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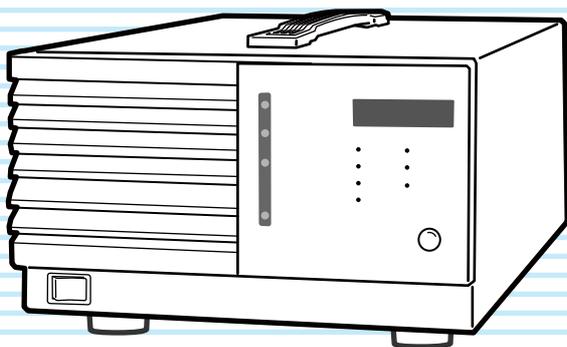
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Operation Manual

Charge/Discharge System

Charge/discharge System Controller
PFX2500 Series

PFX2512



Description

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Volt/Thermometer Unit
OP02-PFX

6

8Slot Unit
SL01-PFX

7

Voltmeter Unit
OP03-PFX

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Characteristics of Digital
CC/CV Control

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Power Supply

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Troubleshooting

Thank you for purchasing the PFX2512 Charge/Discharge System Controller.

Using a dedicated software application on a PC, you can set the conditions for battery charge/discharge characteristic tests, execute the tests, and analyze the test results.

The software application that you use to control the PFX2512 Charge/Discharge System Controller is BPChecker3000.

This application is sold separately.

About This Manual

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

Read this manual thoroughly to use the functions of the product effectively. You can also review this manual when you are confused about an operation or when a problem occurs.

After reading, always keep the manual nearby so that you may refer to it as needed.

If you find any misplaced or missing pages in operation manual, it will be replaced.

If the operation manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact Kikusui distributor/agent, and provide the "Kikusui Part No." given on the cover page.

Operation manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact Kikusui distributor/agent.

Product firmware versions

This manual applies to products with firmware versions 2.0X.

When contacting us about the product, please provide us with:

- The model (marked in the top section of the front panel)

- Firmware version (See 64 page)

- The serial number (marked in the bottom section of the rear panel)

How to read this manual

This manual is designed to be read from beginning to end. We recommend that you read it thoroughly before using this product for the first time.

Related manuals

For details on the BPChecker3000, see the corresponding operation manual.

For details on the PWR-01 series, PWR series Regulated DC Power supplies, PAS series Regulated DC Power supplies, and PLZ-5W series, PLZ-4W series Electronic Loads, and PLZ2405WB, PLZ2004WB Electronic Load Boosters, see the corresponding operation manual.

Intended readers of this manual

This manual is intended for users of the product or persons teaching other users on how to operate the product.

The manual assumes that the reader has knowledge about electrical safety testing.

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The specifications of this product and the contents of operation manual are subject to change without prior notice.

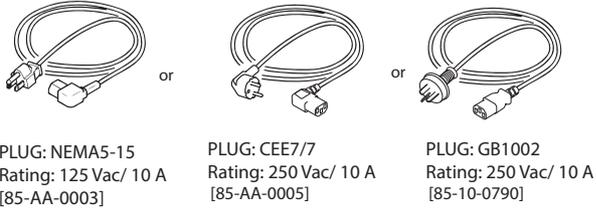
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Checking the Package Contents

Check that all accessories are included and that the main unit and accessories have not been damaged during transportation.

If the main unit or any of the accessories are damaged or missing, contact your Kikusui agent or distributor.

We recommend that you save all packing materials, in case the PFX2512 needs to be transported at a later date.



PLUG: NEMA5-15
Rating: 125 Vac/ 10 A
[85-AA-0003]

PLUG: CEE7/7
Rating: 250 Vac/ 10 A
[85-AA-0005]

PLUG: GB1002
Rating: 250 Vac/ 10 A
[85-10-0790]

- Power cord (1 pc.)
Length: Approx. 2.5 m

The power cord that is provided varies depending on the destination for the product at the factory-shipment.



- Cable with solderless terminal (4 pcs.)
Red (2 pc.) : 91-80-7557
White (2 pc.) : 91-80-7522



- Sensing connector (1 pc.)
[84-61-7705]



- Thermistor (1 pc.)
[38-00-0160]



- 26-core flat cable (1 pc.)
(I/F cable for PWR400L/
PWR800L/ PWR1600L/ PAS
DC Power Supplies)
[83-22-6050]



- 20-core flat cable (1 pc.)
(I/F cable for PLZ-4W Electronic
Load) [91-80-6136]



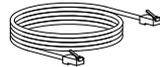
- Ferrite core for
26-core flat cable (1 pc.)
[96-01-0260]



- Ferrite core for
20-core flat cable (1 pc.)
[96-01-0250]



- Lock lever (2 pcs.)
[83-06-5060]



- LAN cable (1 pc.)
Straight type



- Operation manual
(This manual, 1 copy)

Cables required for system configuration

To configure a system, the following cables are necessary in addition to the included cables.

These cables are available as options (sold separately).

- **DUT cable (+--)** (for connecting the DUT): 80 mm²
- **Sensing cable (voltage / temperature sensing cable)**
- **I/F cable for PWR-01 DC power supply**
- **I/F cable for PLZ-5W Electronic load**

Make the cables as short as possible by considering the loss in the cables ([See](#) p. 21) according to your system configuration.

If cables are to be connected in a system configuration shown in "Connecting the devices" on page 32, you can use the optional cable set.

Use it as a guide in selecting the cables.

For information about options, contact your Kikusui agent or distributor.

- **Cable set** ([See](#) p. 123)

Model	Description	Length	Quantity
TL08-PFX	DUT cable (For connecting the DUT: +--) [Solderless terminal: M6-M6]	Approx. 5 m	1 pc.
	Sensing cable (voltage / temperature sensing cable: already assembled)		

- **I/F cable for PWR-01 DC power supply** ([See](#) p. 124)

Model	Description	Length	Quantity
SC07-PFX	I/F cable For between a PFX2512 and PWR-01	Approx. 1 m	1 pc.

- **I/F cable for PLZ-5W Electronic load** ([See](#) p. 124)

Model	Description	Length	Quantity
SC05-PFX	I/F cable For between a PFX2512 and PLZ-5W	Approx. 1 m	1 pc.
	M8 screw set		2 sets

• **Parallel cable for electronic loads** ( PLZ-5W, PLZ-4W)

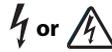
Model	Description	Length	Quantity
PC01-PLZ-4W	20-core flat cable For between PLZ-4Ws and between boosters	Approx. 30 cm	1 pc.
PC02-PLZ-4W	20-core flat cable For between a PLZ-4W and booster	Approx. 45 cm	1 pc.
PC01-PLZ-5W 1	Parallel operation signal cable kit For between PLZ-5Ws	Approx. 30 cm	1 pc.

1. One cable is included for the PLZ2405WB (booster).



Safety Symbols

For the safe use and safe maintenance of this product, the following symbols are used throughout operation manual and on the product. Note the meaning of each of the symbols to ensure safe use of the product. (Not all symbols may be used.)



Indicates that a high voltage (over 1 000 V) is used here. Touching the part causes a possibly fatal electric shock. If physical contact is required by your work, start work only after you make sure that no voltage is output here.

DANGER

Indicates an imminently hazardous situation which, if ignored, will result in death or serious injury.



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 damage to the product and other property.



Indicates a prohibited act.



Indicates a warning, caution, or danger. When this symbol is marked on the product, see the relevant section in this manual.



Protective conductor terminal.



Chassis (frame) terminal.



On (power supply).



Off (power supply).



In position of a bi-stable push control.



Out position of a bi-stable push control.



Indicates that this product conforms to the requirements of the Waste Electrical and Electronic Equipment Directive.

In the EU, this product cannot be disposed of as domestic household waste.

When disposing of this product, follow the Waste Electrical and Electronic Equipment (WEEE) Directive.

In areas outside of the EU, dispose of it as per the instructions of the local authorities.



Safety precautions

The following safety precautions must be observed to avoid fire hazards, electric shock, accidents, and device failures. Keep them in mind and make sure to observe them.

Using the product in a manner that is not specified in this manual may impair the protection functions provided by the product.



Users

- This product must be used only by qualified personnel who understand the contents of this operation manual.
- If an unqualified personnel is to use the product, be sure the product is handled under the supervision of qualified personnel (those who have electrical knowledge). This is to prevent the possibility of personal injury.



Purpose of use

- Never use the product for purposes other than the product's intended use.
- This product is not designed or manufactured for general home or consumer use.



Input power supply

- Use the product within the rated input line voltage range.
- For applying power, use the power cord provided. For details, see the respective page in this manual.
- The product is an equipment of IEC Overvoltage Category II (energy-consuming equipment supplied from the fixed installation).



Cover

- Some parts inside the product are hazardous. Do not remove the external cover.



Grounding

- The product is IEC Safety Class I equipment (equipment with a protective conductor terminal). To prevent electric shock, be sure to connect the protective conductor terminal of the product to electrical ground (safety ground).



Operation

- Before use, visually check for problems in the power cord, discharge gun, and high-voltage cable. When checking for these problems, turn off the circuit breaker of distribution.
- If you notice a malfunction or abnormality in the product, stop using it immediately, and turn off the circuit breaker of

distribution. Make sure the product is not used until it is completely repaired.

- Do not disassemble or modify the product. If you need to modify the product, contact your Kikusui distributor or agent.



Maintenance, inspection, and calibration

- To maintain the performance and safety of the product, we recommend periodic maintenance, inspection, cleaning, and calibration.
- To prevent electric shock, be sure to unplug the product before carrying out maintenance or inspection. Do not remove the external cover.
- Check periodically that there are no tears or breaks in the power cord.
- If the panel needs cleaning, gently wipe it using a soft cloth with water-diluted neutral detergent. Do not use volatile chemicals such as benzene or thinner.
- This product is calibrated before shipment. To maintain the product's performance, we recommend periodic calibration. To have your product calibrated, contact your Kikusui agent/distributor.



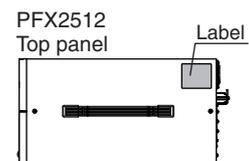
Service

- Kikusui service engineers will perform internal service of the product. If the product needs adjustment or repairs, contact your Kikusui distributor or agent.



Warning label

- There is a warning label affixed to the product. If this label tears or falls off, replace with a new label. If you need a new label, contact your Kikusui agent or distributor.





Precautions When Moving the Product



Note the following points when moving the product to the installation location or when transporting the product.

- Turn the POWER switch off.
Moving the product with the POWER switch turned on may cause electric shock or damage to the product.
- Remove all wiring.
Moving the product with the cables connected may cause wires to break or injuries due to the product falling over.
- Increase the number of people or take other safety measures when carrying the product over a slope or across steps.
- When transporting the product, be sure to use the original packing materials.
Otherwise, damage may result from vibrations or from the product falling during transportation.
- Be sure to include this manual.



Precautions Concerning Installation



Be sure to observe the following precautions when installing the product.

- Do not use the product in a flammable atmosphere.
To prevent the possibility of explosion or fire, do not use the product near alcohol, thinner, or other combustible materials, or in an atmosphere containing such vapors.
- Avoid locations where the product is exposed to high temperature or direct sunlight.
Do not install the product near a heater or in areas subject to drastic temperature changes.
Operating temperature range: 0 °C to +40 °C (32 °F to 104 °F)
Storage temperature range: -10 °C to +60 °C (14 °F to 140 °F)
- Avoid humid environments.
Do not install the product in high-humidity locations such as near a boiler, humidifier, or water supply.
Operating humidity range: 20 %rh to 85 %rh (no condensation)
Storage humidity range : 0 %rh to 90 %rh (no condensation)
Condensation may form even within the operating humidity range. If this happens, do not use the product until the condensation dries up completely.
- Be sure to use the product indoors.
This product is designed for safe indoor use.
- Provide adequate space around the power cord plug.
Do not insert the power cord plug into an outlet that is not easily accessible. Do not place objects near the power cord plug that would make it difficult to access.
- Do not install the product in a corrosive atmosphere.
Do not install the product in a corrosive atmosphere or in environments containing sulfuric acid mist, etc. This may cause corrosion of various conductors or reduce the quality of the connector contacts inside the product, and this could lead to malfunction, failure, and possibly fire.
- Do not install the product in a dusty location.

Dust accumulation can lead to electric shock or fire.

- Do not use the product in a poorly ventilated location.
Provide adequate space around the product for air to circulate around it.
- Do not place objects on top of the product.
Placing heavy objects on top of the product may cause malfunction.
- Do not install the product on an inclined surface or in a location subject to vibrations.
The product may fall or tip over and cause damage and injury.
- Do not use the product in a location subject to strong magnetic or electric fields or in a location where the input power supply signal contains large amounts of distortion or noise.
Doing so may cause the product to malfunction.
- Use the product 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.
- For KC mark.
이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Notations used in this manual



Indicates useful information.

