User's Manual

PX8000 Precision Power Scope Getting Started Guide

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM PX8000-03EN
7th Edition

Product Registration

Thank you for purchasing YOKOGAWA products.

YOKOGAWA provides registered users with a variety of information and services. Please allow us to serve you best by completing the product registration form accessible from our website.

http://tmi.yokogawa.com/

Thank you for purchasing the PX8000 Precision Power Scope (hereinafter, “PX8000” will refer to this products).
This getting started guide primarily explains the handling precautions and basic operations of the PX8000. To ensure correct use, please read this manual thoroughly before operation.
Keep this manual in a safe place for quick reference in the event that a question arises.

List of Manuals

This manual is one of four PX8000 manuals. Please read all manuals.

Manual Title	Manual No.	Description
PX8000 Precision Power Scope Features Guide	IM PX8000-01EN	The manual explains all the PX8000 features other than the communication interface features.
PX8000 Precision Power Scope User’s Manual	IM PX8000-02EN	The manual explains how to operate the PX8000.
PX8000 Precision Power Scope Getting Started Guide	IM PX8000-03EN	This guide. Provided as a printed manual. This guide explains the handling precautions, basic operations, and specifications of the PX8000.
PX8000 Precision Power Scope Communication Interface User’s Manual	IM PX8000-17EN	The manual explains the PX8000 communication interface features and instructions on how to use them.
Model PX8000 Precision Power Scope	IM PX8000-92Z1	Document for China

The “EN” and “Z1” in the manual numbers are the language codes.
PDF files of all the manuals above are included in the accompanying manual CD.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument’s performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of YOKOGAWA is strictly prohibited.
- The TCP/IP software of this product and the documents concerning it have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from the Regents of the University of California.

Trademark

- Microsoft, Internet Explorer, MS-DOS, Windows, Windows XP, and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe is either registered trademark or trademark of Adobe Systems Incorporated.
- MATLAB is a registered trademark of The MathWorks, Inc. in the United States.
- GIGAZoom ENGINE is a registered trademark of Yokogawa Electric Corporation.
- In this manual, the ® and TM symbols do not accompany their respective registered trademark or trademark names.
- Other company and product names are trademarks or registered trademarks of their respective companies.

7th Edition: July 2019 (YMI)

Revisions

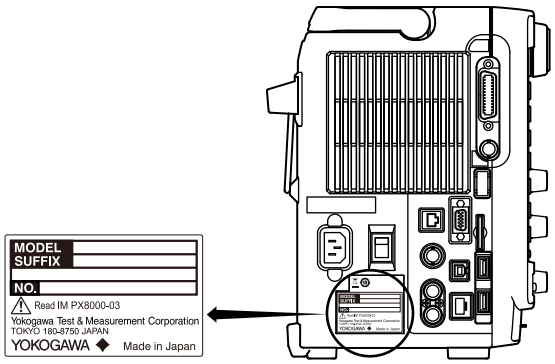
- 1st Edition: January 2014
- 2nd Edition: January 2014
- 3rd Edition: August 2014
- 4th Edition: December 2015
- 5th Edition: June 2017
- 6th Edition: October 2017
- 7th Edition: July 2019

Checking the Contents of the Package

Unpack the box, and check the contents before operating the instrument. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

PX8000

Check that the product that you received is what you ordered by referring to the model name and suffix code given on the name plate on the left side panel.



MODEL	Suffix Code		Description
PX8000			Main device, 8 slots, 10 Mpoint memory
Power cord[1]	-D		UL/CSA Standard Power Cord (Part No.: A1006WD) [Maximum rated voltage: 125 V]
	-F		VDE Standard Power Cord (Part No.: A1009WD) [Maximum rated voltage: 250 V]
	-Q		BS Standard Power Cord (Part No.: A1054WD) [Maximum rated voltage: 250 V]
	-R		AS Standard Power Cord (Part No.: A1024WD) [Maximum rated voltage: 250 V]
	-H		GB Standard Power Cord (Part No.: A1064WD) [Maximum rated voltage: 250 V]
	-N		NBR Standard Power Cord (Part No.: A1088WD) [Maximum rated voltage: 250 V]
	-T		Taiwanese Standard Power Cord (Part No.: A1100WD) [Maximum rated voltage: 125 V]
	-B		Indian Standard Power Cord (Part No.: A1101WD) [Maximum rated voltage: 250 V]
	-U		IEC Plug Type B Power Cord (Part No.: A1102WD) [Maximum rated voltage: 250 V]
	-Y		No power cord included.[2]
Language (The factory default message language)	-HE		English
	-HG		German
	-HJ		Japanese
Options		/B5	Built-in printer[3]
		/C20	IRIG
		/G5	Harmonic Measurement
		/M1	50 Mpoint memory expansion[4]
		/M2	100 Mpoint memory expansion[4]
		/P4	4ch Probe power supply
		/PD[5]	4ch Sensor power supply
		/PD2	4ch Sensor power supply

1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.
2 Prepare a power cord that complies with the standard specified by the country or region that the instrument will be used in.
3 Includes one roll of paper (B9988AE)
4 The /M1 and /M2 options cannot be installed on the same instrument.
5 End of sale : June 2017.

For products whose suffix code contains “Z,” an exclusive manual may be included.
Please read it along with the standard manual.

No. (Instrument Number)

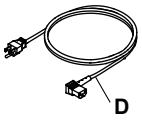
When contacting the dealer from which you purchased the instrument, please give them the instrument number.

Standard Accessories

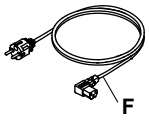
The standard accessories below are supplied with the instrument. Check that all contents are present and undamaged.

Power cord (one cord that matches the suffix code is included)[1]

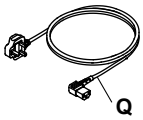
UL/CSA Standard A1006WD



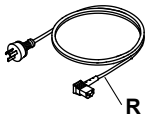
VDE Standard A1009WD



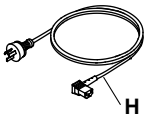
BS Standard A1054WD



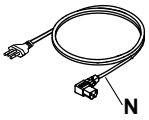
AS Standard A1024WD



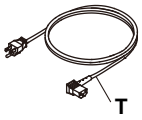
GB Standard A1064WD



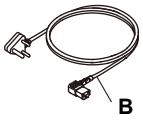
NBR Standard A1088WD



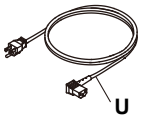
Taiwanese Standard A1100WD



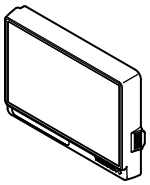
Indian Standard A1101WD



IEC plug Type B A1102WD



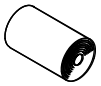
Front-panel protection cover B8074EA 1 panel



Rubber stoppers B9989EX, 4 stoppers (1 sheet)

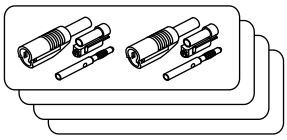
Cover panels B8073CY, 8 panels

Printer roll paper[2] B9988AE, 1 roll

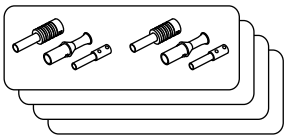


Hexagonal socket wrench B9317WD, 1 piece

Safety terminal adapter set[3] B8213ZD (red/black), 4 sets

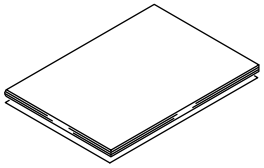


Safety terminal adapter set[3] B8213ZA (red/black), 4 sets

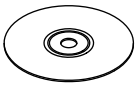


Manuals[4]

• Printed manuals



• Manual CD



1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in. If the suffix code is -Y, a power cord is not included.

2 Only included with models that have a built-in printer (/B5)

3 For instructions on how to assemble the 758931, see section 2.6.

4 Manuals

Item	Model or Part No.	Quantity	Specifications and Notes
Printed manuals	IM PX8000-03EN	1	Getting Started Guide (this guide)
	IM PX80008-92Z1	1	Document for China
	PIM 113-01Z2	1	List of worldwide contacts
Manual CD	B8213YC	1	Contains PDFs of the user's manuals (For the types of manuals that CD contains, see the next page.)

Standard accessories are not covered by warranty of this instrument.

Manual CD

The English folder in the manual CD contains the PDF files shown below. The CD also contains Japanese manuals.

File Name	Manual Title	Manual No.
Communication Interface.pdf	PX8000 Precision Power Scope Communication Interface User's Manual	IM PX8000-17EN
Features Guide&Users Manual.pdf	PX8000 Precision Power Scope Features Guide	IM PX8000-01EN
	PX8000 Precision Power Scope User's Manual	IM PX8000-02EN
Getting Started Guide.pdf	PX8000 Precision Power Scope Getting Started Guide	IM PX8000-03EN

To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

WARNING

Never play this manual CD, which contains the user's manuals, in an audio CD player. Doing so may cause loss of hearing or speaker damage due to the large sounds that may be produced.

French

AVERTISSEMENT

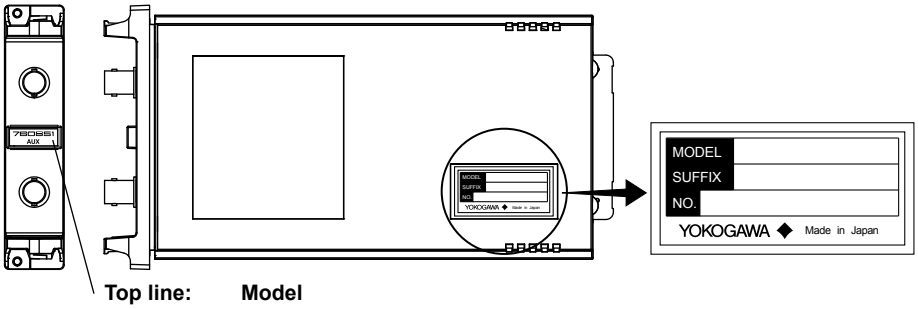
Ce CD contient les manuels d'utilisation. Ne jamais insérer ce CD dans un lecteur de CD audio. Cela pourrait entraîner une perte d'audition ou l'endommagement des enceintes en raison du volume potentiellement élevé des sons produits.

Input Modules (Sold Separately)

To make sure that an input module is the module that you ordered, check the module name written on it.

MODEL	Name	Abbreviation
760811	Voltage Module	VOLTAGE
760812	Current Module	CURRENT
760813	Current Module	CURRENT
760851	AUX Module	AUX

Example:760851



Top line: Model
Bottom line: Abbreviation
The location varies depending on the module.

In this manual, input modules are referred to by their model names and abbreviations.
For example, the Voltage Module is referred to as the 760811 (VOLTAGE). However, if a module has already been referred to previously, it may be referred to only by its model name (for example, 760811).
The combination of the 760811 (voltage module) and the 760812 (current module), or the combination of the 760811 (voltage module) and the 760813 (current module) is called a power measurement element. It is sometimes referred to simply as element in this manual.

Optional Accessories (Sold Separately)

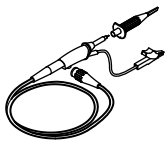
The optional accessories below are available for purchase separately. Check that all contents are present and undamaged.
Use the accessories specified in this manual. Moreover, use the accessories of this product only with Yokogawa products that specify them as accessories. For information about ordering accessories, contact your nearest YOKOGAWA dealer.

Name	Model	Safety standard[1]	Note
Isolated probe	700929	1000 Vrms CAT II	10:1 safety probe for the 760851
	701947	1000 Vrms CAT II	100:1 safety probe for the 760851
High voltage differential probe	701926	1000 Vrms CAT III[2]	Switchable between 1000:1 and 100:1. For use with the 760851. Measurable voltage: 7000 Vpeak (5000 Vrms)
1:1 BNC safety adapter lead	701901	1000 Vrms CAT II	For use with the 760851. Used with the following items (which are sold separately): the 701954, 701959, 758922, 758929, or 758921.
Alligator clip (dolphin type)	701954	1000 Vrms CAT III	Two pieces in one set (red/black)
Safety mini-clip (hook type)	701959	1000 Vrms CAT II	Two pieces in one set (red/black)
Alligator clip adapter	758922	300 Vrms CAT II	Two pieces in one set
Alligator clip adapter	758929	1000 Vrms CAT II	Two pieces in one set
Fork terminal adapter	758921	1000 Vrms CAT II	Two pieces in one set (red/black). For 4 mm screws.
Cable[3]	366926	—	For measuring low voltage of less than or equal to 42 V
Banana–alligator clip cable	366961	—	For measuring low voltage of less than or equal to 42 V
Safety terminal adapter set	758923	—	Two pieces in one set
Safety terminal adapter set	B8213ZD	1000V CAT II 600V CAT III	Two pieces in one set (red/black)
Safety terminal adapter set	B8213ZA	1000V CAT III	Two pieces in one set (red/black)
Hexagonal socket wrench	B9317WD	—	One piece in one set, for assembling B8213ZA and B8213ZD
Long test clips	701906	1000V CAT II	Two pieces in one set (red/black)
Plug-on clips	701948	1000V CAT II	For 700929
External current sensor cable	B9284LK	—	For connecting to the PX8000's external current sensor input connector. Cable length: 0.5 m.
Measurement lead	758917	1000 Vrms CAT II	Two pieces in one set. Used with the 758922 or 758929 adapter. The adapters are sold separately.
External I/O cable	720911	—	For external I/O
BNC cable	366924	—	42 V or less. Total length: 1 m.
BNC cable	366925	—	42 V or less. Total length: 2 m.
Safety BNC cable	701902	1000 Vrms CAT II	Cable length: 1 m
Safety BNC cable	701903	1000 Vrms CAT II	Cable length: 2 m
Soft carrying case	701963	—	Has three pockets
Shunt resistor box (5 Ω)	A1323EZ	—	±0.05%, Current rating: 580 mA * Usage is limited to 5 minutes for 580 mA to 667 mA input.
Shunt resistor box (10 Ω)	A1324EZ	—	±0.02%, Current rating: 300 mA
Shunt resistor box (20 Ω)	A1325EZ	—	±0.02%, Current rating: 200 mA
Current sensor cable	A1559WL	—	Cable length: 3 m
Current sensor cable	A1560WL	—	Cable length: 5 m
Direct current input cable[4]	A1589WL	—	Cable length: 3 m, Current rating: 667 mA
Direct current input cable[4]	A1628WL	—	Cable length: 5 m

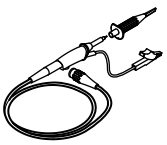
Optional accesories(sold separately) are not covered by warranty of this instrument.

1 The actual voltage that can be used is the lowest voltage of the PX8000 input modules and cable specifications.
2 For details on the safety standard, see the manual that came with the 701926. Be sure to connect the GND lead provided with the 701926 to the functional ground terminal of the PX8000.
3 Use cables (366926) that YOKOGAWA has been shipping since February 4, 1998. Cables (366926) shipped before this date cannot be used in combination with the PX8000 input modules.
4 Used with the female to female adapter.

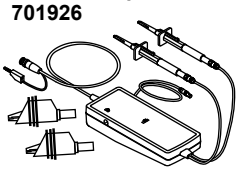
Isolated probe 700929



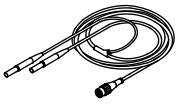
Isolated probe 701947



High Voltage differential probe 701926

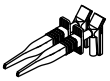


1:1 BNC safety adapter lead 701901[1]

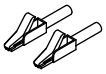


Alligator clip (dolphin type) 701954

Safety miniclip (hook type) 701959



Alligator clip adapter (rated 300 V) 758922

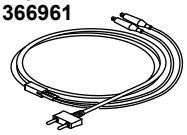


Alligator clip adapter (rated 1000 V) 758929

Fork terminal adapter 758921

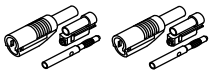
Cable 366926

Banana–alligator clip cable 366961

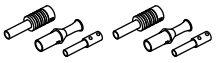


Safety terminal adapter set 758923

Safety terminal adapter set B8213ZD



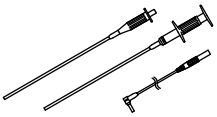
Safety terminal adapter set B8213ZA



Hexagonal socket wrench B9317WD

Long test clips 701906

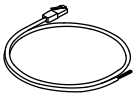
Plug-on clips 701948



External current sensor cable B9284LK

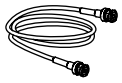
Measurement lead 758917

External I/O cable 720911



BNC cable (1 m) 366924

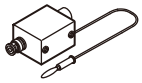
BNC cable (2 m) 366925



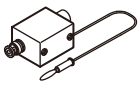
Safety BNC cable (1 m) 701902

Safety BNC cable (2 m) 701903

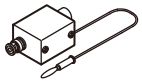
Shunt resistor box (5 Ω) A1323EZ



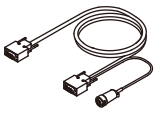
Shunt resistor box (10 Ω) A1324EZ



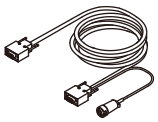
Shunt resistor box (20 Ω) A1325EZ



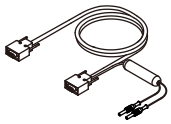
Current sensor cable (3 m) A1559WL



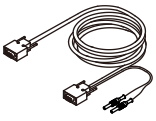
Current sensor cable (5 m) A1560WL



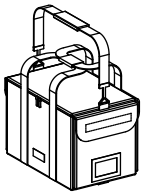
Direct current input cable (3 m) A1589WL



Direct current input cable (5 m) A1628WL



Soft carrying case 701963



1 The 1:1 BNC safety adapter lead (701901) must be used with one of the following accessories (which are sold separately): alligator clip (dolphin type: 701954), safety miniclip (hook type: 701959), alligator adapter (758922 or 758929), or fork terminal adapter (758921).

Spare Parts (Sold Separately)

The spare parts below are available for purchase separately. Check that all contents are present and undamaged.

For information about ordering spare parts, contact your nearest YOKOGAWA dealer.

Name	Part No.	Minimum Q'ty	Note
Printer roll paper	B9988AE	10	Thermo-sensitive paper, 111 mm × 10 m

Spare parts(sold separately) are not covered by warranty of this instrument.

Safety Precautions

This product is designed to be used by a person with specialized knowledge.
This instrument is an IEC safety class I instrument (provided with a terminal for protective earth grounding).
The general safety precautions described herein must be observed during all phases of operation.
If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.
This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.

The Following Symbols Are Used on This Instrument.


Handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.


Electric shock, danger


Protective ground terminal


Ground or the functional ground terminal (do not use as the protective earth ground terminal)


Alternating current

Direct current


Both direct and alternating current

ON (power)


OFF (power)

French


À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.


Choc électrique, danger


Borne de protection à la terre


Borne de terre ou borne de terre fonctionnelle (ne pas utiliser cette borne comme prise de terre)


Courant alternatif

Courant direct


Courant direct et alternatif

Marche (alimentation)


Arrêt (alimentation)

Make sure to comply with the precautions below. Not complying might result in injury or death.

WARNING

Use the Instrument Only for Its Intended Purpose
This instrument is a waveform measuring device that monitors and measures electrical signals. Do not use this instrument for anything other than as a waveform measuring device.

Check the Physical Appearance
Do not use the instrument if there is a problem with its physical appearance.

Use the Correct Power Supply
Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.

Use the Correct Power Cord and Plug
To prevent the possibility of electric shock or fire, be sure to use the power cord for the instrument. The main power plug must be plugged into an outlet with a protective earth terminal. Do not invalidate this protection by using an extension cord without protective earth grounding. Further, do not use this power cord with other instruments.

Connect the Protective Grounding Terminal
Make sure to connect the protective earth to prevent electric shock before turning on the power. The power cord that you can use for the instrument is a three-prong cord. Connect the power cord to a properly grounded three-prong outlet.

Do Not Impair the Protective Grounding
Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so poses a potential shock hazard.

Do Not Operate with Defective Protective Grounding or Fuse
Before using this instrument, check that the protection functions, such as the protective grounding and fuse, are working properly. If you suspect a defect, do not use the instrument.

Do Not Operate in an Explosive Atmosphere
Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such an environment constitutes a safety hazard.

Do Not Remove the Covers or Disassemble or Alter the Instrument
Only qualified YOKOGAWA personnel may remove the covers and disassemble or alter the instrument. The inside of the instrument is dangerous because parts of it have high voltages.

Ground the Instrument before Making External Connections
Securely connect the protective grounding before connecting to the item under measurement or an external control unit. If you are going to touch the circuit, make sure to turn OFF the circuit and check that no voltage is present.

Measurement Category
This instrument is a measurement category II product. Do not use it for measurement category III or IV measurements.

Installation Location

- This instrument is designed to be used indoors. Do not install or use it outdoors.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

When Carrying the Instrument

First, turn off the circuit under measurement and remove the measurement cables. Then, turn off the instrument and remove the power cord and any attached cables. When carrying the instrument, use the handle, or use both hands to hold the instrument firmly..

Precautions to Be Taken When Using the Modules

- Do not apply input voltage exceeding the maximum input voltage, maximum allowable common mode voltage, withstand voltage, or allowable surge voltage.
- To prevent the possibility of electric shock, be sure to furnish protective earth grounding of the PX8000.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical protection function and the mechanical protection function will not be activated.
- Do not leave the modules connected to the instrument in environments in which a voltage that exceeds the allowable surge voltage may occur.

Connect Cables Correctly

This instrument can measure large voltages and currents directly. If you use a voltage transformer or a current transformer together with this power meter, you can measure even larger voltages or currents. When you are measuring a large voltage or current, the power capacity of the item under measurement becomes large. If you do not connect the cables correctly, an overvoltage or overcurrent may be generated in the circuit under measurement. This may lead to not only damage to the instrument and the item under measurement, but electric shock and fire as well. Be careful when you connect the cables, and be sure to check the following points.

Before you begin measuring (before you turn the item under measurement on), check that:

- Cables have been connected to the input module's terminals of this instrument correctly.
  - Check that there are no voltage measurement cables that have been connected to the current input terminals.
  - Check that there are no current measurement cables that have been connected to the voltage input terminals.
  - If you are measuring multiphase power, check that there are no mistakes in the phase wiring.
- Cables have been connected to the power supply and the item under measurement correctly. Check that there are no short circuits between terminals or between connected cables.
- The current measurement cables are fixed to the current module with a cable strap.

During measurement (never touch the terminals and the connected cables when the item under measurement is on), check that:

- The input terminals are not abnormally hot.
- The cable strap fixing the current measurement cables to the current module is not loose.

After measuring (immediately after you turn the item under measurement off):

After you measure a large voltage or current, power may remain for some time in the item under measurement even after you turn it off. This remaining power may lead to electric shock, so do not touch the input terminals immediately after you turn the item under measurement off. The amount of time that power remains in the item under measurement varies depending on the item.

Accessories

Use the accessories specified in this manual. Moreover, use the accessories of this product only with Yokogawa products that specify them as accessories.
Do not use faulty accessories.

Precautions to Be Taken When Using the Probes

Be sure to connect the GND lead of the high voltage differential probe (the 701926) to the functional ground terminal of the PX8000. High voltage may appear at the BNC of the high voltage differential probe. Also, be sure to connect the GND lead to the PX8000 before you connect to the device under measurement.

Damaged Signal Cable

If the signal cable is torn and the inner metal is exposed or if a color different from the outer sheath appears, stop using the cable immediately.

CAUTION

Operating Environment Limitations

This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference, in which case the user will be required to correct the interference.

French

AVERTISSEMENT

Utiliser l’instrument aux seules fins pour lesquelles il est prévu
Cet instrument est un appareil de mesure de forme d’onde pour le contrôle et la mesure des signaux électriques. Ne pas utiliser cet instrument à d’autres fins que celles de mesure de forme d’onde.

Inspecter l’apparence physique
Ne pas utiliser l’instrument si son intégrité physique semble être compromise.

Vérifier l’alimentation
Assurez-vous que la tension d’alimentation correspond à la tension d’alimentation nominale de l’appareil et qu’elle ne dépasse pas la plage de tension maximale du cordon d’alimentation à utiliser.

Utiliser le cordon d’alimentation et la fiche adaptés
Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d’alimentation prévu pour cet instrument. La fiche doit être branchée sur une prise secteur raccordée à la terre. En cas d’utilisation d’une rallonge, celleci doit être impérativement reliée à la terre. Par ailleurs, ne pas utiliser ce cordon d’alimentation avec d’autres instruments.

Brancher la prise de terre
Avant de mettre l’instrument sous tension, penser à brancher la prise de terre pour éviter tout choc électrique. Le cordon d’alimentation que vous utilisez pour l’instrument est un cordon à trois broches. Brancher le cordon d’alimentation sur une prise de courant à trois plots et mise à la terre.

Ne pas entraver la mise à la terre de protection
Ne jamais neutraliser le fil de terre interne ou externe, ni débrancher la borne de mise à la terre. Cela pourrait entraîner un choc électrique ou endommager l’instrument.

Ne pas utiliser lorsque les fonctions de protection sont défectueuses
Avant d’utiliser l’instrument, vérifier que les fonctions de protection, telles que le raccordement à la terre et le fusible, fonctionnent correctement. En cas de dysfonctionnement possible, ne pas utiliser l’instrument.

Ne pas utiliser dans un environnement explosif
Ne pas utiliser l’instrument en présence de gaz ou de vapeurs inflammables. Cela pourrait être extrêmement dangereux.

Ne pas retirer le capot, ni démonter ou modifier l’instrument
Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier l’instrument. Certains composants à l’intérieur de l’instrument sont à haute tension et par conséquent, représentent un danger.

Relier l’instrument à la terre avant de le brancher sur des connexions externes
Toujours relier l’instrument à la terre avant de le brancher aux appareils à mesurer ou à une commande externe. Avant de toucher un circuit, mettre l’instrument hors tension et vérifier l’absence de tension.

Catégorie de mesure
Cet instrument appartient à la catégorie de mesure II. Ne pas l'utiliser pour réaliser des mesures de catégorie III ou IV.

Installer et utiliser l'instrument aux emplacements appropriés
- L'instrument est prévu pour une utilisation en intérieur. Ne pas l'installer, ni l'utiliser à l'extérieur.
- Installer l'instrument de manière à pourvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

Transport de l'instrument
Commencer par mettre le circuit à mesurer hors tension et débrancher les câbles de mesure. Puis mettre l'instrument hors tension, et retirer le cordon d'alimentation et tout autre câble branché. Lors du transport de l'instrument, utiliser la poignée ou maintenir fermement l'instrument à deux mains.

Precautions to Be Taken When Using the Modules
- Ne pas dépasser les valeurs maximales de tension d'entrée, de tension de mode commun, de tension de maintien ou de surtension admissible.
- Pour éviter tout risque de choc électrique, toujours relier le PX8000 à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Ne pas laisser les modules branchés à l'instrument dans des environnements dans lesquels la tension pourrait dépasser la surtension admissible.

Brancher les câbles correctement
L'instrument est capable de mesurer directement les tensions et les courants élevés. L'utilisation d'un transformateur de tension ou d'un transformateur de courant avec cet instrument permet de mesurer des tensions et des courants encore plus élevés. Lors de la mesure d'une tension ou d'un courant élevé, la capacité de l'appareil mesuré devient élevée. Si les câbles sont incorrectement branchés, une surtension ou une surintensité risque de se produire dans le circuit soumis à la mesure.
Cela pourrait non seulement endommager l'instrument et l'appareil mesuré, mais aussi entraîner un choc électrique et un incendie. Toujours brancher les câbles correctement et vérifier les points suivants.

Avant de procéder à une mesure (avant de mettre l'appareil mesuré sous tension), vérifier que :
- Les câbles ont été correctement branchés sur les bornes du module d'entrée de l'instrument.
  - Les câbles de mesure de la tension n'ont pas été malencontreusement branchés sur les bornes d'entrée de courant.
  - Les câbles de mesure du courant n'ont pas été malencontreusement branchés sur les bornes d'entrée de tension.
  - Pour la mesure d'alimentation multiphase, vérifier que le câblage est correct.
- Les câbles ont été correctement branchés sur le secteur et sur l'appareil à mesurer. Vérifier qu'il n'y a pas de court-circuit entre les bornes ou les câbles.
- Les câbles de mesure du courant sont fixés au module de courant à l'aide d'un attache-câble.

Pendant la mesure (ne jamais toucher les bornes et les câbles branchés lorsque l'appareil à mesurer est sous tension), vérifier que :
- Les bornes d'entrée ne chauffent pas anormalement.
- L'attache-câble qui maintient en place les câbles de mesure du courant au module de courant, est serré.

Après la mesure (tout de suite après avoir mis l'appareil mesuré hors tension) :

Si vous avez mesuré une tension ou un courant élevé, une puissance résiduelle peut rester un certain temps dans l'appareil mesuré, même après sa mise hors tension. La puissance résiduelle peut entraîner un choc électrique, par conséquent, après avoir mis l'appareil hors tension, il convient d'attendre avant de toucher les bornes d'entrée. La durée pendant laquelle la puissance résiduelle reste dans l'appareil mesuré varie selon les appareils.

Accessoires

Utiliser les accessoires spécifiés dans ce manuel. En outre, utiliser les accessoires de ce produit uniquement avec des produits Yokogawa pour lesquels ils sont spécifiés comme accessoires.

Ne pas utiliser d'accessoires défectueux.

Précautions à prendre lors de l'utilisation de sondes

Veiller à brancher le câble GND (Terre) de la sonde différentielle haute tension (réf. 701926) sur la borne de terre fonctionnelle du PX8000. Le connecteur BNC de la sonde différentielle peut présenter une tension élevée. De plus, veiller à brancher le câble GND au PX8000 avant de le brancher sur l'appareil à mesurer.

Câble de signal endommagé

Si le câble de signal est déchiré et que le métal intérieur est exposé ou si une couleur différente de la gaine externe est visible, arrêter immédiatement d'utiliser ce câble.

ATTENTION

Limitations relatives à l'environnement opérationnel

Ce produit est classé dans classe A (pour utilisation dans des environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

Regulations and Sales in Each Country or Region

Waste Electrical and Electronic Equipment

Waste Electrical and Electronic Equipment (WEEE), Directive
(This directive is valid only in the EU.)
This product complies with the WEEE directive marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive, this product is classified as a "Monitoring and control instruments" product.

When disposing products in the EU, contact your local Yokogawa Europe B.V. office. Do not dispose in domestic household waste.

EU Battery Directive

EU Battery Directive
(This directive is valid only in the EU.)
Batteries are included in this product. This marking indicates they shall be sorted out and collected as ordained in the EU battery directive.

Battery type: Lithium battery

You cannot replace batteries by yourself. When you need to replace batteries, contact your local Yokogawa Europe B.V. office.

Authorized Representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Test & Measurement Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

關於在台灣銷售

This section is valid only in Taiwan.
關於在台灣所販賣的符合其相關規定的電源線 A1100WD 的限用物質含量信息，請至下麵的網址進行查詢
https://tmi.yokogawa.com/support/service-warranty-quality/product-compliance/

Disposal

When disposing of YOKOGWA products, follow the laws and ordinances of the country or region where the product will be disposed of.

Symbols and Notation Used in This Manual

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

k: Denotes 1000. Example: 100 kHz (frequency)

K: Denotes 1024. Example: 720 KB (file size)

Displayed Characters

Bold characters in procedural explanations are used to indicate panel keys and soft keys that are used in the procedure and menu items that appear on the screen.

Notes and Cautions

The notes and cautions in this manual are categorized using the following symbols.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

French

AVERTISSEMENT Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

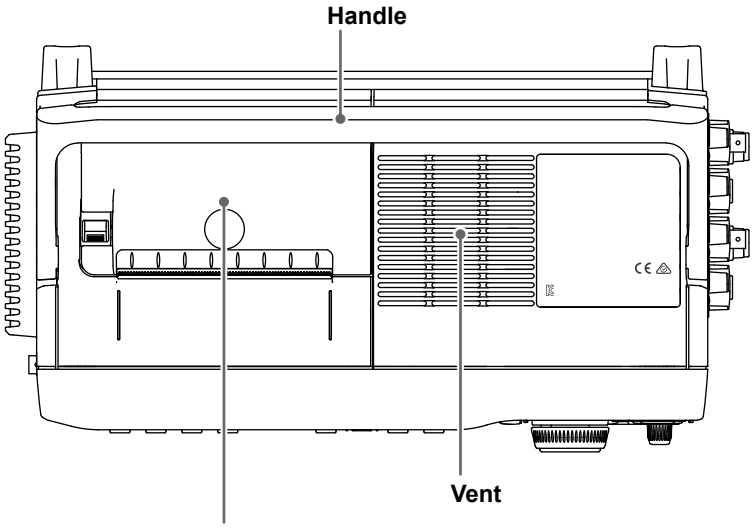
ATTENTION Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

Note Calls attention to information that is important for proper operation of the instrument.

Contents

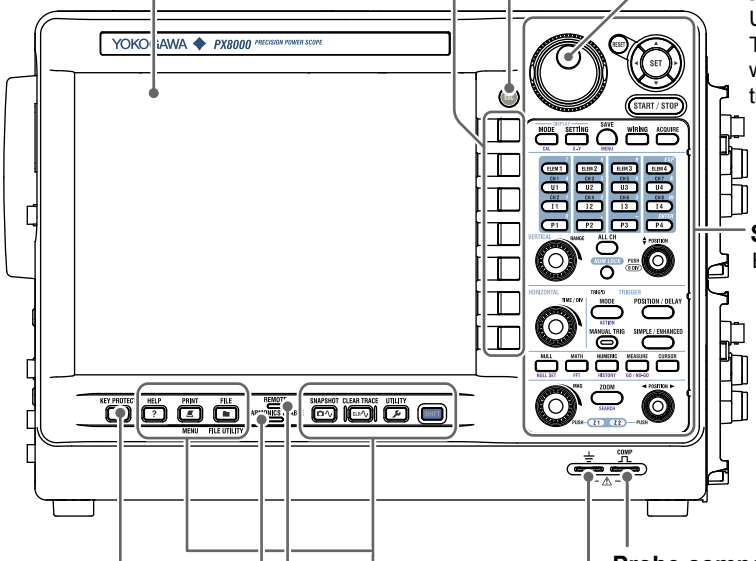
1.1 Top Panel, Front Panel, Right Side Panel, and Left Side Panel

Top Panel



Built-in printer (optional)
You can print the display.

Front Panel



Soft keys
Use to select items on the setup menus that appear during configuration.

ESC key
Use to clear setup menus and pop-up menus.

LCD
Description of the displayed contents → Section 1.3

Jog shuttle
Use to change values and move cursors. Turn the shuttle ring to vary the rate at which values change. The rate is based on the shuttle ring angle.

Setup and execution keys and knobs
Explanation → Section 1.2

Probe compensation signal output terminal (1 kHz/1 Vp-p) ⚠
Transmits correction signals for probes.
Probe correction procedure → Section 2.13

Setup and execution keys
Explanation → Section 1.2

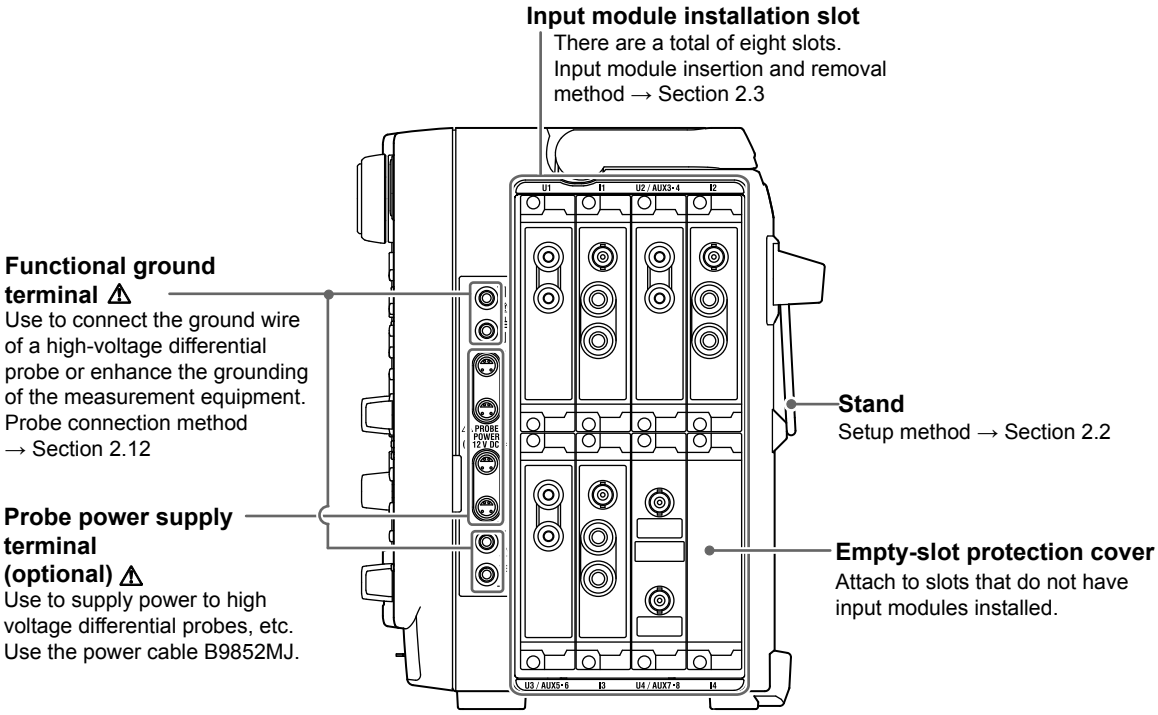
Functional ground terminal ⚠
Connect a ground wire to this terminal when performing probe correction.

Remote indicator
On: Remote mode
Off: Local mode

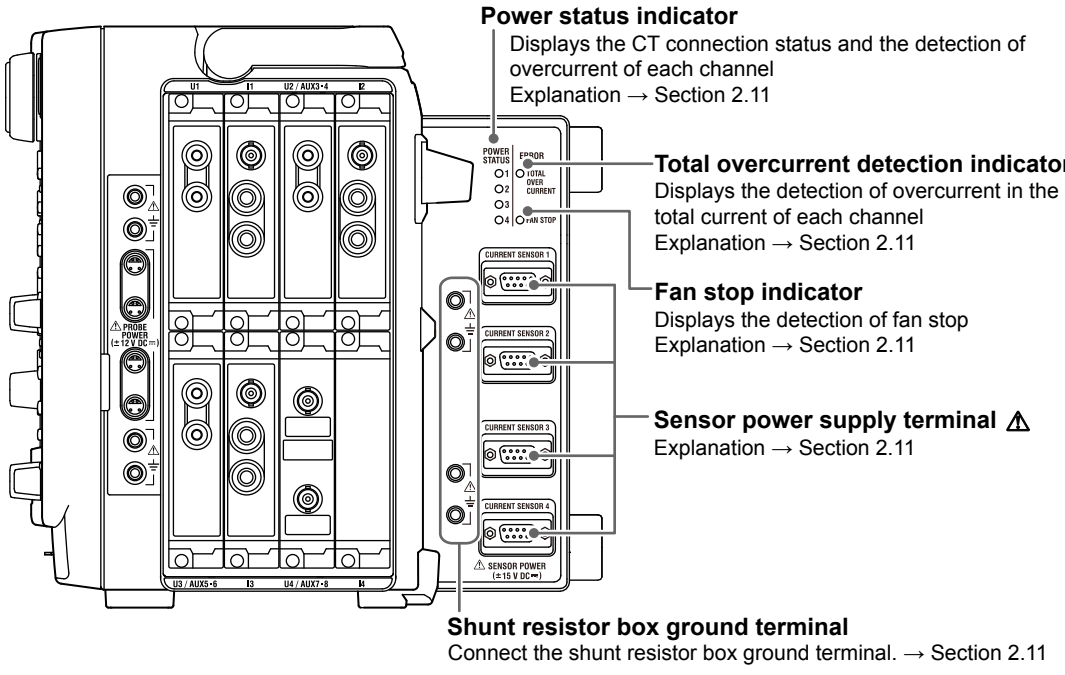
Harmonics enable indicator
Illuminates when harmonic measurement is possible.

KEY PROTECT key
Locks the keys. → Section 1.2

Right Side Panel



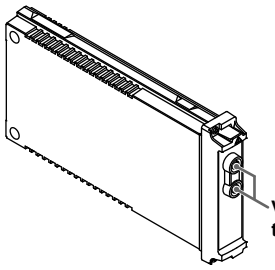
Models with the Sensor Power Supply (/PD, or /PD2) Option



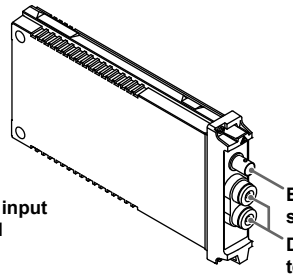
Input Modules

The following 4 input modules are available.

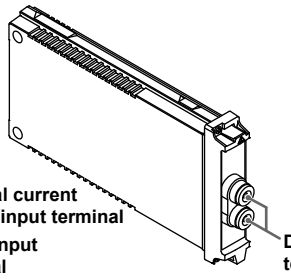
Voltage Module
VOLTAGE
(model: 760811)



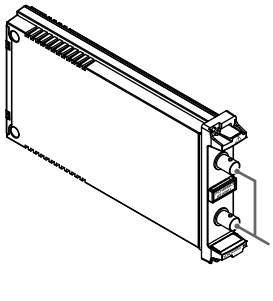
Current Module
CURRENT
(model: 760812)



Current Module
CURRENT
(model: 760813)



AUX Module
AUX
(model: 760851)



Left Side Panel

Video signal output terminal
You can output the displayed image in an XGA RGB signal.
Explanation about how to use → Section 5.4

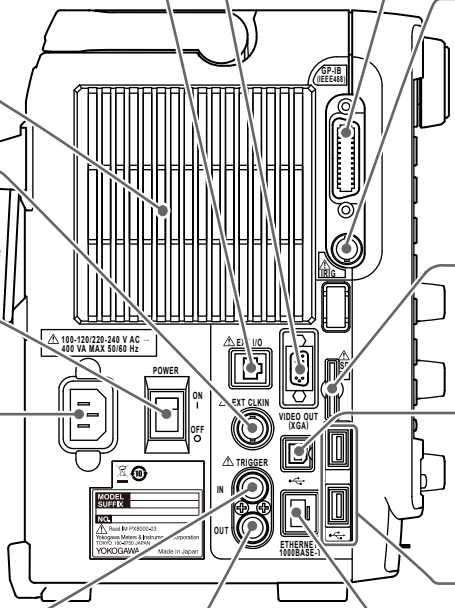
GO/NO-GO and external start/stop I/O connector ⚠
Transmits GO/NO-GO determination I/O signals.
Can also be used to start and stop the PX8000 through external control.
Explanation about how to use → Section 5.5

Vent

External-clock input terminal ⚠
Use when applying an external clock signal.
Explanation about how to use → Section 5.3

Main power switch
Turning the power on and off → Section 2.4

Power inlet ⚠
Power connection → Section 2.4



Trigger input terminal ⚠
This terminal is used when an external signal is used as one of the following signal sources.
• Trigger source
• Synchronization source
• PLL source
• Math period (Ext Gate)
Explanation about how to use → Section 5.1

Trigger output terminal ⚠
Use to transmit trigger signals.
Explanation about how to use → Section 5.2

GP-IB connector
Use to communicate with the PX8000 through the GP-IB interface. For information about the PX8000's communication features, see the communications interface user's manual.

IRIG input terminal (optional) ⚠
Use when applying an external synchronization signal (IRIG signal).
Explanation about how to use → Section 5.6

SD memory card slot ⚠
Use to connect an SD memory card.
Explanation about how to use → User's manual

USB port for PCs
Use to connect the PX8000 to a PC that has a USB port.
Explanation about how to use → Communication interface user's manual

USB ports for peripherals
Use to connect a USB keyboard, mouse, or storage device.
Explanation about how to use → Section 3.3 and User's manual

Ethernet port
Use to connect the PX8000 to a LAN.
Explanation about how to use → Feature's guide and communication interface user's manual

1.2 Panel Keys and Knobs

Inpuit Signal and Vertical Axis

ELEM1 to ELEM4 Keys

These keys display menus for configuring settings as follows.

Voltage Module (760811), Current Module (760812, 760813)

line filter, frequency filter, turning scaling on and off, VT ratio, CT ratio, power coefficient (scaling factor) and measurement period (synchronization source)

AUX Module (760851)

turning motor mode on and off, Pm function name, scaling, unit and measurement period (synchronization source)

U1 to U4, I1 to I4, and P1 to P4 Keys

These keys display menus for configuring settings as follows.

U1 to U4

turning the display of each channel on and off, display label settings, vertical zoom method, zoom settings, the offset value and turning the auto range on and off

I1 to I4

turning the display of each channel on and off, display label settings, vertical zoom method, zoom settings, the offset value, turning the auto range on and off, turning the external current sensor on and off and external current sensor conversion ratio*

* This can be set only on a 760812 (current module).

P1 to P4

turning the display of each channel on and off, display label settings, vertical zoom method, zoom settings and the offset value

Each key illuminates when its corresponding channel is on.
Also, you can press U1 to U4 or I1 to I4 key to select the channel that the RANGE knob will control.

ALL CH Key

Press this key to display a window in which you can configure all the settings from the menus that appear when you press ELEM1 to ELEM4, U1 to U4, I1 to I4, and P1 to P4. The settings appear in a list.

NUM LOCK Key

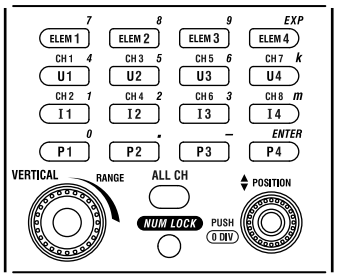
Press this key to use the ELEM1 to ELEM4, U1 to U4, I1 to I4, and P1 to P4 keys to enter numbers.

