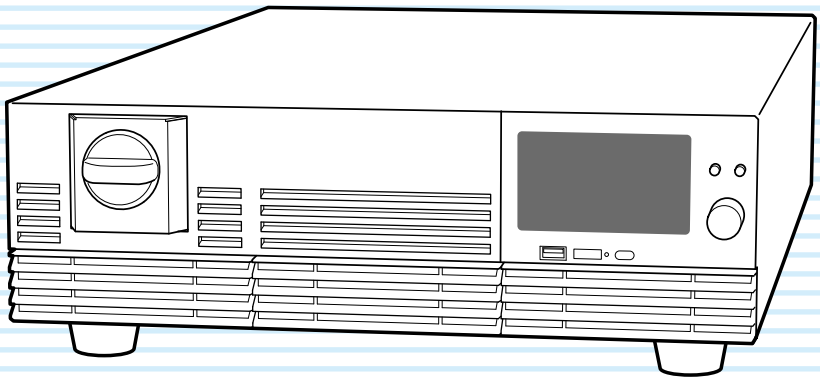
KIKUSUI

Part No. IB036833
Jun 2025

User's Manual

Regenerative Electronic Load
PXZ Series

PXZ20K-500
PXZ20K-1000
PXZ20K-1500



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General Description

About Manuals

This manual provides an overview of the product and notes on usage. It also explains how to configure it, operate it, perform maintenance on it, and so on. Read this manual thoroughly before use, and use the product properly.

Intended readers

These manuals are intended for users of this product and their instructors. The manuals assume that the reader has knowledge about power supplies.

Manual construction

User's Manual (this manual) PDF </> HTML

This document is intended for first-time users of this product. It provides an overview of the product, notes on usage, and specifications. It also explains how to connect the product, configure the product, operate the product, perform maintenance on the product, and so on.

Communication Interface Manual PDF </> HTML

This document contains details about remote control. It is written for readers with sufficient basic knowledge of how to control testers and measuring instruments using SCPI commands.

Getting Started Guide Paper

This document is intended for first-time users of the product. It gives an overview of the product, connecting procedures, safety precautions etc. Please read this manual before you operating the product.

Safety Information Paper PDF

This document contains general safety precautions. Keep them in mind and make sure to observe them.

Manual updates

This manual is subject to be revised due to product improvement and/or specification change. The latest manual (PDF and HTML) is available on our website.

https://global.kikusui.co.jp/manual/

System versions that this manual covers

This manual applies to the products with the firmware of system version 1.1X.

For information on how to check the system version, see "Displaying the Device Information" *(p.161)*.

When contacting us about the product, please provide us with the following information.

Model (marked in the top section of the front panel)
System version *(p.161)*
Serial number (marked on the rear panel)

Trademarks

Company names and product names in this manual are generally trademarks or registered trademarks of the respective companies.

Copyright

Disposal

Dispose of PXZ series in accordance with your local regulations.

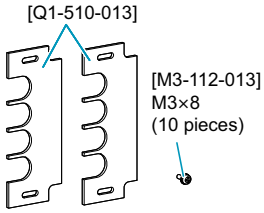
Open Source Software

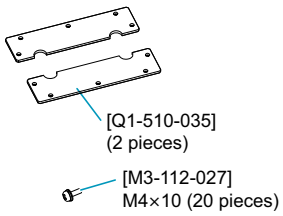
This product contains open source software under the licensing terms of GNU General Public License (GPL), GNU LESSER General Public License (LGPL), and other licenses. For details, see the following URL.

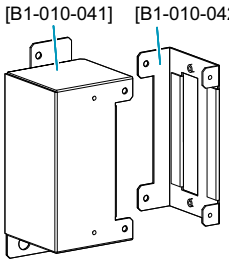
https://rddocuments.kikusui.co.jp/oss/pxz

Accessories

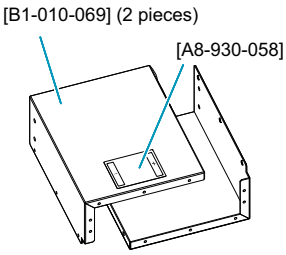
Accessories for PXZ20K-500



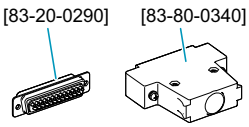




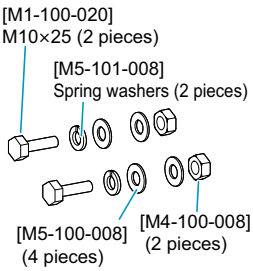
☐AC INPUT terminal cover



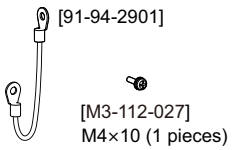
☐DC INPUT terminal cover



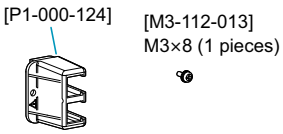
☐External control connector kit (1 set)



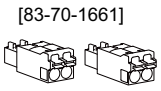
☐DC INPUT terminal screws (1 pair)



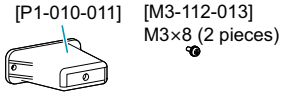
☐Chassis connection wire



☐EXT SYNC connector cover

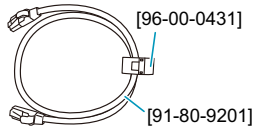


☐SENSING connector (2 pc.)



☐SENSING connector cover

☐Heavy object warning label (1 piece)
When you move PXZ series, be sure to put this sticker on a position where their contents can be seen. Make sure not to cover the air inlet and outlet with the sticker.



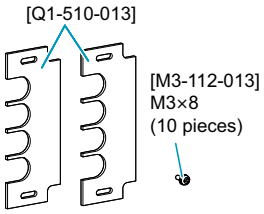
☐Synchronized operation signal cable kit

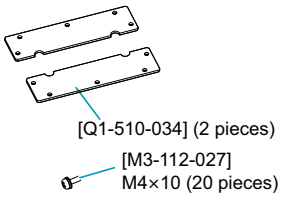
☐Safety Information (1 copy)

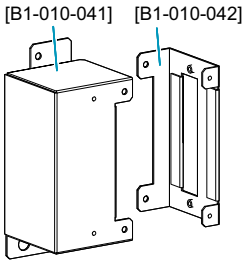
☐China RoHS sheet (1 sheet)

☐Getting Started Guide (1 copy)

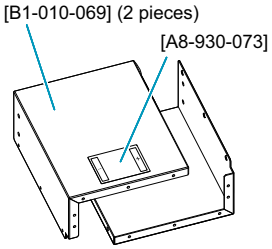
Accessories for PXZ20K-1000



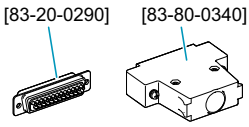




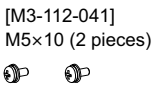
☐AC INPUT terminal cover



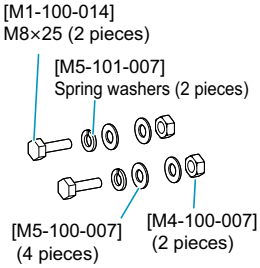
☐DC INPUT terminal cover



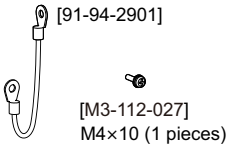
☐External control connector kit (1 set)



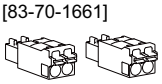
☐DC INPUT terminal screws (1 pair)



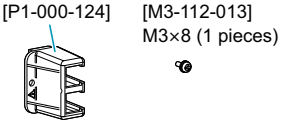
☐DC INPUT terminal screws (1 pair)



☐Chassis connection wire

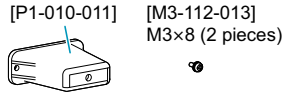


☐SENSING connector (2 pc.)

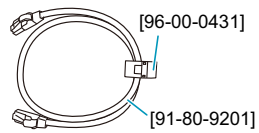


☐EXT SYNC connector cover

☐Heavy object warning label (1 piece)
When you move PXZ series, be sure to put this sticker on a position where their contents can be seen. Make sure not to cover the air inlet and outlet with the sticker.



☐SENSING connector cover



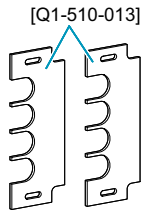
☐Synchronized operation signal cable kit

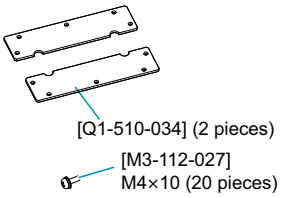
☐Safety Information (1 copy)

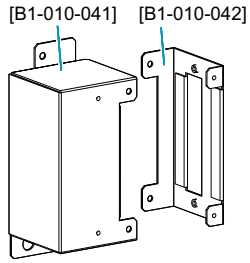
☐China RoHS sheet (1 sheet)

☐Getting Started Guide (1 copy)

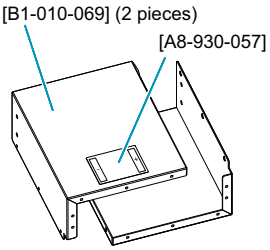
Accessories for PXZ20K-1500



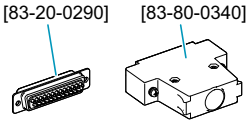




☐AC INPUT terminal cover

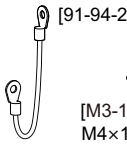


☐DC INPUT terminal cover

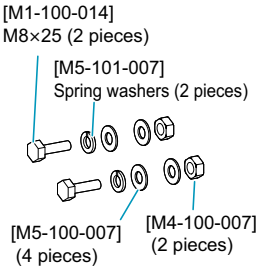


☐External control connector kit (1 set)

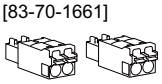
☐DC INPUT terminal screws (1 pair)



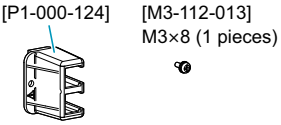
☐Chassis connection wire



☐DC INPUT terminal screws (1 pair)



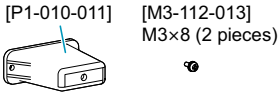
☐SENSING connector (2 pc.)



☐EXT SYNC connector cover

☐Heavy object warning label (1 piece)

When you move PXZ series, be sure to put this sticker on a position where their contents can be seen. Make sure not to cover the air inlet and outlet with the sticker.

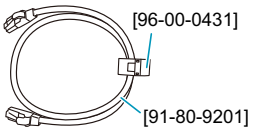


☐SENSING connector cover

☐Safety Information (1 copy)

☐China RoHS sheet (1 sheet)

☐Getting Started Guide (1 copy)



☐Synchronized operation signal cable kit

Product Overview

This product is a Bidirectional dc power supply designed to offer the highest levels of reliability and safety.

Model configurations

Model	AC Input voltage rating	DC Input rating		
		Power	Voltage	Current
PXZ20K-500	200 V	20 kW	500 V	120 A
	400 V	20 kW	500 V	120 A
PXZ20K-1000	200 V	20 kW	1000 V	60 A
	400 V	20 kW	1000 V	60 A
PXZ20K-1500	200 V	20 kW	1500 V	30 A
	400 V	20 kW	1500 V	30 A

Features

In addition to basic constant current, constant voltage, constant power, and constant resistance modes, this product offers a variety of other functions.

Equipped with touch panel display
You can operate this intuitively by pressing the display. The pressure-sensitive panel allows you to operate it with your gloves on.

Interface available with external expansion
Connecting with LAN, USB, RS232C, and external analog control are set default.

Realizing a compact but large-capacity power system
20 kW power in a single 3U-size housing is realized.

Highly flexible external digital control
5 input terminals and 6 output terminals are provided for free function selection. The signal input and output are non-polar.

Equipped with slew rate switching and response switching
Optimal test condition is provided according to the application.

Effect of power saving
Since the regenerated power is delivered back to the local power lines, you can expect benefits from power savings.

Notations Used in This Manual

In-Text notations

- In this manual, units of Regenerative Electronic Load PXZ20K-500, PXZ20K-1000 and PXZ20K-1500 refer to as “PXZ series”
- Constant voltage may be described as “CV”, constant current as “CC”, constant power as “CP”, and constant resistance as “CR”.
- “PC” in this manual is a generic term for personal computers and workstations.
- The term “DUT” is used to refer generally to a device under test.
- “>” indicates the hierarchy of items you need to select. The item to the left of this symbol indicates a higher level item.
- The screen captures and illustrations used in this manual may differ from the actual items.

Safety information

⚠WARNING

Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation which, if ignored, may result in slight injury or damage to the product and other property.

NOTE

Indicates information that you should know.

Safety Precautions

When using this product, be sure to observe the precautions in the Safety Information Manual. Items specific to this product are given below.

When using in general

⚠WARNING

- **Wear earplugs when working near PXZ series when it is running.**
  The noise sound pressure level of PXZ series is 80 dB or less, however, when PXZ series is operated in the same place as other equipment with a large noise sound pressure level or when plural units of PXZ series are operated simultaneously in the same place, make sure to take measures to prevent hearing loss. The noise sound pressure level near PXZ series may exceed 80 dB.

Installation

⚠CAUTION

- **Do not install the product in residential environment.**
  PXZ series is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
- **Keep distance of 50 cm or more from the air outlet.**
  Stay away from the exhaust because it can get hot. The air outlet of the PXZ series should be away from the wall or objects installed so that the exhaust air does not directly hit the wall or objects installed.
- **Work with two or more people when lifting or moving PXZ series.**
  Be careful not to pinch your fingers and/or hands while working.

Terminal cover

⚠WARNING

Risk of electric shock.

- **Before turn the POWER switch on, make sure that the included SENSING terminal cover and DC INPUT terminal cover are attached.**
- **Do not attach a terminal cover other than the included ones.**

Connection

⚠WARNING

Risk of electric shock.

- **Do not touch DC INPUT terminal when the load is turned on.**
- **Do not connect DUT to the DC INPUT terminal while the load is on.**
- **Do not approach or place non-isolated objects within 5 cm of the load cables when the input is turned on.**
- **Before you connect the power cable, turn off the switchboard breaker (a switch that cuts off the power supply from the switchboard).**
- **Connect the protective conductor terminal to earth ground.**
  PXZ series is IEC Safety Class I equipment (equipment with a protective conductor terminal). Ground the product to prevent electric shock.
- **Have a qualified engineer make the connection to the switchboard.**
- **After connecting PXZ series to the switchboard, attach the AC INPUT terminal cover.**
- **For load cables, use cables whose rated voltage is higher than the isolation voltage of PXZ series.**

Risk of fire.

- **Use load cables having strong flame-resistant insulation with sufficient margin for the current.**

⚠CAUTION

- **When connecting PXZ series to the switchboard, be sure to match polarities (R, S, T and ⏚ (Protective conductor terminal)).**
  Inside PXZ series, protection circuits are connected to match the AC INPUT terminal.

Risk of overheating.

- **Use appropriate crimping terminals and the included screw set to connect the load cables.**

Risk of damage to DUT.

- **Make sure to connect with the correct polarities.**
  If you connect with reversed polarity, overcurrent will flow through the diode inside the PXZ series regardless of the load ON/OFF.

Power on and off

⚠WARNING

Risk of electric shock.

- **Before turn the POWER switch on, make sure that the DC INPUT terminal cover and Sensing terminal cover are attached.**

⚠CAUTION

- **If you notice strange sounds, unusual odors, fire, or smoke around or from inside PXZ series, turn POWER switch off.**

Residual voltage

⚠WARNING

Risk of electric shock.

- **If you turn off the POWER switch due to a HIGH alarm, do not touch the DC INPUT terminal.**
  A residual charge may exist in the DC INPUT terminal. For more information on the required time for the discharge, refer to “Guide for Required Time for Residual Voltage Discharge” *(p.197)*.

Remote sensing

⚠WARNING

Risk of electric shock.

- **Do not connect cables to the SENSING terminals while the POWER switch is turned on.**

- **For SENSING cables, use cables whose rated voltage is higher than the isolation voltage of PXZ series.**
  Recommended wiring: UL3239; Rated voltage 3 kV
- **Make sure not to have the conductor of the cable touch the chassis when connecting.**
- **Before turn the POWER switch on, make sure that the Sensing terminal cover is attached.**

⚠CAUTION

PXZ series and DUT may be damaged.

- **Securely connect the SENSING terminals with the cables having the designated wire size.**
  Make sure that wiring is not disconnected during remote sensing.

Pre-charge function

⚠WARNING

Risk of electric shock.

- **If the pre-charge function is enabled, overvoltage protection (OVP) should be set for safety.**
  When the pre-charge function is used, a high voltage is output depending on the voltage set value.

Parallel operation

⚠CAUTION

PXZ series and DUT may be damaged.

- **Do not leave one end of the parallel operation signal cable connected to the PARALLEL connector when the other end is not connected.**
- **Do not perform standalone operation with the parallel operation signal cable left connected to the PARALLEL connector.**

External control

⚠CAUTION

PXZ series and DUT may be damaged.

- **Do not input voltages outside the control voltage range to the analog input terminal and digital input terminal.**
  For the input specifications, refer to “External Control Specifications” *(p.186)*.

Cleaning

⚠WARNING

Risk of electric shock.

- **Turn the POWER switch off, and turn the switch of the switchboard off.**

Disposal

⚠WARNING

Risk of electric shock.

- **To remove the power cord from the switchboard, turn the switch of the switchboard off.**

Risk of rupture or ignition.

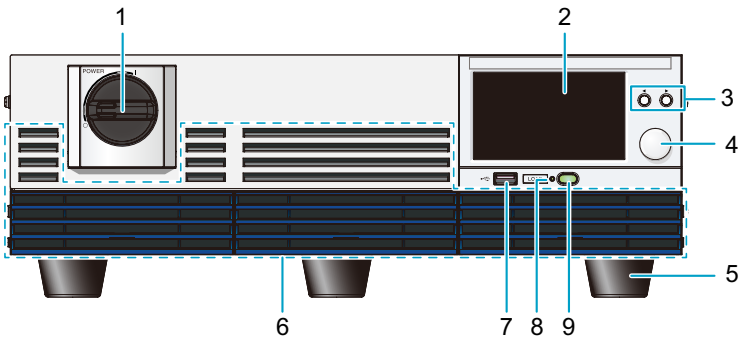
- **Do not short-circuit, charge, disassemble, deform, throw into fire, or overheat the built-in battery.**

Notes on Usage

- When using or storing PXZ series, be sure to observe the temperature and humidity ranges. For environmental conditions, see General Specifications *(p.191)*.
- The PXZ series is designed with the assumption of local regeneration. Use in an environment where the power at the site is greater than the regenerated power.

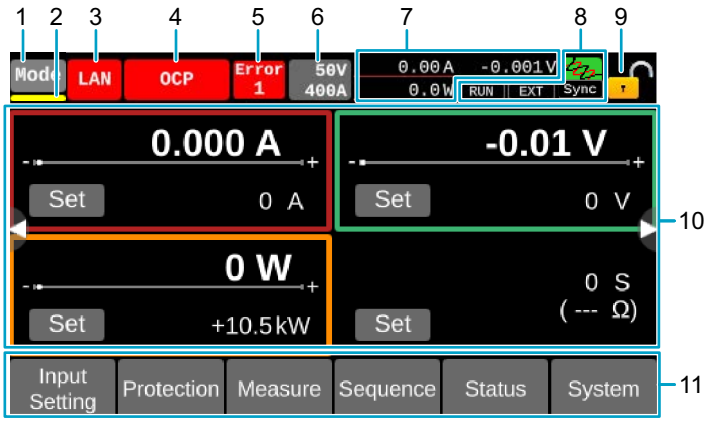
Component Names

Front Panel



Number	Name	Description
1	POWER switch	Turning the handle to the I side turns the power on, and the O side turns it off. *(p.24)*
2	Touch panel display	Display the settings, measured values, and other information. Use the touch panel to operate. *(p.33)*
3	◀ and ▶ keys	Move the cursor left and right. Select the left and right items. *(p.36)*
4	Rotary knob	Select items. Input numbers and characters. *(p.37)*
5	Foot	5 locations on bottom panel. Remove them when installing in a rack. *(p.203)*
6	Air inlet	Air inlet for cooling.
7	USB port (host)	This port is used to connect an save and load setup memory *(p.101)*, save and load programs *(p.128)*, and update the firmware *(p.169)*. Connecting a mouse allows you to operate the display. *(p.33)*
8	LOAD LED	Lights when the load is on. *(p.38)*
9	LOAD key	Switch on/off of the load from the DC INPUT terminal. *(p.38)* Stops the sequence. *(p.127)*

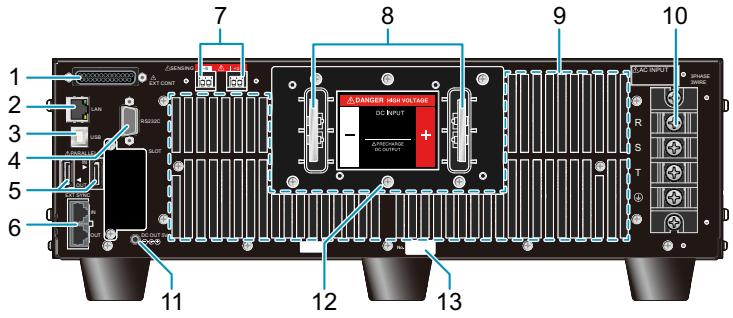
Touch Panel Display (Homepage)



Number	Name	Description
1	Operation mode	During load on, the current operating mode is displayed. When pressed at load off, the preferred mode of operation can be set. *(p.42)*
		CV: Constant voltage mode, CC: Constant current mode, CP: Constant power mode, CR: Constant resistance mode
2	Interlock release in progress	While the interlock of the pre-charge function is being released, a yellow symbol is displayed. *(p.84)*
3	LAN status	Display the LAN connection status. Green: Communication enabled, Orange: Preparing for communication, Red: Not connected. Press this icon to display the communication setting. *(p.152)*
4	Alarm information	Turn red when an alarm is sounding and displays the alarm name. If two or more alarms are occurring simultaneously, “Many” is displayed. Press this icon to display the alarm screen. *(p.65)*
5	SCPI error information	The error icon is displayed when an SCPI error is occurring. The number of error incidents (up to 16) is displayed numerically. Press this icon to display the error information. *(p.173)*
6	Rated value	The rated values of the input current and input voltage are displayed. Press this icon to display the device information. *(p.161)*
7	Measured value	The input voltage, input current, and input power are displayed. Press the measured value to enlarge the display.
8	Sequence/external control/Sensing connection/synchronized operation status	RUN The sequence is running. *(p.107)*
		EXT Digital input/output for external control is enabled. *(p.142)*
		Sensing function is enabled. *(p.68)*
		Sync Synchronized operation is valid. *(p.87)*
9	Key lock status	Key lock is released. Press and hold to enable the key lock. *(p.162)*
		Indicate that key lock is on. The lock level is indicated with a number *(p.162)*. Press and hold to release the key lock.
		Local Indicate that key lock is on. This is indicated on key-locked slave units during parallel operation. Press and hold the icon to release the key lock.
		Remote The key is locked by the RLST command under remote control. The lock can be released by pressing and holding the icon in some cases. *(p.163)*
		RWLS The key is locked by the RLST command under remote control. You cannot release the lock by panel operation. *(p.163)*
		LWLS The key is locked by the status of remote control. You cannot release the lock by panel operation. *(p.163)*
10	Measured value / Set value	Measured value / Set value are displayed. *(p.39)*
11	Menu	Press a button in Menu to move to the screen of each function. *(p.34)*

Rear Panel

The following shows the rear panel of PXZ20K-1500 as an example. The position of each part is the same for all models.



Number	Name	Description
1	EXT CONT connector	This connector is used for external control. Covers are attached to the terminals. *(p.130)*
2	LAN port	This connector is used for remote control. For details, see the Communication Interface Manual.
3	USB port	
4	RS232C port	
5	PARALLEL connector	This connector is used for parallel operation. *(p.92)*
6	EXT SYNC connector	This connector is used for synchronized operation. A cover is attached. *(p.87)*
7	SENSING terminals	These terminals are used for remote sensing. Connect the included SENSING connector. A cover is attached. *(p.68)*
8	DC INPUT terminal (PRECHARGE DC OUTPUT terminal)	Used for connection with the DUT. A cover is attached. *(p.27)* This is the DC OUTPUT terminal when the pre-charge function *(p.84)* is used.
9	Air outlet	Air outlet for cooling.
10	AC INPUT terminal block	This connector is used to connect the power cord. A cover is attached. *(p.16)*
11	DC OUT 5V connector	This connector is used during GPIB converter (option) use. *(p.204)*
12	Chassis terminal	This terminal is used to ground the input from the DUT. *(p.27)*
13	Serial number	The product's serial number.

Preparation

This chapter describes how to prepare this product for use.

- For information about installing and moving this product, see “Precautions Concerning Installation Location” and “Precautions to Be Taken When Moving the Product” in the Safety Information Manual.
- When using or storing this product, be sure to observe the temperature and humidity ranges. For environmental conditions, see “General Specifications” *(p.191)*.
- If you want to mount the product on a rack, see “Rack mount bracket” *(p.203)*.

Connecting the Power Cord

⚠WARNING

Risk of electric shock.

- **Before you connect the power cable, turn off the switchboard breaker (a switch that cuts off the power supply from the switchboard).**
- **Connect the protective conductor terminal to earth ground.**
  PXZ series is IEC Safety Class I equipment (equipment with a protective conductor terminal). Ground the product to prevent electric shock.
- **Have a qualified engineer make the connection to the switchboard.**
- **After connecting PXZ series to the switchboard, attach the AC INPUT terminal cover.**

⚠CAUTION

When connecting PXZ series to the switchboard, be sure to match polarities (R, S, T and ⏚ (Protective conductor terminal)).

Inside PXZ series, protection circuits are connected to match the AC INPUT terminal.

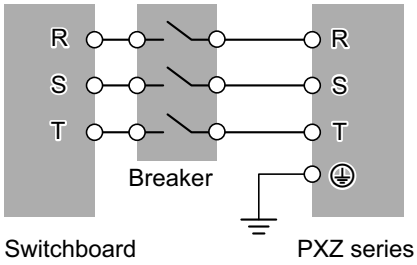
NOTE

- The PXZ series is designed with the assumption of local regeneration. Use in an environment where the power at the site is greater than the regenerated power.
- The POWER switch of the product can be used to disconnect the product from the AC line in an emergency. Provide adequate space around the POWER switch so that the POWER switch can be turned off at any time.
- We recommend that you use one of the optional specialized power cords to connect to the AC power line. If you will not use one of these power cords, use an appropriate power cord with a length of 3 m or less that has been selected by a qualified technician.

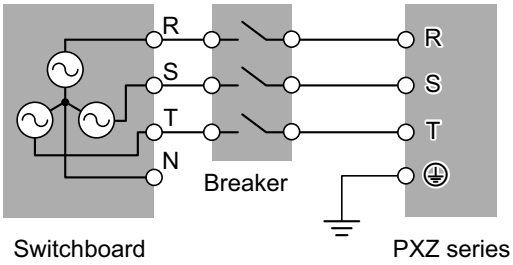
This product is designed as an equipment of IEC Overvoltage Category II (energy-consuming equipment supplied from a fixed installation).

Connection example are described below.

Example of 3P3W (200 V or 400 V input)



Example of 3P4W (400 V input)



Preparing for connection

Preparing power cord

A power cord is not included with this product. Optional three-phase input power cords *(p.202)* are available. If you do not use the optional power cords, use ones with a nominal cross-sectional area of 22 mm^2 or more.

The power cord can be drawn out to the lateral side or rear-panel side of the main unit.

If you pull out the power cords to the side, use ones with a crimping terminal compatible with R22-S6 on one end to be connected to the AC INPUT terminal. (The optional power cords are equipped with such a crimp terminal.)

If you pull out the power cords to the rear side, you need to bend them, which may cause damage to them. We recommend using a right-angle terminal compatible with R22-S6 to connect the cords to the AC INPUT terminal.

Checking the distribution system

The following distribution systems are available. Make sure that the distribution system to be connected falls within the scope.

Distribution system	Nominal voltage	Allowable variation range	Note
Three-phase three-wire	200 Vac to 240 Vac	180 Vac to 252 Vac	Interphase voltage = Line voltage
	380 Vac to 480 Vac	342 Vac to 504 Vac	Interphase voltage = Line voltage
Three-phase four-wire	380 Vac to 480 Vac	342 Vac to 504 Vac	Interphase voltage x $\sqrt{3}$ = Line voltage Neutral line is not used.

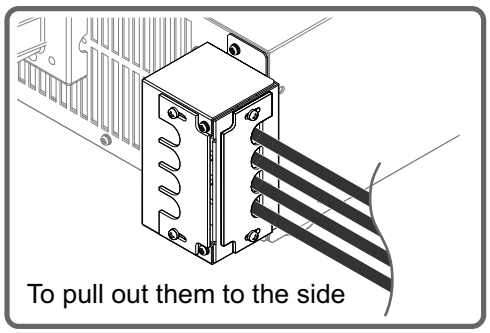
When using breaker

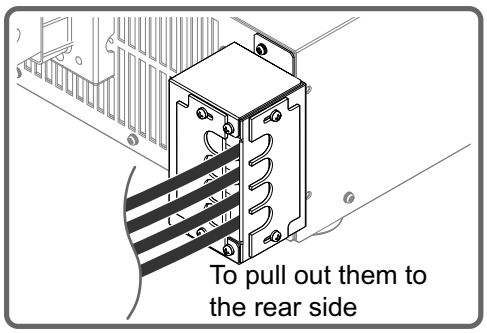
Use a circuit breaker that meets the requirement below:

Input specifications for PXZ series	Nominal current	Current sensitivity
200 Vac input	100 A or less	15 mA or more
400 Vac input	50 A or less	30 mA or more

Connecting the power cord

Make sure to attach the included INPUT terminal cover on the AC INPUT terminal block. The power cords can be pulled out in two different directions according to the installation environment.





1 **Check that the AC power line meets the nominal input rating of the product.**

Acceptable input voltage (any nominal supply voltage in the following ranges):

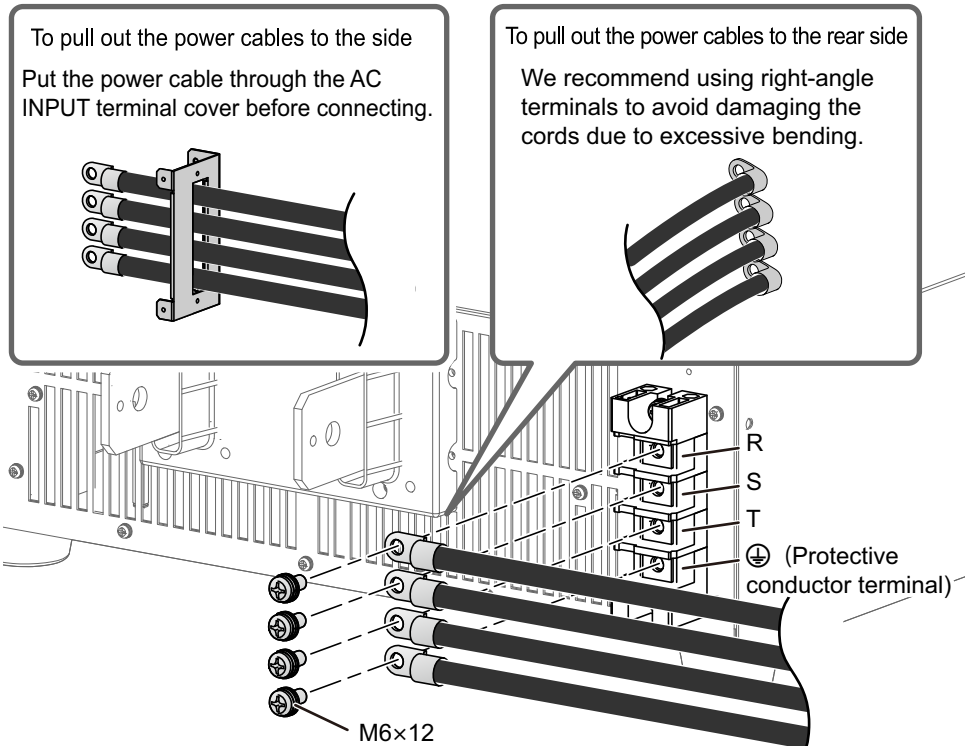
200 Vac input model: 200 Vac to 240 Vac
400 Vac input model: 380 Vac to 480 Vac

The supported frequencies are 50 Hz and 60 Hz. (Frequency range: 47 Hz to 63 Hz)

2 **Turning the POWER switch off (○).**

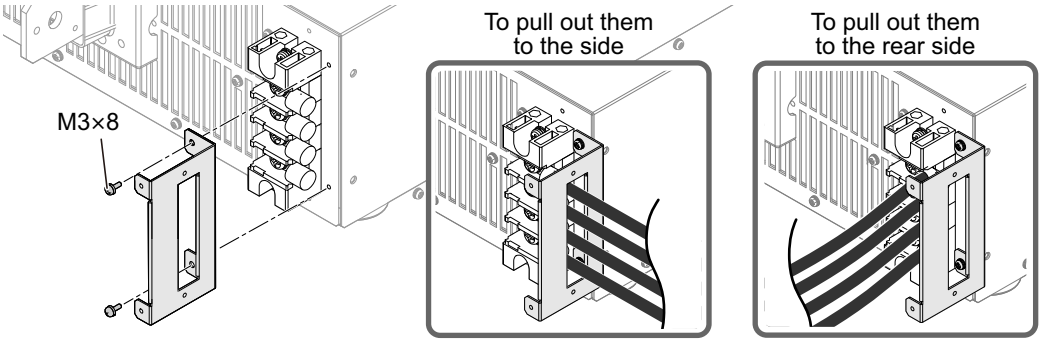
3 **Connect the power cords with R, S, T, and ⏚ (Protective conductor terminal) of the AC INPUT terminal block.**

Tightening torque: 2.5 N·m

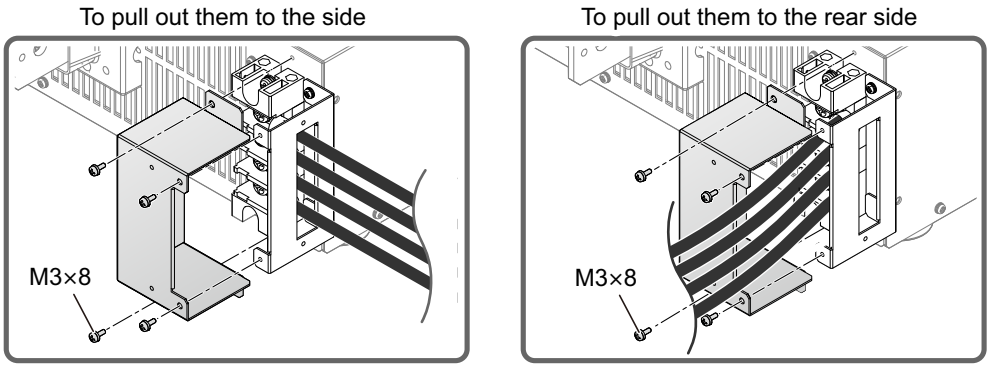


4 Attach the included side-panel AC INPUT terminal cover.

Set the cover as shown in the drawings according to the direction where the power cords are pulled out.



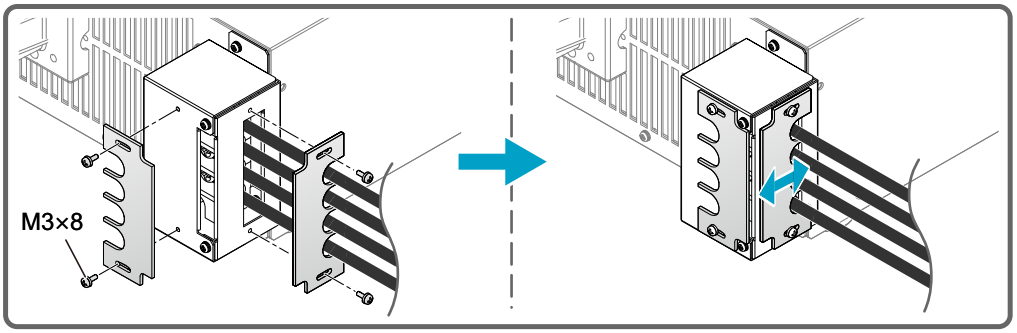
5 Attach the included rear-panel AC INPUT terminal cover.



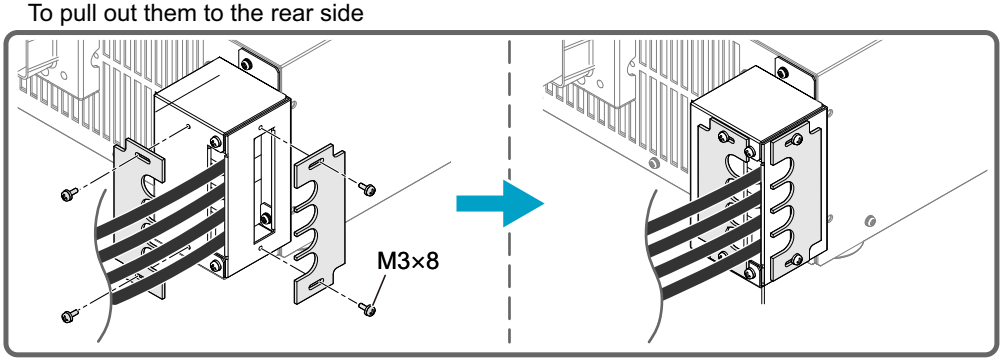
6 **Attach the included protection plate.**

The direction of the protection plate differs depending on the direction where the power cords are pulled out. Make sure to prevent your fingers from being caught in the INPUT terminal cover when attaching the protection plate.

To pull out them to the side



To pull out them to the rear side



7 **Attach a crimping terminal that matches the terminal screw of the circuit breaker to the breaker side of the power cord.**

8 **Turn off the switchboard's circuit breaker.**

9 **Connect the power cords with R, S, and T of the circuit breaker and ground ⏚ (Protective conductor terminal).**

This completes the connections.

Attaching the Terminal Cover

For the safety, attach the included covers to the DC INPUT terminal and the SENSING terminal before turning ON the power supply of the PXZ series.

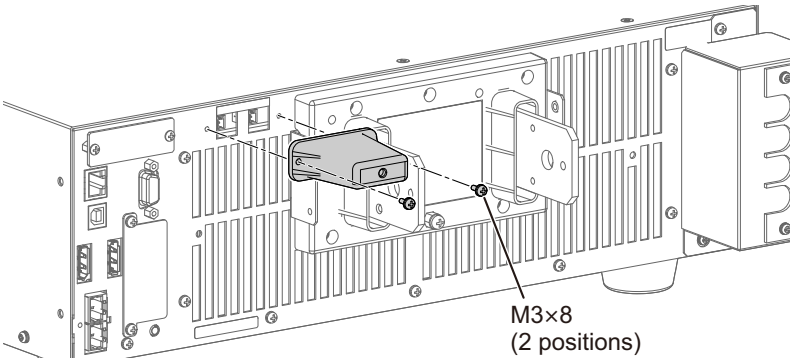
⚠WARNING

Risk of electric shock.

- **Before turn the POWER switch on, make sure that the included SENSING terminal cover and DC INPUT terminal cover are attached.**
- **Do not attach a terminal cover other than the included ones.**

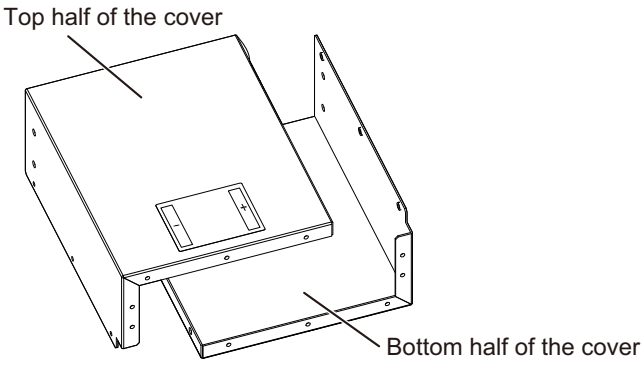
Attaching the SENSING terminal cover

Attach the included SENSING terminal cover referring to the figure below. The following figure shows an example of PXZ20K-1500.



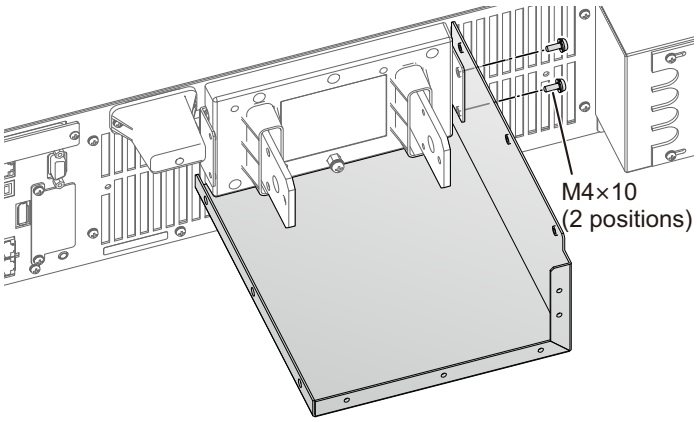
Attaching the DC INPUT terminal cover

There are two types of the DC INPUT terminal cover, the top side and the bottom side. The cover with the polarity sticker on it is the top side.

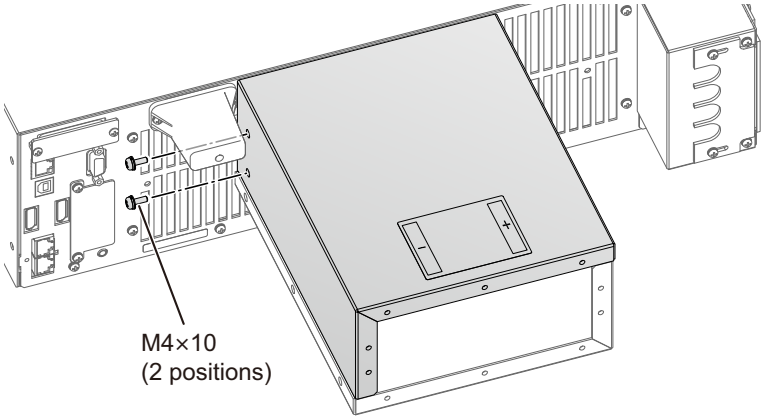


The procedure is explained using PXZ20K-1500 as an example.

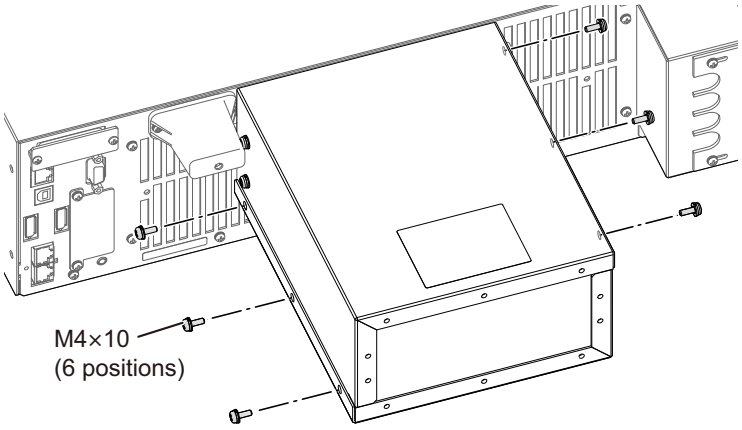
1 **Attach the included bottom half of the DC INPUT terminal cover.**



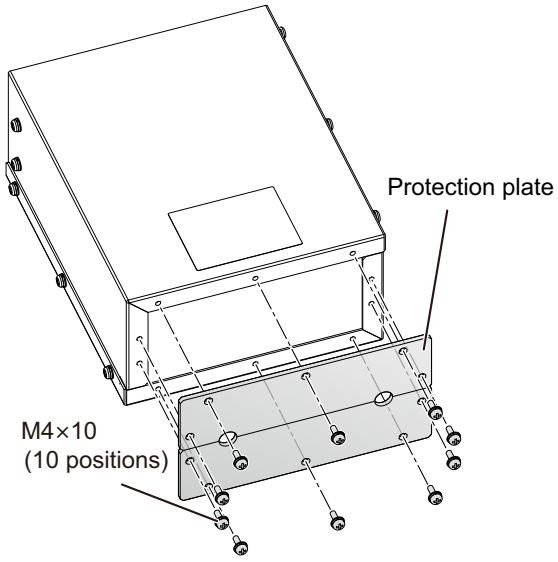
2 **Attach the included top half of the DC INPUT terminal cover.**



3 **Fix the DC INPUT terminal covers on both sides.**



4 **Attach the included protection plate to the DC INPUT terminal cover.**



This completes the installation.