- In this manual, the PFX2512 Charge/Discharge System Controller is also referred to as the PFX2512 or the PFX2500 series.
- Application software BPChecker3000 is also referred to as BPChecker3000.
- The PWR-01 Series Regulated DC Power Supply is also referred to as the PWR-01.
- The PWR Series Regulated DC Power Supply is also referred to as the PWR.
- The PAS Series Regulated DC Power Supply is also referred to as the PAS.
- The PAT-T Series Regulated DC Power Supply is also referred to as the PAT-T.
- The PLZ-5W Series Electronic Load is also referred to as the PLZ-5W.
- The PLZ-4W Series Electronic Load is also referred to as the PLZ-4W.
- The PLZ2405WB Electronic Load Booster is also referred to as the PLZ2405WB.
- The PLZ2004WB Electronic Load Booster for the PLZ-4W Series Electronic Load is also referred to as the PLZ2004WB.
- The OP02-PFX Volt/Thermometer Unit is also referred to as the OP02-PFX.
- The OP03-PFX Voltmeter Unit is also referred to as the OP03-PFX.
- The SL01-PFX 8Slot Unit is also referred to as the SL01-PFX.
- The EX01-PFX board for connecting the PFX2512 and the SL01-PFX is also referred to as the EX01-PFX.
- The term "PC" is used to refer generally to both personal computers and workstations.
- The following markings are used in the explanations in this manual.

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 damage to the product or other property.

NOTE

Indicates information that you should know.



Indicates reference to detailed information.



Indicates reference to detailed information operation manual.



Indicates reference to detailed information help file.

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- **What is the best combination to perform charge/discharge tests?** → "Combination for Performing Charge/Discharge Tests" *p. 19*
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- **How do I configure the component devices?** → "Setting the Model ID" *p. 59*
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 [Io Config](#), [Test Condition Editor](#), [Test Executive](#), [Graph View](#)
- **How do I control the connected DC power supply and electronic load?** →  [PWR-01](#), [PWR](#), [PAS](#), [PLZ-5W](#), [PLZ-4W](#), [PLZ2405WB](#), [PLZ2004WB](#) —
- **How do I perform discharge tests with voltages that are lower than the minimum discharge operating voltage?** → "Connecting to a Bias power supply" *p. 131*

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- **How do I clean the dust filter?** → "Cleaning the Dust Filter" *p. 125*

Troubleshooting

See "Troubleshooting" on page 135.

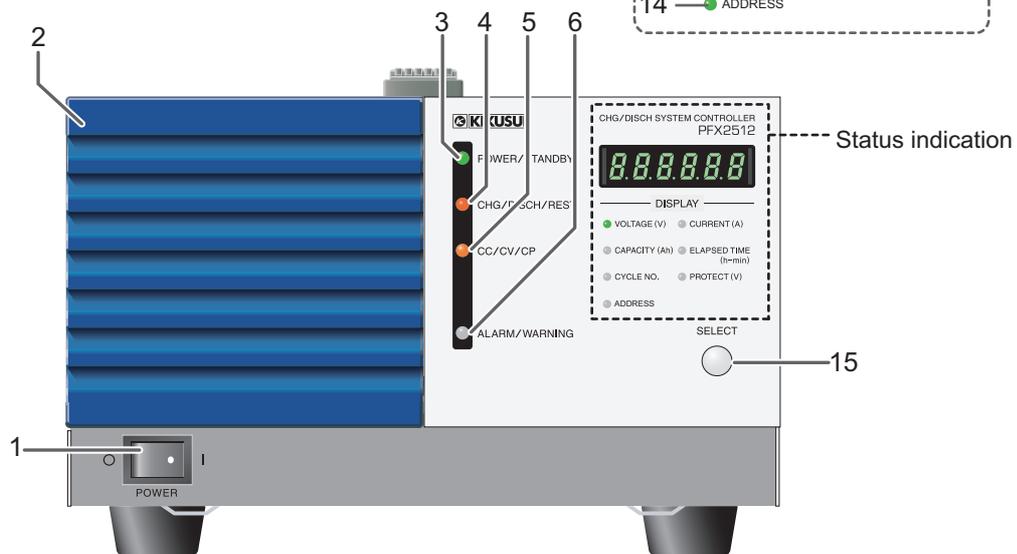
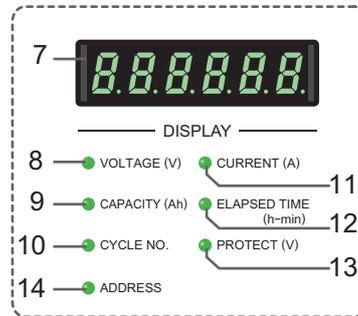
Component Names

Front panel

Status LED colors and operating status

	Red	Green	Orange
● POWER/STANDBY	—	POWER	—
● CHG/DISCH/REST	CHG	DISCH	REST
● CC/CV/CP	CC	CV	CP
● ALARM/WARNING	ALARM	—	WARNING

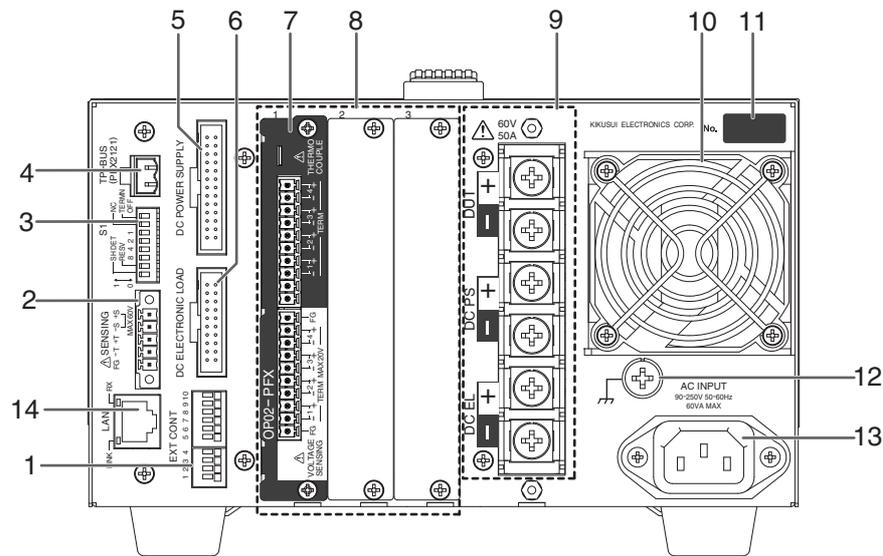
Status indication



No.	Name	Function	
1	POWER switch	Turns on / off of the power.	See p. 64
2	Air inlet (Louver)	Intake for air circulation to cool down of the internal components.	—
3	POWER/STANDBY LED	The POWER LED (Green) Illuminates when the test can be executed.	—
4	CHG/DISCH/REST LED	The CHG LED (Red) Illuminates when it is in the charge status, the DISCH LED (Green) Illuminates when it is in the discharge status, and the REST LED (Orange) Illuminates when it is in the resting status.	—
5	CC/CV/CP LED	The CC LED (Red) Illuminates when it is in the constant current operation, the CV LED (Green) Illuminates when it is in the constant voltage operation, and the CP LED (Orange) Illuminates when it is in the constant power operation.	—
6	ALARM/WARNING LED	The ALARM LED (Red) Illuminates when the alarm is detected. The WARNING LED (Orange) Illuminates when the protection function is activated.	p. 68
7	Display	Displays the status of selected function by SELECT key (VOLTAGE (V), CURRENT (A), CAPACITY (Ah), ELAPSED TIME (h-min), CYCLE NO., PROTECT, LAN interface, Alarm, etc.).	p. 58 p. 66 p. 68
8	VOLTAGE (V) LED	It Illuminates when the voltage value is displayed. (when it is selected by the SELECT key)	p. 66
9	CAPACITY (Ah) LED	It Illuminates when the capacity value is displayed. (when it is selected by the SELECT key)	p. 66
10	CYCLE NO. LED	It Illuminates when the testing cycle number is displayed. (when it is selected by the SELECT key)	p. 66
11	CURRENT (A) LED	It Illuminates when the current value is displayed. (when it is selected by the SELECT key)	p. 66
12	ELAPSED TIME (h-min) LED	It Illuminates when the elapsed time is displayed. (when it is selected by the SELECT key)	p. 66

No.	Name	Function	See
13	PROTECT (V) LED	It illuminates when the status of protection function is displayed. (when it is selected by the SELECT key)	p. 66
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15	SELECT key	To select the item to display on the DISPLAY.	p. 66

Rear panel



Example in which a Volt / Thermometer Unit OP02-PFX is installed in slot 1 of a PFX2512.

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1	EXT CONT terminal board	External control terminal	p. 66
2	SENSING connector	A connector for the sensing cables	p. 42, p. 44
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4	TP-BUS connector	A connector for maintenance	—
5	DC POWER SUPPLY connector	A connector for controlling the power supply	p. 36
6	DC ELECTRONIC LOAD connector	A connector for controlling the Electronic load	p. 40
7	Volt / Thermometer Unit (OP02-PFX)	An option board for expanding the number of voltage and temperature measurement points	p. 85 p. 123
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9	Input/Output terminal board*1	Terminals for the testing device (DUT), the DC power supply (DCPS), and the Electronic load (DCEL)	p. 45, p. 33 p. 37, p. 43
10	Air outlet	Exhaust port for cooling	—
11	Serial number	—	—
12	Chassis terminal	A terminal used for ground the output	p. 32
13	AC INPUT connector	AC inlet	p. 28
14	LAN connector	A connector for communicating with BPChecker3000	p. 54

*1. The terminal cover for protecting the input/output terminal is being attached to the terminal when the PFX2512 is shipped from the factory.

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1

General Description

This chapter describes the product, the devices that can be connected to the product, and the procedure from charge / discharge test preparation to test execution.

Product Overview

The PFX2512 is a dedicated charge / discharge system controller used to measure the charge / discharge voltage and current of batteries and the like with high accuracy in combination with Kikusui's DC power supplies and electronic loads to evaluate the characteristics of DUTs (power storage devices such as rechargeable batteries). Depending on the DC power supply and electronic load combination, large capacity, and wide rating range evaluation tests can be performed.

NOTE

For the system requirements, see the BPChecker3000 application software's setup guide.

Features

Charge / discharge control system

● Wide range of ratings

Wide range of ratings can be supported by selecting the appropriate combination of Kikusui's DC power supplies and electronic loads. Implementation cost can be suppressed by selecting the appropriate devices for your charge / discharge test conditions.

● Digital constant current (CC) / constant voltage (CV) control method

The adoption of the digital CC / CV control method minimizes the disparities in the constant current (CC) / constant voltage (CV) setting accuracy and drift characteristics due to the differences in the system component devices (DC power supplies and electronic loads). This ensures highly accurate tests. There is absolutely no need to make adjustments after system configuration.

● Highly accurate measurement

Highly accurate measurement circuits are built in. Battery voltage and charge / discharge current are detected with high accuracy. (Voltage measurement: 100 μ V resolution, current measurement: 100 μ A resolution, elapsed time measurement: monthly error of 30 s or less (10 ppm or less))

True electric energy and integrated capacity can be measured even for pulse currents that are difficult to be captured.

● Protection functions

The PFX2512 has a built-in path switch (load switch). The path switch is equipped with a high-speed shutoff function that quickly detaches DC power supplies and electronic loads when an error is detected.

It also detects electric potential difference that exceeds specified values in DUT cables and voltage sensing wires, wiring errors, poor DUT (battery) connection, and so on to prevent damage to the connected devices and DUTs (batteries).

- **Vibration sensor**

In a disaster or the like, the PFX2512 detects large shaking and shock during charge / discharge test and turns off the output. This prevents damage to the connected devices and DUTs (batteries).

- **10 000-step pattern charge / discharge feature**

You can set up to 10 000-step CC or CP (with V or I limits) steps.

High-speed charge / discharge switching control enables you to perform complicated charge / discharge tests with step times as short as 100 ms. The PFX2512 can be used to create a wide variety of test and simulation patterns for standard tests.

- **High-speed charge / discharge switching**

Traditionally, it has taken time to switch between controlling DC power supplies and controlling electronic loads. This product can be used to control DC power supplies and electronic loads at the same time, which enables seamless charge / discharge switching.

- **High-speed sampling as fast as 1 sample / ms**

Voltage and current can be measured at an interval as short as 1 ms with the specified voltage or current step as the trigger. You can acquire highly accurate voltage waveforms that are synchronized with the step current. This is an optimal feature for analyzing test impedance and evaluating service life of DUTs.

- **Expandable cell monitor measurement feature**

By installing a Volt/Thermometer Unit OP02-PFX (sold separately), you can expand the number of measurement points by 4 voltage and 4 temperature measurement points. You can expand the number of measurement points by a maximum of 12 voltage and 12 temperature measurement points.

If you further need to expand the number of voltage measurement points, you can increase the number to 72 by installing OP03-PFX Voltmeter Units (sold separately) in a 8 Slot Unit SL01-PFX and installing a Volt/Thermometer Unit OP02-PFX (sold separately) in the PFX2512 main unit.

- **Cell CV function**

A cell CV function is available in addition to the cell unbalance detection function. During charging, the PFX2512 instantly detects the highest cell voltage and controls the charging operation so that the specified cell CV value is reached. During discharging, the PFX2512 does the same for the lowest cell voltage.