RANGE Knob

Use this knob to set the measurement range (vertical scale). Before you turn this knob, select the target waveform by pressing a key from U1 to U4 or I1 to I4. If you change the scale while waveform acquisition is stopped, the setting actually takes effect when you restart waveform acquisition.

▲▼POSITION Knob (Vertical POSITION Knob)

Use this knob to adjust the vertical display position (vertical position) of an input waveform. Before you turn this knob, select the target waveform by pressing a key from U1 to U4, I1 to I4, and P1 to P4. This knob has a push switch. You can press the knob to reset the position to 0.00 div.



Horizontal Axis

TIME/DIV knob

Use this knob to set the time-axis scale. If you change the scale while waveform acquisition is stopped, the scale change actually takes effect when you restart waveform acquisition.

TRIGGER Group Keys

MODE Key

Displays a menu for selecting the trigger mode.

ACTION (SHIFT+MODE) Key

Press SHIFT and then MODE to display a menu for configuring action-on settings.

POSITION/DELAY Key

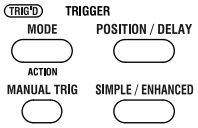
Press this key to set the trigger position and the trigger delay.

MANUAL TRIG Key

Press this key to make the PX8000 trigger regardless of the trigger settings.

SIMPLE/ENHANCED Key

Displays a trigger setup menu.



Other Keys

NULL Key
Press NULL to enable the NULL feature. The NULL indicator illuminates. Press NULL again to disable the NULL feature. The NULL indicator turns off.

NULL SET (SHIFT+NULL) Key
Press SHIFT and then NULL to display a menu for setting the NULL feature.

MATH Key
Displays a menu for waveform computation.

FFT (SHIFT+MATH) Key
Press SHIFT and then MATH to display a menu for configuring FFT computation.

NUMERIC Key
Displays a menu for numeric computation.

HISTORY (SHIFT+NUMERIC) Key
Press SHIFT and then NUMERIC to display a menu for using the history feature to recall data.

MEASURE Key
Displays a menu for automated measurement of waveform parameters.

GO/NO-GO (SHIFT+MEASURE) Key
Press SHIFT and then MEASURE to display a menu for GO/NO-GO determination.

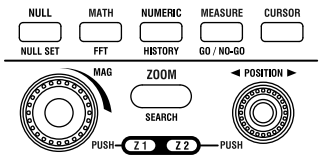
CURSOR Key
Displays a menu used when performing cursor measurements.

ZOOM Key
Displays a waveform zoom display menu.

SEARCH (SHIFT+ZOOM) Key
Press SHIFT and then ZOOM to display a menu for data searching (the search & zoom function).

MAG Knob
Use this knob to set the zoom factors for the Zoom1 and Zoom2 zoom boxes. This knob has a push switch. Press the MAG knob to switch the zoom box whose zoom factor is set by it.

◄POSITION► Knob (Zoom POSITION knob)
Use this knob to set the zoom position. This knob has a push switch. Press the POSITION knob to switch the zoom box whose zoom position is set by it.



RESET Key
Resets the value to its default value.

SET Key
Press this key to select the menu item that you have moved the cursor to using the jog shuttle. You can also press the SET key to start entering a value or characters.

Arrow Keys (▲▼►◄ keys)
Use the ►◄ keys to move the cursor between numeric digits. Use the ▲▼ keys to increment or decrement the value of a digit. You can also use the ▲▼ keys to select setup items.

START/STOP Key
Starts and stops waveform acquisition according to the trigger mode. The key is illuminated while the PX8000 is acquiring waveforms.

DISPLAY MODE Key
Displays a menu used to set the display mode.

CAL (SHIFT+DISPLAY MODE) Key
Press SHIFT and then DISPLAY MODE to display a calibration menu.

DISPLAY SETTING Key
Use this key to configure the display.

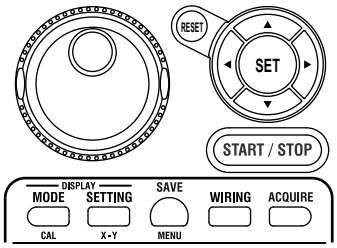
X-Y (SHIFT+DISPLAY SETTING) Key
Press SHIFT and then DISPLAY SETTING to display an X-Y display menu.

SAVE Key
Press this key to save waveform or screen capture data to a storage medium.

MENU (SHIFT+SAVE) Key
Press SHIFT and then SAVE to display a menu for configuring the save operation.

WIRING Key
Displays a menu for selecting the wiring system, setting the efficiency equation, selecting the independent element configuration, setting the delta computation, and setting the deskew.

ACQUIRE Key
Displays a menu used to set the waveform acquisition mode.



KEY PROTECT Key
When you press this key, it illuminates, and the keys on the front panel are locked. Press the key again to unlock the keys.

HELP Key
Turns on and off the help window, which explains various features.

PRINT Key
Use this key to save and print screen capture data.

MENU (SHIFT+PRINT) Key
Press SHIFT and then DISPLAY to display a menu for printing screen captures to the built-in printer or displays a menu for saving screen capture data to a storage medium.

FILE Key
Displays a menu for saving and loading data from a storage medium.

FILE UTILITY (SHIFT+FILE) Key
Press SHIFT and then FILE to display a menu for file manipulation.

SNAPSHOT Key
Retains the currently displayed waveforms on the screen in white. Snapshot waveforms can be saved and loaded.

CLEAR TRACE Key
Clears the waveform acquired using the snapshot function.

UTILITY Key
Displays a menu for configuring system, communication, network, environment settings, and storing and recalling setup data; for performing self tests; and for displaying system information (information about installed modules, installed options, and the firmware version).

SHIFT Key
Press this key once to access the features that are written in purple below each key. The shift key illuminates when the keys are shifted. Pressing the key again clears the shifted condition.

Note

Press SHIFT and then CLEAR TRACE to switch from remote mode to local mode. For details, see the communication interface user's manual.

Notes about Using of Knobs
The vertical POSITION, ZOOM MAG, and ZOOM POSITION knobs have push switches. Push the knobs straight. If you push a knob at an angle, it may not operate properly. If this happens, push the knob straight one more time.

CAUTION

Do not push the knob sideways with strong force. Doing so may break the knobs.

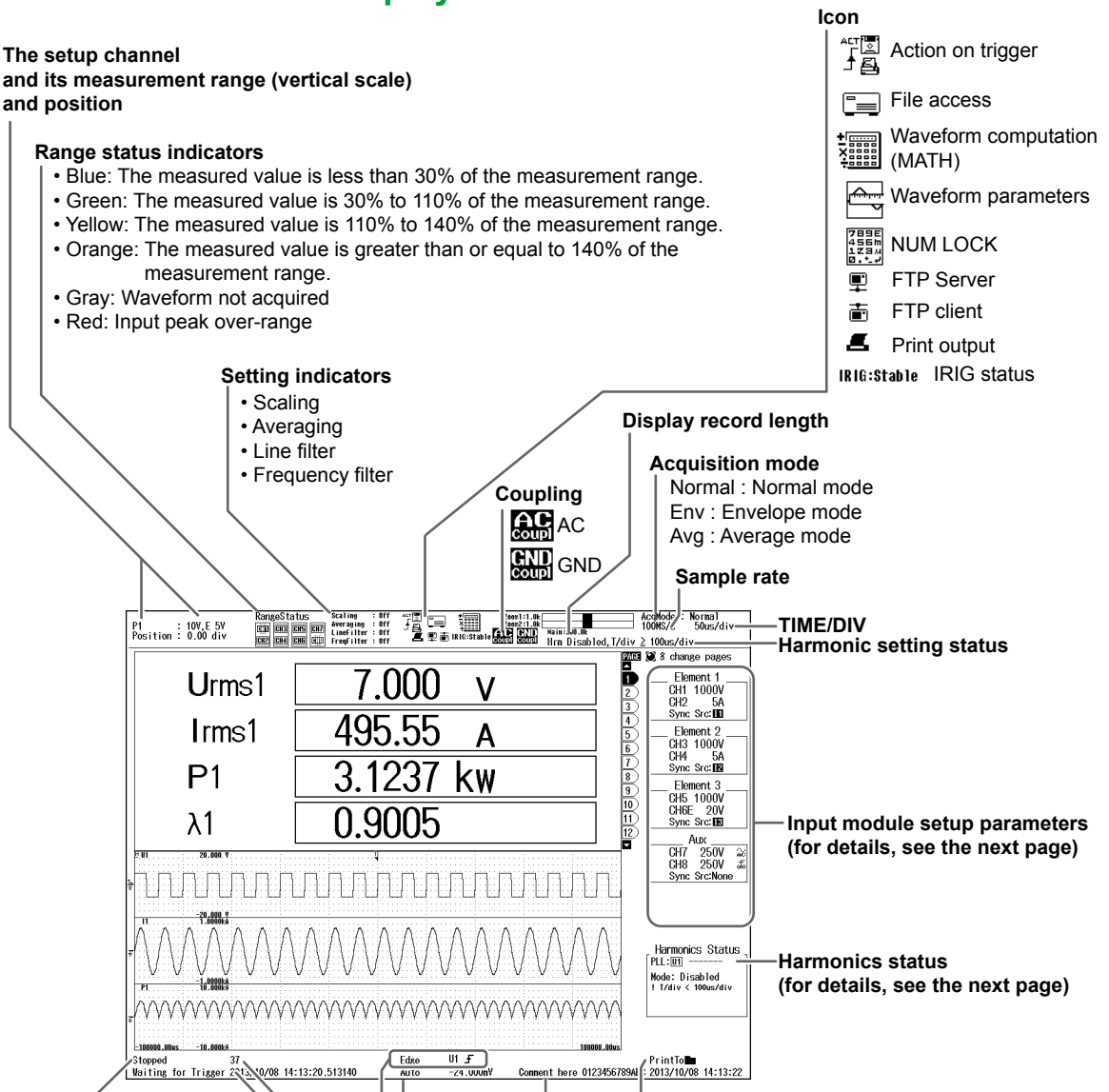
French

ATTENTION

Ne pas enfoncer les boutons latéralement en employant une force excessive. Cela pourrait les endommager, voire les casser.

1.3 Screens

Normal Waveform Display



Note

The PX8000 LCD may include a few defective pixels. For details, see section 7.4, “Display.”

WARNING

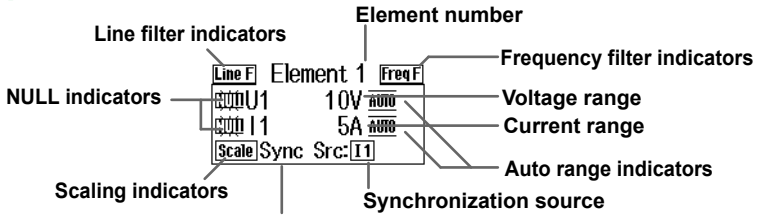
If the input signal peak value exceeds approximately 200% of the voltage range, current range, or sensor input (AUX) range, a peak over-range message shown below blinks. In this condition, the PX8000 does not make measurements even when a high voltage or large current is being received. Consequently, there is no way of knowing that such input is being received. To prevent electric shock and damage to the instrument, increase the voltage, current, or sensor-input measurement range to check the voltage or current value of the input signal.

French

AVERTISSEMENT

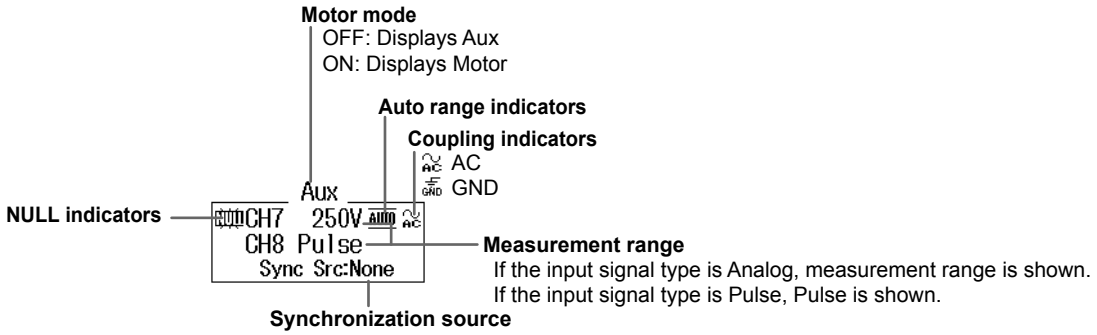
Si la valeur crête du signal d'entrée dépasse d'environ 200 % la plage de tension, la plage de courant ou la plage d'entrée de capteur (AUX), le message de dépassement indiqué ci-dessous s'affiche en clignotant. Dans ce cas, le PX8000 n'effectue pas les mesures même en présence d'une tension élevée ou d'un courant important. Par conséquent, il n'y a aucun moyen de connaître les valeurs reçues. Pour éviter tout risque de choc électrique et d'endommagement de l'instrument, augmenter la plage de mesure de la tension, du courant ou d'entrée de capteur afin de vérifier la valeur de tension ou de courant du signal d'entrée.

Power measurement element (voltage and current modules) setup parameters

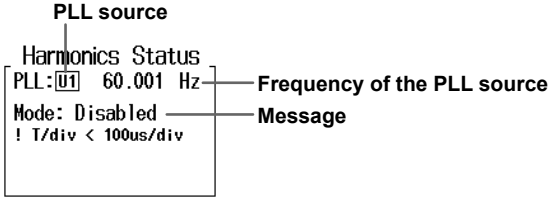


(Elements of the same wiring unit are indicated with a border.)

AUX module setup parameters



Harmonics status



Display modes

For details on numeric data display and waveform display, see the following chapters in the Features Guide, IM PX8000-01EN.

- Numeric Data Display : Section 8
- Waveform Display : Section 10
- Bar Graph Display : Section 12
- Vector Display : Section 13
- X-Y Display : Section 13
- Zooming in on Waveforms : Section 14
- FFT : Section 18

Indications Other Than Values on the Numeric Data Display

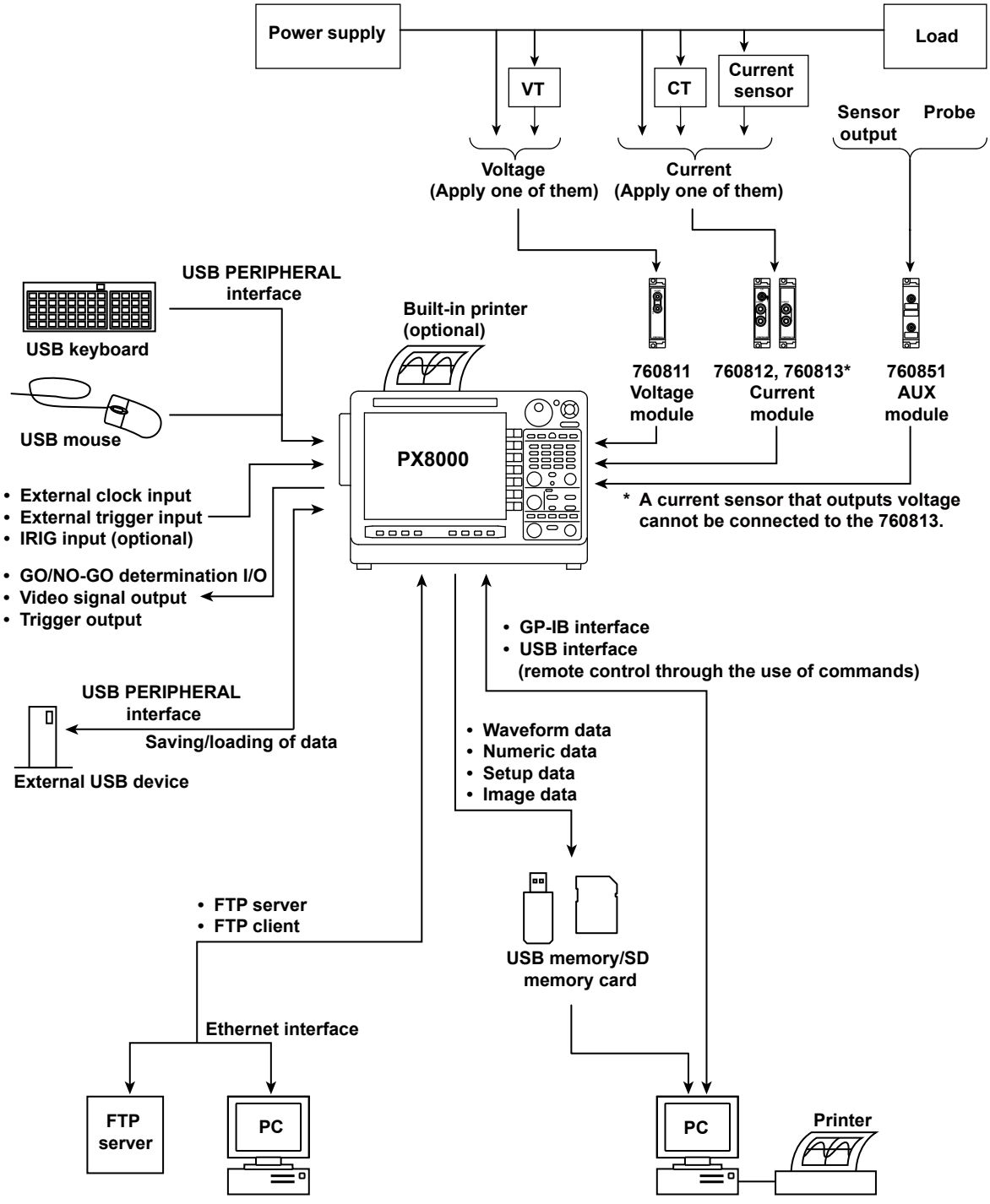
--OL-- **Overload**
Displayed if the measured value exceeds 140% of the measurement range.

--OF-- **Overflow**
Displayed if the measured or computed result cannot be displayed using the specified decimal place or unit.

------- **No data**
Displayed if a measurement function is not selected or if there is no numeric data.

Error **Error**
Displayed in cases such as when a measured value is outside of its determined range.

1.4 System Configuration



2.1 Handling Precautions

Safety Precautions

If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on pages iX to Xii.

Do Not Remove the Case

Do not remove the case from the instrument. Some sections inside the instrument have high voltages and are extremely dangerous. For internal inspection and adjustment, contact your nearest YOKOGAWA dealer.

Unplug If Abnormal Behavior Occurs

If you notice smoke or unusual odors coming from the instrument, immediately turn off the power and unplug the power cord. Also, turn off the power to any circuits under measurement that are connected to the input terminals. If such an irregularity occurs, contact your dealer.

Do Not Damage the Power Cord

Nothing should be placed on the power cord. The cord should be kept away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Always hold and pull by the plug. If the power cord is damaged or if you are using the instrument in a location where the power supply specifications are different, purchase a power cord that matches the specifications of the region that the instrument will be used in.

Operating Environment and Conditions

This instrument complies with the EMC standard under specific operating environment and operating conditions. If the installation, wiring, and so on are not appropriate, the compliance conditions of the EMC standard may not be met. In such cases, the user will be required to take appropriate measures.

General Handling Precautions

Do Not Place Objects on Top of the Instrument

Never place other instruments or objects containing water on top of the instrument, otherwise a breakdown may occur.

Do Not Apply Shock or Vibration

Do not apply shock or vibration. Doing so may damage the instrument. Shocks to the input connectors or probes may turn into electrical noise and enter the instrument via the signal lines.

Keep Electrically Charged Objects Away from the Instrument

Keep electrically charged objects away from the input terminals. They may damage the internal circuitry.

Do Not Damage the LCD

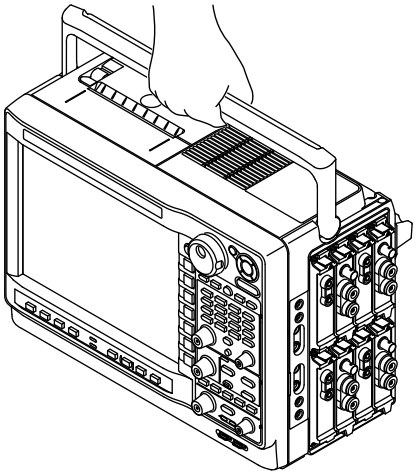
Since the LCD screen is very vulnerable and can be easily scratched, do not allow any sharp objects near it. Also it should not be exposed to vibrations and shocks.

Unplug during Extended Non-Use

Turn off the power to the circuit under measurement and the instrument and remove the power cord from the outlet.

When Carrying the Instrument

First, turn off the circuit under measurement and remove the measurement cables. Then, turn off the instrument and remove the power cord and any attached cables. When carrying the instrument, use the handle as shown in the following figure, or use both hands to hold the instrument firmly.



WARNING

- When you hold or put away the handle, be careful not to get your hand caught between the handle and the case.
- When you carry the instrument, be careful not to get your hand caught between the wall, installation surface, or other objects and the instrument.

French

AVERTISSEMENT

- Lorsque vous attrapez ou rabattez la poignée, veillez à ne pas vous coincer la main entre la poignée et l'instrument.
- Lorsque vous déplacez l'instrument, veillez à ne pas vous coincer la main entre l'instrument et le mur, la surface d'installation ou tout autre objet.

Cleaning

When cleaning the case or the operation panel, turn off the circuit under measurement and the instrument and remove the instrument's power cord from the outlet. Then, wipe the instrument lightly with a clean dry cloth. Do not use chemicals such as benzene or thinner. Doing so may cause discoloring and deformation.

2.2 Installing the Instrument

WARNING

- This instrument is designed to be used indoors. Do not install or use it outdoors.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

If you block the inlet or outlet holes on the instrument, it will become hot and may break down.

French

AVERTISSEMENT

- L'instrument est prévu pour une utilisation en intérieur. Ne pas l'installer, ni l'utiliser à l'extérieur.
- Installer l'instrument de manière à pourvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

ATTENTION

Ne pas boucher les orifices d'entrée ou de sortie de l'instrument pour éviter toute surchauffe et panne éventuelle.

Installation Conditions

Install the instrument in a place that meets the following conditions.

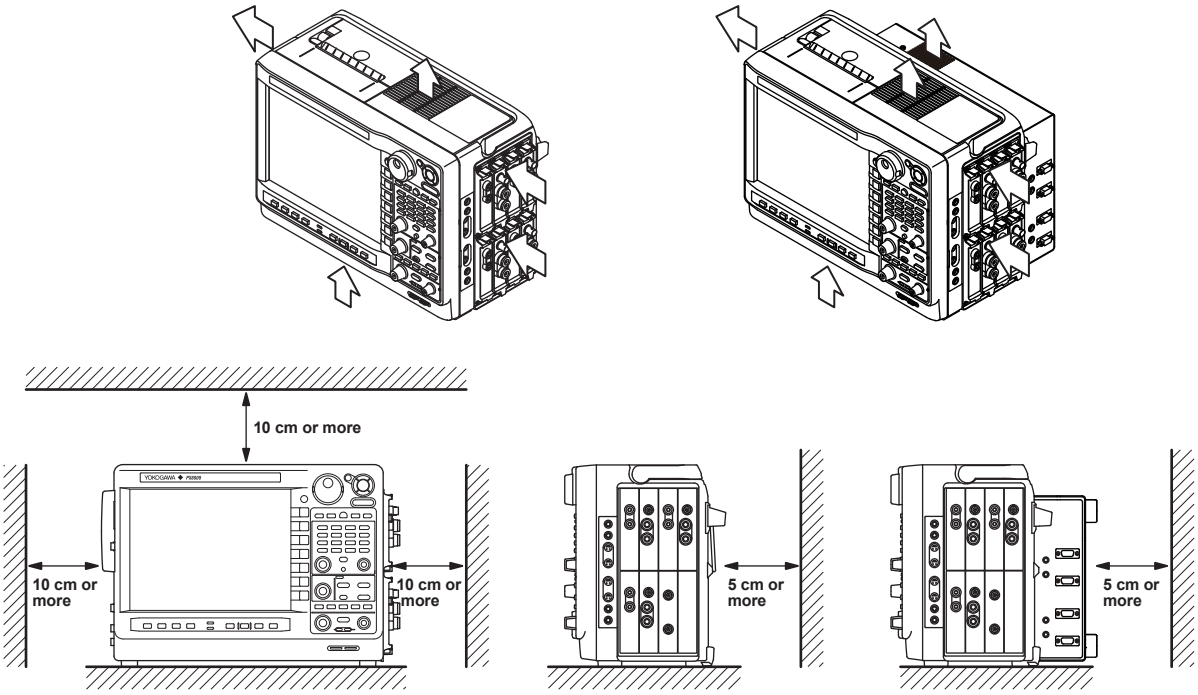
Flat, Even Surface

Install the instrument in the correct orientation (see page 2-5) in a safe place, with no tilting from front to back or left to right. On models without the sensor power supply (/PD, or /PD2) option, if you want to install the instrument with the rear panel facing down, you can tilt the instrument with the stand. The recording quality of the printer may be hindered when the instrument is placed in an unstable or inclined place.

Well-Ventilated Location

There are inlet holes on the bottom side of the instrument. There are also vent holes for the cooling fan on the left side panel and the top panel. To prevent internal overheating, allow for enough space around the instrument (see the figure below) and do not block the inlet and exhaust holes.

Models with the Sensor Power Supply (/PD, or /PD2) Option



When connecting cables and opening and closing the cover of the built-in printer, provide extra operating space in addition to the space in the figure shown above.

Ambient Temperature and Humidity

Ambient temperature: 5 to 40°C (when the PX8000 is installed horizontally)
Ambient temperature: 5 to 35°C (when the PX8000 is installed with the rear panel facing down)
Ambient humidity: 20 to 80% RH (when the printer is not used; no condensation)
35 to 80% RH (when the printer is used)

Note

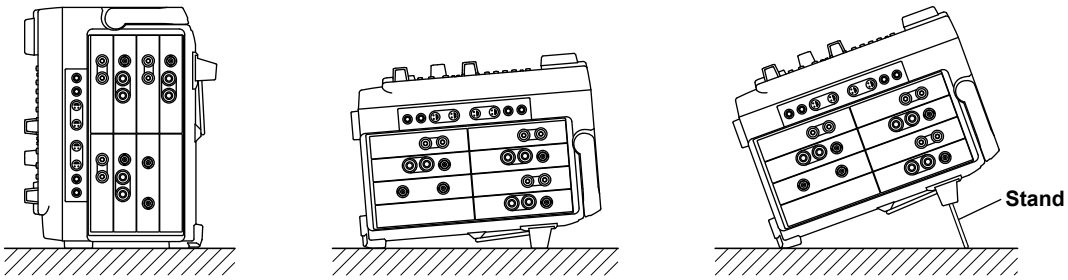
- To ensure high measurement accuracy, operate the instrument in the 23 ±5°C temperature range and 30 to 75% RH.
  When using the instrument in a place where the ambient temperature is 5°C to 18°C or 28°C to 40°C, add the temperature coefficient to the accuracy as specified in chapter 7.
- When installing the instrument in a place where the ambient humidity is 30% or less, take measures to prevent static electricity such as using an anti-static mat.
- Condensation may occur if the instrument is moved to another place where the ambient temperature is higher, or if the temperature changes rapidly. In such cases, allow the instrument adjust to the new environment for at least an hour before using the instrument.

Do not install the instrument in the following places.

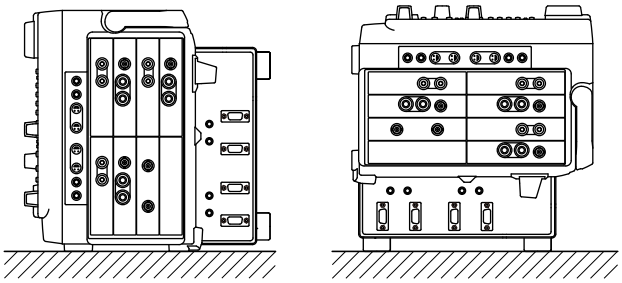
- Outdoors.
- In direct sunlight or near heat sources.
- Where the instrument is exposed to water or other liquids.
- Where an excessive amount of soot, steam, dust, or corrosive gas is present.
- Near strong magnetic field sources.
- Near high voltage equipment or power lines.
- Where the level of mechanical vibration is high.
- On an unstable surface.

Installation Position

Install the instrument so that it is flat or with the rear panel facing down.
As shown in the lower right figure, if you want to use the stand on models without the sensor power supply (/PD, or /PD2) option, push the stand out until it locks. Push the stand back in when you store the instrument.
A stand is not available on models with the sensor power supply (/PD, or /PD2) option. Tilting is not possible.



Models with the Sensor Power Supply (/PD, or /PD2) Option



Note

The ambient temperature in which the PX8000 can be used (operating environment temperature) varies depending on the installation orientation.
See “Ambient Temperature and Humidity” above.

WARNING

- When you put away the stand, be careful not to get your hand caught between the stand and the instrument.
- Handling the stand without firmly supporting the instrument can be dangerous. Please take the following precautions.
  - Only handle the stand when the instrument is on a stable surface.
  - Do not handle the stand when the instrument is tilted.
- Do not place the instrument in any position other than those shown in the above figures. Also, do not stack the instrument.

CAUTION

Do not apply excessive force or shock to the stand. Doing so may break the stand support.

French

AVERTISSEMENT

- Lorsque vous rabattez le support, veillez à ne pas vous coincer la main entre le support et l'instrument.
- Lorsque vous manipulez le support, soutenez toujours l'instrument fermement. Prenez les précautions suivantes.
  - Ne manipulez le support que lorsque l'instrument est placé sur une surface stable.
  - Ne manipulez pas le support lorsque l'instrument est incliné.
- Ne pas placer l'instrument dans des positions autres celles indiquées ci-dessus. Ne pas empiler l'instrument.

ATTENTION

Évitez d'appliquer une force excessive ou des chocs sur le support. Le système de soutien du support peut se casser.

Rubber Stoppers

If the instrument is installed so that it is flat as shown in the above figure, rubber stoppers can be attached to the feet to prevent the instrument from sliding. One set of rubber stoppers (four stoppers) are included in the package.

Storage Location

- Ambient temperature: -20 to 60°C (no condensation)
- Ambient humidity: 20 to 80% RH (no condensation)

Do not store the instrument:

- Where the level of mechanical vibration is high
- In direct sunlight
- Where there are corrosive or explosive gasses
- Where an excessive amount of soot, dust, salt, or iron is present
- Near a strong source of heat or moisture
- Where water, oil, or chemicals may splash onto the instrument

We recommend that the instrument be stored in an environment where the temperature is between 5°C and 40°C.

2.3 Installing Input Modules

WARNING

- To prevent electric shock and damage to the instrument, be sure to turn the power off before you install or remove input modules.
- Check that the input cable is not connected to the input terminals before installing or removing the input module.
- To prevent electric shock and to satisfy the specifications, make sure to put the accessory cover plate on the slots that are not being used.
  Using the instrument without the cover plate allows the dust to enter the instrument and may cause malfunction due to the rise in temperature inside the instrument.
- If the input module happens to come out of the slot while it is in use, it may cause electric shock or cause damage to the instrument as well as the input module. Make sure to screw the input module in place at the two locations (top and bottom).
- There are protrusions in the slot. Do not put your hand in the slot. If you put your hand in the slot, the protrusions may cut your hand.

Precautions to Be Taken When Using the Modules

- Do not apply input voltage exceeding the maximum input voltage, maximum allowable common mode voltage, withstand voltage, or allowable surge voltage.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Failing to do so is extremely dangerous, because the electrical and mechanical protection functions will not be activated.
- Do not leave the instrument connected to devices in an environment that may be subject to voltage surges.
- When measuring high voltages using the 760851 (AUX), use an isolated probe (the 700929 or 701947), 1:1 safety cable (a combination of the 701901 and 701954), or high voltage differential probe (701926).
- To prevent the possibility of electric shock, be sure to connect the GND lead of the high voltage differential probe (the 701926) to the functional ground terminal of the PX8000 before you connect to the device under measurement. High voltage may appear at the BNC of the high voltage differential probe.

French

AVERTISSEMENT

- Pour éviter tout risque de choc électrique et d'endommagement de l'instrument, veiller à mettre l'instrument hors tension avant d'installer ou de retirer des modules d'entrée.
- Avant d'installer ou de retirer des modules d'entrée, vérifier que le câble d'entrée n'est pas connecté aux bornes d'entrée.
- Pour éviter tout risque de choc électrique et respecter les spécifications, penser à recouvrir les slots qui ne sont pas utilisés à l'aide du cache de recouvrement prévu à cet effet. L'utilisation de l'instrument sans le cache de recouvrement favorise l'introduction de poussière dans l'instrument et peut entraîner un dysfonctionnement due à une température excessive à l'intérieur de l'instrument.
- Si le module d'entrée venait à sortir de son slot pendant son utilisation, cela pourrait entraîner un choc électrique ou endommager l'instrument et le module d'entrée. Veiller à bien visser le module d'entrée aux deux emplacements prévus (haut et bas).
- Les sots présentent des rebords en saillie. Ne pas insérer les doigts dans les slots, car les saillies pourraient vous blesser.

Précautions à prendre lors de l'utilisation des modules

- Ne pas dépasser les valeurs maximales de tension d'entrée, de tension de mode commun, de tension de maintien ou de surtension admissible.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Ne pas laisser l'instrument branché sur les appareils dans des environnements pouvant être soumis à des surtensions.
- Lors de la mesure de tensions élevées à l'aide du 760851 (AUX), utiliser une sonde isolée (700929 ou 701947), un câble de sécurité 1:1 (701901 et 701954 conjointement) ou une sonde différentielle haute tension (701926).
- Pour éviter tout risque de choc électrique, veiller à brancher le câble GND de la sonde différentielle haute tension (701926) sur la borne de terre fonctionnelle du PX8000 avant de brancher l'appareil à mesurer. Le connecteur BNC de la sonde différentielle peut présenter une tension élevée.

Types of Input Modules

The following 4 types of input modules are available.

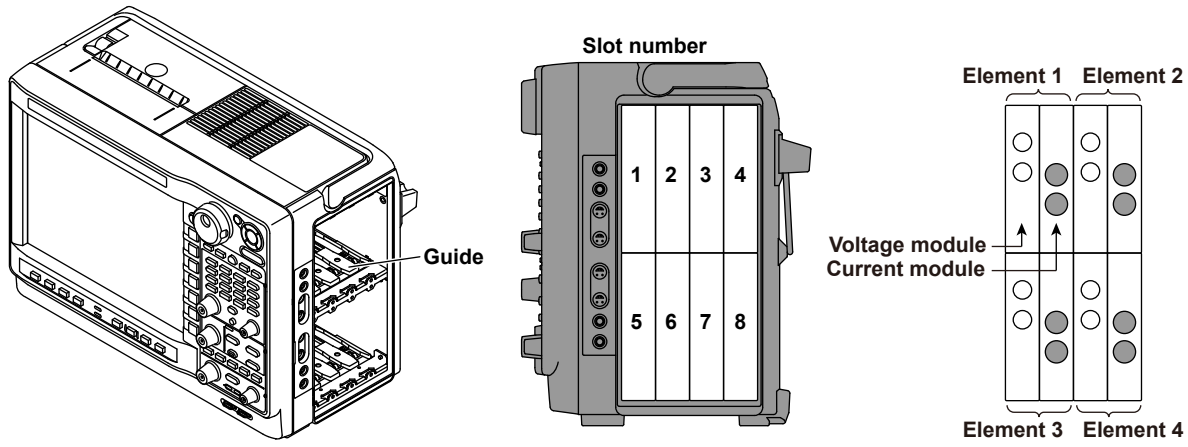
Voltage Module	760811 (VOLTAGE)
Current Module	760812 (CURRENT)
Current Module	760813 (CURRENT)
AUX Module	760851 (AUX)

Precautions to Be Taken When Installing or Removing Input Modules

- Form elements by using the pairs of voltage and current modules that you received at the time of purchase. This is because the power accuracy is guaranteed for pairs of specific voltage and current modules. If voltage and current modules are paired differently from those that you received at the time of purchase, power accuracy is not guaranteed.
  You can check the instrument number of the pairing module. For details, see “Overview (Overview)” in chapter 26, “Other Features” of the features guide, IM PX8000-01EN.
- If you replace one installed input module with another, the settings for the channel will be reset to their defaults when the power is turned on. If you want to keep the settings, specify a save destination and save them.

Installation Procedure of Modules

1. Make sure that the power switch on the left side panel of the instrument is turned off.
2. Check the channel number displayed above the input module installation slot on the right side panel of the instrument, and then install the input module along the guide.
   Holding the handles on the top and bottom of the input module, press hard until it clicks in place. If there is a cover plate on the slot in which to install the module, remove the cover plate, first.
3. Firmly fasten the screws that came with the instrument in two places: the top and bottom of the input module. (screw tightening torque: 0.6 N•m)
4. Turn the instrument’s power switch on.
5. In the overview screen, check that the name of the module that you installed is displayed correctly at the appropriate channel number. If it is not correct, remove the module according to the steps in “Removal” shown below, and reinstall the module according to steps 1 to 3 shown above. To display the overview screen, see section 25.3, “Viewing System Information (Overview),” in the user’s manual.



Input Module Installation Positions

- Install a pair of voltage and current modules in slots with small numbers.
- Install voltage modules in odd-numbered slots and current modules in even-numbered slots.
- Install AUX modules in odd-numbered slots.

The installation positions vary depending on the type of input modules and number.

- VOLTAGE: 760811, voltage module
- CURRENT: 760812 or 760813, current module
- AUX: 760851, AUX module

A pair of voltage and current modules

	Channel number							
	U1	**I1**	**U2 /AUX3•4**	**I2**	**U3 /AUX5•6**	**I3**	**U4 /AUX7•8**	**I4**
No AUX	VOLTAGE	CURRENT						
One AUX	VOLTAGE	CURRENT	AUX					
	VOLTAGE	CURRENT			AUX			
	VOLTAGE	CURRENT					AUX	
Two AUX	VOLTAGE	CURRENT	AUX		AUX			
	VOLTAGE	CURRENT	AUX				AUX	
	VOLTAGE	CURRENT			AUX		AUX	
Three AUX	VOLTAGE	CURRENT	AUX		AUX		AUX	

Two pairs of voltage and current modules

	Channel number							
	U1	**I1**	**U2 /AUX3•4**	**I2**	**U3 /AUX5•6**	**I3**	**U4 /AUX7•8**	**I4**
No AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT				
One AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT	AUX			
	VOLTAGE	CURRENT	VOLTAGE	CURRENT			AUX	
Two AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT	AUX		AUX	

Three pairs of voltage and current modules

	Channel number							
	U1	**I1**	**U2 /AUX3•4**	**I2**	**U3 /AUX5•6**	**I3**	**U4 /AUX7•8**	**I4**
No AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT		
One AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT	AUX	

Four pairs of voltage and current modules

	Channel number							
	U1	**I1**	**U2 /AUX3•4**	**I2**	**U3 /AUX5•6**	**I3**	**U4 /AUX7•8**	**I4**
No AUX	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT	VOLTAGE	CURRENT

Note

You cannot only install AUX modules without voltage and current modules.

Removal

1. Make sure that the instrument's power switch is off.
2. Loosen the two screws that are fastened to the input module.
3. Hold the two handles at the top and bottom of the input module, and pull it out.

Safety Precautions for Laser Products

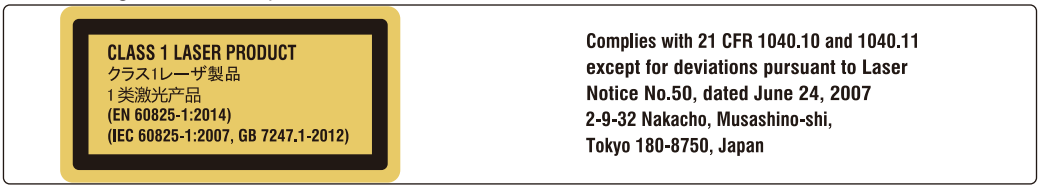
The voltage module (760811 (VOLTAGE)), current module (760812/760813 (CURRENT)), and AUX module (760851 (AUX)) uses laser light sources internally. These modules correspond to Class 1 laser product as defined in IEC/EN60825-1 Safety of Laser Products-Part 1:Equipment Classification, and Requirements. In addition, this instrument complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

PX8000

The following information is printed on the top.

Voltage Module (760811), Current Module (760812/760813), AUX Module (760851)

The following information is printed on the side.



Laser Specifications

Center wavelength: 850 ± 10 nmX
Pulse width: ≤ 10 ms (100 MHz), ≤ 2.5 ns (2 GHz)
Output: ≤ 6 mW

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these warnings and requirements.

2.4 Connecting to a Power Supply and Turning the Power Switch On and Off

Before Connecting the Power

Make sure that you observe the following points before connecting the power. Failure to do so may cause electric shock or damage to the instrument.

WARNING

- Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.
- Connect the power cord after checking that the power switch of the instrument is turned off.
- To prevent electric shock or fire, use the power cord for the instrument.
- To avoid electric shock, be sure to ground the instrument. Connect the power cord to a three-prong power outlet with a protective earth terminal.
- Do not use an extension cord without a protective earth ground. Otherwise, the protection function will be compromised.
- If there is no AC outlet that is compatible with the power cord that you will be using and you cannot ground the instrument, do not use the instrument.

French

AVERTISSEMENT

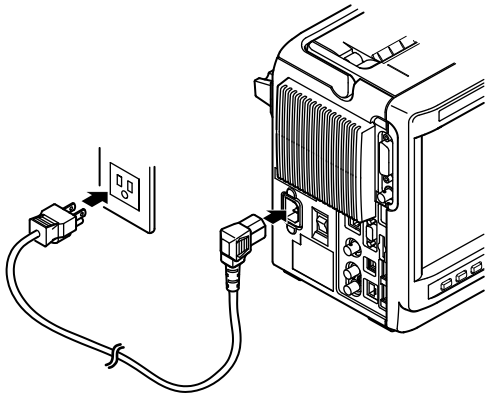
- Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.
- Brancher le cordon d'alimentation après avoir vérifié que l'interrupteur d'alimentation de l'instrument est sur OFF.
- Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument.
- Relier l'instrument à la terre pour éviter tout risque de choc électrique. Brancher le cordon d'alimentation sur une prise de courant à trois plots reliée à la terre.
- Toujours utiliser une rallonge avec broche de mise à la terre, à défaut de quoi l'instrument ne serait pas relié à la terre.
- Si une sortie CA conforme au câble d'alimentation fourni n'est pas disponible et que vous ne pouvez pas relier l'instrument à la terre, ne l'utilisez pas.

Connecting the Power Cord

1. Check that the power switch is off.
2. Connect the power cord plug to the power inlet on the left side panel.
3. Connect the other end of the cord to an outlet that meets the conditions below. Use the three-prong power outlet equipped with a protective earth terminal.

Rated supply voltage*	100 to 120 VAC/220 to 240 VAC
Permitted supply voltage range	90 to 132 VAC/198 to 264 VAC
Rated supply voltage frequency	50/60 Hz
Permitted supply voltage frequency range	48 to 63 Hz
Maximum power consumption	Approx. 200 VA max (When the built-in printer is being used). Approx. 400 VA max (With the /PD, or /PD2 option and when the built-in printer is being used).

* The instrument can use a 100 V or a 200 V power supply. The maximum rated voltage differs according to the type of power cord. Check that the voltage supplied to the instrument is less than or equal to the maximum rated voltage of the power cord that you will be using before use.



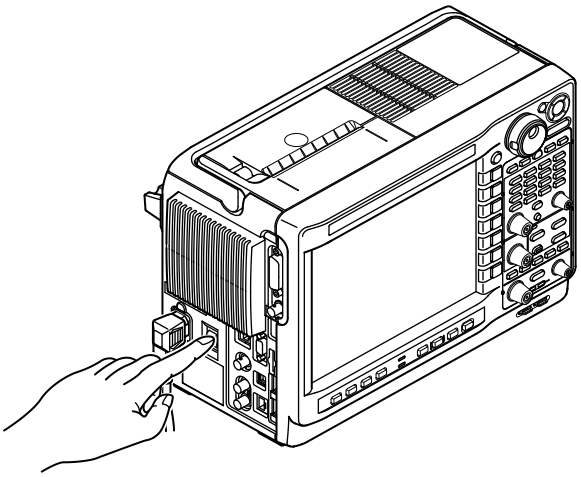
Turning the Power Switch On and Off

Before Turning On the Power, Check That:

- The instrument is installed properly (see section 2.2, “Installing the Instrument”).
- The power cord is connected properly (see above description).

Turning the Power Switch On and Off

Flip the power switch on the left side panel to ON (|) to turn the instrument on, and to OFF (○) to turn the instrument off.



Operations Performed When the Power Is Turned On

When the power switch is turned on, self testing and calibration start automatically. This lasts for approximately 30 seconds. When the PX8000 starts normally, the screen that was displayed immediately before the power was turned off appears. Check that the PX8000 has started normally before you use it.

Note

- After turning the power off, wait at least 10 seconds before you turn it on again.
- It takes several seconds for the startup screen to appear.

When the Power-on Operation Does Not Finish Normally

If the instrument does not operate as described above when the power is turned on or the screen that was displayed immediately before the power was turned off does not appear, turn the power off, and check:

- That the power cord is plugged in properly.
- That the correct voltage is coming to the power outlet (see the previous page).
- After checking the above, try turning on the power switch while holding down the RESET key to initialize the settings (reset them to their factory defaults). For details about initializing the settings, see section 3.6, “Initializing Settings.”

If the instrument still does not work properly, contact your nearest YOKOGAWA dealer for repairs.

To Make Accurate Measurements

- After turning on the power switch, wait at least 30 minutes to allow the instrument to warm up.
- Perform calibration after the instrument has warmed up (see section 3.7 for details).