Checking Whether the Power is On or Off

Turning the power on

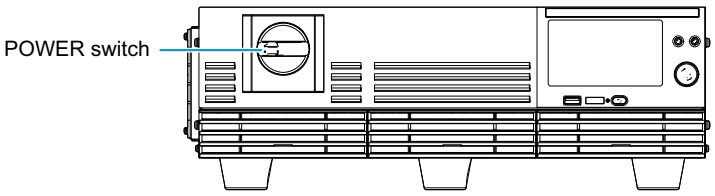
⚠WARNING

Risk of electric shock.

- **Before turn the POWER switch on, make sure that the DC INPUT terminal cover and Sensing terminal cover are attached.** *(p.21)*

⚠CAUTION

If you notice strange sounds, unusual odors, fire, or smoke around or from inside PXZ series, turn POWER switch off.

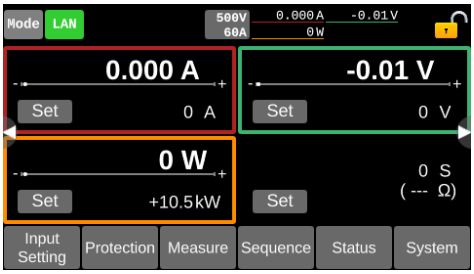


1 **Check that the power cord is connected properly.**

2 **Turn the POWER switch on (|).**

Power turns on, and the model name and system version are displayed.

Then, the Homepage is displayed.



By factory default, the panel settings immediately before the POWER switch is turned off are saved. When you turn the power on, the product starts in the same state as it was in the last time it was turned off.

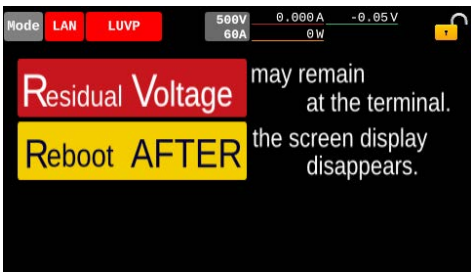
The panel setting state at startup can be changed *(p.73)*.

The load state at startup can be changed *(p.74)*.

Turning the power off

1 **Turn the POWER switch off (○).**

Caution on residual voltage appears, then the power turns off.



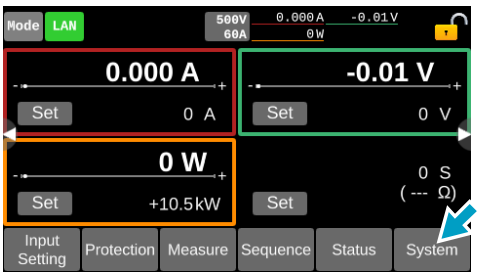
NOTE

- Although the LUVP alarm occurs in the external or remote control when the power turns off, it is not an error.
- If you want to turn the POWER switch back on, wait at least 10 seconds after the fan stops. Repeatedly turning the POWER switch on and off at short intervals will shorten the service life of the POWER switch and the internal input fuse.

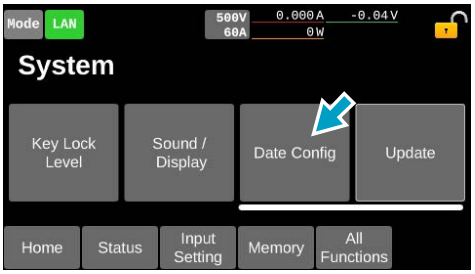
Setting the Date/Time

Set the year, month, day, and time. If connecting to an NTP server over a LAN, refer to “Retrieving the time from an NTP server” *(p.166)*.

1 Press System on the homepage.

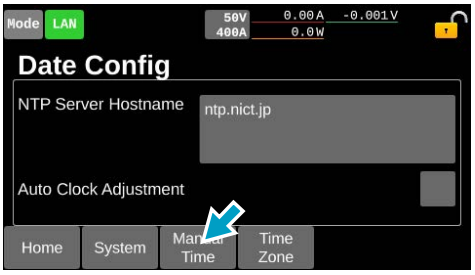


2 Swipe to the left, or press the ▶ key, till Date Config is displayed.



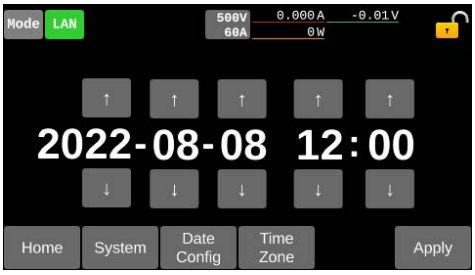
The date/time setup screen appears.

3 Press Manual Time.



4 Set the year, month, day, and time.

Press ↑ and ↓ to set the number.



Setting range: 2022-1-1 0:00 to 2037-12-31 23:59

5 Press Apply.

This completes the setting.

Connecting to the DUT

Grounding the DC INPUT terminal

To ground the input terminal, connect the chassis terminal to the − or + terminal of DC INPUT with the included chassis connection wire.

NOTE

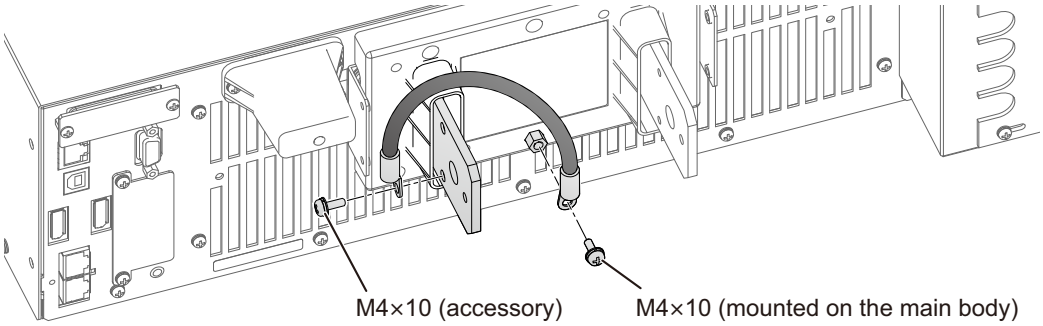
- When the chassis terminal is connected to the + terminal of DC INPUT, do not input a voltage exceeding the isolation voltage *(p.191)*. This may damage PXZ series.
- When grounding the DC INPUT terminal, do no ground the DUT.

1 **Load off the PXZ Series and remove the INPUT terminal cover from the DC INPUT terminal.**

2 **Connect the chassis connection terminal to the − or + terminal of DC INPUT with the included chassis connection wire.**

Tightening torque: 1.33 N·m

The following figure shows an example of connecting to the –terminal.



This completes the connections.

Connecting the DUT

For details on selecting a load cable, refer to“Appendix” “Selecting the Load Cables” *(p.196)* in the Appendix. Load cables are available as options *(p.202)*.

⚠WARNING

Risk of electric shock.

- **Do not touch DC INPUT terminal when the load is turned on.**
- **Do not connect DUT to the DC INPUT terminal while the load is on.**
- **Do not approach or place non-isolated objects within 5 cm of the load cables when the input is turned on.**
- **Before turn the POWER switch on, make sure that the included SENSING terminal cover and DC INPUT terminal cover are attached.**

⚠CAUTION

Risk of damage to DUT.

- **Make sure to connect with the correct polarities.**
  If you connect with reversed polarity, overcurrent will flow through the diode inside the PXZ series regardless of the load ON/OFF.

Risk of overheating.

- **Use appropriate crimping terminals and the included screw set to connect the load cables.**

1 Load off the PXZ series and remove the DC INPUT terminal cover from the DC INPUT terminal.

2 Attach crimping terminals to the load cables.

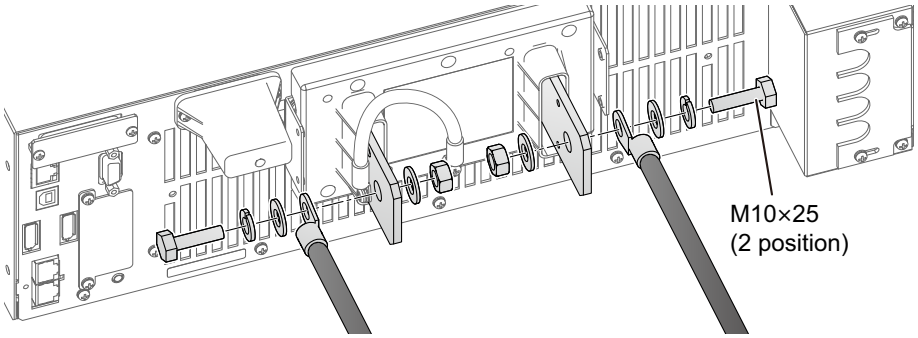
The DC INPUT terminals have holes for connecting the load cables. Attach the appropriate crimping terminals to the cables.

Model	Bolt or screw size
PXZ20K-500	M10 × 25
PXZ20K-1000, PXZ20K-1500	M5 × 10, M8 × 25

3 Connect the load cables to the DC INPUT terminals using the included screw set for DC INPUT terminals.

■For PXZ20K-500

Tightening torque: 22.46 N·m

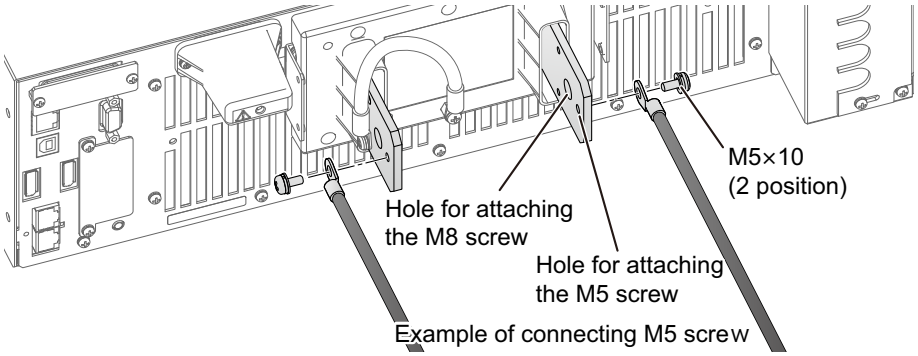


■For PXZ20K-1000 or PXZ20K-1500

Tightening torque

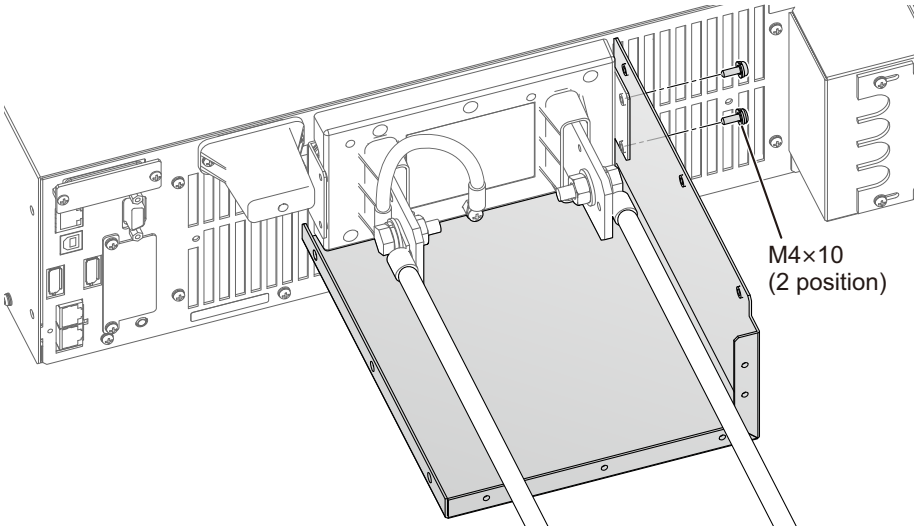
M5: 2.61 N·m

M8: 11.22 N·m

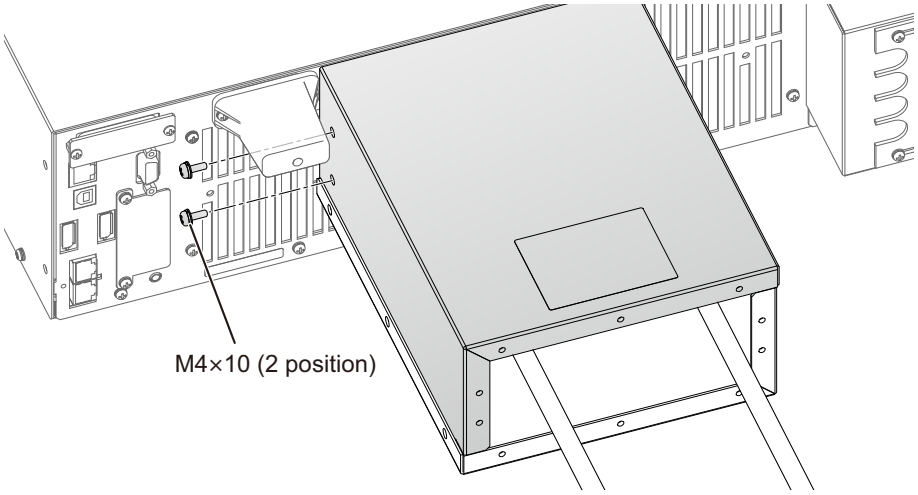


4 Attach the included bottom half of the DC INPUT terminal cover.

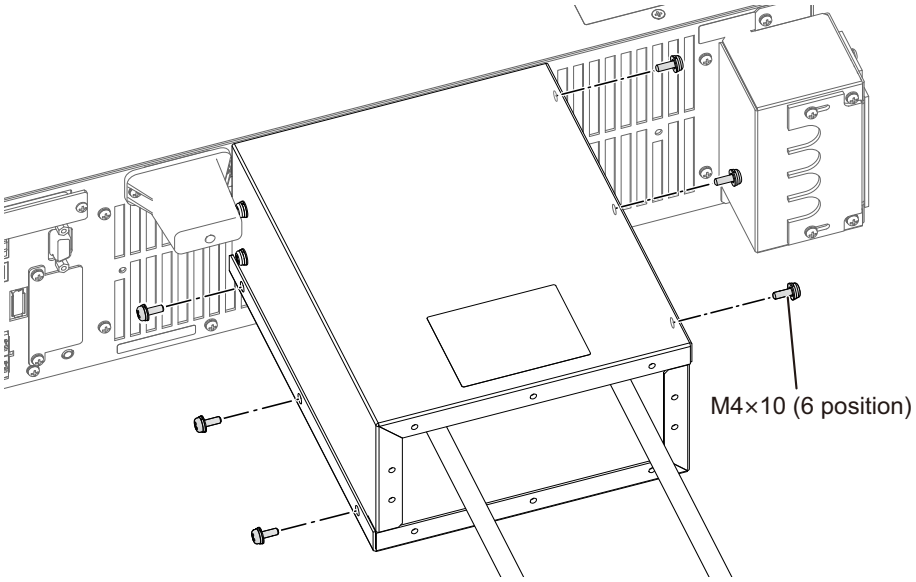
Make sure the cover without the polarity sticker is on the bottom side.



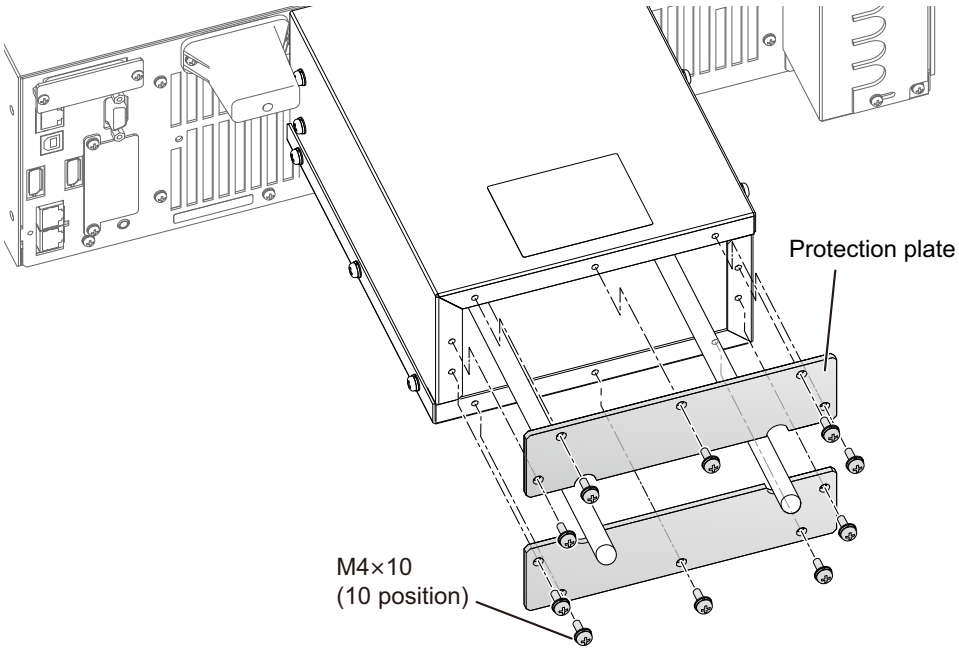
5 **Attach the top half of the DC INPUT terminal cover.**



6 **Fix the DC INPUT terminal covers on both sides.**



7 Attach the included protection plate to the DC INPUT terminal cover.



8 Connect the load cables to the DUT.

Be careful to match the polarities of the DC INPUT terminals with those of the DUT terminals during connection.

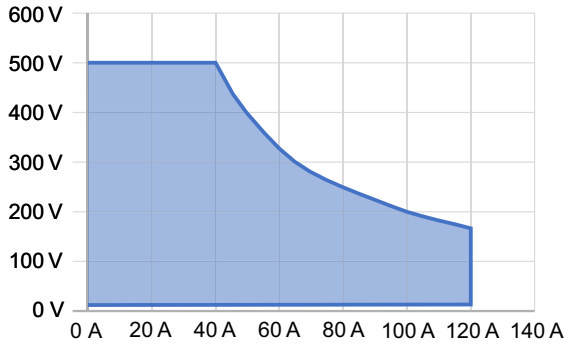
Use the shortest cables possible to connect the product and DUT, and twist the cables. If the cables are too thick to be twisted, bring the DC INPUT terminal's positive and negative terminal cables close together and make them parallel.

This completes the connections.

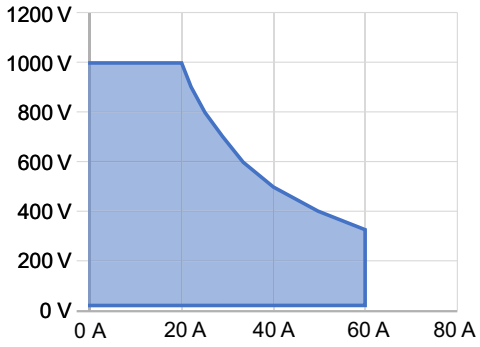
Basic Operation

Operating Area

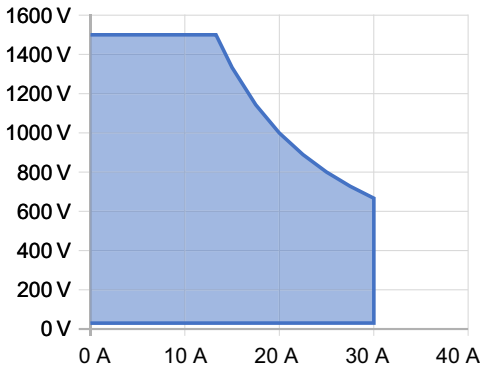
Operation area of PXZ20K-500



Operation area of PXZ20K-1000



Operation area of PXZ20K-1500



Touch Operation

The touch-panel display (hereinafter “display”) can be operated by touch to display menus and change values. By connecting a mouse to the USB connector on the front panel, you can also operate with a mouse.

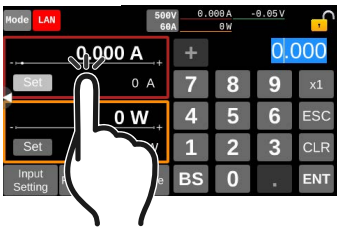
In this document, we explain the touch operation.

Touch operation

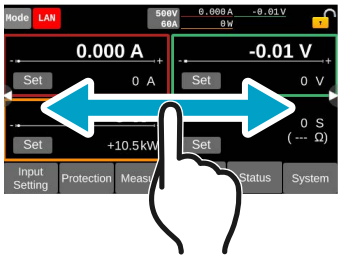
The display is a pressure-sensitive type, which allows you to operate it even when wearing gloves. Use your finger to push down the target items on the display. Press and hold for 1 second or more to give a long press.

Instead of the swipe operation, using the ◄ / ► keys on the front panel is also available.

Press / Press and hold



Swipe

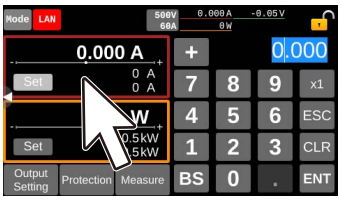


Mouse operation

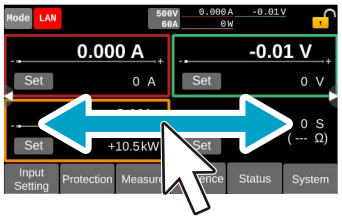
By connecting a mouse to the USB connector on the front panel, a mouse cursor appears on the display. With a left mouse click, you can select an item displayed on the screen or set a number.

When dragging with the mouse, you can perform an action equivalent to a swipe by touch. Press and hold the left mouse button for 1 second or more for a long press.

Click / hold down



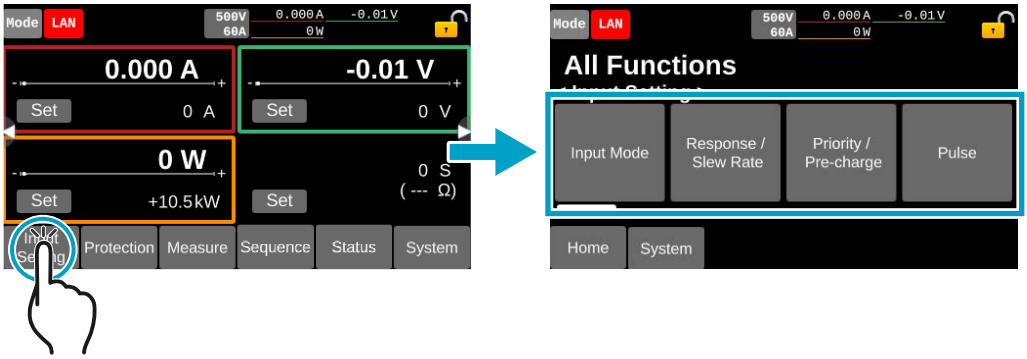
Drag



Displaying the menu

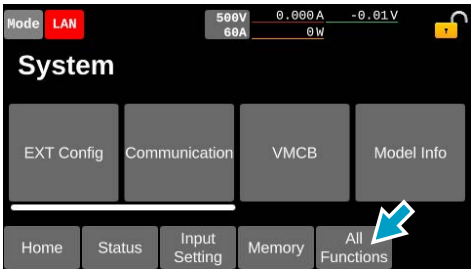
Press the menu button shown at the bottom of the display to indicate the menu for each function.

When there is a menu not fully displayed, swipe the menu to the left or press the ▶ key on the front panel to scroll the screen.



■Displaying all functions available in the menu

When All Functions at the bottom of the System menu is pressed, all menus are displayed.

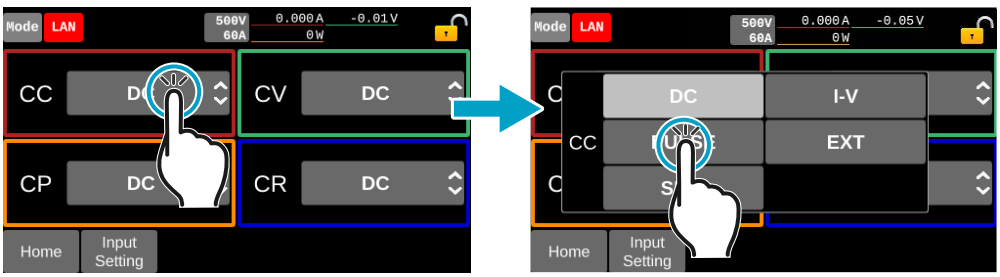


Menu reference

Menu		Available operations
Input Setting	Input Mode	Setting the Input Mode *(p.43)*
	Response/Slew Rate	Set the response *(p.71)* and slew rate *(p.72)*
	Priority	Set the priority operation mode *(p.42)*
	Pre-charge	Setting the Pre-charge *(p.84)*
	Pulse	Setting the pulse function *(p.75)*
	Sine	Setting the sine function *(p.77)*
	I-V List	Setting the I-V list function *(p.79)*
	Synchronize	Synchronized operation *(p.87)*
Protection	–	Set the protection function *(p.55)*
Measure	Measure Config	Set the measurement trigger *(p.45)*, Integration *(p.50)*, and remote sensing *(p.68)*
	View List	List display of measurement data *(p.52)*
	View Chart	Graph display of measurement data *(p.52)*
Sequence	Select edit	Setting the program *(p.109)*
	Initiate	Executing sequences *(p.124)*
	Export	Exporting programs *(p.128)*
	Import	Importing programs *(p.129)*
Status	Alarm Status	Confirm the alarm *(p.65)*
	SCPI Status	Confirm SCPI Errors *(p.173)*
Memory	*RST	Reset the settings *(p.172)*
	Memory Config	Set the confirmation operation at the time of recalling the preset memory *(p.100)* Panel settings at startup *(p.73)* Load state at power-on *(p.74)*
	Preset	Save / recall the preset memory *(p.98)*
	Setup	Save / recall the setup memory *(p.101)*
	Sanitize	Reset to factory default *(p.170)*
System	EXT Config	Set the external control *(p.130)*
	Communication	Display, set the communication function *(p.152)*
	VMCB	Setting Multichannel *(p.157)*
	Model Info	Display the information of models and system version *(p.161)*
	Key Lock Level	Set the key lock *(p.162)*
	Sound/Display	Set the buzzer sound *(p.164)* and screen brightness *(p.165)*
	Date Config	Set the year, month, day, and time *(p.166)*
	Update	Firmware update *(p.169)*

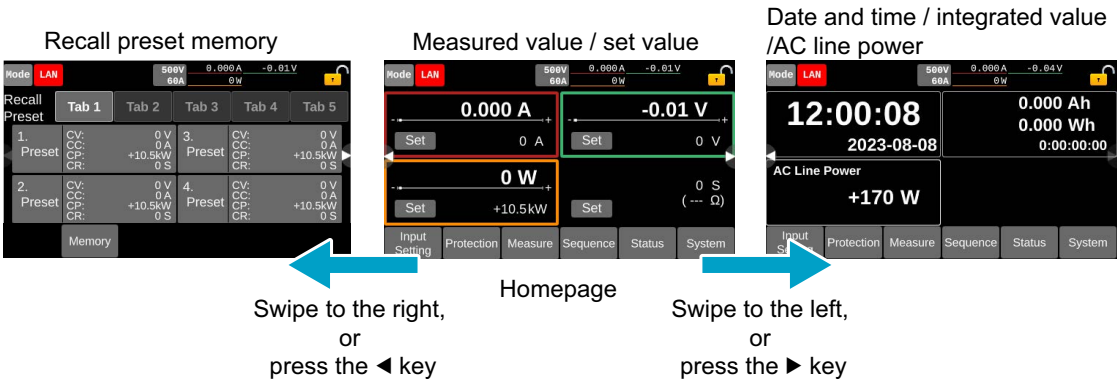
Changing values

Press the item you want to change their set value. If there are multiple choices, a list of choices will be displayed. Press the item you want to set.



Homepage

When the POWER switch is turned on, the model name and system version will be displayed, and then the homepage will appear. Swipe the display to the right or left, or press the ◀ or ▶ key on the front panel to switch the homepage to the right or left.



NOTE

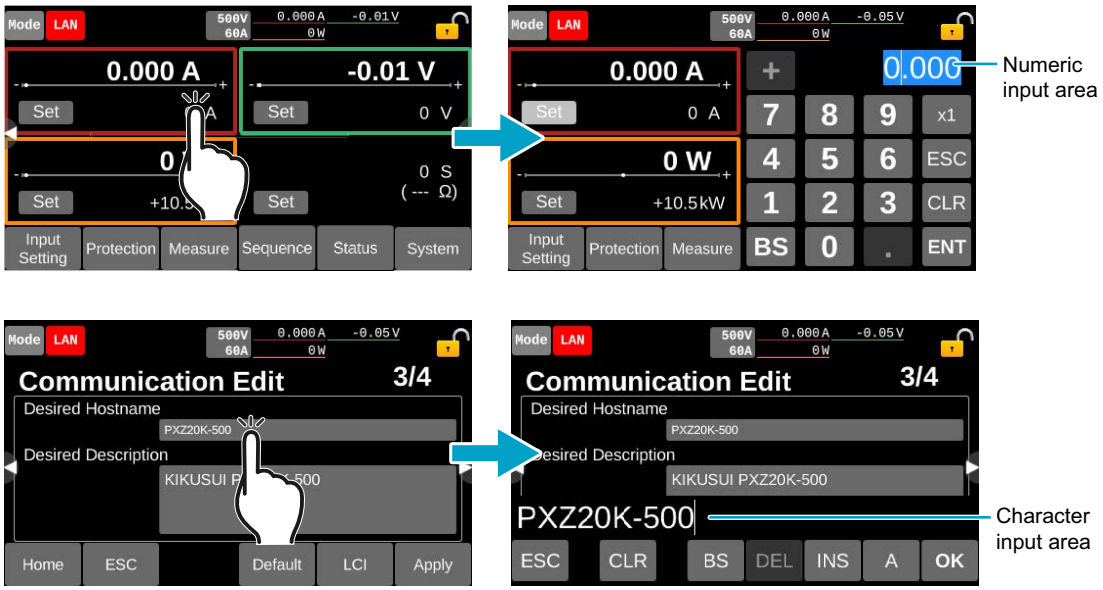
The power display on the AC power line is a reference value and may fluctuate by approximately ±500 W at the maximum.

Number and Character Input

Use the touch panel display, the ◀ and ▶ keys, and the rotary knob to enter numbers and characters.

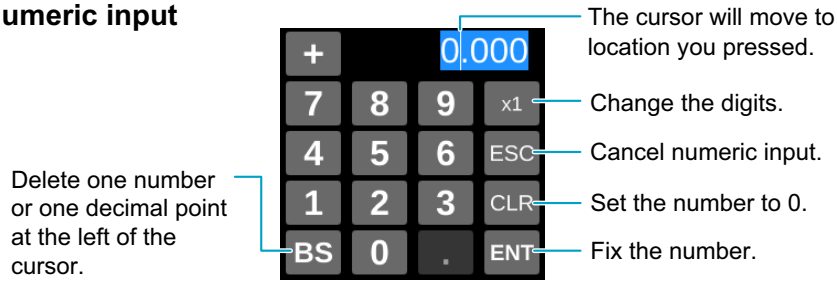
When you press an item that requires numbers and characters for setting, the numeric or text input area will appear.

If numbers or characters are selected in an input area, they can be changed. If only a cursor is shown in an input area, you can enter characters or numbers at the cursor position.

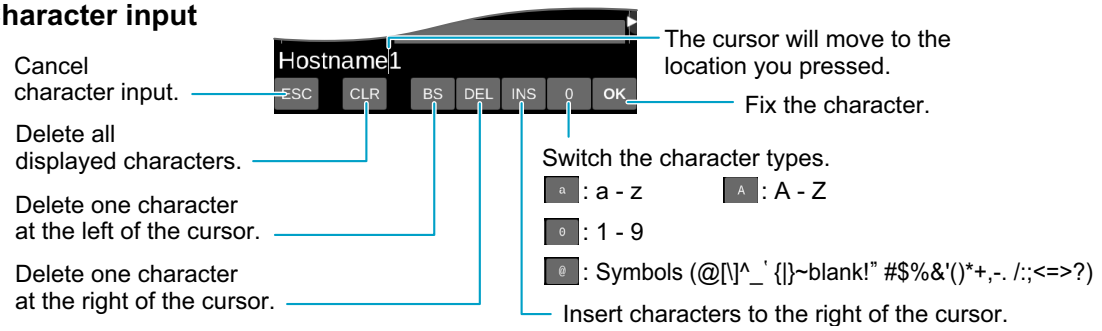


Touch panel operation

Numeric input



Character input



Operations of the rotary knob and the ◄ / ► keys

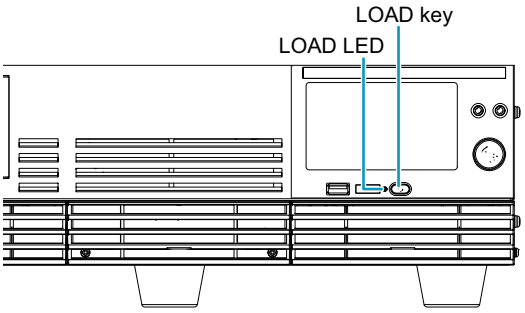
Purpose	Controls	Description
Numeric input	Rotary knob	Select the number to enter. Turn clockwise to increase the value and counter-clockwise to decrease. The value is confirmed immediately upon input.
Character input	Rotary knob	Select the characters to enter. Turn clockwise to select characters in ascending order. Turn counterclockwise to enter character in reverse order. To enter the next character, press the ◄ or ► key to move the cursor.
Cursor movement	◄ and ► keys	Change the digits or input position.

Load On/Off

“Load on” refers to the state in which current is flowing in the PXZ series and to the operation of applying current. “Load off” refers to the state in which no current is applied to the PXZ series and the operation in which no current is applied. You can turn the load on and off using the LOAD key.

1 **To load on, press and hold the LOAD key (approx. 0.2 sec.).**
To load off, press the LOAD key.

The value switches between load on and load off each time you press LOAD.
The LOAD LED lights up in the load on state.
The LOAD LED turns off in the load off state.



Controlling load on/off externally

Load on/off can be controlled by an external signal *(p.143)*.

Synchronize load on/off with other PXZ Series

Load on/off can be synchronized with the PXZ Series with synchronous connection *(p.88)*.

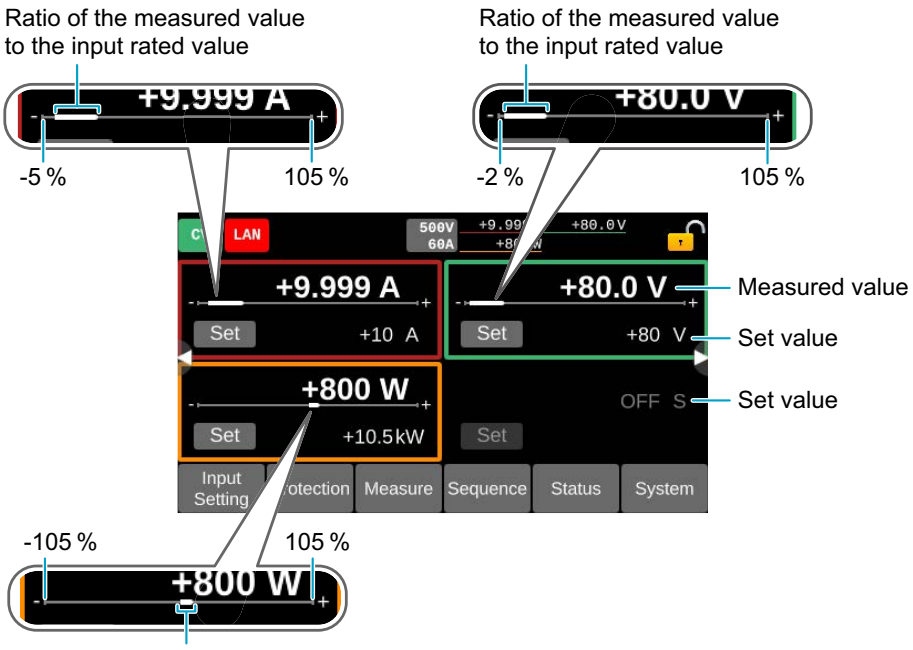
Load on at startup

The load can be turned on at startup *(p.74)*.

Displaying the Measured Value and Setting the Input Value

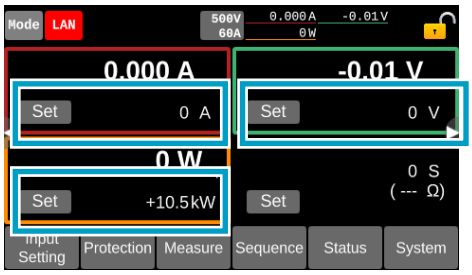
On the homepage, the latest measured values are displayed. You can also change the set values of various inputs.

Input set values can be changed while the load is on.



*During pre-charge *(p.84)*, it is displayed in minus.

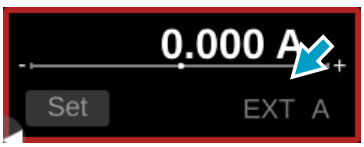
1 Press the input value to be set on the homepage.



2 Use the display or the rotary knob to enter the input value.

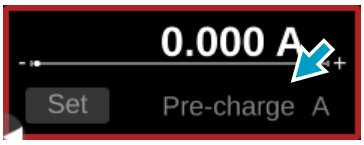
This completes the setting.

■In the case that the value is displayed as EXT, PULSE, SINE, or I-V



Due to Setting the Input Mode *(p.43)*, the values cannot be changed from the display during external control (EXT), pulse function operation (PULSE), sine function operation (SINE), or I-V characteristic function operation (I-V).

■When “Pre-charge” is displayed in the set value

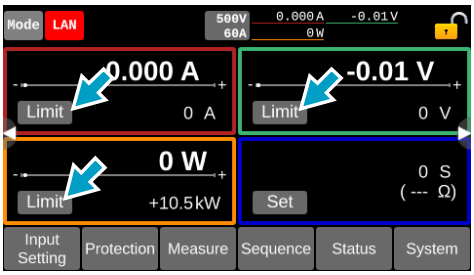


Pre-charge *(p.84)* is enabled and the set value cannot be changed.

■When “OFF” is displayed for the conductance set value

CR in Input Mode*(p.43)* is set to OFF.

■When “Limit” is displayed



CR in Input Mode *(p.43)* is set to other than OFF. A blue box appears in the conductance set value column, and the input value is limited by the conductance set value.

When the operation mode is CC, CV, or CP, the Limit icon in the setting column for the respective input value is framed.

Operating in CC mode

Operating in CV mode

Operating in CP mode

NOTE

If you increase the input current setting from 0 A during the Load on, the input current may overshoot. To prevent overshoot from occurring, change the input current setting from 0.01 A instead of 0 A.

Error display

When the current/voltage/power cannot be measured, an error will be displayed at the position of the measured value.

Error display	Description
Over Range	The value exceeded the measurement range.
Under Range	The value went below the measurement range.
Not Measurable	A HIGH alarm *(p.56)* is generated.

Setting the Priority Operation Mode

The PXZ Series offers constant voltage (CV), constant current (CC), constant power (CP), and constant resistance (CR) operating modes.

The preferred operation mode can be set from CC, CP, and CR when the load is turned on. If the voltage of the connected DUT is higher than the voltage set value of the PXZ Series, current flows from the DUT to the PXZ Series.

Select the CC mode when the connected DUT is such a device as a battery or power supply.

Cannot be set during load on.

Item	Description
CC	When the load is turned on, it operates in constant current mode. It maintains the set current even when the voltage changes. Current overshoot can be reduced when load on is performed with an external battery or other voltage source connected.
CP	When the load is turned on, it operates in constant power mode. It maintains the set power even when the current or voltage changes. When a load is turned on with a large external capacitive load connected, both input voltage and input current may become large enough to cause an overpower protection (OPP) alarm. You may avoid alarms by using the CP mode.
CR	When the load is turned on, it operates in constant resistance mode. A current proportional to the change in voltage is applied using the set conductance value as a proportionality constant.

NOTE

The priority operation mode is enabled when the input voltage, input current, and input power are all 20 % or more of the rated values. In the case of 20 % or less, it will not be input in the intended operation mode and the start-up time will be delayed.

1 **Press Input Setting > Priority on the homepage.**

The same screen will appear when you press the Mode icon on the upper left part of the homepage.

2 **Press the input field for Priority when load is ON to select the preferred operation mode.**

This completes the setting.

Input Mode Setting

Set how to control the input for each operation mode. Cannot be set during load on.

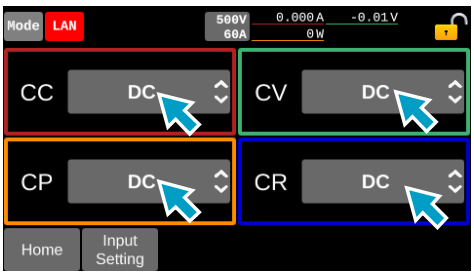
Item		Description
CC		It maintains the set current even when the voltage changes.
	DC	This is the normal input mode. Controls the current by the current set value.
	PULSE	Controlled by pulse function. *(p.75)*
	SINE	Controlled by sine function. *(p.77)*
	I-V	Controlled by arbitrary I-V characteristics. *(p.79)*
	EXT	The current setting is controlled by external voltage *(p.137)*. The external voltage input to EXT CONT is treated as an absolute value and applied to the current set value.
CV		Maintains the voltage set value even if the current changes.
	DC	This is the normal input mode. Controls the voltage by the voltage set value.
	PULSE	Controlled by pulse function. *(p.75)*
	SINE	Controlled by sine function. *(p.77)*
	I-V	Controlled by arbitrary I-V characteristics. *(p.79)*
	EXT	The voltage is controlled by external voltage. *(p.137)*
CP		It maintains the set power even when the voltage and/or current change.
	DC	This is the normal input mode. Controls the power by the power set value.
	EXT	Controls the power set value by the external voltage. *(p.137)*
CR		A current proportional to the change in voltage is applied using the set conductance value as a proportionality constant.
	DC	This is the normal input mode. Controls the current and voltage by the conductance set value.
	PULSE	Controlled by pulse function. *(p.75)*
	EXT	Controls the conductance set value by the external voltage. *(p.137)*
	OFF	Not controlled by conductance set value.

NOTE

- CC, CP, and CR cannot be set to EXT at the same time.
- When setting PULSE, SINE or I-V to CC, you cannot set PULSE, SINE or I-V to CV or CR simultaneously.
- When setting PULSE, SINE or I-V to CV, you cannot set PULSE, SINE or I-V to CC or CR simultaneously.
- When setting PULSE, SINE or I-V to CR, you cannot set PULSE, SINE or I-V to CV or CC simultaneously.
- When setting DC to CR, you cannot set PULSE, SINE, I-V or EXT to CC or CV.
- If the pre-charge function *(p.84)* is enabled, PULSE, SINE, or I-V cannot be set.

1 **Press Input Setting > Input Mode on the Home screen.**

2 **Press the input field for each operation mode to select the input mode.**



This completes the setting.

Measurement Recording

You can record the measured values (voltage, current, power, elapsed time, integrated current, and integrated power). To record them, set the recording conditions and then operate the touch panel display to start recording.

Recording measured values

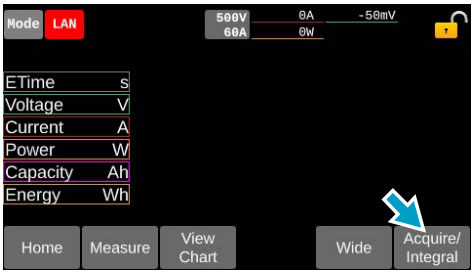
You can record the following measured values:

- The average values (of voltage, current, and power) measured during the recording period set in Average *(p.45)* of Acquire Trigger after the start of recording.
- The integrated values (of elapsed time, integrated current, and integrated power) at a point in time when the period set in Average *(p.45)* of Acquire Trigger has elapsed since the start of the recording.