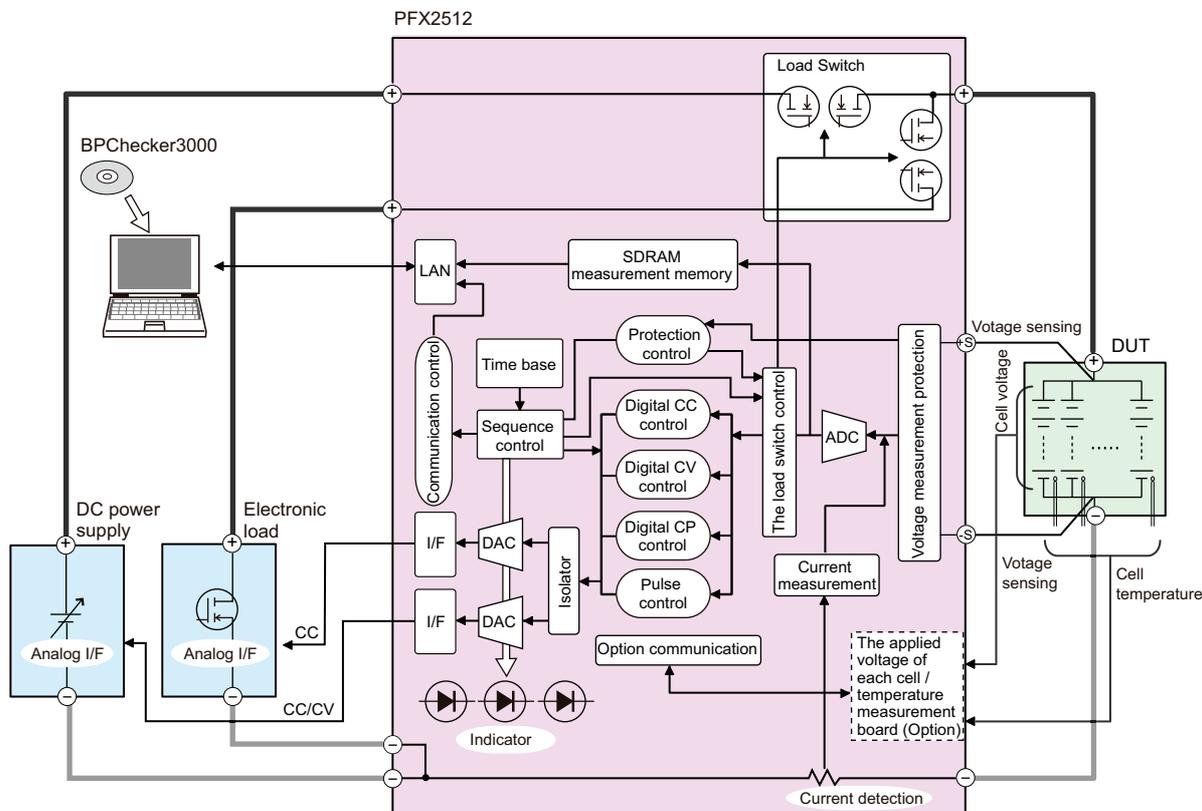
Safe charge/discharge is possible even on battery modules with unbalanced cells.

- **Support for EV standards**

The system supports tests for EV-related standards such as the IEC standards. It is easy to use and works well with Microsoft Office software. It also has features for displaying and exporting high-speed sample data.

System Configuration

The following figure shows a basic configuration example of a charge / discharge system that uses the PFX2512. The system consists of a PFX2512, Kikusui's DC power supplies and electronic loads, and peripheral subsystems.



Charge / Discharge System configuration (Example)

The PFX2512 functional block is mainly made up of a DUT voltage / current / temperature measurement section, a digital constant current / constant voltage control section, a power supply / electronic load I / F section, a host communication control section, and a load switch.

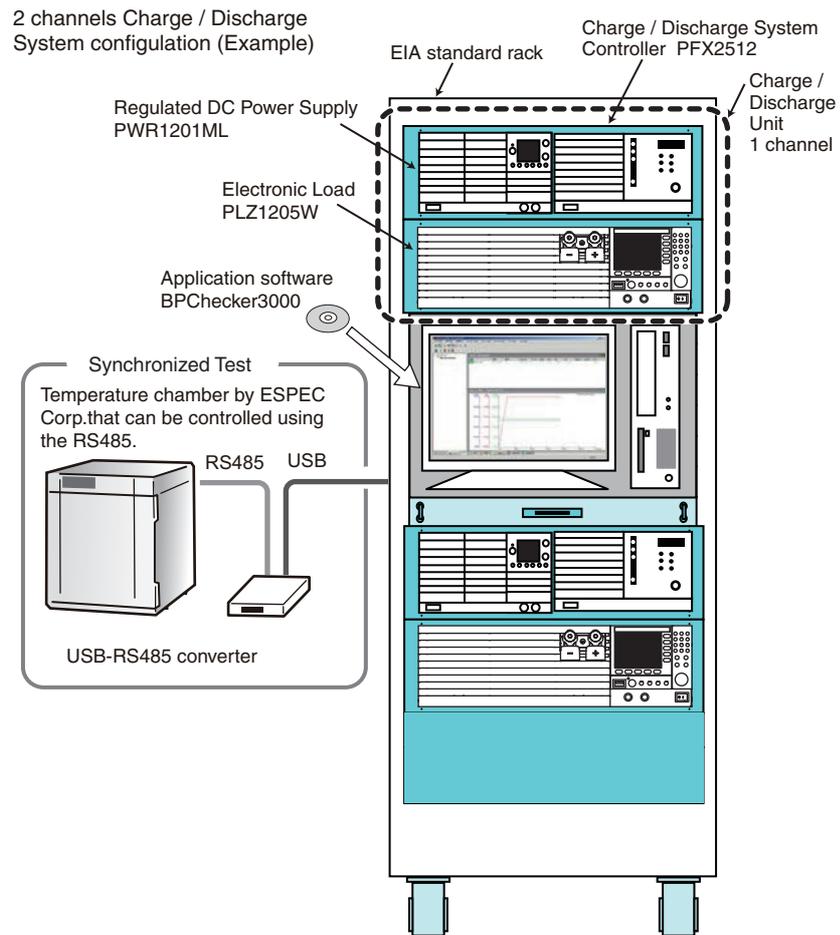
The PFX2512 has an interface that directly connects to Kikusui's power supplies and electronic loads. The system is designed to allow full-scale charge / discharge testing with easy initial configuration without extra equipment or external circuits.

The connection status of DC power supplies, electronic loads, and DUT (battery) is constantly monitored. If a problem is detected in any of the devices, the charge / discharge test is safely aborted.

The PFX2512 is controlled from a PC through the LAN interface.

Application software BPChecker3000 is used to configure and control charge / discharge test conditions. For details on the application software, see the corresponding help file.

 Help	BPChecker3000
Hardware configuration	Io Config
Test condition creation	Test Condition Editor
Test execution	Test Executive
Test result analysis	Graph Viewer



The 1 channel of the charge and discharge system consists of one unit of each PFX2512, DC power supply, and Electronic load.

The figure shown above is an example of system configuration for 2 channels of the charge and discharge system. This system consists of 2 sets of each for the PFX2512, PWR1201ML (Regulated DC power supply), the PLZ1205W (Electronic load), and 1 set of each for the PC installed into the rack unit connecting with the temperature chamber.

If you configure a system with the Charge / Discharge System Controller PFX2512, you can connect charge / discharge units with 72 voltage measurement points and 8 temperature measurement points or 12 voltage measurement points and 12 temperature measurement points to up to 7 channels (using options¹).

Synchronized testing with a temperature chamber is also possible. An ESPEC temperature chamber is connected to the PC through a dedicated USB-RS485 converter². To perform a synchronized test with a temperature chamber, you need a VISA³ library.

1 The Volt / Thermometer Unit OP02-PFX, which is installed in the PFX2512, and the Voltmeter Unit OP03-PFX, which is installed in the optional 8Slot Unit are available.

2 Use a converter specified by ESPEC Corporation.

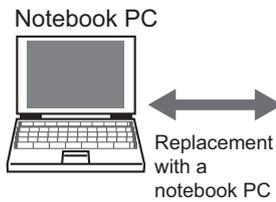
3 VISA (Virtual Instrument Software Architecture) was developed by the VXIplug&play Systems Alliance. It is the standard specification for measurement instrument connection software. KI-VISA is a Kikusui-original VISA library that complies with the VXIplug&play VISA specifications. You can download the latest version of KI-VISA from the Kikusui website (<http://www.kikusui.co.jp/en/download>).

Performing Stable System Operation

Suggestions for the PC executing tests

- Turn off the PC's sleep mode.
- Set Windows Update to manual mode.
- If possible, do not install virus protection software.
- Do not run other programs.
- Connect a uninterruptible power supply.

Using a notebook PC for executing tests is advantageous in that you do not need to use a UPS.

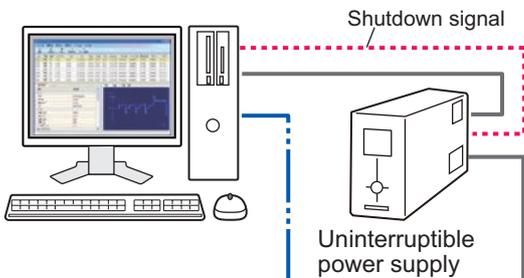


Install a UPS. Be sure to connect the shutdown signal. Connecting the shutdown signal allows BPChecker3000 to automatically shut down the charge/discharge system in a safe and orderly manner even when a power outage occurs or when the system suddenly stops for some other reason.

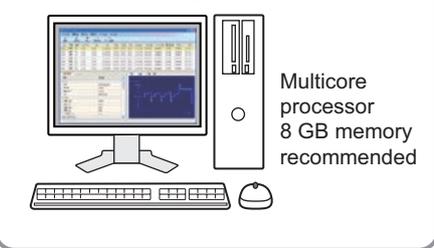
Ideal system shutdown when a power outage or sudden interruption occurs (executed automatically)

The PFX2512 charge/discharge system turns off.
 ↓
 The PC remains on using the power from the UPS.
 ↓
 BPChecker3000 detects a communication error. (Io Err)
 ↓
 BPChecker3000 process and protects the test file.
 ↓
 A few minutes later, the UPS sends the PC a shutdown signal.
 ↓
 The PC powers off.

PC for executing tests (Test Executive)



PC for data analysis (Graph Viewer)



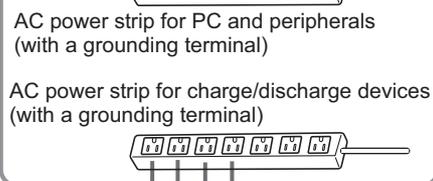
If you need to run tests for a long time, using separate PCs for testing and data analysis will reduce the load placed on the PCs and allow the tests to run smoothly.

After configuration is complete, do not connect the system to the Internet or corporate LAN during charge/discharge tests.



Avoid using wireless LAN for connections.

Switching hub or router



It is safer to use separate AC power supplies for the PC and the charge/discharge system.

PFX2512 Charge/Discharge System



Combination for Performing Charge/Discharge Tests

See p. 59

With the PFX2512, the following combination can be used to perform charge / discharge tests.

Model IDs are assigned to different combinations of devices used for charge / discharge tests. To execute a charge / discharge test, you need to set an appropriate model ID according to the combination of devices to be connected.

The charge / discharge operation range (maximum voltage and maximum current) that can be used for charge / discharge testing varies depending on the DC power supplies and electronic loads that are connected to the PFX2512.

■ Possible combinations

Model ID	DC power supply	Electronic Load	Maximum charge power ¹	Maximum discharge power
7101 ²	PWR800L	PLZ1004W (H range)	800 W	1000 W
7102	PWR800L	PLZ1004W (M range)	800 W	1000 W
7103	PWR1600L	PLZ1004W (2 in parallel)	1600 W	2000 W
7104	PWR800L	PLZ334W (H range)	800 W	330 W
7105 ³	PAT60-67T	PLZ1004W+PLZ2004WB (M range)	3000 W	3000 W
7106	PWR1600L	PLZ1004W (H range)	1600 W	1000 W
7107	PAS10-70	PLZ1004W (H range)	700 W	1000 W
7108	PAS20-36	PLZ1004W (H range)	720 W	1000 W
7109	PAS20-54	PLZ1004W (H range)	1080 W	1000 W
7110	PAS40-27	PLZ1004W (H range)	1080 W	1000 W
7111	PWR800L	PLZ164W (H range)	800 W	165 W
7112	PAS10-35	PLZ334W (H range)	350 W	330 W
7113	PWR400L	PLZ164W/ PLZ164WA (H range)	400 W	165 W
7114	PWR400L	PLZ1004W (H range)	400 W	1000 W
7115	PWR800L	PLZ1004W+PLZ2004WB (M range)	800 W	3000 W
7116	PAS20-36	PLZ334W (H range)	720 W	330 W
7118	PWR800L	PLZ664WA (H range)	800 W	660 W
7119	PWR1600L	PLZ1004W+PLZ2004WB (M range)	1600 W	3000 W
7121	PWR400L	PLZ334W (H range)	400 W	330 W
7122	PAS60-12	PLZ664WA (H range)	720 W	660 W
7123	PWR400L	PLZ664WA (H range)	400 W	660 W
7124	PAS40-9	PLZ1004W (H range)	360 W	1000 W
7125	PWR1600L	PLZ664WA (H range)	1600 W	660 W
7126	PWR801L	PLZ1004W (H range)	800 W	1000 W
7127	PWR801ML	PLZ1004W (H range)	800 W	1000 W
7128	PWR1201L	PLZ1004W (H range)	1200 W	1000 W
7151	PWR401L	PLZ205W (H range)	400 W	200 W
7152	PWR401ML	PLZ205W (H range)	400 W	200 W
7153	PWR401L	PLZ405W (H range)	400 W	400 W
7154	PWR401ML	PLZ405W (H range)	400 W	400 W
7155	PWR801L	PLZ1205W (H range)	800 W	1200 W
7156	PWR801ML	PLZ1205W (H range)	800 W	1200 W

Model ID	DC power supply	Electronic Load	Maximum charge power ¹	Maximum discharge power
7157	PWR1201L	PLZ1205W (H range)	1 200 W	1 200 W
7158	PWR1201ML	PLZ1205W (H range)	1 200 W	1 200 W
7159	PWR1201ML	PLZ1205W+PLZ1205W (H range)	1 200 W	2 400 W
7160	PWR1201ML	PLZ1205W+PLZ2405WB (M range)	1 200 W	3 000 W

- 1 It may not be possible to use up to the power specified here due to loss in cables.
- 2 Factory default settings
- 3 A separate cable is required. For details, contact your Kikusui agent or distributor.