Operations Performed When the Power Is Turned Off

When the power switch is turned off (or the power plug is removed), the instrument stores the current settings in its memory. This means that if you turn the power switch on and begin measurement, the instrument will perform measurements using the settings from immediately before the instrument was last turned off.

Note

The instrument stores the settings using an internal lithium battery. The battery lasts for approximately five years when the ambient temperature is 23°C. When the lithium battery voltage falls below a specified value and you turn on the power, a message (error 901) appears on the screen. If this message appears frequently, you need to replace the battery soon. Do not try to replace the battery yourself. Contact your nearest YOKOGAWA dealer to have the battery replaced.

CAUTION

Abruptly turning off the power switch or unplugging the power cord while data is being saved or the internal printer is printing may corrupt the media on which data is being saved or damage the built-in printer. Also, the data being saved is not guaranteed. Always turn the power switch off after data has been saved.

French

ATTENTION

Mettre brutalement l’instrument hors tension ou débrancher le cordon d’alimentation pendant l’enregistrement de données ou le fonctionnement de l’imprimante interne peut corrompre le support d’enregistrement des données ou endommager l’imprimante intégrée. Les données en cours d’enregistrement pourront également être perdues. Toujours mettre l’instrument hors tension après que les données ont été enregistrées.

2.5 Precautions When Wiring the Circuit under Measurement

To prevent electric shock and damage to the instrument, follow the warnings below.

WARNING

- Ground the instrument before connecting measurement cables. The power cord to use is a three-prong type power cord. Insert the power cord into a grounded three-prong outlet.
- Turn the circuit under measurement off before connecting and disconnecting cables to it. Connecting or removing measurement cables while the power is on is dangerous.
- Do not wire a current circuit to the voltage input terminal or a voltage circuit to the current input terminal.
- When connecting measurement cables to the voltage input terminals, only connect measurement cables that have safety terminals that cover their conductive parts. Using a terminal with bare conductive parts (such as a banana plug) can be dangerous if the terminal comes loose.
- When connecting cables to the external current sensor input terminals, only connect cables that have safety terminals that cover their conductive parts. Using a connector with bare conductive parts can be dangerous if the voltage is 42 V or higher.
- When you apply current directly to the current input terminals of the 760812 (current module) to measure it, the voltage of the item under measurement appears at the external current sensor input connector. To prevent electric shock, remove the cable connected to the external current sensor.
- When the voltage of the circuit under measurement is being applied to the current input terminals of the 760812 (current module), do not touch the external current sensor input terminals. Doing so is dangerous because the terminals are electrically connected inside the instrument.
- When connecting a measurement cable from an external current sensor to an external current sensor input connector, remove the cables connected to the current input terminals. Also, when the voltage of the circuit under measurement is being applied to the external current sensor input terminals, do not touch the current input terminals. Doing so is dangerous because the terminals are electrically connected inside the instrument.
- When using an external voltage transformer (VT) or current transformer (CT), make sure that it has enough dielectric strength for the voltage (U) being measured (2U + 1000 V recommended). Also, make sure that the secondary side of the CT does not become an open circuit while the power is being applied. If this happens, high voltage will appear at the secondary side of the CT, making it extremely dangerous.
- Do not connect a current transformer without protection.
- When using an external current sensor, make sure to use a sensor that comes in a case. The conductive parts and case should be insulated, and the sensor should have enough dielectric strength for the voltage of the circuit under measurement. Using a bare sensor is dangerous, because there is a high probability that you might accidentally touch it.
- When using a shunt-type current sensor as an external current sensor, turn off the circuit under measurement before you connect the sensor. Connecting or removing the sensor while the power is on is dangerous.

- When using a clamp-type current sensor as an external current sensor, make sure that you understand the voltage of the circuit under measurement and the specifications and handling of the clamp-type sensor, and then confirm that there are no dangers, such as shock hazards.
- When measuring the current of a circuit under measurement whose common-mode voltage exceeds 600 V using a current input terminal, the 760812 (current module) cannot provide safe measurement in compliance with the EN61010-2-030 standard. Use the 760813 (current module) instead. If 760812s (current modules) and 760813 (current modules) are installed simultaneously in the PX8000, be careful not to connect a circuit under measurement whose common-mode voltage exceeds 600 V to a 760812 (current module).
- After connecting the measurement cables, fix the current cables to the current modules with cable straps to prevent the current safety terminal adapters from coming loose.
- To make the protective features effective, before applying the voltage or current from the circuit under measurement, check that:
  - The power cord for the instrument is being used to connect to the power supply, and the instrument is grounded.
  - The instrument is turned on.
  - The current cables are fixed to the current module with a cable strap.
- When the instrument is turned on, do not apply a signal that exceeds the following values to the voltage or current input terminals. When the instrument is turned off, turn the circuit under measurement off. For information about other input terminals, see the specifications in chapter 7.

Instantaneous maximum allowable input (within 20 ms)

Voltage input

Peak value of 2.2 kV or rms value of 1.5 kV, whichever is less.

Current input

Direct input

Peak value of 30 A or rms value of 15 A, whichever is less.

External current sensor input

External current sensor input : Peak value less than or equal to 10 times the range.

Instantaneous maximum allowable input (1 s or less)

Voltage input

Peak value of 2.2 kV or rms value of 1.5 kV, whichever is less.

Current input

Direct input

Peak value of 8.5 A or rms value of 6 A, whichever is less.

External current sensor input

External current sensor input : Peak value less than or equal to 10 times the range.

Continuous maximum allowable input

Voltage input

Peak value of 2 kV or rms value of 1.1 kV, whichever is less.
If the frequency of the input voltage exceeds 100 kHz
(1100–f) Vrms or less f is the frequency of the input voltage in units of kHz.
The continuous allowable input is 3 Vrms or higher.

Current input

Direct input

Peak value of 8.5 A or rms value of 6 A, whichever is less.
If the frequency of the input current exceeds 100 kHz
$(6 \times e^{(-0.00017 \times f)})$ Arms or less f is the frequency of the input current in units of kHz.

External current sensor input

External current sensor input : Peak value less than or equal to 4 times the range.

CAUTION

Use measurement cables with dielectric strengths and current capacities that are appropriate for the voltage or current being measured.
Attaching a measurement cable to this product may cause radio interference in which case the user will be required to correct the interference.

French

AVERTISSEMENT

- Relier l'instrument à la terre avant de brancher les câbles de mesure. Le cordon d'alimentation à utiliser est un cordon d'alimentation à trois broches. Brancher le cordon d'alimentation sur une prise de courant à trois plots mise à la terre.
- Mettre le circuit à mesurer hors tension avant de brancher et de débrancher les câbles. Il est dangereux de brancher ou de débrancher les câbles de mesure lorsque le circuit est sous tension.
- Ne pas brancher un circuit de courant sur une borne d'entrée de tension ou un circuit de tension sur une borne d'entrée de courant.
- Lors de la connexion des câbles de mesure sur les bornes d'entrée de tension, ne brancher que des câbles de mesure dotés de bornes de sécurité capables de couvrir leurs éléments conducteurs. L'utilisation d'une borne dotée d'éléments conducteurs nus (comme une fiche banane) serait dangereuse si la borne venait à se détacher.
- Lors de la connexion de câbles sur les bornes d'entrée du capteur de courant, ne brancher que des câbles dotés de bornes de sécurité capables de couvrir leurs éléments conducteurs. L'utilisation d'un connecteur doté d'éléments conducteurs peut être dangereuse si la tension est de 42 V ou plus.
- Lorsque le courant est directement appliqué sur les bornes d'entrée de courant de 760812 (module de courant) afin de le mesurer, la tension de l'appareil à mesurer apparaît au connecteur d'entrée du capteur de courant externe. Pour éviter tout risque de choc électrique, retirer le câble branché sur le capteur de courant externe.
- Lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de courant de 760812 (module de courant), ne pas toucher les bornes d'entrée de capteur de courant externe, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.
- Lors du branchement d'un câble de mesure d'un capteur de courant externe sur un connecteur d'entrée de capteur de courant externe, retirer les câbles branchés sur les bornes d'entrée de courant. De plus, lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de capteur de courant externe, ne pas toucher les bornes d'entrée de courant, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.
- En cas d'utilisation d'un transformateur externe de tension ou de courant, vérifier que la rigidité diélectrique est suffisante pour la tension (U) à mesurer (2U + 1000 V recommandé). De plus, il convient d'éviter que le côté secondaire du transformateur de courant devienne un circuit ouvert pendant que le courant est appliqué. Si cela se produisait, la haute tension se déplacerait du côté secondaire du transformateur de courant, le rendant extrêmement dangereux.
- Ne pas brancher de transformateur de courant sans protection.
- Lors de l'utilisation d'un capteur de courant externe, toujours utiliser un capteur rangé dans un étui. Les éléments conducteurs et l'étui doivent être isolés, et le capteur doit avoir une rigidité diélectrique suffisante pour la tension du circuit à mesurer. L'utilisation d'un capteur nu est dangereuse car le risque de le toucher accidentellement est très élevé.
- Lors de l'utilisation d'un capteur de courant de type shunt en guise de capteur de courant externe, mettre le circuit à mesurer hors tension avant de brancher le capteur. Il est dangereux de brancher ou de débrancher le capteur lorsque le circuit est sous tension.

- Lors de l'utilisation d'un capteur de courant par serrage en guise de capteur de courant externe, tenir compte de la tension du circuit à mesurer, des spécifications et des consignes de manipulation du capteur par serrage, puis vérifier l'absence de dangers, tels le choc électrique.
- Lors de la mesure du courant d'un circuit dont la tension de mode commun dépasse 600 V à l'aide d'une borne d'entrée de courant, le 760812 (module de courant) ne peut garantir une mesure sécurisée conformément à la norme EN61010-2-030. Utiliser à la place le 760813 (module de courant). En cas d'installation simultanée de 760812 (modules de courant) et de 760813 (modules de courant) dans le PX8000, veiller à ne pas brancher de circuit à mesurer dont la tension de maintien dépasse 600 V, sur un 760812 (module de courant).
- Après avoir branché les câbles de mesure, attacher les câbles de courant aux modules de courant à l'aide d'attache-câbles, afin d'éviter que les adaptateurs de bornes de sécurité de courant ne se détachent.
- Pour garantir la sécurité, avant d'appliquer la tension ou le courant depuis le circuit à mesurer, vérifier ce qui suit :
  - Le cordon d'alimentation de l'instrument est utilisé pour la connexion à l'alimentation, et l'instrument est bien relié à la terre.
  - L'instrument est sous tension.
  - Les câbles du courant sont fixés au module de courant à l'aide d'un attache-câble.
- Lorsque l'instrument est sous tension, ne pas appliquer de signal sur les bornes d'entrée de tension ou de courant dépassant les valeurs suivantes. Lorsque l'instrument est hors tension, éteindre également le circuit à mesurer. Pour de plus amples informations sur d'autres bornes d'entrée, se reporter aux spécifications au chapitre 7.

Entrée instantanée maximale admissible (dans une fourchette de 20 ms)

Entrée de tension

Valeur crête de 2,2 kV ou valeur efficace de 1,5 kV, selon la valeur la plus basse.

Entrée de courant

Entrée directe

Valeur crête de 30 A ou valeur efficace de 15 A, selon la valeur la plus basse.

Entrée de capteur externe

Entrée de capteur externe : Valeur crête inférieure ou égale à 10 fois la plage.

Entrée instantanée maximale admissible (1 s ou moins)

Entrée de tension

Valeur crête de 2,2 kV ou valeur efficace de 1,5 kV, selon la valeur la plus basse.

Entrée de courant

Entrée directe

Valeur crête de 8.5 A ou valeur efficace de 6 A, selon la valeur la plus basse.

Entrée de capteur externe

Entrée de capteur externe : Valeur crête inférieure ou égale à 10 fois la plage.

Entrée continue maximale admissible

Entrée de tension

Valeur crête de 2 kV ou valeur efficace de 1,1 kV, selon la valeur la plus basse.
Si la fréquence de tension d'entrée dépasse 100 kHz
(1100–f) Vrms ou moins, f est la fréquence de tension d'entrée en unités de kHz.
L'entrée continue admissible est de 3 Vrms ou plus.

Entrée de courant

Entrée directe

Valeur crête de 8,5 A ou valeur efficace de 6 A, selon la valeur la plus basse.
Si la fréquence de courant d'entrée dépasse 100 kHz
$(6 \times e^{(-0.00017 \times f)})$ Arms ou moins, f est la fréquence de courant d'entrée en unités de kHz.

Entrée de capteur externe

Entrée de capteur externe : Valeur crête inférieure ou égale à 4 fois la plage.

ATTENTION

Utiliser des câbles de mesure dont la rigidité diélectrique et la capacité de courant conviennent pour la tension ou le courant à mesurer.
Le branchement d'un câble de mesure sur ce produit peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

Note

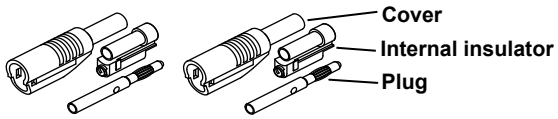
- If you are measuring large currents or voltages or currents that contain high frequency components, take special care in dealing with mutual interference and noise when you wire the cables.
- Keep measurement cables as short as possible to minimize the loss between the circuit under measurement and the instrument.
- The thick lines on the wiring diagrams shown in sections 2.9 to 2.11 are the parts where the current flows. Use wires that are suitable for the current levels.
- To make accurate measurements of the voltage of the circuit under measurement, connect the measurement cable that is connected to the voltage input terminal to the circuit as closely as possible.
- To make accurate measurements, separate the measurement cables as far away from the ground wires and the instrument's case as possible to minimize static capacitance to the ground.
- To measure the apparent power and power factor more accurately on an unbalanced three-phase circuit, we recommend that you use the three-voltage, three-current method (3V3A).

2.6 Assembling the Adapters for the Voltage or Current Input Terminals

Voltage Input Terminals

When connecting a measurement cable to a PX8000 voltage input terminal, use the included B8213ZD Safety Terminal Adapter or the 758923 Safety Terminal Adapter (sold separately).

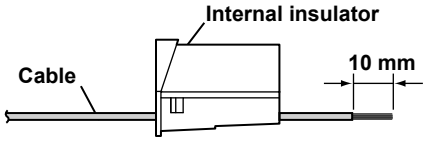
B8213ZD Safety Terminal Adapter



When using the B8213ZD Safety Terminal Adapter, assemble it according to the following procedure. When assembling an adapter, check the wiring method in sections 2.9 to 2.11, and connect an appropriate cable.

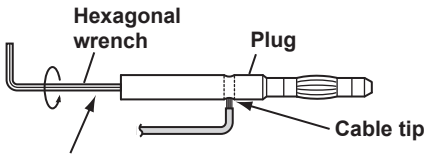
Assembling the Safety Terminal Adapter

1. Remove approximately 10 mm of the covering from the end of the cable and pass the cable through the internal insulator.



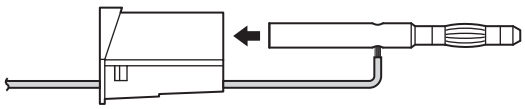
Attachable cable
Covering: max. diameter 3.9 mm
Core wire: max. diameter 1.8 mm

2. Insert the tip of the cable into the plug. Fasten the cable in place using the included hexagonal wrench (B9317WD).

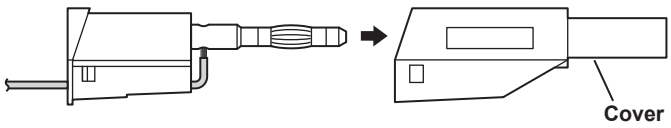


Insert the hexagonal wrench into the plug and tighten.

3. Insert the plug into the internal insulator.



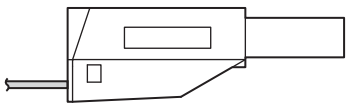
4. Attach the external cover. Make sure that the cover does not come off.



Note

Once you attach the cover, it is difficult to disassemble the safety terminal adapter. Use care when attaching the cover.

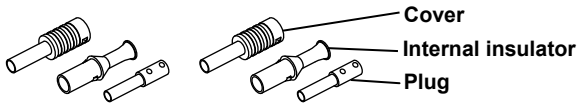
Below is an illustration of the adapter after it has been assembled.



Current Input Terminals

When connecting a measurement cable to a PX8000 current input terminal, use the included B8213ZA Safety Terminal Adapter.

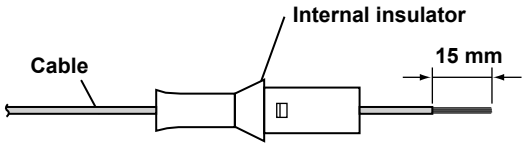
B8213ZA Safety Terminal Adapter



When using the B8213ZA Safety Terminal Adapter, assemble it according to the following procedure. When assembling an adapter, check the wiring method in sections 2.9 to 2.11, and connect an appropriate cable.

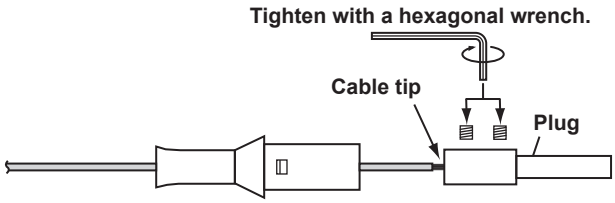
Assembling the Safety Terminal Adapter

1. Remove approximately 15 mm of the covering from the end of the cable and pass the cable through the internal insulator.



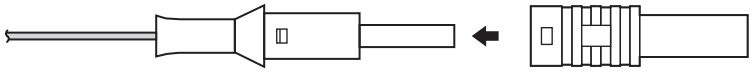
Attachable cable
Covering: max. diameter 4.0 mm
Core wire: max. diameter 2.5 mm

2. Insert the tip of the cable into the plug. Fasten the cable in place using the included hexagonal wrench (B9317WD).



3. Insert the plug into the internal insulator.

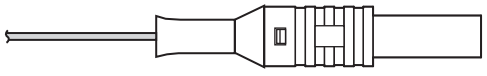
4. Attach the external cover. Make sure that the cover does not come off.



Note

Once you attach the cover, it is difficult to disassemble the safety terminal adapter. Use care when attaching the cover.

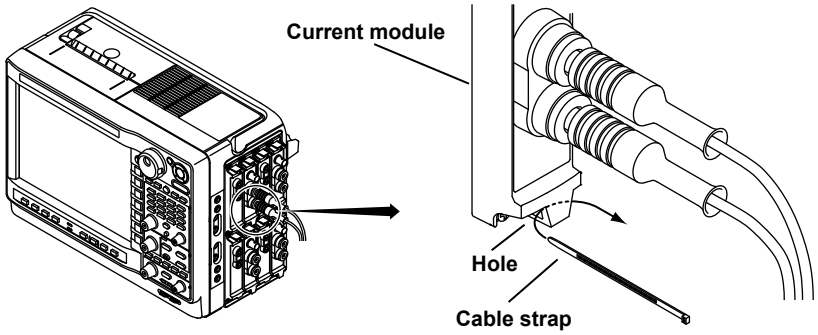
Below is an illustration of the adapter after it has been assembled.



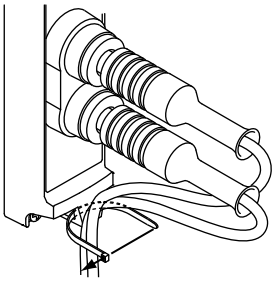
Fixing Current Cables in Place

After connecting safety terminal adapters to the current input terminals, fix the cables to the current modules with cable straps to prevent the current safety terminal adapters from coming loose. Cable straps are not supplied with the PX8000. Please obtain off-the-shelf cable straps.

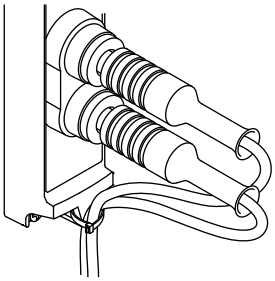
1. Pass a cable strap through the hole at the bottom of the current module.



2. Bundle the cables with the cable strap.



3. Tighten the cable strap to fix the cables in place. Cut the excess portion of the cable strap.



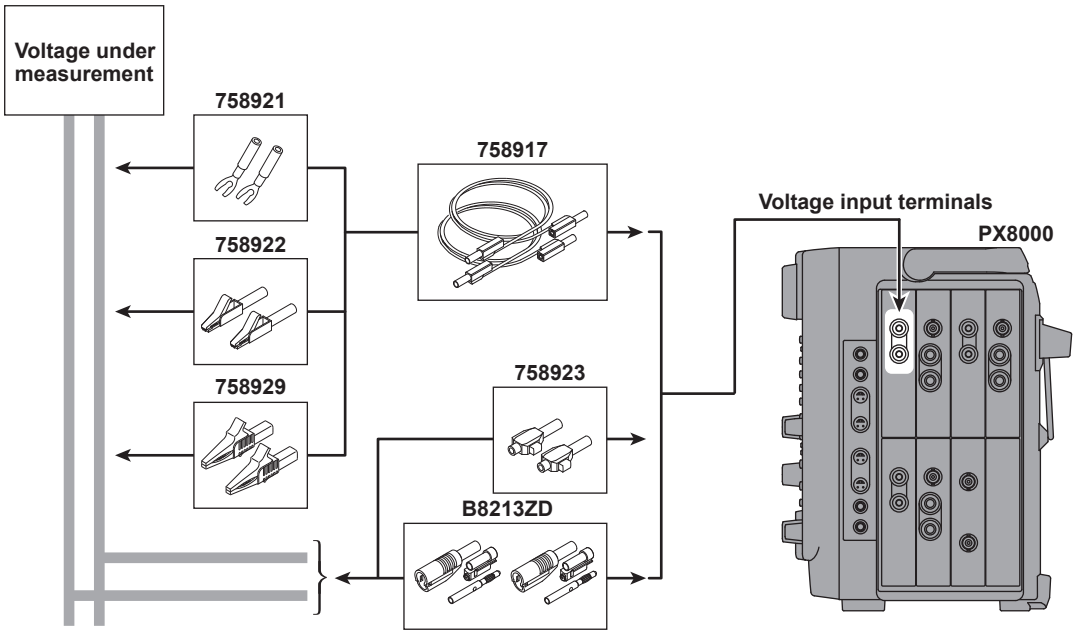
Note

Leave some slack in the cables to prevent excessive force from being applied to the safety terminal adapters and cables.

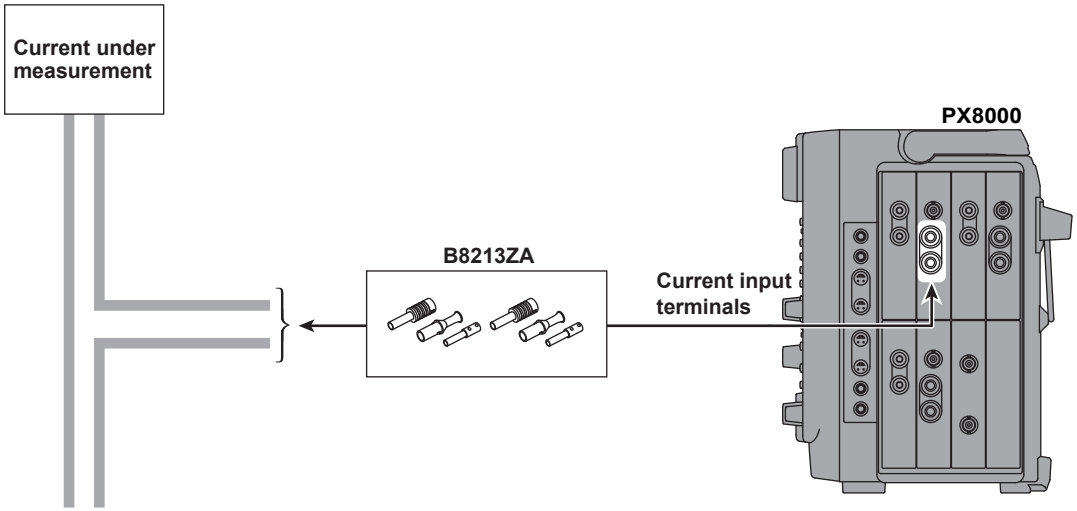
Explanation

Wire the adapters that come with the PX8000 or the adapters and various sensors that are sold separately as shown below:

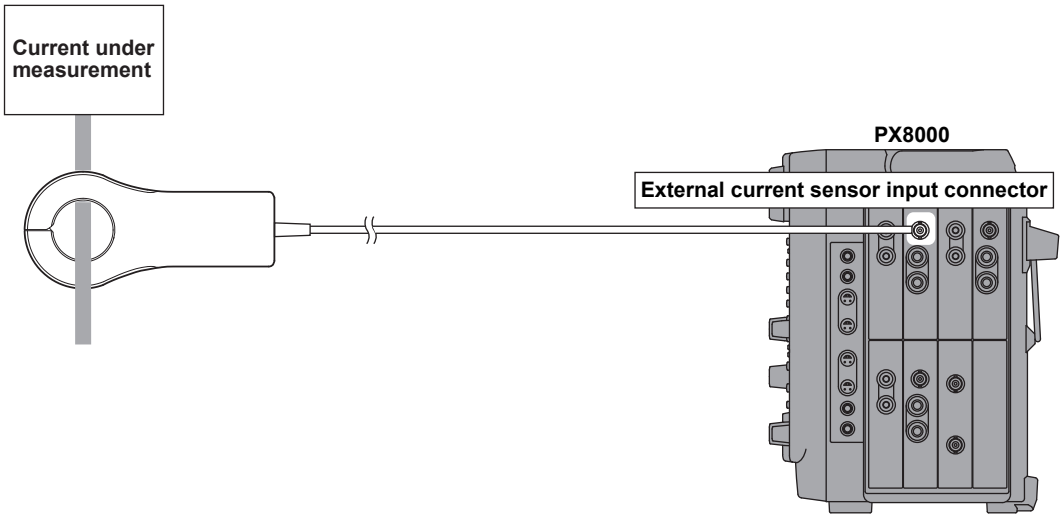
Wiring to a Voltage Input Terminal



Wiring to a Current Input Terminal



Use the current sensors that output voltage as shown below.



* A current sensor that outputs voltage cannot be used with the 760813 (current module).

* The current input terminal and external current sensor input connector on the same module cannot be wired (used) simultaneously.

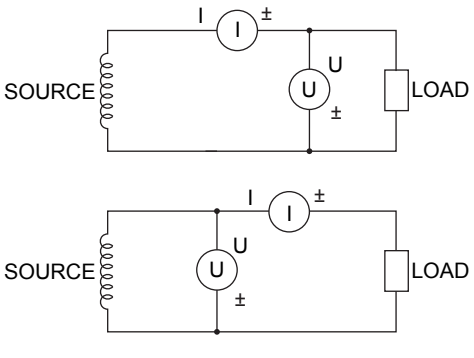
2.7 Wiring for Accurately Measuring a Single-phase Device

When you are wiring a single-phase device, there are the four patterns of terminal wiring positions shown in the following figures for wiring the voltage input and current input terminals. Depending on the terminal wiring positions, the effects of stray capacitance and the effects of the measured voltage and current amplitudes may become large. To make accurate measurements, refer to the items below when wiring the voltage input and current input terminals.

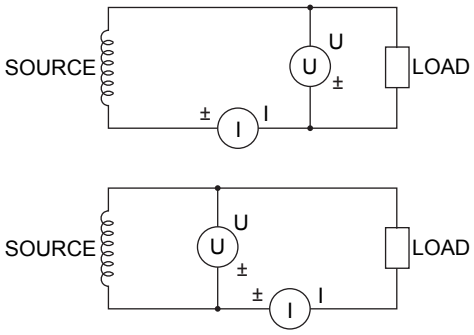
Effects of Stray Capacitance

When you are measuring the power of a single-phase device, you can minimize the effects of stray capacitance on measurement accuracy by connecting the instrument's current input terminal to the side that is closest to the earth potential of the power supply (SOURCE).

• Easily affected

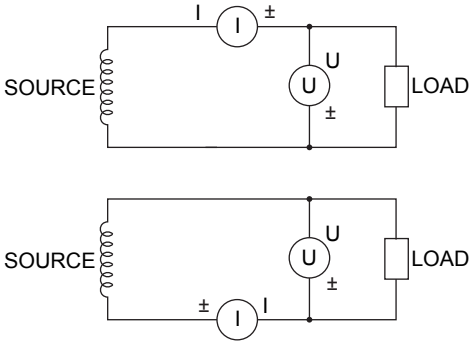


• Not easily affected

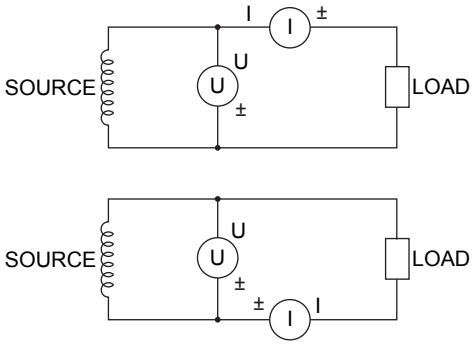


Effects of the Measured Voltage and Current Amplitudes

• When the measured current is relatively large
Connect the voltage input terminal between the current input terminal and the load.



• When the measured current is relatively small
Connect the current input terminal between the voltage input terminal and the load.



Explanation

For details on the effects of stray capacitance and the effects of the measured voltage and current amplitudes, see appendix 1, "How to Make Accurate Measurements."

2.8 Guide for Selecting the Method Used to Measure the Power

Select the measurement method from the table below according to the amplitude of the measured voltage or current. For details about a wiring method, see the section indicated in the table.

Voltage Measurement Methods

		When the Voltage Is 1000 V or Less	When the Voltage Exceeds 1000 V
Voltage wiring	Direct input	→ section 2.9	Direct input is not possible.
	Voltage transformer (VT)	→ section 2.11	

Current Measurement Methods

760812 (current module)

		When the Voltage Is 1000 V or Less		When the Voltage Exceeds 1000 V
		When the Current Is 5 A or Less	When the Current Exceeds 5 A	
Current wiring	Direct input	→ section 2.9[1]	Direct input is not possible.	
	Shunt-type current sensor	→ section 2.10[1]		Shunt-type current sensors cannot be used.
	Clamp-type current sensor (voltage output type)	→ section 2.10		
	Clamp-type current sensor (current output type)	→ section 2.11		
	Current transformer (CT)	→ section 2.11		

1: Voltage:

- 1000 V or less (maximum allowable voltage that can be measured)
- 600 V or less (rating voltage of EN61010-2-030)

Do not touch the inside of the external current sensor input BNC.

760813 (current module)

		When the Voltage Is 1000 V or Less		When the Voltage Exceeds 1000 V
		When the Current Is 5 A or Less	When the Current Exceeds 5 A	
Current wiring	Direct input	→ section 2.9[2]	Direct input is not possible.	
	Clamp-type current sensor (current output type)	→ section 2.11		
	Current transformer (CT)	→ section 2.11		

2: Voltage: 1000 V or less (rating voltage of EN61010-2-030)

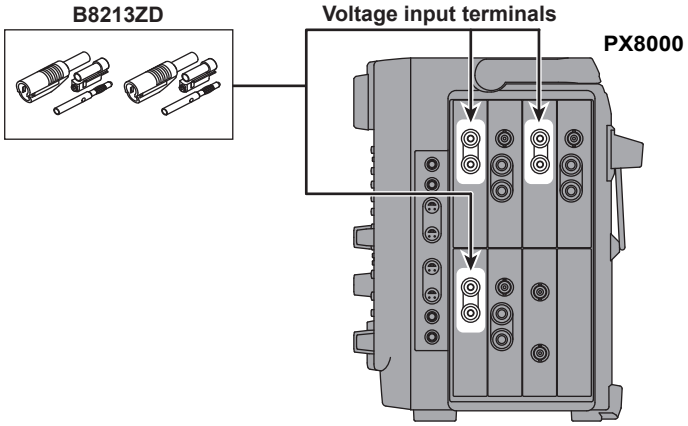
2.9 Wiring the Circuit under Measurement for Direct Input

This section explains how to wire the measurement cable directly from the circuit under measurement to the voltage or current input terminal. To prevent electric shock and damage to the instrument, follow the warnings given in section 2.5, “Precautions When Wiring the Circuit under Measurement.”

Connecting to the Input Terminals

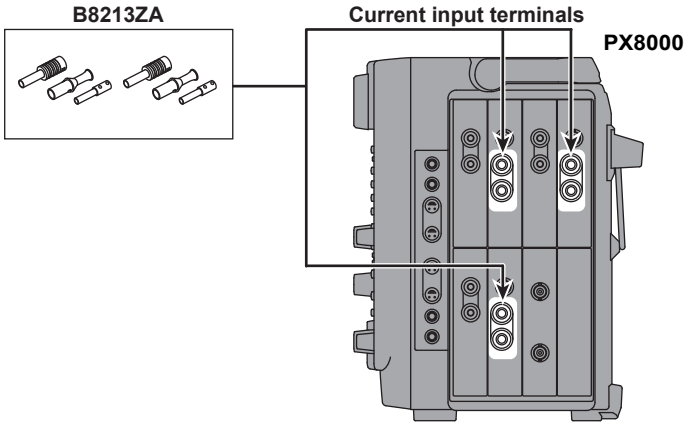
Voltage Input Terminals

- The terminals are safety banana jacks (female) that are 4 mm in diameter.
- Only insert a safety terminal whose conductive parts are not exposed into a voltage input terminal.
- If you are using the included B8213ZD Safety Terminal Adapter, see section 2.6.



Current Input Terminals

- The terminals are safety banana jacks (male) that are 4 mm in diameter.
- Only insert a safety terminal whose conductive parts are not exposed into a current input terminal.
- If you are using the included B8213ZA Safety Terminal Adapter, see section 2.6.



WARNING

- When the voltage of the circuit under measurement is being applied to the current input terminals, do not touch the external current sensor input terminal. Doing so is dangerous because the terminals are electrically connected inside the instrument.
- When connecting a measurement cable from an external current sensor to an external current sensor input connector, remove the cables connected to the current input terminals. Also, when the voltage of the circuit under measurement is being applied to the external current sensor input terminals, do not touch the current input terminals. Doing so is dangerous because the terminals are electrically connected inside the instrument.

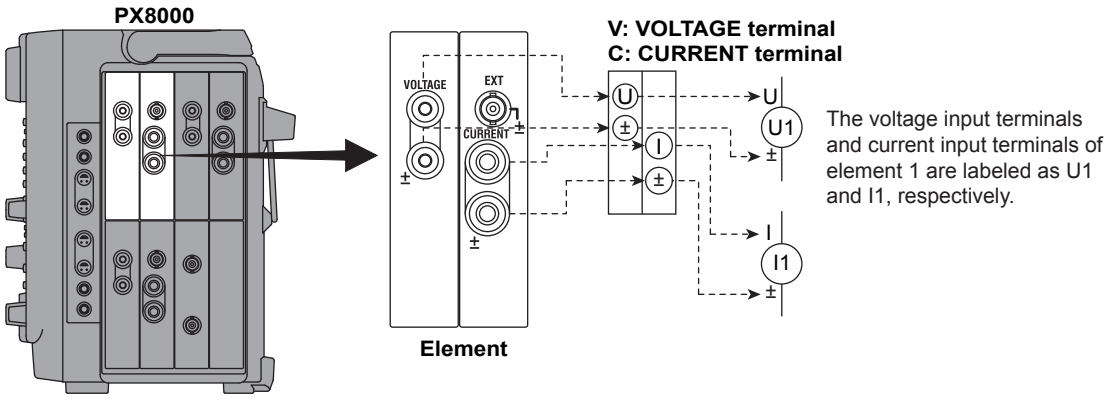
French

AVERTISSEMENT

- Lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de courant, ne pas toucher les bornes d'entrée de capteur de courant externe, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.
- Lors du branchement d'un câble de mesure d'un capteur de courant externe sur un connecteur d'entrée de capteur de courant externe, retirer les câbles branchés sur les bornes d'entrée de courant. De plus, lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de capteur de courant externe, ne pas toucher les bornes d'entrée de courant, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.

Connecting to the PX8000

In the wiring examples that follow, the PX8000 elements, voltage input terminals, and current input terminals are simplified as shown in the following figure.



The wiring examples shown below are examples of the following wiring systems in which the specified elements have been wired. To wire other elements, substitute the numbers in the figures with the appropriate element numbers.

- Single-phase, two-wire systems (1P2W): Element 1
- Single-phase, three-wire system (1P3W) and three-phase, three-wire system (3P3W): Elements 1 and 2
- Three-phase, three wire system that uses a three-voltage, three-current method (3P3W; 3V3A) and three-phase, four-wire system (3P4W): Elements 1 to 3

CAUTION

The thick lines on the wiring diagrams are the parts where the current flows. Use wires that are suitable for the current levels.

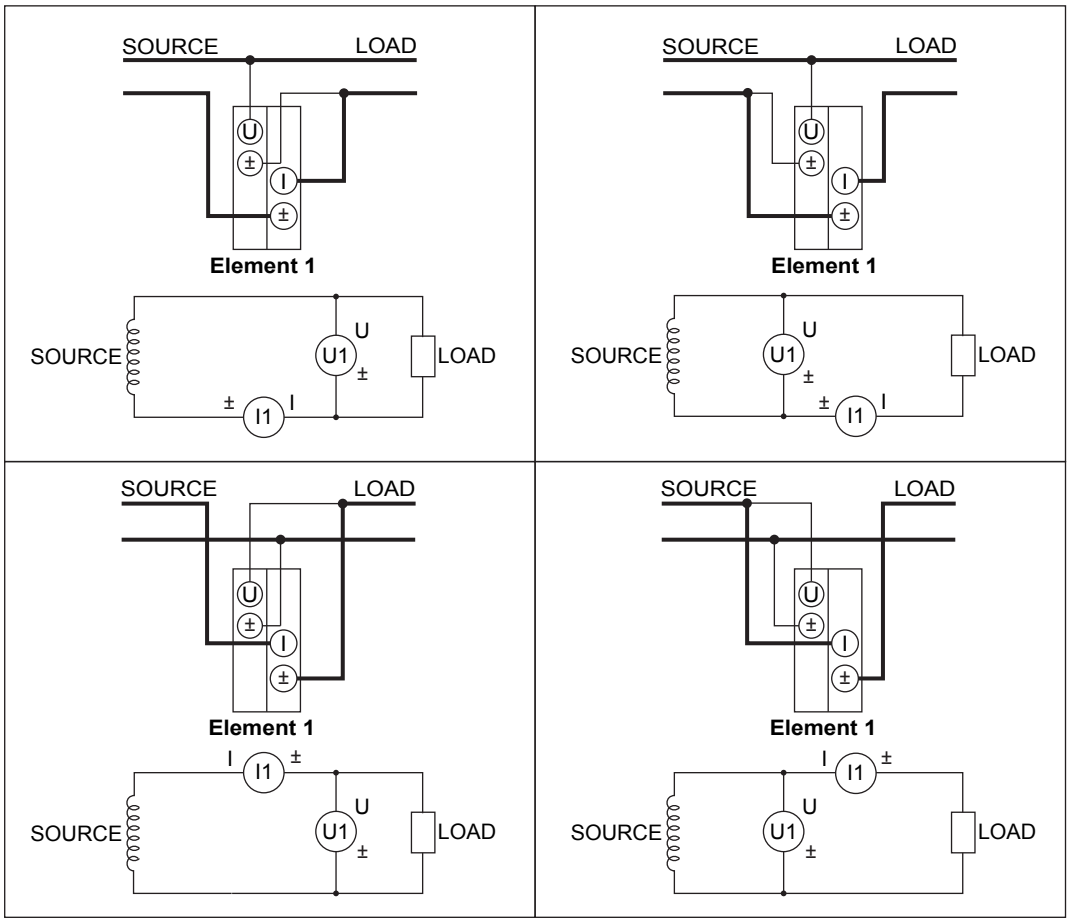
French

ATTENTION

Les lignes épaisses sur les schémas de câblage illustrent l'acheminement du courant. Utiliser des fils qui conviennent aux niveaux de courant.

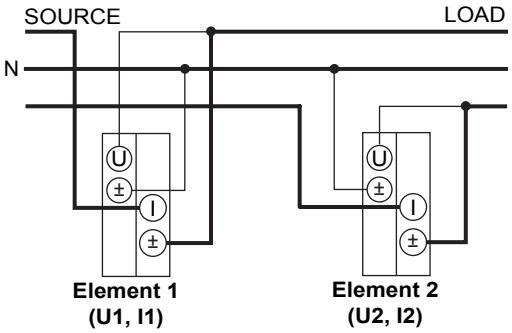
Wiring Examples of Single-Phase, Two-Wire Systems (1P2W)

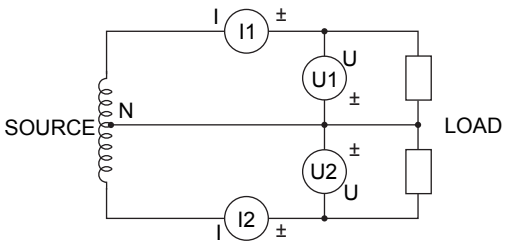
If four elements are available, four single-phase, two-wire systems can be wired.
When you are wiring a single-phase device, there are the four patterns of terminal wiring positions shown in the following figures for wiring the voltage input and current input terminals. To select which pattern to use, see section 2.7.



Wiring Example of a Single-Phase, Three-Wire System (1P3W)

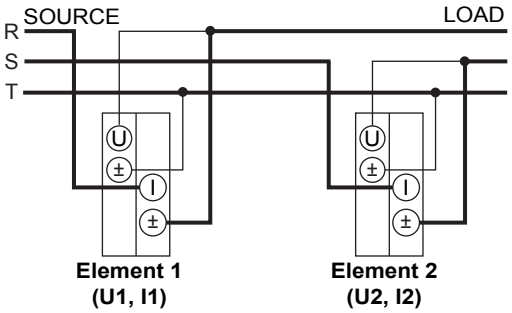
If four elements are available, two single-phase, three-wire systems can be set up (elements 1 and 2 and elements 3 and 4).

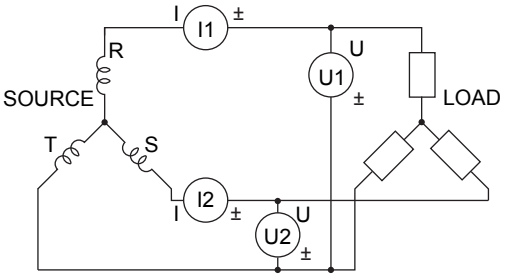




Wiring Example of a Three-Phase, Three-Wire System (3P3W)

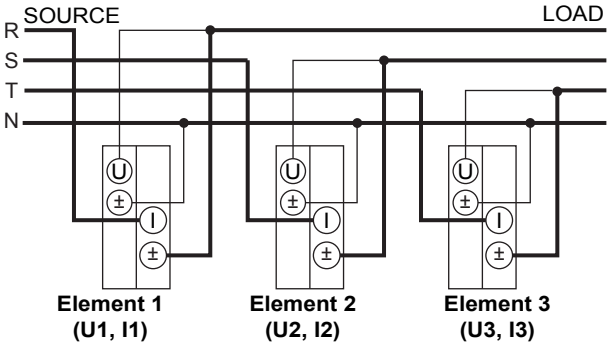
If four elements are available, two three-phase, three-wire systems can be set up (elements 1 and 2 and elements 3 and 4).

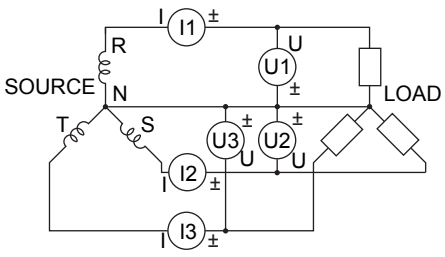




Wiring Example of a Three-Phase, Four-Wire System (3P4W)

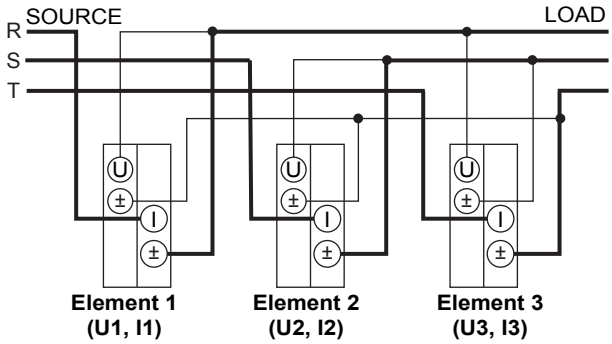
If four elements are available, one three-phase, four-wire system can be set up (elements 1, 2, and 3 or elements 2, 3, and 4).

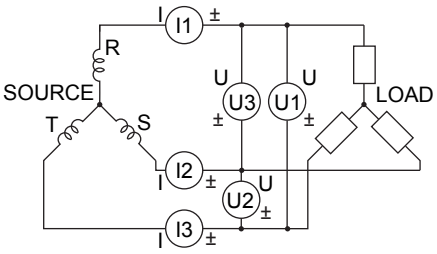




Wiring Example of a Three-Phase, Three-Wire System That Uses a Three-Voltage, Three-Current Method (3P3W; 3V3A)

If four elements are available, one three-phase, three-wire system (three-voltage, three-current system) can be set up (elements 1, 2, and 3 or elements 2, 3, and 4).





Note

For details about the relationship between the wiring system and how measured and computed values are determined, see appendix 1, “Symbols and Determination of Measurement Functions.” in the features guide, IM PX8000-01EN.

2.10 Wiring the Circuit under Measurement When Using Current Sensors

To prevent electric shock and damage to the instrument, follow the warnings given in section 2.5, “Precautions When Wiring the Circuit under Measurement.”