1 **Press Measure > View List or View Chart on the homepage.**

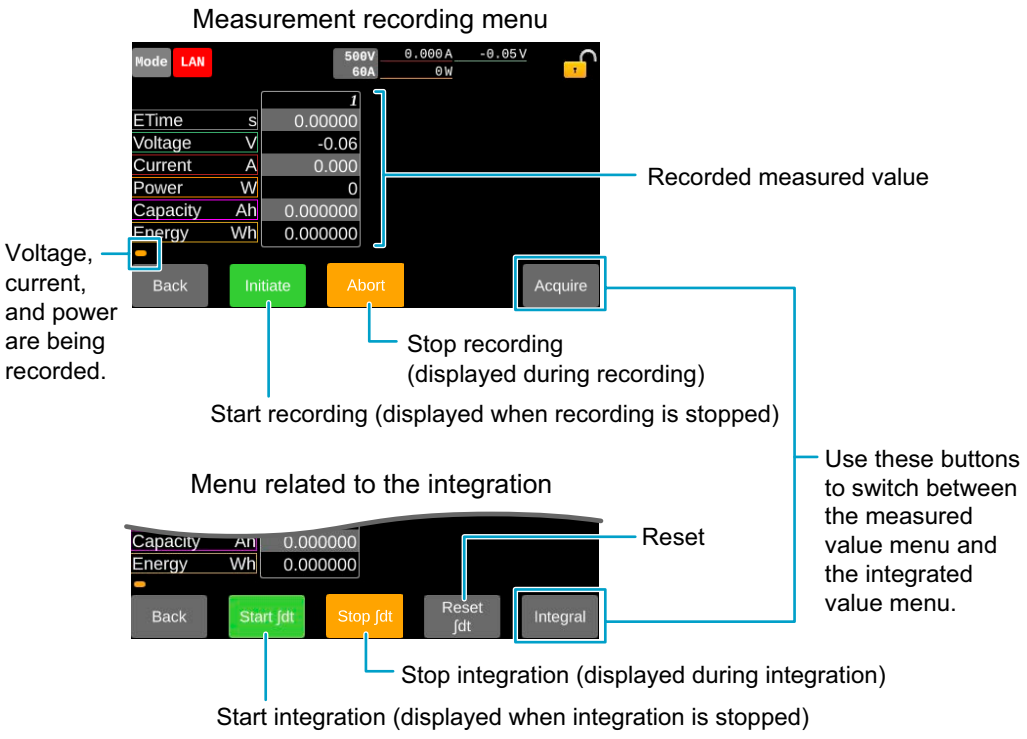
2 **Press Acquire/Integral.**

The following figure shows an example of the View List screen.



Execute measurement screen is displayed.

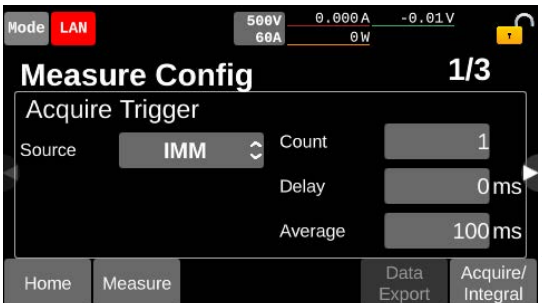
On the execute measurement screen, the menu can be switched between menus related measurement and menus related to integration. The menus related to integration is displayed when the conditions for starting/stopping integration and resetting the integration value are set to Manual.



Changing the settings of measurement

Press Measure > Measure Config on the homepage to change the measurement settings.

To display settings not fully displayed on the screen, swipe the measurement setting area to the left or right, or press the ◀/▶ keys to scroll the screen. Limit is a steady-state behavior limit, not a transient limit.



You can set the following conditions.

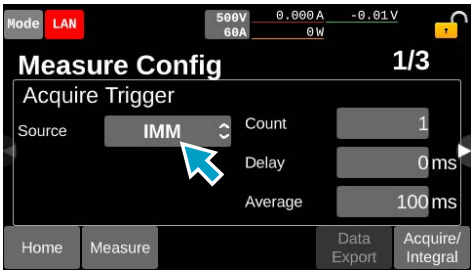
Item		Description
Acquire Trigger	Source	Set the condition to start recording measured values (trigger source). *(p.45)*
	Average	Sets the number of times measurement values are to be recorded. *(p.46)*
	Delay	Set the delay time until the measurement is started after the trigger is applied. *(p.46)*
	Average	Sets the recording time period per measurement. *(p.46)*
Acquire Interval	Timer	When Enable is checked, the recording interval time is set. *(p.47)*
	Enable	Set whether to measure at intervals when the measured values are recorded two or more times. *(p.47)*

Measurement trigger settings

■ Trigger wait settings

Set the condition to start measurement (trigger source).

Inputting the set trigger source is input applies the trigger. Press the input field for Source to select the value with the display.



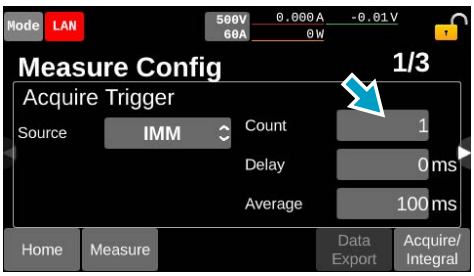
Item	Description
IMM	A trigger is applied immediately.
BUS	A trigger is applied when the *TRG command in received by remote control.
EXT	The trigger is applied at the time of inputting a signal to the terminal where the general-purpose digital input of the EXT CONT connector *(p.143)* is set to ACQUIRE TRIG.
MSYN	Trigger is applied when Msync is pressed during synchronization *(p.89)* or when receiving a sync signal of measurement by remote control.
Load OFF	The trigger is applied when the load off.

Setting the number of times of recording

Sets the number of times measurement values are to be recorded.

Press the input field for Count to select the value with the display or the rotary knob.

Busy is displayed during measurement and key operations will be disabled.

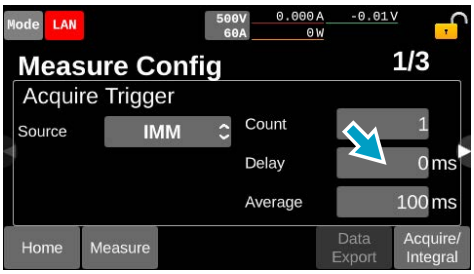


Setting range: 1 to 65536

Setting the delay time

Set the delay time until the measurement is started after the trigger is applied.

Press the input field for Delay to select the value with the display or the rotary knob.



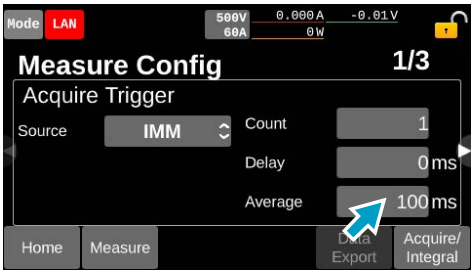
Setting range: 0 ms to 100000 ms

Setting the recording time

Sets the recording time period per measurement.

For voltage, current, and power, the average value is recorded within the Average time after the measurement is started. For elapsed time, integrated current, and integrated power, the integrated value is recorded at a point in time when the Average time has elapsed after the measurement is started.

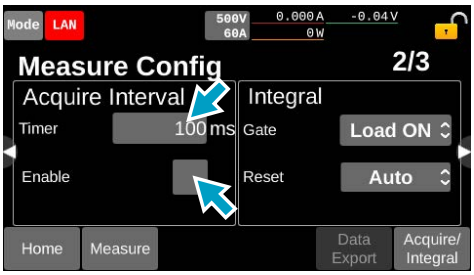
Press the input field for Average to select the value with the display or the rotary knob.



Setting range: 0.1 ms to 1000 ms

Setting the recording interval

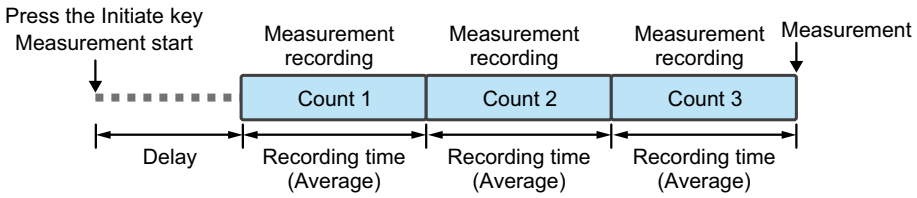
Set the recording interval time when measured values are recorded two or more times. Press the input field for Timer to select the value with the display or the rotary knob. Press the input field for Enable and check it to enable the Timer.



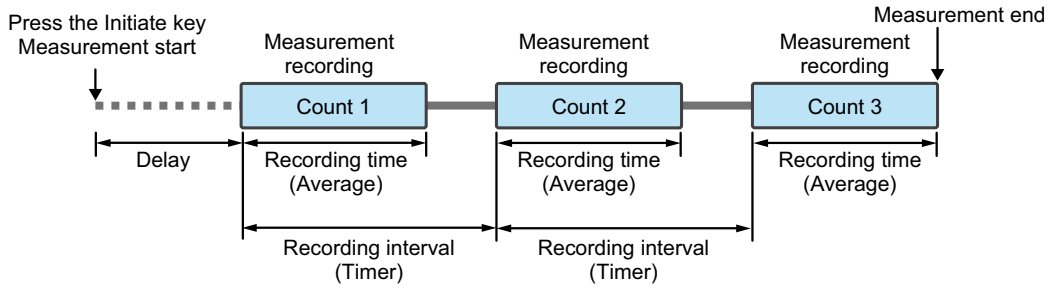
Setting range: 0.1 ms to 3600000 ms

Example of measurement operation

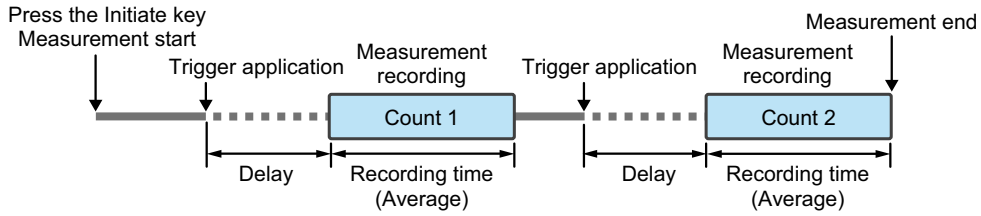
Source: IMM
Count: 3
Enable: No check



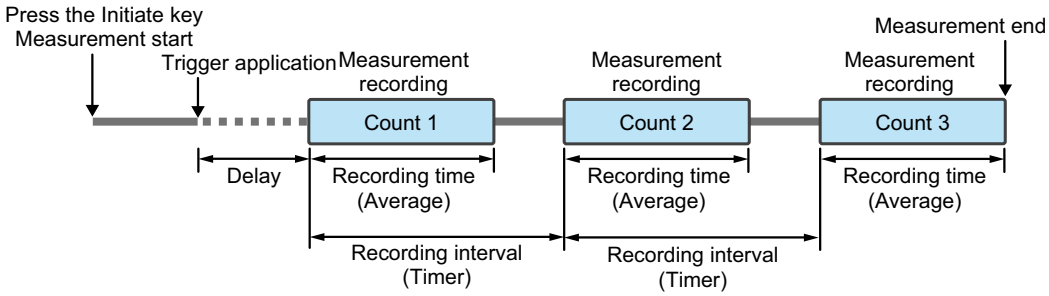
Source: IMM
Count: 3
Enable: With check



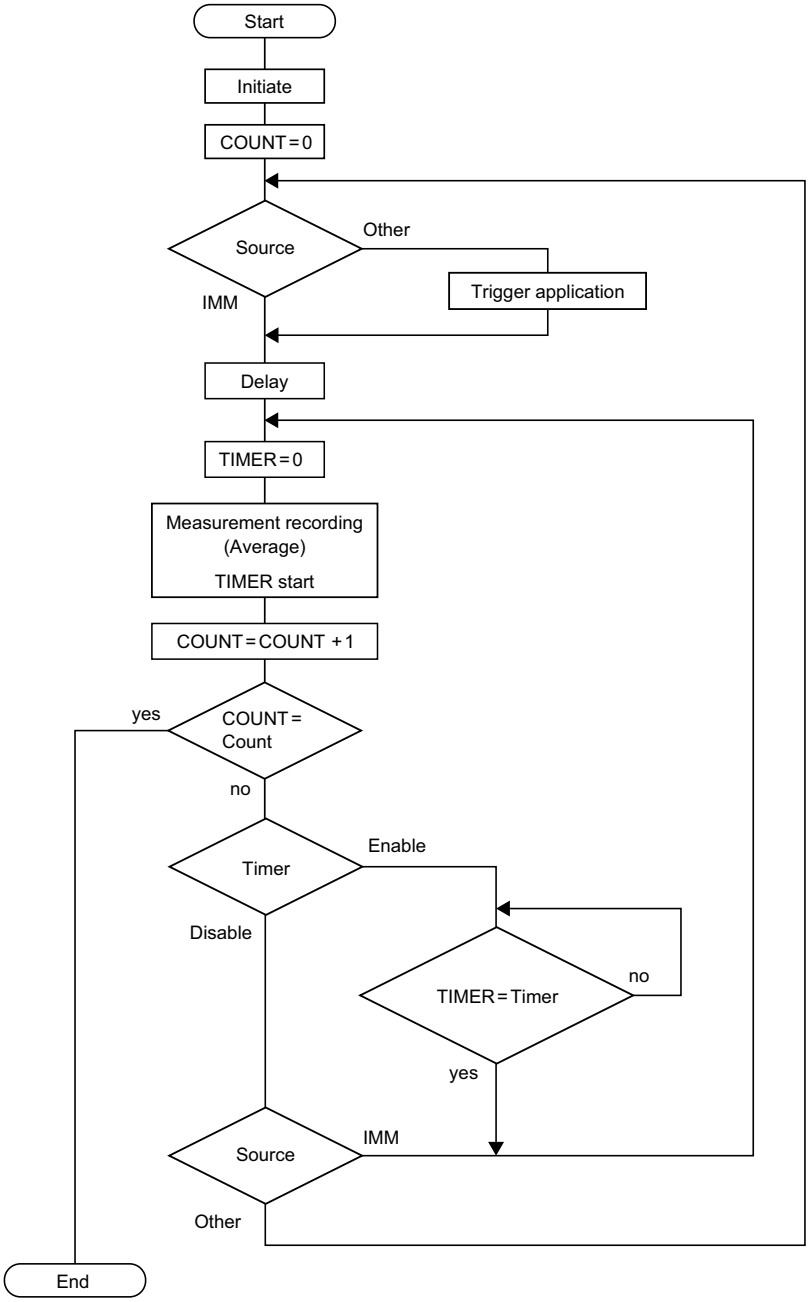
Source: BUS, EXT, MSYN or Load OFF
Count: 2
Enable: With check



Source: BUS, EXT, MSYN, or Load OFF
Count: 3
Enable: With check

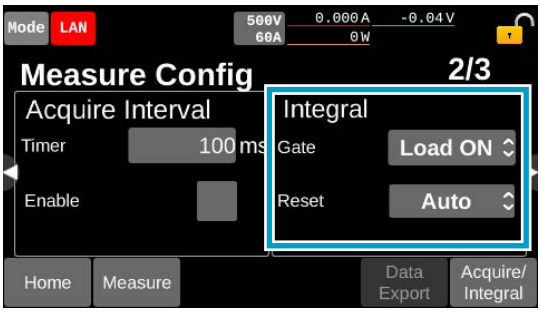


Measurement recording flowchart



Changing the integration settings

Pressing Measure > Measure Config on the homepage and swipe to the left or press the ▶ key on the front panel will enable to change the integration settings.



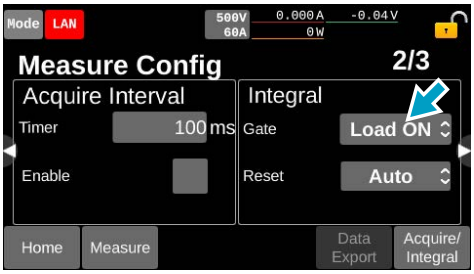
You can set the following conditions.

Item		Description
Integral	Gate	Set the conditions for starting and stopping the integration of elapsed time, current, and power. *(p.50)*
	Reset	Sets the condition to reset the recorded integrated value. *(p.51)*

Conditions for starting/stopping integration

Set the conditions for starting and stopping the integration of elapsed time, current, and power.

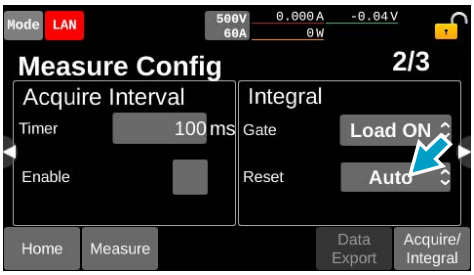
Press the input field for Gate to select the value with the display.



Item	Description
Manual	Press Start ∫dt to start integration, and press Stop ∫dt to stop integration.
Load ON	Integration starts/stops in conjunction with load on/off.
EXT	Integration starts/stops when a signal *(p.143)* is input to the EXT CONT connector.
PROG RUN	Integration is started/stopped interlocking with sequence execution.

Conditions for resetting the integrated values

Conditions for resetting the recorded integrated values. If the product is restarted, integrated value is reset. Press the input field for Reset to select the value with the display.

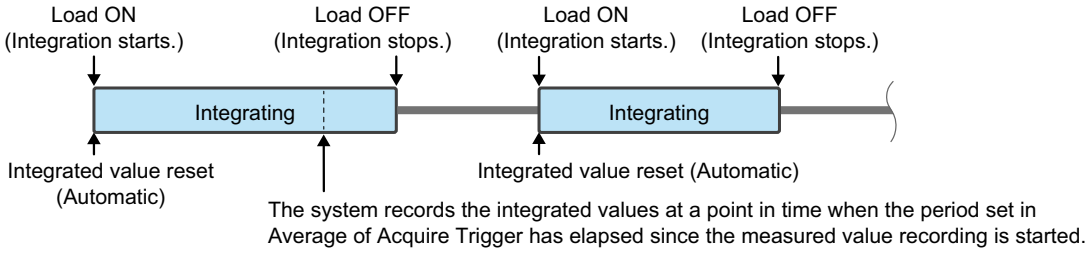


Item	Description
Manual	Press Reset ∫dt to reset.
Auto	The value is automatically reset before starting the integration.
EXT	The value is reset when a signal *(p.143)* is input to the EXT CONT connector.

Example of Integration operation

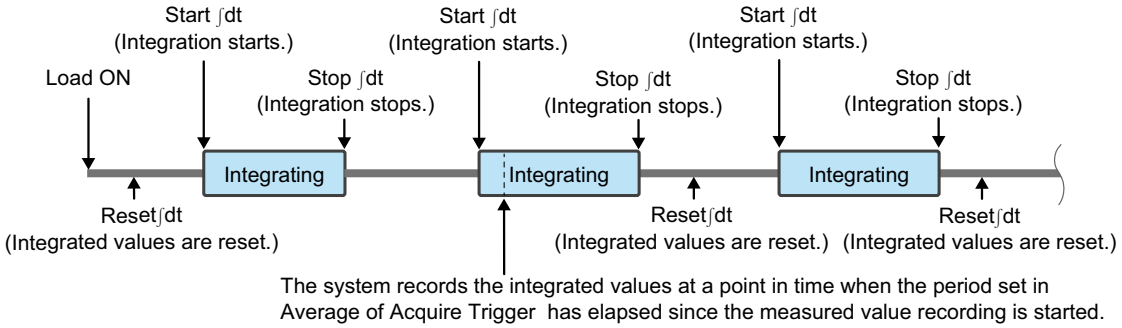
Gate: Load ON

Reset: Auto



Gate: Manual

Reset: Manual



Displaying the measured value recorded

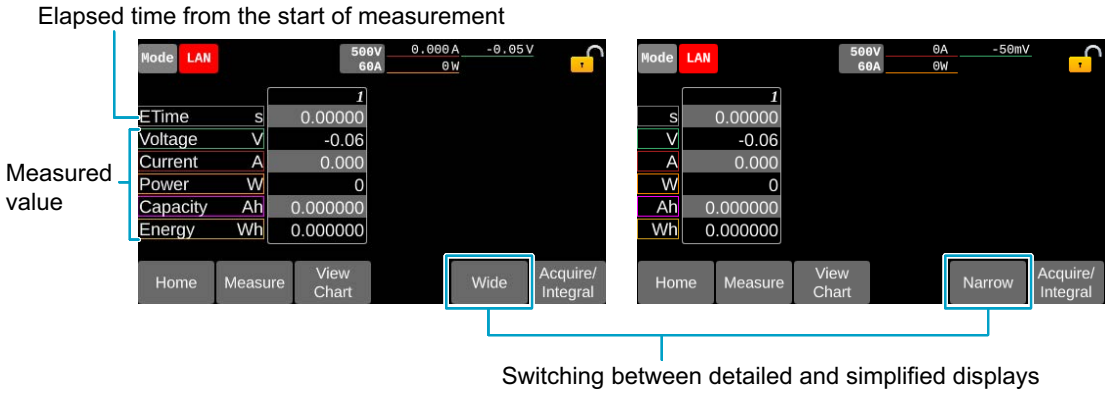
Measured values can be displayed in the list and graph forms.

NOTE

The measured values are redrawn each time they are displayed. Since it takes time to draw when there are 2000 measurement points or more (approximately 14 minutes maximum as a guide), it may appear that the measurement is ongoing even after the measurement is complete.

Displaying in the list form

Pressing Measure > View List on the homepage enables to display recorded measured values according to the number of times recorded.

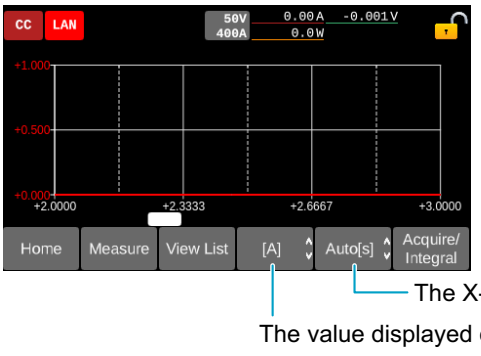


Pressing Wide or Narrow enables to switch between detailed and simplified displays.

Pressing View Chart switches to the display in graph form.

Displaying in the graph form

Pressing Measure > View Chart on the homepage enables to display recorded measured values in the graph form.

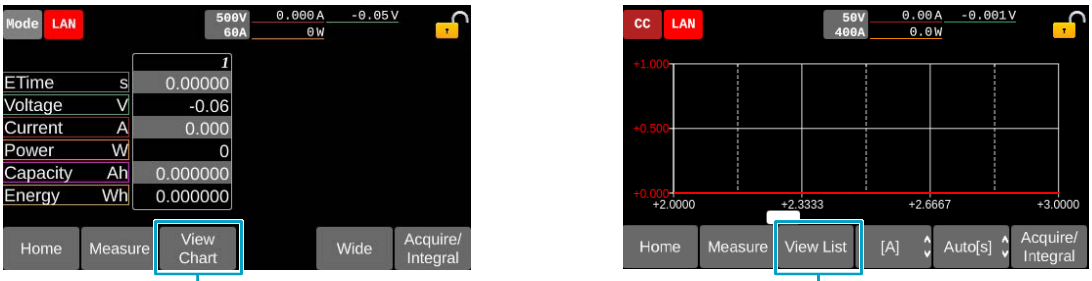


The value to be displayed on the Y-axis can be selected from current, voltage, or current and voltage. Displays the elapsed time since the start of measurement on the X-axis. The range of the X-axis can be changed.

Item	Selectable values
Values to be displayed on the Y-axis	[V],[A]/[V]/[A]
X-axis range	Auto[s]/Auto[min]/Auto[h]/30.0[min]/60.0[min]/10.0[h]/50.0[h]/100.0[h]

Switching between list and graph format display

Pressing View Chart or View List enables to switch between list and graph format displays.



Switching between list and graph format

Exporting measured values to a USB memory device

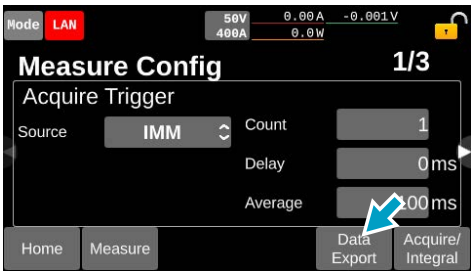
Saves the measured value recorded in the PXZ series to a USB memory device in CSV format. To open the CSV files, use an application that is compatible with the CSV format in order to prevent the index part from being turned into a character string.

1 **Insert a USB memory device into the USB connector on the front panel.**

2 **Press Measure > Measure Config on the homepage.**

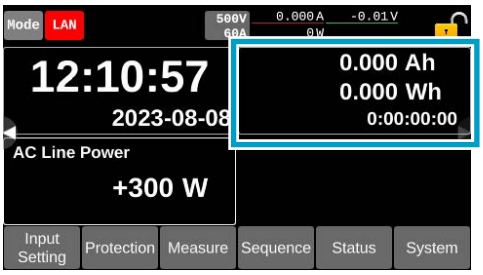
3 **Press Data Export.**

A “MEAS” folder is created on the USB memory device and the CSV file will be saved.
When there are no recorded measured values, Data Export will be grayed out.



Displaying the most recent integrated values

Swiping to the left on the homepage or pressing the ▶ key enables to display the latest integration value.



Protection Functions

When a protection function is activated, an alarm is generated. Here, alarm types, how to set the protection function, and the operation when an alarm is generated are explained.

Alarm Types

There are two levels in alarm (LOW / HIGH) depending on the level of urgency.

LOW alarm

When a LOW alarm occurs, the load is turned off. While a sequence is running, the sequence is paused. Check the settings that is being a cause of the alarm.

Remove the cause of the alarm, then clear the alarm *(p.67)*. It is not necessary to turn off power of the PXZ series.

When the alarm is released, the paused sequence is resumed.

LOW alarms that occur on the master unit during standalone operation or parallel operation

Name	Display indication	Description
Overvoltage protection	OVP	A voltage at the OVP set value *(p.58)* or higher was applied to the DC INPUT terminal.
Undervoltage protection	UVP	The voltage at the DC INPUT terminal dropped to the UVP set value *(p.59)* or lower.
Overcurrent protection	OCP	A current at the OCP set value *(p.60)* or higher flowed to the DC INPUT terminal.
Overpower protection	OPP	Electric power of the OPP set value *(p.61)* or higher was generated at the DC INPUT terminal.
Communication error protection	WDOG	SCPI communication was not performed to or over the time set under the communication error protection *(p.63)*.
External input alarm detection	EXT LOW	A signal was entered to the terminal where L ALARM IN is set by the general-purpose digital input of the EXT CONT connector. Clear the signal entered to the EXT CONT connector.

LOW alarms that occur on the master unit or slave units during parallel operation

Name	Display indication	Description
Slave unit overvoltage protection	SLV OVP	A voltage higher than the rated voltage was applied to the slave unit. Make sure that the wiring of the load cables are appropriate.
Slave unit overcurrent protection	SLV OCP	A current in excess of the rated current flowed to the slave unit. Make sure that the wiring of the load cables are appropriate.
Slave unit overpower protection	SLV OPP	Power in excess of the rated power was generated in the slave unit. Make sure that the wiring of the load cables are appropriate.

HIGH alarm

⚠WARNING

Risk of electric shock.

- **If you turn off the POWER switch due to a HIGH alarm, do not touch the DC INPUT terminal.**
  A residual charge may exist in the DC INPUT terminal. For more information on the required time for the discharge, refer to “Guide for Required Time for Residual Voltage Discharge” *(p.197)*.

When a HIGH alarm occurs, the load is turned off. Turn off power of PXZ series to remove the cause of the problem, then turn on power again. If the OHP alarm goes off, leave it for about 10 minutes with power on.

HIGH alarms that occur on the master unit during standalone operation or parallel operation

Name	Display indication	Description
Reverse-connection detection protection	REVE	A negative voltage was applied to the DC INPUT terminal. If this happens, immediately shut off the DUT output.
Overheat protection	OHP	The temperature of the internal devices exceeds the standard. Make sure that the front-panel air inlet and rear-panel air outlet are not blocked, and leave it for about 10 minutes with power on. Then, turn off power and turn on power again.
Grid overvoltage protection	LOVP	A voltage at or higher the LINE OVP set value was applied to the AC INPUT terminal.
Grid undervoltage protection	LUVP	Input voltage rating 200 Vac model: Input voltage at the AC INPUT terminal is less than 175 V. Input voltage rating 400 Vac model: Input voltage at the AC INPUT terminal is less than 333 V.
Grid abnormal frequency protection	FREQ	A frequency other than the input frequency (42 Hz to 68 Hz) was entered to the INPUT terminal.
External input alarm detection	EXT HIGH	A signal is entered to H ALARM IN (Pin No. 21) of the EXT CONT connector. Cancel the signal input, disable the digital I/O *(p.142)*, turn the power off, and then back on.
Incorrect sensing connection detection	SENS	The voltage difference between DC INPUT terminal and the sensing terminal is 10 % or more of the rated input voltage. Make sure that there is no reverse connection or disconnection, and that the load cables are appropriate.
Hardware error	ERRH	A problem occurred in PXZ series hardware. If the alarm does not clear, even after turning off the power supply of the PXZ series unit and then turning on it, contact your Kikusui agent or distributor.
Software error	ERRS	A problem occurred in PXZ series software. If the alarm does not clear, even after turning off the power supply of the PXZ series unit and then turning on it, contact your Kikusui agent or distributor.

HIGH alarms that occur on the master unit or slave units during parallel operation

Name	Display indication	Applicable function	Description
Parallel operation communication error	PARA COM	Master unit Slave unit	An error occurred in communication with a PXZ series unit connected in parallel operation. Turn off the POWER switch of PXZ series, check the parallel operation signal cable connection, and then turn on the POWER switch again.
Not applicable device connected	SLV INC	Slave unit	A model with a different voltage rating than the master unit is connected in parallel.
Too many parallel connections	TOO MANY	Master unit	Ten or more slave units were connected.
Slave unit hardware error	SLV ERRH	Master unit	A problem occurred in the slave unit hardware. If the alarm does not clear, even after turning off the power supply of the PXZ series unit and then turning on it, contact your Kikusui agent or distributor.
Slave unit software error	SLV ERRS	Master unit	A problem occurred in the slave unit software. If the alarm does not clear, even after turning off the power supply of the PXZ series unit and then turning on it, contact your Kikusui agent or distributor.
Slave unit overheat protection	SLV OHP	Master unit	The temperature of the internal device of the slave unit exceeded the preset value. Make sure that the front-panel air inlet and rear-panel air outlet are not blocked, and leave it for about 10 minutes with power on. Then, turn off power and turn on power again.
Slave unit system overvoltage protection	SLV LOVP	Master unit	A voltage higher than the LINE OVP setting was applied to the AC INPUT terminal of the slave unit.
Slave unit system frequency abnormal	SLV FREQ	Master unit	A frequency other than the input frequency (42 Hz to 68 Hz) was input to the AC INPUT terminal of the slave unit.
Slave unit system undervoltage protection	SLV LUVP	Master unit	When the slave unit is input voltage rating 200 Vac model: The input voltage at the AC INPUT terminal has become less than 175 V. When the slave unit is input voltage rating 400 Vac model: The input voltage at the AC INPUT terminal has become less than 333 V.
Slave unit abnormal	SLV OTHR	Slave unit	An alarm of another unit was detected.

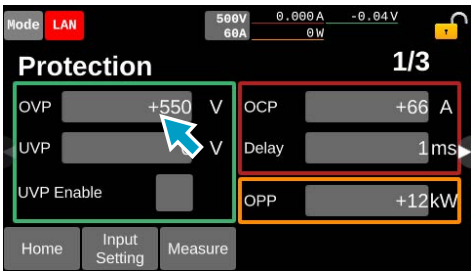
Setting the Protection Functions

Setting overvoltage protection (OVP)

When a voltage greater than the set value is applied to the DC INPUT terminal, an alarm occurs and the load is turned off.

1 **Press Protection on the homepage.**

2 **Press the input field for OVP.**



Setting range (PXZ20K-500): 50 V to 550 V
Setting range (PXZ20K-1000): 100 V to 1100 V
Setting range (PXZ20K-1500): 150 V to 1650 V

3 **Use the display or the rotary knob to enter the voltage value.**
This completes the setting.

Setting undervoltage protection (UVP)

When the voltage at the DC INPUT terminal falls below the set value, an alarm occurs and the load is turned off. You can also disable UVP.

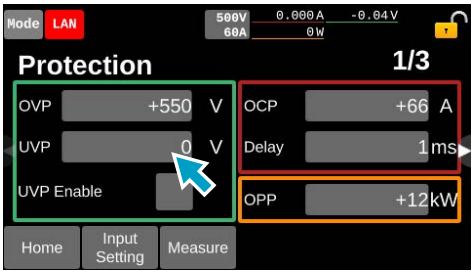
NOTE

When using UVP, load on and enable UVP after the voltage reaches the set value. The alarm occurs when the voltage immediately after the load is turned on is below the UVP set value, because the protection function is activated immediately after the load is turned on.

1 **Press Protection on the homepage.**

2 **Set the voltage of UVP.**

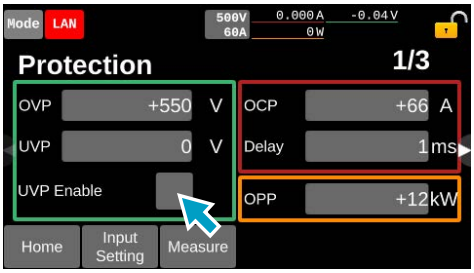
Press the input field for UVP to enter the voltage value on the display or by the rotary knob.



Setting range (PXZ20K-500): 0 V to 500 V
Setting range (PXZ20K-1000): 0 V to 1000 V
Setting range (PXZ20K-1500): 0 V to 1500 V

3 **Enable or disable UVP.**

Press the check box of UVP Enable. Each time you press the check box, the existence of checking changes. With a check mark, UVP is enabled, without a check, UVP is disabled.



This completes the setting.

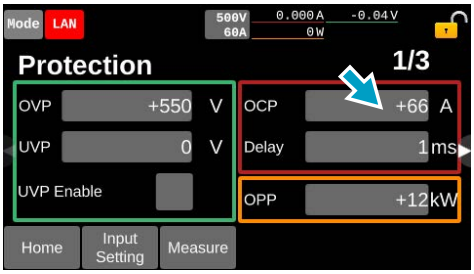
Setting overcurrent protection (OCP)

When a current exceeding the set value flows through the DC INPUT terminal, an alarm occurs and the load is turned off. The delay time from the detection of an electric current at the set value or higher to the activation of the OCP can also be set.

1 **Press Protection on the homepage.**

2 **Set the current in OCP.**

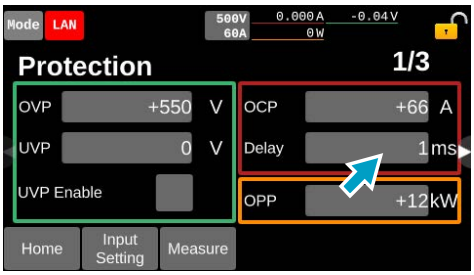
Press the input field for OCP, and enter the current value on the display or by the rotary knob.



Setting range (PXZ20K-500): 12 A to 132 A
Setting range (PXZ20K-1000): 6 A to 66 A
Setting range (PXZ20K-1500): 3 A to 33 A

3 **Set the delay time to the activation of the OCP.**

Press the input field for Delay to enter the delay time on the display or by the rotary knob.



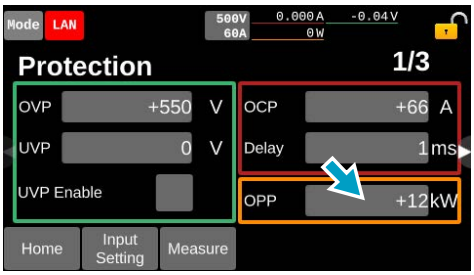
Setting range: 1 ms to 2000 ms
This completes the setting.

Setting overpower protection (OPP)

When a power exceeding the set value is generated to the DC INPUT terminal, an alarm occurs and the load is turned off.

1 **Press Protection on the homepage.**

2 **Press the input field for OPP.**



Setting resolution: 2 W
Setting range: 2 kW to 24 kW

3 **Use the display or the rotary knob to enter the power value.**
This completes the setting.

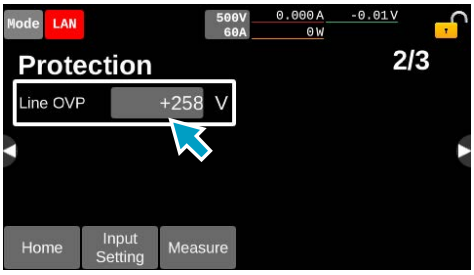
Setting grid overvoltage protection (LOVP)

When a voltage greater than the set value is applied to the AC INPUT terminal, an alarm occurs and the load is turned off.

1 **Press Protection on the homepage.**

2 **Swipe to the left, or press the ▶ key.**

3 **Press the input field for Line OVP.**



Input voltage rating 200 Vac model: 200 V to 258 V
Input voltage rating 400 Vac model: 380 V to 516 V

4 **Use the display or the rotary knob to enter the voltage value.**
This completes the setting.

Setting communication error protection (WDOG)

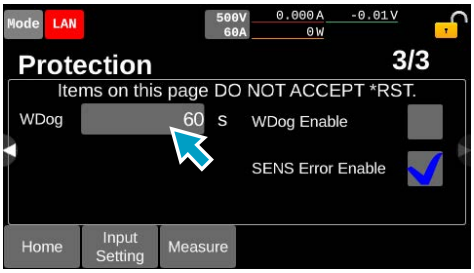
When there is no SCPI communication for a period of time longer than the WDOG set value, an alarm is generated and the load is turned off.

1 **Press Protection on the homepage.**

2 **Swipe to the left, or press the ▶ key, till WDog is displayed.**

3 **Enter the set value for WDog.**

Press the input field for WDog to enter the time on the display or by the rotary knob.



Setting range: 1 s to 3600 s

4 **Enable / disable WDog.**

Press the check box of WDog Enable. Each time you press the check box, the existence of checking changes. With a check mark, UVP is enabled, without a check, UVP is disabled.

This completes the setting.

Setting incorrect sensing connection detection (SENS)

When the voltage difference between the DC INPUT and SENSING terminals exceeds 10 % of the rated voltage, an alarm occurs and the load is turned off.

1 **Press Protection on the homepage.**

2 **Swipe to the left, or press the ▶ key, till SENS Error Enable is displayed.**

3 **Press the check box of SENS Error Enable.**

Each time you press the check box, the existence of checking changes. With a check mark, UVP is enabled, without a check, UVP is disabled.

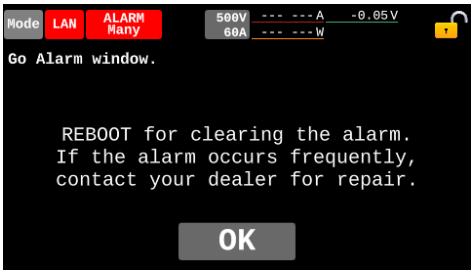
This completes the setting.

Remedying Alarm Generation

When an alarm occurs

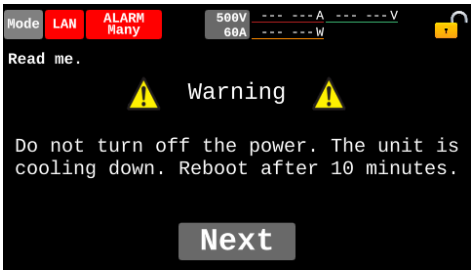
Common actions

When the protective function is activated and an alarm is generated, the load is turned off. A message corresponding to the alarm level will be indicated on the display. Press OK to display the alarm screen. If alarm-related settings are made for the general-purpose digital output of the external control *(p.145)*, the signal of the EXT CONT connector corresponding to the settings will be turned on.



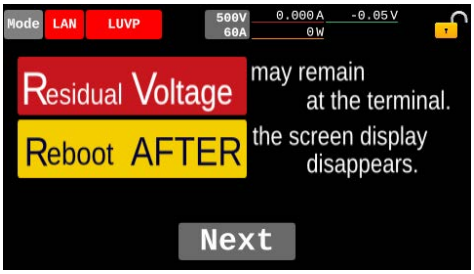
When the overheat protection (OHP) is activated

A message requesting 10-minute cooling down before clearing the alarm will appear. Press “Next” to see a message corresponding to the alarm level.



When the grid undervoltage protection (LUVP) is activated

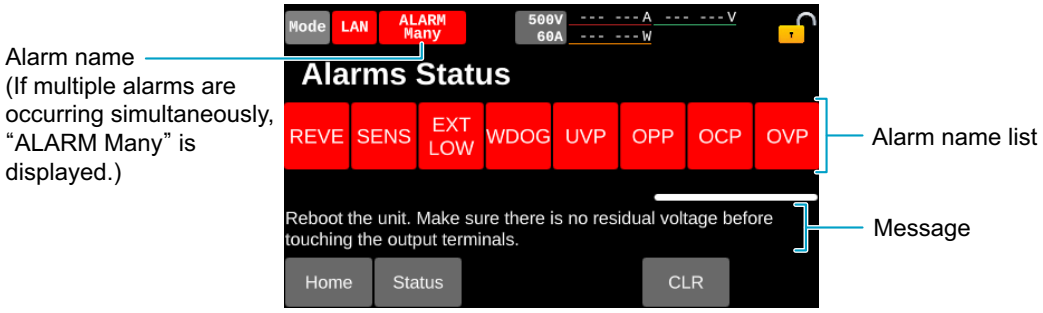
A screen similar to the one when you turned off power will appear, and “Next” will be displayed 15 seconds after. Press “Next” to see a message corresponding to the alarm level.



Checking alarm screen

On the alarm screen, the alarm name and message will be displayed. When the alarm names are not fully displayed on one screen, swipe the list of alarm names or press the ◀/▶ keys to scroll the screen.

The alarm screen can also be displayed by pressing Status > Alarm Status on the homepage.



For the details of alarm names and descriptions, refer to “Alarm Types” *(p.55)*.

Clearing an alarm

The recovery method varies depending on the level of the alarm occurring. The recovery method will be displayed on the alarm screen as a message. For details, refer to “Alarm Types” *(p.55)*.

Clearing LOW alarm

1 **Remove the cause of the alarm.**

2 **Press CLR.**

The alarm is cleared.

NOTE

- If the cause of the alarm remains, the alarm will occur again.
- You can also clear the LOW alarm with an external control signal *(p.143)*.

Clearing HIGH alarm

1 **Turn off the POWER switch, and remove the cause of the alarm.**

In the case of OHP alarm, make sure that the front-panel air inlet and rear-panel air outlet are not blocked, and leave it for about 10 minutes with power on. Then, turn off the POWER switch.

2 **Turn on the POWER switch again.**

The alarm is cleared.

NOTE

If you want to turn the POWER switch back on, wait at least 10 seconds after the fan stops. Repeatedly turning the POWER switch on and off at short intervals will shorten the service life of the POWER switch and the internal input fuse.

Advanced Functions

Remote Sensing

You can change a voltage measurement point from a DC INPUT terminal to an arbitrary sensing point. By setting the sensing point to the DUT end, up to 10 % of the rated voltage can be compensated in a reciprocating motion. Remote sensing stabilizes the load current by reducing the effects of voltage drop, etc. caused by the load cable resistance.

To use remote sensing, connect PXZ series to the load with sensing cables and enable remote sensing.

Connecting the sensing cables

⚠WARNING

Risk of electric shock.

- **Do not connect cables to the SENSING terminals while the POWER switch is turned on.**
- **For SENSING cables, use cables whose rated voltage is higher than the isolation voltage of PXZ series.**
  Recommended wiring: UL3239; Rated voltage 3 kV
- **Make sure not to have the conductor of the cable touch the chassis when connecting.**
- **Before turn the POWER switch on, make sure that the Sensing terminal cover is attached.**

⚠CAUTION

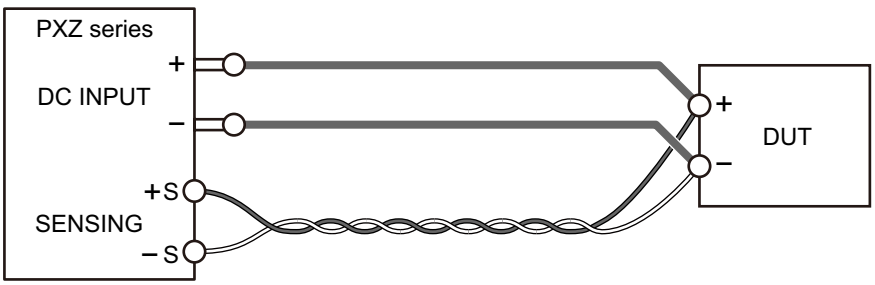
PXZ series and DUT may be damaged.

- **Securely connect the SENSING terminals with the cables having the designated wire size.**
  Make sure that wiring is not disconnected during remote sensing.

Connect the sensing cables to the SENSING terminals (+S, −S) of PXZ series and the DUT end.

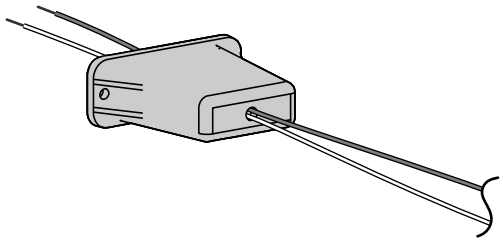
Use AWG22 - AWG16 cables when connecting to the sensing terminals.

When performing parallel operation, connect the sensing cable only to the master unit.