Combinations whose model IDs have not been determined are planned to be available through version updates.

For the latest combination information, visit the product information page on our website (<http://www.kikusui.co.jp/en>). For details, contact your Kikusui agent or distributor.

Selecting the appropriate DC power supplies and Electronic loads

The range is different between charging and discharging. Select DC power supplies and electronic loads that meet each condition.

The graph below shows the range of chargeable voltage and current using the following equation. Use devices whose voltage (constant voltage, cutoff voltage) and current (constant current) do not exceed the range.

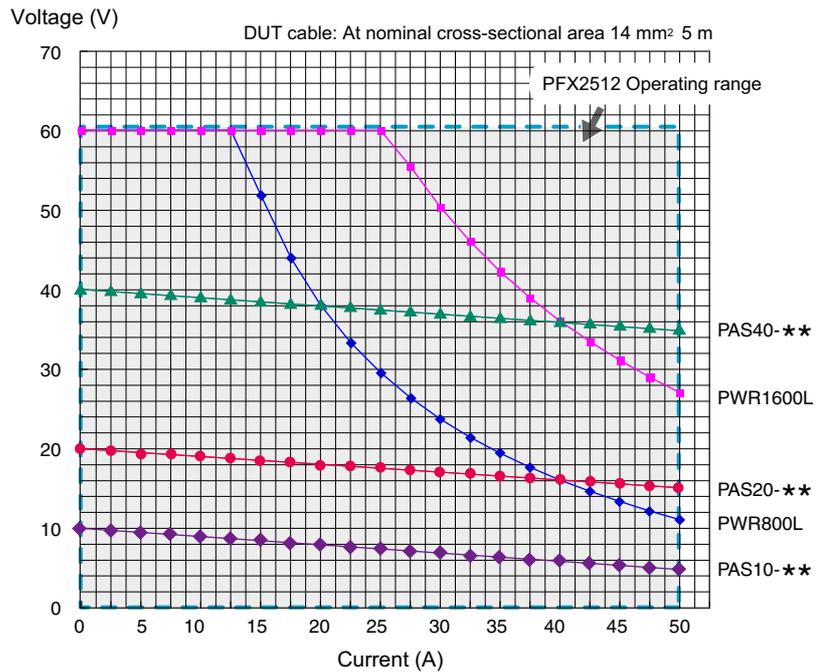
$$\text{Maximum charge power} = \text{Maximum rated power of DC power supply} - \text{Loss in cables}^1$$

NOTE

If the allowable power of DC power supplies is exceeded during charging, PS / B alarm or the like occurs, and the test is aborted.

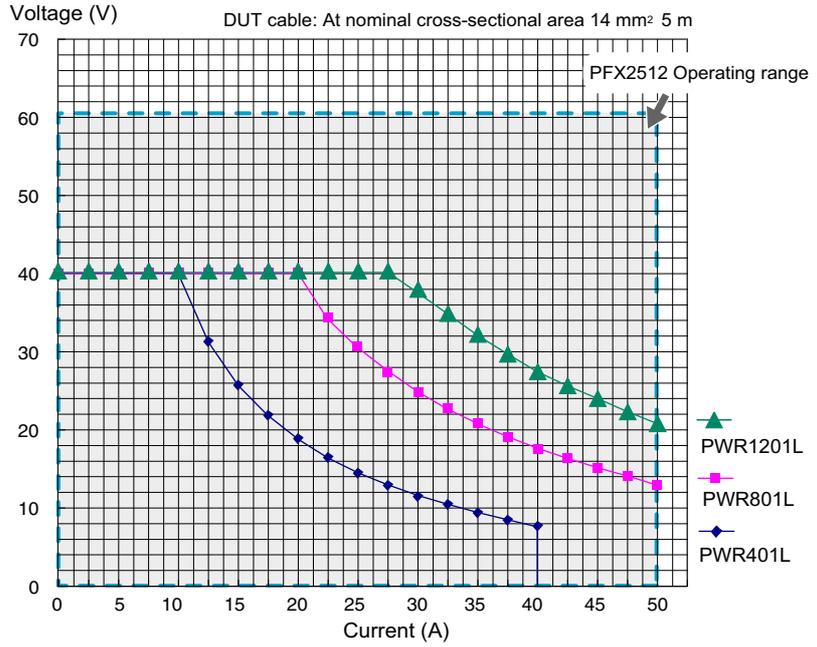
Voltage (V) axis	Constant voltage value (CV Voltage) or cutoff voltage value (Cutoff voltage)
Current (A) axis	Constant current value (CC Current)

Charge operation range of the DC power supply [PWR-L/ PAS]

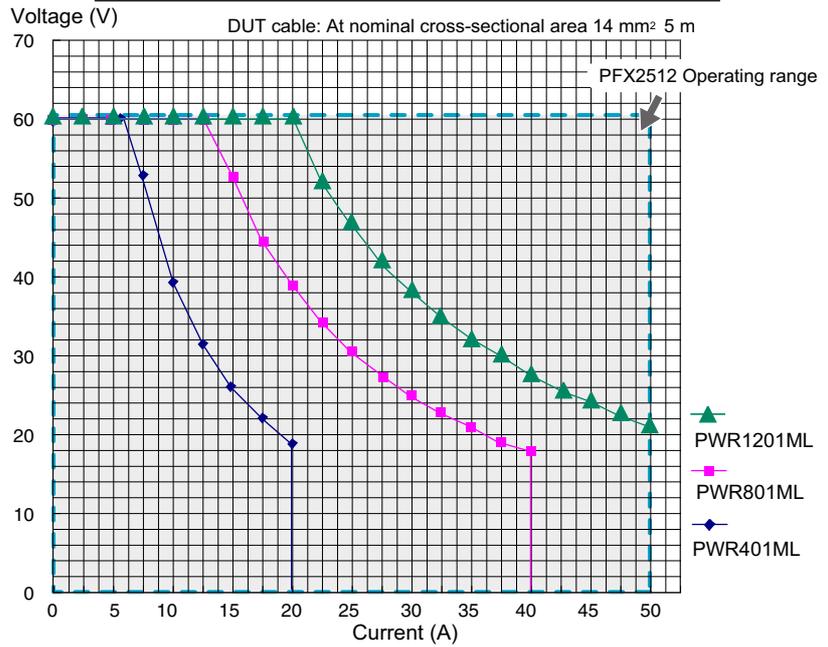


1 What is loss in cables?
Voltage drops occur as a result of charge currents flowing through DUT cables, connection cables, PFX2512 current path circuits, and so on. Loss in cables is the power loss during charging due to this voltage drop. The maximum power that can be used for charging is the resultant value after subtracting the loss in cables.

Charge operation range of the DC power supply [PWR-01L]



Charge operation range of the DC power supply [PWR-01ML]



The graph below shows the range of dischargeable voltage and current using the following equation. Use devices whose voltage (discharge start voltage, cutoff voltage) and current (constant current) do not exceed the range. Also, make sure that the discharge voltage does not fall below the minimum discharge operating voltage.

When using constant power discharge (CP Dish), calculate the discharge current from the specified constant power value and DUT (battery) voltage, and check that it is within the range on the graph.

$$\text{Minimum discharge operating voltage}^1 = \text{Minimum operating voltage of the electronic load} + \text{voltage drop due to loss in cables}$$

See p. 131

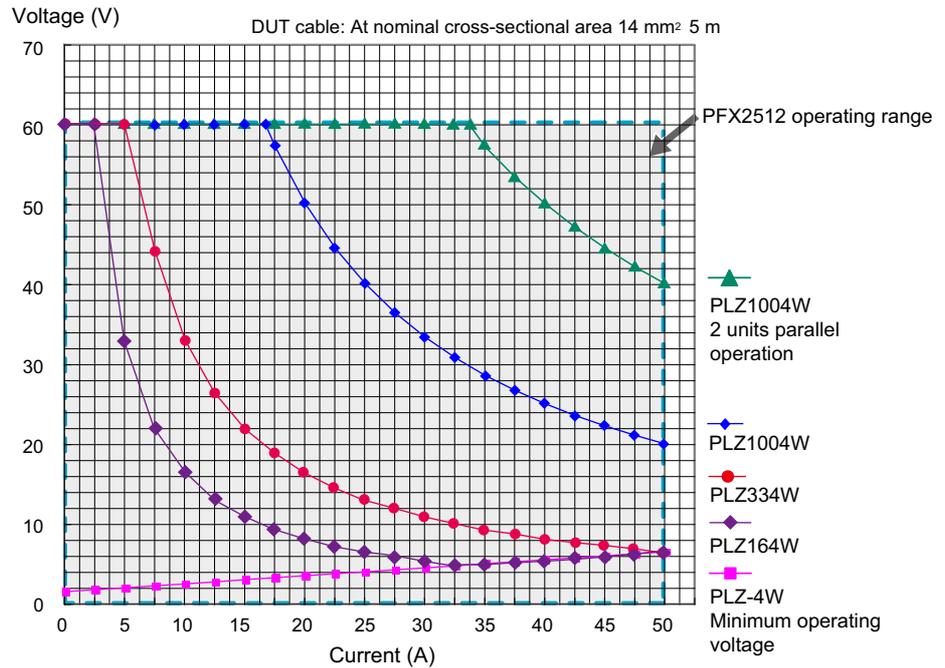
If you want to perform discharge tests with a voltage lower than the minimum discharge operating voltage, use a bias power supply in combination.

NOTE

If the allowable power of electronic loads is exceeded during discharging or the voltage falls below the minimum discharge operating voltage, a CD / B alarm or the like occurs, and the test is aborted.

Voltage (V) axis	Discharge start voltage value (Start voltage) or cutoff voltage value (Cutoff voltage)
Current (A) axis	Constant current value (CC Current)

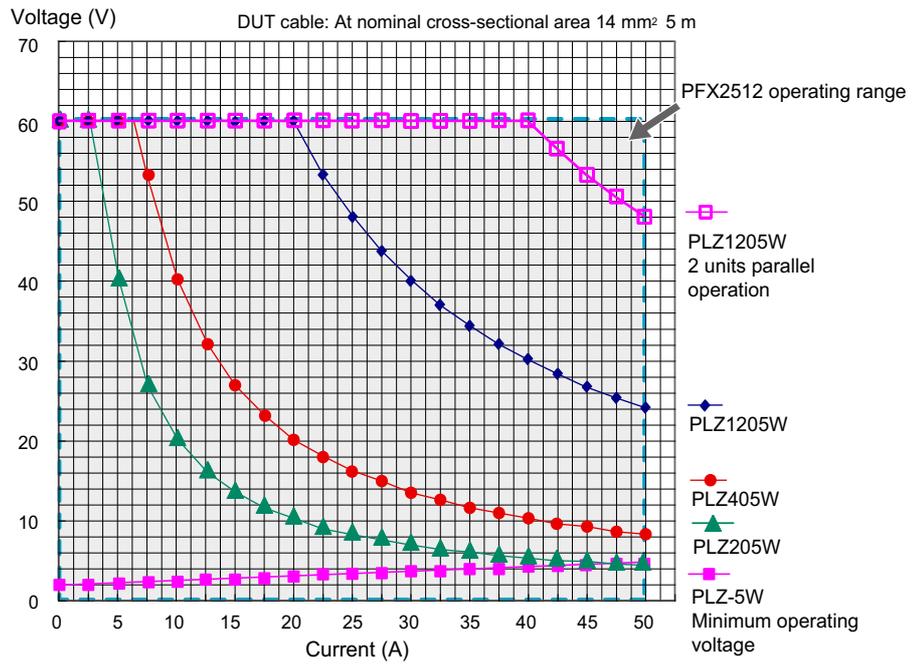
Discharge operating range of each electronic Load [PLZ-4W]



1 What is minimum discharge operating voltage?

It is a voltage based on the minimum operating voltage of the electronic load. The minimum discharge operating voltage is this minimum operating voltage with the loss in cable (voltage drop) added.

Discharge operating range of each electronic Load [PLZ-5W]



To perform a charge / discharge test, configure a system with the PFX2512, DC power supplies, electronic loads, and PC, and control the system using application software BPChecker3000.