If the maximum current of the circuit under measurement exceeds the maximum range of the elements, you can measure the current of the circuit under measurement by connecting an external current sensor to the external current sensor input connector.

Current Sensor Output Type

Voltage Output

Refer to the wiring examples in this section when using a shunt-type current sensor or a clamp-type current sensor that outputs voltage with 760812 (current module).
A current sensor that outputs voltage cannot be used with the 760813 (current module).

Current Output

If you are using a clamp-type current sensor that outputs current, see section 2.11.

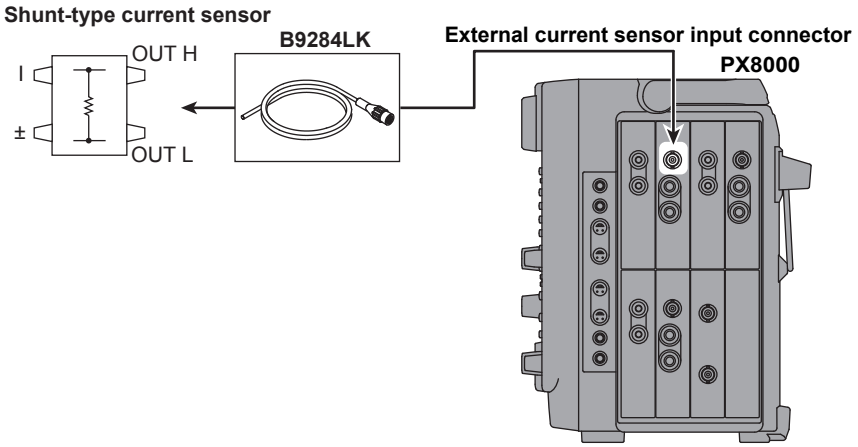
Connecting to the Input Terminals

Voltage Input Terminals

- The terminals are safety banana jacks (female) that are 4 mm in diameter.
- Only insert a safety terminal whose conductive parts are not exposed into a voltage input terminal.
- If you are using the included B8213ZD Safety Terminal Adapter, see section 2.6.

External Current Sensor Input Terminal

- The terminal is an isolated BNC.
- When using shunt-type current sensors, connect an external current sensor cable with an isolated BNC (B9284LK, sold separately) to an external current sensor input connector.



Note

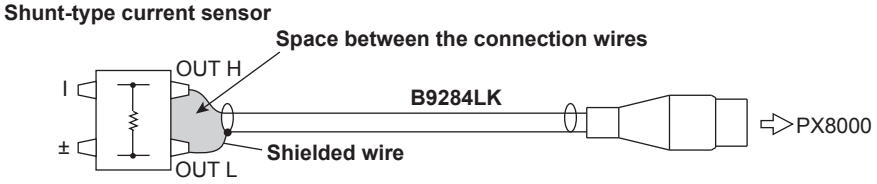
- Make sure that you have the polarities correct when you make connections. If the polarity is reversed, the polarity of the measurement current will be reversed, and you will not be able to make correct measurements. Be especially careful when connecting clamp-type current sensors to the circuit under measurement, because it is easy to reverse the connection.
- Note that the frequency and phase characteristics of the current sensor affect the measured data.
- To measure the apparent power and power factor more accurately on an unbalanced three-phase circuit, we recommend that you use the three-voltage, three-current method (3V3A).

Notes about Using Shunt-type Current Sensors and Clamp-type Current Sensors That Output Voltage

Connecting an External Current Sensor Cable

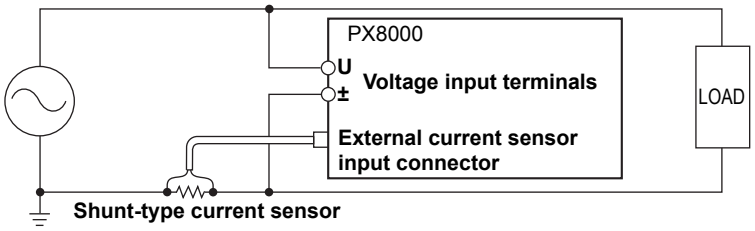
To minimize error when using shunt-type current sensors, follow the guidelines below when connecting the external current sensor cable.

- Connect the shielded wire of the external current sensor cable to the L side of the shunt output terminal (OUT).
- Minimize the area of the space between the wires connecting the current sensor to the external current sensor cable. This reduces the effects of the lines of magnetic force (which are caused by the measurement current) and the external noise that enter the space.



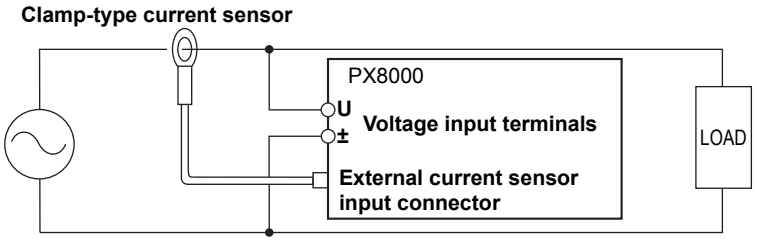
Position on the (Grounded) Circuit under Measurement That You Should Connect the Shunt-type Current Sensor To

Connect the shunt-type current sensor to the power earth ground as shown in the figure below. If you have to connect the sensor to the non-earth side, use a wire that is thicker than AWG18 (with a conductive cross-sectional area of approximately 1 mm^2) between the sensor and the instrument to reduce the effects of common mode voltage. Take safety and error reduction into consideration when constructing external current sensor cables.

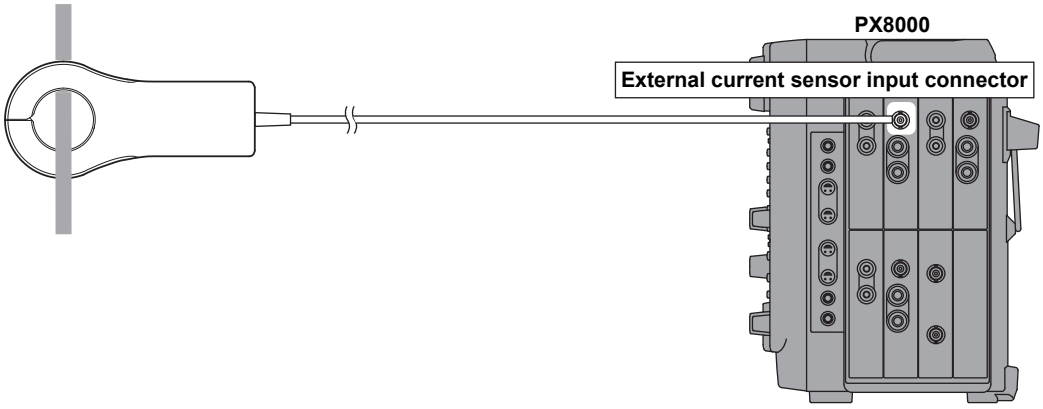


Ungrounded Measurement Circuits

When the circuit under measurement is not grounded and the signal is high in frequency or large in power, the effects of the inductance of the shunt-type current sensor cable become large. In this case, use an isolation sensor (CT, DC-CT, or clamp) to perform measurements.



Connecting the Current Sensors



WARNING

When connecting a measurement cable from an external current sensor to an external current sensor input connector, remove the cables connected to the current input terminals. Because the external current sensor input terminal and the current input terminal are connected internally, connecting both terminals simultaneously not only results in measurement errors but may also cause damage to the instrument. Also, when the voltage of the circuit under measurement is being applied to the external current sensor input terminals, do not touch the current input terminals. Doing so is dangerous because the terminals are electrically connected inside the instrument.

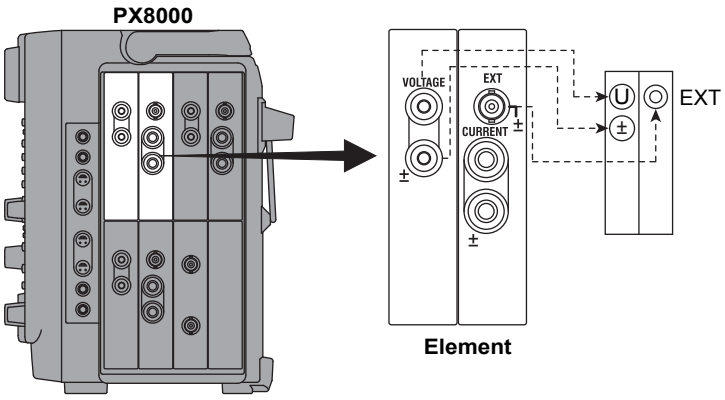
French

AVERTISSEMENT

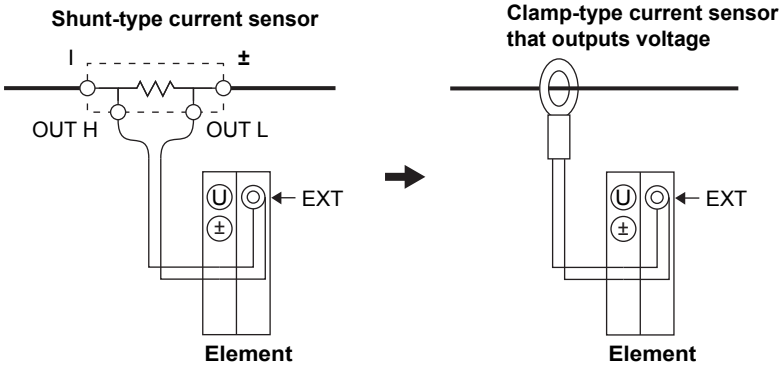
Lors du branchement d'un câble de mesure d'un capteur de courant externe sur un connecteur d'entrée de capteur de courant externe, retirer les câbles branchés sur les bornes d'entrée de courant. Parce que la borne d'entrée de capteur de courant externe et la borne d'entrée de courant sont connectées en interne, la connexion des deux bornes simultanément, non seulement entraîne des erreurs de mesure, mais peut également endommager l'instrument. De plus, lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de capteur de courant externe, ne pas toucher les bornes d'entrée de courant, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.

Connecting to the PX8000

In the wiring examples that follow, the PX8000 elements, voltage input terminals, and current input terminals are simplified as shown in the following figure.



Also, the wiring example is for when a shunt-type current sensor is connected. When connecting a clamp-type current sensor that outputs voltage, substitute the shunt-type current sensor with the clamp-type current sensor.



The wiring examples shown below are examples of the following wiring systems in which the specified elements have been wired. To wire other elements, substitute the numbers in the figures with the appropriate element numbers.

- Single-phase, two-wire system (1P2W): Element 1
- Single-phase, three-wire system (1P3W) and three-phase, three-wire system (3P3W): Elements 1 and 2
- Three-phase, three wire system that uses a three-voltage, three-current method (3P3W; 3V3A) and three-phase, four-wire system (3P4W): Elements 1 to 3

CAUTION

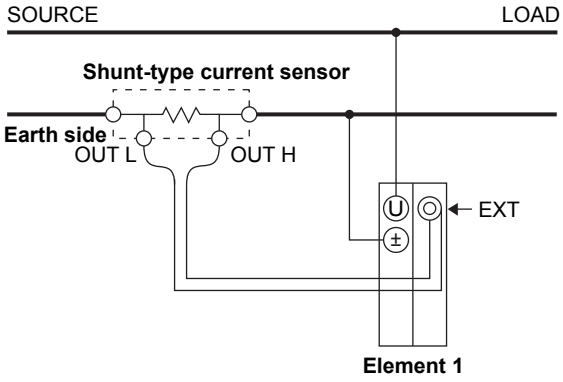
The thick lines on the wiring diagrams are the parts where the current flows. Use wires that are suitable for the current levels.

French

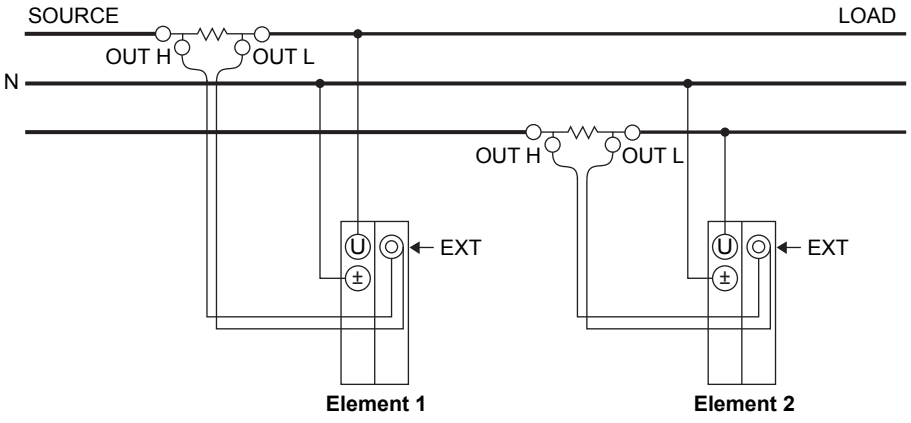
ATTENTION

Les lignes épaisses sur les schémas de câblage illustrent l'acheminement du courant. Utiliser des fils qui conviennent aux niveaux de courant.

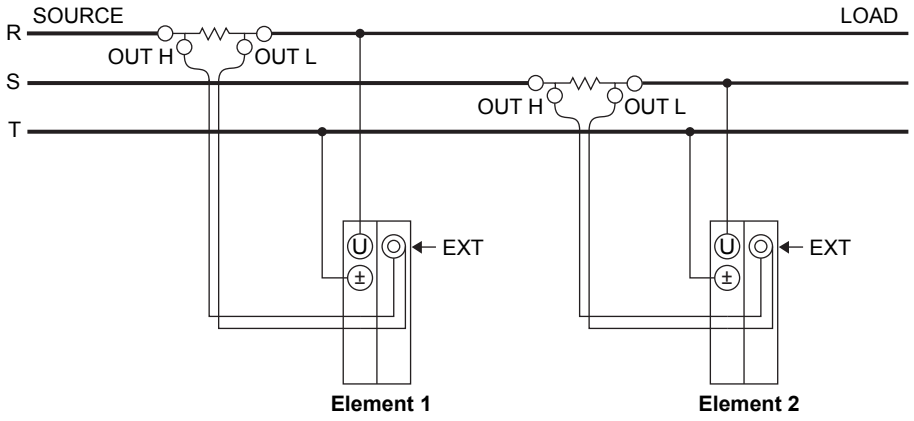
Wiring Example of a Single-Phase, Two-Wire System (1P2W) with a Shunt-Type Current Sensor



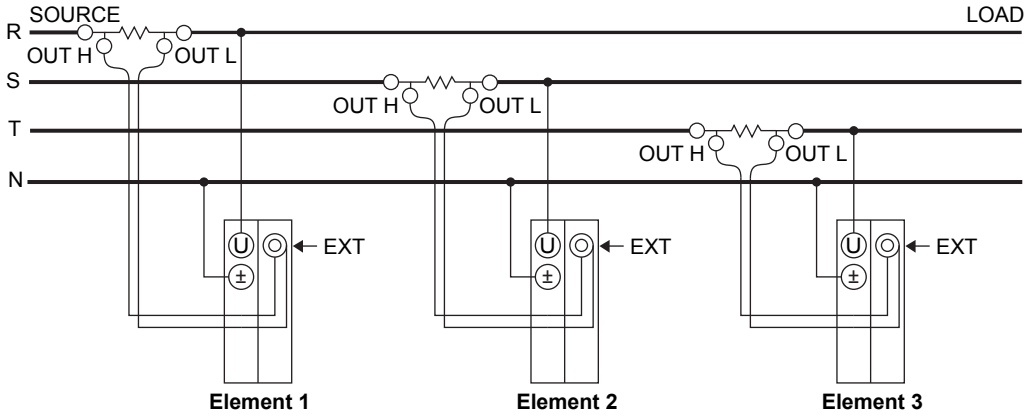
Wiring Example of a Single-Phase, Three-Wire System (1P3W) with Shunt-Type Current Sensors



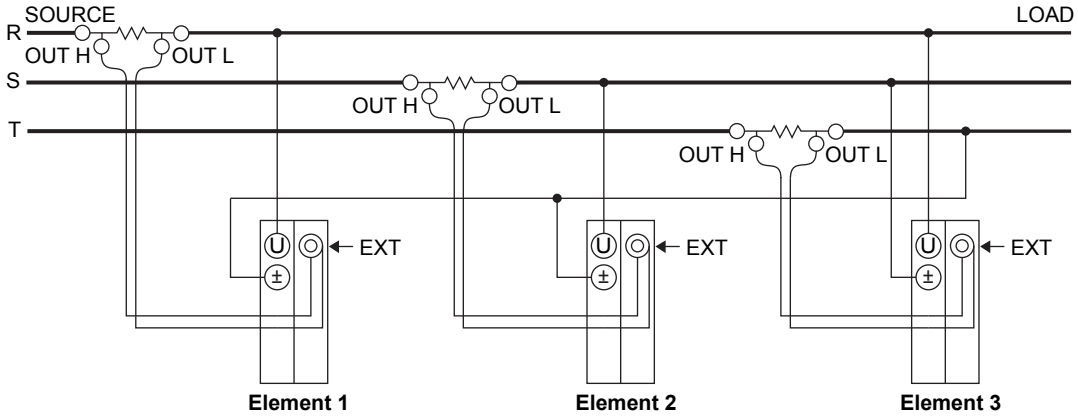
Wiring Example of a Three-Phase, Three-Wire System (3P3W) with Shunt-Type Current Sensors



Wiring Example of a Three-Phase, Four-Wire System (3P4W) with Shunt-Type Current Sensors



Wiring Example of a Three-Phase, Three-Wire System That Uses a Three-Voltage, Three-Current Method (3P3W; 3V3A) with Shunt-Type Current Sensors



Note

For details about the relationship between the wiring system and how measured and computed values are determined, see appendix 1, “Symbols and Determination of Measurement Functions.” in the features guide, IM PX8000-01EN.

2.11 Wiring the Circuit under Measurement When Using a Voltage or Current Transformer

This section explains how to wire measurement cables from external voltage transformers[1] or current transformers[2] to the voltage or current input terminals of elements. Also refer to this section when wiring clamp-type current sensors that output current.

*1 VT (voltage transformer)

*2 CT (current transformer)

To prevent electric shock and damage to the instrument, follow the warnings given in section 2.5, “Precautions When Wiring the Circuit under Measurement.”

Voltage Measurement

When the maximum voltage of the circuit under measurement exceeds 1000 Vrms, you can perform measurements by connecting an external VT to the voltage input terminal.

Current Measurement

When the maximum current of the circuit under measurement exceeds 5 Arms, you can measure the current of the circuit under measurement by connecting an external CT or a clamp-type sensor that outputs current to the current input terminal.

Connecting to the Input Terminals

Voltage Input Terminals

- The terminals are safety banana jacks (female) that are 4 mm in diameter.
- Only insert a safety terminal whose conductive parts are not exposed into a voltage input terminal.
- If you are using the included B8213ZD Safety Terminal Adapter, see section 2.6.

Current Input Terminals

- The terminals are safety banana jacks (male) that are 4 mm in diameter.
- Only insert a safety terminal whose conductive parts are not exposed into a current input terminal.
- If you are using the included B8213ZA Safety Terminal Adapter, see section 2.6.

WARNING

- Do not connect a current transformer without protection.
- When the voltage of the circuit under measurement is being applied to the current input terminals, do not touch the external current sensor input terminal. Doing so is dangerous because the terminals are electrically connected inside the instrument.
- When connecting a measurement cable from an external current sensor to an external current sensor input connector, remove the cables connected to the current input terminals. Also, when the voltage of the circuit under measurement is being applied to the external current sensor input terminals, do not touch the current input terminals. Doing so is dangerous because the terminals are electrically connected inside the instrument.

French

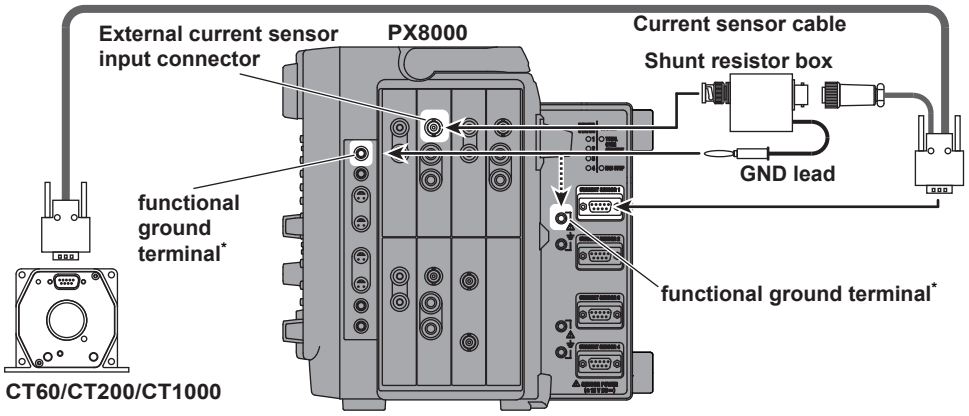
AVERTISSEMENT

- Ne pas brancher de transformateur de courant sans protection.
- Lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de courant, ne pas toucher les bornes d'entrée de capteur de courant externe, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.
- Lors du branchement d'un câble de mesure d'un capteur de courant externe sur un connecteur d'entrée de capteur de courant externe, retirer les câbles branchés sur les bornes d'entrée de courant. De plus, lorsque la tension du circuit à mesurer est appliquée aux bornes d'entrée de capteur de courant externe, ne pas toucher les bornes d'entrée de courant, car elles sont connectées électroniquement à l'intérieur de l'instrument, ce qui présente un danger.

Connecting a CT60/CT200/CT1000/CT2000A to the Sensor Power Supply (/PD, or /PD2 Option)

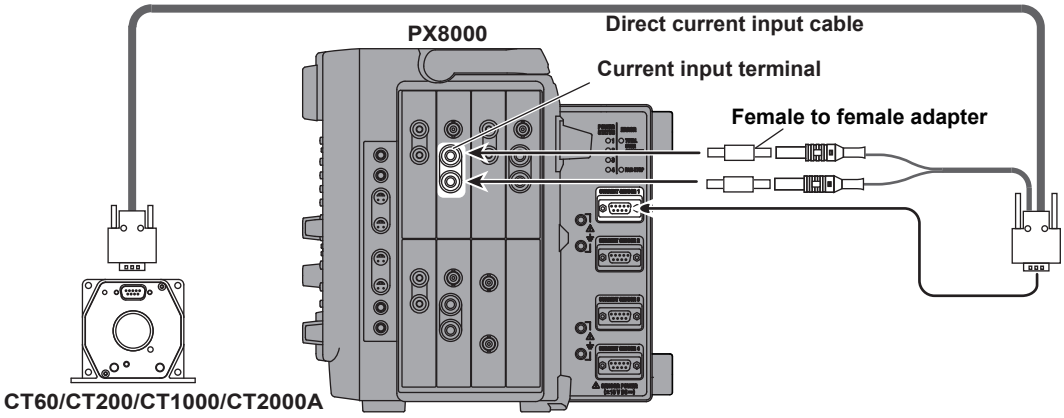
Models with the sensor power supply option can supply power to YOKOGAWA's CT60/CT200/CT1000/CT2000A AC/DC current sensors.

When connecting a CT60/CT200/CT1000 to the PX8000, connect the current sensor cable (sold separately) and the shunt resistor box as shown below.



If you want to connect a shunt resistor box to element 1 or 3, we recommend that you connect the GND lead to the functional ground terminal on the left side of the input module. If you want to connect a shunt resistor box to element 2 or 4, we recommend that you connect the GND lead to the functional ground terminal on the right side of the input module.

When applying the CT60/CT200/CT1000/CT2000A output current to this instrument's direct current input terminals, connect the direct current input cable (sold separately) and the female to female adapter as shown below.



Direct current input cable : A1589WL (CT60/CT200/CT1000)
A1628WL (CT60/CT200/CT2000A)
Female to female adapter : Coming Soon (CT60/CT200/CT1000/CT2000A)

WARNING

Before connecting the shunt resistor box to the CT with the current sensor cable, be sure to connect the GND lead of the shunt resistor box to the functional ground terminal on the right side panel of the PX8000. Not doing so is dangerous as high voltage may appear in the BNC.

CAUTION

- Before connecting or disconnecting a CT from the PX8000, turn the PX8000 off. Connecting or disconnecting the CT while the power is on can damage the PX8000 or CT.
- Use the sensor power supply terminal (option) on the right side panel of the PX8000 only as a power supply for the CT60/CT200/CT1000. Connecting other devices may damage the PX8000 or the connected device.

French

AVERTISSEMENT

Avant de connecter le boîtier de shunt au TC à l'aide du câble prévu à cet effet, veillez à raccorder le câble de terre (GND) du boîtier de shunt à la borne de protection à la terre située sur le panneau droit du PX8000. Il est dangereux de ne pas effectuer cette opération, car une tension élevée risque de se manifester au niveau du connecteur BNC.

ATTENTION

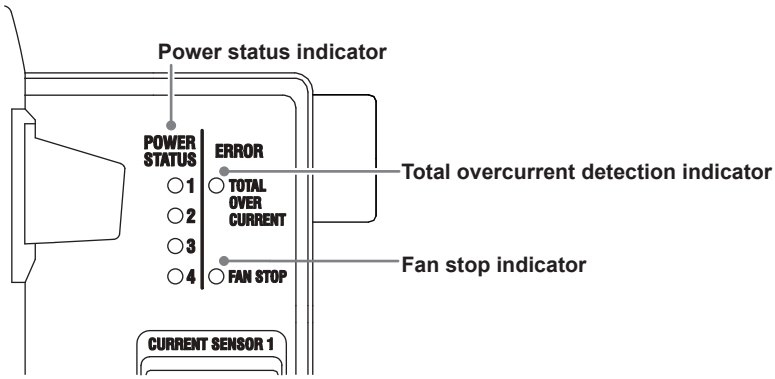
- Avant de connecter ou de déconnecter un TC du PX8000, mettez ce dernier hors tension. Vous risqueriez d'endommager le PX8000 ou le TC si vous déconnectez ce dernier pendant que l'alimentation est sous tension.
- Utilisez uniquement la borne d'alimentation de capteur (en option) sur le panneau droit du PX8000 comme alimentation du CT60/CT200/CT1000. Le branchement d'autres dispositifs risque d'endommager le PX8000 ou le dispositif connecté.

Note

Warm up the CT60/CT200/CT1000 for at least 30 minutes without input.

Sensor Power Supply Status Display

The sensor power supply status is displayed with the following indicators.



Power status indicator

The indicators display the CT connection status and the detection of overcurrent of channels 1 to 4.

- Off: A CT is not connected.
- Green: A CT is connected.
  Check the presence of a power supply with the CT's NORMAL OPERATION indicator.
- Red: Overcurrent detected. If overcurrent is detected on any channel, the power supply to all channels is stopped.*

Total overcurrent detection indicator

This indicator displays the detection of overcurrent in the total current of each channel.

- Off: Overcurrent not detected.
- Red: Overcurrent detected. The power supply to all channels is stopped.*

Fan stop indicator

This indicator displays the detection of fan stop.

- Off: Fan stop not detected.
- Red: Fan stop detected. The power supply to all channels is stopped.*

* To resume the power supply, remove the root cause of the overcurrent, and then restart the PX8000. If the indicator still lights red after the PX8000 is restarted, the PX8000 needs to be repaired.

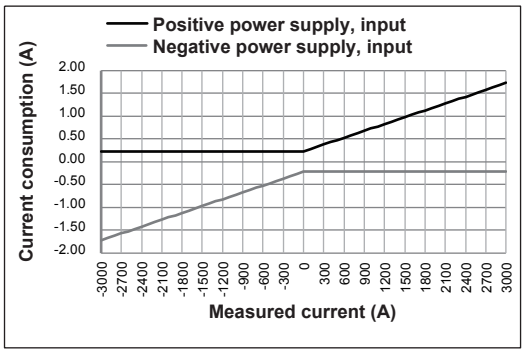
Specifications of the Sensor Power Supply Terminals (Optional)

Item	
Number of channels	4
Output voltage	±15 V
Output current	1 A/ 1 channel (/PD) 1.8 A/ 1 channel (up to 4 A total of 4 channels /PD2)

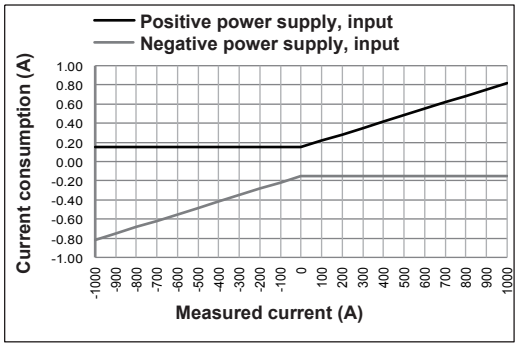
If you are connecting YOKOGAWA's CT series to the power supply terminal of this instrument's current sensor power option, make sure that the following current is not exceeded.
If exceeded, power supply to the CT series will stop due to the activation of the power supply overcurrent protection circuit of this instrument.

- 1 A/1 channel(/PD)
- 1.8 A/1 channel(PD2)
- 4 A for a total of four channels(PD2)

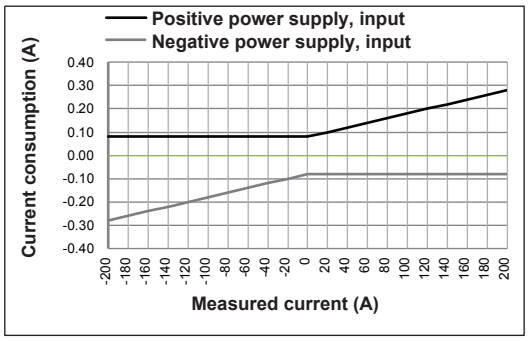
When using the CT series, the number of sensors that can be used is limited by the current generated by the device under measurement(current measured by the CT seris). The measured versus consumed current characteristics of CT siries that can be connected to the instrument are indicated below.



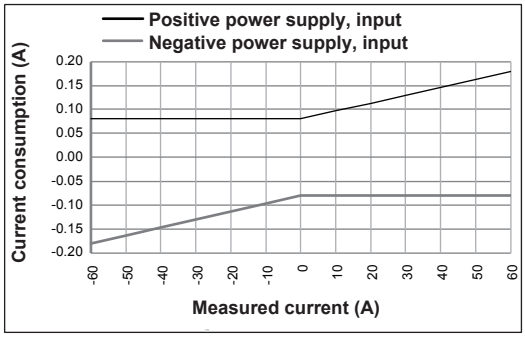
Measured current and current consumption of the CT2000A(example of characteristics)



Measured current and current consumption of the CT1000(example of characteristics)



Measured current and current consumption of the CT200(example of characteristics)



Measured current and current consumption of the CT60(example of characteristics)

Item	CT2000A	CT1000	CT200	CT60
Current Rating	DC: 0 to 2000 A AC: 3000 Apeak	DC: 0 to 1000 A AC: 1000 Apeak	DC: 0 to 200 A AC: 200 Apeak	DC: 0 to 60 A AC: 60 Apeak
Output Current	Primary rated current at 2000 A is 1A	Primary rated current at 1000 A is 666.6mA	Primary rated current at 200 A is 200.0mA	Primary rated current at 60 A is 100.0mA
Current Transformation Ratio	2000 : 1	1500 : 1	1000 : 1	600 : 1

For details of CT specifications, refer to their manuals.

Configuration after Connection

Set Sensor Preset and CT Preset according to the instructions in section 2.7, “Displaying the Menu for Configuring All Channels,” in the User’s Manual. If the configuration is not appropriate, measured values will not be read correctly.

General VT and CT Handling Precautions

- Do not short the secondary side of a VT. Doing so may damage it.
- Do not short the secondary side of a CT. Doing so may damage it.

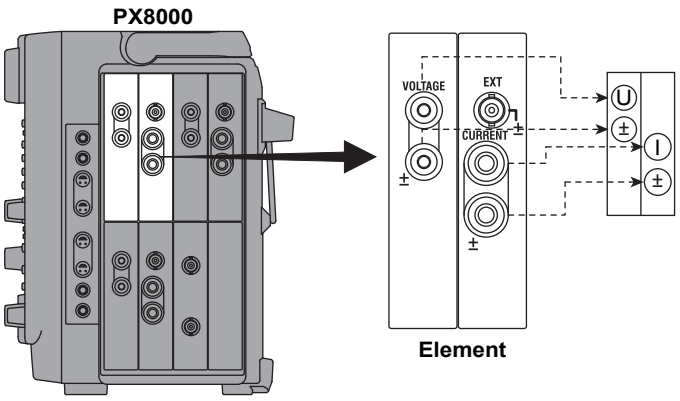
Also, follow the VT or CT handling precautions in the manual for the VT or CT that you are using.

Note

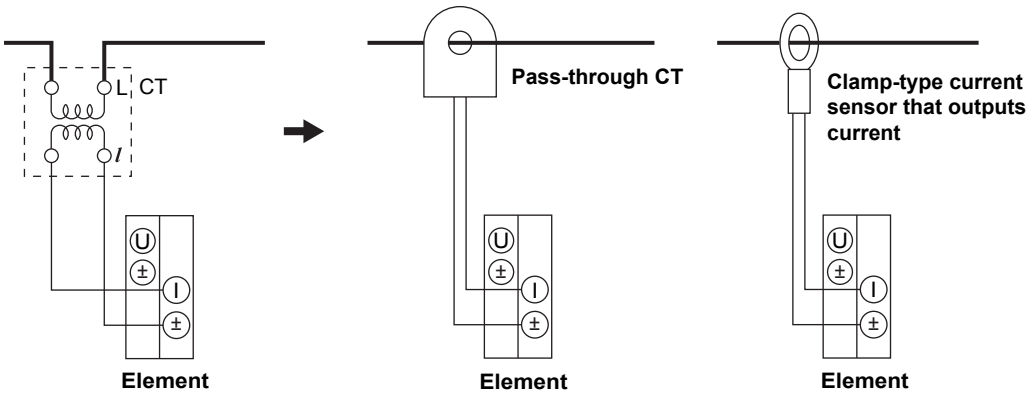
- Make sure that you have the polarities correct when you make connections. If the polarity is reversed, the polarity of the measurement current will be reversed, and you will not be able to make correct measurements. Be especially careful when connecting clamp-type current sensors to the circuit under measurement, because it is easy to reverse the connection.
- Note that the frequency and phase characteristics of the VT or CT affect the measured data.
- For safety reasons, the common terminals (+/–) of the secondary side of the VT and CT are grounded in the wiring diagrams in this section. However, the necessity of grounding and the grounding location (ground near the VT or CT or ground near this instrument) vary depending on the item under measurement.
- To measure the apparent power and power factor more accurately on an unbalanced three-phase circuit, we recommend that you use the three-voltage, three-current method (3V3A).

Connecting to the PX8000

In the wiring examples that follow, the PX8000 elements, voltage input terminals, and current input terminals are simplified as shown in the following figure.



Also, the wiring examples are for when a CT is connected. When connecting a pass-through CT or a clamp-type current sensor that outputs current, substitute the CT with the pass-through CT or clamp-type current sensor.



Note

Some CTs (including through types) require load resistance and power supplies. Check your CT's manual.

The wiring examples shown below are examples of the following wiring systems in which the specified elements have been wired. To wire other elements, substitute the numbers in the figures with the appropriate element numbers.

- Single-phase, two-wire systems (1P2W): Element 1
- Single-phase, three-wire system (1P3W) and three-phase, three-wire system (3P3W): Elements 1 and 2
- Three-phase, three wire system that uses a three-voltage, three-current method (3P3W; 3V3A) and three-phase, four-wire system (3P4W): Elements 1 to 3

CAUTION

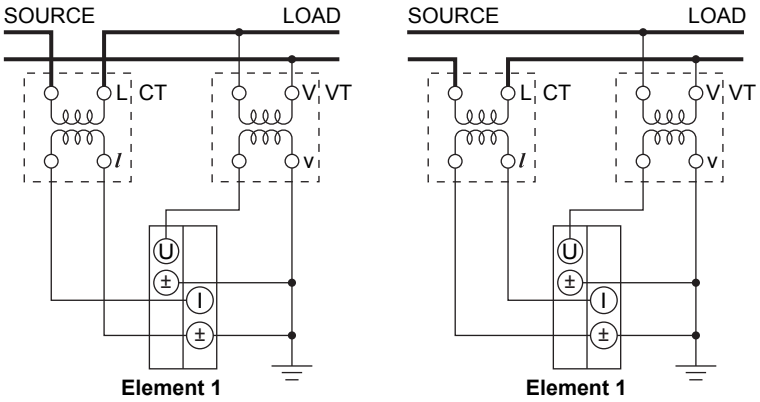
The thick lines on the wiring diagrams are the parts where the current flows. Use wires that are suitable for the current levels.

French

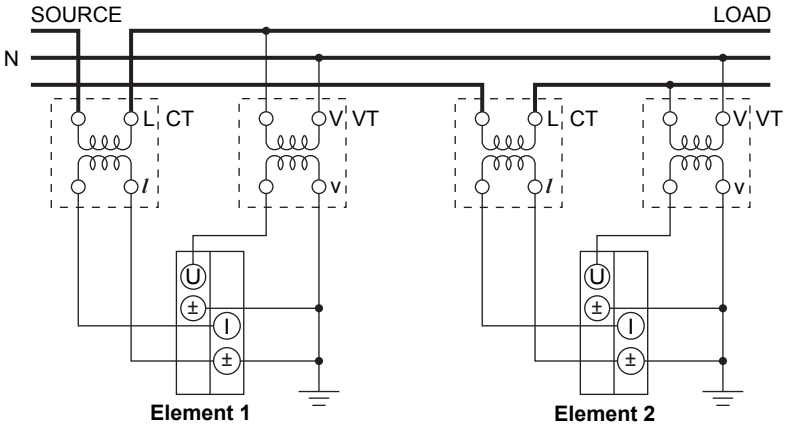
ATTENTION

Les lignes épaisses sur les schémas de câblage illustrent l'acheminement du courant. Utiliser des fils qui conviennent aux niveaux de courant.

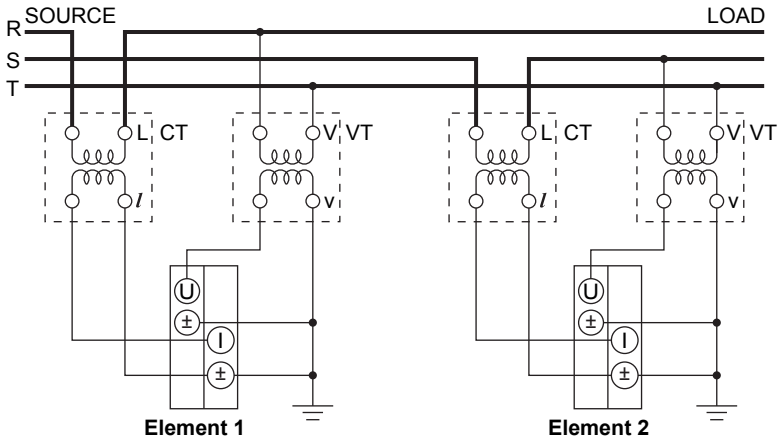
Wiring Example of Single-Phase, Two-Wire Systems (1P2W) with a VT and CT



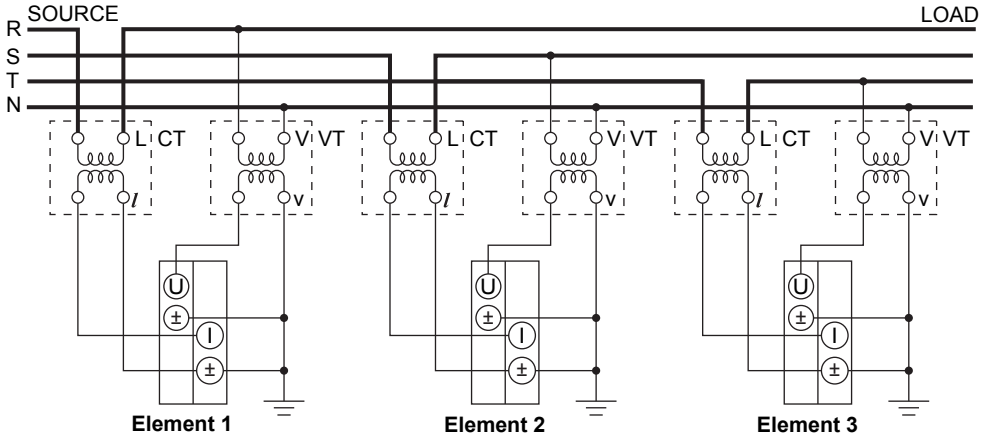
Wiring Example of a Single-Phase, Three-Wire System (1P3W) with VTs and CTs



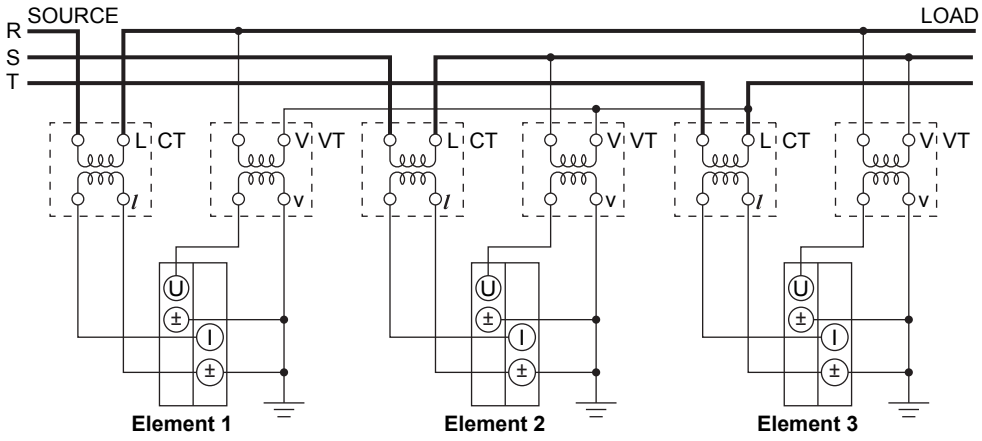
Wiring Example of a Three-Phase, Three-Wire System (3P3W) with VTs and CTs



Wiring Example of a Three-Phase, Four-Wire System (3P4W) with VTs and CTs



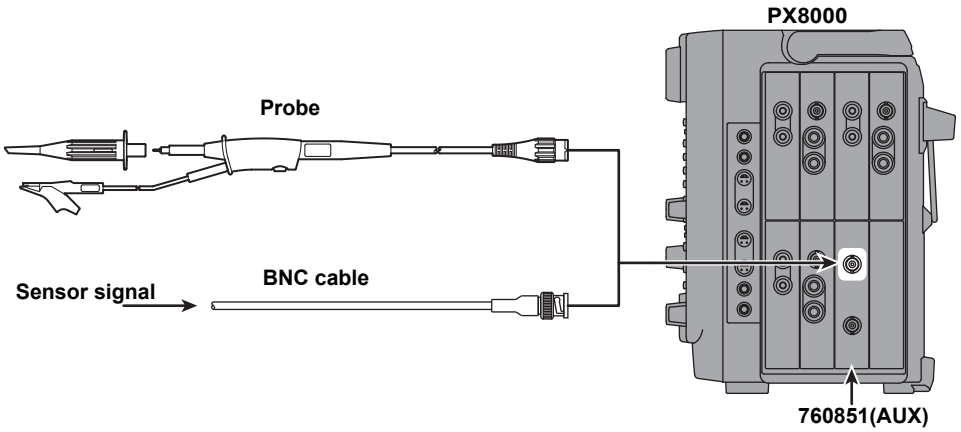
Wiring Example of a Three-Phase, Three-Wire System That Uses a Three-Voltage, Three-Current Method (3P3W; 3V3A) with VTs and CTs



Note

For details about the relationship between the wiring system and how measured and computed values are determined, see appendix 1, “Symbols and Determination of Measurement Functions.” in the features guide, IM PX8000-01EN.

2.12 Connecting Probes or BNC Cables to AUX Modules



WARNING

- When connecting a device under measurement to the instrument, be sure to turn off the device. It is extremely dangerous to connect or remove cables while the device under measurement is on.
- Do not apply input voltage exceeding the maximum input voltage, maximum allowable common mode voltage, withstand voltage, or allowable surge voltage.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Failing to do so is extremely dangerous, because the electrical and mechanical protection functions will not be activated.
- Do not leave the instrument connected to devices in an environment that may be subject to voltage surges.
- To prevent the possibility of electric shock, always connect cables that match the voltage range that you are measuring to the signal input terminals of the 760851(AUX).
- When measuring high voltages using the 760851 (AUX), use an isolated probe (the 700929 or 701947), 1:1 safety cable (a combination of the 701901 and 701954), or high voltage differential probe (701926).
- Be sure to connect the GND lead of the high voltage differential probe (the 701926) to the functional ground terminal of the PX8000 before you connect to the device under measurement. High voltage may appear at the BNC of the high voltage differential probe.
- Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value.