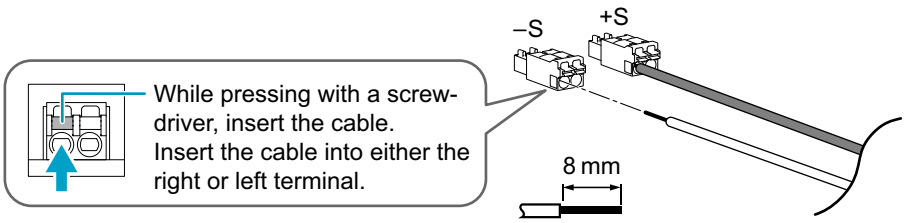
1 **Turning the POWER switch off (○) and remove the sensing terminal cover from the sensing terminal.**

2 **Insert the sensing cables to the included sensing terminal cover.**



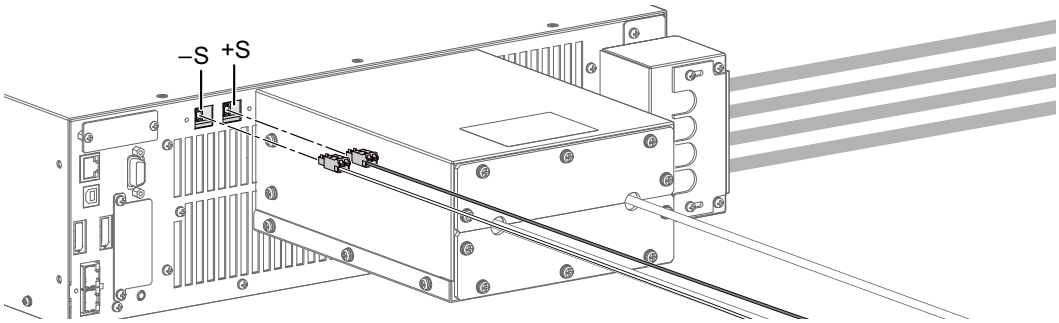
3 **Connect the sensing cables to the included sensing connectors.**

Strip approximately 8 mm of coating from the end of the sensing cable.



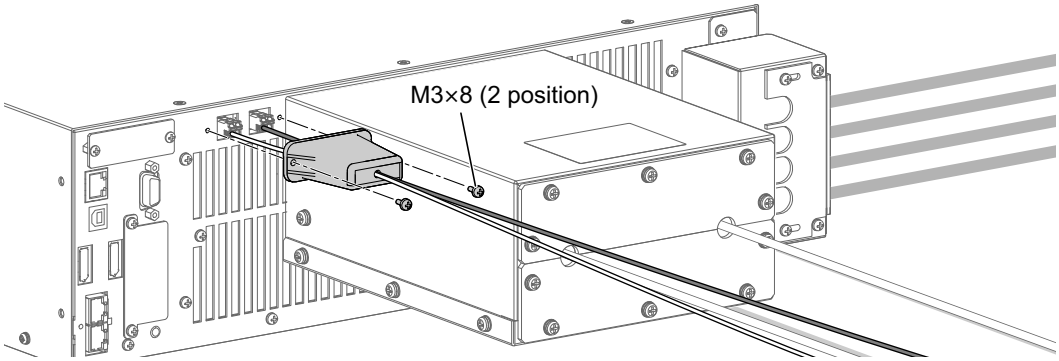
4 **Connect the sensing connectors to the sensing terminal.**

The following figure shows an example of PXZ20K-1500.



5 **Attach the sensing terminal cover.**

The following figure shows an example of PXZ20K-1500.



6 **Connect the sensing cables to the DUT.**

Twist the sensing cables, and connect the SENSING terminals with the DUT terminals by matching their polarities.

This completes the connections.

Enabling or disabling remote sensing

After connecting the sensing cables to the SENSING terminals, enable remote sensing.
You cannot set it while load on.

1 **Press Measure > Measure Config on the homepage.**

2 **Swipe to the left, or press the ▶ key, till RMT Sensing is displayed.**

3 **Press the input field for RMT Sensing.**
The value switches between Enabled and Disabled each time that you press the key.

When remote sensing is enabled, the sensing icon ( ) appears on the upper right part of the display.
This completes the setting.

Response

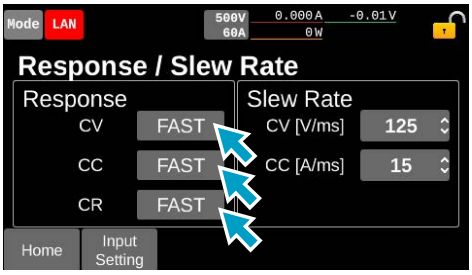
Select the response in the CV mode / CC mode / CR mode from “SLOW” or “FAST.”
Cannot be set during load on.

NOTE

When the response speed is set to FAST, the operation may become unstable if the load cable is long or has a large loop. In those cases, set the response to SLOW.

1 **Press Input Setting > Response / Slew Rate on the homepage.**

2 **Press the input field for CV, CC or CR below Response.**
Each time you press the field, it switches between SLOW and FAST.



This completes the setting.

Slew Rate

Setting slew rate

Set the amount of change per unit time when changing the current or voltage in the CV or CC mode. The value is common to rising and falling slopes. You cannot set it while load on.

The slew rate functions in the following cases.

- When the current or voltage value is changed by changing the set value.
- When the current or voltage value is changed by an external control.
- When the current or voltage value is changed by turning the load on.
- When the load is turned off.

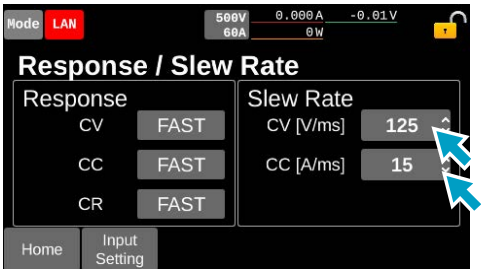
Model	Operation mode	Slew rate
PXZ20K-500	CV [V/ms]	0.125/1.25/12.5/125/MAX
	CC [A/ms]	0.3/3/30/60/MAX
PXZ20K-1000	CV [V/ms]	0.25/2.5/25/250/MAX
	CC [A/ms]	0.150/1.50/15.0/30/MAX
PXZ20K-1500	CV [V/ms]	0.375/3.75/37.5/375/MAX
	CC [A/ms]	0.075/0.75/7.5/15/MAX

NOTE

- In the CV mode, the set slew rate may not be achieved due to the input capacitance of the DUT.
- When set to MAX, the slew rate is 25 % or more of the rating in CV mode and 100 % or more of the rating in CC mode. For example, the maximum CV mode of the PXZ20K-1500 will result in a slew rate of 375 V/ms or more. It can be used when you need the fastest operation, but note the following points.
  - Overshoot will occur more easily due to the faster response time.
  - OCP alarms may occur when the OCP setting is 20 % or less of the rating. It is because the charge current of the internal capacitor is detected during input even if the DUT is not connected.

1 **Press Input Setting > Response / Slew Rate on the homepage.**

2 **Press the input field for CV [V/ms] or CC [A/ms] below Slew Rate.**



3 **Select the slew rate value.**

This completes the setting.

Settings at Startup

Select the setting status at power-on.

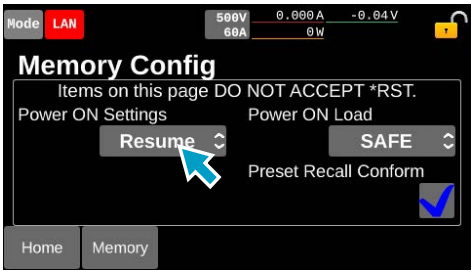
For load on/off status, the Power ON Load *(p.74)* setting is reflected.

Item	Description
RST	Start with the reset settings *(p.193)*.
Recall	Starts in the state of loading an arbitrary setup memory.
Resume	Start with the same settings as when the power was switched off the previous time.

1 **Swipe to the right, or press the ◄ key on the homepage.**

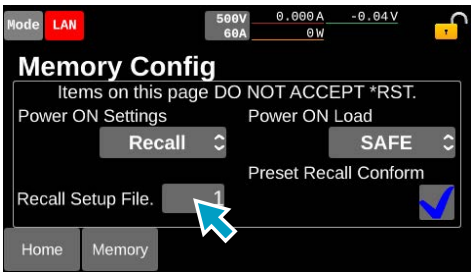
2 **Press Memory > Memory Config.**

3 **Press the input field for Power ON Setting.**



4 **Select and press the item.**

5 **In the case of selecting Recall, press the input field for Recall Setup File and Input the number of the setup memory with the display or the rotary knob.**



This completes the setting.

Load State at Startup

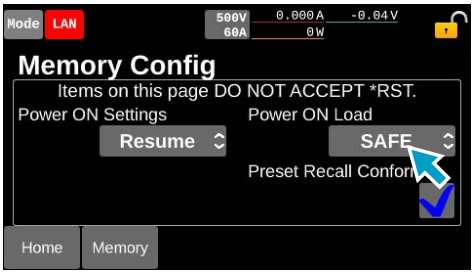
Set the load state at power-on.

Item	Description
SAFE	Load off to start.
AUTO	Operation varies depending on the settings at startup *(p.73)*. For RST, start with load off. If Resume is set, starts at the settings applied when the POWER switch was turned off last time. In the case of recall, the setup memory is started in the loaded state when it is called.
FORCE	Load on to start.

1 **Swipe to the right, or press the ◀ key on the homepage.**

2 **Press Memory > Memory Config.**

3 **Press the input field for Power ON Load.**



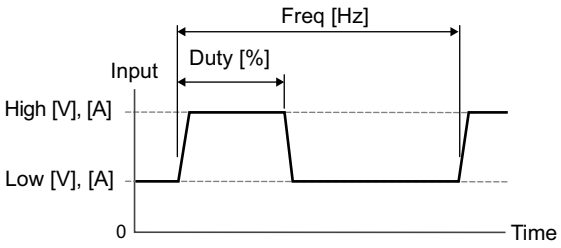
4 **Select and press the item.**
This completes the setting.

Pulse Function

Pulse refers to the operation of executing two settings repetitively. It is suitable for transient response characteristics testing of large capacity power supplies and batteries. Settings cannot be performed while a sequence is running.

Setting the pulse waveform

Set the pulse waveform with High input value, Low input value, frequency, and duty cycle. Settings are performed in CV mode, CC mode and CR mode, respectively.



High and Low: Voltage value in CV mode, current value in CC mode and conductance value in CR mode
Freq: Frequency
Duty: Operation time on the High side [s] × Freq [Hz] × 100

NOTE

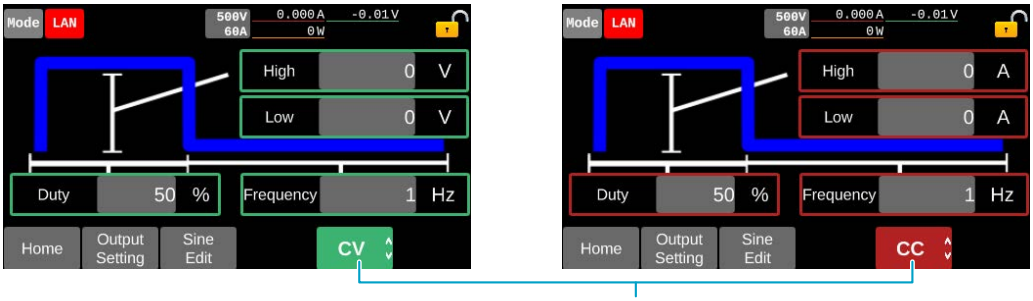
- The amplitude of the waveform may be smaller than the value depending on the DUT to be connected.
- The input voltage value or input current value should be set to 20 % or more of the rated value. If input value is lower than 20 % of the rated value, the rising and falling times will be slower for the following reasons:
  - Transition to other operation mode
  - Input voltage cannot be discharged
- Due to the PXZ series gain characteristics, the input is diminished when setting frequency to 500 Hz or more.

1 **Press Input Setting on the homepage.**

2 **Swipe left or press the ▶ key until PULSE appears, then press PULSE.**

The setup screen for pulse waveforms is displayed.

3 **Press the input fields for High, Low, Duty, and Frequency to input the values with the display or rotary knob, respectively.**



Operation mode to be displayed can be switched.

Pressing Sine Edit switches to the setup screen for sine waveforms *(p.78)*.

To enable the pulse function, set the input mode of the CV mode, CC mode or CR mode to PULSE *(p.76)*.

Enabling the pulse function

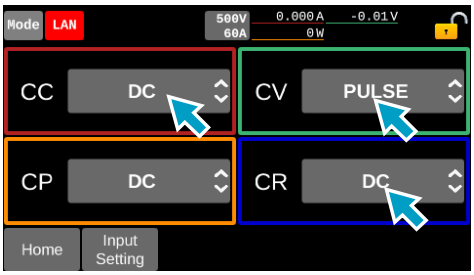
Selecting PULSE in CC mode, CV mode or CR mode input mode enables the pulse function.

NOTE

SINE, I-V, and PULSE cannot be set simultaneously in multiple input modes.

1 **Press Input Setting > Input Mode on the homepage.**

2 **Press the input field for CC, CV or CR to set the input mode to PULSE.**



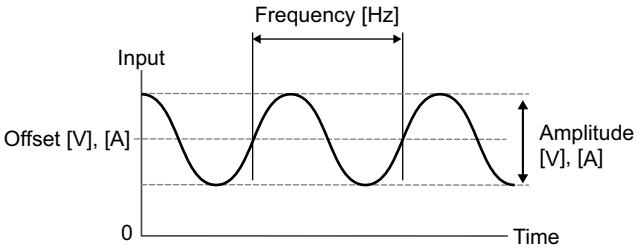
This completes the setting.

Sine Function

The sine function varies the current sinusoidally. It is suitable for superposed ripple testing of large capacity power supplies and batteries. Settings cannot be performed while a sequence is running.

Setting the sine waveform

Sets sine waveforms with amplitude (peak-to-peak value), waveform correction value, and frequency. Settings are performed in CV mode and CC mode, respectively.



Amplitude: peak-to-peak value
Offset: Center value of the amplitude

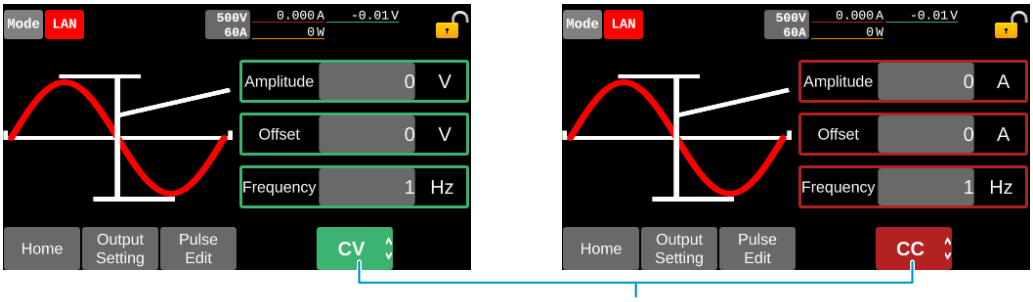
NOTE

- The amplitude of the waveform may be smaller than the value depending on the DUT to be connected.
- PXZ series measured value is an average value. Maximum value, minimum value, and rms value cannot be measured.
- Due to the gain characteristics of the PXZ Series, the input is attenuated when frequency is set to 500 Hz or higher.

1 **Press Input Setting on the homepage.**

2 **Swipe left or press the ▶ key until Sine appears, then press Sine.**
The setup screen for sine waveforms is displayed.

3 **Press the input fields for Amplitude, Offset and Frequency to input the values with the display or rotary knob, respectively.**



Operation mode to be displayed can be switched.

Pressing Pulse Edit switches to the setup screen for pulse waveforms *(p.75)*.
This completes the setting.
To enable the sine function, set the input mode of the CC/CV mode to SINE *(p.78)*.

Enabling the sine function

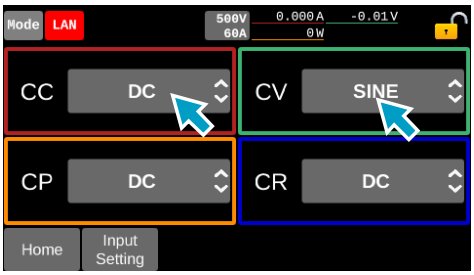
Selecting SINE in the input mode of the CC/CV mode enables the sine function.

NOTE

SINE, I-V, and PULSE cannot be set simultaneously in multiple input modes.

1 **Press Input Setting > Input Mode on the homepage.**

2 **Press the input field for CC or CV to set the input mode to SINE.**



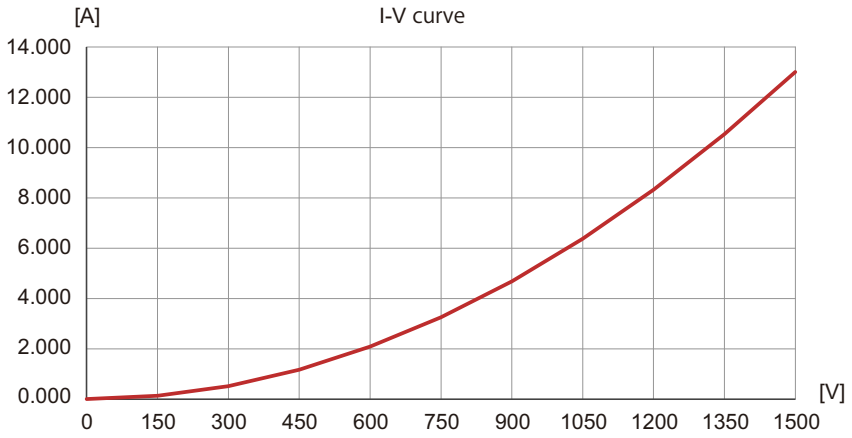
This completes the setting.

I-V Characteristic Function

Arbitrary I-V characteristics can be set according to each CC and CV operation mode by registering multiple I-V characteristic points (pairs of voltage and current values). Three to 100 points can be registered, and the space between two points is linearly interpolated. They can be used for nonlinear load simulation, etc.

Examples of PXZ20K-1500 and CC mode settings are shown.

Points	Voltage [V]	Current [A]
1	0	0.000
2	150	0.130
3	300	0.520
4	450	1.170
5	600	2.080
6	750	3.250
7	900	4.680
8	1050	6.370
9	1200	8.320
10	1350	10.530
11	1500	13.000



NOTE

- Delay of approx. 50 ms at maximum will occur before turning load on.
- If the input current and input voltage oscillate, slow down the slew rate *(p.72)*.

Setting I-V characteristics

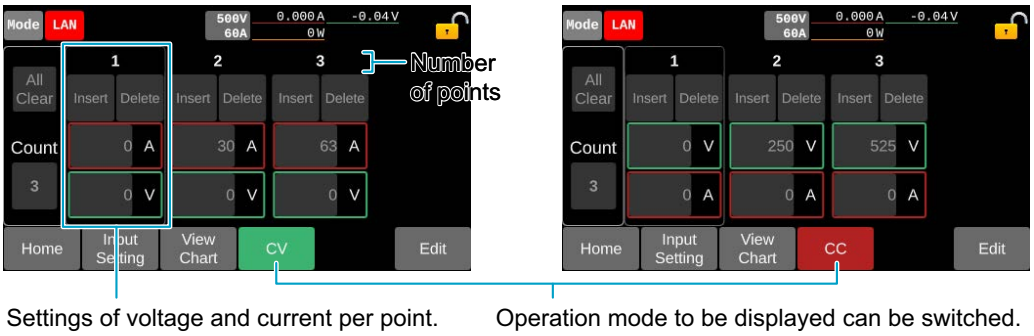
Set the numbers of points of the I-V characteristics and set the voltage and current values for each score.

1 **Press Input Setting on the homepage.**

2 **Swipe to the left, or press the ▶ key, till “I-V List“idisplayed and press I-V List.**

The I-V characteristic edit screen is displayed.

To see I-V characteristics not fully displayed on the screen, swipe to the left and press the ▶ key or the rotary knob to scroll the display.

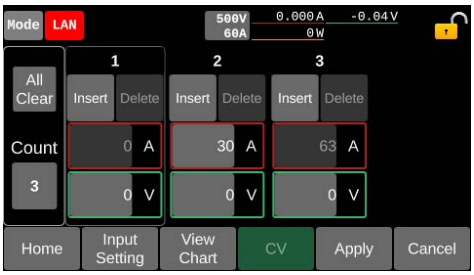


Settings of voltage and current per point.

Operation mode to be displayed can be switched.

3 **Press Edit**

The I-V characteristic editing screen is displayed. The following figure shows an example of the CV mode.



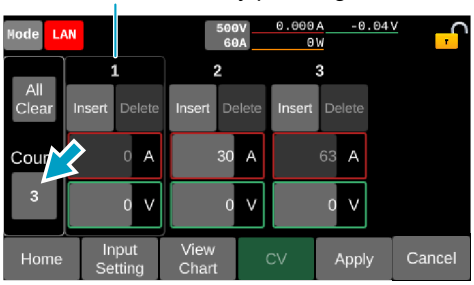
Then, set the number of points of the I-V characteristics and input the value. Points can also be inserted or deleted.

Setting the number of points of the I-V characteristics

Changing the value of Count on the I-V characteristic editing screen changes the number of points of the I-V characteristics.

To increase the number of points, copy the selected points and add them at the end. To reduce the number of points, delete the points behind, including the points being selected. The first and last points cannot be deleted.

Selection is made by pressing the number of points.

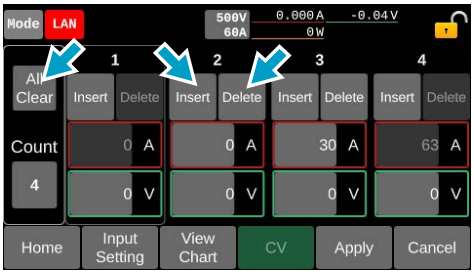


Inserting and deleting points

Press Insert to insert points. Copy points and insert one point at the end.

Press Delete to delete points. The first and last points cannot be deleted.

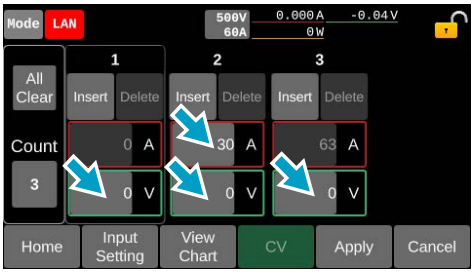
To return the I-V characteristics to its initial setting, press All Clear.



Inputting values

Press the input field for each value to input the value with the display or the rotary knob.

In CV mode, the current at the first point is fixed at the minimum value and the current at the last point is fixed at the maximum value. In CV mode, the voltage at the first point is fixed at the minimum value and the voltage at the last point is fixed at the maximum value.

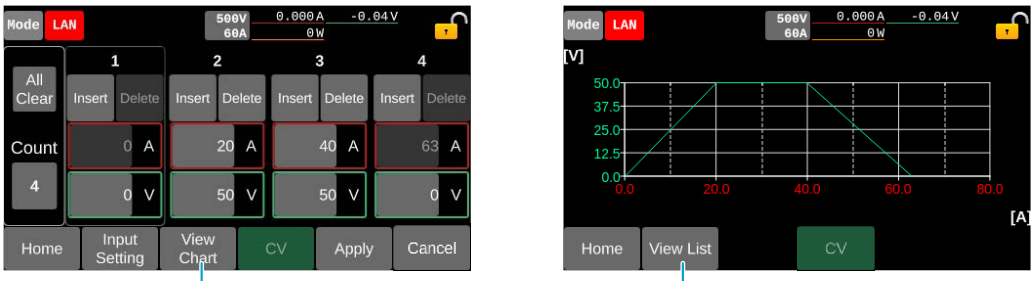


After input, the current in the case of CV mode and the voltage in the case of CC mode are sorted in ascending order from left to right at the following timings:

- When switching between list and graph displays
- When displaying a screen other than the I-V characteristics edit screen
- When pressing Apply or Cancel

Switching between list and graph displays

To switch between list and graph displays, press View Chart or View List on the I-V Characteristic edit screen.



Graph and list displays can be switched.

Application and cancellation of I-V characteristics

Press Apply to apply I-V characteristics. As a verification screen is displayed, press OK. I-V characteristic is saved.

To enable the I-V characteristic function, set the input mode of the CC/CV mode to I-V *(p.83)*.

To clear editing of the I-V characteristics, press Cancel. As a verification screen is displayed, press OK.

Enabling the I-V characteristic function

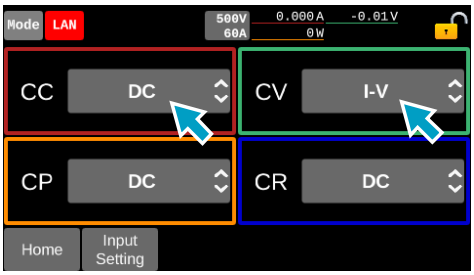
Selecting I-V in the input mode of the CC/CV mode enables the I-V characteristic function.

NOTE

SINE, I-V, and PULSE cannot be set simultaneously in multiple input modes.

1 **Press Input Setting > Input Mode on the homepage.**

2 **Press the input field for CC/CV to set the input mode to I-V.**



This completes the setting.

Pre-charge Function

When a DC/DC converter such as an on-board charger is used as a DUT, an inrush current is generated by the charging current flowing through the capacitors of the DUT during testing. The pre-charge function can be used to prevent inrush current during testing by charging the DUT's capacitors before the test.

The pre-charge function also allows the user to check for disconnection of the test path or a defective DUT (rechargeable battery) prior to the test, since a current of 5 % of the rated value is applied in the CC mode.

To activate the pre-charge, release the interlock.

Releasing the interlock

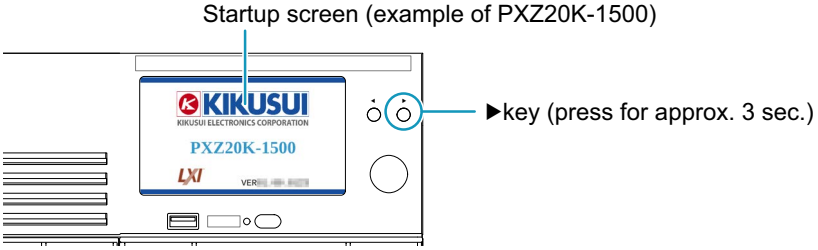
When the pre-charge function is used, high voltage is generated depending on the voltage set value. Therefore, if the POWER switch is turned on in the normal procedure, the pre-charge function cannot be activated due to an interlock for safety reasons.

The interlock can be released by following the procedure below.

1 **Turn the POWER switch on (|).**

2 **When the startup screen appears, press the ▶ key for about 3 seconds.**

Startup screen (example of PXZ20K-1500)



When the interlock is released, a symbol appears on the startup screen.

While the interlock is being released, a yellow symbol appears in the upper left corner of the display.

This completes the setting.

Enable/disable the pre-charge function

To use the pre-charge function, release the interlock beforehand *(p.84)*.

The pre-charge function cannot be enabled during load-on, sequence execution, or when I-V, PULSE, or SINE is set in the input mode *(p.43)*.

⚠WARNING

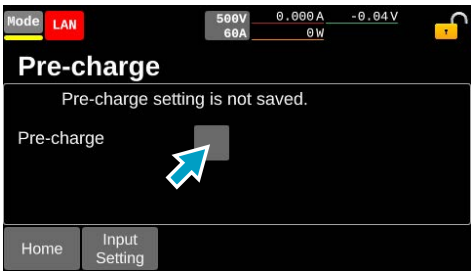
Risk of electric shock.

- **If the pre-charge function is enabled, overvoltage protection (OVP) should be set for safety. *(p.58)***
  When the pre-charge function is used, a high voltage is output depending on the voltage set value.

1 **Press Input Setting > Pre-charge on the Home screen.**

2 **Press the check box for pre-charge.**

Each time you press the check box, the existence of checking changes. With a check mark, it is enabled, without a check, it is disabled.



If the check is enabled, a reminder will be displayed.

Press NEXT > OK to close the reminder display.

This completes the setting.

NOTE

- When pre-charge is enabled, current, power, and conductance values cannot be set.
- When pre-charge is enabled, preset memory recall is not possible.
- When pre-charge is enabled, the following settings are ignored.
  Priority operation mode *(p.42)*, pulse function *(p.75)*, sine function *(p.77)*, I-V characteristic function *(p.79)*

Execute pre-charge to start the test

Please release the interlock *(p.84)* and enable the pre-charge function *(p.85)* in advance.

1 **Set the voltage value on the Home screen.**
When the voltage set value is reached during pre-charge, the mode shifts to CV mode.

2 **Setting overvoltage protection (OVP) *(p.58)*.**
An OVP alarm is generated when the voltage rises due to an abnormality in the test path, etc.

3 **Press and hold the LOAD key (approx. 0.2 sec.).**
The LOAD LED illuminates and the pre-charge is executed. During pre-charge, 5 % of the rated current flows through the DUT in CC mode. The capacitor in the DUT is charged and when the voltage value set in the Home screen is reached, the DUT shifts to CV mode.

4 **After entering CV mode, press the LOAD key.**
The LOAD LED turns off and the pre-charge is complete.

5 **Disable the pre-charge function.**
Disable the pre-charge function by referring to “Enable/disable the pre-charge function” *(p.85)*.

6 **Set any test condition and start the test.**
Operation completed.

Synchronized Operation

When the PXZ series is connected to each other with a synchronous operation signal cable, load on/off measurement, and sequence synchronous operation can be performed from any of the PXZ series in the connection.

Any of the PXZ series models can be connected together. Synchronized operation is possible even during parallel operation.

Connection for synchronized operation

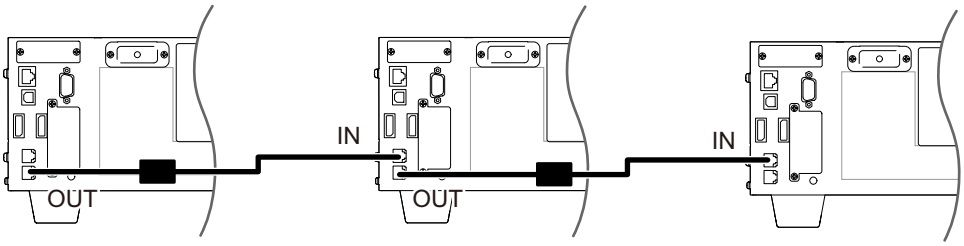
Use the included synchronized operation signal cable kit to connect the PXZ series for synchronized operation.

1 **Turn off all the PXZ series products that you will connect.**

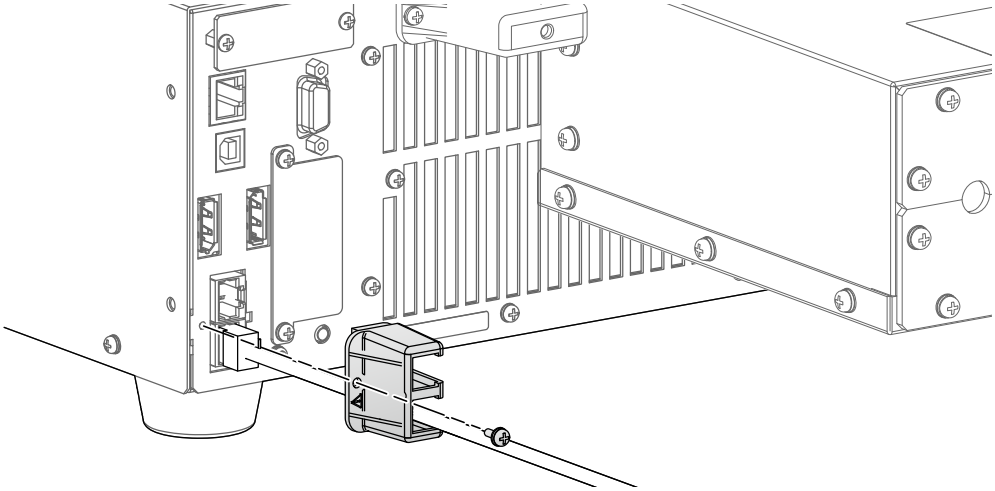
2 **Connect all PXZ series with the included synchronized operation signal cables.**

Connect the OUT connector and IN connector of the EXT SYNC with a synchronized operation signal cables.

Connection example



3 **When you complete the connection, attach the included EXT SYNC port cover.**



This completes the connections.

When synchronized operation becomes possible, the Sync icon (Sync) appears in the upper right corner of the display.

Synchronizing the load on/off operation

Synchronize load on/off on multiple PXZ Series connected in synchronization.

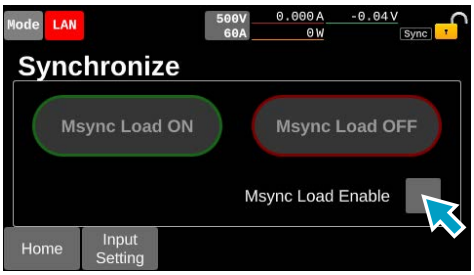
NOTE

Even during synchronized load on/off operation, if the LOAD key on the front panel is pressed, only the PXZ series for which the LOAD key is pressed will be loaded on/off.

1 **Press Input Setting on the homepage.**

2 **Swipe to the left, or press the ▶ key, till Synchronize is displayed and press Synchronize.**

3 **Press the input field for Msync Load Enable and check the box.**



4 **Perform Step 1 to Step 3 on all PXZ series to be synchronized.**

5 **Press Msync Load ON or Msync Load OFF on the homepage of any PXZ series connected in synchronization.**

Load is turned ON/OFF simultaneously in all PXZ series to be synchronized.

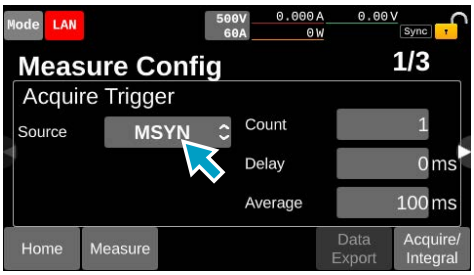
Synchronization of the measurement start

The start of measurement is synchronized among multiple PXZ series products connected in synchronization.

1 **Press Measure > Measure Config on the homepage.**

The Measure Config screen is displayed.

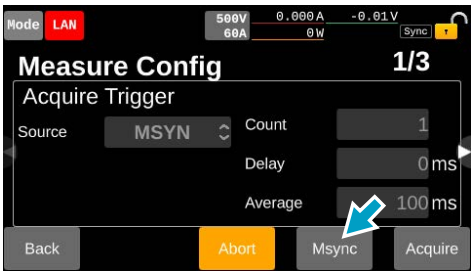
2 **Press the input field for Source to select MSYN with the display.**



3 **Press Acquire/Integral > Initiate.**

4 **Perform Step 1 to Step 3 on all PXZ series to be synchronized.**

5 **Press Acquire > Msync on any of the Measure Config screens of the PXZ series that are connected in synchronization.**



Measurement starts simultaneously on all synchronized PXZ series products.

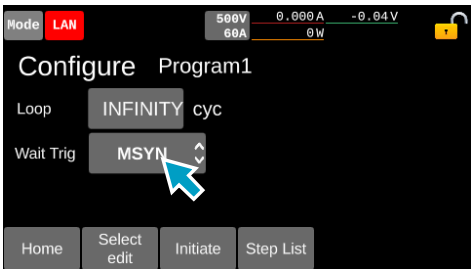
Synchronization of the program start

The start of program is synchronized among multiple PXZ series products connected in synchronization.

1 **Press Sequence > Select edit on the homepage.**
The program list screen is displayed.

2 **Hold down the program to be synchronized, or press the program and press the selected program again.**
The program setup screen is displayed.

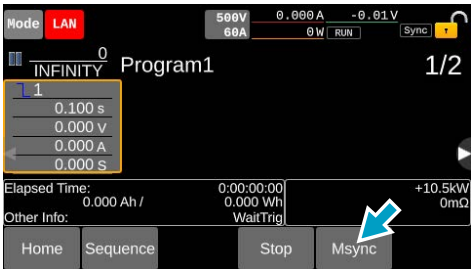
3 **Press the input field for Wait Trig to select MSYN with the display.**



4 **Press Initiate > Run.**
Sequence is paused and enters a trigger wait state.

5 **Perform Step 1 to Step 4 on all PXZ series to be synchronized.**

6 **Press Msync on any PXZ series connected in synchronization.**



Trigger wait is released for all PXZ series to be synchronized, and sequence starts simultaneously.

Synchronization of the step start

When Wait Trig *(p.118)* is set to MSYN in the program step, sequence pauses (waits for trigger) before starting steps. The release of trigger wait is synchronized among multiple PXZ series products connected in synchronization.

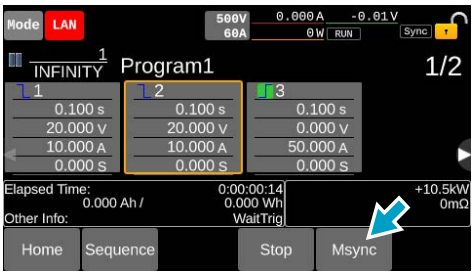
1 **Set Wait Trig to MSYN in the program step settings for all PXZ series to be synchronized. *(p.118)***

2 **Starting sequence in all PXZ series to be synchronized.**

3 **Wait for sequence to pause in all PXZ series to be synchronized.**

Sequence is paused before starting the step for which Wait Trig is set to Msync, and enters trigger wait state. Msync is displayed in the menu area.

4 **Press Msync on any of PXZ series connected in synchronization.**



Trigger wait is released for all PXZ series to be synchronized, and sequence resumes simultaneously.

Returning from synchronized operation to standalone operation

The synchronized operation setting is cleared when you remove the synchronized operation signal cables.

Parallel Operation

PXZ series units can be connected in parallel to increase the current and power capacities.

For parallel connection, use the optional parallel operation signal cable kit *(p.202)*.

You can control up to nine slave units from a master unit. Parallel operation is also possible among models with different input voltage ratings. The master unit and the slave units are automatically configured according to the connection status. The master unit displays the total input current, total input power, and total power of the AC power lines for all the units that are connected in parallel.

NOTE

- The system version of all PXZ series units to be operated in parallel must be the same.
- During parallel operation, the product may not meet the specifications that it has during independent operation. The setting accuracy and measurement accuracy can be improved by performing calibration in a parallel state. To have your product calibrated, contact your Kikusui agent or distributor.
- The setting resolution during parallel operation varies depending on the number of units in parallel operation.
- Series operation is not possible.

Maximum current and maximum power during parallel operation (when the models are all the same)

Number of slaves	Maximum current / Maximum power		
	PXZ20K-500	PXZ20K-1000	PXZ20K-1500
1	240 A/40 kW	120 A/40 kW	60 A/40 kW
2	360 A/60 kW	180 A/60 kW	90 A/60 kW
3	480 A/80 kW	240 A/80 kW	120 A/80 kW
4	600 A/100 kW	300 A/100 kW	150 A/100 kW
5	720 A/120 kW	360 A/120 kW	180 A/120 kW
6	840 A/140 kW	420 A/140 kW	210 A/140 kW
7	960 A/160 kW	480 A/160 kW	240 A/160 kW
8	1080 A/180 kW	540 A/180 kW	270 A/180 kW
9	1200 A/200 kW	600 A/200 kW	300 A/200 kW

Making connections for parallel operation

Connect the PXZ series units to be operated in parallel to the DUT, and connect each unit using parallel operation signal cables.

This section explains an example of performing parallel operation using three PXZ20K-500 units.

⚠WARNING

Risk of fire.

- **Use load cables having strong flame-resistant insulation with sufficient margin for the current.**

Risk of electric shock.

- **Turn the POWER switch off before you touch the DC INPUT terminal.**
- **Attach the DC INPUT terminal cover after wiring the load cables.**

⚠CAUTION

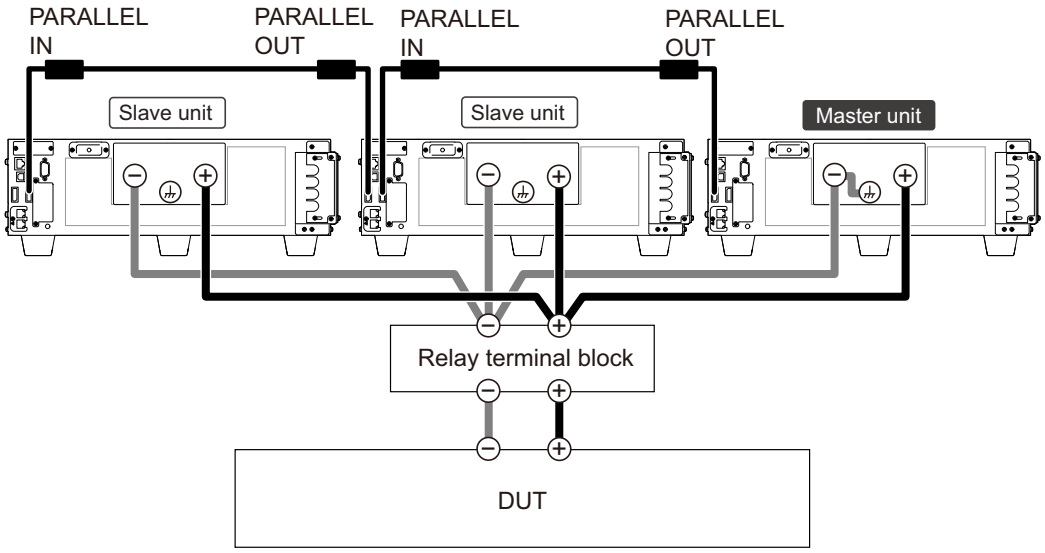
PXZ series and DUT may be damaged.

- **Do not leave one end of the parallel operation signal cable connected to the PARALLEL connector when the other end is not connected.**

NOTE

If there is a PXZ series unit not used in parallel operation, disconnect the parallel operation signal cable.

Connection example



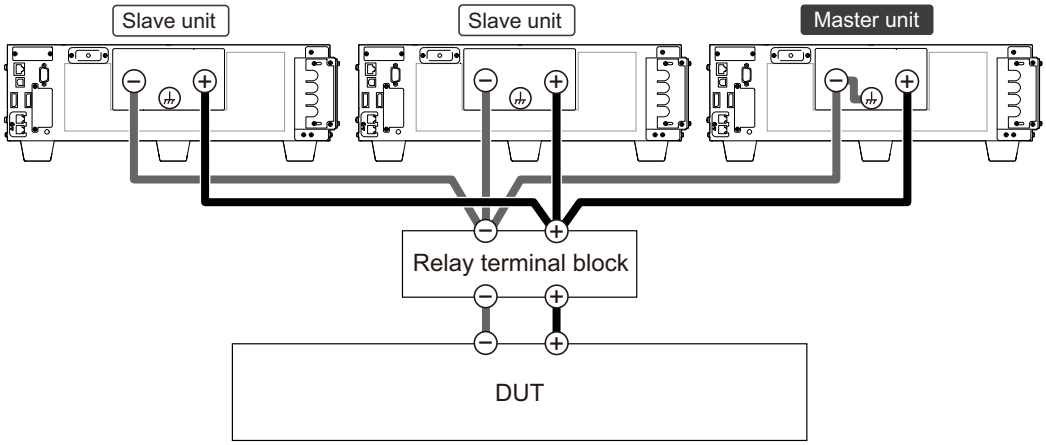
1 Turn off all the PXZ series units that you will connect in parallel.

2 Connect the DC INPUT terminals of the PXZ series units to the DUT.

Refer to “Connecting the DUT” *(p.28)* and securely connect the DC INPUT terminals of multiple units in parallel. Be sure to attach a DC INPUT terminal cover to the DC INPUT terminals.

NOTE

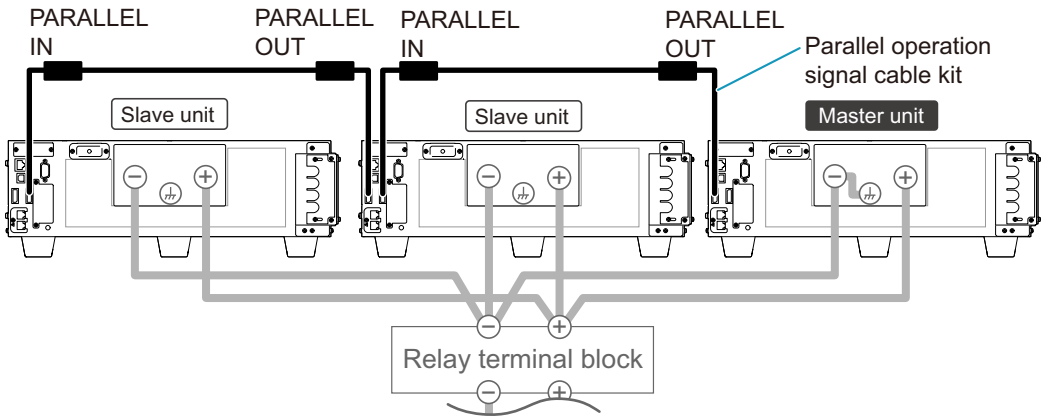
- When grounding the DC INPUT terminal, do no ground the DUT.
- Ground only one PXZ series unit, as grounding multiple units creates unwanted current paths.