The following procedure describes the main steps to configure a system, set test conditions, and start and stop tests.

Connecting devices to configure a system

See p. 28

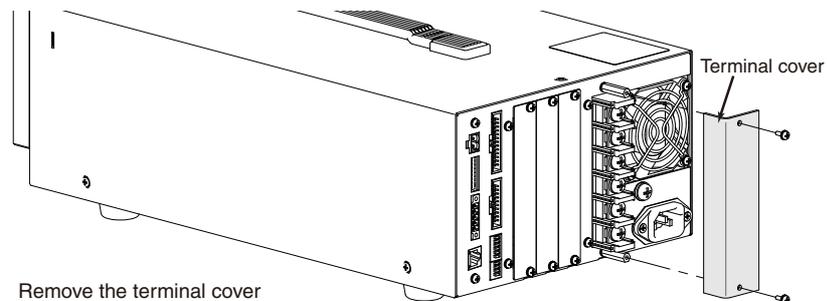
1 Connect power cords to each device.

See p. 45

2 Set the vibration sensor using the S1 switch of the PFX2512.

To use several PFX2512s, set channel numbers using the S1 switch before connecting them to DC power supplies and electronic loads.

3 Remove the terminal cover attached to the input/output terminal board on the rear panel of the PFX2512.



See p. 33

4 Connect the PFX2512 to the DC power supplies.

Use the cable with a solderless terminal which comes with the PFX2512 as a standard accessory.

See p. 37

5 Connect the PFX2512 to the electronic loads.

Use the cable with a solderless terminal which comes with the PFX2512 as a standard accessory.

See p. 47

6 Configure the DC power supplies.

Configure the protection function (OVP / OCP) and external analog control, and lock the panels.

See p. 49

7 Configure the electronic loads.

Configure the protection function (OCP), slew rate, external analog control, and the master unit and slave units during parallel operation, and lock the panels.

See p. 54

8 Connect the PFX2512 to a PC.

Setting test conditions and starting and stopping tests

 p. 64

 p. 54 , p. 56

 Io Config

 p. 59

 Test Condition Editor

 Test Executive

 Graph Viewer

 p. 65

1 Turn on the devices.

2 Assign IP addresses to the PC and PFX2512 and connect them.

You can automatically assign IP addresses with the DHCP server function or assign fixed IP addresses.

If you want to use a fixed IP address, set the PFX2512 IP address.

3 Start Io Config on BPChecker3000 to configure the hardware.

Specify the channel that you want to configure on Io Config, and then set the PFX2512 model ID.

If you want to use temperature chambers, set the temperature chamber driver, VISA resource, and the number of temperature chambers.

4 Start Test Condition Editor on BPChecker3000, and create test conditions.

Create and edit the test conditions. If necessary, configure the protection function.

5 Connect the DUT to the PFX2512.

6 When the DUT (battery) is connected, firmly apply cables ties.

Check that the terminal covers do not come off.

7 Start Test Executive on BPChecker3000, and configure the hardware protection.

Set the hardware protection (HOVP / HUVP) and voltage range.

8 Use Test Executive on BPChecker3000 to execute a test.

The charge / discharge test is executed with the test conditions that you created with Test Condition Editor.

9 Start Graph Viewer on BPChecker3000, and analyze the test results.

Graph the test data that was acquired by Test Executive, and display or print this data.

10 After the test is complete, remove the DUT (battery) before turning off the devices.

11 Turn off the devices.



2

Connecting and Configuring Devices

This chapter describes how to connect and configure the devices.

Connecting the Power Cord

The PFX2512 conforms to IEC Overvoltage Category II (energy-consuming equipment that is supplied from a fixed installation).



WARNING

Risk of electric shock.

- **The PFX2512 conforms to IEC Safety Class I (equipment that has a protective conductor terminal). Be sure to earth ground the product to prevent electric shock.**
- **The PFX2512 is grounded by the earth wire of the AC power cable. Connect the ground terminal to earth ground.**

Connecting the power cord with a plug



NOTE

- Use the supplied power cord to connect to an AC power line. If the supplied power cord cannot be used because the rated voltage or the plug shape is incompatible, have a qualified engineer replace it with an appropriate power cord that is 3 m or less in length. If obtaining an appropriate power cord is difficult, consult your Kikusui agent or distributor.
- A power cord with a plug can be used to disconnect the PFX2512 from the AC line in an emergency. Connect the plug to an easily accessible power outlet so that the plug can be removed from the outlet at any time. Be sure to provide adequate clearance around the power outlet.
- Do not use the supplied power cord for other devices.
- It may cause a damage of the test data or a malfunction of the product, please connect the power cable of each equipment to the same outlet.

In addition to the supplied power cord, Kikusui also provides other 200 V power cords with plugs (sold separately).

- 1 Check that the AC power line meets the nominal input rating of the PFX2512.**
The PFX2512 can receive a nominal line voltage in the range of 100 Vac to 240 Vac at 50 Hz or 60 Hz.
- 2 Check that the POWER switch is turned off.**
- 3 The power cord of the should be connected with the AC INPUT inlet of a rear panel of equipment.**
- 4 To ensure the safety charge and discharge testing, the power cord of the all connected equipments should be connected to the outlet with the same ground terminal.**

Protect the malfunction in such case when the AC power line is shut down.

Connecting to the switchboard



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).

Risk of electric shock or fire.

- Be sure to have a qualified engineer make the connection to the switchboard.
- The switchboard breaker must meet the requirements shown below.



CAUTION Inside the product, protection circuits are connected to match the polarity of the input terminal. Be sure to connect the L, N, and ⊕ (GND) terminals correctly between the switchboard and the product.



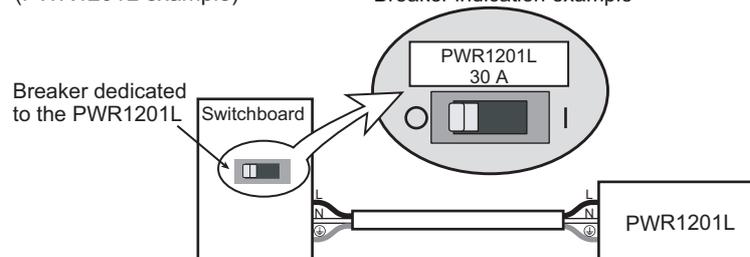
- In an emergency, turn off the switchboard breaker to separate the product from the AC power line.
- Risk of damage to test data and malfunction. To perform charge/discharge tests safely, connect the power cords of each device to the same AC power line, and insert the plugs in the same type of outlet.

Switchboard breaker requirements

- Rated current: 30 A (100 V system), 15 A (200 V system)
For safety reasons, circuit breakers exceeding the specified current cannot be used
- Only use the breaker with this PFX2512.
- Keep the breaker readily accessible at all times.
- Indicate that the circuit breaker is dedicated for use with this PFX2512 and that it is used to disconnect the product from the AC power line.

Connection to a switchboard
(PWR1201L example)

Breaker indication example



Connecting the Devices

The following example is consisting of the Charge/ Discharge System Controller PFX2512, DC power supply PWR1201ML, the Electronic load PLZ1205W, and the DUT (battery).

The direction of leading cables of input / output terminal board can be either right or left angle. However, wire the all the cables to become same directions as possible. Use the cable whichever it comes as standard accessory.

For stable operation, reduction of noise effects, and prevention of malfunction, note the following.

- Twist the + and - cables.
- Do not bind or cross the cables.
- Do not bind flat cables with cables for running current or pass them between cables.



Risk of electric shock.

There is no specific order in connecting the devices, but connect the DUT (battery) last. When connecting the DUT (battery), connect the PFX2512 side first.

The PFX2512 does not come with cables for connecting to the DUT (battery). Prepare the necessary cables for each device.

There is an optional TL08-PFX cable set that contains cables for connecting the PFX2512 to the DUT (battery).

Taking the current capacity into consideration, we recommend that you use cables with a nominal cross-sectional area of at least 14 mm².

See p. 123

■ Nominal cross-sectional area of wires and allowable currents (reference)

Nominal cross-sectional area (mm ²)	AWG	Reference cross-sectional area [mm ²]	Allowable current ¹ [A](Ta = 30°C)	Kikusui-recommended current (A)
2	14	(2.08)	27	10
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	-
60	2/0	(67.43)	217	-
80	3/0	(85.01)	257	200
100	4/0	(107.2)	298	-
125	-	-	344	-
150	-	-	395	300
200	-	-	469	-

1 Excerpt from Japanese laws related to electrical equipment.

Constructing cables

See p. 21

Make the cables as short as possible by considering the loss in the cables according to your system configuration.

See p. 30

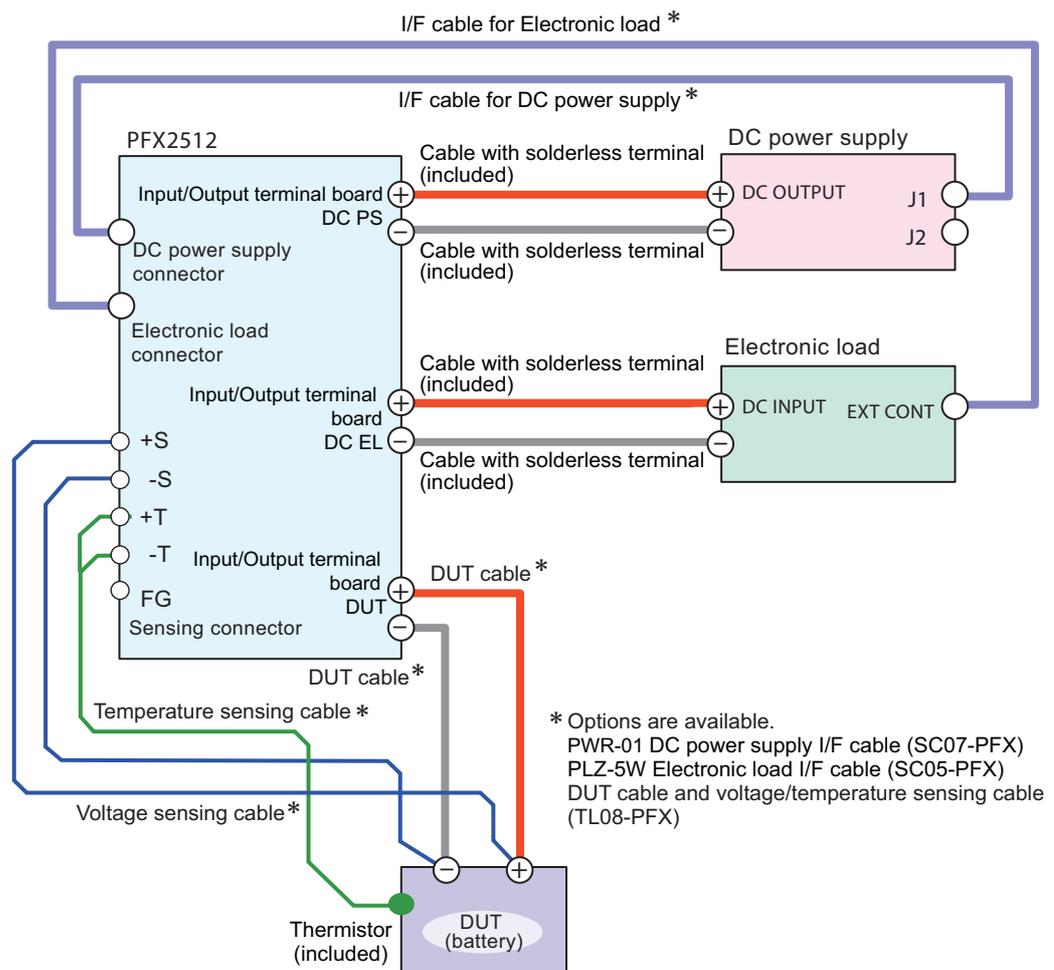
- 1 Select the appropriate cable.
- 2 Attach an M6 solderless terminal to the PFX2512 end of the cable.

CAUTION

If the DUT will be subject to high temperature, such as by placing it in a temperature chamber, pay attention to the allowable temperature of the DUT cable. If the heat resistance of the DUT cable and the like is insufficient, the DUT will be in a dangerous situation due to poor insulation, increased contact resistance, and so on.

NOTE

- The cable can be extended up to 5 m. If the cable is longer than 5 m, constant current control may become unstable, or accurate capacity measurement may be compromised.
- To prevent incorrect wiring, use different color solderless terminals or cables to make the polarities easily distinguishable.