  Maximum input voltage (at a frequency of 1 kHz or less)
  - With the safety cable (1:1; a combination of the 701901 and 701954)[5] or direct input[9] 200 V (DC + ACpeak)

  Maximum allowable common mode voltage (at a frequency of 1 kHz or less)
  - When used with the safety cable (1:1; a combination of the 701901 and 701954).[8] 1000 Vrms (CAT II)
  - Direct input[10] 42V (DC + ACpeak, CAT O and CAT II, 30 Vrms)

French

AVERTISSEMENT

- Au moment de brancher l'appareil à mesurer sur l'instrument, veiller à ce que l'appareil soit hors tension. Il est extrêmement dangereux de brancher ou de débrancher des câbles lorsque l'appareil à mesurer est sous tension.
- Ne pas dépasser les valeurs maximales de tension d'entrée, de tension de mode commun, de tension de maintien ou de surtension admissible.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Ne pas laisser l'instrument branché sur les appareils dans des environnements pouvant être soumis à des surtensions.
- Pour éviter tout risque de choc électrique, toujours brancher sur les bornes d'entrée de signal du 760851(AUX), des câbles correspondants à la plage de tension mesurée.
- Lors de la mesure de tensions élevées à l'aide du 760851 (AUX), utiliser une sonde isolée (700929 ou 701947), un câble de sécurité 1:1 (701901 et 701954 conjointement) ou une sonde différentielle haute tension (701926).
- Veiller à brancher le câble GND de la sonde différentielle haute tension (701926) sur la borne de terre fonctionnelle du PX8000 avant de brancher l'appareil à mesurer. Le connecteur BNC de la sonde différentielle peut présenter une tension élevée.
- L'application d'une tension supérieure à la valeur indiquée ci-dessous pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, une tension inférieure à cette valeur pourra tout de même endommager la section d'entrée.

  Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)
  - Avec câble de sécurité (1:1; 701901 et 701954 utilisés conjointement) 5 ou entrée directe[9]
    200 V (c.c. + crête c.a.)

  Tension de mode commun maximale admissible (à une fréquence 1 kHz ou inférieure)
  - Utilisation avec un câble de sécurité (1:1; 701901 et 701954 utilisés conjointement).[8]
    1000 Vrms (CAT II)
  - Entrée directe[10]
    42V (c.c. + crête c.a., CAT O et CAT II, 30 Vrms)

Precautions to Be Taken When Connecting Probes

- When connecting a probe to the instrument for the first time, perform phase correction of the probe as described in section 2.13, "Compensating the Probe (Phase Correction)." Failure to do so will cause unstable gain across different frequencies, thereby preventing correct measurement. Make the phase correction on each channel to which the probe is to be connected.
- If the object to be measured is connected to the instrument directly, without using a probe, a correct measurement cannot be performed due to the input impedance. Please be aware of this.
- Follow the instructions given in section 2.4, "Configuring Sensor Input Voltage Measurements," in the user's manual to set the probe attenuation (type) to match the actual value using the setup menu. If they do not match, measured values cannot be read correctly.

CAUTION

Do not use the probe power supply terminals (optional) on the right side panel of the PX8000 for purposes other than supplying power to the probes. In addition, observe the number of probes that can be used that is indicated in the table. Otherwise, the PX8000 or the devices connected to them may get damaged.

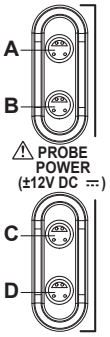
French

ATTENTION

Ne pas utiliser les bornes d'alimentation de sonde (option) sur le volet droit du PX8000 à des fins autres que l'alimentation des sondes. De plus, respecter le nombre de sondes pouvant être utilisées, indiqué dans le tableau, à défaut de quoi, le PX8000 ou tout appareil connecté pourrait être endommagé.

Precautions to Be Taken When Using Probes

When connecting the probe to the probe power supply terminal on the right side panel, make sure that the current does not exceed the range shown below. Otherwise, the PX8000 operation may become unstable due to the activation of the excessive current protection circuit of the power supply.



If the terminals are named A through D

(Total current consumption for A through D) ≤ 1 A

Specifications of the Probe Power Supply Terminals (Optional)

Item	
Number of sensors that can be used	4
Supply voltage	±12 V, four outputs (up to 1 A total current)

For details about each probe, contact your nearest YOKOGAWA dealer.

2.13 Correcting the Probe Phase

For the 760851(AUX) module, always correct the probe phase before you use a probe for measurement.

CAUTION

Do not apply external voltage to the probe compensation signal output terminal. This may cause damage to the internal circuitry.

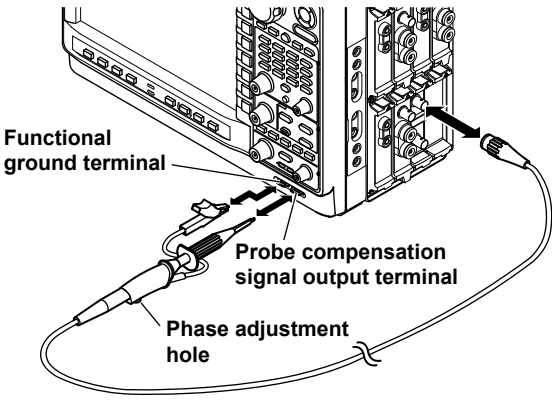
French

ATTENTION

Ne pas appliquer de tension externe sur la borne de sortie de signal de compensation de la sonde. Cela pourrait endommager le circuit interne.

1. Turn on the power switch.
2. Connect the probe to a signal input terminal (the terminal that you will actually apply the signal to measure to).
3. Connect the tip of the probe to the probe compensation signal output terminal on the front panel of the instrument, and connect the ground wire to the functional ground terminal.
4. Configure the PX8000 as follows:
   - Display mode: Wave
   - Display format: 1
   - Display channel: Input channel that the probe is connected to
   - AUX module measurement range: 1 V
   - AUX input signal type: Analog
   - Input coupling: DC
   - Probe attenuation: Set according to the probe that you are using.
   - Bandwidth: Full
   - Time axis setting: 200 s/div
   - Trigger mode: Auto
   - Trigger Types: Simple
   - Trigger source: Input channel that the probe is connected to
   - Trigger slope: Rising
   - Trigger level: 500 mV

   For the configuration procedure, see the Features Guide, IM PX8000-01EN.
5. Insert a screwdriver into the phase adjustment hole, and turn the variable capacitor so that the displayed waveform is an appropriate square wave.



Necessity of Phase Correction of the Probe

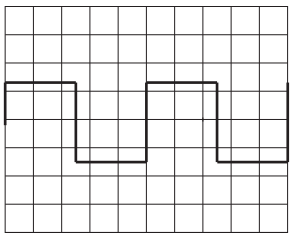
If the probe's input capacitance is not within the appropriate range, the gain will not be steady in relation to the frequency, and waveforms will not be displayed correctly. Also, because the input capacitance is not the same for each probe, the probe's have variable capacitors (trimmers) that need to be adjusted. This adjustment is referred to as phase correction.
Always correct the phase of a probe that you are using for the first time.
Also, because the appropriate input capacitance range is different for each channel, you need to perform phase correction when you change the channel that a probe is connected to.

Phase Compensation Signal

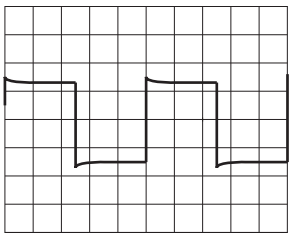
The instrument generates the following square wave signal from the COMP signal output terminal.
Frequency: 1 kHz ± 1%
Computation: 1 V ± 10 %

Differences in the Waveform due to the Phase Correction of the Probe

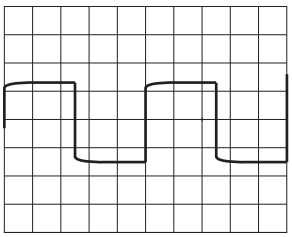
Correct waveform



Too much adjustment (increased gain in the high frequency band)



Not enough adjustment (reduced gain in the high frequency band)



2.14 Loading Roll Paper into the Built-In Printer (Optional)

This section explains how to load roll paper into the optional built-in printer.

Printer Roll Paper

Only use roll paper specifically made for use with the PX8000. The PX8000 comes with one set of roll paper included. Use this when you first load roll paper into the built-in printer. When you need a new supply of roll paper, please contact your nearest YOKOGAWA dealer.

Part Number:	B9988AE
Specifications:	Heat sensitive paper, 10 m
Minimum Quantity:	10 rolls

Handling Roll Paper

The roll paper is made of heat sensitive paper that changes color thermochemically. Please read the following information carefully.

Storage Precautions

The heat-sensitive paper changes color gradually at temperatures of approximately 70°C or higher. The paper can be affected by heat, humidity, light, and chemicals, whether something has been recorded on it. As such, please follow the guidelines listed below.

- Store the paper in a cool, dry, and dark place.
- Use the paper as quickly as possible after you break its protective seal.
- If you attach a plastic film that contains plasticizing material, such as vinyl chloride film or cellophane tape, to the paper for a long time, the recorded sections will fade due to the effect of the plasticizing material. Use a holder made of polypropylene to store the roll paper.
- When pasting the record paper to another material, do not use paste that contains organic solvents such as alcohol or ether. Doing so will change the paper's color.
- We recommend that you make copies of the recordings if you intend to store them for a long period of time. Because of the nature of heat-sensitive paper, the recorded sections may fade.

Handling Precautions

- Only use genuine, YOKOGAWA-supplied roll paper.
- If you touch the roll paper with sweaty hands, there is a chance that you will leave fingerprints on the paper, or blur the recorded sections.
- If you rub something hard against the surface of the roll paper, the paper may change color due to frictional heat.
- If the roll paper comes into contact with products such as chemicals or oil, the paper may change color or the recorded sections may disappear.

Attaching the Roll Paper

CAUTION

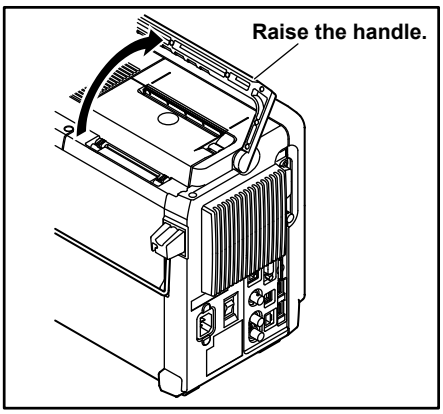
- Do not touch the print head. If you do, you may burn yourself.
- Do not touch the roll paper cutter section at the front end of the printer cover. Doing so may cause injury.

French

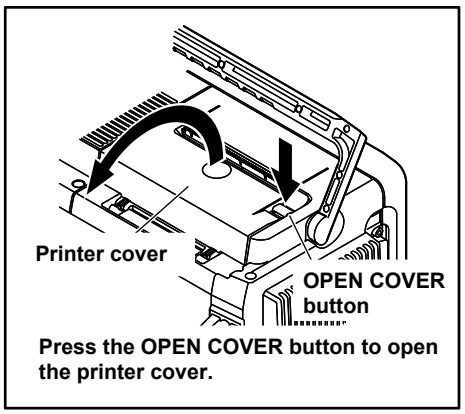
ATTENTION

- Ne pas toucher la tête d'impression. Vous pourriez vous brûler.
- Ne pas toucher la section du coupe-papier à l'extrémité du cache de l'imprimante. Vous pourriez vous blesser.

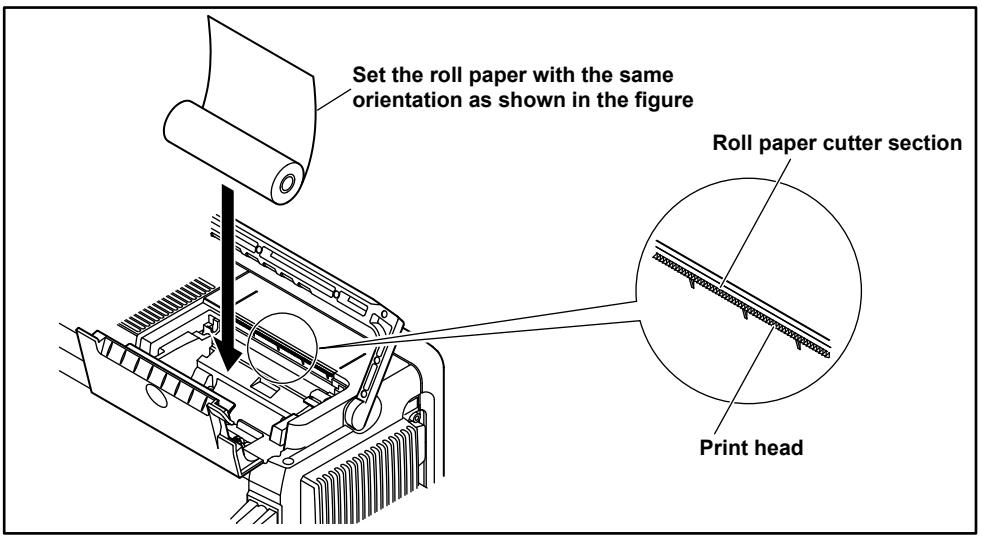
1.



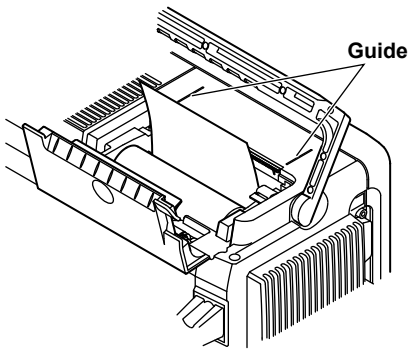
2.



3.

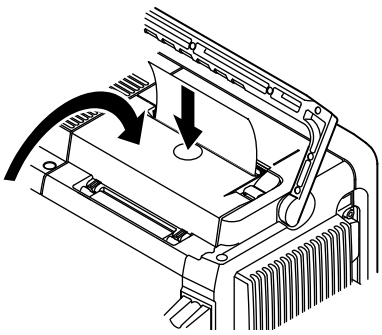


4.



Align the ends of the roll paper with the guides, and set the roll in place.

5.



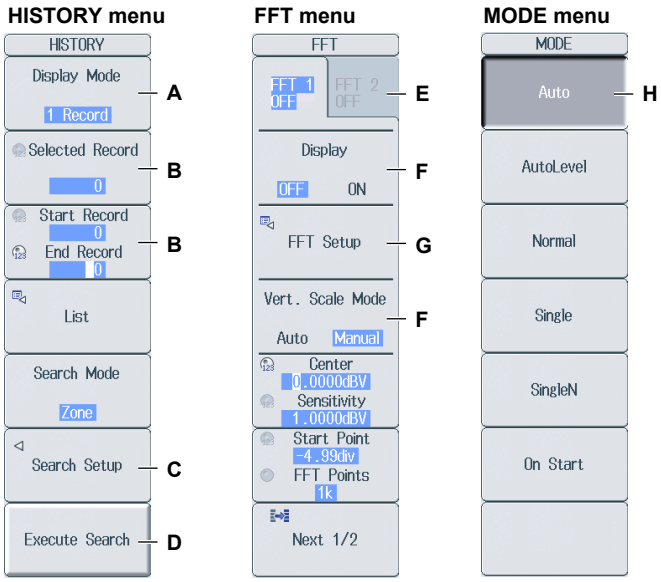
Close the cover, and press LOCK on the center of the cover until you hear a click.

3.1 Key and Jog Shuttle Operations

Key Operations

How to Use Setup Menus That Appear When Keys Are Pressed

The operation after you press a key varies depending on the key that you press.



A: Press the soft key to display a selection menu.
Press the soft key that corresponds to the appropriate setting.

B: Press the soft key to use the jog shuttle to configure this setting. Use the jog shuttle or the arrow keys to set the value or select an item.
To set a value, press NUM LOCK, and then use the ELEM1 to P4 keys.

C: A related setup menu appears when you press the soft key.

D: Press the soft key to execute the specified feature.

E: Selects which item to configure when configuring a feature that consists of two items that operate with different settings, such as the FFT1 and FFT2 features.

F: The selected setting switches each time you press the soft key.

G: Displays a dialog box or a keyboard.
Use the jog shuttle, SET key, and arrow keys to configure the settings in the dialog box or operate the keyboard.

H: Pressing a key sets the item to the setting that corresponds to that key.

How to Display the Setup Menus That Are Written in Purple below the Keys

In the explanations in this manual, “SHIFT+key name (written in purple)” is used to indicate the following operation.

1. Press **SHIFT**. The SHIFT key illuminates to indicate that the keys are shifted.
   Now you can select the setup menus written in purple below the keys.
2. Press the key that you want to display the setup menu of.

ESC Key Operation

If you press the **ESC** key when a setup menu or available settings are displayed, the screen returns to the menu level above the current one. If you press the **ESC** key when the highest level menu is displayed, the setup menu disappears.

RESET Key Operation

If you press **RESET** when you are using the jog shuttle to set a value or select an item, the setting is reset to its default value (depending on the operating state of the PX8000, the setting may not be reset).

SET Key Operations

The operation varies as indicated below depending on what you are setting.

- For a setup menu that has two values that you use the jog shuttle to adjust
  Press **SET** to switch the value that the jog shuttle adjusts.
- For a menu that has the jog shuttle + SET mark (◯+SET) displayed on it.
  Press **SET** to confirm the selected item.

Arrow Key Operations

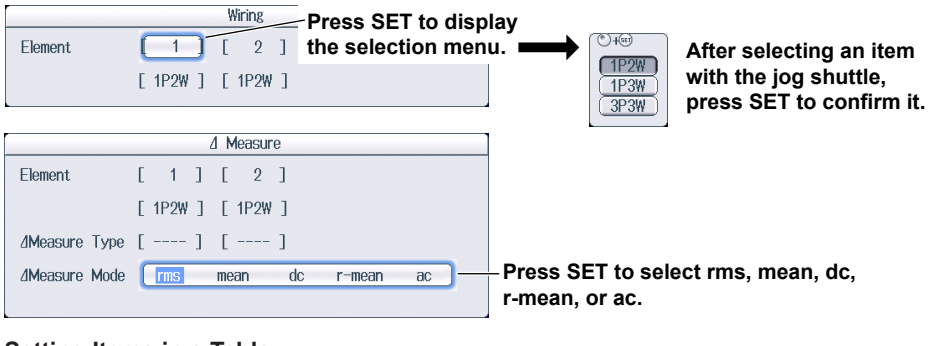
The operation varies depending on what you are setting.

- When setting a value
  Up and down **arrow** keys (▲, ▼): Increases and decreases the value
  Left and right **arrow** keys (◄, ►): Changes which digit to set
- When selecting the item to set
  You can use the up, down, left, and right **arrow** keys (▲, ▼, ◄, ►).

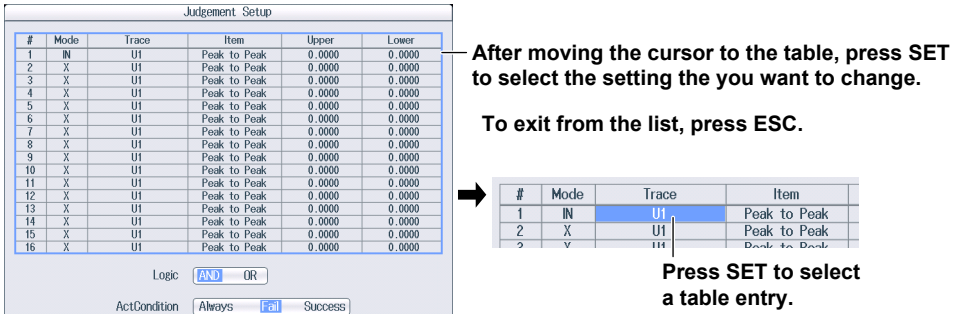
How to Enter Values in Setup Dialog Boxes

1. Use the keys to display the appropriate setup dialog box.
2. Use the **jog shuttle** or the **arrow** keys to move the cursor to the setting that you want to set.
3. Press **SET**. The operation varies as indicated below depending on what you are setting.
   - A selection menu appears.
   - A check box is selected or cleared.
   - An item is selected.
   - A table of settings is selected.

Displaying a Selection Menu and Selecting an Item



Setting Items in a Table



How to Clear Setup Dialog Boxes

Press **ESC** to clear the setup dialog box from the screen.

3.2 Entering Values and Strings

Entering Values

Using Dedicated Knobs

You can use the following dedicated knobs to enter values directly.

- ▲▼ POSITION knob (vertical position knob)
- RANGE knob
- TIME/DIV knob
- MAG knob (magnification knob)
- ◀ POSITION ▶ knob (Zoom position knob)

Using the Jog Shuttle

Select the appropriate item using the soft keys, and change the value using the jog shuttle, the SET key, and the arrow keys. This manual sometimes describes this operation simply as “using the jog shuttle.”

Using the Keypad

Press **NUM LOCK** to illuminate the NUM LOCK key, and use the **ELEM1** to **P4** keys to enter a value. After you enter the value, press **ENTER** to confirm it.

Use the keypad to enter the value.

Note

Some items that you can set using the jog shuttle are reset to their default values when you press the RESET key.

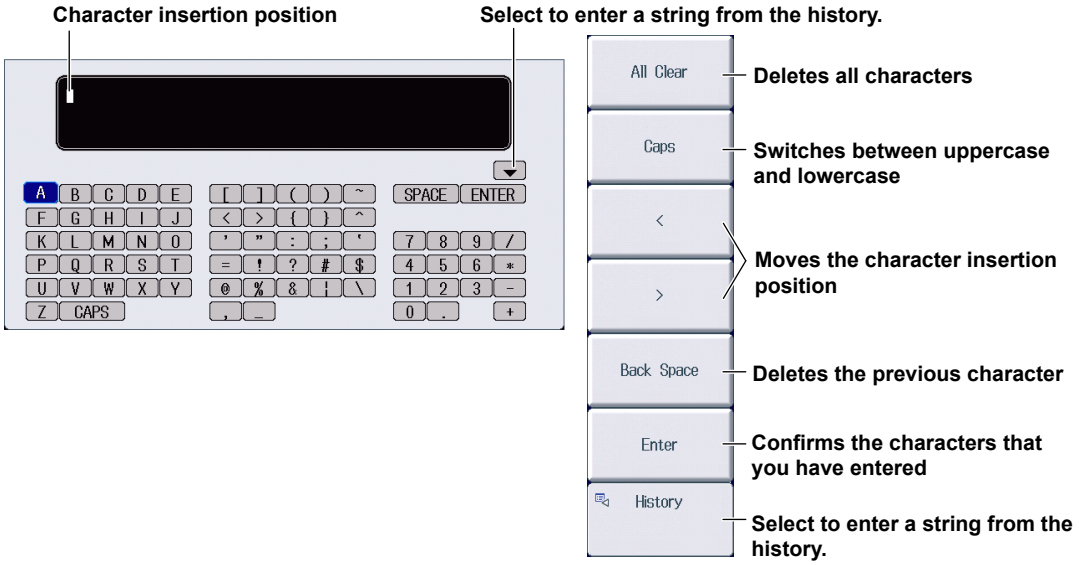
Entering Character Strings

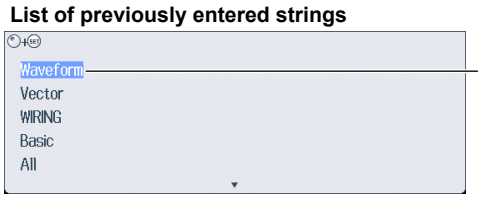
Use the keyboard that appears on the screen to enter file names and comments. Use the jog shuttle, the SET key, and the arrow keys to operate the keyboard and enter a character string.

How to Operate the Keyboard

1. After bringing up the keyboard, use the jog shuttle to move the cursor to the character that you want to enter. You can also move the cursor using the up, down, left, and right **arrow** keys.
2. Press **SET** to enter the character.
   - If a character string has already been entered, use the arrow soft keys (< and >) to move the cursor to the position you want to insert characters into.
   - To switch between uppercase and lowercase letters, press the **Caps** soft key, or move the cursor to **CAPS** on the keyboard, and then press **SET**.
   - To delete the previous character, press the **Back Space** soft key.
   - To delete all the characters, press the **All Clear** soft key.
3. Repeat steps 1 and 2 to enter all of the characters in the string.
   - Select ▼ on the keyboard or press the **History** soft key to display a list of character strings that you have entered previously. Use the jog shuttle to select a character string, and press **SET** to enter the selected character string.
4. Press the **Enter** soft key, or move the cursor to ENTER on the keyboard, and press **SET** to confirm the character string.

   The character string is confirmed, and the keyboard disappears.





Note

- @ cannot be entered consecutively.
- File names are not case-sensitive. Comments are case-sensitive. The following file names cannot be used due to MS-DOS limitations:
  AUX, CON, PRN, NUL, CLOCK, COM1 to COM9, and LPT1 to LPT9
  For details on file name limitations, see the Features Guide, IM PX8000-01EN.
- When a character string is confirmed, it is stored in a list of previously entered strings. Up to 50 character strings are stored. The new character string appears at the top of the list of previously entered strings.

3.3 Using USB Keyboards and Mouse Devices

Connecting a USB Keyboard

You can connect a USB keyboard and use it to enter file names, comments, and other items.

Usable Keyboards

You can use the following keyboards that conform to USB Human Interface Devices (HID) Class Ver. 1.1.

- When the USB keyboard language is English: 104 keyboards
- When the USB keyboard language is Japanese: 109 keyboards

Note

- Do not connect incompatible keyboards.
- The operation of USB keyboards that have USB hubs or mouse connectors is not guaranteed.
- For USB keyboards that have been tested for compatibility, contact your nearest YOKOGAWA dealer.

USB Ports for Peripherals

Connect a USB keyboard to the USB port for peripherals on the left side panel.

Connection Procedure

Connect a USB keyboard directly to the PX8000 using a USB cable. You can connect or remove the USB cable regardless of whether the PX8000 power switch is turned on (hot-plug support). Connect the type A connector of the USB cable to the PX8000, and connect the type B connector to the keyboard. When the power switch is on, the keyboard is detected and enabled approximately 6 seconds after it is connected.

Note

- Only connect a compatible USB keyboard, mouse, printer, or storage device to the USB port for peripherals.
- Do not connect multiple keyboards. You can connect one keyboard, one mouse, and one printer to the PX8000.
- Do not connect and disconnect multiple USB devices repetitively. Wait for at least 10 seconds after you connect or remove one USB device before you connect or remove another USB device.
- Do not remove USB cables during the time from when the PX8000 is turned on until key operation becomes available (approximately 20 to 30 seconds).

Entering File Names, Comments, and Other Items

When a keyboard is displayed on the screen, you can enter file names, comments, and other items using the USB keyboard.

Entering Values from a USB Keyboard

You can use a USB keyboard to enter the values of items with 123 marks on the menu screens by pressing CTRL+N on the USB keyboard to put the PX8000 in the NUM LOCK state.

Using a USB Mouse

You can connect a USB mouse and use it to perform the same operations that you can perform with the PX8000 keys. Also, by clicking a menu item, you can perform the same operation that you can perform by pressing the menu item's soft key or selecting the menu item and pressing the SET key.

USB Ports for Peripherals

Connect a USB mouse to the USB port for peripherals on the left side panel.

Usable USB Mouse Devices

You can use mouse devices (with wheels) that are compliant with USB HID Class Version 1.1.

Note

- For USB mouse devices that have been tested for compatibility, contact your nearest YOKOGAWA dealer.
- Some settings cannot be configured by a mouse without a wheel.

Connection Procedure

To connect a USB mouse to the PX8000, use one of the USB ports for peripherals. You can connect or disconnect the USB mouse at any time regardless of whether the PX8000 is on or off (hot-plugging is supported). When the power switch is on, the mouse is detected approximately 6 seconds after it is connected, and the mouse pointer (↖) appears.

Note

- Only connect a compatible USB keyboard, mouse, or storage device to the USB port for peripherals.
- Even though there are two USB ports for peripherals, do not connect two mouse devices to the PX8000.

Operating the PX8000 Using a USB Mouse

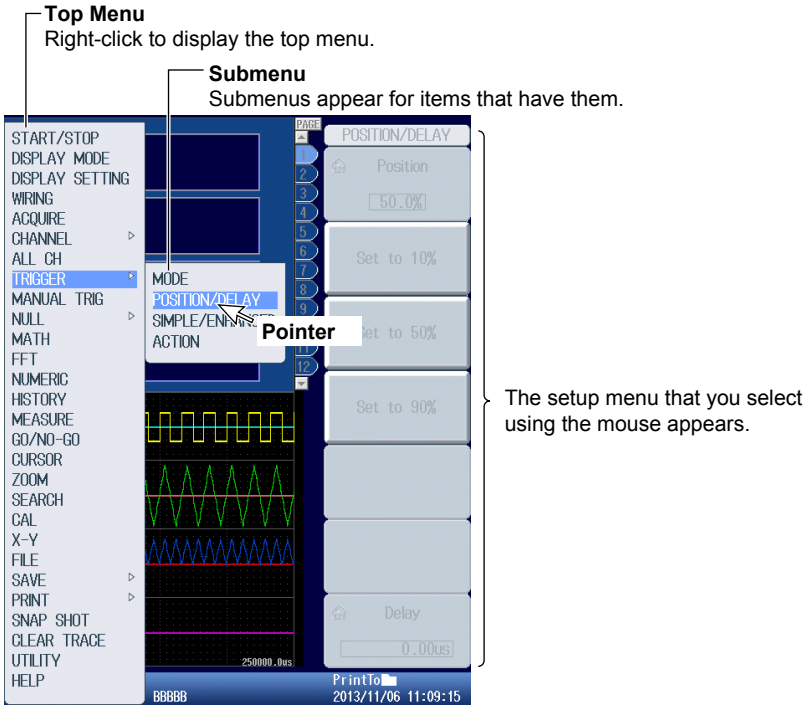
- **Operations That Correspond to the Front Panel Keys (Top Menu)**

  Displaying the Top Menu

  Right-click on the display. A menu of the PX8000 front panel keys appears.

  Selecting an Item from the Top Menu

  Click on the item that you want to select. A setup menu that corresponds to the item that you selected appears at the bottom of the display. The top menu disappears.
  To display an item's submenu, point to the item. To select an item on a submenu, click on it, just as you would to select an item on the top menu.



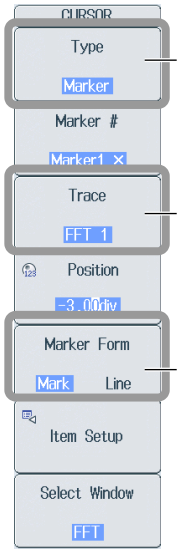
Note

- The following keys are not displayed in the top menu:
  ESC, RESET, and SET

- **Setup Menu Operations (Same as soft key operations)**

  Selecting a Setup Menu Item

  Click the setup menu item that you want to select.
  If a selection menu appears after you select an item, click the selection menu item that you want to choose.
  If an item such as ON or OFF appears, click on the item to change its setting.
  For menu items that are usually selected using the job shuttle and the SET key, clicking on the item that you want to select will confirm your selection and close the dialog box.



Click in this area to display a selection menu.
Clicking the selection menu item that you want to select will confirm your selection.

Click in this area to display a menu for selecting items using the jog shuttle and SET.
Clicking the menu item that you want to select will confirm your selection.

Click in this area to change the selected item.

  Clearing the Menu

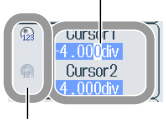
  To clear the menu, click outside of it.

- **Specifying Values**

  The following description explains how to specify values for menu items that have a 123 icon next to them.

  - If there are two 123 icons next to a single menu item, click on the item to select an item to configure.
  - To increase a value, rotate the mouse wheel back.
  - To decrease a value, rotate the mouse wheel forward.
  - To increase a value, move the pointer above the value so that the pointer becomes a , and then click the left mouse button.
  - To decrease a value, move the pointer below the value so that the pointer becomes a , and then click the left mouse button.
  - To move the decimal place, point to the left or right of the value you want to set so that the pointer becomes a or a , and then click the left mouse button. The decimal place will move one place to the right or left each time you click the left mouse button.

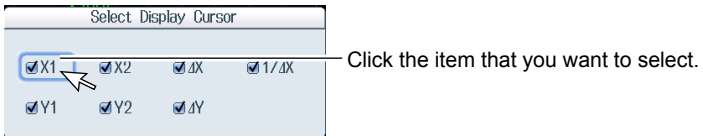
Change the value by clicking and using the mouse wheel.



Click within this area to select the item that you want to set.

- **Selecting Check Boxes**

  To select a check box, click it. To clear a check box, click it again.



Note

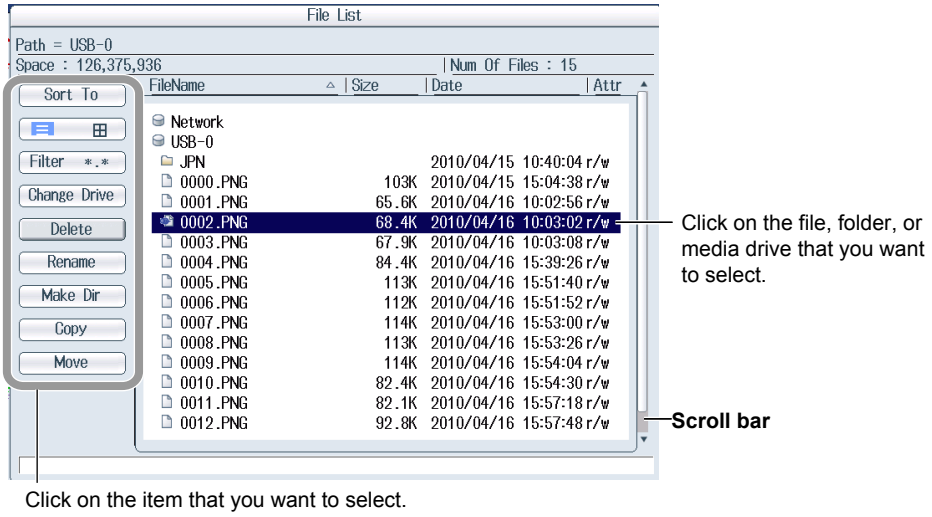
To close a dialog box, click outside of it.

- **Selecting a File, Folder, or Media Drive from the File List Window**

  Click on a file, folder, or media drive to select it.

  Rotate the mouse wheel to scroll through the file list.

  To cancel your selection, click outside of the File List window. The File List window will close when you cancel your selection.



- **Setting the measurement range and TIME/DIV**

  Setting the measurement range

  Move the pointer close to the measurement range value in the upper left of the display. The pointer becomes a  . Rotate the mouse wheel forward to increase the measurement range value, and rotate it back to decrease the value.

  Setting TIME/DIV

  Move the pointer close to the TIME/DIV value in the upper right of the display. The pointer becomes a  . Rotate the mouse wheel forward to increase the TIME/DIV value, and rotate it back to decrease the value.

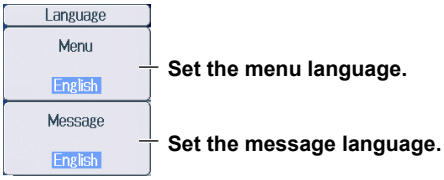
3.4 Setting the Menu and Message Languages

This section explains how to set the language that is used to display the menus and messages on the screen.
The factory default setting is as follows.

- Menu language: English
- Message language: Depends on the language suffix code (see page iii)

UTILITY System Config Menu

Press **UTILITY**, the **System Config** soft key, and then the **Language** soft key to display the following menu.



Setting the Menu Language (Menu Language)

You can choose to display menus using one of the following languages.

- Japanese
- English
- German

Setting the Message Language (Message Language)

Error messages appear when errors occur. You can choose to display these messages and the help (see section 3.7) using one of the following languages. The error codes that accompany error messages are the same for all languages. For more information about error messages, see chapter 25 in the user's manual, IM PX8000-02EN.

- Japanese
- English
- German

Note

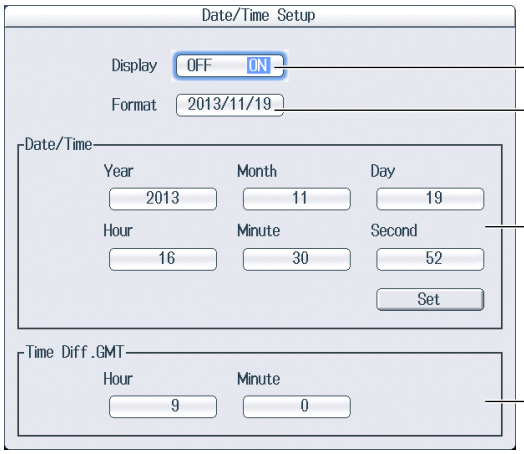
- Even if you set the menu or message language to a language other than English, some terms will be displayed in English.
- You can specify different menu and message languages.

3.5 Synchronizing the Clock

This section explains how to set the PX8000 clock, which is used to generate timestamps for measured data and files. The PX8000 is factory shipped with a set date and time. You must set the clock before you start measurements.

UTILITY System Config Menu

Press **UTILITY**, the **System Config** soft key, and then the **Date/Time** soft key to display the following screen.



Turns the display of the date and time on and off.
Set the display format.
Set the date and time.
Set the time difference from Greenwich Mean Time.

Setting the Display Format (Format)

You can display the date in one of the following formats.

2008/09/30 (year/numeric month/day)
30/09/2008 (day/numeric month/year)
30-Sep-08 (day-English abbreviation of the month-last two digits of the year)
30 Sep 2008 (day month (English abbreviation) year)

Setting the Time Difference from Greenwich Mean Time (Time Diff. GMT)

Set the time difference between the region where you are using the PX8000 and Greenwich Mean Time.

Selectable range: -12 hours 00 minutes to 13 hours 00 minutes

For example, Japan standard time is ahead of GMT by 9 hours. In this case, set Time Hour to 9 and Minute to 00.

Checking the Standard Time

Using one of the methods below, check the standard time of the region where you are using the PX8000.

- Check the Date, Time, Language, Regional Options on your PC.
- Check the standard time at the following URL:http://www.worldtimeserver.com/

Note

- The PX8000 does not support Daylight Saving Time. To set the time to Daylight Saving Time, reset the time difference from Greenwich Mean Time.
- Date and time settings are backed up using an internal lithium battery. They are retained even if the power is turned off.
- The PX8000 has leap-year information.

3.6 Initializing Settings

You can reset the PX8000 settings to their factory default values. This feature is useful when you want to cancel all of the settings that you have entered or when you want to redo measurement from scratch.

UTILITY System Config Menu

Press **UTILITY**, the **System Config** soft key, and then the **All Setup** soft key to display the following menu.

Initializes the settings

Undoes initialization

Settings That Cannot Be Reset to Their Factory Default Values

- Date and time settings
- Communication settings
- Language setting (English or Japanese)

Undoing the Reset Operation

If you reset the settings by mistake, you can press the Undo soft key to revert to the previous settings. However, you cannot undo the reset operation if you switch to a different setup menu or clear the SETUP menu by pressing the ESC key.

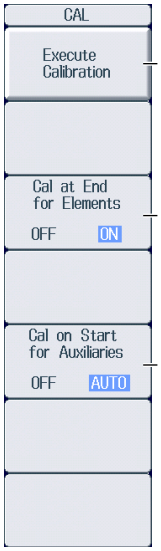
To Reset All Settings to Their Factory Default Settings

While holding down the RESET key, turn the power switch on. All settings except the date and time settings (display on/off setting will be reset) and the setup data stored in internal memory will be reset to their factory default values.

3.7 Calibrating the PX8000

CAL Menu

Press **SHIFT+DISPLAY MODE** (CAL) to display the following menu.



Executes calibration

Turns on and off the calibration that is performed when a measurement is completed on an element

Set the calibration that is performed after starting signal acquisition on AUX modules (OFF, AUTO).

Calibration (Zero-level compensation)

The following items are calibrated. Execute calibration when you want to make accurate measurements.

- Vertical axis ground level

Note

Calibration is performed automatically when the power switch is turned on.

Notes about Calibration

- Allow the PX8000 to warm up for at least 30 minutes before you execute calibration. If you execute calibration immediately after power-on, the calibrated values may drift due to temperature changes or other environmental changes.
- Execute calibration in an environment with a stable temperature ranging from 5 to 40°C* (23 ± 5°C recommended).
  * When the PX8000 is installed horizontally. 5 to 35°C when the PX8000 is installed with the rear panel facing down.
- Do not apply signals when calibrating. Calibration may not be executed properly when input signals are being applied to the PX8000.

Auto Calibration

Voltage Modules (760811) and Current Modules (760812/760813)

Calibration is performed automatically at the following two instances.

- Immediately after a measurement is started before triggers start operating
- Immediately after the completion of a measurement if measurement is performed continuously. Calibration values take effect in the subsequent measurement.

Calibration That Is Performed When a Measurement Is Completed on an Element (Cal at End for Elements)

Select whether to execute calibration on voltage and current modules when a measurement is completed.

- OFF: Auto calibration is not executed.
- ON: Auto calibration is executed.

AUX Modules (760851)

Calibration That Is Performed When AUX Modules Start (Cal on Start for Auxiliaries)

Select whether to execute calibration when signal acquisition is first started when the following time periods elapse after the power is turned on.

- Approx. 3 minutes
- Approx. 10 minutes
- Approx. 30 minutes and every 30 minutes thereafter

- OFF: Auto calibration is not executed.
- AUTO: Auto calibration is executed.

If calibration is executed while signals are being applied to the PX8000, we recommend that you recalibrate the PX8000 without any signals being applied to it.

3.8 Starting and Stopping Waveform Acquisition

Starting and Stopping Waveform Acquisition.

Press **START/STOP** to start or stop waveform acquisition.

The key is illuminated while the PX8000 is acquiring waveforms.

Waveform Acquisition and Indicators

- When the START/STOP key is illuminated, the PX8000 is acquiring waveforms. “Running” appears in the lower left of the screen.
- When the START/STOP key is not illuminated, waveform acquisition is stopped. “Stopped” appears in the lower left of the screen.

PX8000 Operation When the Acquisition Mode Is Set to Averaging

- Averaging stops when you stop waveform acquisition.
- If you restart waveform acquisition again, averaging starts from the beginning.

Note

You can use the snapshot feature to retain the displayed waveform on the screen. This feature allows you to retain a waveform on the screen while the PX8000 continues signal acquisition.

3.9 Displaying Help

Displaying Help

Press the help key (?) to display help.
The table of contents and index appear in the left frame, and text appears in the right frame.

Switching between Frames

To switch to the frame that you want to control, use the left and right arrow keys.

Moving Cursors and Scrolling

To scroll through the screen or to move the cursor in the table of contents or index, turn the jog shuttle.

Moving to the Link Destination

To move to a description that relates to blue text or to move from the table of contents or index to the corresponding description, move the cursor to the appropriate blue text or item, and press SET.

Displaying Panel Key Descriptions

With help displayed, press a panel key to display an explanation of it.

Returning to the Previous Screen

To return to the previous screen, press RESET.

Hiding Help

Press the help key (?) to clear help.

4.1 Setting the Voltage Range

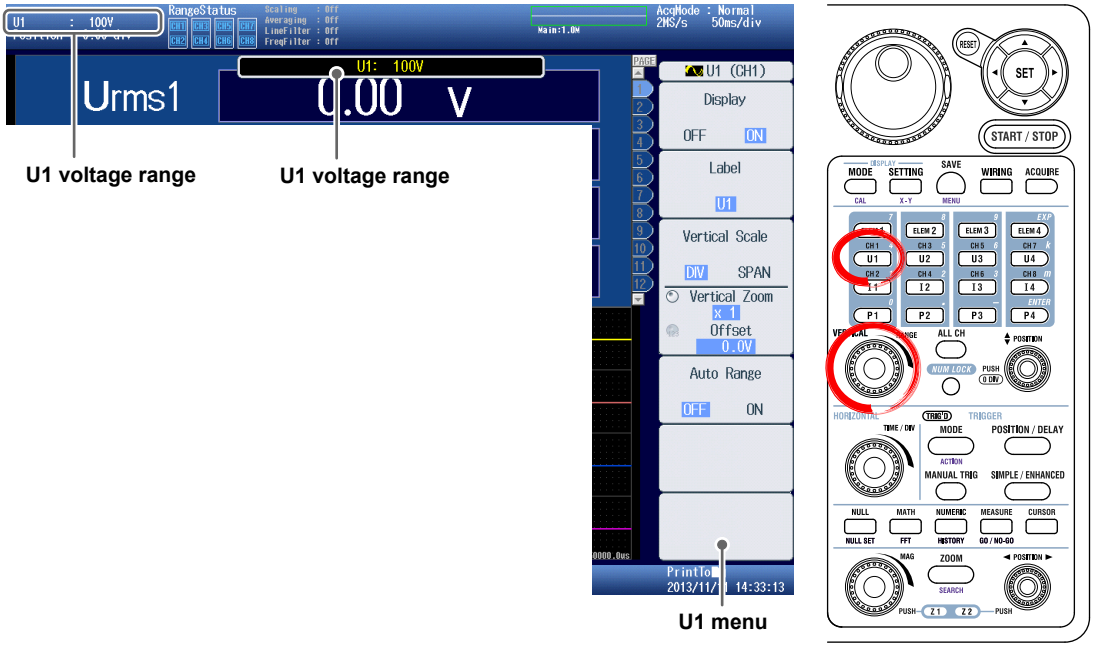
For details, see section 2.1 in the User's Manual, IM PX8000-02EN.

This chapter provides basic operation examples of the PX8000. The examples assume that the PX8000 is initialized as described in section 3.6. For details on each function and procedure, see the reference sections at the upper right of relevant pages.

Voltage Range

You can use the measurement range settings to adjust the waveform display amplitude so that signals are easy to view. To make accurate measurements, you need to set the measurement ranges appropriately.

For the voltage range, set the voltage that corresponds to 2.5 divisions on the waveform screen. For example, if you set the voltage range to 100 V, the waveform display amplitude will be ±200 V.



1. Press **U1** to display the U1 menu.
   The U1 voltage range is displayed in the upper left and in the top center of the screen.
2. Turn the **RANGE** knob to set the voltage range.