- Refer to “Grounding the DC INPUT terminal” *(p.27)* when grounding DC INPUT terminals.
- Connect each PXZ series unit to the relay terminal block within 3 m using cables of equivalent length and cross-sectional area.
- Use load cables that are as short as possible and have sufficient thickness for the current to be used.
- Route the load cables as far as possible from the signal cables.

3 Connect all the PXZ series units to be operated in parallel with parallel operation signal cables.

Connect the PARALLEL OUT connector and IN connector with a parallel operation signal cable.



This completes the connections.

Performing parallel operation

When connected in parallel and the power supply is turned on, the master unit automatically recognizes the slave units.

For the setting range during parallel operation, refer to “Setting Range and Resolution During Parallel Operation” *(p.200)*

You can turn the POWER switches of all the PXZ series on or off in any order.

1 Turn on the POWER switch of all PXZ series units within 20 seconds.

The master unit automatically recognizes the slave units.

Another option is to turn on all the POWER switches of the PXZ series in advance to turn on the power supply all at once with an external circuit breaker.

Behavior during parallel operation

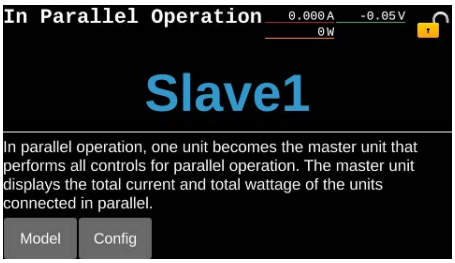
Slew rate and response speed

During parallel operation, the slew rate and response speed settings on the master unit are used. The slew rate increases proportionally to the number of units operating in parallel. For details, see Appendix *(p.200)*.

If control of the PXZ series becomes unstable and oscillation occurs, set the Response *(p.71)* to SLOW to ensure stable operation.

Display on a slave unit

During parallel operation, the homepage of a slave unit will be displayed as follows.



- Press Model to display the device information *(p.161)*.
- Press Config to display the Line overvoltage protection (Line OVP) setup screen.

Protection function

Line overvoltage protection (Line OVP) should be set to the same value for all master unit and slave units. Protection functions other than Line OVP operate with the set values of the master unit.

If an error occurs during parallel operation, an alarm is displayed on the display area of the master or slave unit and the load is turned off. Refer to “LOW alarms that occur on the master unit or slave units during parallel operation” *(p.55)* and “HIGH alarms that occur on the master unit or slave units during parallel operation” *(p.57)* for descriptions of alarms.

Key lock

Key lock should be set on all master and slave units. Each time you press and hold the key lock icon displayed on the upper right of the display, the key lock switches between enabled and disabled.

When key lock is enabled on a slave unit, the Local key lock icon (

) is displayed on the upper right of the display of the slave unit.

External Control

Among the external controls using the EXT CONT connector, monitoring of voltage and current values can be used regardless of whether the unit is a master or a slave. In current value monitoring, the master unit outputs the signal of the current value of the entire system, and the slave unit outputs the signal of the current value of the slave unit alone.

External controls other than monitoring voltage and current values can be used only on the master unit.

Changing from parallel operation back to standalone operation

Turn off all the units connected for parallel operation, and then remove all connections for parallel operation. Then, connect for standalone operation.

⚠CAUTION

PXZ series and DUT may be damaged.

- **Do not perform standalone operation with the parallel operation signal cable left connected to the PARALLEL connector.**

NOTE

When changing from standalone operation to parallel operation, or when changing the number of units in parallel operation, the units start up with the settings reset *(p.193)*. After starting, the error messages of “-314 Save/recall memory lost” and “-315 Configuration memory lost” always appear, but they are not abnormal. To remove the error messages, press CLR on the SCPI error screen *(p.173)* or turn the power off and then back on.

Memory Function

There is a preset memory to save only parts of the input set values and protection functions for quick switching, and a setup memory to save basic setting items.

Memory Types

Preset memory can store input value and part of protection function. Because you can recall saved settings just by pressing a key, this feature is useful when you want to switch between the sets of values in order.

Setup memory can store all basic setup items.

■ Differences between Preset and Setup Memory

Parameter	Preset memories	Setup memories
Number of memory entries	20	21
Memory name	Preset.1 to Preset.20	Resume[1], 1.info to 20.info
Saved setting	Input voltage value/Input current value/Input power value/Conductance value Over voltage protection (OVP) Under voltage protection (UVP, UVP Enable) Over current protection (OCP, Delay) Over power protection (OPP)	Load On/off Input voltage value/Input current value/Input power value/Conductance value Input mode Response Slew Rate Priority operation mode (Priority when load is ON) Value of the pulse function (Duty, Frequency, High, Low) Value of the sine function (Amplitude, Frequency, Offset) Number of I-V characteristics (Count) Over voltage protection (OVP) Under voltage protection (UVP, UVP Enable) Over current protection (OCP, Delay) Over power protection (OPP) Line overvoltage protection (Line OVP) Measurement trigger settings (Source, Count, Delay, Enable, Timer) Integration settings (Gate, Reset)

1. Settings at the time of turning off the power supply overwrite existing files. This is the memory used when Resume is set in Settings at Startup *(p.73)*.

Preset Memory

Input value and part of protection function can be saved. Because you can recall saved settings just by pressing a key, this feature is useful when you want to switch between the sets of values in order.

Item	Description
Number of memory entries	20
Memory name	Preset.1 to Preset.20
Saved setting	Input voltage value/Input current value/Input power value/Conductance value Over voltage protection (OVP) Under voltage protection (UVP, UVP Enable) Over current protection (OCP, Delay) Over power protection (OPP)

Saving to preset memory

You can save preset memory when the input mode *(p.43)* is DC.

1 **Swipe to the right, or press the ◀ key on the homepage.**

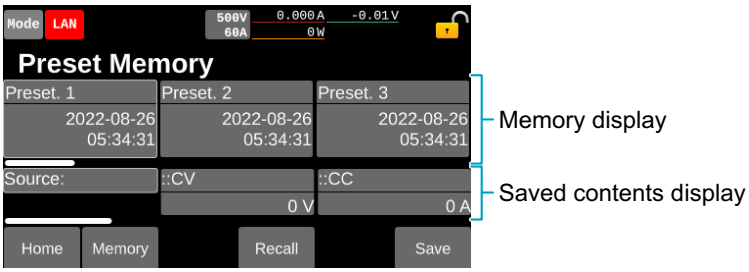
2 **Press Memory > Preset.**

3 **Press the preset memory in the save location.**

Preset memory is selected and the saved contents is displayed.

To display memory not fully displayed, swipe the display area of the memory to the left, or press the ▶ key to scroll.

To display saved contents not fully displayed, swipe the display area of the saved contents to the left, or scroll the screen with the rotary knob.



4 **Press Save.**

A confirmation screen appears.

5 **Press OK.**

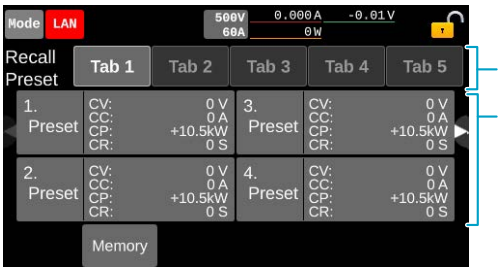
This completes the setting.

Recalling preset memory entries

The preset memory can be recalled when the input mode *(p.43)* is set to DC and the pre-charge function *(p.84)* is disabled.

1 Swipe to the right, or press the ◄ key on the homepage.

A simplified screen of the preset memory will be displayed.



In this screen, 4 preset memories are displayed. To display other memories, press Tab at the top. Press Preset memory to recall the memory in fewer steps.

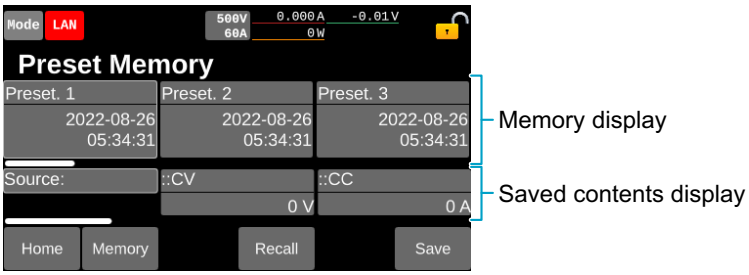
If you want to check further details before recalling, refer to the followings.

2 Press Memory > Preset.

3 Press the preset memory.

The saved contents of the preset memory is displayed at the bottom part of the memory.

To display the memory not fully displayed, swipe the display area of the memory to the left, or press the ► key to scroll the screen. To display saved contents not fully displayed, swipe the display area of the saved contents to the left, or scroll the screen with the rotary knob.



4 Press Recall.

If Preset Recall Conform *(p.100)* is marked with a check, press OK on the confirmation screen.

Setup memory will override the various settings.

This completes recalling.

Setting the confirmation operation when recalling memories

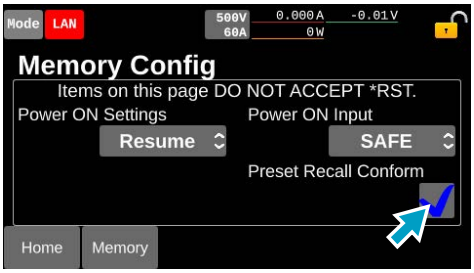
Set to display a confirmation screen or not to recall memories.

1 **Swipe to the right, or press the ◀ key on the homepage.**

2 **Press Memory > Memory Config.**

3 **Press the check box for Preset Recall Conform.**

Each time you press the check box, the existence of checking changes. When checked, a confirmation screen will appear when recalling a preset memory.



This completes the setting.

Setup Memory

Basic setting items can be saved for later recall when necessary.

Parameter		Description
Number of memory entries	USB memory device	21
	Internal memory	Depends on the memory size
Memory name	USB memory device	Resume[1], 1.info to 20.info
	Internal memory	Any name
Saved setting		Load on/off Input voltage value/Input current value/Input power value/ Conductance value Input mode Response Slew Rate Priority operation mode (Priority when load is ON) Value of the pulse function (Duty, Frequency, High, Low) Value of the sine function (Amplitude, Frequency, Offset) Number of I-V characteristics (Count) Over voltage protection (OVP) Under voltage protection (UVP, UVP Enable) Over current protection (OCP, Delay) Over power protection (OPP) Line overvoltage protection (Line OVP) Measurement trigger settings (Source, Count, Delay, Enable, Timer) Integration settings (Gate, Reset)

1. Settings at the time of turning off the power supply overwrite existing files. This is the memory used when Resume is set in Settings at Startup *(p.73)*.

Saving to the setup memory

Saves the present settings to setup memory. Data can be exported to the internal memory or to a USB memory device with a capacity up to 16 GB.

Saving over previous settings (internal memory and USB memory)

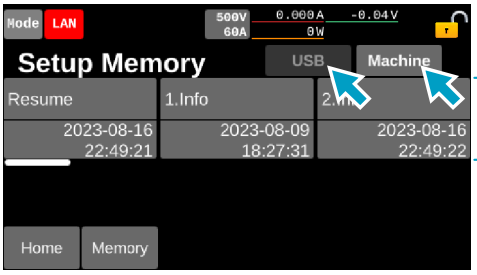
1 **Swipe to the right, or press the ◄ key on the homepage.**

2 **Press Memory > Setup.**

3 **When saving to a USB memory device, insert the USB memory device into the USB connector on the front panel.**

4 **Press USB or Machine.**

Item	Description
USB	Save to a USB memory device. Can be selected when a USB memory device is connected to the front panel.
Machine	Data is saved in the internal memory of the PXZ series.

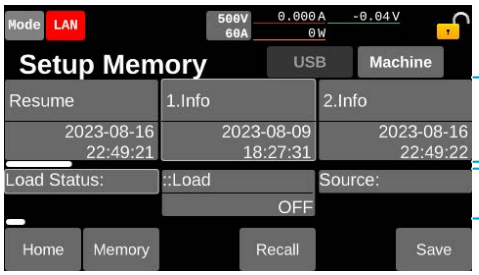


Setup memory
The memory name and the latest save date/time are displayed.

5 **Press the setup memory in the save destination.**

The contents of the memory are displayed at the bottom part of the setup memory.

To display the memory not fully displayed, swipe the display area of the memory to the left, or press the ► key to scroll the screen. To display saved contents not fully displayed, swipe the display area of the saved contents to the left, or scroll the screen with the rotary knob.



Memory display

Saved contents display

Since the Resume in the internal memory is overwritten with the set data from when the power supply was turned off, it cannot be used at the save destination for arbitrary values.

6 **Press the Save and press OK on the confirmation screen.**

The value saved to the setup memory.

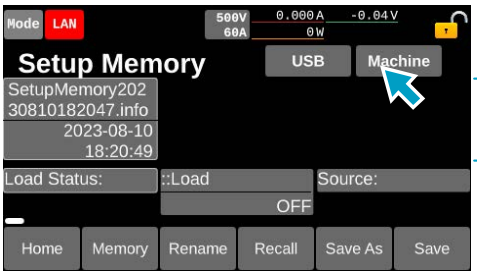
Saving to a new file (USB memory device only)

1 **Swipe to the right, or press the ◄ key on the homepage.**

2 **Press Memory > Setup.**

3 **Insert a USB memory device into the USB port on the front panel.**

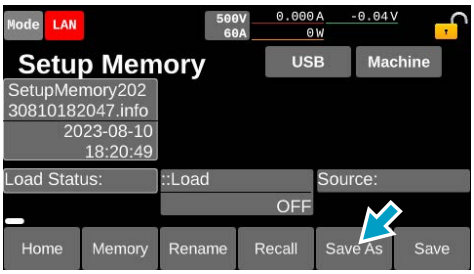
4 **Press USB.**



Setup memory
The memory name and the latest save date/time are displayed.

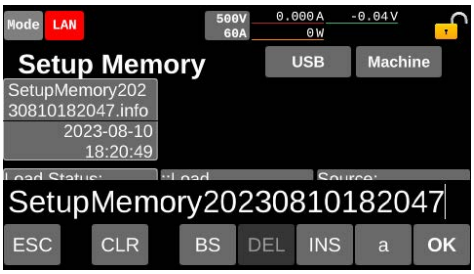
5 **Press Save As.**

The present settings are saved.



6 **Input an arbitrary memory name and press OK.**

You can enter up to 63 characters for the memory name.



The value saved to the setup memory.

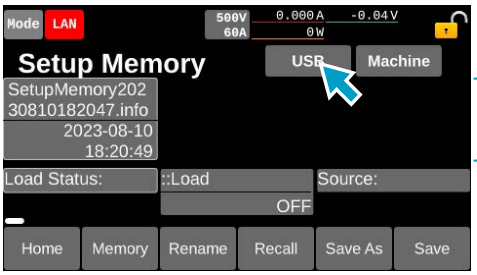
Changing the memory name (USB memory device only)

1 **Swipe to the right, or press the ◄ key on the homepage.**

2 **Press Memory > Setup.**

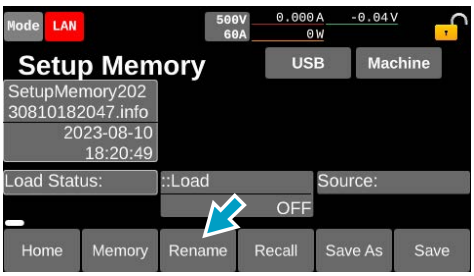
3 **Insert a USB memory device into the USB port on the front panel.**

4 **Press USB.**

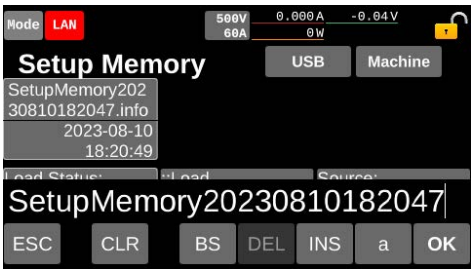


Setup memory
The memory name and the latest save date/time are displayed.

5 **Select any memory and press Rename.**



6 **Input an arbitrary memory name and press OK.**



The memory name is changed.

Recalling the setup memory

You can recall memory content when load is turned off. If the pre-charge function *(p.84)* is set to enabled, recalling the setup memory will set the pre-charge function to disabled.

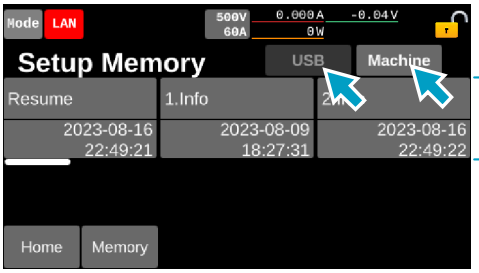
1 **Swipe to the right, or press the ◄ key on the homepage.**

2 **Press Memory > Setup.**

3 **When recalling out of the USB memory device, insert the USB memory device into the USB connector on the front panel.**

4 **Press USB or Machine.**

Item	Description
USB	Recalls out of the USB memory device. Can be selected when a USB memory device is connected to the front panel.
Machine	Data is recalled out of the internal memory of the PXZ series.



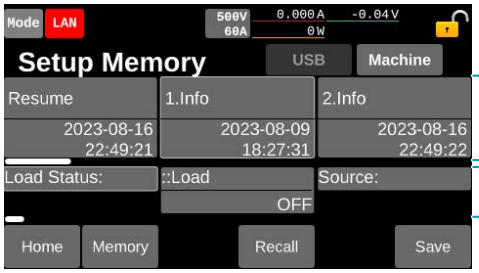
Setup memory
The memory name and the latest save date/time are displayed.

The data set at the previous power supply off is stored in the Resume memory.

5 **Press the setup memory to be recalled.**

The contents of the memory are displayed at the bottom part of the setup memory.

To display the memory not fully displayed, swipe the display area of the memory to the left, or press the ► key to scroll the screen. To display saved contents not fully displayed, swipe the display area of the saved contents to the left, or scroll the screen with the rotary knob.



Memory display

Saved contents display

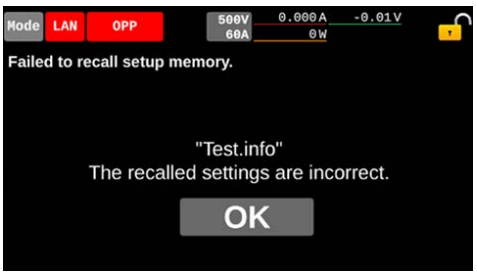
6 **Press the Recall and press OK on the confirmation screen.**

If the pre-charge function is set to be enabled, in addition to the confirmation screen for the memory number, a confirmation screen will also be displayed to inform the user that the pre-charge function will be disabled.

The setup memory entry is recalled.

When the memory cannot be recalled

When values that cannot be set in the PXZ series currently in use are saved in the setup memory, an error screen is displayed. By pressing OK, the setting returns to the one before recalling.



When the setup memory is not displayed (USB memory device only)

Out of the setup memory saved on USB, memory falling under the following conditions will not appear on the display.

- In the case of changing the file extension (.info) of the setup memory file
- In the case of importing with a PXZ series with an older system version than that of the saved PXZ series
- In the case that the model name is different from that of the saved PXZ series
- In the case that the rated voltage is different from that of the saved PXZ series

Sequence Function

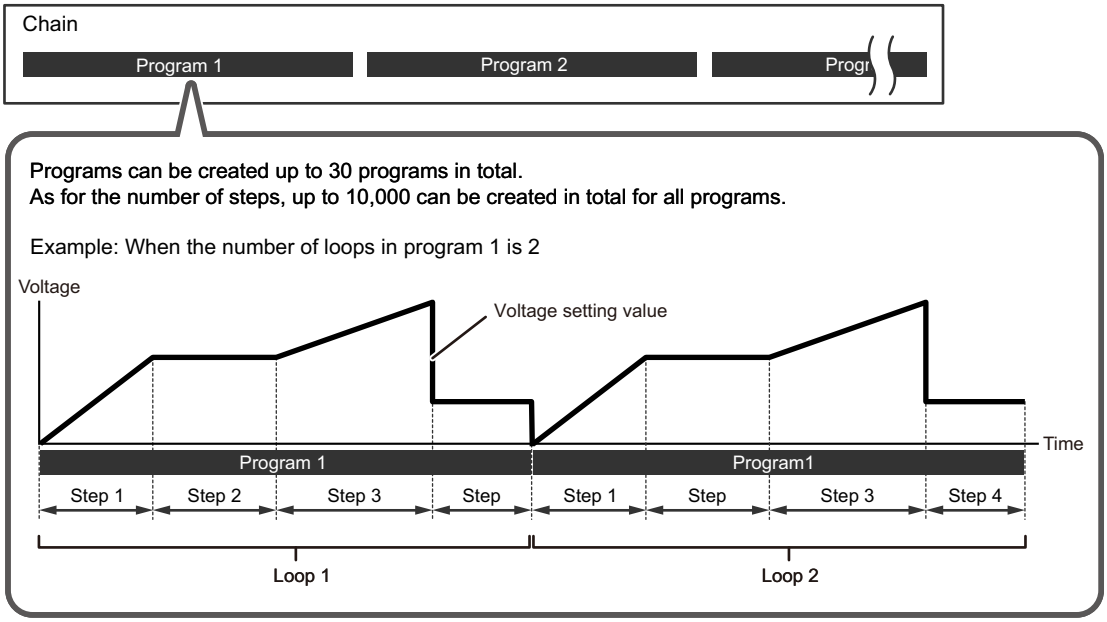
Overview of the Sequence Function

Sequence is a function that executes a sequence of operations set in advance.

Configuration of sequence

A sequence consists of programs, steps and chains. A program is a collection of steps. Steps are executed in order one at a time, starting from step 1. When the loop has been specified in the program, the program will be repeated for the number of loops, and when the last step is completed, the program will end.

To execute sequences, register one or more programs in the chain. Multiple programs registered in chains will be executed consecutively. When all programs registered in chain are executed, the sequence ends.



Main functions

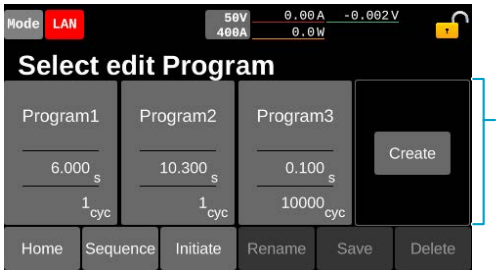
Setting range	Setting	Description
For each program	Number of loops of program	1 to 100000 repetitions, or infinite repetitions.
	Trigger	Trigger wait settings
By step	Input value	Voltage, current, conductance, power.
	Transition at the time of operation mode change	Function of transition to the next step (ON/OFF) when the operation mode changes while executing steps
	Step execution time	0.001 s to 3600000.000 s (1000 h)
	Load on/off state	Load ON / OFF
	Input set value transition method	Select input set value transition method from the step or the slope in line with operation mode.
	Trigger	Trigger output and trigger wait settings
	Pre-charge	Enable/disable pre-charge

Program Configuration

Displaying the program list screen

When pressing Sequence > Select edit on the homepage, the program list screen is displayed.

When the program is not fully displayed on the screen, swipe the program to the left and right and press the ◀/▶ key or scroll with the rotary knob. The following figure shows an example when three programs are being registered.



Program

Execution time and the number of loops are displayed.

Creating a program

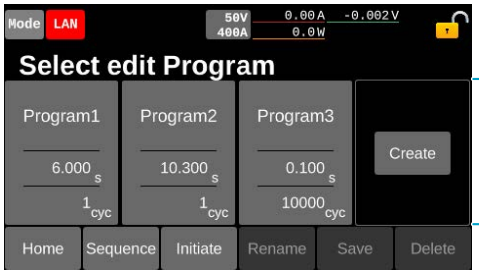
First, create an empty program without registering any steps.

1 **Press Sequence > Select edit on the homepage.**

The program list screen is displayed.

2 **Press Create.**

When Create is not displayed, swipe the program to the left until Create is displayed.



Program

An empty program is created.

To register steps in the program, see “Setting Steps” *(p.115)*.

Changing program settings

When holding down a program on the program list screen *(p.109)* or pressing program and pressing the selected program again, the program setup screen is displayed.

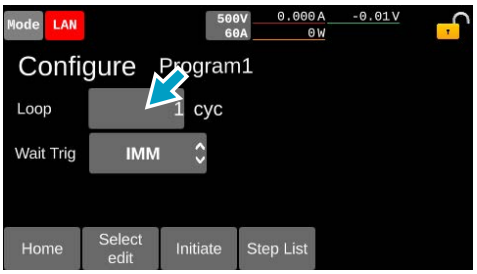
Pressing Select edit returns to the program list screen.

On the program setup screen, the following values can be changed.

Item	Description
Loop	Set the number of loops of the program. *(p.110)*
Wait Trig	Set the conditions for starting the program. *(p.111)*

Loop count

Set the number of loops of the program. Press the input field for Loop to select the value with the display or the rotary knob.



Setting range: 0 to 100000

Setting it to 0 will make the loop count infinite, and INFINITY will be displayed.

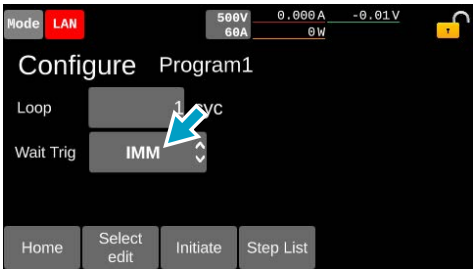
Trigger wait settings

Set the condition for starting the execution of sequences (trigger source).

When inputting the set trigger source on the sequence execution screen *(p.124)*, the sequence will be executed. Press the input field for Wait Trig to select the value with the display.

NOTE

In the programs registered in the second and later order of the chain, the trigger wait settings will become invalid.



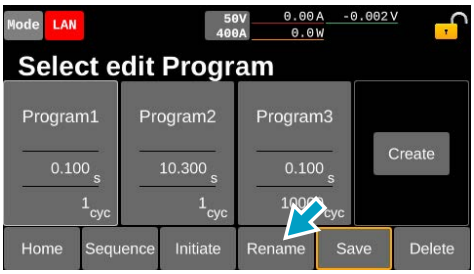
Item	Description
IMM	Sequence starts at the following timing: • When pressing Run on the sequence execution screen *(p.126)* • When inputting SEQ RUN with the external control *(p.143)* • When receiving INITiate command via remote control
BUS	The sequence is started at the time of receiving the software trigger (*TRG) by remote control.
EXT	The sequence is started at the time the signal is input to the terminal where the general-purpose digital input of the external control *(p.143)* is set to SEQ TRIG IN.
MSYN	The sequence is started at the time of pressing Msync on the display of the PXZ series connected in synchronization. Or, the sequence is started at the time of receiving the sync signal for the sequence by remote control.

Changing a program name

1 **Press Sequence > Select edit on the homepage.**
The program list screen is displayed.

2 **Press a program.**
The program is selected.

3 **Press Rename.**



4 **Input the program name with the display or rotary knob and press OK.**
Naming convention: Alphabet characters A-Za-z, numbers 0-9, dot (.), comma (,), parentheses (), brackets [], braces </>, and (&), dollar ($), hash (#), caret (^), percent (%), equal (=), hyphen (-), plus (+), underscore (_), space ( ), case-sensitive, up to 32 characters.
This completes the setting.

NOTE

The order of the programs is rearranged in numerical and alphabetical order when the power supply of the PXZ series is turned off and then on again.

Saving the program

When a program is saved, the program is saved even after the power supply of the PXZ series is turned off. When the total number of steps of all saved programs is large, it will take longer time to turn the power supply of the PXZ series on (as a reference, it takes about 15 minutes for 10000 steps).

1 **Press Sequence > Select edit on the homepage.**

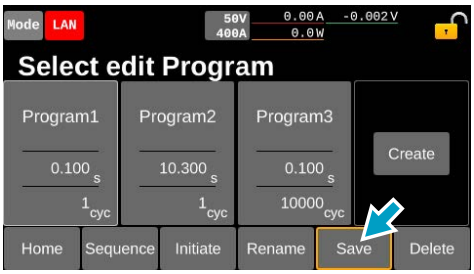
The program list screen is displayed.

2 **Press a program.**

The program is selected.

3 **Press Save.**

When a program is not yet saved, a yellow frame is displayed on the Program and Save.



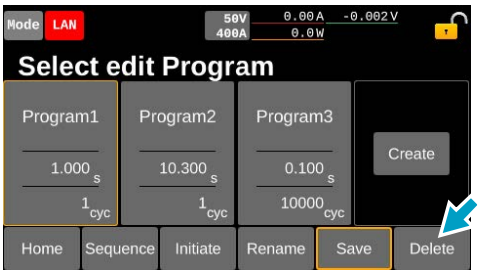
This completes saving.

Deleting a program

1 **Press Sequence > Select edit on the home page.**
The program list screen is displayed.

2 **Press a program.**
The program is selected.

3 **Press Delete.**



A confirmation screen appears.

4 **Press OK.**
The program is now deleted.

Setting Steps

Displaying the step list screen

NOTE

If the number of steps of the program increases, it will take more time to display the step list. (Approximately 30 seconds for 10,000 steps as a rough guide).

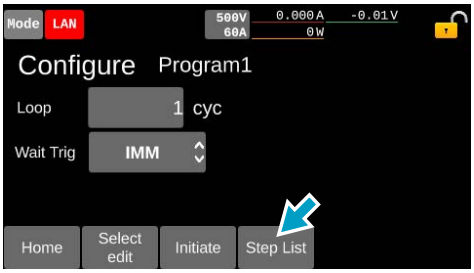
1 **Press Sequence > Select edit on the homepage.**

The program list screen is displayed.

2 **Hold down the program. Or, press the program and press the selected program again.**

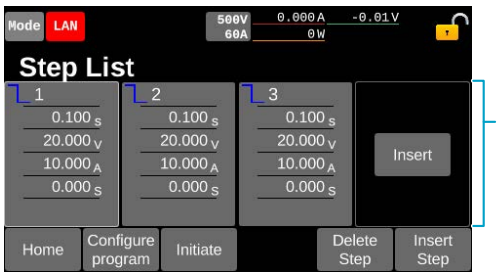
The program setup screen is displayed.

3 **Press Step List.**



The step list screen is displayed.

When the step is not fully displayed on the screen, swipe the step to the left and right and press the ◀/▶ key or scroll with the rotary knob. The following figure shows an example when three steps are being registered.



Steps
Execution time and input value are displayed.

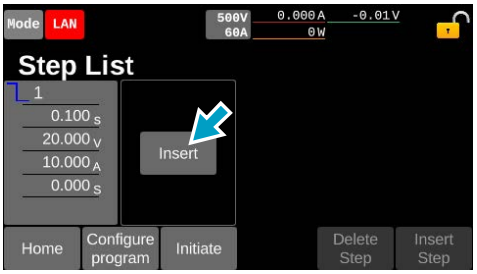
Pressing Configure program returns to the program setup screen.

Creating steps

New preparation

When pressing Insert on the step list screen, a copy of the last step will be inserted as a new step.

When Insert is not displayed, swipe the step list to the left and press the ▶ key or scroll with the rotary knob.

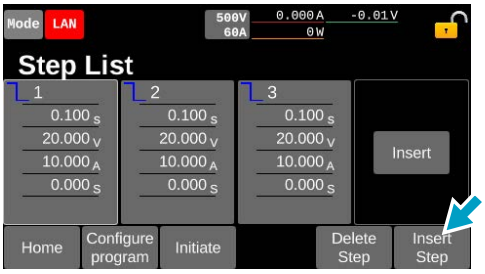


Inserting the step

1 **Press the step on the step list screen.**

Step is selected.

2 **Press Insert Step.**

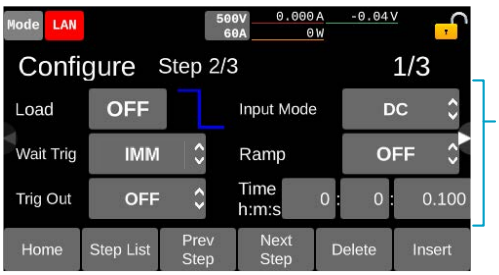


The selected steps are copied and inserted.

Changing the step settings

When pressing a step on the step list screen and pressing the selected step again, the step setup screen is displayed.

To display settings not fully displayed on the screen, swipe the step setting area to the left or right, or press the ◀/▶ keys to scroll the screen.



Pressing Step List returns to the step list screen.

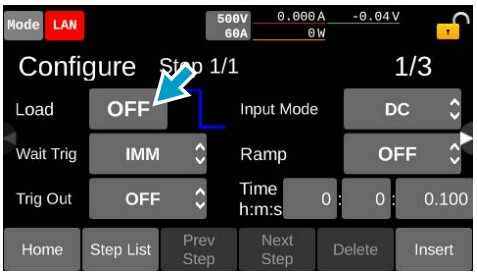
Pressing Prev Step or Next Step will switch to the previous/next step setup screen.

On the step setup screen, the following values can be edited.

Item	Description
Load	Set whether to load on during step. *(p.118)*
Wait Trig	Set the conditions for starting the step. *(p.118)*
Trig Out	Set whether to perform trigger output when starting the step. *(p.119)*
Input Mode	Set input mode. *(p.119)*
Ramp	Set whether the transition from the previous step to the next will be in step or slope. *(p.120)* In the case of step 1, this set value is ignored.
Time	Set the step execution time. *(p.120)*
CC	Set the current. *(p.121)*
CV	Set the voltage. *(p.121)*
CP	Set the power. *(p.121)*
CR	Set the conductance. *(p.121)*
Input Mode Transition	Set whether to perform transition to the next step automatically when the operation mode changes during step. *(p.121)*
Pre-charge	Enables the pre-charge function. *(p.122)*

Sets load on/off

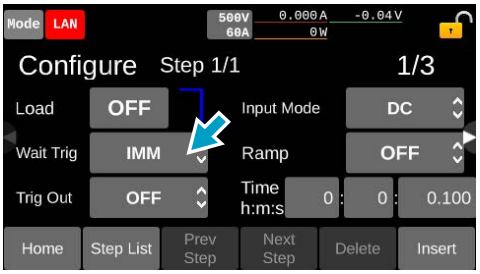
Sets whether to load on during the step. ON and OFF are switched every time the input field for Load is pressed.



Item	Description
ON	Turns the load on.
OFF	Turns the load off.

Trigger wait settings

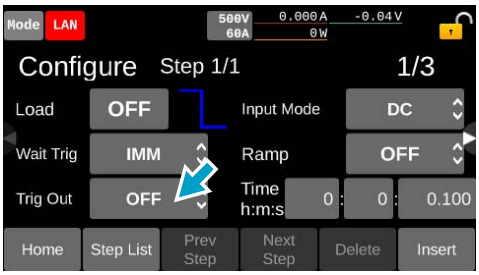
Set the conditions for starting the step. Press the input field for Wait Trig to select the value with the display.



Item	Description
IMM	Starts the step immediately.
BUS	The step is started at the time the *TRG command is input by remote control.
EXT	The step is started at the time the signal is input to the terminal set to SEQ TRIG IN in the general-purpose digital input *(p.143)*.
MSYN	The step is started at the time of pressing Msync on the display of the PXZ series connected in synchronization.

Trigger output setting

Set whether to perform trigger output when starting the step. Press the input field for Trig Out to select the value with the display.

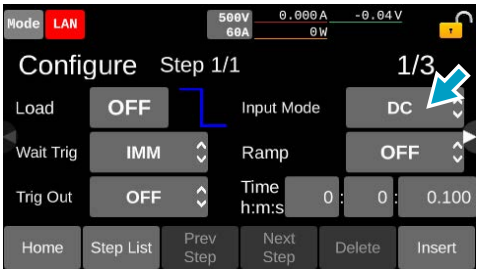


Item	Description
OFF	Trigger is not output.
PULSE	The trigger is output at the time of step start from the terminal where SEQ TRIG OUT is set by the general-purpose digital output *(p.145)*.
DC	The trigger is output while executing steps from the terminal where SEQ TRIG OUT is set by the general-purpose digital output *(p.145)*.

Input mode setting

Sets the input method. Press the input field for Input Mode and select the set value on the display.

Only DC can be set if pre-charge *(p.122)* is enabled within the same step.

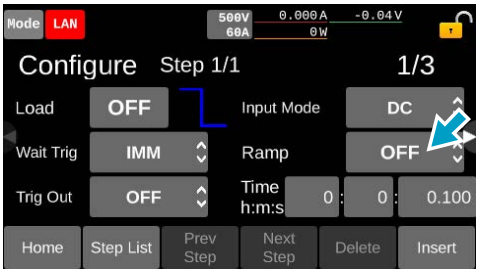


Item	Description
DC	Current and power are controlled by source and sink side values, respectively.
CV SINE	Operates in CV mode sine function.
CC SINE	Operates in CC mode sine function.
CR	Operates in CR mode.

Input value transition method

The set value transition method from the previous step will be set in step or slope. Press the input field for Ramp and select the set value on the display.

If the pre-charge function *(p.122)* is set to enabled within the same step, only OFF or CV RAMP can be set.

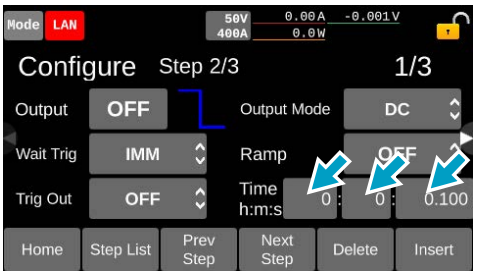


Item	Description
OFF	Transition is performed in steps from the set value of the previous step.
CV RAMP	Transition is performed in CV mode in slope from the set value of the previous step.
CC RAMP	Transition is performed in CC mode in slope from the set value of the previous step. If pre-charge was executed in the previous step, the transition is made from 0 A on the slope.
CR RAMP	Transition is performed in CR mode in slope from the set value of the previous step.
CP RAMP	Transition is performed in CP mode in slope from the set value of the previous step.

Step execution time

Set the step execution time. Press the input field for Time to enter h (hours), m (minutes), and s (seconds) on the display or with the rotary knob.

Entering a value of 60 or more for m or s will move up the display automatically.

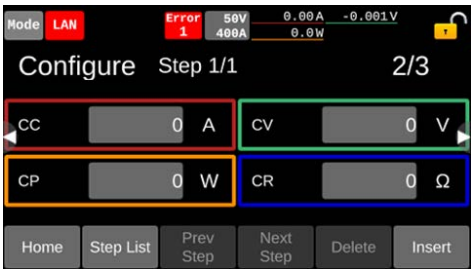


Setting range: 0:0:0.001 to 1000:0:0.000 (0.001 seconds to 1000 hours)

Input value setting

Set voltage, current, power and conductance. Press the input field for each value to select the value with the display or the rotary knob.

Only CV can be set if pre-charge *(p.122)* is enabled within the same step.



Item	Description
CC	Input current in CC mode.
CV	Input voltage in CV mode.
CP	Input power in CP mode.
CR	Input conductance in CR mode.

Transition of step at the time of operation mode change

Set whether to perform transition to the next step automatically when the operation mode changes during step.

Press the Input Mode Transition checkbox to change whether it is checked or not. When checked, transition to the next step occurs automatically approximately 10 ms after the operation mode changes during a step.

Enable/disable the pre-charge function

When the pre-charge function is enabled and Load *(p.118)* is set to ON, pre-charge is executed after the step starts. During pre-charge, 5 % of the rated current is output in CC mode, and when the voltage set value of CV *(p.121)* is reached, the mode shifts to CV mode.

For more information on the pre-charge function, see “Pre-charge Function” *(p.84)*.

⚠WARNING

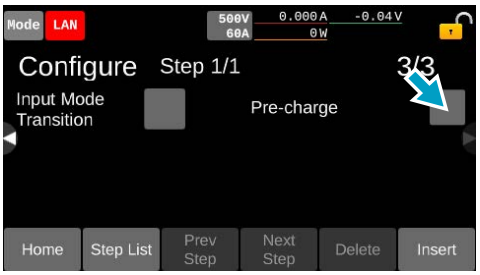
Risk of electric shock.

- **If the pre-charge function is enabled, overvoltage protection (OVP) should be set for safety. *(p.58)***

NOTE

- To use the pre-charge function in a step, release the interlock before executing the sequence *(p.84)*.
- To prevent voltage overshoot, create a step with load set to OFF and pre-charge set to disabled before the second and subsequent steps with the pre-charge function set to enabled *(p.199)*.

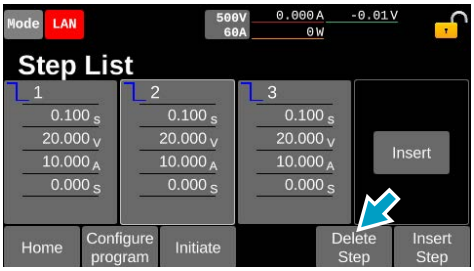
Press the pre-charge checkbox to change whether it is checked or not. When checked, a reminder will be displayed. Press Next > OK to activate the pre-charge function.



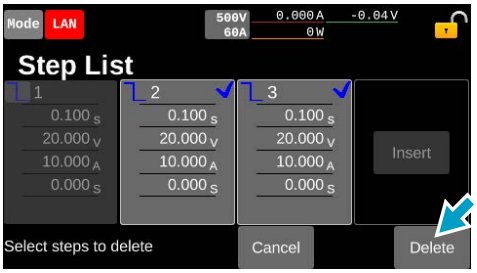
Deleting a step

There are three ways to delete a step.

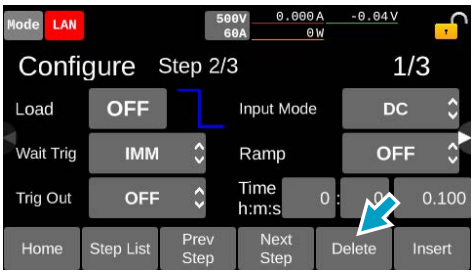
- Press Delete Step in the state where the step is selected by pressing the step on the step list screen.



- Press Delete in the state where the multiple steps are pressed and selected by holding down the steps on the step list screen.



- Press Delete on the step setup screen.



Executing, Pausing, and Stopping Sequences

When the program and step settings are complete, register the program in the chain and execute the sequence. You can pause or stop the sequence while it is running. By setting triggers *(p.111)*, the start timing of the sequence can be controlled.

Registering the program in the chain

Program is executed in the order of registration in the chain.

NOTE

- Unlock the chain and register it again in the following case:
  - When wishing to change the order of the programs registered in the chain
- Chain is unlocked in the following cases:
  - When turning off the power supply of the PXZ series
  - When creating a new program
  - When changing settings of/deleting a program registered in the chain or a program not registered in the chain
  - When priority operation mode *(p.42)* is set to CR
- To register a program that contains a step with the pre-charge function *(p.122)* enabled in the chain, release the interlock *(p.84)*.
- When priority operation mode *(p.42)* is set to CR, only programs whose input mode is set to CR in all steps can be registered in the chain.

1 **Press Sequence > Initiate on the homepage.**

The sequence execute screen will be displayed.

The same screen is displayed when Initiate is pressed on the program list screen *(p.109)*.

2 **Swipe the display to the left, or press the ▶ key.**

The chain creation screen is displayed.

Swipe the list to the left when the created program is not fully displayed. When the program registered in the chain is not fully displayed, swipe the list to the left, or scroll the screen with the rotary knob.

List of programs already created
Program name and execution time are displayed.

List of programs registered in the chain
Program name and execution time are displayed.

3 **Press the program desired to be registered in the chain on the list of programs already created.**

The program is selected.

4 **Press Add.**

Program is registered in the chain.

5 **Repeat Step 3 and Step 4.**

In the case of executing a sequence, the programs on the left side of the Chained List are executed in order. Operation completed.

Unlocking a chain

1 **Press CLR on the chain creation screen.**

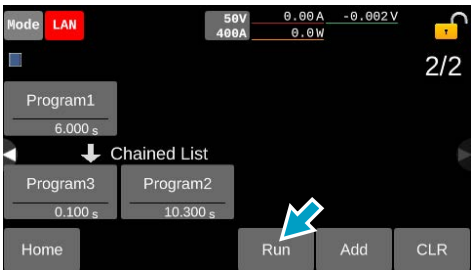
All programs registered in the chain is unlocked.

Executing sequences

Programs registered in the chain are executed in order.

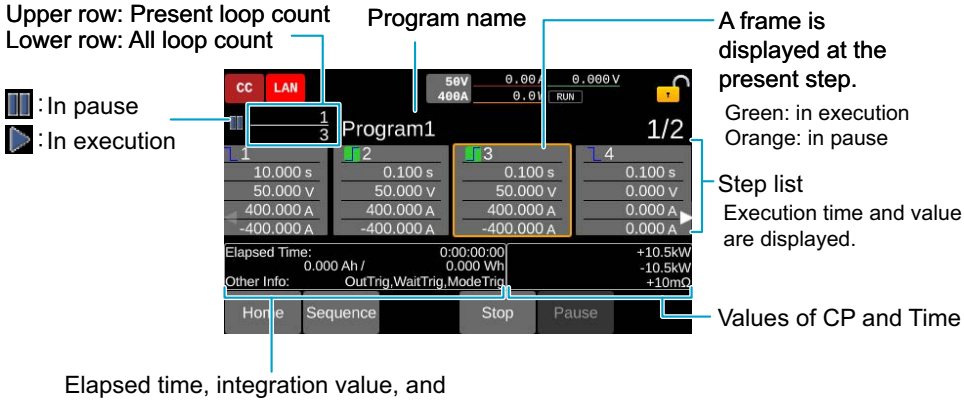
During running or pausing a sequence, the Run icon (RUN) appears in the upper right corner on the display.