Example of connecting figure of the charge / discharge system with the DUT (battery)

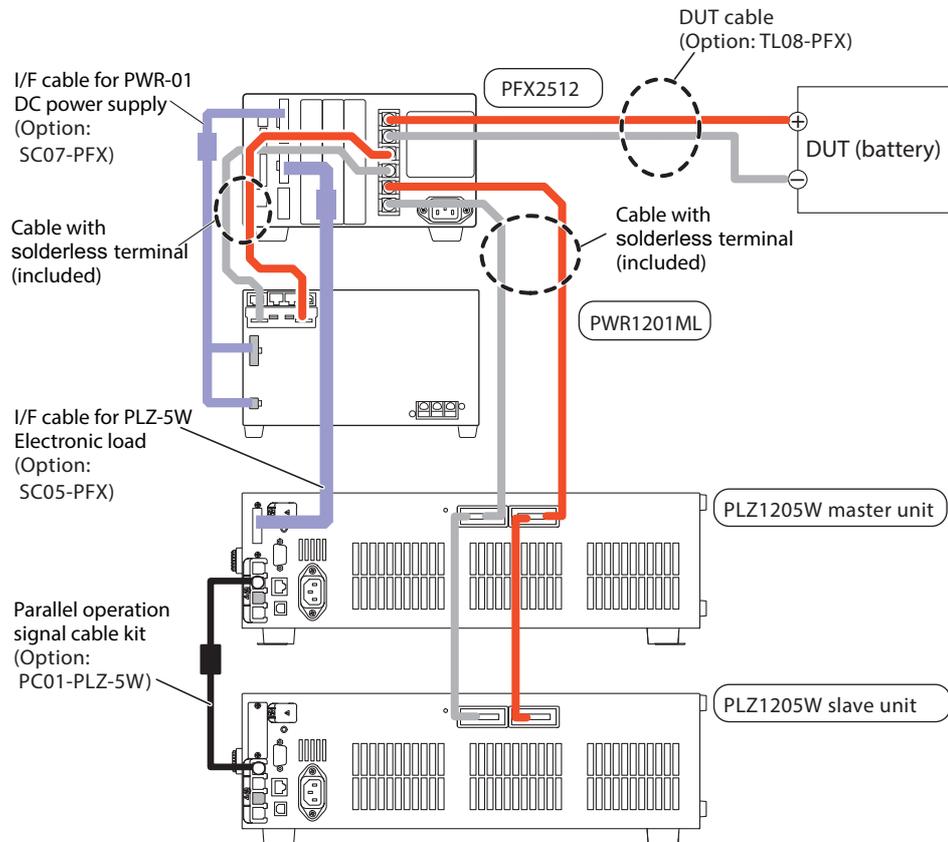
■ **Connecting the chassis terminal**

The chassis terminal is a grounding terminal designed for many purposes. It can be effective in reducing noise and preventing malfunction during large current operation. In the event a cable or the like makes contact with the chassis, the terminal prevent electric shock accidents. To perform charge/discharge tests safely, we recommend that you ground the chassis terminal.

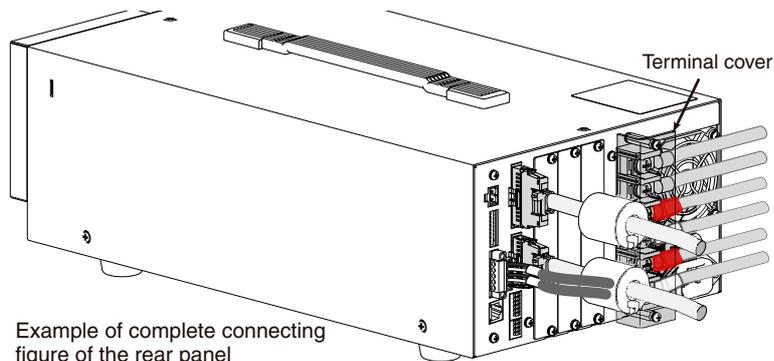
For the chassis terminal grounding cable, use a cable that can handle at least the maximum current that will flow during charge/discharge tests.

■ **Connecting the devices**

The following shows an example of system configuration which consist of 1set of the Charge/Discharge System Controller (PFX2512), 1 set the DC power supply (PWR1201ML), and 2sets of the Electronic load (PLZ1205W) in parallel operation. As for the parallel operation of the Electronic load units (PLZ1205W), locate the master unit with a position nearest to the PFX2512.



Example of a charge/discharge unit with two electronic loads (PLZ1205Ws) connected in parallel



Example of complete connecting figure of the rear panel

Connecting to DC Power Supplies

See p. 25

Connect the PFX2512 to the DC power supply using the cable with the solderless terminal and the I/F cable. This section explains an example of connecting a Kikusui PWR-01 Regulated DC Power Supply (L type, ML type) using the optional SC007-PFX I/F cable for the PWR-01.

For wiring precautions and other items to be considered, see the DC power supply operation manual.

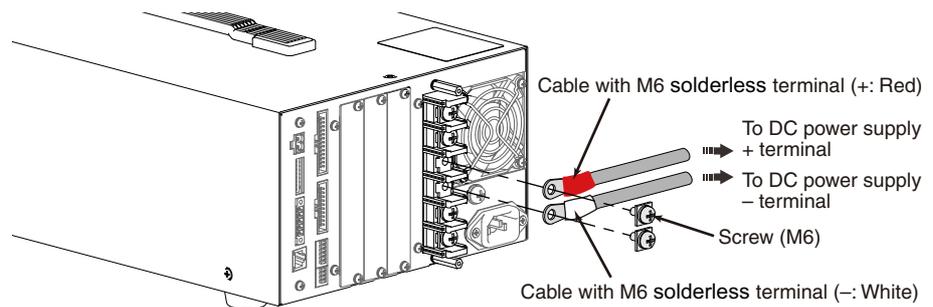
2

Connecting and Configuring Devices

Connecting the PFX2512 to a DC power supply

- 1 Confirm that the POWER switch of all connected equipments are turned off.**
- 2 Connect the cable with the solderless terminal to the DC PS + and the DC PS- on the input/output terminal of the PFX2512. The solderless terminal (M6) with a red cap is connected to the DC PS + terminal, and the solderless terminal (M6) with a white cap is connected to the DC PS - terminal.**

Pull out the cable in horizontal angle and fix it by screws.



- 3 Remove the chassis wire when it is connected the output terminal of the DC power supply.**

The output of the DC power supply is used as floating.

4 Connect the other end of the cable with the solderless terminal to the output terminal on the rear panel of the DC power supply. The solderless terminal (M8) with a red cap is connected to the DC OUTPUT + terminal, and the solderless terminal (M8) with a white cap is connected to the DC OUTPUT - terminal.

Use the screw set included with the PWR-01 to make the connections.

To reduce the influence of noise on the output, keep the cables as short as possible. If possible, twist the positive and negative load cables.

Follow the figure for the direction of the screw. If the screws are not mounted correctly, the OUTPUT terminal cover may not be attached properly.

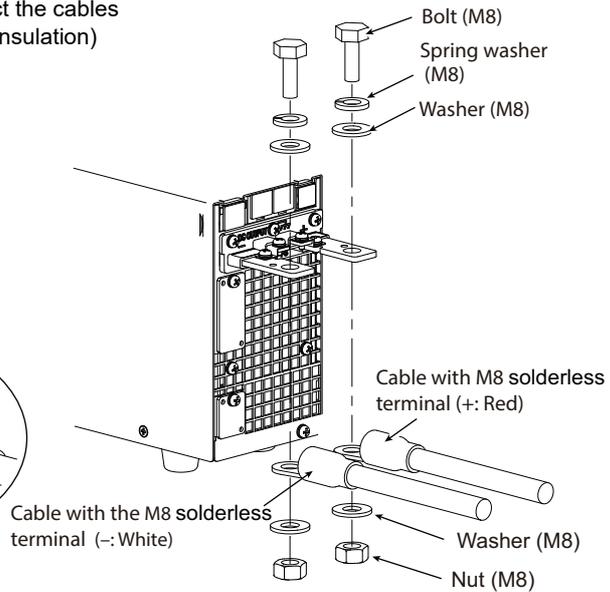
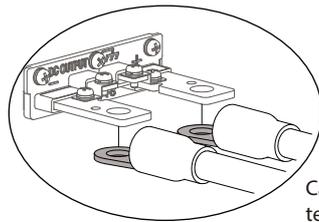
★ Memo

To prevent short circuits, this has been designed to operate in a completely floating condition.

Using the M8 bolt set to connect the cables
Cable diameter (including the insulation)
ø8 to ø17

Applicable models
L type, ML type

Bring the ring to the bottom side, and align to the bottom side of the output terminal.



Open PWR-01, PWR, PAS

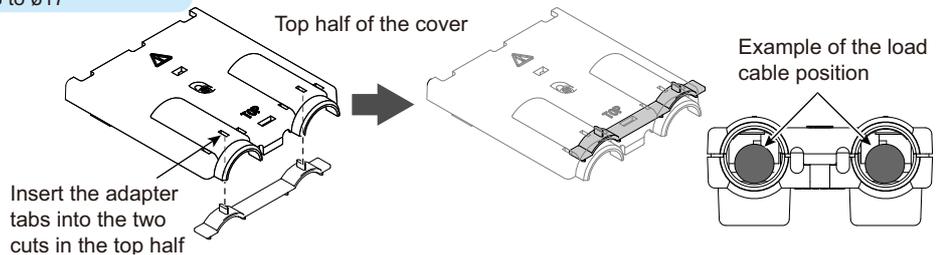
5 Attach an OUTPUT terminal cover to the DC power supply's output terminals. Attach the adapter to the top half of the OUTPUT terminal cover.

Insert the adapter tabs into the cuts in the OUTPUT terminal cover.

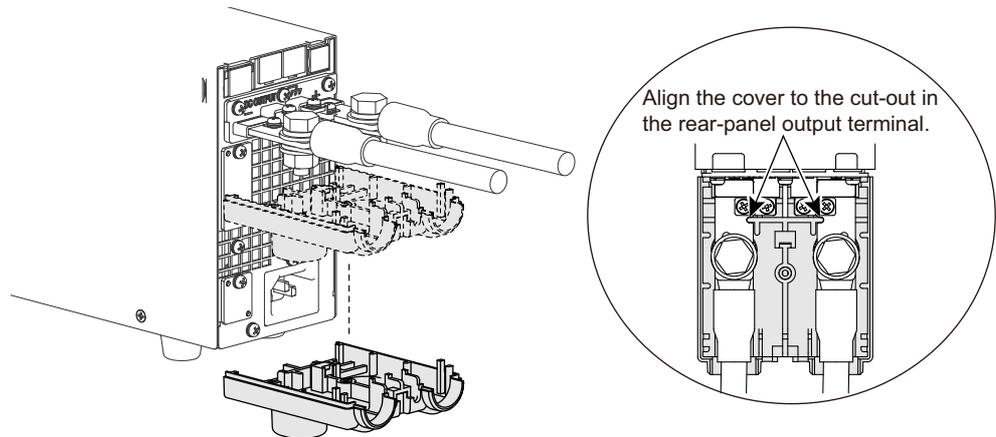
★ Memo

The top and bottom halves of the OUTPUT terminal cover have different shapes.

Cable diameter (including the insulation)
ø8 to ø17

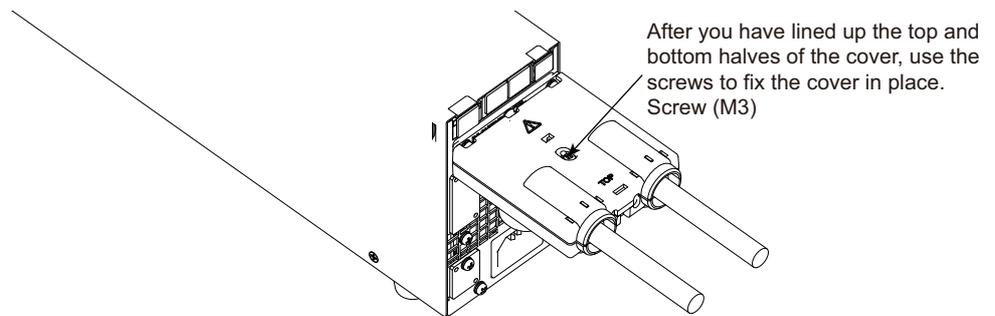


- 6** Align the bottom half of the OUTPUT terminal cover to the rear-panel output terminals.



- 7** Place the top half of the OUTPUT terminal cover over the bottom half, and screw them together.

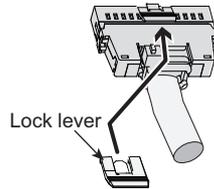
Make sure that the screws are securely fastened.



Connecting the DC Power Supply Control Cable

1 Attach the included lock lever to the SC07-PFX I/F cable for the PWR-01.

Attach it to the connector on the side with the ferrite core.
If the lock lever is not attached, the connector may come off.



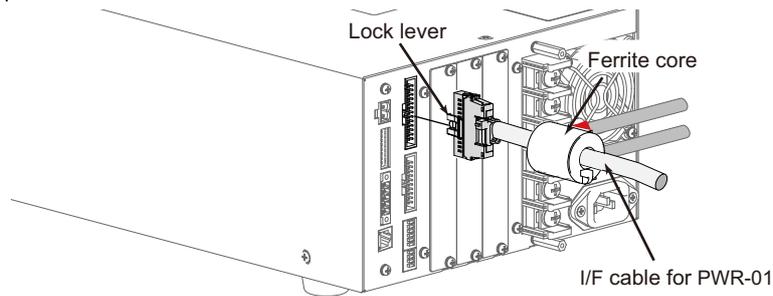
2 Confirm that the POWER switch of all connected equipments are turned off.

3 Insert the I/F cable SC07-PFX for PWR-01 into the DC POWER SUPPLY connector of the PFX2512.

Insert the end with a ferrite core into the PFX2512.
Insert it securely using the lock lever. Check that it does not fall out.