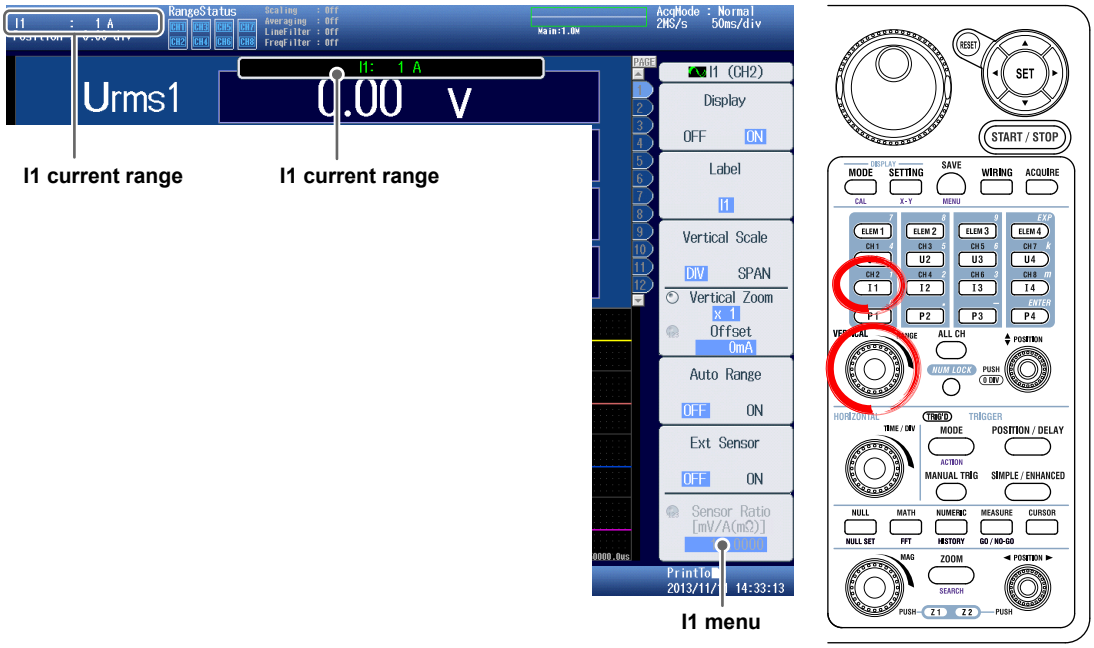
Note

If the following message appears, increase the measurement range.

4.2 Setting the Current Range

For details, see section 2.2 in the User's Manual, IM PX8000-02EN.

For the current range, set the current that corresponds to 2.5 divisions on the waveform screen. For example, if you set the current range to 1 A, the waveform display amplitude will be ±2 A.



1. Press **I1** to display the I1 menu.
   The I1 current range is displayed in the upper left and in the top center of the screen.
2. Turn the **RANGE** knob to set the current range.

Note

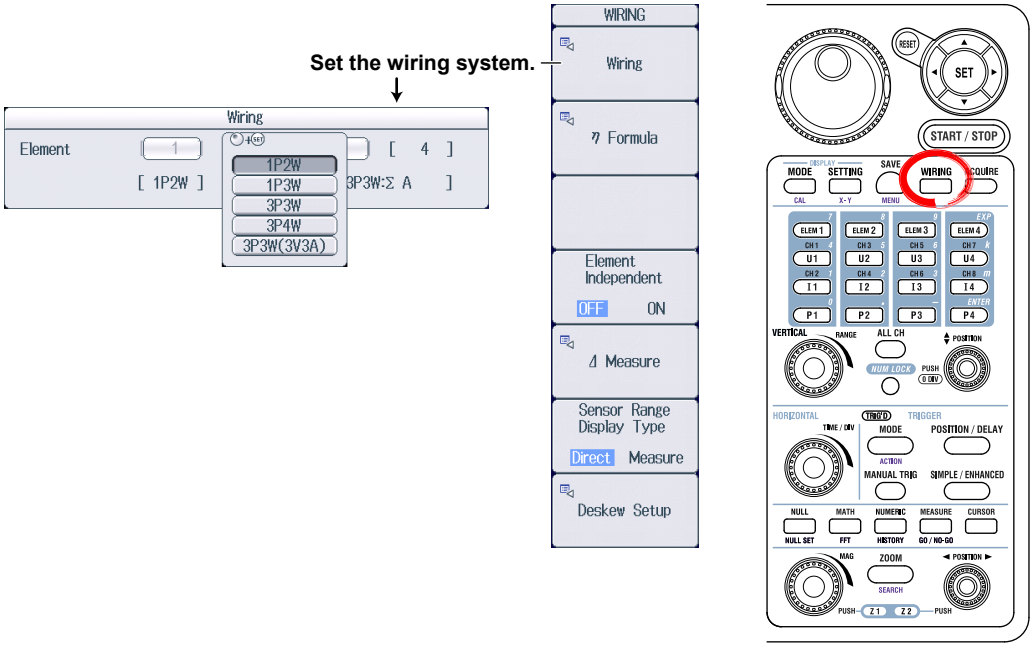
When using a current sensor that outputs voltage, turn off the external current sensor (see section 2.2 in the User's Manual, IM PX8000-02EN).

4.3 Configuring the Wiring System Settings

For details, see section 1.1 in the User's Manual, IM PX8000-02EN.

Set a wiring system that matches the connected circuit under measurement.

- To measure power of a single-phase two-wire system, use the factory default wiring system setting (1P2W).
- To measure power of one of the following wiring systems, change the wiring system setting.
  - Single-phase three-wire (1P3W)
  - Three-phase three-wire (3P3W)
  - Three-phase four-wire (3P4W)
  - Three-voltage three-current measurement method (3P3W(3V3A))

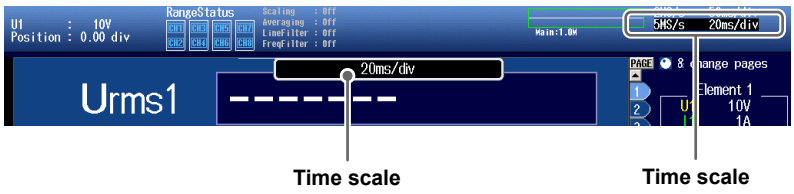


1. Press **WIRING** to display the WIRING menu.
2. Press the **Wiring** soft key to display the Wiring dialog box.
3. When you select an element, the wiring systems that you can select are displayed. Select the wiring system from those displayed.

4.4 Setting the Horizontal Scale (Time Scale)

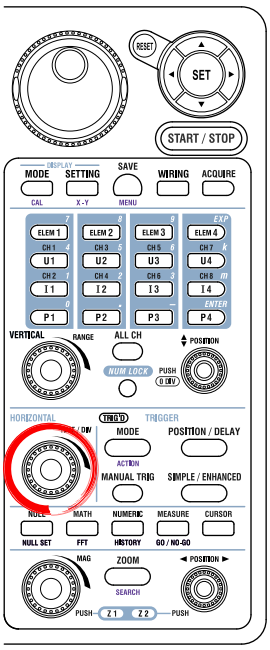
For details, see section 2.8 in the User's Manual, IM PX8000-02EN.

Set the time for displaying acquired waveforms.



Time scale

Time scale

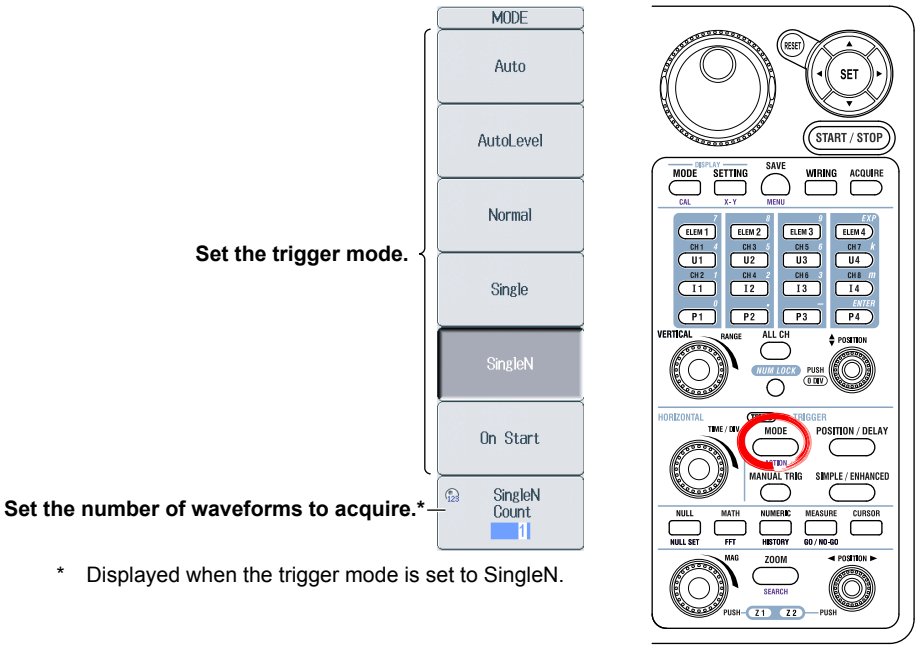


Turn the **TIME/DIV** knob to set the time scale.
The time scale is displayed in the upper right and in the top center of the screen.

4.5 Setting the Trigger Mode

For details, see section 3.1 in the User's Manual, IM PX8000-02EN.

Triggers are events used to display waveforms. Trigger is said to be activated when the specified trigger conditions are met, and the PX8000 enters a state in which waveforms are displayed on the screen.



* Displayed when the trigger mode is set to SingleN.

1. Press **MODE** in the TRIGGER area to display the TRIGGER MODE menu.
2. Press a soft key to select the trigger mode.

4.6 Setting Edge Triggers

For details, see section 3.4 in the User's Manual, IM PX8000-02EN.

This section explains how to configure the PX8000 so that it triggers on the rising or falling edge of an input signal.

Trigger Source

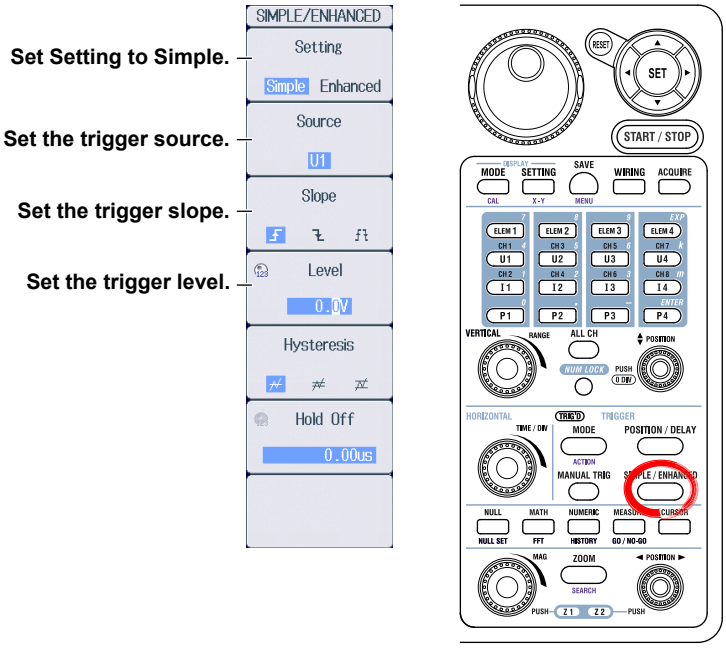
Trigger source refers to the signal used to determine whether the specified trigger conditions are met.

Trigger Level

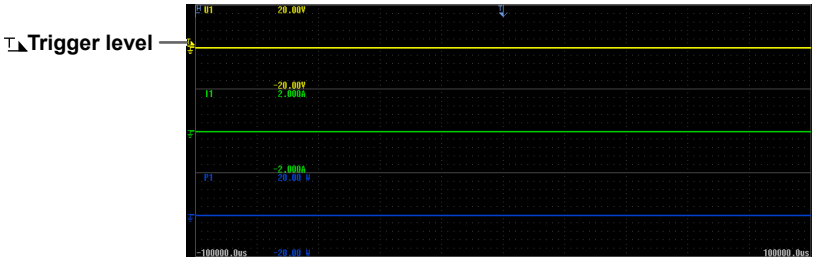
Trigger level refers to the signal level at which the rising or falling edge or the high or low state of the trigger source is determined. In a simple trigger like the edge trigger, a trigger is activated when the trigger source level passes through the specified trigger level.

Trigger Slope

Trigger slope refers to the movement of the trigger source such as moving from a low level to a high level (rising) or moving from a high level to a low level (falling). In triggering, the slope of the trigger source is specified as one of the trigger conditions. This slope is called the trigger slope.



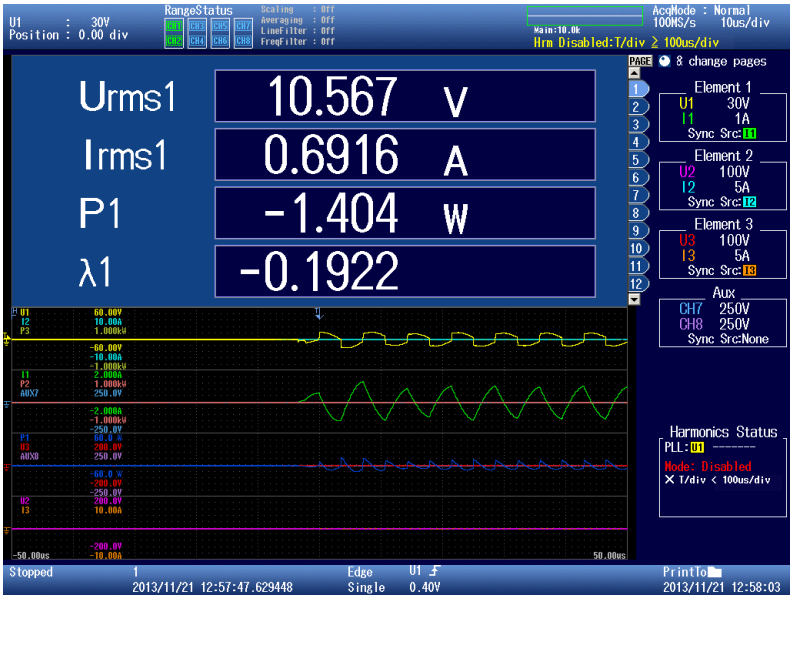
1. Press **SIMPLE/ENHANCED** to display the SIMPLE/ENHANCED menu.
2. Using soft keys, set the trigger source, trigger slope, and trigger level.

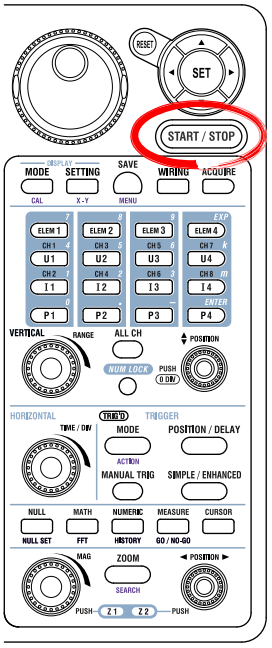


4.7 Starting and Stopping Waveform Acquisition

For details, see section 4.2 in the User's Manual, IM PX8000-02EN.

This section explains how to start and stop waveform acquisition.





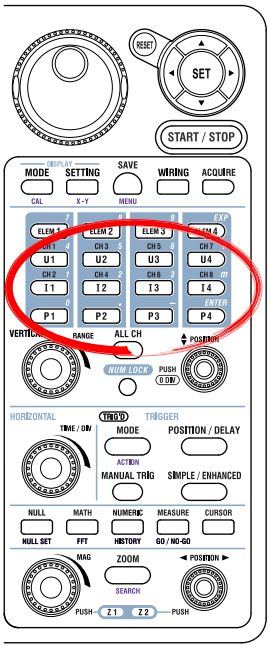
Press **START/STOP** to start or stop waveform acquisition.
When the START/STOP key is illuminated, the PX8000 is acquiring waveforms.

After waveform acquisition is started and a trigger is activated, numeric data and waveforms are displayed.

4.8 Turning the Waveform Display On and Off

For details, see section 2.1 or 8.1 in the User's Manual, IM PX8000-02EN.

By factory default, the waveform displays of all input modules' input signals are turned on. Turn on or off each waveform display depending on which waveforms you want to observe.



Using the Channel Keys

The waveform display turns on and off each time you press one of the **U1-U4**, **I1-I4**, **P1-P4**, and **CH3-CH8** (when AUX modules are installed) keys.

For example, if you want to observe the three input signals U1, I1, and P1, turn off the waveform display of other input signals.

Using the Channel Key Soft Key Menu

1. Press one of the **U1-U4**, **I1-I4**, **P1-P4**, and **CH3-CH8** (when AUX modules are installed) keys that you want to turn on or off. A menu for the key appears.
2. Press the **Display** soft key to select ON or OFF.

Using the Dialog Box

1. Press **SETTING** in the DISPLAY area to display the WAVE SETTING menu.
   If the screen is showing a split display of numeric data and waveforms, press **SETTING** twice to display the WAVE SETTING menu.

Note

Display setting on the split display

The SETTING menu for the top half of the screen and that of the bottom half of the screen toggles each time you press DISPLAY SETTING.

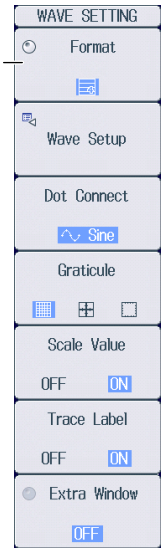
2. Press the **Wave Setup** soft key to display the Wave Setup dialog box.
3. Use the **jog shuttle** to turn on or off the display of the input signals in the Disp column.

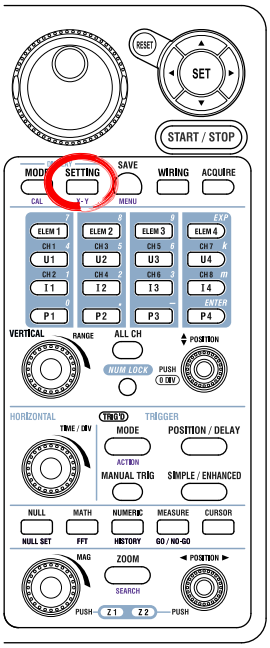
4.9 Selecting the Waveform Display Format

For details, see section 8.1 in the User's Manual, IM PX8000-02EN.

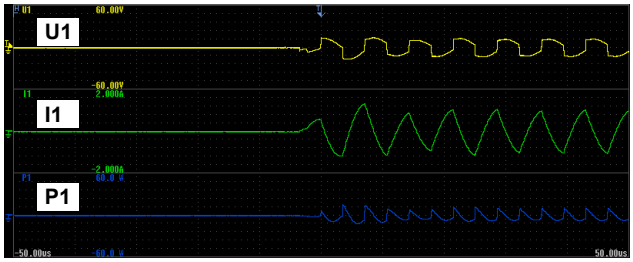
You can select the number of divided waveform display windows to make it easier to view input waveforms and math waveforms.

Set the display format.





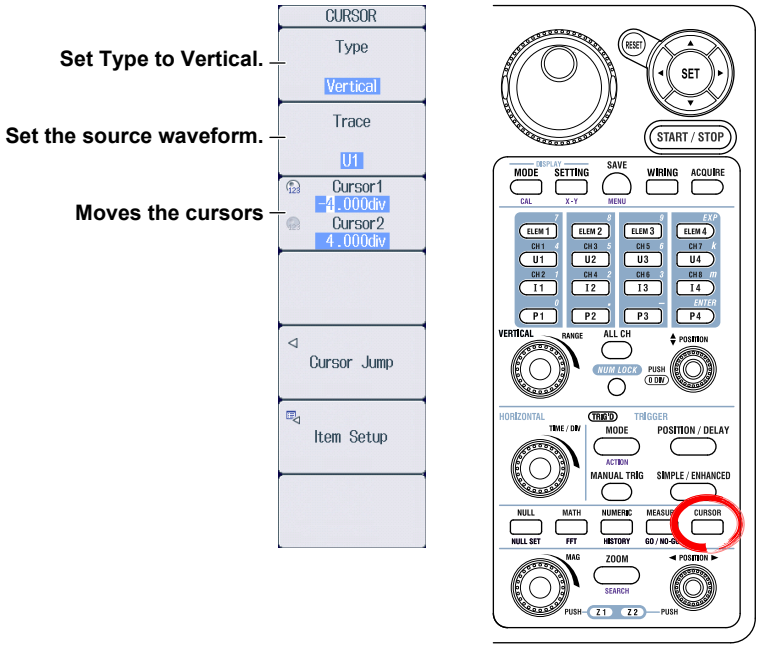
1. Press **SETTING** in the DISPLAY area to display the WAVE SETTING menu.
   If the screen is showing a split display of numeric data and waveforms, press **SETTING** twice to display the WAVE SETTING menu.
2. Press the **Format** soft key. The jog shuttle now controls the Format setting.
3. Use the **jog shuttle** to select the display format.
   For example, if you want to observe the three input signals U1, I1, and P1, set the display format to 3.



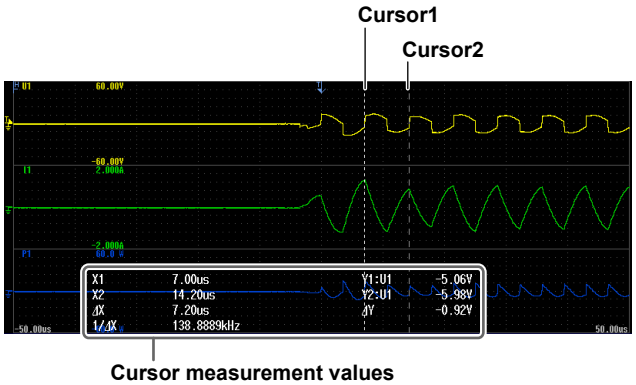
4.10 Measuring with Cursors

For details, see section 13.2 in the User's Manual, IM PX8000-02EN.

Cursors can be placed on displayed waveforms to display the measured values at the intersections of cursors and waveforms.



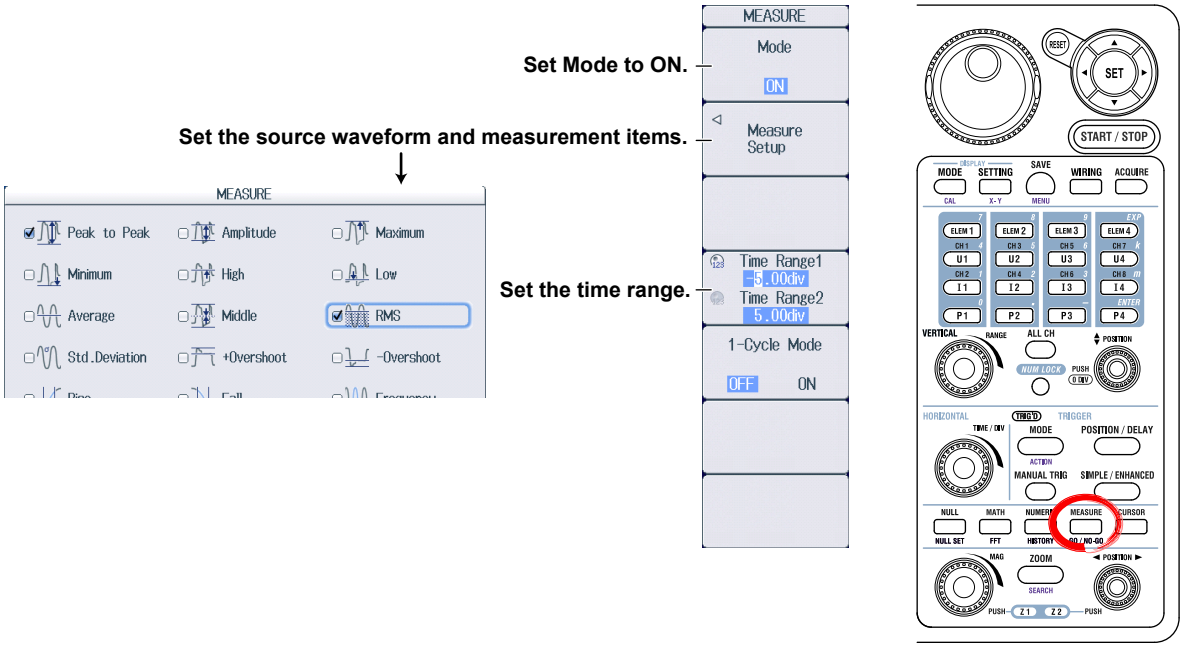
1. Press **CURSOR** to display the CURSOR menu.
2. Press the **Type** soft key to select Vertical.
3. Press the **Trace** soft key to select the input signal that you want to measure with cursors.
4. Press the **Cursor1 Cursor2** soft key. The jog shuttle now controls the cursors.
5. Use the **jog shuttle** to set the positions of Cursor1 and Cursor2.
   The time and other values at the cursor positions are displayed at the bottom of the screen.



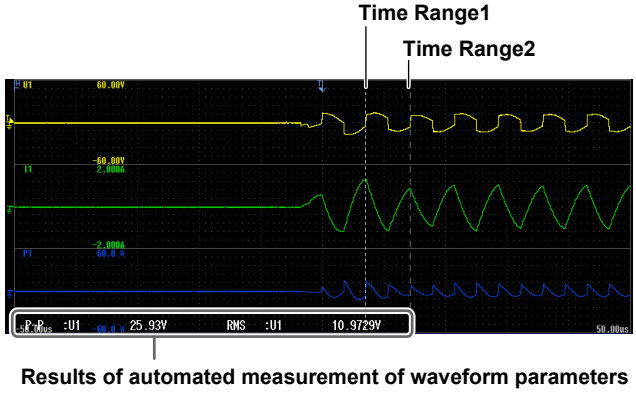
4.11 Computing Values in a Specified Time Range Using the Automated Measurement of Waveform Parameters

For details, see section 14.1 in the User's Manual, IM PX8000-02EN.

For waveforms that are displayed on the screen, various measurement items (waveform parameters), such as maximum and minimum values, can be measured automatically and their statistics can be calculated.



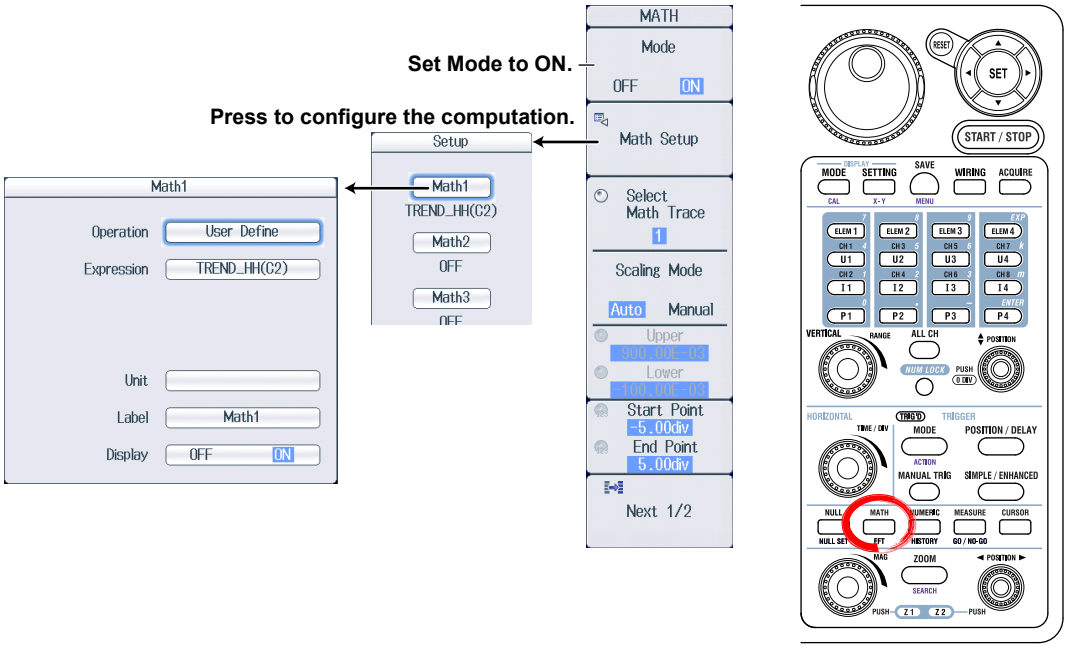
1. Press **MEASURE** to display the MEASURE menu.
2. Press the **Mode** soft key and select ON.
3. Press the **Measure Setup** soft key to display the Source dialog box.
4. Press the **Item** soft key. Then, use the jog shuttle and the SET key to select the check boxes for the items that you want to measure.
   In this example, the check boxes for Peak to Peak and RMS have been selected.
5. Press **ESC** to close the Source dialog box.
6. Press the **Time Range1 Time Range2** soft key. The jog shuttle now controls the cursors.
7. Use the **jog shuttle** to set the cursor positions of Time Range1 and Time Range2.
   The results of automated measurement of waveform parameters are displayed at the bottom of the screen.



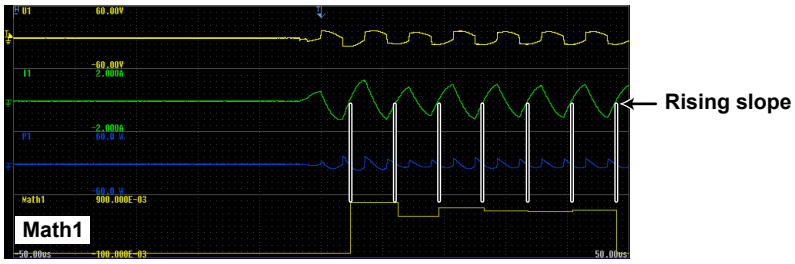
4.12 Using Waveform Computation to Display the Trend of the Rms Current per Cycle

For details, see section 15.5 in the User's Manual, IM PX8000-02EN.

Waveform data can be computed using addition, subtraction, multiplication, division, FFT (power spectrum), square root, differentiation, digital filtering, and the like.



1. Press **MATH** to display the MATH menu.
2. Press the **Mode** soft key and select ON.
3. Press the **Math Setup** soft key to display the Setup dialog box.
4. Use the **jog shuttle** and the **SET** key to select Math1.
5. Use the **jog shuttle** and the **SET** key to set Operation to User Define.
6. Use the **jog shuttle** and the **SET** key to select Expression.
7. Use the **jog shuttle** and the soft keys to set Expression to TREND_HH(C2).
   TREND_HH(C2) shows the rms value of C2(I1) for each cycle divided by the rising edge.
8. Follow the procedure in section 4.9 to set the display format to 4.
   The Math1 waveform appears in the fourth waveform display area. In the factory default condition, the synchronization source is set to I1. Thus, the rms value of I1 for each cycle divided by the rising edge of I1 is displayed in Math1.



5.1 External Trigger Input (TRIGGER IN)

CAUTION

Only apply signals that meet the following specifications. Signals that do not meet the specifications may damage the PX8000, because of factors such as excessive voltage.

French

ATTENTION

N'appliquer que des signaux correspondant aux spécifications suivantes. Les autres signaux pourraient endommager le PX8000 en raison de divers facteurs, notamment la tension excessive.

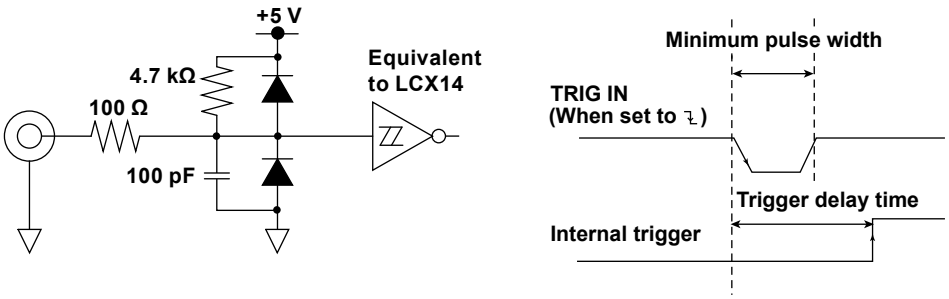
External Trigger Input Terminal

This terminal is used when an external signal is used as one of the following signal sources.

- Trigger source (External)
- Synchronization source (External)
- PLL source (External)
- Math period (Ext Gate)

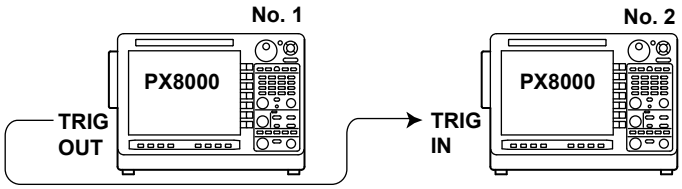
Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Minimum pulse width	100 ns
Logic	Rising and falling edges
Trigger delay time	Within 100 ns + 1 sample period
Externally synchronized operation	Possible (through the connection of the TRIG IN and TRIG OUT terminals of two PX8000s)

Circuit Diagram and Timing Chart for External Trigger Input



Note

You can synchronize the operation of two PX8000s by using the trigger output function.



5.2 Trigger Output (TRIGGER OUT)

CAUTION

Do not short the TRIG OUT terminal or apply external voltage to it. Doing so may damage the instrument.

French

ATTENTION

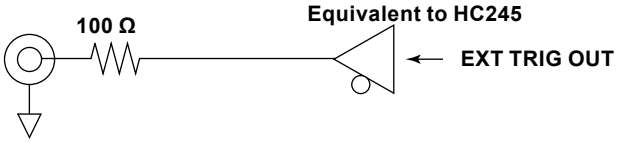
Ne pas court-circuiter la borne TRIG OUT et ne pas appliquer de tension de sortie. Cela pourrait endommager l'instrument.

External Trigger Output Terminal

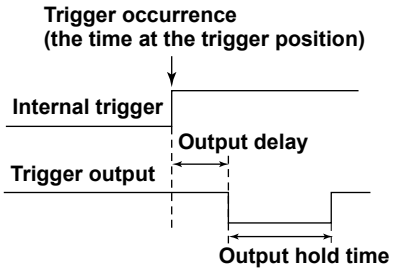
When a trigger occurs, the PX8000 produces a CMOS level signal. You can set the output mode to normal or pulse. The signal level is normally high. It becomes low when a trigger occurs.

Item	Specifications	
Connector type	BNC	
Output level	CMOS level (0 to 5 V)	
Output formats	Normal mode and pulse mode	
Logic	Normal mode	Low when a trigger occurs and high after acquisition is completed
	Pulse mode	Low when a trigger occurs and high after a specified period of time has passed
Output delay	Normal mode	Within 100 ns + 1 sample period
	Pulse mode	Within 100 ns + 1 sample period
	Delay in the module	Within (deskew value of the trigger source + 21 µs)
Output hold time	Normal mode	100 ns or more
	Pulse mode	1 ms, 50 ms, 100 ms, or 500 ms

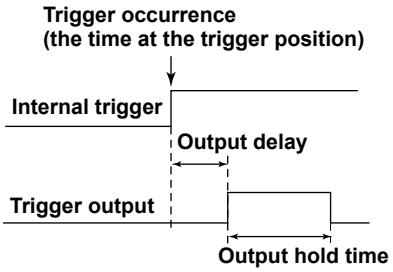
Circuit Diagram and Timing Chart for Trigger Output



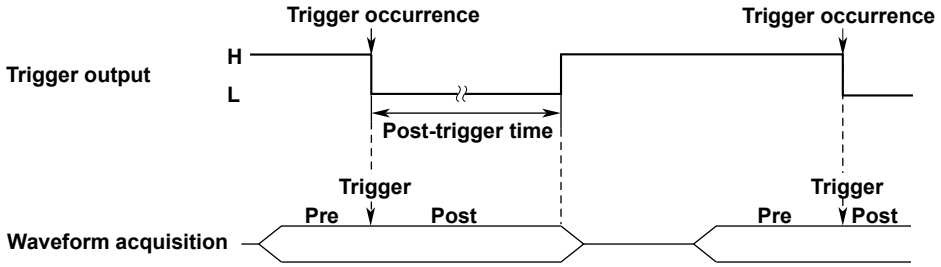
• Normal mode



• Pulse mode



Low Level and High Level Hold Times (In normal mode)



5.3 External Clock Input (EXT CLK IN)

CAUTION

Only apply signals that meet the following specifications. Signals that do not meet the specifications may damage the PX8000, because of factors such as excessive voltage.

French

ATTENTION

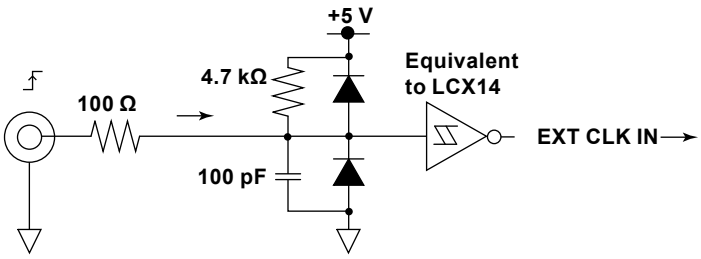
N’appliquer que des signaux correspondant aux spécifications suivantes. Les autres signaux pourraient endommager le PX8000 en raison de divers facteurs, notamment la tension excessive.

External-clock input terminal

Use this terminal to operate the PX8000 using an external clock signal.

Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Detected edge	Rising
Minimum pulse width	50 ns or more for both high and low
External clock frequency range	Up to 9.5 MHz

Circuit Diagram for External Clock Input



5.4 Video Signal Output (VIDEO OUT (XGA))

CAUTION

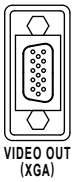
- Only connect the PX8000 to a monitor after turning both the PX8000 and the monitor off.
- Do not short the VIDEO OUT terminal or apply external voltage to it. Doing so may damage the PX8000.

French

ATTENTION

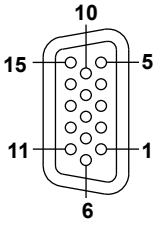
- Ne brancher le PX8000 sur un moniteur qu'après avoir mis hors tension le PX8000 et le moniteur.
- Ne pas court-circuiter la borne VIDEO OUT et ne pas appliquer de tension de sortie. Cela pourrait endommager le PX8000.

Video Signal Output Terminal



You can use video signal output to display the PX8000 screen on a monitor. Any multisync monitor that supports XGA can be connected.

Item	Specifications
Connector type	D-sub 15-pin
Output format	Analog RGB output
Output resolution	XGA output, 1024 × 768 dots, approx. 60 Hz Vsync



D-Sub 15-pin receptacle

Pin No.	Signal	Specifications
1	Red	0.7 V_{P-P}
2	Green	0.7 V_{P-P}
3	Blue	0.7 V_{P-P}
4	—	
5	—	
6	GND	
7	GND	
8	GND	
9	—	
10	GND	
11	—	
12	—	
13	Horizontal sync signal	Approx. 36.4 kHz, TTL positive logic
14	Vertical sync signal	Approx. 60 Hz, TTL positive logic
15	—	

Connecting to a Monitor

1. Turn off the PX8000 and the monitor.
2. Connect the PX8000 and the monitor using an RGB cable.
3. Turn on the PX8000 and the monitor.

5.5 GO/NO-GO Determination I/O and External Start/Stop Input (EXT I/O)

Connecting to Other Instruments

CAUTION

- Do not apply external voltage to the NO-GO OUT and GO OUT output pins. Doing so may damage the instrument.
- When connecting the GO/NO-GO determination signal output to another device, do not connect the wrong signal pin. Doing so may damage the PX8000 or the connected instrument.
- Do not connect a USB cable to the GO/NO-GO output terminal. Doing so may damage the instrument.

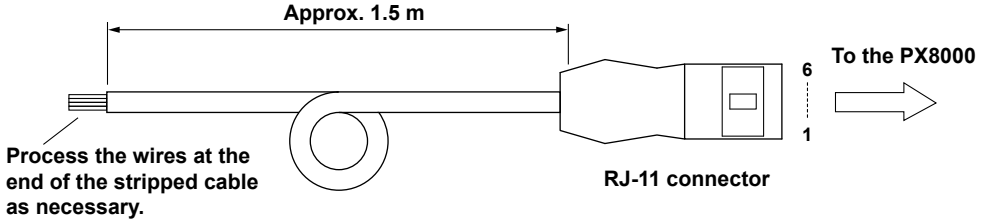
French

ATTENTION

- Ne pas appliquer de tension externe aux broches de sortie NO-GO OUT et GO OUT. Cela pourrait endommager l'instrument.
- Lors de la connexion de la sortie de signal de détermination GO/NO-GO à un autre instrument, veiller à ne pas connecter les mauvaises broches de signal. Cela pourrait endommager le PX8000 ou l'instrument connecté.
- Ne pas brancher de câble USB sur le connecteur de sortie GO/NO-GO. Cela pourrait endommager l'instrument.

About the External I/O Cable (720911; sold separately)

- Do not use the cable for anything other than the PX8000 external I/O.
- Refer to the following figure to connect the cable to an external device.



Wire color	Pin no.	Signal	Logic
Red	1	NC (no connection)	
Yellow	2	START IN	Negative logic
White	3	GO OUT	Negative logic
Green	4	NOGO OUT	Negative logic
Blue	5	GND	

GO/NO-GO Determination I/O

You can apply an external signal to the PX8000's GO/NO-GO I/O terminal and perform GO/NO-GO determination, and you can output the results of GO/NO-GO determination from the GO/NO-GO I/O terminal.

GO/NO-GO I/O Connector

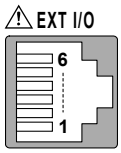
Type

The connector uses an RJ-11 modular jack. Use the external I/O cable accessory (720911; sold separately). If you are using a commercially sold cable (four-conductor modular telephone cable), wire the pins according to the above figure.

I/O Level

Within 0 to 5 V, threshold level: TTL

Pinout



Connector on the PX8000

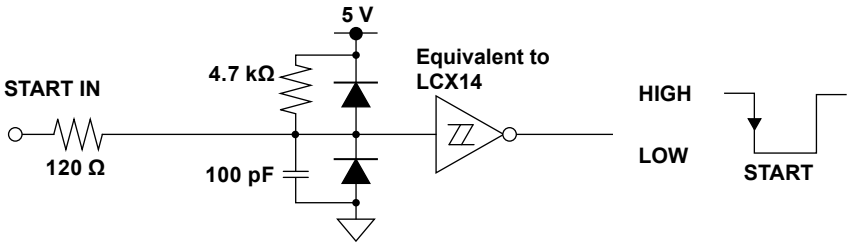
Pin no.	Signal		
1	NC (no connection)		
2	START IN	IN	Starts on low edge
3	GO OUT	OUT	Active low (GO)
4	NOGO OUT	OUT	Active low (NO-GO)
5	GND		
6	NC (no connection)		

Input Signal

START IN (Negative logic)

Use this signal to perform GO/NO-GO determination by synchronizing to an external input signal. The signal is only valid when on the GO/NO-GO menu, Remote is set to ON. If Remote is set to OFF, GO/NO-GO determination is performed regardless of the external signal input (the GO/ NO-GO determination result is output).

Signal Input Circuit



Output Signal

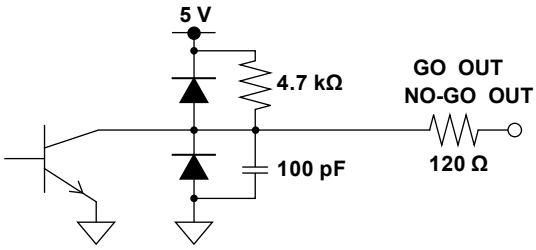
NOGO OUT (Negative logic)

When the determination result is NO-GO (fail), the output signal level temporarily changes from high (H) to low (L).

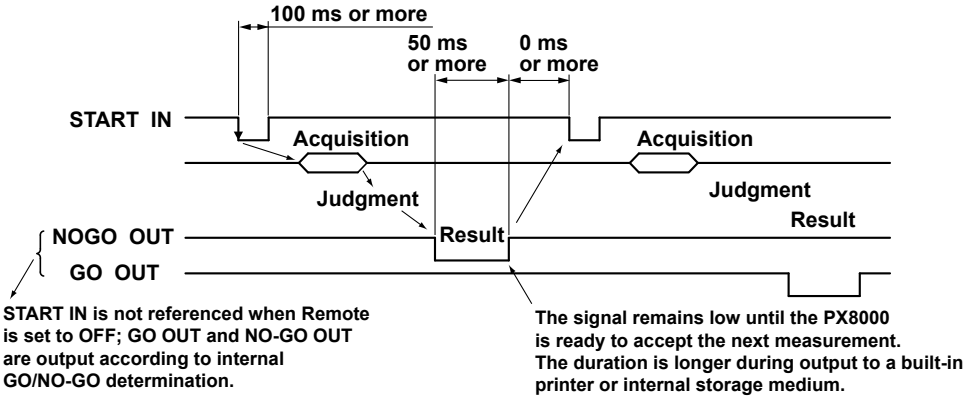
GO OUT (Negative logic)

When the determination result is GO, the output signal level temporarily changes from high (H) to low (L).

Signal Output Circuit



GO/NO-GO I/O Timing



External Start/Stop Input (EXT I/O)

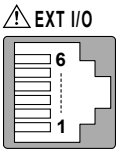
You can use an external signal to start and stop the PX8000.

External Start/Stop Input Terminal

The External Start/Stop Input terminal and the GO/NO-GO I/O terminal are the same terminal. This terminal is used as an external start/stop input when the GO/NO-GO determination I/O function is not used (when on the GO/NO-GO menu, Mode is set to OFF).

Specifications

The connector uses an RJ-11 modular jack. Connect the separately sold 720911 cable to the connector.