1 Press Run on the sequence execution screen or on the chain creation screen.



Screens during program execution are displayed.

To confirm steps not fully displayed, swipe the step list to the left and right, or scroll the screen with the rotary knob.



NOTE

- To interlock the integrated value of elapsed time with the sequence execution, set “Conditions for starting/stopping integration” *(p.50)* to PROG RUN.
- If the waveform is not input as set after the sequence starts, check the following.
  - Check that a voltage of 2 % or more of the rated voltage is applied to the DC INPUT terminal.
  - If the waveform is not input in the set time, set the input setting value of the step *(p.121)* to 20 % or more of the rating. The operation mode may have transitioned.

Synchronization of the start timing of a program or a step

The start timing of a program or a step can be synchronized with the PXZ series connected in synchronization. For details, see “Synchronization of the program start” *(p.90)* and “Synchronization of the step start” *(p.91)*.

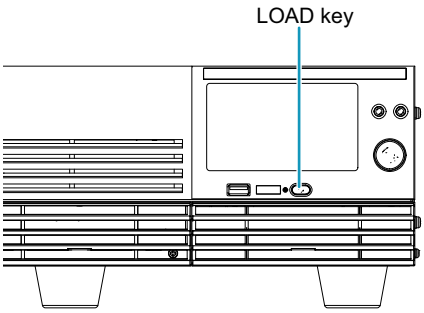
Start timing of a program or step is controlled by a trigger

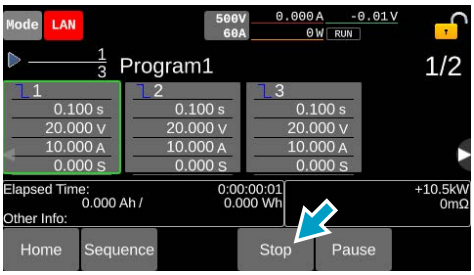
The timing to start a program can be controlled by setting a trigger wait *(p.111)* in the program.

The timing to start a step can be controlled by setting a trigger wait *(p.118)* in the step.

Stops the sequence

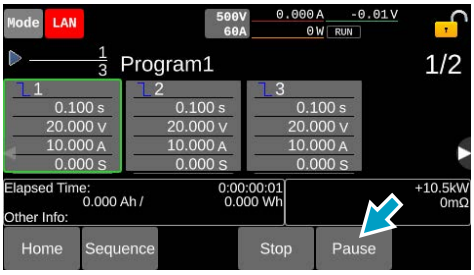
If you press the LOAD key on the front panel or press Stop on the sequence execution screen while a sequence is running, the sequence will stop and the loads will be turned off.



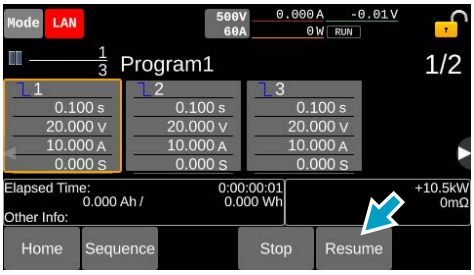


Pausing a sequence

Pressing the Pause while a step is running will pause the sequence. Press Resume to resume the sequence.



While a sequence is running



Sequence paused

Exporting and Importing Programs

Programs saved in the internal memory can be exported to a USB memory device with a capacity up to 16 GB. Programs exported to a USB memory device can also be imported into the internal memory.

Exporting programs to a USB memory device

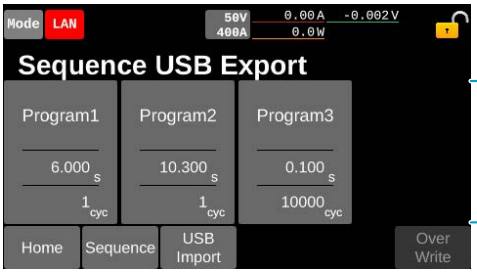
Save the program to the root folder of the USB memory device.

1 **Insert a USB memory device into the USB connector on the front panel.**

2 **Press Sequence > Export on the homepage.**

Program exporting screen is displayed.

To display programs not fully displayed on the screen, swipe the program list to the left or right, or press the ◀/▶ keys to scroll the screen.



The program list saved in the internal memory.
The execution time and the number of loops are displayed.

In the case of pressing USB Import, the display switches to the program importing screen.

3 **Press a program.**

The program is selected.

4 **Press OverWrite.**

Overwrite programs to a USB memory device.

Operation completed.

Importing programs from a USB memory device

NOTE

If the number of steps is large, loading will take more time (approximately 5 minutes for 10000 steps as a rough guide).

1 **Insert a USB memory device into the USB connector on the front panel.**

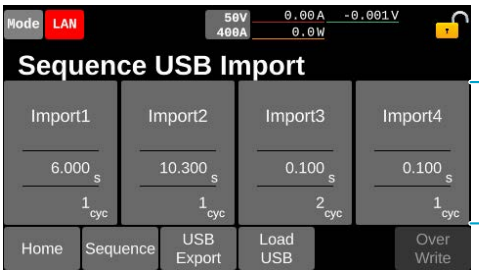
2 **Press Sequence > Import on the homepage.**

Program importing screen is displayed.

3 **Press Load USB.**

The list of programs saved to the USB memory device is displayed.

To display programs not fully displayed on the screen, swipe the program list to the left or right, or press the ◀/▶ keys to scroll the screen.



The program list saved in the USB memory.
The execution time and the number of loops are displayed.

In the case of pressing USB Export, the display switches to the program exporting screen.

4 **Press a program.**

The program is selected.

5 **Press OverWrite.**

Overwrite programs to the internal memory.

The loaded program will be displayed at the end of the program list.

Operation completed.

In the case that the program cannot be used

When the input set values of the saved program exceed the rated values, the program is grayed out in the PXZ series and cannot be selected.

The program will not be displayed in the PXZ series in the following cases:

- In the case of changing the file extension (.json) of the program file
- In the case of importing with a PXZ series with an older system version than that of the saved PXZ series
- In the case that the rated voltage is different from that of the saved PXZ series
- When the number of programs exceeds 30
- When the total number of steps of all programs exceeds 10000 steps

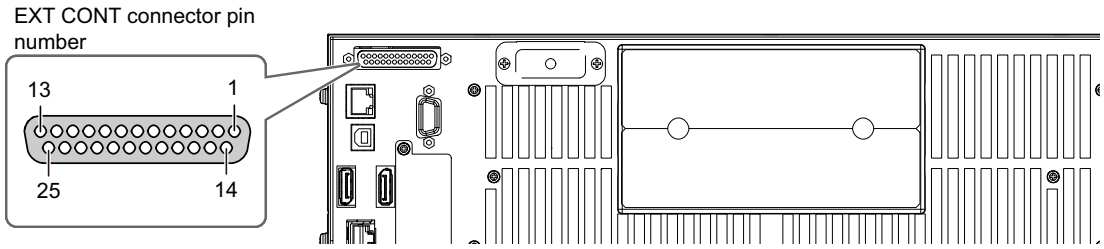
External Control

Overview of the External Control

An external device can control PXZ series using the EXT CONT connector on the rear panel. Outline of the controllable functions are as follows. An arbitrary function can be assigned to the general-purpose digital input and output terminals.

Method	Function	Connection method	Setting procedure
Analog input	Set voltage and current	*p.132*	*p.137*
Analog output	Monitor the voltage and current values	*p.133*	*p.137*
General-purpose digital input (Ch.1 to Ch.5)	• Load on/off • LOW alarm occurrence / clearance • Starting/stopping integration measurement • Reset integrated value • Input the measurement trigger • Recall settings from preset memory	*p.134*	*p.142*
Digital input (Ch.6)	HIGH alarm occurrence (fixed)	*p.134*	–
General-purpose digital output (Ch.1 to Ch.6)	• Monitor the load state • Monitor the power on • Monitor the alarm • Monitor the operation mode • Monitor the preset memory	*p.135*	*p.142*

EXT CONT Connector Pin Arrangement



Terminal No.	Method	I/O	Name	Description
1	Digital	O	OUT Ch.1	General-purpose output terminal
2	Digital	O	OUT Ch.2	General-purpose output terminal
3	Digital	O	OUT Ch.3	General-purpose output terminal
4	–	–	DO COM	Digital output common
5	–	–	DI COM	Digital input common
6	Digital	I	IN Ch.1	General-purpose input terminal
7	Digital	I	IN Ch.2	General-purpose input terminal
8	Digital	I	IN Ch.3	General-purpose input terminal
9	–	O	+12 V OUT	12 V reference voltage available for digital input
10	–	–	–	Not used
11	–	–	A COM	Analog signal common
12	Analog	O	VMON	Voltage monitor
13	Analog	O	IMON	Current monitor
14	Digital	O	OUT Ch.4	General-purpose output terminal
15	Digital	O	OUT Ch.5	General-purpose output terminal
16	Digital	O	OUT Ch.6	General-purpose output terminal
17	–	–	DO COM	Digital output common
18	–	–	DI COM	Digital input common
19	Digital	I	IN Ch.4	General-purpose input terminal
20	Digital	I	IN Ch.5	General-purpose input terminal
21	Digital	I	H ALARM IN	HIGH alarm EXT HIGH occurrence
22	–	–	12 V COM	12 V reference voltage common
23	–	–	A COM	Analog signal common
24	Analog	I	EXT CV	Voltage control in the constant voltage mode
25	Analog	I	EXT CC/CP	Current control in the constant current / power modes

Connecting to the EXT CONT Connector

To connect the signal cable to the EXT CONT connector, use the external control connector (made by Hirose Electric) that comes with the product. For details on how to use the connectors, see the Hirose Electric catalog. For information about how to obtain these tools or replacement parts, contact your Kikusui agent or distributor.

Name	Product name	Notes
Connector	HDBB-25P(05)	Wire diameter: AWG28 to AWG20 Solder wiring method. Use a soldering iron of 40 W or less for soldering, and complete the operation within 4 seconds.
Plug case	HDB-CTH(4-40)(10)	–

When performing parallel operation, connect the signal cable only to the EXT CONT connector of the master unit.

Connecting to the analog input terminal

For analog input, the voltage and current values input can be set by external voltage.

⚠CAUTION

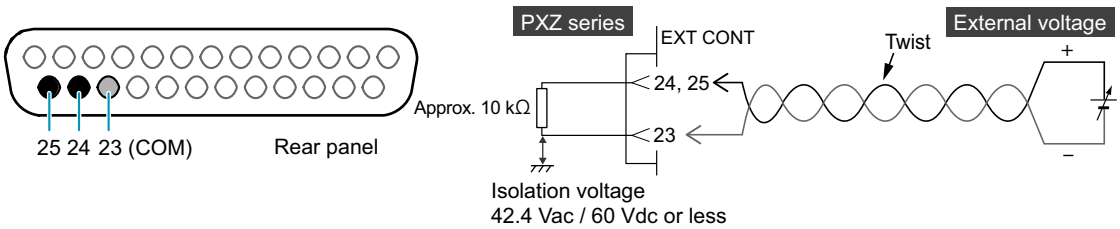
PXZ series and DUT may be damaged.

- **Do not input voltages outside the control voltage range to the analog input terminal and digital input terminal.**
  For the input specifications, refer to “External Control Specifications” *(p.186)*.

Connection method

Turn off power, and connect the external voltage to the EXT CONT connector referring to the followings.
The analog input terminal and the DC INPUT terminal are isolated from each other.

Controls	Terminal to be connected
Voltage control in the constant voltage mode	Between the terminals No.24 and 23
Current control in the constant current / power modes	Between the terminals No.25 and 23



Settings related to analog input

- Enabling analog input/output *(p.137)*
- Setting the input range of the voltage control signal *(p.138)*
- Set input ranges for current/power/conductance control signals *(p.139)*

Connecting to the analog output terminal

The analog output can monitor input voltage and current values.

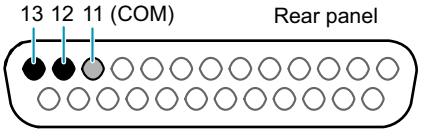
NOTE

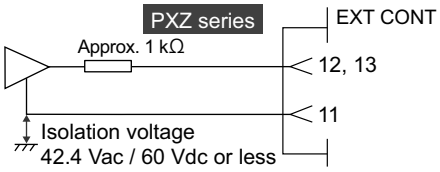
Transient current fluctuations cause a difference between the current monitor value and the actual current.

Connection method

Turn off power, and connect the external voltage to the EXT CONT connector referring to the followings.
The analog output terminal and the DC INPUT terminal are isolated from each other.

Controls	Terminal to be connected
Monitoring of voltage	Between the terminals No.12 and 11
Monitoring of current	Between the terminals No.13 and 11





For the output specifications, refer to Specifications *(p.186)*.

Settings related to analog output

- Enabling analog input/output *(p.137)*
- Setting the output range of the voltage control signal *(p.140)*
- Setting the output range of the current control signal *(p.141)*

Connecting to the digital input terminal

Digital input includes general-purpose digital input terminals (Ch.1 to Ch.5) that allow you to arbitrarily select a function to be controlled, and terminals that generate a HIGH alarm (Ch.6).

For details on the functions that can be selected by Ch.1 to Ch.5, refer to “Setting the functions of the general-purpose digital inputs” *(p.143)*.

⚠CAUTION

PXZ series and DUT may be damaged.

- **Do not input voltages outside the control voltage range to the analog input terminal and digital input terminal.**
  For the input specifications, refer to “Input specifications” *(p.135)*.

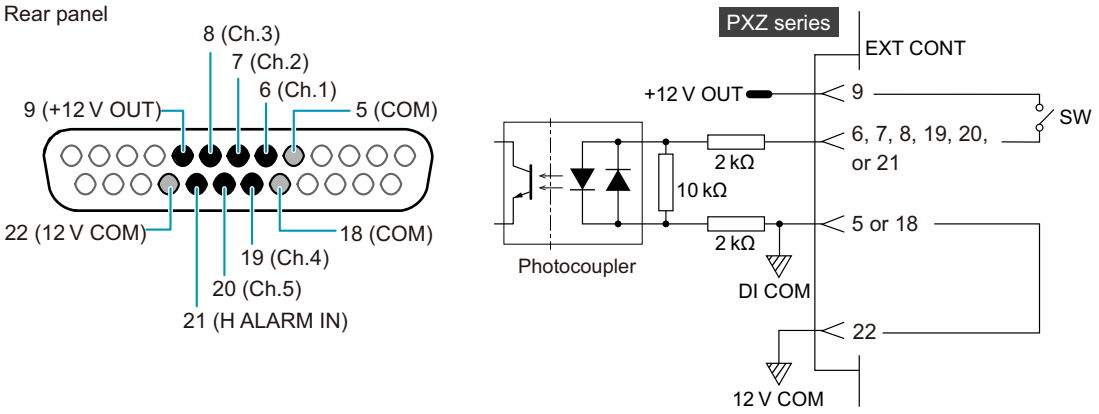
Connection method

Turn off power of PXZ series, and connect the external contact to the EXT CONT connector.

Controls	Terminal to be connected
General-purpose digital input	It depends on the channel to use. Between the terminals No.6 (Ch.1), No.7 (Ch.2), No.8 (Ch.3), No.19 (Ch.4), or No.20 (Ch.5), and No.5 or No.18
Generate HIGH alarm EXT HIGH *(p.56)*	Between the terminals No.21, and No.5 or No.18

Power supply is necessary to use digital input. The 12 V reference voltage of the EXT CONT connector or arbitrary external power supply can be used.

The following drawings show an example of connection using the 12 V reference voltage (No. 9 and No. 22) of the EXT CONT connector as a power supply.



NOTE

Since the digital input terminals are compatible with both positive and negative common, you can also set DI COM to positive common.

Input specifications

Item	Specifications
Input resistance	4 kΩ
Input ON current	1.5 mA or more
Input OFF current	0.1 mA or less
External circuit power supply range	12 Vdc to 24 Vdc (±10 %)
Response speed	Within 200 µsec (response time of photocoupler)

Connecting to the digital output terminal

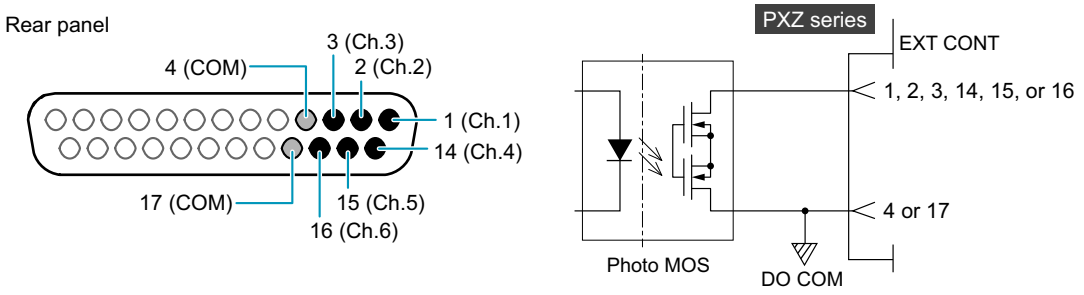
These are general-purpose digital output terminals (Ch.1 to Ch.6) you can arbitrarily select a function to be controlled.

For details on the functions that can be selected by Ch.1 to Ch.6, refer to “Setting the functions of the general-purpose digital output” *(p.145)*.

Connection method

It depends on the channel to use. Turn off power, and connect a signal cable between the terminals No.1 (Ch.1), No.2 (Ch.2), No.3 (Ch.3), No.14 (Ch.4), No.15 (Ch.5), or No.16 (Ch.6), and No.4 or No.17 of the EXT CONT connector.

For details on output specifications of each channel, see below.



NOTE

Since the digital output terminals are compatible with both positive and negative common, you can also set DO COM to positive common.

Output specifications

Item	Ch.1 to Ch.5	Ch.6
Output pressure-resistance	Max. ±42.4 V	Max. ±30 V
Output current	Maximum 80 mA (per channel)	Maximum 1.2 A
Output ON resistance	16.0 Ω or less	0.25 Ω or less
Output OFF leakage current	1.0 µA or less	1.0 µA or less
Response speed	Within 2.0 msec	Within 3.0 msec

Connecting to the EXT CONT connector

Storing the protection plate

By factory default, the protection plate is mounted on the EXT CONT connector. When using the EXT CONT connector, keep the removed protection plate in a safe place. If you are not using the EXT CONT connector, attach the protection plate for your safety and to prevent external disturbances. If it is damaged or lost, contact your Kikusui agent or distributor.

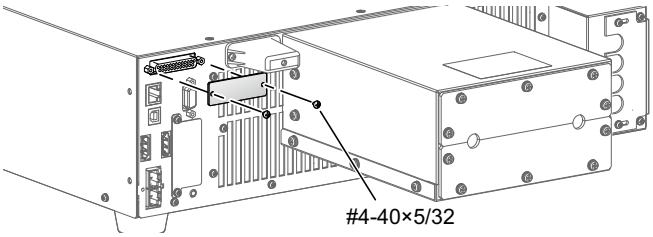
Connecting an external control connector

NOTE

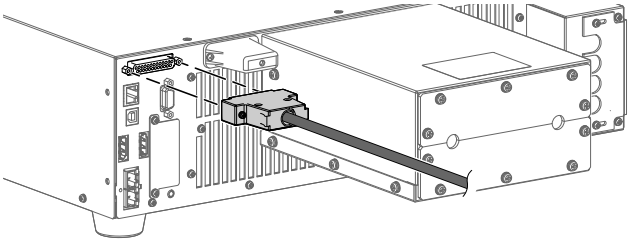
- To prevent noise interference, use twisted wires for the signal cables.
- Use a highly stable power supply that has low noise for the external controller.

1 **Turn the POWER switch off.**

2 **Remove the protection plate of the EXT CONT connector.**



3 **Connect the external control connector to the EXT CONT connector.**



4 **Connect the signal cable to the external controller.**

This completes the external control connection procedure.

Setting Analog Input/Output

The input voltage, input current, and input power can be controlled by external voltage using the analog input terminals *(p.132)* and analog output terminals *(p.133)* of the EXT CONT connector.

Enabling analog input/output

To control the input voltage, input current, or input power with external control, set the input function of the respective operation modes to External Control (EXT).

Item		Description
CC	EXT	Controls the current value by the external voltage.
CV	EXT	Controls the voltage value by the external voltage.
CP	EXT	Controls the power value by the external voltage.
CR	EXT	Controls the conductance value by the external voltage.

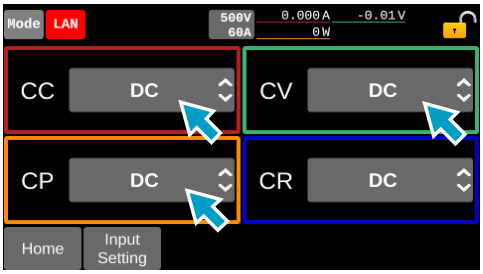
NOTE

You cannot set CC, CP and CR to EXT simultaneously.

1 **Turn off the load.**

2 **Press Input Setting > Input Mode on the homepage.**

3 **Press the input field for CC, CV, CP or CR.**



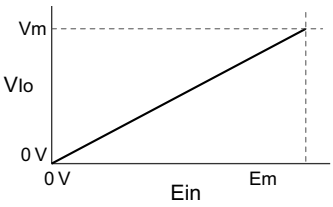
4 **Press EXT.**

This completes the setting.

Setting the input range of the voltage control signal

When an external voltage is applied to the analog input terminal *(p.132)*, a voltage value proportional to the change is obtained.

Set the range of the applied voltage to 0-10 V or 0-5 V. You cannot set it while load on.



Vlo: Input voltage
Vm: Rated voltage
Em: 5 V or 10 V
Ein: External voltage

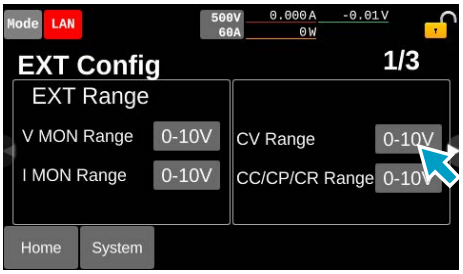
$$Vlo \approx \frac{Vm \times Ein}{Em}$$

$0 \leq Ein \leq Em$

1 **Press System > EXT Config on the homepage.**

2 **Press the input field for CV Range.**

Each time you press the field, it switches between 0-10 V and 0-5 V.

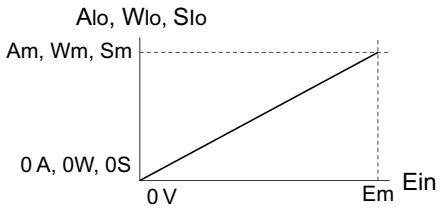


This completes the setting.

Set input ranges for current/power/conductance control signals

Applying an external voltage to the analog input terminals *(p.132)* produces a current, power, or conductance value proportional to the change.

Set the range of the applied voltage to 0-10 V or 0-5 V. You cannot set it while load on.



Alo: Input current
Wlo: Input power
Slo: Conductance
Am: Rated current
Wm: Rated power
Sm: Rated conductance
Ein: External voltage
Em: 5 V or 10 V

$$Alo \approx \frac{Am \times Ein}{Em} \qquad 0 \le Alo \le Am$$

$$Wlo \approx \frac{Wm \times Ein}{Em} \qquad 0 \le Wlo \le Wm$$

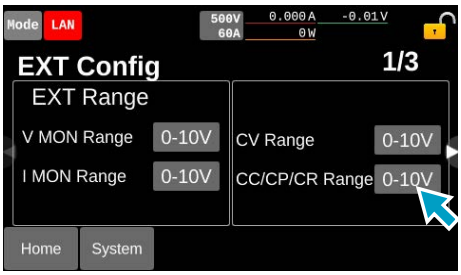
$$Slo \approx \frac{Sm \times Ein}{Em} \qquad 0 \le Slo \le Sm$$

$$0 \le Ein \le Em$$

1 **Press System > EXT Config on the homepage.**

2 **Press the input field for CC/CP/CR Range.**

Each time you press the field, it switches between 0-10 V and 0-5 V.

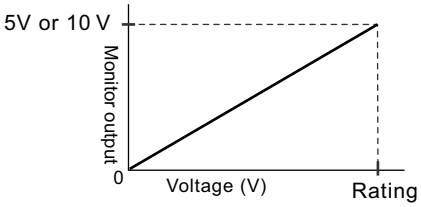


This completes the setting.

Setting the output range of the voltage control signal

A signal with a voltage proportional to the input voltage value is output from the analog output terminal *(p.133)*.

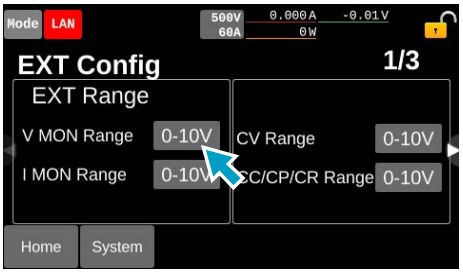
Set the range of the output voltage to 0-10 V or 0-5 V. You cannot set it while load on.



1 **Press System > EXT Config on the homepage.**

2 **Press the input field for V MON Range.**

Each time you press the field, it switches between 0-10 V and 0-5 V.

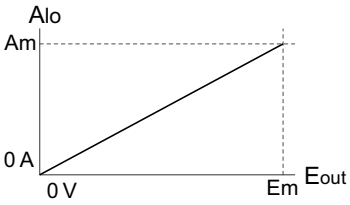


This completes the setting.

Setting the output range of the current control signal

A signal with a voltage proportional to the input current value is output from the analog output terminal *(p.133)*.

Set the range of the output voltage to 0-10 V or 0-5 V. You cannot set it while load on.



A_{lo}: Input current value
Am: Rated current
Eout: Output signal voltage
Em: 5 V or 10 V

$$A_{lo} \approx \frac{Am \times Ein}{Em}$$

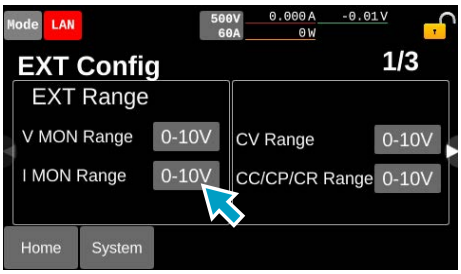
$0 \leq E_{out} \leq Em$

$0 \leq A_{lo} \leq Am$

1 **Press System > EXT Config on the homepage.**

2 **Press the input field for I MON Range.**

Each time you press the field, it switches between 0-10 V and 0-5 V.



This completes the setting.

Setting Digital Input/Output

Set the operation when a signal is entered to the digital input terminal *(p.134)* or digital output terminal *(p.135)* of EXT CONT.

Enabling/disabling the digital input/output

When digital input/output is enabled, the EXT icon (EXT) is displayed on the upper right of the screen.

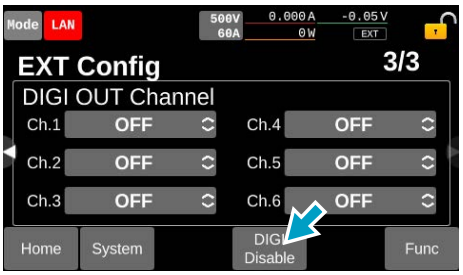
1 **Press System > EXT Config on the homepage.**

2 **Swipe to the left, or press the ▶ key.**

3 **Press DIGI Disable or DIGI Enable.**

Each time you press it, the digital input/output is switched to be enabled/disabled.

When the input fields for Ch.1 to Ch.6 are grayed out, the digital input and output is disabled.



This completes the setting.

Setting the functions of the general-purpose digital inputs

General-purpose digital input terminals are provided at Ch.1 to Ch.5. Ch.6 is fixed for H Alarm IN (HIGH alarm). Arbitrary functions from the following items can be selected respectively.

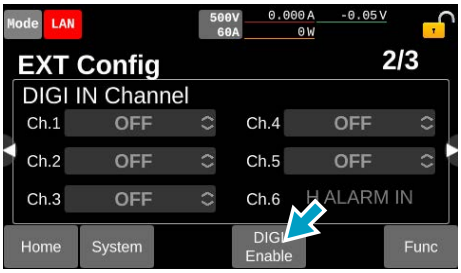
Set value	Description
OFF	Terminals are not used.
LOAD ON	When the signal is turned ON from OFF, the load is turned on.
LOAD OFF	The load is turned off while the signal is on.
LOAD CTRL	When the signal is turned ON from OFF, the load is turned on. The load is turned off while the signal is off.
L ALARM IN	While the signal is on, a LOW alarm is generated and the load is turned off.
ALARM CLR	When the signal is set to ON from OFF, the LOW alarm is cleared. If L ALARM IN is being set ON simultaneously, L ALARM IN will be prioritized.
SEQ RUN	When the signal is set to ON from OFF, the sequence will be executed. When the signal is set to OFF from ON, the sequence will be cancelled.
SEQ PAUSE	When the signal is set to ON from OFF, the sequence will be paused. When the signal is set to OFF from ON, the sequence will be resumed.
INTEG CTRL	When the signal is turned ON from OFF, the elapsed time, current and power are integrated. When the signal is turned OFF from ON, the integration is stopped.
INTEG RESET	While the signal setting is ON, the integrated values of elapsed time, current, and power are reset.
ACQUIRE TRIG	When the signal is set to ON from OFF, the measurement trigger will be input. When the Source of the measurement trigger is in the trigger wait state with EXT *(p.45)*, the measurement will be started.
SEQ TRIG IN	When the signal is set to ON from OFF, the sequence trigger will be input. When the Wait Trig of the sequence is in the trigger wait state with EXT *(p.111)*, the sequence will be started.
MEM1 RECALL	Preset memory 1 is recalled when the signal is turned ON from OFF.[1]
MEM2 RECALL	Preset memory 2 is recalled when the signal is turned ON from OFF.[1] If it is set to ON simultaneously with MEM1 RECALL, MEM1 RECALL will be prioritized.
H ALARM IN	The function fixed to Ch.6. While the signal is on, a HIGH alarm is generated and the load is turned off.

1. While the signal is on, the set values to be saved in the preset memory cannot be changed.

1 **Press System > EXT Config on the homepage.**

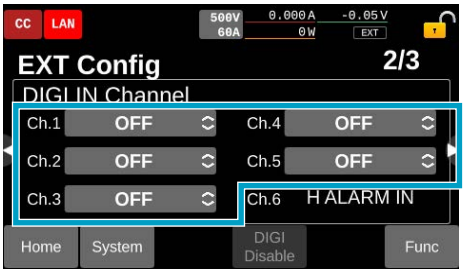
2 **Swipe to the left, or press the ▶ key.**

3 **When the input fields for Ch.1 to Ch.5 are grayed out, press DIGI Enable.**



Enable the digital input/output.

4 **Press an arbitrary Ch.**



5 **Select and press the set value.**

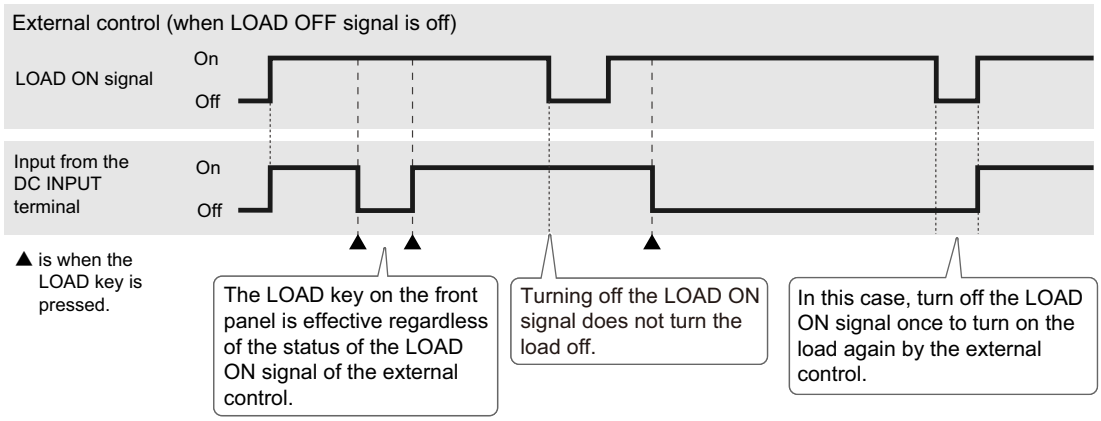
This completes the setting.

Priority relation between the general-purpose digital input and the front panel operation

Priority relation between LOAD ON/LOAD OFF for general-purpose digital input and the LOAD key operation on the front panel is as shown below.

If a signal to load off (LOAD OFF signal on or LOAD CTRL signal off) is input, load off takes precedence over signals or operations to load on (LOAD ON signal on, LOADCTRL signal on, and front panel LOAD key operation).

When the LOAD OFF signal is off, the relationship between the LOAD ON signal and LOAD key operation is as follows.



Setting the functions of the general-purpose digital output

General-purpose digital output terminal are provided at Ch.1 to Ch.6. Arbitrary set values from the following items can be selected respectively.

Set value	Condition for outputting signals
OFF	Terminals are not used.
LOAD ON	The signal is turned on while load on.
POWER ON	The signal is turned on while the load can be turned on.
H ALARM OUT	The signal is turned on after a HIGH alarm is generated until it is cleared.
L ALARM OUT	The signal is turned on after a LOW alarm is generated until it is cleared.
CC STATUS	The signal is turned on while operating in the CC mode.
CV STATUS	The signal is turned on while operating in the CV mode.
SEQ TRIG OUT	Pulse signal is output when sequence step is started.
SEQ STATUS	The signal turns on while the steps of the sequence are running.
EXT DIN BUSY	The signal is turned on while the digital input of the EXT CONT connector is busy. When using both external control and remote control, monitor the EXT DIN BUSY signal. During the busy state, control not to input any signal to the digital input terminal.
MEM1 ACT TIME	When Preset Memory 1 is recalled by a general-purpose digital input, the signal is turned on until the set value is changed after the memory is recalled.
MEM2 ACT TIME	When Preset Memory 2 is recalled by a general-purpose digital input, the signal is turned on until the set value is changed after the memory is recalled.
RELAY DRIVE	The signal is turned on and off in conjunction with load on/off. The signal is output after approx. 100 ms from the load on/off. You can set this parameter to only Ch.6.

NOTE

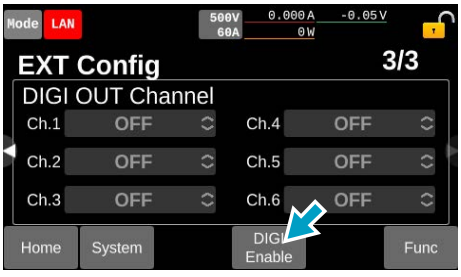
When digital input/output is enabled by setting EXT DIN BUSY and a remote control is used, mind the following points.

- The remote control command processing will take more time than when EXT DIN BUSY is not set. For details, refer to “Main Command Processing Time” in the Interface Manual.
- Sending remote control commands at intervals shorter than 5 ms may stop the operation of PXZ series.

1 **Press System > EXT Config on the homepage.**

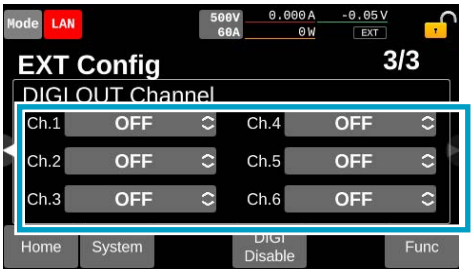
2 **Swipe to the left, or press the ▶ key, till DIGI OUT Channel is displayed.**

3 **When the input fields for Ch.1 to Ch.6 are grayed out, press DIGI Enable.**



Enable the digital input/output.

4 **Press an arbitrary Ch.**



5 **Select and press the set value.**

This completes the setting.

Switching the filter for digital input

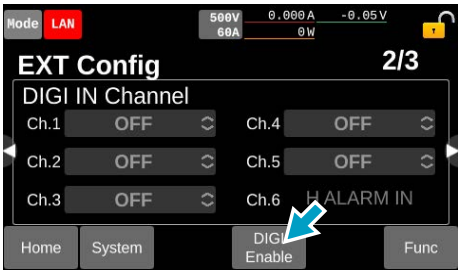
Set the signal input time filter for each digital input channel.

Set value	Behavior
SLOW	The digital input is activated when there is an input to the digital input terminal for 10 ms. This is recommended if you are using relays, etc. that may cause chattering.
FAST	The digital input is activated when there is an input to the digital input terminal for 150 µs. This is recommended when using semiconductor switches, etc.

1 **Press System > EXT Config on the homepage.**

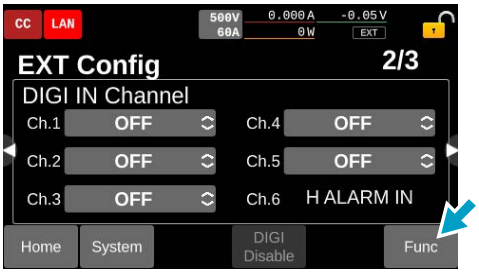
2 **Swipe to the left, or press the ▶ key.**

3 **When the input fields for Ch.1 to Ch.5 are grayed out, press DIGI Enable.**



Enable the digital input/output.

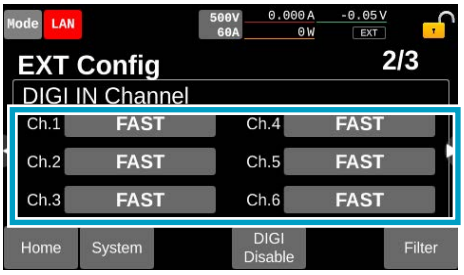
4 **Press Func.**



“Func” switches to “Filter,” and the filter setup screen for each channel is displayed.

5 **Select and press the set value for each channel.**

Each time you press the button, it switches between SLOW and FAST.



This completes the setting.

Switching the polarities for digital input

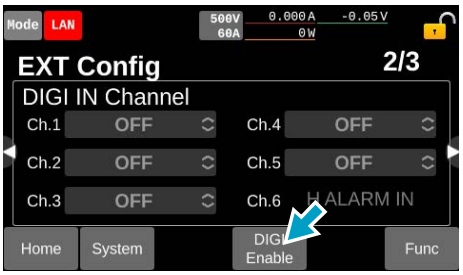
Set the polarities of on/off for each digital input channel.

Set value	Behavior
Positive	It turns on when a current of 1.5 mA or more flows to the digital input channel.
Negative	It turns on when the current at the digital input channel drops to 0.1 mA or lower.

1 **Press System > EXT Config on the homepage.**

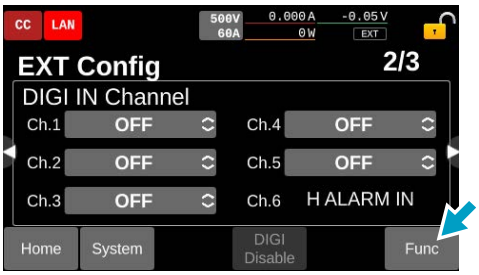
2 **Swipe to the left, or press the ▶ key.**

3 **When the input fields for Ch.1 to Ch.5 are grayed out, press DIGI Enable.**



Enable the digital input/output.

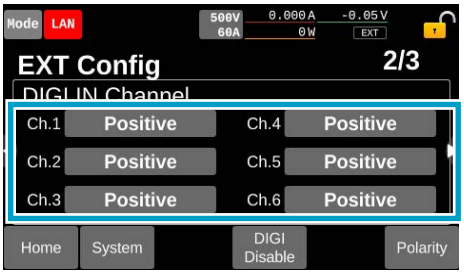
4 **Press Func > Filter.**



It switches in the order of “Func” → “Filter” → “Polarity” to display the polarity setup screen for each channel.

5 **Select and press the set value for each channel.**

Each time you press the button, Positive and Negative are switched.



This completes the setting.

Switching the polarities for digital output

Set the polarities of on/off for each digital output channel.

Set value	Behavior
Positive	When the digital output is on, the channel is closed.
Negative	When the digital output is on, the channel is open.

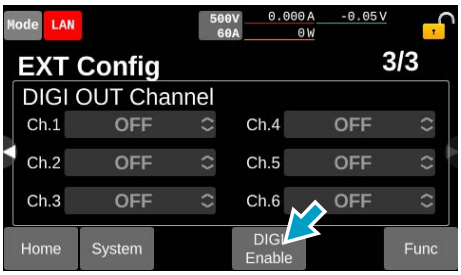
NOTE

For channels with the general-purpose digital output function set to POWER ON, if the polarity is set to Negative, it cannot be monitored that the channel is ready to load on. This is because the channel is open both before and after the POWER switch is turned on and when it is ready to load on. In this case, the channel with POWER ON will be closed once when the power is turned off, and will be open again when the power is completely turned off.

1 **Press System > EXT Config on the homepage.**

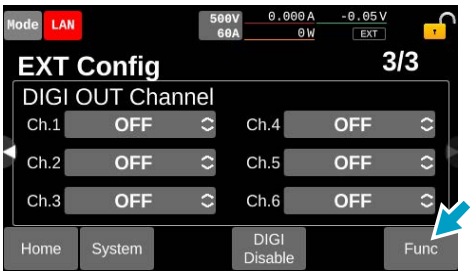
2 **Swipe to the left, or press the ▶ key, till DIGI OUT Channel is displayed.**

3 **When the input fields for Ch.1 to Ch.6 are grayed out, press DIGI Enable.**



Enable the digital input/output.

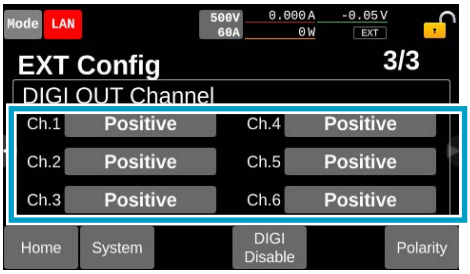
4 **Press Func.**



"Func" switches to "Polarity" to display the polarity setup screen for each channel.

5 **Select and press the set value for each channel.**

Each time you press the button, Positive and Negative are switched.



This completes the setting.

System Settings

You can check/set the following items.

Item	Description
Communication	Set the operations related to LAN and RS232C connections *(p.152)*
VMCB Edit	Set Multichannel *(p.157)*
Model Info	Display information *(p.161)*
Key Lock Level	Set the key lock *(p.162)*
Sound/Display	Set the operations related to sound *(p.164)* and display *(p.165)*.
Date Config	Set the year, month, day, and time *(p.166)*
Update	Update the firmware *(p.169)*
Factory Default	Return the product to its factory default condition *(p.170)*
SCPI Status	Check the details of SCPI errors *(p.173)*

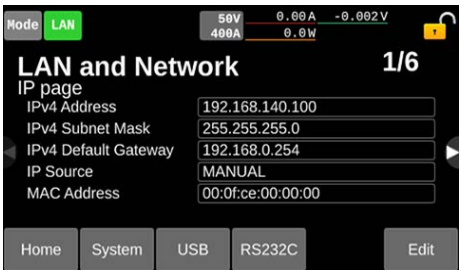
Communication Setting

Display and change of LAN settings, display and change of RS232C settings, and USB settings can be confirmed.

Displaying LAN settings

When pressing System > Communication on the homepage or pressing the LAN icon in the upper left corner of the homepage, the LAN and network screen is displayed.

To display settings not fully displayed on the screen, swipe to the left or right, or press the ◀/▶ keys to scroll the page.



Following items can be confirmed.

Item	Description
IPv4 Address	IPv4 address
IPv4 Subnet Mask	IPv4 subnet mask
IPv4 Default Gateway	IPv4 default gateway
IP Source	IP address assignment method
MAC Address	MAC address
IPv4 DNS Server1	Primary IPv4 DNS server address
IPv4 DNS Server2	Secondary IPv4 DNS server address
Hostname	mDNS host name
Description	Description
Domain	Domain
VXI-11 VISA	VISA resource name of VXI-11
HiSLIP VISA	VISA resource name of HiSLIP
SCPI-RAW VISA	VISA resource name of SCPI-RAW
SCPI-RAW	Port number of SCPI-RAW
SCPI-Telnet	Port number of SCPI-Telnet
HiSLIP	Port number of HiSLIP

Changing LAN settings

Following items can be changed. If you intend to use PXZ series products in an existing network, check with your network administrator for configuration details.