★ Memo

If you reverse the cable ends, it will not work.



4 Insert the other end of the I/F cable SC07-PFX for PWR-01 to the "J1" and "J2" connector on the DC POWER SUPPLY.

Insert it securely, and check that it does not fall out.

Connecting to the Electronic Load

See p. 25

Connect the PFX2512 to the Electronic load using the cable with the solderless terminal and the I/F cable.

This section explains an example of connecting a Kikusui PLZ-5W Electronic Load using the optional SC005-PFX I/F cable for the PLZ-5W.

The cable is not included. For wiring precautions and other items to be considered, see the electronic load operation manual.

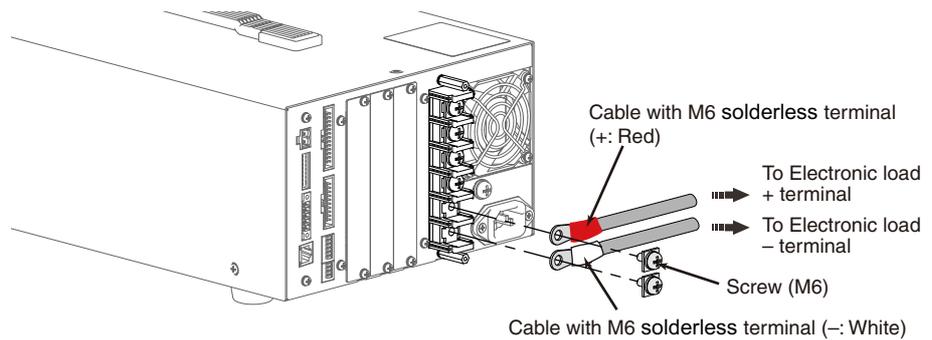
2

Connecting and Configuring Devices

Connecting the PFX2512 to an electronic load

- 1 Confirm that the POWER switch of all connected equipments are turned off.
- 2 Connect the cable with the solderless terminal to the DC EL + and the DC EL - on the input/output terminal of the PFX2512. The solderless terminal (M6) with a red cap is connected to the DC EL + terminal, and the solderless terminal (M6) with a white cap is connected to the DC EL - terminal.

Pull out the cable in horizontal angle and fix it by screws.

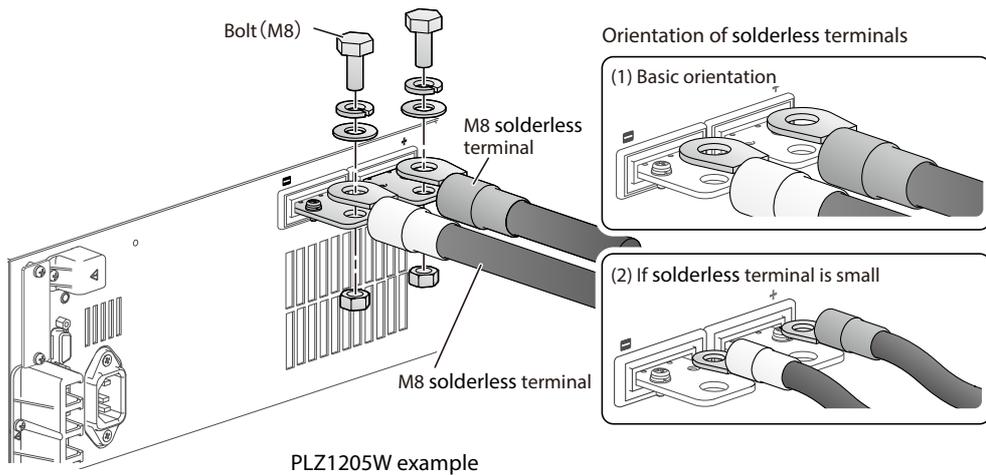


3 Connect the other end of the cable with the solderless terminal to the output terminal on the rear panel of the electronic load. The solderless terminal (M8) with a red cap is connected to the DC INPUT + terminal, and the solderless terminal (M8) with a white cap is connected to the DC INPUT -terminal.

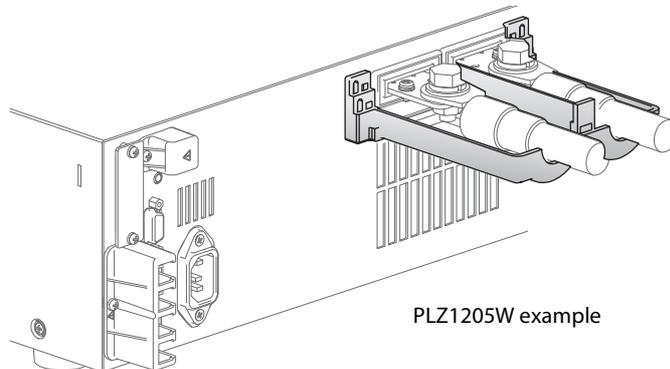
Use the M8 screw set included with the SC05-PFX I/F cable for the PLZ-5W to make the connections.

Connect the cables as perpendicular to the input terminals as possible.

To prevent interference with the cover for the load input terminals on the rear panel, basically connect the solderless terminals in orientation (1) in the figure. If the solderless terminals are small and cannot be connected in orientation (1), connect them in orientation (2).



4 Place the bottom half of the cover for the load input terminals on the rear panel underneath the cables connected to the load input terminals.

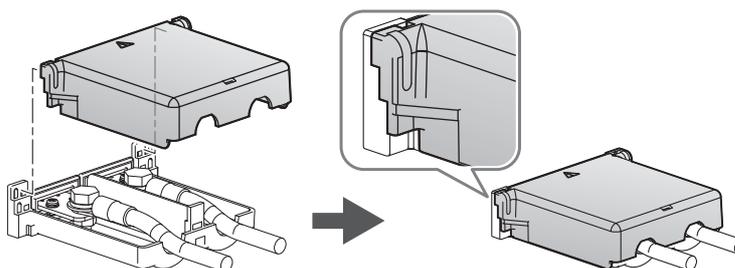


5 Align the tabs of the top cover for the load input terminals on the rear panel with those of the bottom cover.

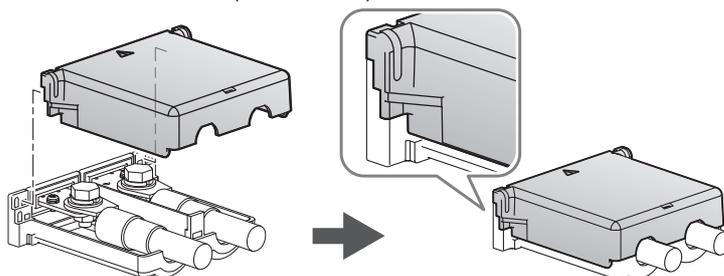
Align the tabs of the load input terminal cover according to the load cable diameter. You can adjust the diameter of the holes that the load cables pass through by changing the position that the top and bottom covers are put together. There are two available positions. Use the appropriate position for the load cables that you are using.

- For cables up to $\varnothing 10$ mm: Put the top and bottom load input terminal covers together so that the hole diameter is small.
- For cables that are between $\varnothing 10$ and 20 mm: Put the top and bottom load input terminal covers together so that the hole diameter is large.

For thin load cables (up to $\Phi 10$)

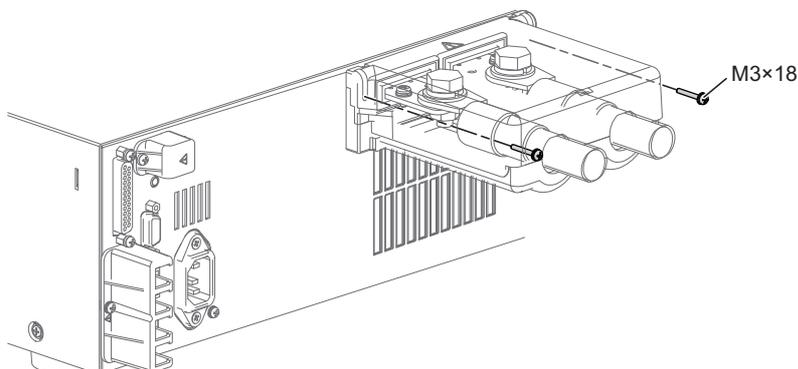


For thick load cables ($\Phi 10$ to $\Phi 20$)



6 Push the cover for the load input terminals on the rear panel against the panel, and fasten it with the included screws.

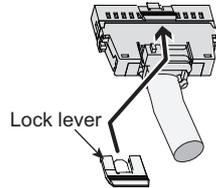
Make sure that the screws are securely fastened.



Connecting the electronic load control cable

1 Attach the lock lever to the I/F cable SC05-PFX for PLZ-5W.

Attach it to the connector on the side with the ferrite core.
If the lock lever is not attached, the connector may come off.



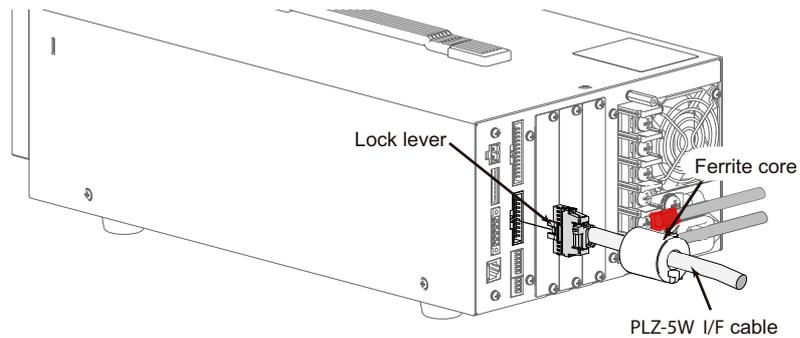
2 Confirm that the POWER switch of all connected equipments are turned off.

3 Insert the I/F cable SC05-PFX for PLZ-5W to the "DC ELECTRONIC LOAD" connector on the rear panel of PFX2512.

Insert the end with a ferrite core into the PFX2512.
Confirm that the lock lever is pulled down and it is firmly connected.

★ Memo

If you reverse the cable ends, it will not work.



4 Insert the other end of the I/F cable SC05-PFX for PLZ-5W to the "EXT CONT" connector on the PLZ-5W.

Insert it securely, and check that it does not fall out.

Preparing to Connect the DUT (Battery)

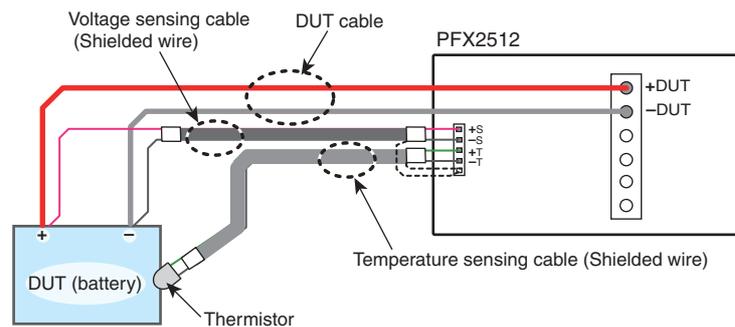
See p. 25、 p. 123

The PFX2512 does not come with cables for connecting to the DUT (battery). Prepare the following cables according to the DUT (battery).

There is an optional TL08-PFX cable that contains cables for connecting PFX2512 and the DUT (battery).

■ Cables and tools that are necessary to make the connection

Wire	• DUT cable (stranded wire)	Cable for running charge/discharge current between the PFX2512 and DUT (battery) See Table "Nominal cross-sectional area of wires and allowable currents (reference)" (p. 30)
	• Voltage sensing cable	Cable for sensing the electrode voltage of the DUT (battery) 0.20 mm ² (AWG24) to 0.52 mm ² (AWG20), shielded cable See "Constructing sensing cables" (p. 42)
	• Temperature sensing cable	Cable for sensing the temperature of the DUT (battery) 0.20 mm ² (AWG24) to 0.52 mm ² (AWG20), shielded cable See "Constructing sensing cables" (p. 42)
Flat-blade screwdriver	Shaft diameter: Ø3, blade tip width: 2.6 mm	
Wire stripper	A wire stripper that matches the wires listed above	

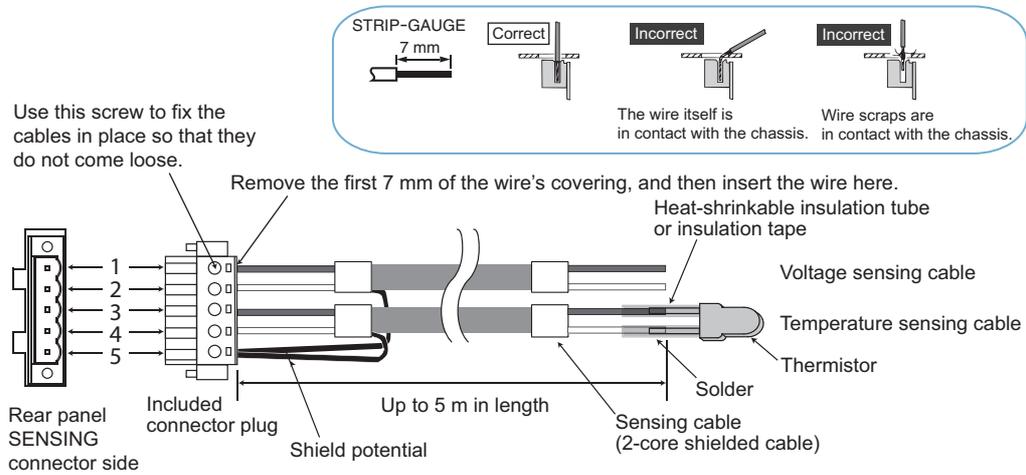


Example of the connecting configuration of the PFX2512 and the DUT (battery)

Constructing sensing cables

Pin no.	Symbol	Description
1	+S	Positive voltage terminal. Connect to the positive terminal of the DUT (battery).
2	-S	Negative voltage terminal. Connect to the negative terminal of the DUT (battery).
3	+T	Temperature measurement terminal. Connect the included thermistor.
4	-T	Temperature measurement terminal. Connect the included thermistor.
5	FG	Shield grounding terminal. This is connected to the PFX2512 chassis. Do not connect the shield electric potential anywhere on the DUT (battery).

