading/Tiling Graph and List Windows

Display Example



Explanation

Window functions are useful, when the measurement mode is set to Harmonic Measurement, the measured data is retrieved (or loaded), and multiple graphs or lists are displayed.

Cascade

- Windows are cascaded so that the title of all displayed windows can be seen.
- The active graph or list window becomes the front window after the cascade operation.
- The cascade order varies depending on the type of displayed window.

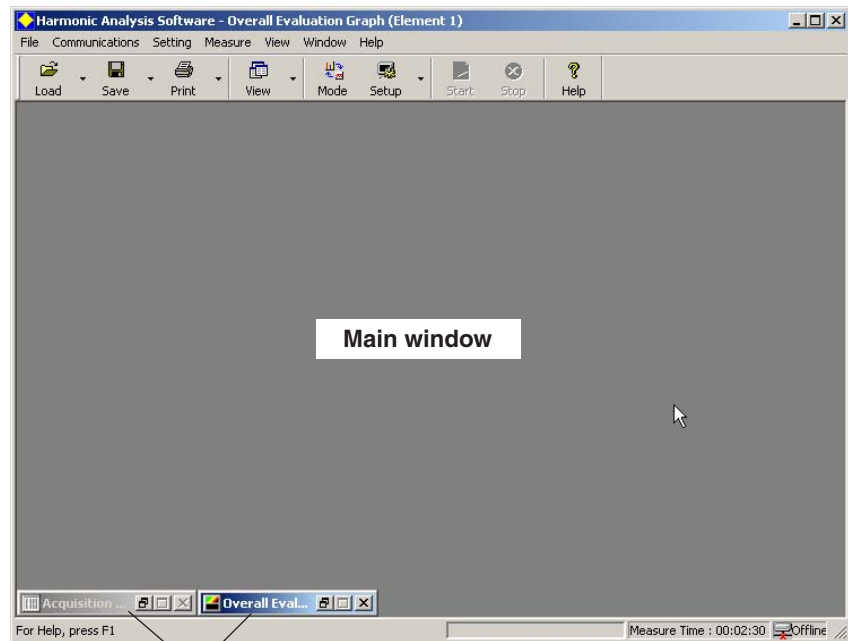
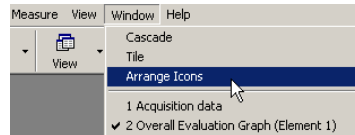
Tile

- All the displayed windows are tiled so that the windows do not overlap each other.
- The active graph or list window becomes the active window after the tile operation.
- The arrangement order varies depending on the type of displayed window.

9.2 Arranging Icons

Procedure

From the **Window** menu, choose **Arrange Icons**. All the minimized windows (icons) are arranged at the lower left corner of the main window of the software.



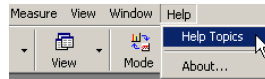
Explanation

This function is useful when various windows such as acquisition data, bar graph, and list windows have been minimized (icons) and the icons have been moved (within or outside the main window of the software).