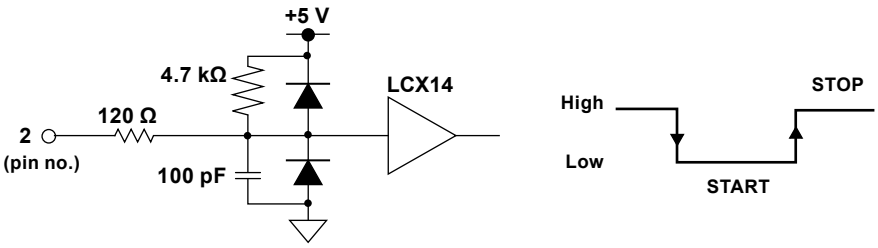


Connector on the PX8000

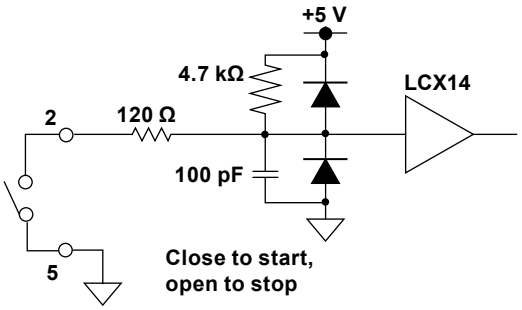
Pin no.	Signal
1	NC (no connection)
2	START IN — Starts on low edge, stops on high
3	NC (no connection)
4	NC (no connection)
5	GND
6	NC (no connection)

Input level: TTL (0 to 5 V)

Circuit Diagram for External Start/Stop Input



• Contact input is possible



Note

- Low and high edges are used to detect starts and stops.
- You can select whether to enable high edges (stops) in the external start/stop signal or disable. For information about how to do so, see section 24.8, “Configuring the Environment Settings,” in the user’s manual.

5.6 IRIG Signal Input (IRIG option)

CAUTION

Only apply signals that meet the following specifications. Signals that do not meet the specifications may damage the PX8000, because of factors such as excessive voltage.

French

ATTENTION

N’appliquer que des signaux correspondant aux spécifications suivantes. Les autres signaux pourraient endommager le PX8000 en raison de divers facteurs, notamment la tension excessive.

IRIG Signal Input Terminal

You can use an IRIG (Inter Range Instrumentation Group) signal to set the time on the PX8000.

Item	Specifications
Input connector	BNC
Number of input connectors	1
Supported IRIG signals	A002, B002, A132, and B122
Input impedance	You can switch between 50 Ω and 5 kΩ.
Maximum input voltage	±8 V
Used for	Synchronizing the PX8000 time Synchronizing the sample clock
Clock sync range	±80 ppm
Post-sync accuracy	No drift from the input signal

6.1 Troubleshooting

Dealing with Problems

- If a message appears on the screen, see chapter 25 in the user's manual, IM PX8000-02EN.
- If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Problems and Solutions		Reference Section
Nothing appears on the screen when you turn on the power.		
	Securely connect the power cord to the instrument and to the power outlet.	2.4
	Set the supply voltage to within the permitted range.	2.4
	Check the screen settings.	24.7[1]
	The built-in power supply fuse may have blown. Servicing is required.	—
Keys do not work.		
	Check the REMOTE indicator. If the REMOTE indicator is illuminated, press LOCAL to turn it off.	—
	Confirm that keys are not protected.	24.10[1]
	Perform a key test. If the test fails, servicing is necessary.	25.2[1]
Triggering does not work.		
	Check the trigger conditions.	Chapter 2[1]
	Confirm that the trigger source is being applied.	Chapter 2[1]
Numeric data is not displayed.		
	Check that the numeric measurement ON/OFF setting is set to ON.	7.1[1]
The displayed data is not correct.		
	Confirm that the ambient temperature and humidity are within their specified ranges.	2.2
	Warm up the instrument for 30 minutes after turning on the power.	—
	Calibrate the instrument.	3.7
	Confirm that noise is not affecting the measurement.	2.1, 2.5
	Check the measurement cable wiring.	2.8-2.11
	Check the wiring system.	2.8-2.11, 1.1[1]
	Confirm that the line filter is off.	1.2[1]
	Check the measurement period settings.	1.2[1],1.3[1]
	Check the FAQ at the following URL. http://tmi.yokogawa.com/	—
	Turn the power off and then on again.	2.4
Unable to make harmonic measurements.		
	Check that the harmonic measurement ON/OFF setting is set to ON.	7.7[1]
	Check the harmonic status.	Chapter 9[2]
Cannot print to the built-in printer.		
	The printer head may be damaged or worn out. Servicing is required.	—
Unable to recognize a storage medium.		
	Check the storage medium format. If necessary, format the storage medium.	22.2[1]
	The storage medium may be damaged.	—
Unable to save data to the selected storage medium.		
	Check the free space on the storage medium. Remove files or use a different storage medium as necessary.	—
	If necessary, format the storage medium.	22.2[1]
Unable to configure or control the instrument through the communication interface.		
	Confirm that the GP-IB address and the IP address settings meet the specifications.	—[3]
	Confirm that the interface meets the electrical and mechanical specifications.	—[3]

1 See the user's manual, IM PX8000-02EN.
2 See the features guide, IM PX8000-01EN.
3 See the communication interface user's manual, IM PX8000-17EN.

6.2 Recommended Replacement Parts

The life and replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline.
For part replacement and purchase, contact your nearest YOKOGAWA dealer.

Parts with Limited Service Life

Part Name	Service Life
Built-in printer	Under normal conditions of use, equivalent of 500 rolls of printer paper (part number: B9988AE)
LCD backlight	Under normal conditions of use, approximately 25,000 hours

Consumable Parts

We recommend replacing them at the following intervals.

Part Name	Recommended Replacement Interval
Cooling fan	3 years
Backup battery (lithium)	5 years

6.3 Calibration and Adjustment

For calibration and adjustment, contact your nearest YOKOGAWA dealer.

Power Measurement Calibration and Adjustment

Power measurement calibration and adjustment require both voltage modules (760811) and current modules (760812/760813). Please request calibration and adjustment for the pairs of voltage and current modules that you received at the time of purchase.

Checking the Correct Pair of Voltage and Current Modules

You can check the pairs on the overview screen. For instructions on how to display the overview screen, see section 25.3, “Viewing System Information (Overview)” in the User’s Manual.

7.1 Signal Input Section

Item	Specifications	
Type	Plug-in input unit	
Number of slots	8 slots (up to four power measurement elements (voltage module + current module)) If four power measurement elements are not installed, up to three AUX modules can be installed.	
Maximum number of input channels	8	
Maximum record length	Standard	10 Mpoint/CH
	/M1 option	50 Mpoint/CH
	/M2 option	100 Mpoint/CH

Power Measurement Element Input Section

Item	Specifications
Input terminal type	Voltage • Plug-in terminal (female safety terminal) Current • Plug-in terminal (male safety terminal) 760812/760813 • External current sensor input: isolated BNC 760812
Input type	Voltage Floating input through resistive voltage divider Current Floating input through shunt
Measurement range	Voltage Crest factor 2: 1.5, 3, 6, 10, 15, 30, 60, 100, 150, 300, 600, 1000 Vrms Current • Direct input Crest factor 2: 10 m, 20 m, 50 m, 100 m, 200 m, 500 m, 1, 2, 5 Arms • External current sensor input Crest factor 2: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 Vrms
Input impedance	Voltage Approx. 2 MΩ, approx. 10 pF Current • Direct input Approx. 100 mΩ + approx. 0.19 μH • External current sensor input Approx. 1 MΩ, approx. 17 pF
Instantaneous maximum allowable input (within 20 ms)	Voltage Peak value of 2.2 kV or rms value of 1.5 kV, whichever is less Current • Direct input: Peak value of 30 A or rms value of 15 A, whichever is less. • External current sensor input: Peak value less than or equal to 10 times the range
Instantaneous maximum allowable input (within 1 s)	Voltage Peak value of 2.2 kV or rms value of 1.5 kV, whichever is less Current • Direct input: Peak value of 8.5 A or rms value of 6 A, whichever is less. • External current sensor input: Peak value less than or equal to 10 times the range
Continuous maximum allowable input	Voltage Peak value of 2 kV or rms value of 1.1 kV, whichever is less If the frequency of the input voltage exceeds 100 kHz, (1100–f) Vrms or less f is the frequency of the input voltage in units of kHz. The continuous allowable input is 3 Vrms or higher. Current • Direct input: Peak value of 8.5 A or rms value of 6 A, whichever is less. If the frequency of the input current exceeds 100 kHz, $(6\times e^{(-0.00017\times f)})$ Arms or less f is the frequency of the input current in units of kHz. • External current sensor input: Peak value less than or equal to 4 times the range
Continuous maximum common-mode voltage (50/60 Hz)	Voltage module (760811) 1000 V CAT II Current module (760812) 1000 V: Maximum allowable voltage that can be measured 600 V CAT II : Rating voltage of EN 61010-2-030 Do not touch the inside of the external current sensor input BNC. Current module (760813) 1000 V CAT II : Rating voltage of EN 61010-2-030

Item	Specifications
Influence of common-mode voltage	Voltage Terminals shorted When 1000 Vrms is applied between an input terminal and case • 50/60 Hz: ±(0.01% of range + 5 mV) • Other frequencies ±{maximum range rating/range rating×0.001×f + 0.001×f + 5 mV} 0.01% or greater. The unit of f is kHz. The maximum range rating in the equation is 1000 V. Current When 1000 Vrms is applied with the current input terminals open, and the external current sensor input terminals shorted. • 50/60 Hz: Direct input: ±(0.01% of range + 10 μA) External current sensor input: ±(0.01% of range + 25 μV) • Other frequencies Direct input ±{maximum range rating/range rating×0.002×f×$2^{(0.5+f/1000)}$ + 0.002×f + 10 μA} External current sensor input ±{maximum range rating/range rating×0.003×f×$2^{(0.5+f/5000)}$ + 0.003×f + 25 μV} 0.01% or greater. The unit of f is kHz. The maximum range rating in the equation is for a direct input of 5 A and external current sensor input of 10 V.
Line filter	Select OFF, 500 Hz, 2 kHz, 20 kHz, or 1 MHz.
Frequency filter	Select OFF, 100 Hz, 500 Hz, 2 kHz, or 20 kHz.
Resolution	Simultaneous conversion of voltage and current inputs. 12-bit resolution.
Maximum sample rate	100 MS/s
Range switching	Can be set separately on each module
Auto range feature	Range increase The range is increased when any of the following conditions is met. • When Urms or Irms exceeds 110% of the measurement range. • When the input signal peak value exceeds approximately 200% of the range. Range decrease The range is decreased when all of the following conditions are met. • The measured Urms or Irms value is less than 30% of the measurement range. • Upk or Ipk is less than or equal to 180% of the next lower range.

AUX Module Input Section

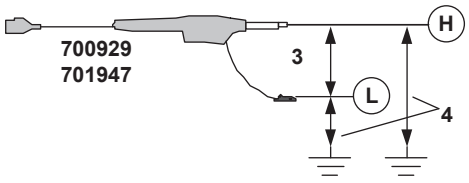
Item	Specifications
Valid measurement range	20 div,[1] twice the measurement range
Number of input channels	2 (select analog input or pulse input on each channel)
Input coupling setting	AC, DC, and GND
Input terminal type	BNC
Input type	Isolated unbalanced
Frequency response[2]	(–3 dB attenuation point when a sine wave with an amplitude equivalent to ± 3div[*1] is received) DC to 20 MHz (input coupling: DC)
Measurement range (analog input)	50 mV to 100 V (1-2.5-5 steps) (for 1:1 probe factor)
Input impedance	Approx. 1 MΩ, approx. 35 pF
Low-frequency –3 dB attenuation point for AC coupling	10 Hz or less (1 Hz or less when using the 700929, 0.1 Hz or less when using the 701947)
Maximum input voltage (at 1 kHz or less)	In combination with 700929(10:1)/701947(100:1):[*3] 1000 V (DC + ACpeak) CAT II During direct input or when a cable and probe that do not comply with the safety standards are connected:[*5] 200 V (DC + ACpeak)
Maximum allowable common mode voltage (at 1 kHz or less)	The working voltage in the safety standards In combination with 700929(10:1)/701947(100:1):[*4] 1000 Vrms (CAT II) During direct input or when a cable and probe that do not comply with the safety standards are connected:[*6] 42 V (DC + ACpeak) (O and CAT II, 30 Vrms)
Maximum sample rate	100 MS/s
Influence of common-mode voltage	When 1000 Vrms (50/60 Hz) is applied between an input terminal and case with the input terminals shorted (measured voltage/applied voltage) is less than or equal to –80 dB at 50/60 Hz
Bandwidth limit	Select Full, 2 MHz, 1.28 MHz, 640 kHz, 320 kHz, 160 kHz, 80 kHz, 40 kHz, 20 kHz, or 10 kHz. Cutoff characteristic: –18 dB/OCT (typical,[7] at 2 MHz)

Item	Specifications
Probe attenuation settings	Voltage probe: 1:1, 10:1, 100:1, 1000:1
Auto range feature (only for analog input)	Range increase The range is increased when any of the following conditions is met. • The DC input signal exceeds 110% of the measurement range. • The input signal peak value exceeds 200% of the measurement range (when motor mode is off). • The input signal peak value exceeds 145% of the measurement range (when motor mode is on). Range decrease The range is decreased when all of the following conditions are met. • The DC input signal is less than 30% of the measurement range. • The input signal peak value is less than or equal to 180% of the next lower range (when motor mode is off). • The input signal peak value is less than or equal to 140% of the next lower range (when motor mode is on).
A/D converter resolution	12 bits
Withstand voltage	1500 Vrms, 1 minute between each input terminal and earth (60 Hz)
Insulation resistance	500 VDC, ≥10 MΩ (between each input terminal and earth)
DC accuracy (analog input)	±(1% of range)*2
Temperature coefficient (analog input)	±(0.1% of range)/°C (Typical*7)
Input range	Analog input: ±110% of the range rating, ±140% of the maximum display range rating
Input range (pulse input)	±5 Vpeak
Frequency measurement range (pulse)	2 Hz to 1 MHz, display range: 1.8 Hz to 2 MHz
Pulse reference level	High level: -9.9 V to +10.0 V, Low level: -10.0 V to +9.9 V
Input waveform (pulse)	Rectangular wave
Minimum pulse width (pulse)	500 ns or more
Accuracy (pulse)	±(0.05% of reading) ± 1 count error (10 ns) However, the observation time is at least 300 times the input pulse period.
Guaranteed accuracy period	1 year

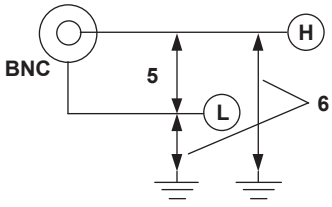
1 What is div?
1 div of voltage applied to a power measurement element corresponds to 2/5 of the range rating (twice the range rating is 5 div). 1 div of current is 2/5 of the range rating (twice the range rating is 5 div). 1 div of power is 4/5 the range rating (four times the range rating is 5 div).
1 div of voltage applied to an AUX module is 1/5 the range rating (range rating corresponds to 5 div).

2 Value measured under standard operating conditions

In combination with the 700929/701947



Direct input (using a cable that does not comply with the safety standards)



Withstand voltage: 1500 Vrms (1 minute)
Allowable transient surge voltage (between the input terminals and earth): ±2100 Vpeak

7 Typical values represent typical or average values. They are not strictly guaranteed.

7.2 Triggering Section

Item	Specifications
Trigger mode	Auto, Auto Level, Normal, Single, Single(N), On Start
Selectable trigger level range	When the trigger source is a voltage, current, or power applied to a power measurement element: ±5 div around 0 div,[1] When the trigger source is a voltage applied to an AUX module: ±10 div around 0 div[1]
Trigger hysteresis	Select ±0.1 div, ±0.5 div, or ±1 div.
Selectable trigger position range	0 to 100% (as a percentage of the display record length in 0.1% steps)
Selectable trigger delay range	0 to 10 s (in 10 ns steps)
Selectable hold-off time range	0 to 10 s (in 10 ns steps)
Manual trigger	Generates a trigger when a dedicated key is pressed, regardless of the trigger source settings
Simple trigger	
Trigger source	Un, In, Pn, AUXn (a specified input channel), EXT, LINE, Time (When AUXn is pulse input, START not allowed)
Trigger slope	Rising, falling, rising and falling
Clock trigger	Date (year/month/day), hour (hour/minute), time interval (10 seconds to 24 hours)
Enhanced trigger	
Trigger source	Un, In, Pn, AUXn (a specified input channel) (When AUXn is pulse input, START not allowed)
Trigger type	
A -> B(N):	After condition A is met, the PX8000 triggers when condition B is met N times. Count specification: 1 to 10000 Condition A: Enter or Exit Condition B: Enter or Exit
A Delay B:	After condition A is met, the PX8000 triggers when condition B is met for the first time after the specified time elapses. Time specification: 0 to 10 s (in 10 ns steps) Condition A: Enter or Exit Condition B: Enter or Exit
Edge on A:	The PX8000 triggers on the logical OR of edges while condition A is met. Condition A: True or False
AND:	The PX8000 triggers on the logical AND of multiple state conditions.
OR:	The PX8000 triggers on the logical OR of multiple edge or state conditions.
Pulse Width:	
B>Time:	The PX8000 triggers when the time from when condition B is met until it is no longer met is greater than the specified time duration. Time specification: 20 ns to 10 s (in 10 ns steps)
B < Time:	The PX8000 triggers when the time from when condition B is met until it is no longer met is less than the specified time duration. Time specification: 20 ns to 10 s (in 10 ns steps)
B Time Out:	The PX8000 triggers when condition B is met continuously for the specified time duration. Time specification: 20 ns to 10 s (in 10 ns steps)
B Between:	The PX8000 triggers when the time duration in which condition B is met is within the specified time duration. Time specification: T1: 10 ns to 9.99999999 s T2: 20 ns to 10 s in 10 ns steps
Period:	The PX8000 triggers when the period meets one of the following conditions.
T>Time:	The PX8000 triggers when the period of condition T is greater than the specified time duration. Time specification: 20 ns to 10 s (in 10 ns steps)
T < Time:	The PX8000 triggers when the period of condition T is less than the specified time duration. Time specification: 20 ns to 10 s (in 10 ns steps)
T1 < T < T2:	The PX8000 triggers when the period of condition T is within than the specified time duration. Time specification: T1: 20 ns to 10 s in 10 ns steps T2: 30 ns to 10 s in 10 ns steps

Item	Specifications	
	T < T1, T2 < T:	The PX8000 triggers when the period of condition T is outside the specified time duration. Time specification: T1: 20 ns to 10 s in 10 ns steps T2: 30 ns to 10 s in 10 ns steps
	Wave Window:	Power supply monitoring trigger The PX8000 creates in real time a template with tolerance by comparing the current waveform with the waveforms 1, 2, and 4 cycles earlier. The PX8000 triggers when the current waveform falls outside this template.
	• Condition A and condition B are parallel patterns consisting of high, low, and don't care values for each channel (the logic AND is taken on each term).	
	• For OR and AND, the condition can be set to High, Low, IN, OUT, or Don't care for each channel.	

1 What is div?
1 div of voltage applied to a power measurement element corresponds to 2/5 of the range rating (twice the range rating is 5 div). 1 div of current is 2/5 of the range rating (twice the range rating is 5 div). 1 div of power is 4/5 the range rating (four times the range rating s 5 div).
1 div of voltage applied to an AUX module is 1/5 the range rating (range rating corresponds to 5 div).

7.3 Time Axis

Item	Specifications	
Selectable time scale range	100 ns/div to 1 s/div (1-2-5 steps), 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 8 s/div, 10 s/div, 20 s/div, 30 s/div, 1 min/div, 2 min/div	
Time axis accuracy*	±0.005%	
External clock input	Connector type	BNC
	Input level	TTL level
	Detected edge	Rising
	Frequency range	Up to 9.5 MHz
	Minimum pulse width	50 ns or higher for both high and low

* Under standard operating conditions after warm-up

7.4 Display

Item	Specifications
Display	10.4-inch color TFT LCD
Resolution of the entire screen*	1024 × 768 dots (H × V)
Resolution of the waveform display	801×656
Display format	Numeric (4 values, 8 values, 16 values, Matrix, All Item, Hrm Single List, Hrm Dual List, Custom) Wave (1, 2, 3, 4, 6, 8, 12, 16) Bar (1, 2, 3) Vector (1, 2) * The above can display up to two windows simultaneously. ZOOM1, ZOOM2 (displayed in the bottom half of the split display) FFT1, FFT2 (displayed in the bottom half of the split display) XY1, XY2 (displayed in the bottom half of the split display)

* Relative to the total number of pixels, 0.002% of the LCD screen may be defective.

Numeric Display

Item	Specifications
Display resolution	5 digits or 6 digits
Number of displayed items	Select 4 Items, 8 Items, 16 Items, Matrix, All Items, Hrm Single List, Hrm Dual List, or Custom.

Waveform Display

Item	Specifications
Waveform display item	Voltage, current, and power of element 1 Voltage, current, and power of element 2 or AUX3, AUX4 Voltage, current, and power of element 3 or AUX5, AUX6 Voltage, current, and power of element 4 or AUX7, AUX8 Math1 to 8

Vector Display and Bar Graph Display (Option)

Item	Specifications
Vector display	Displays the phase difference between the fundamental voltage signal and fundamental current signal as a vector
Bar graph display	Displays a bar graph of the amplitude of each harmonic

Zoom Display

Item	Specifications
Expands waveforms	Up to two screens

FFT Display

Item	Specifications
Displays waveform spectrum	Up to two screens

X-Y Display

Item	Specifications
Display based on specified X-axis and Y-axis	Up to two screens

7.5 Features

Measurement Features and Measurement Conditions

Item	Specifications
Crest factor	200 for the minimum effective input 2 for the measurement range's rated direct input
Measurement period	Period used to determine and compute measurement functions • Set the measurement period based on the zero crossings of the reference signal (synchronization source) or the gate signal applied to external trigger. • When displaying harmonics The measurement period is 8192 points at the sampling frequency during harmonic display from the point specified by a cursor.
Wiring system	1P2W (single-phase two-wire), 1P3W (single-phase three-wire), 3P3W (three-phase three-wire), 3P4W (three-phase four-wire), and 3P3W(3V3A) (three-phase three wire system that uses a three-voltage three-current method) The selectable wiring systems vary depending on the number of power measurement elements that are installed.
Scaling	Set the current sensor conversion ratio, VT ratio, CT ratio, and power coefficient in the range of 0.0001 to 99999.9999 when applying the external current sensor, VT, or CT output to the instrument.
Numeric averaging	Using one of the following methods, perform averaging on the normal or harmonic measurement items: voltage U, current I, power P, apparent power S, or reactive power Q. Power factor λ and phase difference angle Φ are determined from the averaged P and S values. AUX and Δ values are also averaged in the same manner. Select either exponential averages or moving averages. • Exponential average Select the attenuation constant from a value between 2 and 64. • Moving average Select the average count from a value between 8 and 64. • Harmonic measurement Only exponential averaging is valid.
Zero-level compensation/ Null	Performs zero-level compensation Null correction range Power measurement element: ±14% of range AUX module: Analog: ±60% of range Pulse: None NULL can be set on the voltage, current, and AUX separately on eachpower measurement element.
Frequency measurement	Measured item Measures the frequency of the voltage or current applied to an power measurement element. Measurement method: Reciprocal method Measurement range: 10 Hz ≤ f ≤ 5 MHz (the input is at least 30% of the measurement range rating) Time/div: 50 μs or higher • At least five waves within the monitoring period • Sampling/monitoring frequency ≥ 2.5 • 20 kHz frequency filter is ON at 20 kHz or less. • 2 kHz frequency filter is ON at 2 kHz or less. • 500 Hz frequency filter is ON at 500 Hz or less. • 100 Hz frequency filter is ON at 100 Hz or less. Accuracy: ±(0.1% of reading) Display resolution: 99999 Frequency measurement filter: Select OFF, 100 Hz, 500 Hz, 2 kHz, or 20 kHz.

Harmonic Measurement (Option)

Item	Specifications
Measured item	All installed power measurement elements
Method	PLL synchronization method (no external sampling clock)
Frequency range	Fundamental frequency of the PLL source is in the range of 20 Hz to 409.6 kHz (Except when the PLL source is EXTERNAL (external trigger input terminal), the fundamental frequency is in the range of 20 Hz to 6.4 kHz.). Sample rate is 2 MS/s or higher. T/div is 100 µs/div or higher. ACQ Time Base is set to Int.
PLL source	• Select the voltage current, or EXTERNAL (external trigger input terminal) of each power measurement element. • Select one for the PLL source (the PLL source can be changed and recomputing is possible) • 20 mA range or higher for direct current input range • Input level At least 50% of the measurement range rating • The conditions in which frequency filters are turned on are the same as those for frequency measurements.
Number of FFT points	8192 (analysis start point can be specified in the acquisition memory) The amount of acquisition data must be at least twice the window width.
Window function	Rectangular
Anti-aliasing filter	Set using the line filter
FFT Sample rate, window width, and upper limit of harmonic analysis	

Fundamental Frequency	FFT Sample Rate	Window Width	Upper Limit of Harmonic Analysis
20 Hz ≤ f ≤ 600 Hz	f×1024	8 waves	500th harmonic
600 Hz < f ≤ 1.2 kHz	f×512	16 waves	255th harmonic
1.2 kHz < f ≤ 2.6 kHz	f×256	32 waves	100th harmonic
2.6 kHz < f ≤ 6.4 kHz	f×128	64 waves	50th harmonic
6.4 kHz < f ≤ 409.6 kHz	f×64	128 waves	30th harmonic

* If the PLL source is EXTERNAL (external trigger input terminal), fundamental frequency of 6.4 kHz or less

Lower limit of sample rate

Fundamental Frequency	Lower limit of sample rate
20 Hz ≤ f ≤ 6.4 kHz	2 MS/s
6.4 kHz < f ≤ 12.8 kHz	5 MS/s
12.8 kHz < f ≤ 25.6 kHz	5 MS/s
25.6 kHz < f ≤ 51.2 kHz	10 MS/s
51.2 kHz < f ≤ 102.4 kHz	20 MS/s
102.4 kHz < f ≤ 204.8 kHz	50 MS/s
204.8 kHz < f ≤ 409.6 kHz	100 MS/s

* If the PLL source is EXTERNAL (external trigger input terminal), fundamental frequency of 6.4 kHz or less

Accuracy

Add the following accuracy values to the normal measurement accuracy values. However, this applies only to harmonics whose fundamental frequency is 20 Hz ≤ f ≤6.4 kHz.

- When line filter is off
  Voltage and Current: {0.001×f + 0.001×n }% of reading + 0.1% of range
  Power: {0.002×f + 0.002×n }% of reading + 0.2% of range
  f: Frequency at the harmonic order [kHz]
  n: Harmonic order
- Add the following accuracy values when the voltage range is 1.5 V to 10 V.
  Voltage: 1.5 mV
  Power: (1.5 mV/voltage range rating) × 100% of range
- Add the following accuracy values when the voltage range is 15 V to 100 V.
  Voltage: 15 mV
  Power: (15 mV/voltage range rating) × 100% of range
- Add the following accuracy values when the voltage range is 150 V to 1000 V.
  Voltage: 150 mV
  Power: (150 mV/voltage range rating) × 100% of range
- For the direct current input range, add the following accuracy values listed below.
  Current: 50 µA
  Power: (50 µA/current range rating) × 100% of range
- Add the following accuracy values when the external current sensor range is 50 mV to 500 mV.
  Current: 100 µV
  Power: (100 µV/external current sensor range rating) × 100% of range

Item	Specifications
	• Add the following accuracy values when the external current sensor range is 1 V to 10 V. Current: 1 mV Power: (1 mV/external current sensor range rating) × 100% of range • Add the following accuracy values when 100 kHz is exceeded. Voltage and Current: 0.3% of reading Power: 0.6% of reading • For nth order component input, add ({n/(m + 1)}/50)% of (the nth order reading) to the n + mth order and n – mth order of the voltage and current, and add ({n/(m + 1)}/25) [%] of (the nth order reading) to the n + mth order and n – mth order of the power. • Add the following accuracy values when the PLL source frequency is 40 Hz or less. Voltage and Current: (0.003×n)% of reading Power: (0.006×n)% of reading n: Harmonic order • When line filters are turned on Add the line filter influence to the accuracy values when the line filters are turned off. • Power figures that exceed 6.4 kHz are reference values.
Conditions	• The PLL source is a sine wave (with constant DC). • The power factor (λ) is 1. • The guaranteed accuracy ranges for frequency, voltage, and current, are the same as the guaranteed ranges for ordinary measurement.

Waveform Acquisition and Display

Item	Specifications
Acquisition mode	Normal, Envelope, Average
Record length	100 kP, 250 kP, 500 kP, 1 MP, 2.5 MP, 5 MP, 10 MP 25 MP, 50 MP (on models with the /M1 or /M2 option) 100 MP (on models with the /M2 option)
Zoom	Expand displayed waveforms along the time axis Expand up to two areas using separate magnification values Auto scrolling available
Display format	1, 2, 3, 4, 6, 8, 12, 16 divided windows of analog waveforms
Display interpolation	Select dot display of sample points (off), sine interpolation display, linear interpolation display, or pulse interpolation display.
Graticule	Select from three grid types.
Auxiliary display on and off	Scale values, waveform labels, and extra window can be turned on and off.
X-Y display	X-axis and Y-axis selectable from Un, In, Pn, AUXn, and MATHn. Up to four traces × two windows
Snapshot	The currently displayed waveforms can be retained on the screen. Snapshot waveforms can be saved and loaded.
Clear trace	Clears all displayed waveforms.
History	Up to 1000 entries (depending on the record length) A specific waveform, all waveforms, or average waveform can be displayed.

Vertical and Horizontal Control

Item	Specifications
Channel on/off	Un, In, Pn, AUXn, and MATHn can be turned on and off separately.
ALL CH menu	You configure the settings of all channels while displaying waveforms. (You can use a USB keyboard or mouse.)
Vertical axis zooming	×0.1 to ×100. You set the scale using upper and lower limits or switch between different scales.
Vertical position setting	Waveforms can be moved in the range of ±5 div from the center of the waveform display frame.
Scaling	Set the current sensor conversion ratio, VT ratio, CT ratio, and power coefficient in the range of 0.0001 to 99999.9999 when applying the external current sensor, VT, or CT output to the instrument.
Linear scaling	AX+B mode or P1-P2 mode can be specified separately for AUX modules (valid on AUX modules).
Roll mode	Roll mode is enabled automatically when the trigger mode is set to auto, auto level, single, or on-start, and the time axis setting is greater than or equal to 100 ms/div.

Analysis

Item	Specifications
Power computation (numeric)	Calculates voltage, current, power, delta computation, frequency measurement, and AUX value (torque, speed, or Pm) from acquired waveforms. Calculates apparent power, power factor, and the like from the voltage, current, and power. Σ computation.
Zooming and searching	You can search for and then expand and display a portion of the displayed waveform. You can choose from the following search methods. Edge: Searches for rising or falling edges Time: Searches using the specified date and time
History search feature	You can search through history waveforms for specified conditions. Zone search: The PX8000 displays waveforms that pass through or do not pass through a specified area on the screen. Parameter search: The PX8000 displays a waveform when the results of the automated measurement of its parameters meet the specified conditions.
Cursor measurement	Horizontal, Vertica1, H&V, Degree (only during T-Y display), Marker
Cursor measurement (harmonics)	Determines the 8192 points from the cursor position according to the frequency and recalculates harmonic data
Automated measurement of waveform parameters	Up to 24 parameters can be displayed (excluding pulse measurement channel) P-P, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +OvrShoot, -OvrShoot, Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, AvgFreq, AvgPeriod, Integ1TY, Integ2TY, Integ1XY, Integ2XY
Statistical processing	Applicable parameters: Results of automated measurement of waveform parameters Statistical parameters: Max, Min, Avg, Sdv, Cnt Maximum number of cycles: 64000 cycles (when there is one parameter) Maximum total number of parameters: 64000 Maximum measurement range: 100 Mpoint
Normal statistical processing	Statistical processing is performed while waveforms are acquired.
Cyclic statistical processing	The PX8000 automatically measures the waveform parameters of the data in the acquisition memory and performs statistical processing on the parameters once per period.
User-defined computation	Number of math waveforms: Up to 8 (Math1 to Math 8), up to 4 Mpoint can be calculated (for one channel) Equations can be created using the following operators. +, –, ×, ÷, SHIFT, ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, SQR, CUBE, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLBT, MEAN, LS-, RS-, PS-, PSD-, CS-, TF-, CH-, MAG, LOGMAG, PHASE, REAL, IMAG, TREND, TRENDM, TRENDD, TRENDF, _HH, _LL, _XX, ZC
User-defined function	Used to compute equations that are created by combining measurement function symbols and operators (up to 20 equations can be created). Equations can be created using the following operators. Operators: +, –, ×, ÷, ABS, SQR, SQRT, LOG, LOG10, EXP, NEG
Efficiency equation	Up to four efficiencies can be displayed by setting the items to measure with the efficiency equation.
Deskew	Adjusts the phase between voltage and current modules and between individual modules (not available for AUX modules)
GO/NO-GO determination	The following two types of determination are available. • Determination using zones on the screen • Determination using the results of automated measurement of waveform parameters The following operations can be performed at the time of determination: Output screen capture data, save waveform (binary, ASCII, floating, WDF binary) waveform data, notify with a buzzer, save numeric data
Re-execution of numeric computation	Numeric computation can be re-executed after changing the computation conditions.

File Function

Item	Specifications
Saving	Setup parameters, waveform data (including history data), numeric data, and screen capture data can be saved to a storage medium.
Loading	Waveform data (including history data) and setup parameters can be loaded from a storage medium. History: Up to 1000 entries (depending on the record length)

7.6 FFT

Item	Specifications
Computation items	Un, In, Pn, AUXn, MATHn
Number of channels	2
Computation range	From the specified computation start point until the specified number of points have been computed
Computed points	1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k
Time windows	Rect, Hanning, Hamming, FlatTop, Exponential When the Exponential time window is selected, the following settings must be configured. Damping rate: The weight of the last data point, with the weight of the first data point in the specified number of FFT points taken to be 100% (= 1). Selectable range: 1 to 100% Resolution: 1% Force1: Set the percentage of FFT points to use to perform computation from the beginning of the data. Selectable range: 1 to 100% Resolution: 1% Force2: This setting applies to the output (response) signal (second parameter) of a two-waveform FFT. Selectable range: 1 to 100% Resolution: 1%
Display window	The FFT computation results are displayed in a separate window from the normal waveform display. Display range: Set the display range by setting Center and Sensitivity.

7.7 Built-in Printer (Option)

Item	**Specifications**
Print system	Thermal line dot system
Dot density	8 dots/mm
Sheet width	112 mm
Effective recording width	104 mm (832 dots)
Function	Producing a hard copy of the screen

7.8 Storage

SD Card

Item	Specifications
Number of slots	1
Maximum capacity	32 GB
Compatible cards	SD and SDHC memory cards

USB Ports for Peripheral Devices

Item	Specifications
Compatible USB storage devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1
Available space	2 TB Partition format: MBR, format type: FAT32/FAT16

7.9 USB PERIPHERAL Interface

Item	Specifications
Number of ports	2
Connector type	USB type A (receptacle)
Electrical and mechanical	USB Rev. 2.0 compliant
Supported transfer modes	HS (High Speed; 480 Mbps), FS (Full Speed; 12 Mbps), LS (Low Speed; 1.5 Mbps)
Compatible devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1 104 or 109 keyboards that comply with USB HID Class Ver. 1.1 Mouse devices that comply with USB HID Class Ver. 1.1
Power supply	5 V, 500 mA (for each port)

7.10 Auxiliary I/O Section

External Trigger Input

Item	Specifications
Connector type	BNC
Input level	TTL
Minimum pulse width	100 ns
Detected edge	Rising or falling
Trigger delay	Within 100 ns + 1 sample

Trigger Output

Item	Specifications
Connector type	BNC
Output level	5V CMOS
Logic	Falls when trigger conditions are met and rises when acquisition is complete (Normal mode) Rises when trigger conditions are met and falls after a specified period of time has passed (Pulse mode)
Output delay	Within 100 ns + 1 sample Delay in the module: Within (deskew value of the trigger source + 21 µs)
Output hold time	100 ns or more

External Clock Input

Item	Specifications
Connector type	BNC
Input level	TTL
Minimum pulse width	50 ns
Detected edge	Rising
Sampling jitter	Within 100 ns + 1 sample
Frequency range	Up to 9.5 MHz

Video Signal Output

Item	Specifications
Connector type	D-sub 15 pin (receptacle)
Output type	Analog RGB output
Output resolution	XGA-compliant output, 1024 × 768 dots Approx. 60-Hz Vsync (66 MHz dot clock frequency)

GO/NO-GO Signal I/O

Item	Specifications
Connector type	RJ-11 modular jack
Input level	TTL or contact input
Output level	5V CMOS

External Start/Stop Input

Item	Specifications
Connector type	RJ-11 modular jack
Input level	TTL or contact input

COMP Output (Probe Compensation Signal Output Terminal)

Item	Specifications
Output signal frequency	1 kHz ± 1%
Output amplitude	1 Vp-p ± 10%

Probe Power Output (Option)

Item	Specifications
Output terminals	4
Output voltage	±12 V
Output current	Up to a total of 1 A

Time Sync Signal Input (IRIG, Option)

Item	Specifications
Input connector	BNC
Number of input connectors	1
Compatible IRIG signals	A002, B002, A132, B122
Input impedance	You can switch between 50 Ω and 5 kΩ.
Maximum input voltage	±8 V
Function	Synchronizing the PX8000 clock Sample clock synchronization
Clock sync range	±80 ppm
Post-sync accuracy	No drift from the input signal

Sensor Power Supply (Option)

Item	Specifications
Output terminals	4
Output voltage	±15 V
Output current	/PD : Up to 1A/output /PD2 : 1.8A/ output (up to 4A total of 4 output)

Safety Terminal Adapter (Voltage)

Item	Specifications
Maximum allowable current	36 A
Withstand voltage	1000 V CAT III
Contact resistance	10 mΩ or less
Contact section	Nickel plating on brass or bronze
Insulator	Polyamide
Core wire	Maximum diameter 1.8 mm
Insulation	Maximum diameter 3.9 mm

Safety Terminal Adapter (Current)

Item	Specifications
Maximum allowable current	36 A
Withstand voltage	1000 V CAT III
Contact resistance	10 mΩ or less
Contact section	Nickel plating on brass
Insulator	Polypropylene
Core wire	Maximum diameter 2.5 mm
Insulation	Maximum diameter 4.0 mm

7.11 Computer Interface

GP-IB Interface

Item	Specifications
Usable devices	National Instruments Corporation • PCI-GPIB or PCI-GPIB+ • PCIe-GPIB or PCIe-GPIB+ • PCMCIA-GPIB or PCMCIA-GPIB+ • GPIB-USB-HS Use driver NI-488.2M Ver. 1.60 or later.
Electrical and mechanical	Complies with IEEE St'd 488-1978 (JIS C 1901-1987)
Functional specifications	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, and C0
Protocol	Conforms to IEEE St'd 488.2-1992
Code	ISO (ASCII) codes
Mode	Addressable mode
Address	0 to 30
Clear remote mode	Press SHIFT+CLEAR TRACE to clear remote mode (except during Local Lockout).

Ethernet Interface

Item	Specifications
Ports	1
Connector type	RJ-45
Electrical and mechanical	IEEE802.3 compliant
Transmission system	Ethernet (1000BASE-T, 100BASE-TX, 10BASE-T)
Communication protocol	TCP/IP
Supported services	FTP server, DHCP, DNS, remote control (VXI-11), SNTP, and FTP client

USB PC Interface

Item	Specifications
Number of ports	1
Connector	Type B connector (receptacle)
Electrical and mechanical	Complies with USB Rev. 2.0
Supported transfer modes	HS (High Speed; 480 Mbps) and FS (Full Speed; 12 Mbps)
Supported protocols	USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0)
PC system requirements	A PC with a USB port, running the English or Japanese version of Windows 7 (32 bit), Windows Vista (32 bit), or Windows XP (32 bit, SP2 or later)

7.12 Displayed Items

Measurement Functions Used in Normal Measurement

Measurement Functions Determined for Each Power Measurement Element

For details about how the measurement function values are computed and determined, see appendix 1 in the Features Guide, IM PX8000-01EN.

Item	Symbols and Meanings
Voltage (V)	Urms: true rms value Umn: rectified mean value calibrated to the rms value Udc: simple average Urmn: current rectified mean value Uac: AC component
Current (A)	Irms: true rms value Imn: rectified mean value calibrated to the rms value Idc: simple average Irmn: current rectified mean value Iac: AC component
Active power (W)	P
Apparent power (VA)	S
Reactive power (var)	Q
Power factor	λ
Phase difference (°)	Φ
Frequency (Hz)	fU (FreqU): voltage frequency fI(FreqI): current frequency
Voltage max. and min. (V)	U+pk: maximum voltage, U-pk: minimum voltage
Current max. and min. (A)	I+pk: maximum current, I-pk: minimum current
Power max. and min. (W)	P+pk: maximum power, P-pk: minimum power
Crest factor (peak-to-rms ratio)	CfU: voltage crest factor, CfI: current crest factor
Corrected Power (W)	Pc Applicable standards IEC76-1 (1976), IEC76-1 (1993)

Measurement Functions (Σ Functions) Determined for Each Wiring Unit (ΣA and ΣB)

For details about how the Σ function values are computed and determined, see appendix 1 in the Features Guide, IM PX8000-01EN.

Item	Symbols and Meanings
Voltage (V)	UrmsΣ: true rms value UmnΣ: rectified mean value calibrated to the rms value UdcΣ: simple average UrmnΣ: current rectified mean value UacΣ: AC component
Current (A)	IrmsΣ: true rms value ImnΣ: rectified mean value calibrated to the rms value IdcΣ: simple average IrmnΣ: current rectified mean value IacΣ: AC component
Active power (W)	PΣ
Apparent power (VA)	SΣ
Reactive power (var)	QΣ
Power factor	$\lambda\Sigma$
Phase difference (°)	$\Phi\Sigma$
Corrected Power (W)	PcΣ Applicable standards IEC76-1 (1976), IEC76-1 (1993)

Other

Item	Symbols and Meanings
Efficiency	η1 to η4

Measurement Functions Used in Harmonic Measurement (Option)

Measurement Functions Determined for Each Power Measurement Element

Item	Symbols and Meanings	
Voltage (V)	U(k): rms voltage value of harmonic order k[1]	U: total rms voltage[2]
Current (A)	I(k): rms current value of harmonic order k	I: total rms current[2]
Active power (W)	P(k): active power of harmonic order k	P: total active power[2]
Apparent power (VA)	S(k): apparent power of harmonic order k	S: total apparent power[2]
Reactive power (var)	Q(k): reactive power of harmonic order k	Q: total reactive power[2]
Power factor	λ(k): power factor of harmonic order k	λ: total power factor[2]
Phase difference (°)	Φ(k): phase difference between the voltage and current of harmonic order k, Φ: total phase difference ΦU(k): phase difference between harmonic voltage U(k) and the fundamental wave U(1) ΦI(k): phase difference between harmonic current I(k) and the fundamental wave I(1)	
Load circuit impedance (Ω)	Z(k): impedance of the load circuit in relation to harmonic order k	
Load circuit resistance and reactance (Ω)	Rs(k): resistance of the load circuit in relation to harmonic order k when resistor R, inductor L, and capacitor C are connected in series Xs(k): reactance of the load circuit in relation to harmonic order k when resistor R, inductor L, and capacitor C are connected in series Rp(k): resistance of the load circuit in relation to harmonic order k when R, L, and C are connected in parallel Xp(k): reactance of the load circuit in relation to harmonic order k when R, L, and C are connected in parallel	
Harmonic distortion factor (%)	Uhdf(k): ratio of harmonic voltage U(k) to U(1) or U Ihdf(k): ratio of harmonic current I(k) to I(1) or I Phdf(k): ratio of harmonic active power P(k) to P(1) or P	
Total harmonic distortion (%)	Uthd: ratio of the total harmonic voltage to U(1) or U[3] Ithd: ratio of the total harmonic current to I(1) or I[3] Pthd: ratio of the total harmonic active power to P(1) or P[3]	
Telephone harmonic factor (applicable standard: IEC34-1 (1996))	Uthf: Voltage telephone harmonic factor Ithf: Current telephone harmonic factor	
Telephone influence factor (applicable standard: IEEE Std 100 (1996))	Utif: Voltage telephone influence factor Itif: Current telephone influence factor	
Harmonic voltage factor[4]	hvf: harmonic voltage factor	
Harmonic current factor[4]	hcf: harmonic current factor	
K-factor	Ratio of the squared sum weighted harmonic components to the squared sum of the harmonic currents	

1 Harmonic order k is an integer from 0 to the upper limit of harmonic analysis. The 0th order is the DC component. The upper limit is determined automatically according to the PLL source frequency. It can go up to the 500th harmonic order.
2 The total value is determined according to the equation on page App-3 in the User's Manual, IM PX8000-01EN, from the fundamental wave (1st harmonic) and all harmonic components (2nd harmonic to the upper limit of harmonic analysis). The DC component can also be included.
3 Total harmonic values are determined from all harmonic components (the 2nd harmonic to the upper limit of harmonic analysis) according to the equations on page App-4 in the User's Manual, IM PX8000-01EN,.
4 The expression may vary depending on the definitions in the standard. For details, see the corresponding standard.

Measurement Functions that Indicate Fundamental Voltage and Current Phase Differences between Power Measurement Elements

These measurement functions indicate the phase differences between the fundamental voltage U(1) of the smallest numbered element in a wiring unit and the fundamental voltages U(1) or currents I(1) of other elements. The following table indicates the measurement functions for a wiring unit that combines elements 1, 2, and 3.