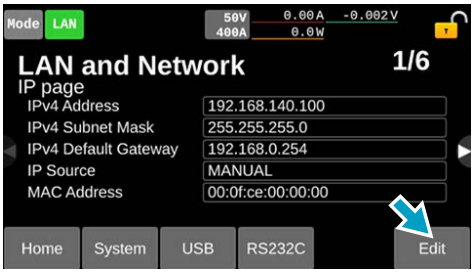
Item	Description	Set value
IP Address assignment method	IP address assignment method	AUTO/MANUAL
IPv4 Address	IPv4 address	–
IPv4 Subnet Mask	IPv4 subnet mask	–
IPv4 Default Gateway	IPv4 default gateway	–
IPv4 DNS Server1	Primary IPv4 DNS server address	–
IPv4 DNS Server2	Secondary IPv4 DNS server address	–
Desired Hostname	Host name (15 characters maximum)	Factory default is model name and serial number.
Desired Description	Description (63 characters maximum)	Factory default setting: KIKUSUI <name> Regenerative Electronic Load -<serial> <name>: model name, <serial>: serial number
Dynamic DNS	Enabling/disabling of dynamic DNS	Enable/Disable
mDNS	Enabling/disabling of multicast DNS	Enable/Disable

1 Press System > Communication on the homepage.

LAN and network screens will be displayed.

The LAN setup screen is displayed also by pressing the LAN icon in the upper left corner of the homepage.

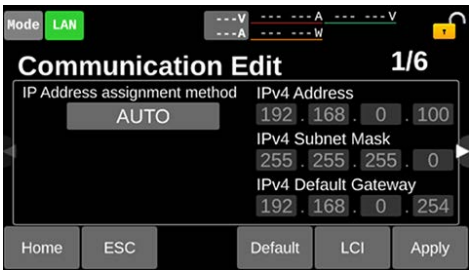
2 Press Edit.



The communication setting edit screen is displayed.

3 Change values settings.

To display settings not fully displayed on the screen, swipe to the left or right, or press the ◀/▶ keys to scroll the page.



Press the input field to change the selected item, entered text/number, or the existence of checking according to the set item.

4 **Press Apply.**
A confirmation screen appears.

5 **Press OK.**
This completes the setting.

Checking / changing the RS232C communication settings

Following items can be displayed/changed.

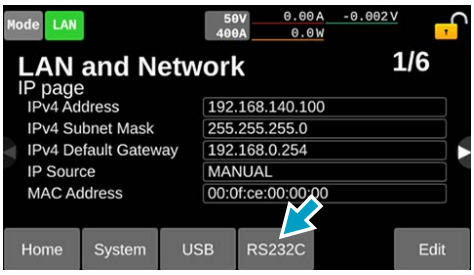
Item	Description	Set value
Data Bits	Data length	8 bit (fixed)
Parity	Parity	None (fixed)
Stop Bits	Stop bits	1 bit (fixed)
Bitrate	Baud rate [bps]	1200/2400/4800/9600/19200/38400/57600/115200
Flow Control	Flow control	None/CTS-RTS

1 **Press System > Communication on the homepage.**

LAN and network screens will be displayed.

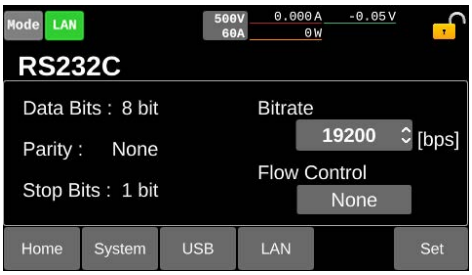
The same screen will appear when you press the LAN icon in the upper left part on the homepage.

2 **Press RS232C.**



The RS232C setup screen is displayed.

3 **Change values settings.**



Press the input field to change settings.

4 **Press Set.**

A confirmation screen appears.

5 **Press OK.**

This completes the setting.

Displaying USB settings

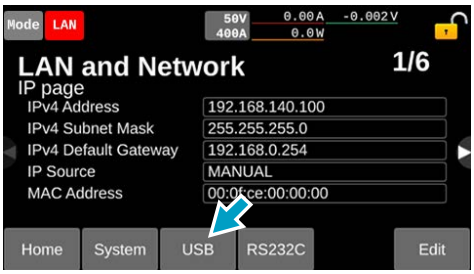
USB vendor ID and product ID are displayed.

1 **Press System > Communication on the homepage.**

LAN and network screens will be displayed.

The same screen will appear when you press the LAN icon in the upper left part on the homepage.

2 **Press USB.**



Vendor ID, Product ID, and Visa address are displayed.

Setting Multichannel

Multichannel

PXZ series supports virtual multichannel (VMCB). If you use Multichannel, you can connect one PC with up to 8 units of PXZ series to construct a virtual multichannel power supply system. You can utilize this to reduce the number of communication ports and control the plural units of PXZ together.

To use Multichannel, connect a PC to PXZ with a switching hub or a broadband router. To control the connected PXZ, send a command from the PC to the PXZ. For details on the connection method and commands for controlling, refer to the Communication Interface Manual.

In this manual, explanations are made only for the Multichannel setting method that can be operated on the display.

Set Multichannel

Set the VMCB Enable/Disable, master/slave units, domain number, and channel number.

Item	Description
VMCB Enable	Sets Enable/Disable of VMCB. If you use Multichannel, set this to Enable.
Master Unit	Sets VMCB master/slave units on PXZ connected to Multichannel. Via the PXZ unit set as the VMCB master unit, the PXZ units set as the VMCB slave units are controlled.
Domain Number	Sets the Domain number. PXZ series that have the same domain number can be controlled under Multichannel as one VMCB network.
Channel	Sets the channel number for the PXZ set as the VMCB slave unit. Channel numbers are used to identify each VMCB slave unit when they are controlled from the PC using commands.

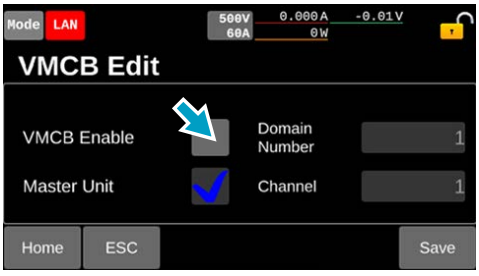
1 **Press System > VMCB > Edit on the homepage.**

Multichannel setup screen is displayed.

2 **Set Enable/Disable of VMCB.**

Press the check box of VMCB Enable.

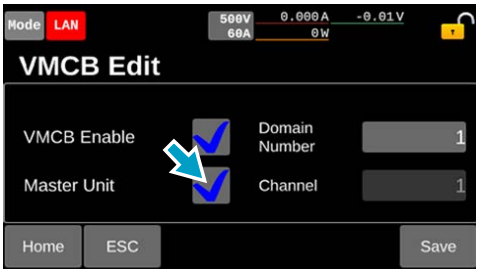
Each time you press the check box, the existence of checking changes. With a check mark, it is enabled, without a check, it is disabled.



3 Set VMCB master and slave units.

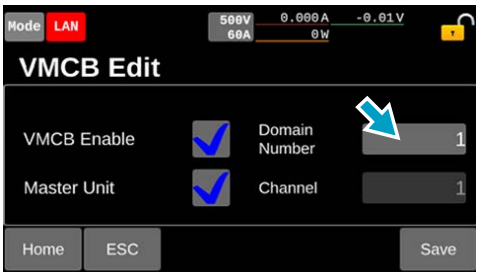
Press the check box of Master Unit.

Each time you press the check box, the existence of checking changes. With the check, it is set as the VMCB master unit, without the check, it is set as a VMCB slave unit.



4 Set the Domain number.

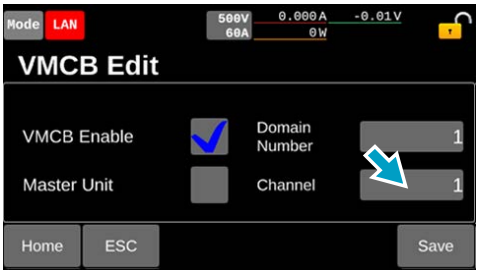
Press the input field for Domain Number and input the domain number on the display or with the rotary knob.



Setting range: 1 to 254

5 When it is set as a VMCB slave unit in Step 3, set a channel number.

Press the input field for Channel and input the channel number on the display or with the rotary knob. Setting of channel number is not necessary for the VMCB master unit.



Setting range: 1 to 7

6 **Press Save.**
A confirmation screen appears.

7 **Press OK.**
Multichannel setup confirmation screen *(p.160)* is displayed.

8 **Turn the POWER switch off.**

9 **Set all the units connected to Multichannel following Step 1 to Step 8.**
For the connection method, refer to the Communication Interface Manual.

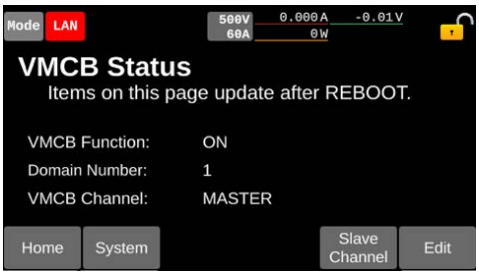
10 **Turn the POWER switches ON in the order of VMCB slave unit to VMCB master unit, or turn the POWER switches of all units ON simultaneously.**
This completes the setting.

Check the settings of Multichannel

1 **Press System > VMCB on the homepage.**

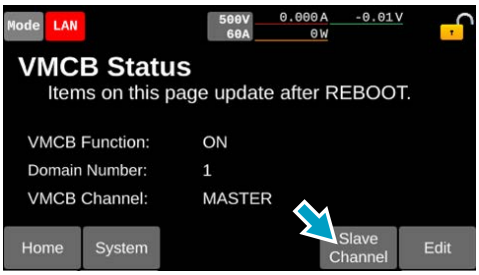
Multichannel setup confirmation screen is displayed.

Press Edit to display the Multichannel setup screen *(p.157)*.



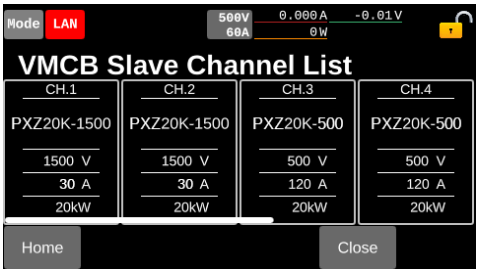
Item	Description
VMCB Function	Multichannel Enabled (ON) / Disabled (OFF)
Domain Number	Domain number
VMCB Channel	Channel number (For the VMCB master unit, “MASTER” is displayed.)

2 **Press Slave Channel if it is the VMCB master unit.**



When a slave unit is detected, the channel list for the slave units is displayed.

On the channel list, the channel number, model name, and input rating are displayed.



Displaying the Device Information

You can display the model name, serial number, system version, and other device information.

1 **Press System > Model Info on the homepage.**

Model Name, Serial Number, System Version, PANEL Version, MAIN Version, FPGA Version, and AFE Version are displayed.

The same screen will be displayed by pressing the rated-value display on the upper part of the homepage.

To display settings not fully displayed on the screen, swipe to the left or right, or press the ◀/▶ keys to scroll the page. Setup items are found on pages 1 through 2. The following figure shows an example of PXZ20K-500.

Key Lock

The keys can be locked to prevent changing the settings or overwriting memory by mistake.

Setting key lock level

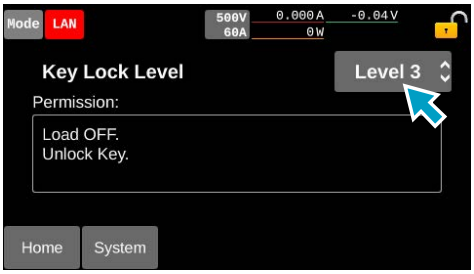
You can set three different key lock levels according to the type of keys whose operation is prohibited. While key lock is enabled, an icon is shown in the top area of the display depending on the key lock level.

Item	Allowed operations	Icon
Level1	Load ON/OFF, recall preset memory, and release key lock.	
Level2	Load ON/OFF and release key lock	
Level3	Load OFF and release key lock	

1 **Press System on the homepage.**

2 **Swipe left or press the ▶ key until Key Lock Level appears.**

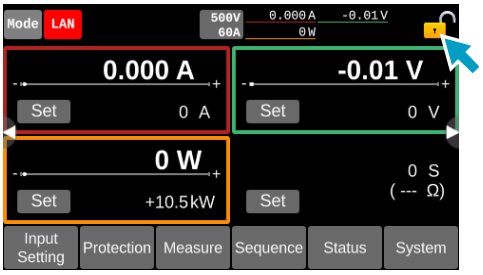
3 **Press the input field for Key Lock Level.**



4 **Select and press the item.**
This completes the setting.

Enabling or disabling the key lock

Key lock switches between enabled and disabled each time you press and hold the key lock icon.



If the key lock cannot be released

When the RWLS icon (RWLS), LWLS icon (LWLS) are displayed, the key lock will not be canceled by pressing and holding. Turn off the power to the PXZ series unit and turn it on again, or refer to the Communication Interface Manual to unlock the remote lock by command.

When the Remote key lock icon (Remote) is displayed, the key lock cannot be released by pressing and holding the icon if Web browser interface display and command transmission through a USB connection are performed simultaneously. Release the key lock by any of the following operations.

- Release the key lock remotely using a command
- Close the browser displaying the Web browser interface
- Disconnect the USB cable
- Turn the power supply of the PXZ series off and then back on

For details on the command and Web browser interface, see the Communication Interface Manual.

Buzzer Sound

You can enable or disable buzzer sounds that are emitted in case of invalid operation, alarm occurrence, or SCPI error.

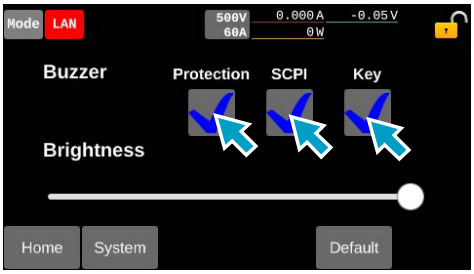
Enables or disables buzzer

1 **Press System on the homepage.**

2 **Swipe left or press the ▶ key until Sound/Display appears.**

3 **Press Sound/Display.**
The screen for setting buzzer sound/display brightness is displayed.

4 **Press the input field for Protection, SCPI, or Key.**
Each time you press the button, the existence of checking changes. If there is a check mark, a buzzer sound will be enabled.
Protection: buzzer sound for alarm occurrence
SCPI: buzzer sound for SCPI errors
Key: buzzer sound for invalid operation



This completes the setting.

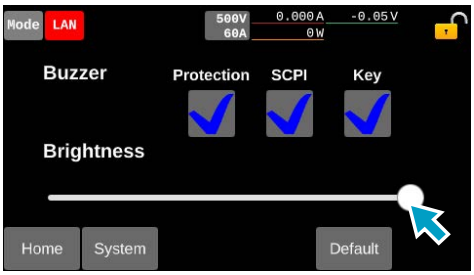
Returning the buzzer to the factory default setting

By pressing Default on the screen for buzzer sound/display brightness settings, Buzzer and Brightness will return to the factory default settings.

Screen Brightness

Set the screen brightness

1. **Press System on the homepage.**
2. **Swipe left or press the ▶ key until Sound/Display appears.**
3. **Press Sound/Display.**
   The buzzer sound/display brightness setup screen is displayed.
4. **Adjust the brightness by moving the Brightness slider.**



This completes the setting.

Returning the display brightness to the factory default setting

By pressing Default on the screen for buzzer sound/display brightness settings, Buzzer and Brightness will return to the factory default settings.

Setting the Date/Time

Set the year, month, day, and time.
The factory default setting for the time zone is UTC+9 (Tokyo).

Retrieving the time from an NTP server

1 **Press System on the homepage.**

2 **Swipe to the left, or press the ▶ key, till Date Config is displayed.**

3 **Press Date Config.**
The date/time setup screen appears.
Next, set the NTP server and time zone.

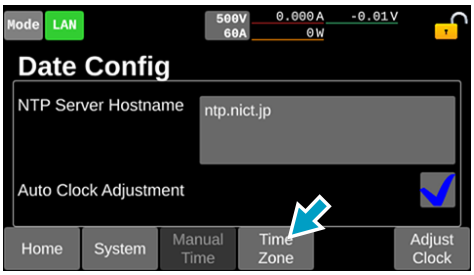
Setting the NTP server

1 **Press the input field for NTP Server Hostname on the date and time setup screen and input the NTP server address.**

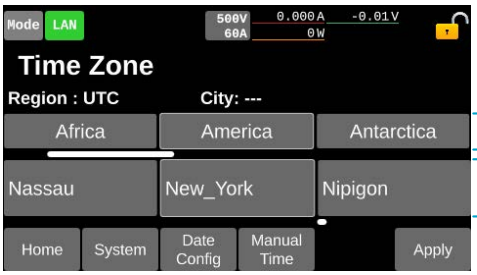
2 **Press the input field for Auto Clock Adjustment and check the box.**
Each time pressing the button, the existence of checking changes.
When checked, Adjust Clock is displayed on the menu. When Adjust Clock is pressed, information is immediately retrieved from the NTP server.
This completes the setting.

Setting the time zone

1 **Press Time Zone on the date and time setup screen.**



Time zone setup screen is displayed.



When pressing the region name, the city name corresponding to the region is displayed.

To display the region name not fully displayed on the screen, swipe the region name to the left, or press the ▶ key to scroll. To display city name not fully displayed on the screen, swipe the city name to the left, or scroll the screen with the rotary knob.

2 **Press the region name and the city name.**

3 **Press Apply.**

This completes the setting.

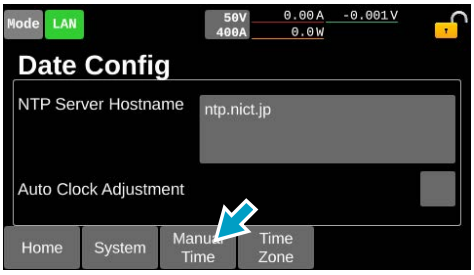
Setting the time manually

1 **Press System on the homepage.**

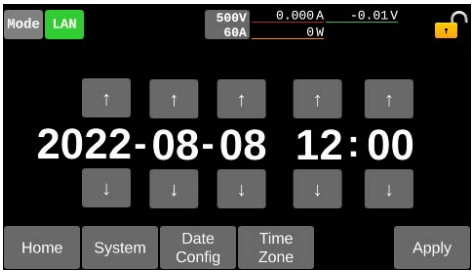
2 **Swipe to the left, or press the ▶ key, till Date Config is displayed.**

3 **Press Date Config.**
The date/time setup screen appears.

4 **Press Manual Time.**



5 **Set the year, month, day, and time.**
Press ↑ and ↓ to set the number.



Setting range: 2022-1-1 0:00 to 2037-12-31 23:59

6 **Press Apply.**
This completes the setting.

Updating

You can update the product's firmware by using a USB memory device.

Updating is not available while an alarm is occurring, load on, or when the voltage coming from the DC INPUT terminal exceeds 30 V.

If there is an update, you can obtain it from the download service on the Kikusui website (https://global.kikusui.co.jp/downloads/).

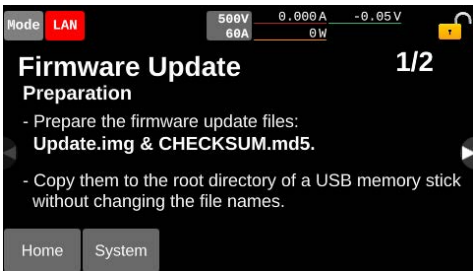
NOTE

Save the update files (Update.img, CHECKSUM.md5) in the root directory of the USB memory device. Do not change the names of the update files.

1 **Press System on the homepage.**

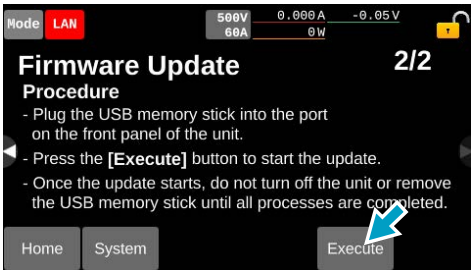
2 **Swipe to the left, or press the ▶ key, till Update is displayed and press Update.**

An update screen appears.



3 **Swipe to the left, or press the ▶ key.**

4 **Insert the USB memory device on which the update files have been saved into the USB port on the front panel, and then press Execute.**



A confirmation screen appears.

5 **Press OK > Enter.**

The update process begins. Do not turn off the POWER switch while updating is in progress. Do not remove the USB memory device. When pressing the ESCAPE, updating is canceled and it restarts.

6 **When "Remove the USB media and turn the device off" is displayed, remove the USB memory device.**

7 **Turn the POWER switch off, leave it for 10 seconds or more, then turn on power again.**

Updating is complete.

Factory Default Settings and Reset Settings

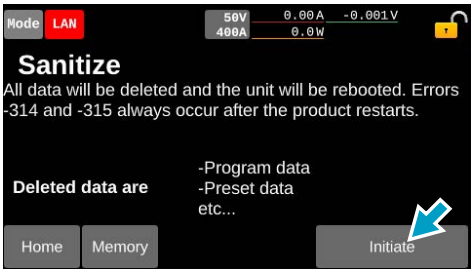
As default settings, this product provides “factory default settings” and “reset settings” where parts of settings are returned to the factory default settings.

Restoring the factory default settings

Restoring the factory default settings deletes all the user data.

For details on the factory default settings, refer to “Settings at Factory Default and at Reset” *(p.193)*.

1. **Swipe to the right, or press the ◄ key on the homepage.**
2. **Press Memory.**
3. **Swipe left or press the ► key until Sanitize appears, then press Sanitize.**
4. **Press Initiate.**



A confirmation screen appears.

5. **Press OK.**
6. **When “Turn the power...” is displayed, turn off the POWER switch, and wait for 10 seconds or more before turning it on again.**

   This will revert to the factory default setting.

NOTE

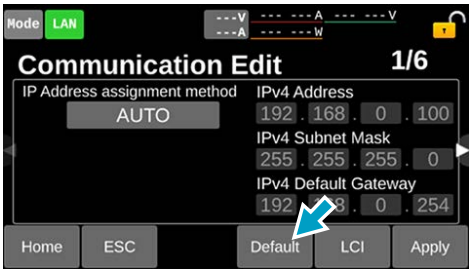
After rebooting, the error messages of “-314 Save/recall memory lost” and “-315 Configuration memory lost” always appear, but they are not abnormal. To remove the error messages, press CLR on the SCPI error screen *(p.173)* or turn the power off and then back on.

Returning the LAN settings to the factory default values

Reset only the settings of LAN to the factory default settings.
For details on factory default setting, refer to “Settings at Factory Default and at Reset” *(p.193)*.

1 **Press System > Communication on the homepage.**

2 **Press Edit > Default.**



A confirmation screen appears.

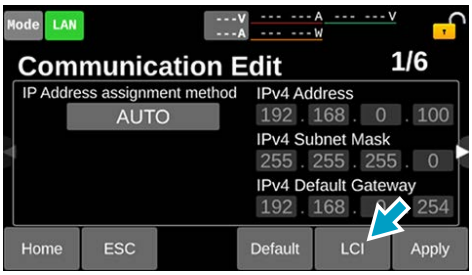
3 **Press OK.**
The interface setting is reset.

Resetting the LAN settings

Reset only the settings of LAN to the reset settings.
For details on reset setting, refer to “Settings at Factory Default and at Reset” *(p.193)*.

1 **Press System > Communication on the homepage.**

2 **Press Edit > LCI.**



A confirmation screen appears.

3 **Press OK.**
The interface setting is reset.

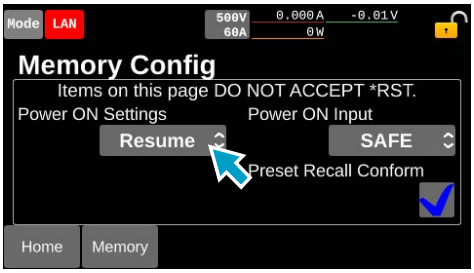
Restoring to reset settings

You can reset some of the settings to their factory defaults.
For the items to be reset, refer to “Settings at Factory Default and at Reset” *(p.193)*.

Resetting at power-on

The settings return to the reset settings each time at startup.

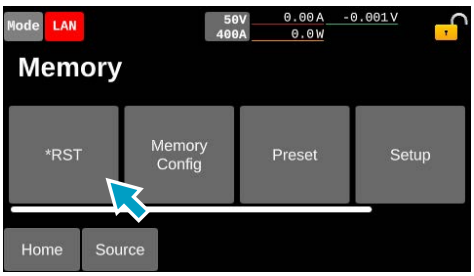
1. **Swipe to the right, or press the ◀ key on the homepage.**
2. **Press Memory > Memory Config.**
3. **Press the input field for Power ON Settings.**



4. **Press RST.**
5. **Turn the POWER switch off, leave it for 10 seconds or more, then turn on power again.**
   It will start in a reset state.

Resetting immediately

1. **Swipe to the right, or press the ◀ key on the homepage.**
2. **Press Memory > *RST on the homepage.**



A confirmation screen appears.

3. **Press OK.**
   Settings are reset.

Displaying SCPI Errors

You can check the content of the SCPI error when an SCPI error occurs during remote control.

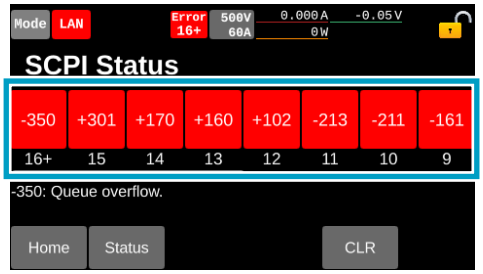
Up to 16 errors are displayed. If the 17th error occurs, the 16th error changes to “-350 Queue overflow,” and subsequent errors are not displayed.

1 Press Status > SCPI Status on the homepage.

The SCPI error number is displayed.

The same screen will appear when you press the SCPI error information on the upper part of the homepage.

2 Press the error number.



The details of the error will be displayed under the error number. The details of the error will be displayed. For details on errors, see the Communication Interface Manual.

When CLR is pressed or the power supply to this product is turned on again after the cause of the error is removed, the error is deleted.

Maintenance

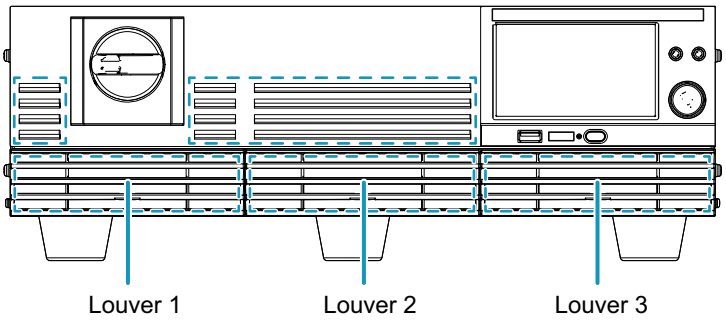
Cleaning the Dust Filter

⚠WARNING

Risk of electric shock.

- **Turn the POWER switch off, and turn the switch of the switchboard off.**

This product has 3 louvers and 5 dust filters. Dust filters are set inside of each louver and the front panel respectively. Remove the louvers and take out the dust filters for cleaning. Clean the dust filters regularly to prevent them from clogging.



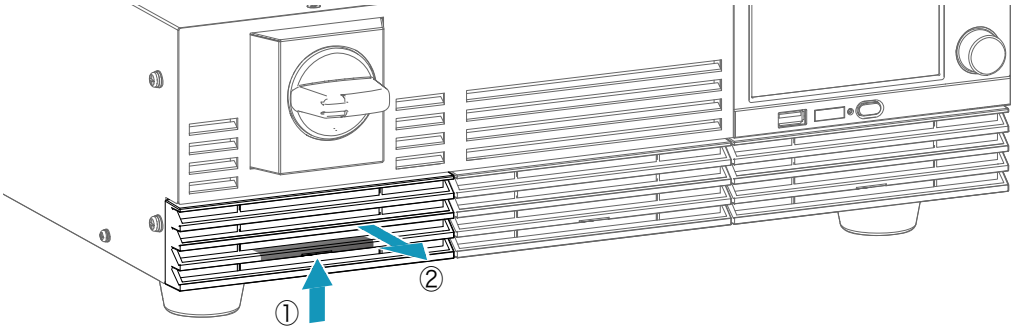
NOTE

Clogging may lead to malfunction or the reduction of the product's service life.

- If the dust filter is clogged, the product's internal cooling capabilities will be reduced.
- When PXZ series is in operation, air is sucked through the dust filter to cool the inside of the device. If moisture is present in the dust filter, the temperature or humidity inside PXZ series increases.

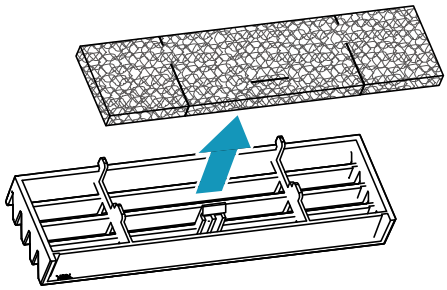
Removing the dust filter

1 **Remove a louver 1 by pushing up the center part of the second rung from the bottom and pulling it toward you.**



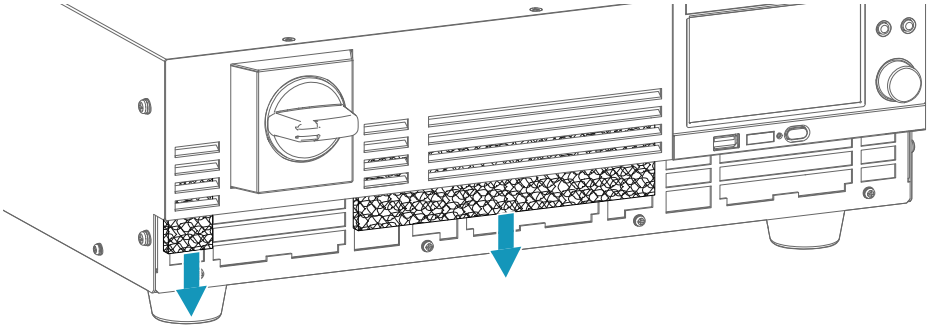
2 **Remove the louvers 2 and 3 in the same way.**

3 **Remove the dust filters set inside the louvers.**



4 **Remove the dust filters set inside the front panel.**

Pull it down from the bottom to take out. Use some tweezers or the like as necessary.



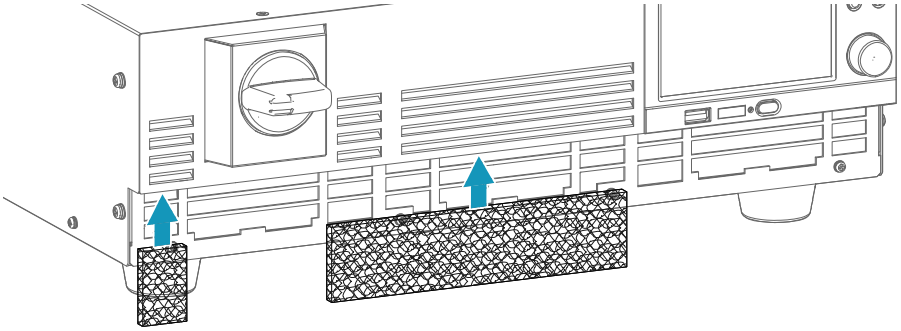
This completes the removal.

Cleaning the dust filter

Use a vacuum cleaner to dispose of the dust and foreign particles that are attached to the dust filters. If the filter is extremely dirty, clean it using water-diluted neutral detergent, and dry it completely.

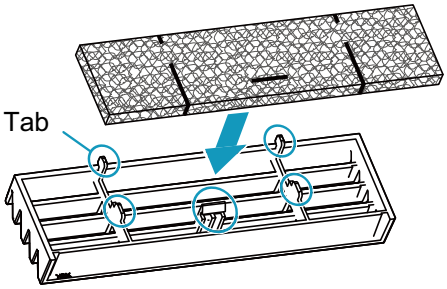
Attaching the dust filter

1 **Insert the dust filters inside the front panel.**



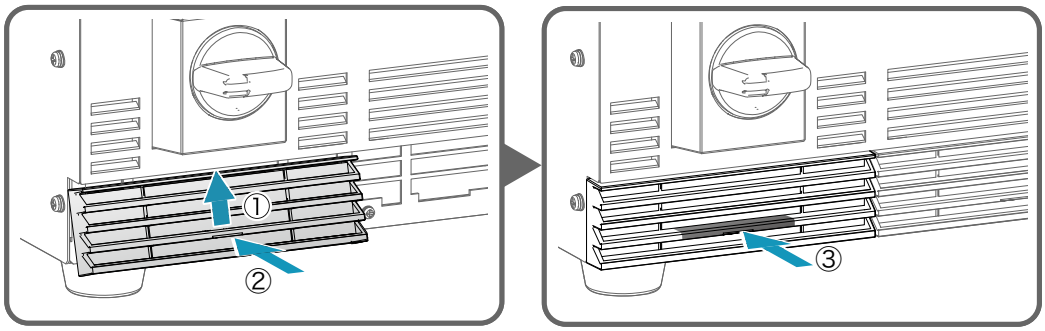
2 **Attach the dust filters to the inside of the louver.**

Attach the dust filters so that the louver's tabs pass through the cuts in the dust filter.



3 **Attach the louver 1 to the front panel.**

Insert the claws on the upper part of the louver first, and then install it.



4 **Install the louvers 2 and 3 in the same way.**

This completes the installation.

Inspection

To purchase accessories or options, contact your Kikusui agent or distributor.

Periodic inspections

Although ideal inspection frequency varies depending on usage patterns, we recommend having the product inspected by your Kikusui agent or distributor every 10000 operating hours.

Backup battery replacement

The product has a battery inside. The battery's service life differs depending on the environment that the product is used in, but three years after it is purchased is a rough estimate for the battery's service life. When the battery is exhausted, the time becomes inaccurate. For information about replacing the battery, contact your Kikusui agent or distributor.

Calibration

The product is calibrated before shipment. To maintain the product's performance, we recommend periodic calibration. To have your product calibrated, contact your Kikusui agent or distributor.

Disposal

Dispose of PXZ series in accordance with your local regulations.

Removing the battery at the time of disposal

This product contains a CR2032 coin-type manganese dioxide lithium battery.

Dispose of the product in accordance with your local regulations after removing the battery referring to the followings.

⚠WARNING

Risk of electric shock.

- **To remove the power cord from the switchboard, turn the switch of the switchboard off.**

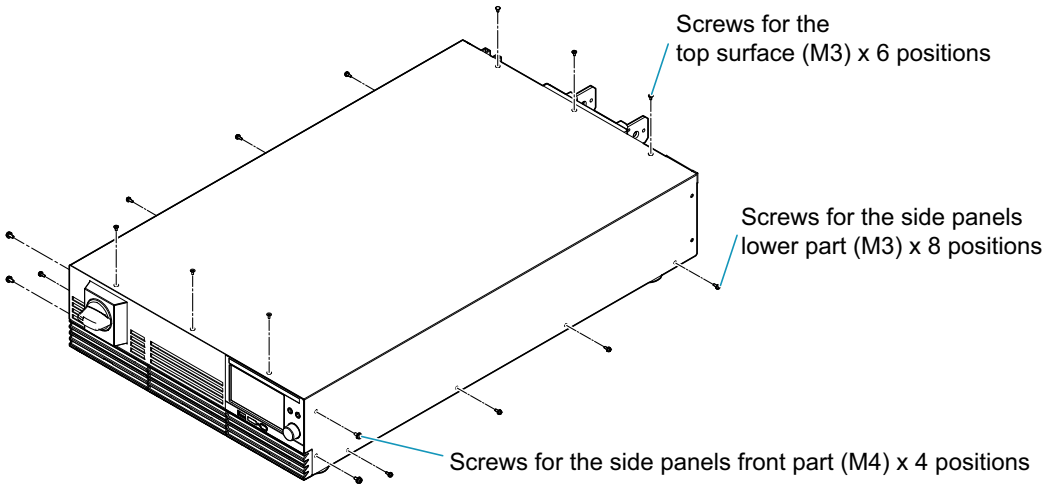
Risk of rupture or ignition.

- **Do not short-circuit, charge, disassemble, deform, throw into fire, or overheat the built-in battery.**

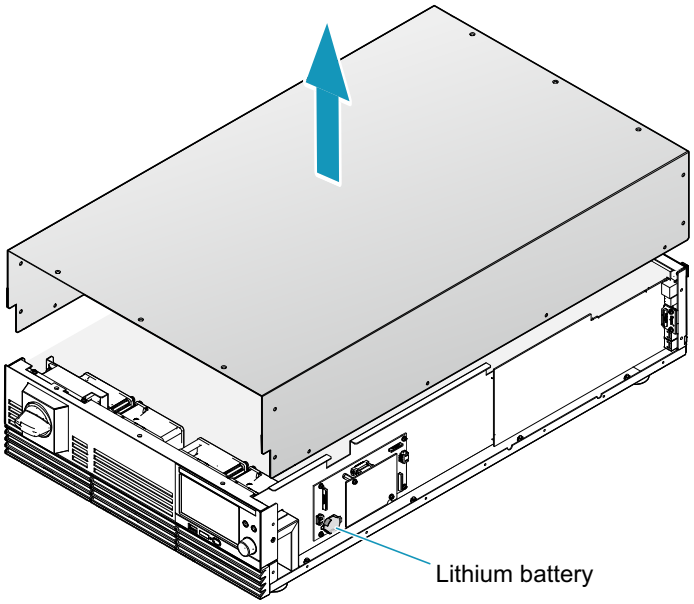
NOTE

The warranty does not apply if the top cover is opened.

1 Remove the screws holding the top cover.



2 **Remove the cover.**



3 **Remove the lithium battery.**

After removing the battery, completely cover their electrode parts with insulation tape.

4 **Close the cover and fasten the screws.**

This completes the removal of the battery.

Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.

- The product is warmed up for at least 30 minutes.

The used terminology is as follows:

- TYP: These are typical values that are representative of situations where the product operates in an environment with an ambient temperature of 23 °C (73.4 °F). These values do not guarantee the performance of this product.
- setting: Indicates a setting.
- reading: Indicates a readout value.
- rating: Indicates a rated value.
- Open: Indicates equivalence to the state in which the DC INPUT terminals are opened.
- Vin: Indicates an input voltage.

DC Input Specifications

Rating

Item	PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Rated power	20000 W	20000 W	20000 W
Rated voltage (DC)[1]	10 V to 500 V	20 V to 1000 V	30 V to 1500 V
Rated current[1]	120 A	60 A	30 A

1. Maximum input current and maximum input voltage are limited by maximum input power.

Constant voltage (CV) mode

Item	PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Maximum settable voltage	525 V	1050 V	1575 V
Setting accuracy	±(0.2 % of setting + 0.1 % of rating)		
Setting resolution	0.05 V	0.1 V	0.1 V
Remote sensing Maximum compensation voltage (reciprocating) (TYP)	10 % of rating	10 % of rating	10 % of rating
Response switching	FAST, SLOW	FAST, SLOW	FAST, SLOW
Slew rate switching (TYP)	125 V/ms or more[1]	250 V/ms or more[1]	375 V/ms or more[1]
	125 V/ms	250 V/ms	375 V/ms
	12.5 V/ms	25 V/ms	37.5 V/ms
	1.25 V/ms	2.5 V/ms	3.75 V/ms
	0.125 V/ms	0.25 V/ms	0.375 V/ms

1. MAX will appear on the display.

Constant current (CC) mode

Item	PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Maximum settable current[1]	+126 A	+63 A	+31.5 A
Setting accuracy[2]	±(0.75 % of rating)	±(0.75 % of rating)	±(0.75 % of rating)
Setting resolution	0.01 A	0.005 A	0.002 A
Power fluctuation[3]	±240 mA	±120 mA	±60 mA
Load variation[4]	±240 mA	±120 mA	±60 mA
Rise time (TYP)[5]	1 ms	1 ms	1 ms
Fall time (TYP)[6]	1 ms	1 ms	1 ms
Response switching	FAST, SLOW	FAST, SLOW	FAST, SLOW
Slew rate switching (TYP)[1]	120 A/ms or more[7]	60 A/ms or more[7]	30 A/ms or more[7]
	60 A/ms	30 A/ms	15 A/ms
	30 A/ms	15.0 A/ms	7.5 A/ms
	3 A/ms	1.50 A/ms	0.75 A/ms
	0.3 A/ms	0.150 A/ms	0.075 A/ms

1. During parallel operation, this will be the value multiplied by the number of units in the configuration.
2. Applies to a range of 1 % to 100 % of the rated current.
3. 180 Vac to 252 Vac for 200 Vac input, 342 Vac to 504 Vac for 400 Vac input. At the constant load.
4. This is the amount of change when the voltage is changed from the rated voltage and rated power to 1/10 of the rated voltage.
5. In the case that the CC mode response setting is set to FAST. The time required for the input current in CC mode to change from 10 % to 90 % of the rated current when the input current value is changed from 0 % to 100 % of the rated current. When the slew rate is set to MAX.
6. In the case that the CC mode response setting is set to FAST. The time required for the input current in CC mode to change from 90 % to 10 % of the rated current when the input current value is changed from 100 % to 0 % of the rated current. When the slew rate is set to MAX
7. MAX will appear on the display.

Constant resistance (CR) mode

Item	PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Conductance rating	2400.0 mS	600.000 mS	200.000 mS
Setting range	0 mS to 2520.0 mS	0 mS to 630.000 mS	0 mS to 210.000 mS
Setting accuracy[1]	±(0.5 % of setting + 0.5 % of rating)		
Setting resolution	0.20 mS	0.05 mS	0.02 mS
Response switching	FAST, SLOW	FAST, SLOW	FAST, SLOW

1. Converted value at the input current.

Constant power (CP) mode

Item	Common to all models
Maximum settable power[1]	21000 W
Setting accuracy[2]	±(0.5 % of power rating + 0.5 % of current rating × Vin)
Setting resolution	2 W

1. During parallel operation, this will be the value multiplied by the number of units in the configuration.
2. Guaranteed in the range from 5 % to 100 % of rated power. Rating indicates the rated current value.

Display Specifications

Item		PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Voltmeter	Maximum display	±600.00 V	±1200.00 V	±1800.00 V
	Display accuracy	±(0.1 % of reading + 0.2 % of rating)		
Ammeter	Maximum display	±168.000 A	±84.000 A	±42.000 A
	Display accuracy	±(0.75 % of rating)	±(0.75 % of rating)	±(0.75 % of rating)
Wattmeter	Maximum display[1]	±24.000 kW	±24.000 kW	±24.000 kW
	Display accuracy	Display the integrated value of voltmeter and ammeter		
Operation display	Load ON / OFF	The LOAD LED on the front panel lights in green		
	Operation mode	Indicate the followings on the upper left part of the display CV: CV icon CC: CC icon CR: CR icon CP: CP icon		
	Remote (LAN)	Indicate the followings on the upper left part of the display		
	Alarm	Indicate the details of activated protection function on the display		
	SCPI error	Indicate the error occurring at present on the display		
	POWER off	Indicate residual charge warning and an instruction to turn off the display, then reboot		
	Key lock	Indicate the key lock status on the upper right part of the display		
	Sensing	When sensing is enabled, indicate the sensing icon on the upper right part of the display		
	During parallel operation	Displaying the slave state on the slave unit		
	External control	When digital input/output is enabled, indicate the EXT icon on the upper right part of the display		

1. The unit will be W if it is less than 10 kW.

AC Input Specifications

200 V three-phase three-wire input

Specifications for models having an input voltage rating of 200 Vac.

Item	Common to all models
Nominal AC input rating	200 Vac to 240 Vac, 50 Hz to 60 Hz
AC Input voltage range	180 Vac to 252 Vac
AC Input frequency range	47 Hz to 63 Hz
AC Input current (MAX)[1]	80 A (When Input voltage is 180 V)
AC Input power (MAX)[1]	22 kVA
Inrush current (TYP)[2]	90 A
Power factor (TYP)[1]	0.96
Input hold time	10 ms or more

1. At the rated input power for the rated input current.
2. Maximum peak current value when the POWER switch is turned on. (Excluding the surge current to the input filter capacitor.)

400 V three-phase three-wire input

Specifications for models having an input voltage rating of 400 Vac.

Item	Common to all models
Nominal AC input rating	380 Vac to 480 Vac, 50 Hz to 60 Hz
AC Input voltage range	342 Vac to 504 Vac
AC Input frequency range	47 Hz to 63 Hz
AC Input current (MAX)[1]	40 A (When Input voltage is 342 V)
AC Input power (MAX)[1]	22 kVA
Inrush current (TYP)[2]	70 A
Power factor (TYP)[1]	0.96
Input hold time	10 ms or more

1. At the rated input power for the rated input current.
2. Maximum peak current value when the POWER switch is turned on. (Excluding the surge current to the input filter capacitor.)

Protection Specifications

LOW alarm

An alarm not requiring a reboot to be cleared.