9.3 Using the Help Function

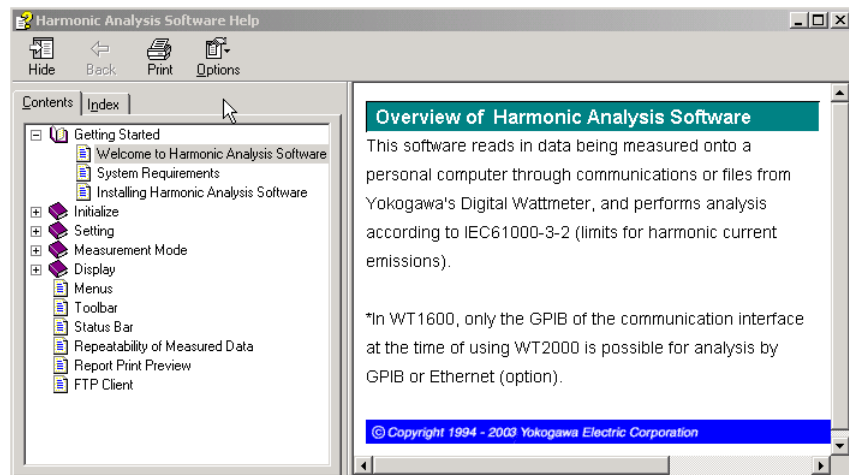
Explanation

1. From the **Help** menu, choose **Help Topics**. The Help dialog box opens. You can also click  on the toolbar.



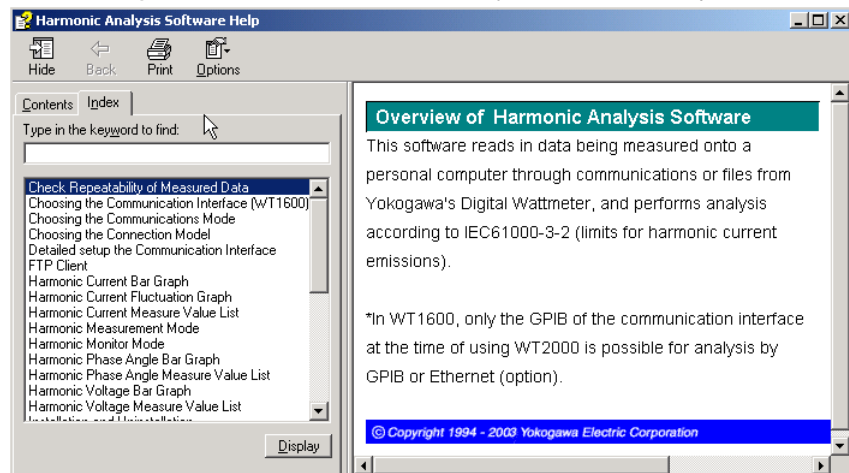
Finding the Topic from the Help Contents

2. Click the **Contents** tab. Find the topic from the menu.



Finding the Topic by Keyword Search

2. Click the **Keyword** tab. Enter or select the keyword to find the topic.



Explanation

On the PC while using the software, you can find information about the operating procedures and terminology of the software.

From the Help Contents

You can select a topic from the contents and find information about the operating procedure and terminology.

Keyword Search

- You can find information about operating procedures and terminology using keywords.
- You can enter the keyword or select the keyword from a list.

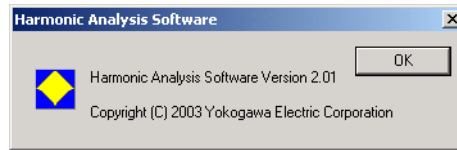
9.4 Viewing Version Information

Procedure

From the **Help** menu, choose **About**. The Harmonic Analysis Software version information dialog box opens.



Harmonic Analysis Software Version Dialog Box



Explanation

The name and version information of the software is displayed.

Specifications

Item	Specifications
Software*	The Harmonic Analysis Software measures harmonic currents of electrical equipment according to the IEC Standard and indicates/saves the results of evaluations made according to the standard. The executable file name is IEC61000_3_2.exe.
Applicable measurement	The WT1600 Digital Power Meter (model 760101), or three of the WT2000 series of digital power meters (the WT2010 model 253101, or the WT2030 models 253102 and 253103) by YOKOGAWA.
Applicable standard*	IEC 61000-3-2 (Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)) Edition 2.1 and EN61000-3-2 Amendment 14.
Functions	<p>Retrieving and loading of measured data/waveform data to be evaluated</p> <ul style="list-style-type: none"> Setting of WT measurement conditions. Retrieving of measured data or waveform data from the WT connected online (On-Line Mode). Loading of measured data or waveform data already saved (Off-Line mode). <p>Measurement mode*</p> <ul style="list-style-type: none"> Harmonic Measurement Mode <ul style="list-style-type: none"> When in On-Line Mode <p>Measures and evaluates harmonics on the measurement data retrieved from the WT according to the method complying with IEC61000-3-2 Edition 2.1.</p> When in Off-Line Mode <p>Evaluates the measurement data loaded from files according to the method complying with IEC61000-3-2 Edition 2.1.</p> Harmonic Monitor Mode <p>Monitor harmonic fluctuation on bar graphs and numerical list while making measurements on the WT only in On-Line mode.</p> Waveform Monitor Mode <p>Monitor waveforms while making measurements on the WT on in On-Line mode.</p> <p>Standard and measurement environment</p> <p>Sets the classification of the equipment under test (EUT) as defined in IEC 61000-3-2 Edition 2.1 and evaluation conditions within each class.</p> <p>Measurement time</p> <p>Time from measurement start to measurement stop. Selectable range: 0 H 2 M 1 S to 24 H 0 M 0 S in units of 1 s.</p> <p>Title/Comment of reports</p> <p>Sets the title/comment of reports. You can select color or black and white for reports. Saved/Printed along with the measured data.</p> <p>Starting/Stopping of measurements</p> <p>Starts measurements when in On-Line mode.</p> <p>Displaying of the evaluation results and measured data/waveform data</p> <p>Only when the measurement mode is set to Harmonic Measurement, displays the result of the evaluation as whether the harmonic current data up is within the limits of IEC 61000-3-2 Edition 2.1 and the corresponding measured data.</p> <ul style="list-style-type: none"> Display of the evaluation result within the entire measurement time <p>Evaluates as to whether all of the harmonic measurement data in the measurement time are within the limits and display the results.</p> Bar graph display of harmonic current/voltage <p>Displays bar graph of the harmonic measurement data and the standard limits for each order.</p> List display of harmonic current/voltage <p>Displays a list of the harmonic measurement data and the standard limits for each order.</p> Fluctuation graph display of harmonic current <p>Displays the graph of the harmonic current fluctuation over time for each order.</p> Waveform display of voltage/current <p>Display the waveforms occurring just after stopping measurement (approximately 2 periods of the waveform using the WT2000, or approximately 4 periods on the WT1600). Place the cursor on the current waveform and read the phase difference (phase angle) from the first zero-crossing point of the voltage waveform and the current value.</p> Fluctuation graph display of voltage/current/active power <p>Displays the graph of the fluctuation of the rms value of the voltage and current as well as the active power that are determined from the measured fundamental signal and all harmonics.</p> Bar graph display of the phase angle of the harmonic current <p>Displays the bar graph of the phase angle of the harmonic current with respect to the fundamental signal for each order.</p> List display of the phase angle of the harmonic current <p>Displays a numerical list of the phase angle of the harmonic current with respect to the fundamental signal for each order.</p>