Item	Symbols and Meanings
Phase angle U1-U2 (°)	ΦU1-U2: phase angle between the fundamental voltage of element 1, which is expressed as U1(1), and the fundamental voltage of element 2, which is expressed as U2(1)
Phase angle U1-U3 (°)	ΦU1-U3: phase angle between U1(1) and the fundamental voltage of element 3, U3(1)
Phase angle U1-I1 (°)	ΦU1-I1: phase angle between U1(1) and the fundamental current of element 1, I1(1)
Phase angle U2-I2 (°)	ΦU2-I2: phase angle between U2(1) and the fundamental current of element 2, I2(1)
Phase angle U3-I3 (°)	ΦU3-I3: phase angle between U3(1) and the fundamental current of element 3, I3(1)
Phase angle I1-I2 (°)	ΦI1-I2: phase angle between I1(1) and the fundamental current of element 2, I2(1)
Phase angle I2-I3 (°)	ΦI2-I3: phase angle between I2(1) and the fundamental current of element 3, I3(1)
Phase angle I3-I1 (°)	ΦI3-I1: phase angle between I3(1) and the fundamental current of element 1, I1(1)

Measurement Functions (Σ Functions) Determined for Each Wiring Unit (ΣA and ΣB)

Item	Symbols and Meanings	
Voltage (V)	UΣ(1): rms voltage of harmonic order 1	UΣ: total rms voltage[1]
Current (A)	IΣ(1): rms current of harmonic order 1	IΣ: total rms current[1]
Active power (W)	PΣ(1): active power of harmonic order 1	PΣ: total active power[1]
Apparent power (VA)	SΣ(1): apparent power of harmonic order 1	SΣ: total apparent power[1]
Reactive power (var)	QΣ(1): reactive power of harmonic order 1	QΣ: total reactive power[1]
Power factor	λΣ(1): power factor of harmonic order 1	λΣ: total power factor[1]

1 The total value is determined according to the equation on page App-3 in the User's Manual, IM PX8000-01EN, from the fundamental wave (1st harmonic) and all harmonic components (2nd harmonic to the upper limit of harmonic analysis). The DC component can also be included.

Measurement Functions of Normal Measurement and Harmonic Measurement

- Harmonics can be displayed from total (Total) or dc (0th order) up to 500th order. However, the numeric data up to the harmonic order corresponding to the upper limit of harmonic analysis that is automatically determined by the PLL source frequency is the data determined by harmonic measurement.
- Places where no measurement function is selected or where there is no numeric data are displayed as no data [-------].
- If Urms, Umn, Urmn, Uac, Udc, Irms, Imn, Irmn, Iac, or Idc exceeds 140% of the measurement range, overload display [-OL-] appears.
- For P, if either the measured voltage or current exceeds 140% of the measurement range, overload display [-OL-] appears.
- If the measured or computed result cannot be displayed using the specified decimal place or unit, overflow display [-OF-] appears.
- zero suppression: If Urms, Uac, Irms, or Iac is less than or equal to 0.3% of the measurement range or if Umn, Urmn, Imn, or Irmn is less than or equal to 2%, Urms, Umn, Urmn, Uac, Irms, Imn, Irmn, Iac, and measurement functions based on these measurement functions are suppressed to zero. For λ and Φ, error display [Error] appears.
- If the measured frequency is outside the measurement range, an error display [Error] appears for fU and fI.
- Phase difference Φ for lead (D) and lag (G) is displayed correctly only when both the voltage and current are sine waves and the ratio of the input to the measurement range is not greatly different between the voltage and current.
- If power factor λ is greater than 1 but less than or equal to 2, λ is displayed as 1. Φ is displayed as 0.
  If λ exceeds 2, an error display [Error] appears for λ and Φ.

Delta Computation Measurement Functions

Item	Delta Computation Setting	Symbols and Meanings
Voltage (V)	difference	ΔU1: differential voltage between u1 and u2 determined through computation
	3P3W->3V3A	ΔU1: unmeasured line voltage computed in a three-phase, three-wire system
	DELTA->STAR	ΔU1, ΔU2, ΔU3: phase voltage computed in a three-phase, three-wire (3V3A) system ΔUΣ=(ΔU1+ΔU2+ΔU3)/3
	STAR->DELTA	ΔU1, ΔU2, ΔU3: line voltage computed in a three-phase, four-wire system ΔUΣ=(ΔU1+ΔU2+ΔU3)/3
Current (A)	difference	ΔI: differential current between i1 and i2 determined through computation
	3P3W→3V3A	ΔI: unmeasured phase current
	DELTA->STAR	ΔI: neutral line current
	STAR->DELTA	ΔI: neutral line current
Power (W)	difference	———
	3P3W->3V3A	———
	DELTA->STAR	ΔP1, ΔP2, ΔP3: phase power computed in a three-phase, three-wire (3V3A) system ΔPΣ=ΔP1+ΔP2+ΔP3
	STAR->DELTA	———

AUX Computation Measurement Functions

When motor mode is on

Item	Symbols and Meanings
Rotating speed	Speed: Motor rotating speed
Torque	Torque: Motor torque
Monitor output (W)	Pm: Motor's mechanical output (mechanical power)

When motor mode is off

Item	Symbols and Meanings
Auxiliary input	Aux3 to Aux8

- Maximum display (OL conversion)
  Analog: Displays up to 140% of the range rating Overload display [-OL-] appears if 140% is exceeded.
  Pulse: Displays up to 2 MHz (OF display at 10 GHz or higher if scaling is used)
- Minimum display (zero suppression)
  Analog: None
  Pulse: Displays pulse frequency down to 1.8 Hz Frequencies less than 1.8 Hz are suppressed to zero.

7.13 Voltage, Current, and Power Accuracies (Power Measurement Element)

Item	Specifications
Accuracy (at 6 months)	Conditions

• Temperature	23 ± 5°C
• Humidity	30 to 75% RH
• Input waveform	Sine waves
• λ (power factor)	1
• Common-mode voltage	0 V
• Line filter	OFF
• Frequency filter	1 kHz or less when turned on
• Time/div	50 µs or higher

- At least five periods of the input signal and 10 kpoints of sampling data within the observation time
- The number of sampled points in a period is 5 or more.
- If the input signal is less than five periods or the sampling data is less than 10 kpoints, add the reference value (one-tenth the reading error)×(5/the number of periods)×(10k/the number of sampling data points)% of reading.
- After warm-up time has passed
- Wired condition after zero-level compensation or measurement range change

* The unit of f in the accuracy equations is kHz.

Voltage

Frequency	Accuracy ±(reading error + measurement range error)
DC:	±(0.2% of reading + 0.2% of range)
0.1 Hz ≤ f < 10 Hz:	±(0.2% of reading + 0.2% of range)
10 Hz ≤ f < 45 Hz:	±(0.2% of reading + 0.1% of range)
45 Hz ≤ f ≤ 1 kHz:	±(0.1% of reading + 0.1% of range)
1 kHz < f ≤ 10 kHz:	±(0.1% of reading + 0.1% of range)
10 kHz < f ≤ 50 kHz:	±(0.2% of reading + 0.2% of range)
50 kHz < f ≤ 100 kHz:	±(0.6% of reading + 0.4% of range)
100 kHz < f ≤ 200 kHz:	±(0.6% of reading + 0.4% of range)
200 kHz < f ≤ 400 kHz:	±(1% of reading + 0.4% of range)
400 kHz < f ≤ 500kHz:	±{(0.1 + 0.003 × f*)% of reading + 0.4% of range}
500 kHz < f ≤ 1 MHz:	±{(0.1 + 0.003 × f*)% of reading + 4% of range}
1 MHz < f ≤ 10MHz:	±{(0.1 + 0.003 × f*)% of reading + 4% of range}
Frequency bandwidth	20 MHz (–3dB, typical)

Current {5 A input}

Frequency	Accuracy ±(reading error + measurement range error)
DC:	±(0.2% of reading + 0.2% of range) +20µA
0.1 Hz ≤ f < 10 Hz:	±(0.2% of reading + 0.2% of range)
10 Hz ≤ f < 45 Hz:	±(0.2% of reading + 0.1% of range)
45Hz ≤ f ≤ 1KHz:	±(0.1% of reading + 0.1% of range)
1kHz < f ≤ 10kHz:	±(0.1% of reading + 0.1% of range)
10kHz < f ≤ 50kHz:	±(0.2% of reading + 0.2% of range)
50kHz < f ≤ 100kHz:	±(0.6% of reading + 0.4% of range)
100kHz < f ≤ 200kHz:	±(0.6% of reading + 0.4% of range)
200kHz < f ≤ 400kHz:	±(1% of reading + 0.4% of range)
400kHz < f ≤ 500kHz:	±{(0.1 + 0.004 × f*)% of reading + 0.4% of range}
500kHz < f ≤ 1MHz:	±{(0.1 + 0.004 × f*)% of reading + 4% of range}
Frequency bandwidth	10 MHz (–3dB, typical)

7.13 Voltage, Current, and Power Accuracies (Power Measurement Element)

Item	Specifications	
Accuracy (at 6 months)	Current {external current sensor input}	
	Frequency	Accuracy ±(reading error + measurement range error)
	DC:	±(0.2% of reading + 0.2% of range) + 50μV
	0.1Hz ≤ f < 10Hz:	±(0.2% of reading + 0.2% of range)
	10Hz ≤ f < 45Hz:	±(0.2% of reading + 0.1% of range)
	45Hz ≤ f ≤ 1KHz:	±(0.1% of reading + 0.1% of range)
	1kHz < f ≤ 10kHz:	±(0.1% of reading + 0.1% of range)
	10kHz < f ≤ 50kHz:	±(0.2% of reading + 0.2% of range)
	50kHz < f ≤ 100kHz:	±(0.6% of reading + 0.4% of range)
	100kHz < f ≤ 200kHz:	±(0.6% of reading + 0.4% of range)
	200kHz < f ≤ 400kHz:	±(1% of reading + 0.4% of range)
	400kHz < f ≤ 500kHz:	±{(0.1 + 0.003 × f*)% of reading + 0.4% of range}
	500kHz < f ≤ 1MHz:	±{(0.1 + 0.003 × f*)% of reading + 4% of range}
	1MHz < f ≤ 10MHz:	±{(0.1 + 0.003 × f*)% of reading + 4% of range}
	Frequency bandwidth	20 MHz (–3dB, typical)
	Power {5 A input}	
	Frequency	Accuracy ±(reading error + measurement range error)
	DC:	±(0.2% of reading + 0.4% of range) +20μA×U*
	0.1Hz ≤ f < 10Hz:	±(0.2% of reading + 0.2% of range)
	10Hz ≤ f < 45Hz:	±(0.2% of reading + 0.1% of range)
	45Hz ≤ f ≤ 1KHz:	±(0.1% of reading + 0.1% of range)
	1kHz < f ≤ 10kHz:	±(0.1% of reading + 0.16% of range)
	10kHz < f ≤ 50kHz:	±(0.2% of reading + 0.2% of range)
	50kHz < f ≤ 100kHz:	±(0.6% of reading + 0.4% of range)
	100kHz < f ≤ 200kHz:	±(1.5% of reading + 0.6% of range)
	200kHz < f ≤ 400kHz:	±(1.5% of reading + 0.6% of range)
	400kHz < f ≤ 500kHz:	±{(0.1 + 0.006 × f*)% of reading + 0.6% of range}
	500kHz < f ≤ 1MHz:	±{(0.1 + 0.006 × f*)% of reading + 6% of range}
	* U is the voltage reading (V).	
	Power {external current sensor input}	
	Frequency	Accuracy ±(reading error + measurement range error)
	DC:	±(0.2% of reading + 0.4% of range) + 50μV×U*
	0.1Hz ≤ f < 10Hz:	±(0.2% of reading + 0.2% of range)
	10Hz ≤ f < 45Hz:	±(0.2% of reading + 0.1% of range)
	45Hz ≤ f ≤ 1KHz:	±(0.1% of reading + 0.1% of range)
	1kHz < f ≤ 10kHz:	±(0.1% of reading + 0.16% of range)
	10kHz < f ≤ 50kHz:	±(0.2% of reading + 0.2% of range)
	50kHz < f ≤ 100kHz:	±(0.6% of reading + 0.4% of range)
	100kHz < f ≤ 200kHz:	±(1.5% of reading + 0.6% of range)
	200kHz < f ≤ 400kHz:	±(1.5% of reading + 0.6% of range)
	400kHz < f ≤ 500kHz:	±{(0.1 + 0.004 × f*)% of reading + 0.6% of range}
	500kHz < f ≤ 1MHz:	±{(0.1 + 0.004 × f*)% of reading + 6% of range}
	* U is the voltage reading (V).	

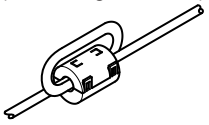
- Reference values for 1 MHz and higher
- Typical values represent typical or average values. They are not strictly guaranteed.
- For the external current sensor range of 50 mV to 500 mV or direct current input range (10 mA to 200 mA) and input frequency of 1 kHz to 50 kHz, add ±(0.2% of reading) to the current accuracies.
- For the external current sensor range of 50 mV to 500 mV or direct current input range (10 mA to 200 mA) and input frequency of 1 kHz to 50 kHz, add ±(0.2% of reading) to the power accuracies.
- If the input is 400 Vrms or higher, add (rated range)/(maximum range) × 0.005× f of reading to the voltage and power accuracies.
  f: Frequency (kHz)

Item	Specifications
Influence of input range of measurement ranges	With sine wave input at 110% to 140% of the range rating: Double the reading error With DC input at ±(110% to 200%) of the range rating: Double the reading error
Influence of temperature change (Influence of temperature changes after zero-level compensation or range change)	Add to the DC voltage accuracies: 0.02% of range/°C Add to the DC current accuracies: 20 μA/°C Add to the external current sensor input DC accuracies: 50μV/°C Add to the DC power accuracies: Sum of voltages × sum of currents
Influence of self-generated heat	Influence of self-generated heat caused by voltage input Add the following to the voltage accuracies. AC input signal: 0.0000001 × U^2% of reading DC input signal: 0.0000001 × U^2% of reading + 0.0000001 × U^2% of range U is the voltage reading (V). Even if the voltage input decreases, the influence from self-generated heat continues until the temperature of the input resistor decreases. Influence of self-generated heat caused by current input Add the following to the current accuracies. AC input signal: 0.006 × I^2% of reading DC input signal: 0.006 × I^2% of reading + 0.004 × I^2 mA I is the current reading (A). Influence of self-generated heat caused by power Add the following to the power accuracies. AC input signal: 0.0000001 × U^2% of reading 0.006 × I^2% of reading DC input signal: 0.0000001 × U^2% of reading + 0.0000001 × U^2% of range 0.006 × I^2% of reading + 0.004 × I^2 ×U mW U is the voltage reading (V). I is the current reading (A). Even if the voltage input decreases, the influence from self-generated heat continues until the temperature of the input resistor decreases.
Accuracy-guaranteed input range	Accuracy-guaranteed ranges for frequency and voltage All accuracy figures for 0.1 Hz to 10 Hz are reference values. The voltage and power accuracy figures for DC and 30 kHz to 100 kHz when the voltage exceeds 750 V are reference values. Accuracy-guaranteed ranges for frequency and current All accuracy figures for 0.1 Hz to 10 Hz are reference values. The current and power accuracy figures for 100 kHz to 1 MHz when the current exceeds 5 A are reference values.
Effective input range	Udc, Idc: 0 to ±110% of the measurement range Urms, Irms: 1 to 110% of the measurement range Umn, Imn: 10 to 110% of the measurement range Urmn, Irmn: 10 to 110% of the measurement range DC power measurement: 0 to ±110%; AC power measurement: 1% to 110% of the voltage and current ranges; up to ±110% of the power range However, the synchronization source level must meet the frequency measurement input signal level.
Line filter influence	Voltage, current, external current sensor 45 to 66 Hz: Add 0.2% of reading. Less than 45 Hz: Add 0.5% of reading. Cutoff frequency/10: Add 0.8% of reading (except 500 Hz filter). Power 45 to 66 Hz: Add 0.3% of reading. Less than 45 Hz: Add 1% of reading. Cutoff frequency/10: Add 1.5% of reading (except 500 Hz filter).
Temperature coefficient influence	Temperature coefficient Add ±0.02% of reading/°C within the range of 5 to 18°C or 28 to 40°C. At frequencies less than or equal to 10 kHz
Power factor influence	When power factor (λ) = 0 (S: apparent power) ±0.15% of S for 45 Hz ≤ f ≤ 66 Hz. Other frequencies (reference data) ± (0.017× f)% of S At 0.15% of apparent power reading or higher f is frequency of input signal in kHz. When 0 < power factor < 1 (φ: phase angle of the voltage and current) (power reading) × [(power reading error %) + (power range error %) × (power range/indicated apparent power value) + {tanφ × (influence when λ = 0)%}]

7.13 Voltage, Current, and Power Accuracies (Power Measurement Element)

Item	Specifications
Apparent power accuracy	Voltage accuracy + current accuracy
Reactive power accuracy	Accuracy of apparent power + $\{\sqrt{(1.0004 - \lambda^2)} - \sqrt{(1 - \lambda^2)}\} \times 100$ % of range
Power factor λ accuracy	± [(λ − λ/1.0002)+|cosΦ−cos{Φ+sin^{-1}(influence % of the power factor when λ=0)/100)}|] ± 1 digit when voltage, current, and external current sensor are at rated input of the measurement range
Phase angle Φ accuracy	± [|Φ−cos^{-1}(λ/1.0002)|+sin^{-1}\{(influence % of the power factor when λ=0)/100}]deg ± 1 digit when voltage, current, and external current sensor are at rated input of the measurement range
Lead and lag detection (Phase angle φ's D (lead) and G (lag))	The lead and lag of the voltage and current inputs can be detected correctly for the following: Sine waves At least 50% of the measurement range Frequency: 10 Hz to 10 kHz Phase difference: ± (5° to 175°) * 1/2 the cutoff frequency or lower when the frequency filter is on (except, 60 Hz or less when the 100 Hz filter is on)
Peak measurement	Measures the peak (max, min) value of voltage, current, or power from the instantaneous voltage, instantaneous current, or instantaneous power that is sampled. Sampling data (instantaneous value) accuracy: ±4% of range (designed value) (10 mA range: ±6% of range (designed value)) Excludes errors due to sampling resolution and analog bandwidth limitations
Accuracy at 1 year	(Guaranteed accuracy period 1 year) 1.5 times the reading errors for the accuracy at 6 months

7.14 General Specifications

Item	Specifications
Standard operating conditions	Ambient temperature: 23 ± 5°C Ambient humidity: 20 to 80% RH Supply voltage and frequency error: Within ±1% of rating After the module has been warmed up for approximately 30 minutes and calibration has then been performed
Warm-up time	At least 30 minutes
Operating temperature	5 to 40°C when the PX8000 is installed horizontally. 5 to 35°C when the PX8000 is installed with the rear panel facing down. Humidity 20 to 80%RH (when the printer is not used; no condensation) 35 to 80%RH (when the printer is used; no condensation)
Operating altitude	2000 m or less
Installation location	Indoors
Storage temperature	–20 to 60°C (no condensation)
	Humidity: 20 to 80%RH (no condensation)
Storage altitude	3000 m or less
Rated supply voltage	100 to 120 VAC, 220 to 240 VAC (auto switching)
Permitted supply voltage range	90 to 132 VAC, 198 to 264 VAC
Rated supply frequency	50/60 Hz
Permitted power supply frequency range	48 to 63 Hz
Power fuse	Built in (not replaceable)
Maximum power consumption	200 VA (when the built-in printer is used)
Maximum power consumption (when /PD, or /PD2 is selected)	400 VA (when the built-in printer is used)
External dimensions	Approx. 355 mm (W) × 259 mm (H) × 180 mm (D), excluding the handle and protrusions
External dimensions (when /PD, or /PD2 is selected)	Approx. 355 mm (W) × 259 mm (H) × 245 mm (D), excluding the handle and protrusions
Weight	Approx. 6.5 kg (main unit only with /B5/C20/G5/M2/P4 installed, excluding recording paper)
Weight (when /PD, or /PD2 is selected)	Approx. 7.6 kg (main unit only with /B5/C20/G5/M2/P4/PD /PD2 installed, excluding recording paper)
Instrument cooling method	Forced air Air vents on the left and top panels
Instrument cooling method (when /PD, or /PD2 is selected)	Forced air. Air vents on the left and top panels Forced air. Main unit: Air vents on the left and top panels, rear section (/PD, or PD2): air vents on the top panel
Battery backup	Setup parameters and the internal clock are backed up with a lithium battery.
Backup battery life	Approx. five years (at an ambient temperature of 25°C)
Safety standards[1]	EN 61010-1, EN 61010-2-030, EN 60825-1 Installation category (overvoltage category) CAT II Measurement category CAT II Pollution degree 2
Emission[1]	Compliant standards EN 61326-1 Class A EN 61326-2-1 EN 55011 Class A, Group1 EN 61000-3-2 EN 61000-3-3 RCM EN 55011 Class A, Group 1 Korea Electromagnetic Conformity Standard (한국 전자파적합성기준) This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference. Cable conditions EXT CLK/TRIG OUT/TRIG IN Use BNC cables.[5] Attach a ferrite core[7] to the PX8000 side of the cable. AUX input terminals Use isolated probes (700929) (with the tip shorted). Attach a ferrite core[7] to the PX8000 end of the cable by passing the cable twice through the core (see the figure below). 

7.14 General Specifications

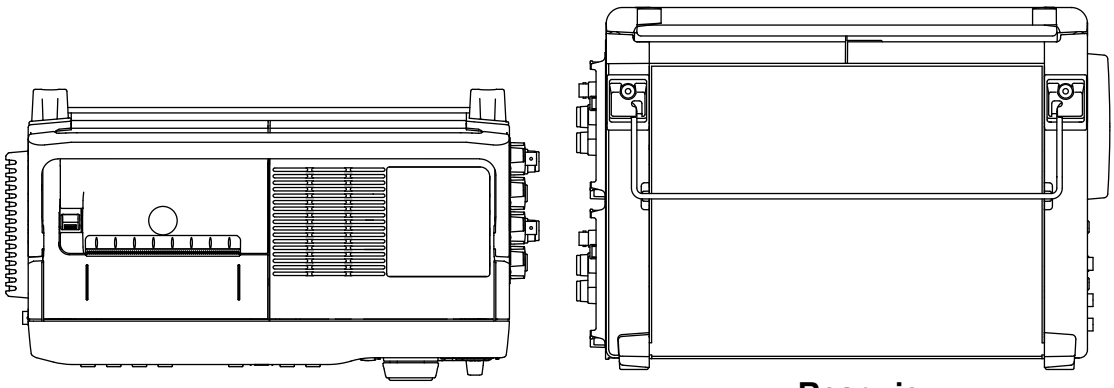
Item	Specifications
	GP-IB interface connector Use shielded GP-IB cables.[5] Attach a ferrite core[8] to the PX8000 side of the cable. USB port (PC) Use a shielded USB cable.[5] Attach a ferrite core[7] to the PX8000 side of the cable. USB port (for peripheral devices) Use a USB keyboard that has a shielded cable.[5] Attach a ferrite core[7] to the PX8000 side of the cable. Ethernet port Use a category 5 or better Ethernet cable (STP).[6] Attach a ferrite core[7] to the PX8000 side of the cable. IRIG cable Use BNC cables.[5] Attach a ferrite core[7] to the PX8000 side of the cable. Video signal output cable Use a shielded cable.[5] Attach a ferrite core[8] to the PX8000 side of the cable. External I/O cable Use a shielded cable.[5] Attach a ferrite core[8] to the PX8000 side of the cable. Probe power cable Attach a ferrite core[7] to the PX8000 end of the cable by passing the cable twice through the core. Current sensor cable Use the dedicated cable.
Immunity[1]	Compliant standards EN 61326-1 Table 2 (for use in industrial locations) EN 61326-2-1 Influence in the immunity environment Signal input 760811 Within ±20% of range (numeric value) 760812 Direct input: Within ±20% of range (numeric value) External current sensor input: Within ±300 mV (numeric value) 760813 Within ±20% of range (numeric value) 760851 ≤±50 mV (envelope mode, input 1:1, 50 mV range conversion) Cable conditions Same as the cable conditions for emission above.
Environmental standard[1]	Compliant Standards EN 50581 Monitoring and control instruments including industrial monitoring and control instruments

1 Applies to products with CE marks. For information on other products, contact your nearest YOKOGAWA dealer.
2 The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. CAT II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.
3 This instrument is a measurement category II product. Do not use it for measurement category III or IV measurements.
Measurement category O applies to measurement of other types of circuits that are not directly connected to a main power source.
Measurement Category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board, and to measurement performed on such wiring.
Measurement category III applies to measurement of facility circuits, such as distribution boards and circuit breakers.
Measurement category IV applies to measurement of power source circuits, such as entrance cables to buildings and cable systems, for low-voltage installations.
4 Use cables of length 3 m or less.
5 Use cables of length 3 m or less.
6 Use cables of length 30 m or less.
7 (TDK ZCAT2035-0930A, YOKOGAWA part No.: A1190MN)
8 (TDK ZCAT3035-1130, YOKOGAWA part No.: A1179MN)

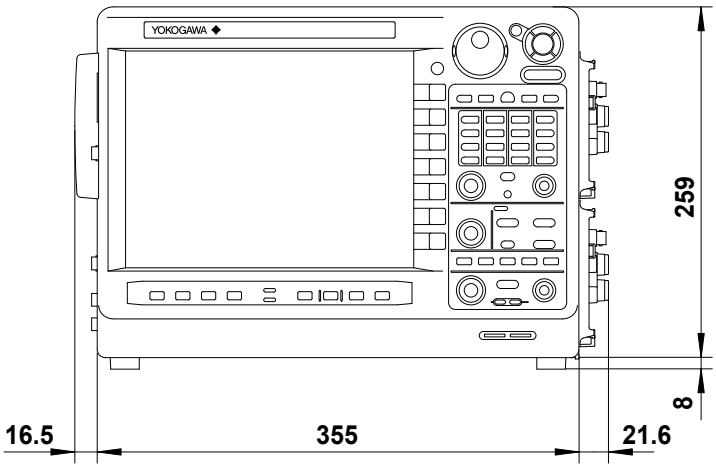
7.15 External Dimensions

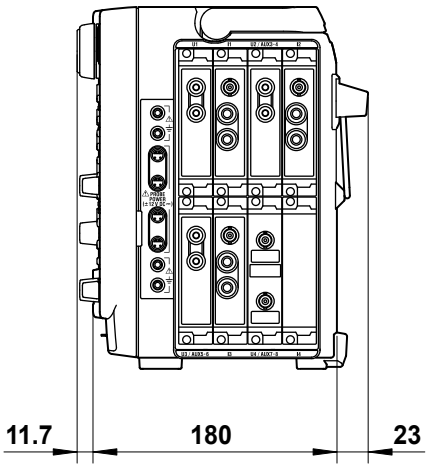
Unit: mm

Unless otherwise specified, tolerances are ±3% (however, tolerances are ±0.3 mm when below 10 mm).

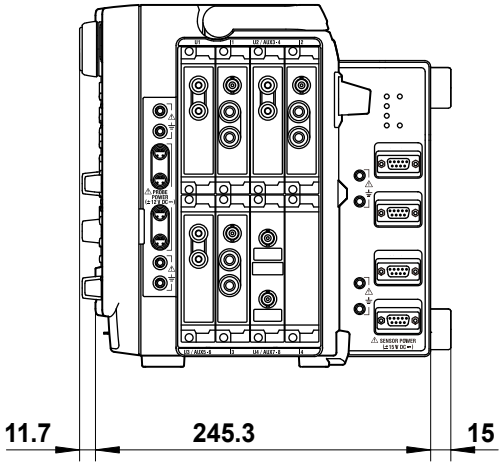


Rear view





Models with the Sensor Power Supply (/PD, or PD2) Option



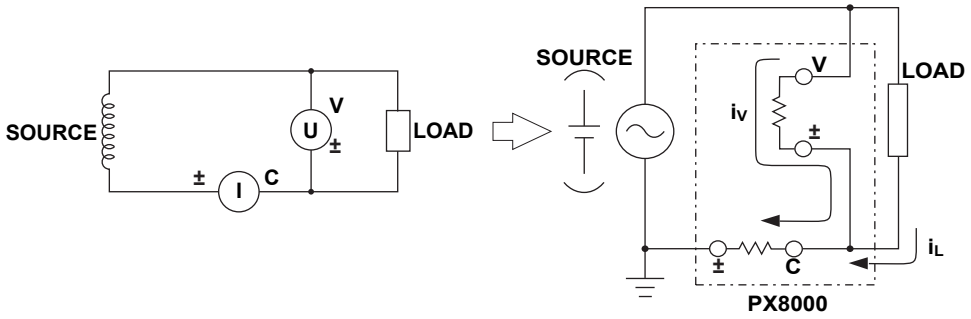
Appendix 1 How to Make Accurate Measurements

Effects of Power Loss

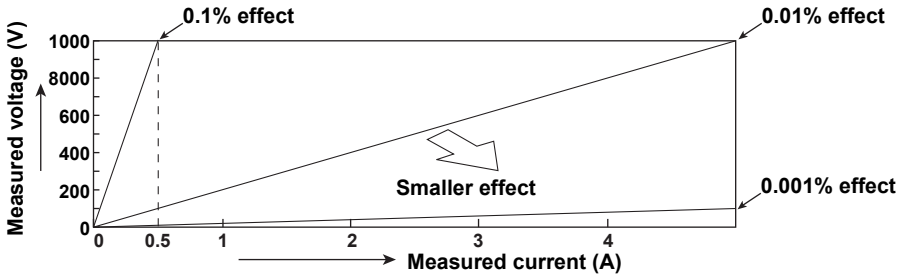
By wiring a circuit to match the load, you can minimize the effects of power loss on measurement accuracy. We will discuss the wiring of the DC power supply (SOURCE) and a load resistance (LOAD) below.

When the Measured Current Is Relatively Large

Connect the voltage measurement circuit between the current measurement circuit and the load. The current measurement circuit measures the sum of i_L and i_V. i_L is the current flowing through the load of the circuit under measurement, and i_V is the current flowing through the voltage measurement circuit. Because the current flowing through the circuit under measurement is i_L, only i_V reduces measurement accuracy. The input resistance of the voltage measurement circuit of the PX80000 is approximately 2 MΩ. If the input voltage is 600 V, i_V is approximately 0.3 mA (600 V/2 MΩ). If the load current i_L is 3 A or more (the load resistance is 200 Ω or less), the effect of i_V on the measurement accuracy is 0.01% or less. If the input voltage is 100 V and the current is 5 A, i_V = 0.05 mA (100 V/2 MΩ), so the effect of i_V on the measurement accuracy is 0.001% (0.05 mA/5 A).

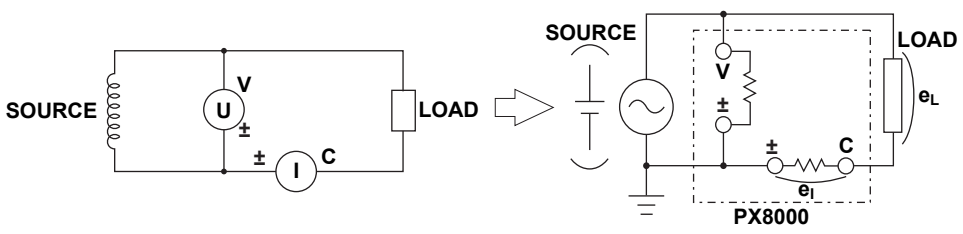


As a reference, the relationships between the voltages and currents that produce effects of 0.01%, 0.001%, and 0.0001% are shown in the figure below.



When the Measured Current Is Relatively Small

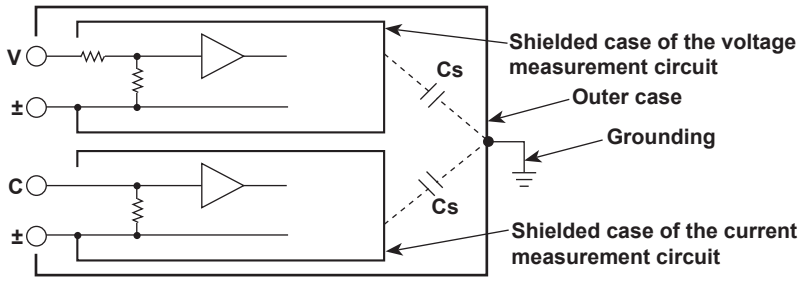
Connect the current measurement circuit between the voltage measurement circuit and the load. In this case, the voltage measurement circuit measures the sum of e_L and e_I. e_L is the load voltage, and e_I is the voltage drop across the current measurement circuit. Only e_I reduces measurement accuracy. For example, the input resistance of the current measurement circuit of the PX8000 is approximately 100 mΩ. If the load resistance is 1 kΩ, the effect on the measurement accuracy is approximately 0.01% (100 mΩ/1 kΩ).



Effects of Stray Capacitance

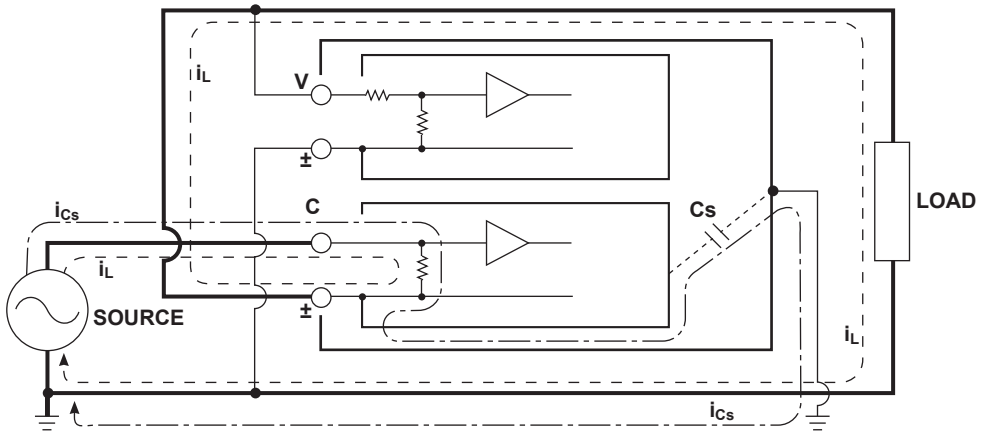
The effects of stray capacitance on measurement accuracy can be minimized by connecting the PX8000 current input terminal to the side of the power supply (SOURCE) that is closest to its earth potential.

The internal structure of the PX8000 is explained below.
The voltage and current measurement circuits are each enclosed in shielded cases. These shielded cases are contained within an outer case. The shielded case of the voltage measurement circuit is connected to the positive and negative voltage input terminals, and the shielded case of the current measurement circuit is connected to the positive and negative current input terminals.
Because the outer case is insulated from the shielded cases, there is stray capacitance, which is expressed as Cs. Cs is approximately 40 pF. The current generated by stray capacitance Cs causes errors.



As an example, we will consider the case when the outer case and one side of the power supply are grounded.
In this case, there are two conceivable current flows, i_L and i_{Cs}. i_L is the load current, and i_{Cs} is the current that flows through the stray capacitance. i_L flows through the current measurement circuit, then through the load, and returns to the power supply (shown with a dotted line). i_{Cs} flows through the current measurement circuit, the stray capacitance, and the earth ground of the outer case, and then returns to the power supply (shown with a dot-dash line).
Therefore, the current measurement circuit ends up measuring the sum of i_L and i_{Cs}, even if the objective is just to measure i_L. Only i_{Cs} reduces measurement accuracy. If the voltage applied to Cs is V_{Cs} (common mode voltage), i_{Cs} can be found using the equation shown below. Because the phase of i_{Cs} is ahead of the voltage by 90°, the effect of i_{Cs} on the measurement accuracy increases as the power factor gets smaller.

$$i_{Cs} = V_{Cs} \times 2\pi f \times C_s$$



Because the PX8000 measures high frequencies, the effects of i_{Cs} cannot be ignored.
If you connect the PX8000 current input terminal to the side of the power supply (SOURCE) that is close to its earth potential, the PX80000 current measurement circuit positive and negative terminals are close to the earth potential, so V_{Cs} becomes approximately zero and very little i_{Cs} flows. This reduces the effect on measurement accuracy.

Appendix 2 Relationship between the Time Axis Setting, Record Length, and Sample Rate

When the Record Length Is 100 kpoint, 250 kpoint, 500 kpoint, or 1 Mpoint

Time/div	Record Length							
	100 kpoint		250 kpoint		500 kpoint		1 Mpoint	
	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)
100 ns	100 M	100	100 M	100	100 M	100	100 M	100
200 ns	100 M	200	100 M	200	100 M	200	100 M	200
500 ns	100 M	500	100 M	500	100 M	500	100 M	500
1 µs	100 M	1 k	100 M	1 k	100 M	1 k	100 M	1 k
2 µs	100 M	2 k	100 M	2 k	100 M	2 k	100 M	2 k
5 µs	100 M	5 k	100 M	5 k	100 M	5 k	100 M	5 k
10 µs	100 M	10 k	100 M	10 k	100 M	10 k	100 M	10 k
20 µs	100 M	20 k	100 M	20 k	100 M	20 k	100 M	20 k
50 µs	100 M	50 k	100 M	50 k	100 M	50 k	100 M	50 k
100 µs	100 M	100 k	100 M	100 k	100 M	100 k	100 M	100 k
200 µs	50 M	100 k	100 M	200 k	100 M	200 k	100 M	200 k
500 µs	20 M	100 k	50 M	250 k	100 M	500 k	100 M	500 k
1 ms	10 M	100 k	20 M	200 k	50 M	500 k	100 M	1 M
2 ms	5 M	100 k	10 M	200 k	20 M	400 k	50 M	1 M
5 ms	2 M	100 k	5 M	250 k	10 M	500 k	20 M	1 M
10 ms	1 M	100 k	2 M	200 k	5 M	500 k	10 M	1 M
20 ms	500 k	100 k	1 M	200 k	2 M	400 k	5 M	1 M
50 ms	200 k	100 k	500 k	250 k	1 M	500 k	2 M	1 M
100 ms	100 k	100 k	200 k	200 k	500 k	500 k	1 M	1 M
200 ms	50 k	100 k	100 k	200 k	200 k	400 k	500 k	1 M
500 ms	20 k	100 k	50 k	250 k	100 k	500 k	200 k	1 M
1 s	10 k	100 k	20 k	200 k	50 k	500 k	100 k	1 M
2 s	5 k	100 k	10 k	200 k	20 k	400 k	50 k	1 M
3 s	2 k	60 k	5 k	150 k	10 k	300 k	20 k	600 k
4 s	2 k	80 k	5 k	200 k	10 k	400 k	20 k	800 k
5 s	2 k	100 k	5 k	250 k	10 k	500 k	20 k	1 M
6 s	1 k	60 k	2 k	120 k	5 k	300 k	10 k	600 k
8 s	1 k	80 k	2 k	160 k	5 k	400 k	10 k	800 k
10 s	1 k	100 k	2 k	200 k	5 k	500 k	10 k	1 M
20 s	500	100 k	1 k	200 k	2 k	400 k	5 k	1 M
30 s	200	60 k	500	150 k	1 k	300 k	2 k	600 k
1 min	100	60 k	200	120 k	500	300 k	1 k	600 k
2 min	50	60 k	200	240 k	200	240 k	500	600 k

When the time axis setting is 100 ms or greater (the settings surrounded by bold lines) and the trigger mode is Auto or Auto Level, waveforms are displayed in roll mode.

When the Record Length Is 2.5 Mpoint, 5 Mpoint, 10 Mpoint, or 25 Mpoint

Time/div	Record Length							
	2.5 Mpoint		5 Mpoint		10 Mpoint		25 Mpoint	
	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)
100 ns	100 M	100	100 M	100	100 M	100	100 M	100
200 ns	100 M	200	100 M	200	100 M	200	100 M	200
500 ns	100 M	500	100 M	500	100 M	500	100 M	500
1 µs	100 M	1 k	100 M	1 k	100 M	1 k	100 M	1 k
2 µs	100 M	2 k	100 M	2 k	100 M	2 k	100 M	2 k
5 µs	100 M	5 k	100 M	5 k	100 M	5 k	100 M	5 k
10 µs	100 M	10 k	100 M	10 k	100 M	10 k	100 M	10 k
20 µs	100 M	20 k	100 M	20 k	100 M	20 k	100 M	20 k
50 µs	100 M	50 k	100 M	50 k	100 M	50 k	100 M	50 k
100 µs	100 M	100 k	100 M	100 k	100 M	100 k	100 M	100 k
200 µs	100 M	200 k	100 M	200 k	100 M	200 k	100 M	200 k
500 µs	100 M	500 k	100 M	500 k	100 M	500 k	100 M	500 k
1 ms	100 M	1 M	100 M	1 M	100 M	1 M	100 M	1 M
2 ms	100 M	2 M	100 M	2 M	100 M	2 M	100 M	2 M
5 ms	50 M	2.5 M	100 M	5 M	100 M	5 M	100 M	5 M
10 ms	20 M	2 M	50 M	5 M	100 M	10 M	100 M	10 M
20 ms	10 M	2 M	20 M	4 M	50 M	10 M	100 M	20 M
50 ms	5 M	2.5 M	10 M	5 M	20 M	10 M	50 M	25 M
100 ms	2 M	2 M	5 M	5 M	10 M	10 M	20 M	20 M
200 ms	1 M	2 M	2 M	4 M	5 M	10 M	10 M	20 M
500 ms	500 k	2.5 M	1 M	5 M	2 M	10 M	5 M	25 M
1 s	200 k	2 M	500 k	5 M	1 M	10 M	2 M	20 M
2 s	100 k	2 M	200 k	4 M	500 k	10 M	1 M	20 M
3 s	50 k	1.5 M	100 k	3 M	200 k	6 M	500 k	15 M
4 s	50 k	2 M	100 k	4 M	200 k	8 M	500 k	20 M
5 s	50 k	2.5 M	100 k	5 M	200 k	10 M	500 k	25 M
6 s	20 k	1.2 M	50 k	3 M	100 k	6 M	200 k	12 M
8 s	20 k	1.6 M	50 k	4 M	100 k	8 M	200 k	16 M
10 s	20 k	2 M	50 k	5 M	100 k	10 M	200 k	20 M
20 s	10 k	2 M	20 k	4 M	50 k	10 M	100 k	20 M
30 s	5 k	1.5 M	10 k	3 M	20 k	6 M	50 k	15 M
1 min	2 k	1.2 M	5 k	3 M	10 k	6 M	20 k	12 M
2 min	2 k	2.4 M	2 k	2.4 M	5 k	6 M	20 k	24 M

When the time axis setting is 100 ms or greater (the settings surrounded by bold lines) and the trigger mode is Auto or Auto Level, waveforms are displayed in roll mode.

When the Record Length Is 50 Mpoint or 100 Mpoint

Time/div	Record Length			
	50 Mpoint		100 Mpoint	
	Sample Rate (S/s)	Display Record Length (Points)	Sample Rate (S/s)	Display Record Length (Points)
100 ns	100 M	100	100 M	100
200 ns	100 M	200	100 M	200
500 ns	100 M	500	100 M	500
1 µs	100 M	1 k	100 M	1 k
2 µs	100 M	2 k	100 M	2 k
5 µs	100 M	5 k	100 M	5 k
10 µs	100 M	10 k	100 M	10 k
20 µs	100 M	20 k	100 M	20 k
50 µs	100 M	50 k	100 M	50 k
100 µs	100 M	100 k	100 M	100 k
200 µs	100 M	200 k	100 M	200 k
500 µs	100 M	500 k	100 M	500 k
1 ms	100 M	1 M	100 M	1 M
2 ms	100 M	2 M	100 M	2 M
5 ms	100 M	5 M	100 M	5 M
10 ms	100 M	10 M	100 M	10 M
20 ms	100 M	20 M	100 M	20 M
50 ms	100 M	50 M	100 M	50 M
100 ms	50 M	50 M	100 M	100 M
200 ms	20 M	40 M	50 M	100 M
500 ms	10 M	50 M	20 M	100 M
1 s	5 M	50 M	10 M	100 M
2 s	2 M	40 M	5 M	100 M
3 s	1 M	30 M	2 M	60 M
4 s	1 M	40 M	2 M	80 M
5 s	1 M	50 M	2 M	100 M
6 s	500 k	30 M	1 M	60 M
8 s	500 k	40 M	1 M	80 M
10 s	500 k	50 M	1 M	100 M
20 s	200 k	40 M	500 k	100 M
30 s	100 k	30 M	200 k	60 M
1 min	50 k	30 M	100 k	60 M
2 min	20 k	24 M	50 k	60 M

When the time axis setting is 100 ms or greater (the settings surrounded by bold lines) and the trigger mode is Auto or Auto Level, waveforms are displayed in roll mode.

Appendix 3 Relationship between the Record Length and the Acquisition Mode

Maximum Record Length That Can Be Set

The maximum record length for each model is indicated below.

Model		
Standard	**/M1 (50 M)**	**/M2 (100 M)**
10 M	50 M	100 M

Unit of record length: Point

Maximum Number of History Waveform Acquisitions

The maximum number of acquisitions varies for each module as indicated below.

Record Length	Number of Waveforms		
	Standard Model (10 Mpoint)	**/M1 Option (50 Mpoint)**	**/M2 Option (100 Mpoint)**
100 kpoint	100	400	1000
250 kpoint	40	200	400
500 kpoint	20	100	200
1 Mpoint	10	40	100
2.5 Mpoint	4	20	40
5 Mpoint	1	10	20
10 Mpoint	1	4	10
25 Mpoint	-	1	3
50 Mpoint	-	1	1
100 Mpoint	-	-	1

* -: This record length cannot be set.