Item		PXZ20K-500	PXZ20K-1000	PXZ20K-1500
OVP (overvoltage protection)	Protection operation	Load off, indicate “OVP” on the display. SLV OVP is displayed on the slave unit.		
	Setting range	50 V to 550 V	100 V to 1100 V	150 V to 1650 V
	Setting accuracy	±(0.1 % of setting + 0.2 % of rating)		
	Setting resolution	0.05 V	0.1 V	0.1 V
OCP (overcurrent protection)	Protection operation	Load off, indicate “OCP” on the display. SLV OCP is displayed on the slave unit.		
	Setting range	12 A to 132 A	6 A to 66 A	3 A to 33 A
	Setting accuracy	±(0.75 % of rating)	±(0.75 % of rating)	±(0.75 % of rating)
	Setting resolution	0.01 A	0.005 A	0.002 A
OPP (overpower protection)	Protection operation	Load off, indicate “OPP” on the display. SLV OPP is displayed on the slave unit.		
	Setting range	2 kW to 24 kW	2 kW to 24 kW	2 kW to 24 kW
	Setting accuracy	±(1.0 % of power rating + 1.0 % of current rating × Vin)		
	Setting resolution	2 W	2 W	2 W
UVP (undervoltage protection)	Protection operation	Load off, indicate “UVP” on the display. SLV UVP is displayed on the slave unit.		
	Setting range	0 V to 500 V	0 V to 1000 V	0 V to 1500 V
	Selectable	Enable/Disable	Enable/Disable	Enable/Disable
	Setting accuracy	±(0.1 % of setting + 0.2 % of rating)		
	Setting resolution	0.05 V	0.1 V	0.1 V
Watchdog Alarm (Communication error protection)	Protection operation	Load off, indicate “WDOG” on the display		
	Setting range	1 s to 3600 s	1 s to 3600 s	1 s to 3600 s
	Selectable	Enable/Disable	Enable/Disable	Enable/Disable
External Alarm LOW Level (external input alarm detection)	Protection operation	Load off, indicate “EXT LOW” on the display		

HIGH alarm

An alarm requiring a reboot to be cleared.

Item		Common to all models
Reverse Alarm (Reverse-connection detection protection)	Protection operation	Load off, indicate “REVE” on the display
OHP (Overheat protection)	Protection operation	Load off, indicate “OHP” on the display. SLV OHP is displayed on the slave unit.
Line OVP (Grid overvoltage protection)	Protection operation	Load off, indicate “LOVP” on the display. SLV LOVP is displayed on the slave unit.
	Setting range	Input voltage rating 200 Vac model: 200 V to 258 V Input voltage rating 400 Vac model: 380 V to 516 V
Line UVP (Grid undervoltage protection)	Protection operation	Load off, indicate “LUVP” on the display. SLV LUVP is displayed on the slave unit.
	Setting range	Input voltage rating 200 Vac model: 175 V or less. Input voltage rating 400 Vac model: 333 V or less.
Line Frequency Error (Grid abnormal frequency protection)	Protection operation	Load off, indicate “FREQ” on the display. SLV FREQ is displayed on the slave unit.
	Detection value	42 Hz/68 Hz
External Alarm HIGH Level (External input alarm detection)	Protection operation	Load off, indicate “EXT HIGH” on the display
SENS Alarm (incorrect sensing connection detection)	Protection operation	Load off, indicate “SENS” on the display
	Setting range	Enable/Disable
Parallel Communication Error (Parallel operation communication error detected)	Protection operation	Load off, indicate “PARA COM” on the display
Para Other Slave Alarm (Parallel operation slave error occurred)	Protection operation	Load off, indicate “SLV OTHR” on the display
Incorrect Slave Alarm (Not applicable device connected)	Protection operation	Load off, indicate “SLV INC” on the display
Too many connections (Too many parallel connections)	Protection operation	Load off, indicate “TOO MANY” on the display
Hardware ERR[1] (Hardware error)	Protection operation	Load off, indicate “ERRH” on the display. SLV ERRH is displayed on the slave unit.
Software ERR[2] (Software error)	Protection operation	Load off, indicate “ERRS” on the display. SLV ERRS is displayed on the slave unit.

1. It occurs when an abnormality related to the hardware is detected and the internal unit comes to an emergency stop.
2. It occurs when an abnormality related to the software is detected and the internal unit comes to an emergency stop.

External Control Specifications

External analog I/O

Item			Common to all models
Input	Input points		2 points
	Voltage (CV) control	Setting range	0 % to 100 % of the rated voltage
		Input voltage range	0 V to 5 V or 0 V to 10 V (Selectable)
		Accuracy	±(1 % of rating)
	Current (CC) control Power (CP) control Resistance (CR) control[1]	Setting range	0 % to 100 % of the rated current, rated power and rated conductance
		Input voltage range	0 V to 5 V or 0 V to 10 V (Selectable)
		Accuracy	±(1 % of rating)
Output	Output points		2 points
	Voltage monitor (VMON)	Output range	0 % to 100 % of the rated voltage
		Output voltage	0 V to 5 V or 0 V to 10 V (Selectable)
		Accuracy	±(1 % of rating)
	Current monitor (IMON)	Output range	0 % to 100 % of the rated current
		Output voltage	0 V to 5 V or 0 V to 10 V (Selectable)
		Accuracy	±(1 % of rating)

1. Select either current control or power control.

External digital input

Item		Common to all models
Fixed input points		1 point (Polarity switchable)
Selected input points		5 points (Polarity switchable)
Input form		Photocoupler isolated input (Applicable to both current sink / source output)
Fixed function	ALARM IN	HIGH alarm occurrence
Selecting function	OFF	Do not use terminals
	LOAD ON	Turn on the load
	LOAD OFF	Turn off the load
	LOAD CTRL	Turn on of off the load
	L ALARM IN	LOW alarm occurrence
	ALARM CLR	LOW alarm clearance
	SEQ RUN	Sequence start/end
	SEQ PAUSE	Sequence pause/resume
	SEQ TRIG IN	Input the trigger for sequence
	ACQUIRE TRIG	Input the measurement trigger
	MEM1 RECALL	Recall preset memory 1
	MEM2 RECALL	Recall preset memory 2
	INTEG CTRL	Starting/stopping integration measurement
	INTEG RESET	Resetting integration measurement data
External circuit power supply range		12 V to 24 Vdc (±10 %)

External digital output

Item		Common to all models
Output points		6 points (Polarity switchable)
Output form		Semiconductor relay output
Selecting function	OFF	Do not use terminals
	LOAD ON	Outputs a signal when load is turned on
	POWER ON	Signal is output when power supply is on and load is possible
	H ALARM OUT	Output a signal when a HIGH alarm occurs
	L ALARM OUT	Output a signal when a LOW alarm occurs
	CC STATUS	Output a signal when operating in the CC mode
	CV STATUS	Output a signal when operating in the CV mode
	SEQ TRIG OUT	Output the trigger for sequence
	SEQ STATUS	Signal is output while the sequence is running
	EXT DIN BUSY	Output a signal when the digital input is in BUSY status
	MEM1 ACT TIME	Signal is output when the setting is completed for preset memory 1
	MEM2 ACT TIME	Signal is output when the setting is completed for preset memory 2
	RELAY DRIVE	Links with load on/off and outputs a signal with a time difference of approx. 100 ms. You can set this parameter to only Ch.6.

Communication Specifications

Item		Common to all models
Common specifications	Software protocol	IEEE std. 488.2-1992
	Command language	Complies with SCPI Specification 1999.0
RS232C	Hardware	D-SUB 9-pin connector Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps Data length: 8 bits, Stop bits: 1 bit, Parity bit: None Flow control: No, CTS-RTS
	Program message terminator	LF during reception, LF during transmission
USB (device)	Hardware	Standard type B socket Complies with the USB 2.0 specifications; data rate: 480 Mbps (high speed)
	Program message terminator	LF or EOM during reception, LF + EOM during transmission
	Device class	Complies with the USBTMC-USB488 device class specifications
USB (host)	Hardware	Standard type A socket Complies with the USB 2.0 specifications; data rate: 480 Mbps (high speed)
LAN	Hardware	IEEE 802.3 100BASE-TX or 10BASE-T Ethernet
	Communication protocol	SCPI-RAW, SCPI-Telnet, HiSLIP, VXI-11
	Program message terminator	HiSLIP: LF or END during reception, LF + END during transmission. SCPI-RAW: LF during reception, LF during transmission
	Compliant standards	LXI Version 1.5 Specifications 2016

Others

Item			Common to all models
Synchronization function (clock synchronization)	Overview		SYNC icon is displayed on the display when synchronization is established with the internal clock after connecting with other PXZ series using the EXT SYNC connector.
	Sequence synchronization		Synchronization of the program start and step start.
	Measurement synchronization		Synchronization of the measurement start
	Load synchronization		Synchronization of load ON/OFF
Sequence function	Operation mode		CV, CC, CR and CP modes
	Maximum number of programs		30
	Maximum number of steps		10000
	Step execution time		1 ms to 3600000 s
	Loop count		1 to 100000, or infinite
Sine function	Operation mode		CV/CC mode
	Frequency setting range		1 Hz to 1000 Hz
	Frequency precision setting	1 Hz to 10 Hz	0.2 Hz
		12 Hz to 100 Hz	2 Hz
		120 Hz to 1000 Hz	20 Hz
	CV	Maximum setting	Setting range up to 105 % of rated voltage
		Maximum offset setting	Setting range up to 105 % of rated voltage
	CC	Maximum setting	Setting range up to 105 % of rated current
		Maximum offset setting	Setting range up to 105 % of rated current
Pulse function	Operation mode		CV/CC/CR mode
	Frequency setting range		1 Hz to 1000 Hz
	Frequency precision setting	1 Hz to 10 Hz	0.01 Hz
		12 Hz to 100 Hz	0.1 Hz
		120 Hz to 1000 Hz	1 Hz
	CV	High level	Setting range up to 105 % of rated voltage
		Low level	Setting range up to 105 % of rated voltage
	CC	High level	Setting range up to 105 % of rated current
		Low level	Setting range up to 105 % of rated current
	CR	High level	Setting range up to 105 % of rated conductance
		Low level	Setting range up to 105 % of rated conductance
	Duty cycle		2.5 % to 97.5 %
Over current protection (OCP) delay function	Setting range		1 ms to 2000 ms
	Setting resolution		1 ms
Multichannel (VMCB) function	Connection between the master unit and a PC		LAN, USB, RS232C
	Connection with slave units		LAN
Measurement trigger	Measurement start condition (trigger source)		Conditions for starting measurement can be selected (when inputting from display, when inputting commands by remote control, when inputting signals by external control, when operating in synchronization, and when load off)
	Number of measurements		1 to 65536
	Measurement delay time	Setting range	0 s to 100 s
		Setting resolution	0.1 ms
	Measurement interval	Setting range	0.1 ms to 3600 s
		Setting resolution	0.1 ms
	Measurement time	Setting range	0.1 ms to 1 s
		Setting resolution	0.1 ms
I-V characteristic function	Operation mode		CV/CC mode
	Number of setup items		3 to 100 items (interpolated between points with straight lines)

Item		Common to all models
Preset value Memory	Number of memory entries	20
	Saved setting	Values in CV, CC, CP, and CR modes, and protection function values
Setup Memory	Number of memory entries	21
	Saved setting	Refer to Setup Memory *(p.101)*
Key Lock	Level 1	Load on/off and preset memory recall are available
	Level 2	Load on/off are available
	Level 3	Load off is available
Number of units in parallel operation		Up to 10 units
Pre-charge function[1]	Maximum settable voltage	105 % of voltage ratings
	Voltage setting accuracy	±(0.2 % of setting + 0.1 % of rating)
	Current setting accuracy[2]	±(1.0 % of rating)

1. Release the interlock.
2. Fixed set value of 5 % of rated current.

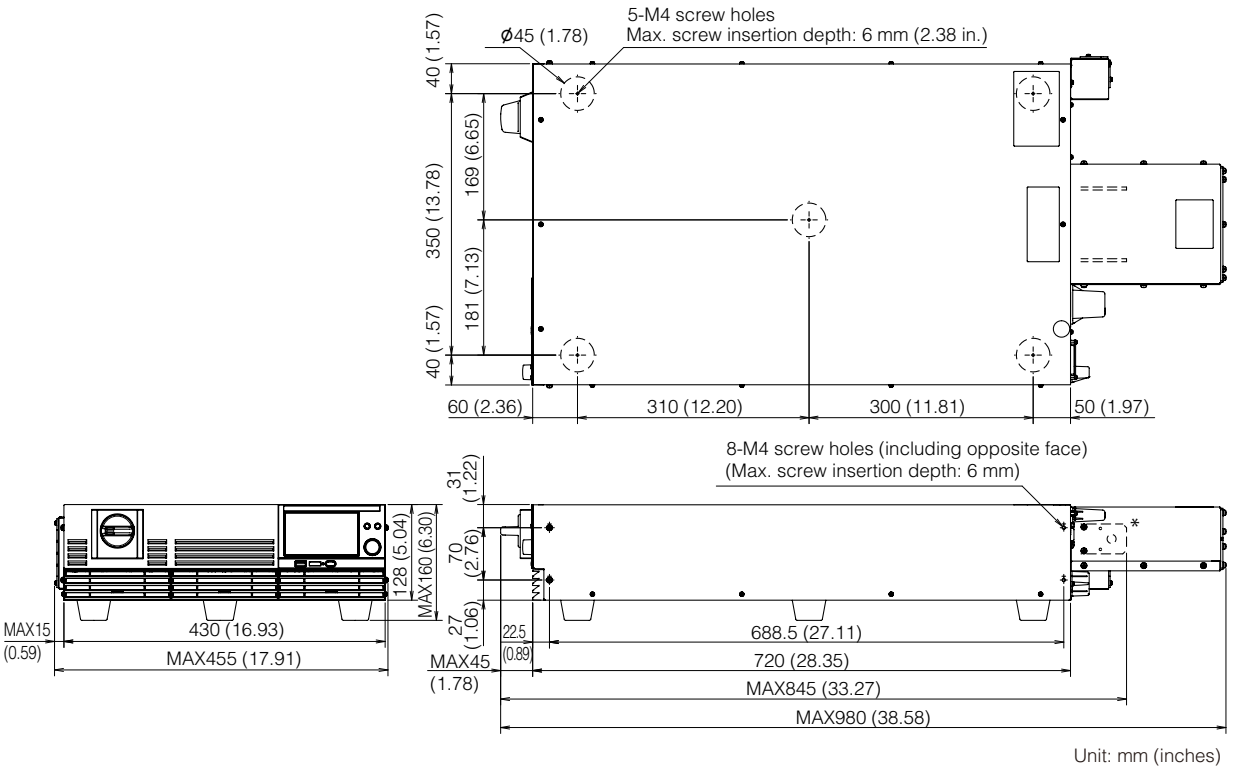
General Specifications

Item		PXZ20K-500	PXZ20K-1000	PXZ20K-1500
Weight		Approx. 38 kg (83.78 lbs)	Approx. 37 kg (81.57 lbs)	Approx. 37 kg (81.57 lbs)
Dimensions		Refer to Outline Drawing *(p.192)*		
Environmental conditions	Operating environment	Indoor use, Overvoltage category II		
	Operating temperature	0 °C to +50 °C (32 °F to +122 °F)		
	Operating humidity	20 % rh to 85 % rh (no condensation)		
	Storage temperature	−25 °C to +60 °C (−13 °F to +140 °F)		
	Storage humidity	90 % rh or less (no condensation)		
	Altitude	Up to 2000 m		
Cooling system		Forced air cooling using fan		
Accessories		Refer to Accessories *(p.8)*		
Withstand voltage	Between primary and FG	2200 Vac for 1 minute		
	Between primary and secondary	2200 Vac for 1 minute		
	Between secondary and FG	1800 Vdc for 1 minute	1800 Vdc for 1 minute	3000 Vdc for 1 minute
Insulation resistance	Between primary and FG	30 MΩ, 500 Vdc		
	Between primary and secondary	30 MΩ, 1000 Vdc		
Isolation voltage		±1000 V	±1000 V	+2000 V/−1000 V
Electromagnetic compatibility (EMC)[1] [2]		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A[3])		
Safety[1]		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU[2] EN 61010-1 (Class I[4], Overvoltage category II, Pollution Degree 2[5])		

1. Does not apply to specially ordered or modified products.
2. Only for models with CE marking / UKCA marking on their body.
3. This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
4. This is a Class I instrument. Be sure to ground this product's protective conductor terminal. The safety of this product is guaranteed only when the product is properly grounded.
5. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielectric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.

Outline Drawing

PXZ20K-500, PXZ20K-1000, PXZ20K-1500



*. The number of bus bars varies depending on the model.

Appendix

Settings at Factory Default and at Reset

Indicate the settings at factory default and reset. All items that have the ✓ mark in the “Reset” column are returned to their factory default values upon reset.

Item		Display	Factory default	Resetting
Voltage		–	0 V	✓
Current		–	0 A	✓
Power		–	Maximum value (105 % of rating)	✓
Response (CV)		Response CV	FAST	✓
Response (CC)		Response CC	FAST	✓
Response (CR)		Response CR	FAST	✓
Slew rate (CV)		Slew Rate CV	PXZ20K-500: 125 V/ms PXZ20K-1000: 250 V/ms PXZ20K-1500: 375 V/ms	✓
Slew rate (CC)		Slew Rate CC	PXZ20K-500: 60 A/ms PXZ20K-1000: 30 A/ms PXZ20K-1500: 15 A/ms	✓
Priority operation mode		Priority when load is ON	CV	✓
Pre-charge function		Pre-charge	Disabled	✓
Pulse function	Maximum value	High	CV: 0 V CC: 0 A	✓
	Minimum value	Low	CV: 0 V CC: 0 A	✓
	Duty cycle	Duty	2.5	✓
	Frequency	Frequency	1 Hz	✓
Sine function	Amplitude	Amplitude	CV: 0 V CC: 0 A	✓
	Correction value of waveform	Offset	CV: 0 V CC: 0 A	✓
	Frequency	Frequency	1 Hz	✓
I-V characteris-tics function	number of points	Count	3	✓
	Set value of the 1st item	–	CV: Minimum current value, 0 V CC: Minimum voltage value, 0 A	✓
	Set value of the 2nd item	–	0 A, 0 V	✓
	Set value of the 3rd item	–	CV: Maximum current value, 0 V CC: Maximum voltage value, 0 A	✓
Input mode		Input Mode	DC in all operation modes	✓

Item			Display	Factory default	Resetting
Protection function	Overvoltage protection		OVP	Maximum value (110 % of rating)	✓
	Undervoltage protection		UVP	Disabled, 0 V	✓
	Overcurrent protection	Current	OCP	Maximum value (110 % of rating)	✓
		Delay time	Delay	1 ms	✓
	Overpower protection		OPP	Maximum value (120 % of rating)	✓
	Grid overvoltage protection		Line OVP	Maximum value (107.5 % of the nominal maximum input rating)	✓
	Communication error protection		WDog	Disabled, 60 s	–
	Sensing protection		SENS Error Enable	Enable	–
Measurement trigger	Trigger source		Source	IMM	✓
	Number of times of recording		Count	1	✓
	Delay time		Delay	0 s	✓
	Recording time		Average	100 ms	✓
	Recording interval		Timer	100 ms	✓
	Enable/Disable of recording interval		Enable	Enable	✓
Integration	Period		Gate	Load ON	✓
	Reset method		Reset	Auto	✓
Remote sensing			RMT Sensing	Disable	–
Preset value Memory	Confirmation at the time of recalling		Preset Recall Conform	Enabled	–
	Memory content		Preset. 1, Preset. 2, Preset. 3	The saved set values *(p.98)* are reset to the factory defaults.	–
Setup memory			Resume, 1.info to 20.info	The saved set values *(p.101)* are reset to the factory defaults.	–
Sequence			Select edit Program	No program	–
Settings at startup			Power ON Setting	Resume	–
Load state at startup			Power ON Load	SAFE	–
External control	Output range of the voltage control signal		V MON Range	0-10 V	–
	Output range of the current control signal		I MON Range	0-10 V	–
	Input range of the voltage control signal		CV Range	0-10 V	–
	Input range of the current control signal		CC/CP Range	0-10 V	–
	Enable/disable of the digital input/output		–	Disable	–
	Filter for digital input		Filter	FAST	–
	Polarity for digital input		Polarity	Positive	–
	Function for digital input		DIGI IN Channel	All OFF	–
	Polarity for digital output		Polarity	Positive	–
	Function for digital output		DIGI OUT Channel	All OFF	–

Item		Display	Factory default	Resetting
System setting	LAN communication setting	IP Address assignment method	AUTO	✓
		Desired Hostname	Factory default is model name and serial number.	–
		Desired Description	Factory default setting: KIKUSUI <name> Regenera-tive Electronic Load -<serial> <name>: model name, <serial>: serial number	–
		Dynamic DNS	Enable	✓
		mDNS	Enable	✓
	RS232C communication setting	Data Bits	8 bit (fixed)	–
		Parity	None (fixed)	–
		Stop Bits	1 bit (fixed)	–
		Bitrate	19200	–
		Flow Control	None	–
	Key lock	Lock Key Level	Disabled, Level 3	–
	Multichannel	VMCB	Disable	–
	Buzzer sound	Buzzer	Protection, SCPI, and KEY are all enabled	–
	Screen brightness	Brightness	Maximum value	–
	Setting the Date/Time	NTP Server Hostname	ntp.nict.jp	–
		Auto Clock Adjustment	Disable	–
		Time Zone	UTC	–
		Manual Time	Not initialized	–

Selecting the Load Cables

⚠WARNING

Risk of fire.

- **Use load cables having strong flame-resistant insulation with sufficient margin for the current.**

Risk of electric shock.

- **For load cables, use cables whose rated voltage is higher than the isolation voltage of PXZ series.**

Current capacity of load cables

A cable's temperature is determined by the resistive loss based on the current, the ambient temperature, and the cable's external thermal resistance. The following table shows the current capacity of heat-resistant vinyl cables that have a maximum allowable temperature of 60 °C when one of the cables is separated and stretched out horizontally in air in an ambient temperature of 30 °C. The current must be reduced under certain conditions, such as when vinyl cables that have a low heat resistance are used, when the ambient temperature is 30 °C or greater, or when cables are bundled together and little heat is radiated.

Nominal cross-sectional area [mm^2]	AWG	(Reference cross-sectional area; mm^2)	Allowable current[1] [A] (Ta = 30 °C)	Kikusui-recommended current [A]
3.5	12	(3.31)	37	–
5.5	10	(5.26)	49	20
8	8	(8.37)	61	30
14	6	(13.3)	88	50
22	4	(21.15)	115	80
30	2	(33.62)	139	–
38	1	(42.41)	162	100
50	1/0	(53.49)	190	–

1. Excerpt from Japanese laws related to electrical equipment.

Taking measures against noise

When connecting cables that have the same heat resistance, separating the cables as much as possible to increase heat radiation enables a greater amount of current to flow. However, wiring the positive (+) and negative (−) wires of the load cable side by side or bundling them together is more effective against unwanted noise. The Kikusui-recommended currents shown in the above table are allowable currents that have been reduced in consideration of the potential bundling of load cables. Use these values as a guideline when connecting cables.

Limitations of the remote sensing

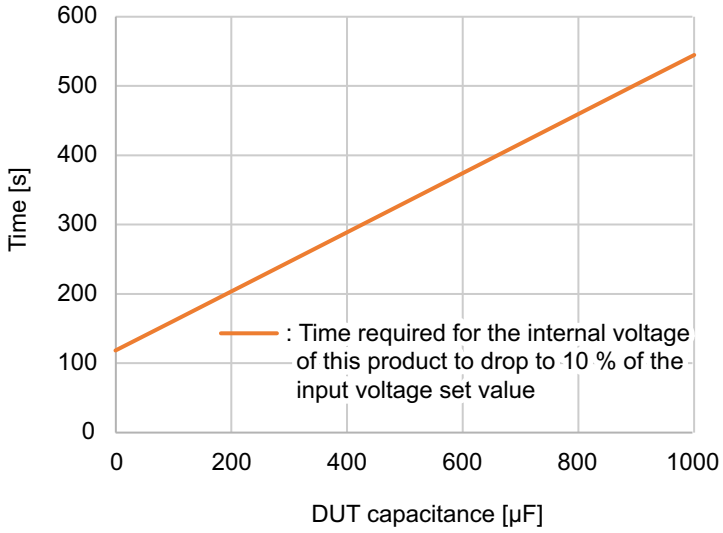
All wires have resistance. As the cable becomes longer or the current becomes larger, the voltage drop in the cable becomes greater. This results in a smaller voltage applied to the DC INPUT terminal. The sensing function of this product compensates for the voltage drop up to 10 % *(p.68)* If the voltage drop exceeds this level, use cables that have a greater cross-sectional area.

Guide for Required Time for Residual Voltage Discharge

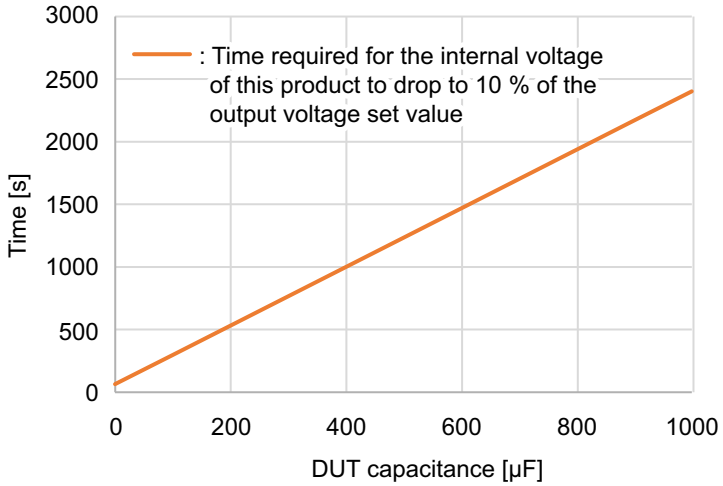
If a HIGH alarm is generated and the POWER switch of the PXZ Series is turned off, a charge may remain in the DC INPUT terminal. Do not touch the DC INPUT terminal until the residual voltage is discharged.

The time required for discharge depends on the capacitance of the DUT. The figure below shows the time required for the PXZ series input voltage to drop to 10 % of the input voltage set value when the power switch of the PXZ series is off or loaded off.

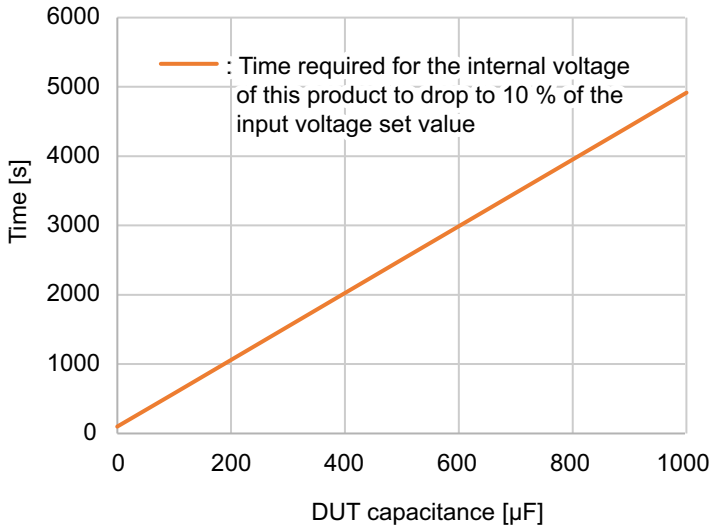
PXZ20K-500



PXZ20K-1000



PXZ20K-1500


6000
5000
4000
3000
2000
1000
0
Time [s]
: Time required for the internal voltage of this product to drop to 10 % of the input voltage set value
0
200
400
600
800
1000
DUT capacitance [µF]

Overshoot During Pre-charge

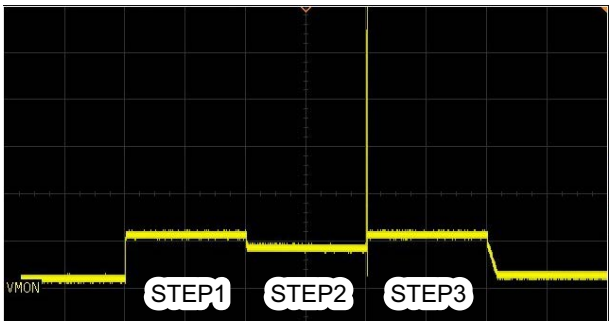
If the pre-charge function (Pre-charge) *(p.122)* transitions from a disabled step to an enabled step while a sequence is running, the voltage may overshoot.

To prevent overshooting, create a step with load turned off and pre-charge disabled before the second and subsequent steps in which the pre-charge function is set to enabled.

Example of overshooting

This is an example of overshoot at the start of step 3.

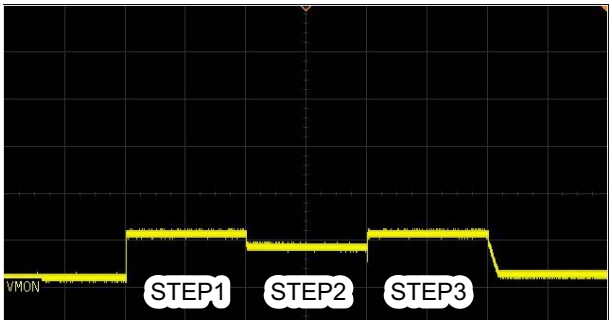
Step number	Load Settings	CV set value	Pre-charge settings
1	ON	10 V	Enable
2	ON	10 V	Disable
3	ON	10 V	Enable



Countermeasure example

Turn off the load settings in step 2. The pre-charge settings are left unchanged as disabled.

Step number	Load settings	CV set value	Pre-charge settings
1	ON	10 V	Enable
2	***OFF***	10 V	***Disable***
3	ON	10 V	Enable



Setting Range and Resolution During Parallel Operation

Setting range during parallel operation

CV setting range

As standalone operation, the minimum value is 0 V, and the maximum value is the maximum settable voltage.

CC setting range

The minimum value is 0 A. The maximum value is the maximum settable current in standalone operation × the number of units including the master unit.

CR setting range

Number of slaves	PXZ20K-500 (mS)	PXZ20K-1000 (mS)	PXZ20K-1500 (mS)
1	0 to 5040.0	0 to 1260.0	0 to 420.00
2	0 to 7560.0	0 to 1890.0	0 to 630.00
3	0 to 10080	0 to 2520.0	0 to 840.00
4	0 to 12600	0 to 3150.0	0 to 1050.0
5	0 to 15120	0 to 3780.0	0 to 1260.0
6	0 to 17640	0 to 4410.0	0 to 1470.0
7	0 to 20160	0 to 5040.0	0 to 1680.0
8	0 to 22680	0 to 5670.0	0 to 1890.0
9	0 to 25200	0 to 6300.0	0 to 2100.0

CP setting range

The minimum value is 0 W. The maximum value is the maximum settable power in standalone operation × the number of units including the master unit.

Voltage slew rate switching

Five-step switching is available as standalone operation. Each voltage slew rate value is the same as in standalone operation.

Current slew rate switching

Five-step switching is available as standalone operation. Each current slew rate value is the slew rate value in standalone operation × the number of units including the master unit.

Setting resolution during parallel operation

Input current setting resolution

Number of slaves	PXZ20K-500 (A)	PXZ20K-1000 (A)	PXZ20K-1500 (A)
1	0.02	0.01	0.005
2	0.05	0.02	0.01
3	0.05	0.02	0.01
4	0.05	0.02	0.01
5	0.05	0.05	0.02
6	0.1	0.05	0.02
7	0.1	0.05	0.02
8	0.1	0.05	0.02
9	0.1	0.05	0.02

Conductance setting resolution

Number of slaves	PXZ20K-500 (mS)	PXZ20K-1000 (mS)	PXZ20K-1500 (mS)
1	0.5	0.1	0.05
2	0.5	0.2	0.05
3	1	0.2	0.1
4	1	0.2	0.1
5	1	0.5	0.1
6	2	0.5	0.1
7	2	0.5	0.2
8	2	0.5	0.2
9	2	0.5	0.2

Input power setting resolution

Number of slaves	Common to all models (W)
1	5
2	5
3	10
4	10
5	10
6	10
7	20
8	20
9	20

Options

This product has the following options.
For information about options, contact your Kikusui agent or distributor.

Load cable

Cable type	Length	Maximum allowable current	Terminal size	Applicable models
DC80-2P3M-M10M10	3 m	200 A	M10/M10	PXZ20K-500
HV22-2P3M-M12M8	3 m	80 A	M12/M8	PXZ20K-1000, PXZ20K-1500

Three-phase input power cord

These are power cords for three-phase input. The switchboard ends of the power cords have not been prepared for connection.

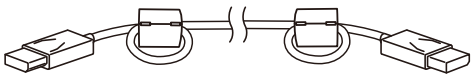
Model: AC22-4P3M-M6C-4S
Length: 3 m
Nominal cross-sectional area: 22 mm^2 (AWG4)
Terminal size: M6

Parallel operation signal cable kit

This kit contains a signal cable for performing parallel operation on the PXZ series.

Model: PC01-PXB

Cable length: 1.5 m



Rack mount bracket

These are rack mounting options.

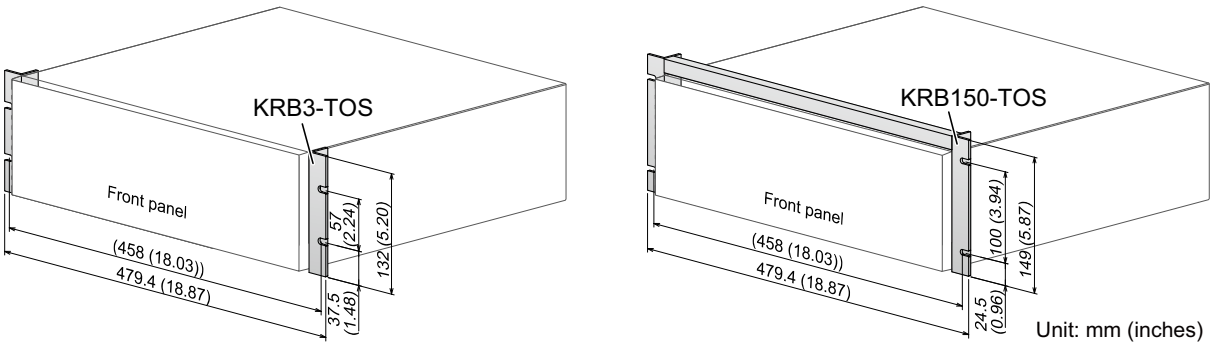
- KRB3-TOS: EIA inch rack standard
- KRB150-TOS: JIS millimeter rack standard

Remove the feet attached to the bottom face of the body when installing in a rack.

NOTE

If you install PXZ series into the rack, allow adequate clearances between other products so that it can operate within the operating temperature range *(p.191)*.

Outline drawing



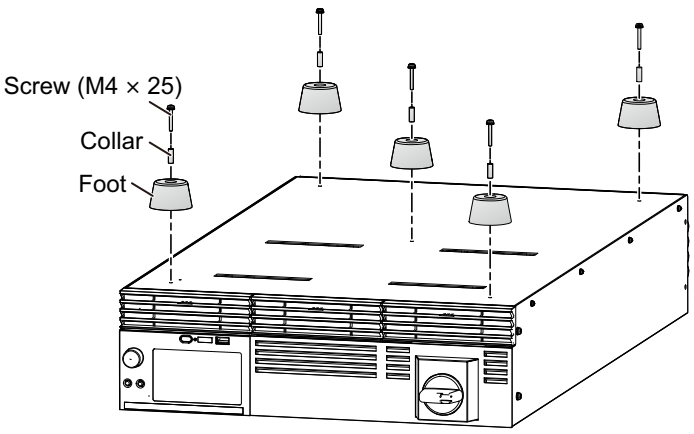
Unit: mm (inches)

Removing the feet

Remove the feet to install a rack mount bracket. For information on rack mounting, see the operation manual of the rack mount bracket.

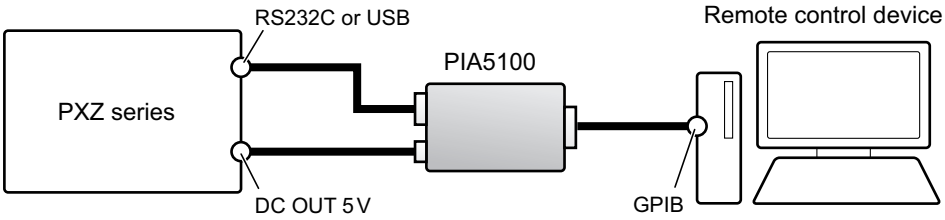
NOTE

We recommend that you keep all pieces that you remove from the product. You will need these pieces if you remove the product from the rack.



GPIB converter (PIA5100)

This converter converts RS232C or USB of the product to GPIB, enabling connection of a remote controller using GPIB. Perform the connection as shown below.



The GPIB communication specifications are as follows.

Item	Specifications
Hardware	Complies with IEEE Std 488.1-1987 SH1, AH1, T6, L4, SR1, PP0, DC1, DT1, C0, E1
Message terminator	LF or EOI during reception, LF + EOI during transmission
Primary address	0 to 30

Some restrictions apply to the GPIB functions that can be used with the PIA5100. When the PXZ series and the PIA5100 are connected via RS232C, they are compatible with the KISTD SAFU protocol, which can remove restrictions on GPIB functions.

For details, see the GPIB converter (PIA5100) operation manual.

Troubleshooting

This section introduces troubleshooting measures. Typical symptoms are listed. Check whether any of the items listed below apply to your case. In some cases, the problem can be solved quite easily.

If none of the items apply to your case, we recommend that you initialize the product to its factory default settings *(p.170)*. If following the remedy does not solve your problem, contact your Kikusui agent or distributor.

■Nothing appears on the display when the POWER switch is turned on.

Check	Possible cause	Remedy
Is the rated voltage being applied to the input power supply (AC)?	The power cord is broken. Bad connection at the rear-panel AC INPUT terminal.	Check that the power cord is not broken and that the connection at the AC INPUT terminal is secure.

■Keys do not work.

Check	Possible cause	Remedy
Are the keys locked? ( /  /  are shown on the display.)	The keys are locked *(p.162)*.	Press and hold the key lock icon ( /  / ) to release the key lock.
Are the keys locked? ( is shown on the display.)	Key lock is active on a slave unit for parallel operation.	Press and hold the key lock icon () to release the key lock.
Are the keys locked by remote control? ( /  /  are shown on the display.)	 It is set to REMote by the RLST command under remote control.	Press and hold the key lock icon () to release the key lock.[1]
	 It is set to RWLock by the RLST command under remote control.	• Turn off the power to the PXZ series unit and turn it on again to release the RWLock. • Set to LOCal by the RLST command under remote control to release the lock. For details, see the Communication Interface Manual.
	 It is set to LWLock. The possible causes are as follows. • The USB cable connection signal stopped during the RWLock status when using the USB interface. • Sent a Go To Local command by VISA during the RWLock status. For details, see the Communication Interface Manual.	• Turn off the power to the PXZ series unit and turn it on again to release the LWLock. • Send an arbitrary command by remote control to return to RWLock.

1. If Web browser interface display and command transmission through a USB connection are performed simultaneously, pressing and holding the icon does not release the key lock *(p.163)*.

Set values cannot be changed.

Check	Possible cause	Remedy
Is “EXT”, “PULSE”, “SINE” or “I-V” displayed in the input set value column on the Home screen?	Cannot be set depending on the input mode setting.	Check “Input Mode Setting” *(p.43)* and set a control method other than “EXT”, “PULSE”, “SINE” or “I-V”.
Is “Pre-charge” displayed in the input set value column on the Home screen?	Cannot be set because the pre-charge function is enabled.	Disable pre-charge *(p.85)*.
Does it return to the original setting after entering a set value?	Preset memory is being recalled by an external control.	If a preset memory is recalled via the general-purpose digital input under an external control, turn off the signal *(p.143)*. When the signal is turned on, the set value is constantly recalled. So, even if the setting is changed, it will be overwritten by the contents of the preset memory.

Input current is unstable or oscillates.

Check	Possible cause	Remedy
Is the rated voltage being applied to the input power supply (AC)?	Supply voltage is dropping.	Use the product in the input supply voltage range.
Is an alarm occurring?	There is an internal or external error.	Check the type of alarm, and eliminate the root cause of the alarm *(p.55)*.
Is there a large loop in the load cable?	The wire inductance has increased.	Twist the wires.
Is the response setting suitable?	The response is too fast or too slow.	Change the response setting *(p.71)*.

Voltage overshoots during pre-charge.

Check	Possible cause	Remedy
Is pre-charge enabled in the sequence step settings?	When the pre-charge function transitions from a disabled step to an enabled step while a sequence is running, the voltage may overshoot.	Before the second and subsequent steps in which the pre-charge function is set to enable, create a step with load set to OFF and Pre-charge set to disabled *(p.199)*

Alarms cannot be cleared.

Check	Possible cause	Remedy
Has overheat detection (OHP) been activated?	The fan has stopped.	Stop use immediately, and contact your Kikusui agent or distributor.
	Vent or inlet holes are blocked.	Move the product so that there is at least 50 cm of space between the vents and the surrounding walls. Do not place objects within 50 cm of the vents.
	The internal temperature has not dropped.	Turn off the load and leave it for 10 minutes with power on.
Is a hardware error (ERRH) alarm generated?	A problem occurred in PXZ series hardware.	If the alarm continues after turning off and then on the power of PXZ series, contact your Kikusui agent or distributor.
Is a software error (ERRS) alarm generated?	A problem occurred in PXZ series software.	

The load cannot be turned on.

Check	Possible cause	Remedy
Are you using an external control signal to turn the load off?	The LOAD key is disabled when the load is turned off by an external control.	Turn off the LOAD OFF signal of the EXT CONT connector to enable the LOAD key *(p.143)*.

The load cannot be turned off.

Check	Possible cause	Remedy
Are the keys locked by remote control? (Remote / RWLS / LWLS are shown on the display.)	It is set to REMote by the RLST command under remote control.	Press and hold the key lock icon (Remote) to release the key lock.[1]
	It is set to RWLock by the RLST command under remote control.	• Turn off the power to the PXZ series unit and turn it on again to release the RWLock. • Set to LOCal by the RLST command under remote control to release the lock. For details, see the Communication Interface Manual.
	It is set to LWLock. The possible causes are as follows. The USB cable connection signal stopped during the RWLock status when using the USB interface. Sent a Go To Local command by VISA during the RWLock status. For details, see the Communication Interface Manual.	• Turn off the power to the PXZ series unit and turn it on again to release the LWLock. • Send an arbitrary command by remote control to return to RWLock.

1. If Web browser interface display and command transmission through a USB connection are performed simultaneously, pressing and holding the icon does not release the key lock *(p.163)*.

USB memory device is not recognized

Check	Possible cause	Remedy
What is the capacity and file system of the USB memory device?	A USB memory device that is not supported by the PXZ series is being used.	Use the following USB memory devices. • Capacity: 16 GB or less • File System: FAT32

The start of PXZ series is slow

Check	Possible cause	Remedy
How many numbers of steps of total program are there in total?	When the total number of steps of all programs becomes large, it will take longer time to turn the power supply of the PXZ series on (as a reference, it takes about 15 minutes for 10,000 steps).	Delete unnecessary steps.

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Warranty Period

Before delivery, our products have undergone strict testing and inspections and have been found to comply with the specifications. We offer different warranty periods for different product models. If the product should become defective within the specific warranty period applied to the product model after the date of purchase, we will repair the product or replace it with a new one for free. In a case in which the customer concluded a separate agreement with us regarding the warranty period, the conditions of the warranty period are applied based on such agreement.

Scope of Warranty

If the product should become defective within the warranty period, we will repair the product or replace it with a new one. However, the warranty does not cover:

- Failure or damage caused by use that is not in accordance with the Operation Manual, misuse, or neglect.
- Failure or damage during transportation after delivery.
- Failure or damage caused by improper modification, adjustment, or repair.
- Failure or damage caused by an Act of God, fire, or other events beyond our control.
- Failure or damage caused by use in a corrosive atmosphere, a dusty environment, or an environment where salt damage occurs or contamination by liquid or foreign matters is likely to occur.
- Failure or damage due to causes that are not attributable to us.

Disclaimer

Regardless of the warranty period, in no event shall we be liable for loss of opportunity or profit caused by the failure of our product, or initial or secondary damages, accident compensation, damages to products other than our products, or compensation for other operations caused by unavoidable circumstances that we may or may not have foreseen.

Every effort has been made to ensure the accuracy of this manual. However, if you have any questions or find any errors or omissions, please contact your Kikusui agent or distributor.

After you have finished reading this manual, store it so that you can use it for reference at any time.

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