Specifications

Item	Specifications
	<p>Loading of setup information, measured data, and waveform data</p> <ul style="list-style-type: none"> • Saving and loading of data Save to a file setup information including the measurement mode, standard and measurement environment settings, measurement time, title/comment of reports. Loading of the setup information is also possible. • Loading of measured data and waveform data Save measured data or waveform data of harmonics to files. Setup information such as the measurement mode, standard and measurement environment settings, measurement time, title/comment of reports and the harmonic measurement conditions of the WT specified by the software are also saved. Loading of the saved measured data, waveform data, harmonic measurement conditions, and setup information is also possible. • Saving of the measured data or waveform data in CSV format Save the measured data or waveform data of harmonics to a file in CSV format. The saved data can be loaded on a PC software application supporting CSV format. <hr/> <p>Saving/Printing of screen images and reports Save screen images or reports to a file in BMP format. Printing also possible.</p> <hr/> <p>Repeatability of measured data Compares the harmonic measurement data that is saved to files, and displays the difference in the measured data on a bar graph and numerical list. Enables confirmation of whether the difference between data measured using the same product is within 5% as defined by the standard (confirmation of repeatability)</p>
System requirements	<p>Hardware</p> <ul style="list-style-type: none"> • PC PC on which Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional runs. Celeron 500 MHz CPU or higher. • Internal memory 128 MB or more. • Hard disk Free space of 10 MB or more. • GP-IB port A GP-IB port made by National Instruments (Version 1.60 or later) must be installed in the PC. • Ethernet communication port (WT1600 only) 10BASE-T/100BASE-T compatible Ethernet communications port required. • Disk drive One CD-ROM drive. The drive is used to install the software. • Display Display compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional. A resolution of 1024 × 768 dots or higher Analog RGB with 65,536 colors or more recommended. • Mouse or pointing device Mouse or pointing device compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional. • Printer Printer compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional. Printer driver compatible with Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional is required. A color printer recommended. <hr/> <p>Operating System Windows 98, Windows Me, Windows XP Professional, Windows NT 4.0 Workstation, or Windows 2000 Professional is required.</p> <hr/> <p>WT Digital Power Meter</p> <ul style="list-style-type: none"> • The WT2010 or WT2030 Digital Power Meters with firmware (ROM) version 1.41 or later and a GP-IB interface. • The WT1600 Digital Power Meters with firmware (ROM) version 2.07 or later, and a GP-IB or Ethernet interface.

* Only the WT2000 supports judgment according to standards. The WT1600 supports analysis based on standards, but measurement accuracy is limited in some parts so measurements cannot be taken that are in full compliance with standards.

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