1 Using AWG 24 to 20 (0.20 mm² to 0.52 mm²) cables, construct the following cable assembly.

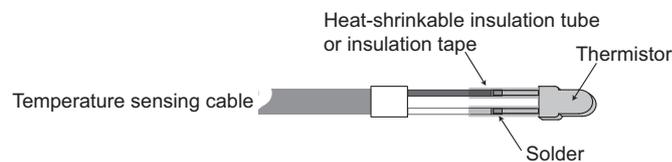


2 Solder the thermistor lead to the tip of the temperature sensing cable.

As a guideline, keep the soldering time for the included thermistor less than 7 seconds at no less than 5 mm from the lead root when the soldering iron (50 W) temperature is 340 °C.

The thermistor does not have polarities.

Be sure to insulate the thermistor lead area with heat-shrinkable insulation tube or the like.



Connecting the DUT (Battery)



Risk of electric shock.

- After connecting the devices, connect the PFX2512 to the DUT (battery). Connect the PFX2512 side first.
- When installing a fuse between the PFX2512 and DUT (battery), be sure to turn off the POWER switch, and turn off the circuit breaker of distribution.



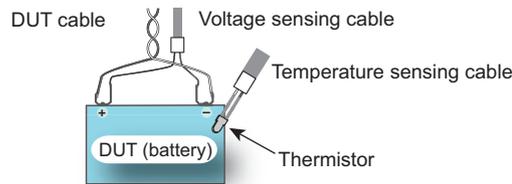
Be sure to connect the voltage sensing cable.

The system will not work properly if it is not connected. Moreover, make sure to connect the cable close to the DUT (battery). Performing a charge/discharge test without connecting the voltage sensing cable may damage the DUT (battery) and is extremely dangerous.

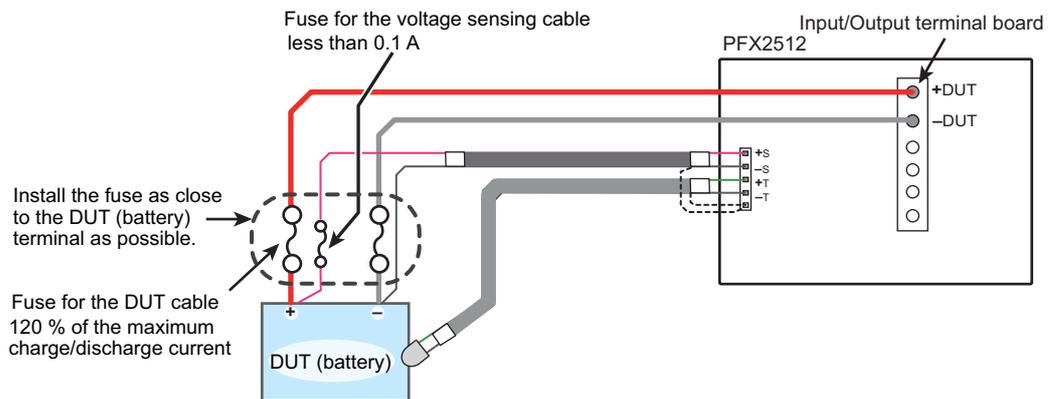


Connect the DUT (battery) after turning on the power switch.

If there is a problem, the warning function ([See](#) p. 70) can prevent failure from occurring.



We recommend that you install a fuse between the PFX2512 and DUT (battery) to allow safe connection between them and to prevent short-circuit accidents in DUT cables and voltage sensing cables. Insert the fuse as close to the DUT (battery) terminal section as possible.



Example for the installation of fuse between the PFX2512 and the DUT (battery)

- DUT cable fuse rating: 120 % of the maximum charge/discharge current
- Voltage sensing cable fuse rating: 0.1 A or less



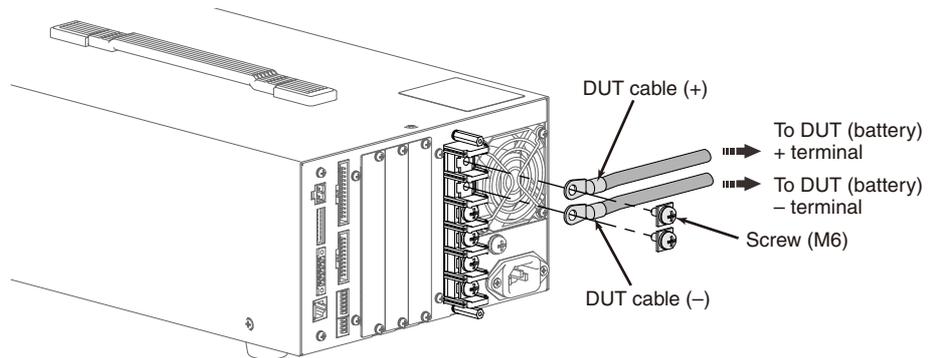
- A fuse blowing may lead to explosions or fire. Be sure to put a cover on the fuse.
- Use DC fuses that have sufficient breaking capacity.

Connecting the PFX2512 to the DUT (Battery)

- 1 Check that the PFX2512 is ready to execute tests (power-on state).**

You can connect or disconnect DUT cables and sensing connectors even when the power switch is on. But, make sure that a charge/discharge test is not in progress.
- 2 Connect DUT cables to the positive and negative DUT terminals of the input/output terminal board of the PFX2512.**

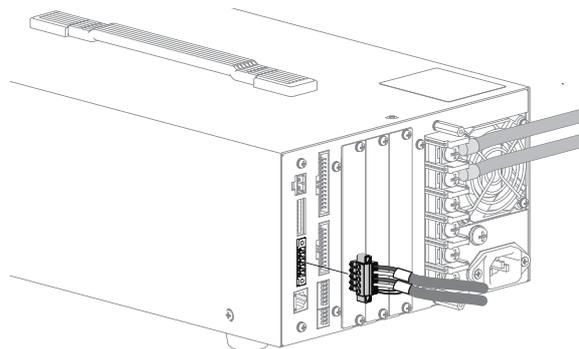
Connect the polarities according to the colors that you decided to use when creating the cables.
Run the cables out as horizontal as possible, and fix them in place with screws.



- 3 Connect the other end of the DUT cables to the DUT (battery).**

Connecting sensing cables

- 1 Insert the assembled sensing connector into the PFX2512 SENSING connector.**



- 2 Connect or attach a voltage sensing cable and thermistor to the DUT (battery).**

Configuring the Devices

Configuration procedure of devices

See p. 45

1 Set the channel numbers and vibration sensor using the S1 switch of the PFX2512.

See p. 47

2 Configure the DC power supply.
Set protection functions, external analog control, and panel lock.

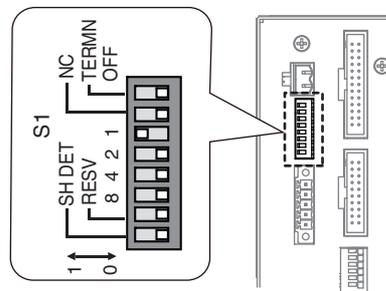
See p. 49

3 Configure the electronic load.
Configure the protection function, slew rate, external analog control, panel lock and if necessary, parallel operation.

Configuring the PFX2512

You can change the following settings using the S1 switch on the rear panel. If you change a setting, turn the PFX2512 off and then back on.

- Channel numbers
- Vibration sensor



Factory default switch position
Example of channel number 1

Signal name	Logic	Notes	Factory default
TERMN OFF ¹	Not used	Always set to zero	0
NC	Not used	Always set to zero	0
1	Set channel numbers (1 to 7). 0 is not allowed.	–	1
2		–	0
4		–	0
8		–	0
RESV	Not used	Always set to zero	0
SH DET	0: Vibration sensor off 1: Vibration sensor on	–	0

¹ TP-BUS connector is not used on the PFX2512.

Setting the channel numbers

To use the PFX2512, you need to set a unique number called channel number to identify the PFX2512 and also to set the IP address. If you are using only a single PFX2512, you do not need to set the channel number.

Tests can be performed under different conditions for each channel number.

Assign a unique number to each PFX2512.

Valid channel numbers	1 to 7
-----------------------	--------

Setting the vibration sensor

The PFX2512 has a built-in vibration sensor.

If set to on, when the PFX2512 detects large shaking (around magnitude 5 and higher) or shock during charge / discharge testing, a SHOCK DETECT alarm will be activated, and the output will be turned off. The vibration sensor sensitivity is fixed.

Set it before turning on the power.

To release the alarm caused by the vibration sensor, execute an alarm release command from BPChecker3000.

SH DET switch	Vibration sensor
0	Off (factory default setting)
1	On

NOTE

- The vibration sensor is designed not to respond to single shock (such as bumping), but it may abort a test due to vibration or shock other than earthquakes. Take this into consideration when you turn on the vibration sensor (set the switch to 1).
- If you want to set the vibration sensor to on (set the switch to 1), install the PFX2512 as upright as possible in a location without vibration or the like. If the installation is inappropriate, the SHOCK DETECT alarm may be activated preventing you from performing tests.

Configuring the DC Power Supply

 PWR-01, PWR, PAS

To protect the connected devices, set the protection function of the DC power supply. Enter the CONFIG settings to control from the PFX2512.

After configuration, we recommend that you lock the panel. This will prevent the settings from being changed accidentally.

DC power supply configuration procedure

You cannot reset the PAS to the factory default settings. Carry out the settings from step 2.

1 Initialize the DC power supply to its factory default settings.

PWR-01 : While holding down LOCAL and PWR DSPL, turn the POWER switch on

PWR : While holding down SHIFT, turn the POWER switch on

The contents in memory will also be cleared.

 p. 47

2 Configure the protection function.

Set the overvoltage protection (OVP) and overcurrent protection (OCP).

 p. 48

3 Configure external analog control.

Set the external voltage control and external control logic.

 p. 48

4 Enable the panel lock.

Set the lock function.

NOTE

- Even when the panel is locked, the output on / off operation is not locked. Note that if you turn on or off the output during a charge/discharge test, an alarm will occur, and the test will be aborted.
- No adjustment is necessary between connected devices.

Setting Protection Functions

If the PFX2512 is disconnected from the DUT (battery) as a result of a DUT protection circuit or fuse being activated during a charge/discharge test, high voltage may be generated temporarily depending on the connected power supply. Set the protection function to prevent excessive voltage from being applied to the DUT protection circuit.

Model	Overvoltage protection (OVP)	Overcurrent protection (OCP)
PWR-01	110 % of the maximum charge voltage	110 % of the maximum charge current
PWR	110 % of the maximum charge voltage	105 % of the maximum charge current
PAS	110 % of the maximum charge voltage	110 % of the maximum charge current



Test Condition Editor

To prevent overcharge or overdischarge, from BPChecker3000 set the software overvoltage (overcharge) protection (S_OVP), software undervoltage (overdischarge) protection (S_UVP), hardware overvoltage (overcharge) protection (H_OVP), and hardware undervoltage (overdischarge) protection (H_UVP).

See p. 70

If the DC power supply's OVP or OCP is activated during a charge/discharge test, PS/B alarm occurs on the PFX2512, and the output is turned off. Turn off the DC power supply, and eliminate the cause of the alarm. Then, turn on the DC power supply, and clear the alarm from BPChecker3000.

For details on the setup procedure, a description of the alarm that occurs when a protection function is activated, and how to clear the alarm, see the operation manual of the DC power supply that you are using.

Setting the external analog control

Set the item concerning the external analog control to the following condition by using the CONFIG setting.

PWR-01	CV control source: Control using an External voltage / External resistance (CF11: ON)
	CC control source: Control using an external voltage/ external resistance (CF10: ON)
	CV/ CC control range: HIGH range (CF12: HIGH)
	External control for turning output on/ off: External control (CF14: ON)
	External control logic of the output on/off: Turn the output on with a Low signal (CF15: LOW)
PWR	CV control source: External voltage control (C-1: 1)
	CC control source: External voltage control (C-2: 1)
	External control logic of the output on/off: Turn the output on with a Low signal (C-6: 1)
PAS	CV control source: External voltage control (DIGIT A: 1)
	CC control source: External voltage control (DIGIT B: 1)
	External control logic of the output on/off: Turn the output on with a Low signal (DIGIT F: 1)

For details on the setup procedure, see the operation manual of the DC power supply that you are using.

Setting the Lock Function

Set the lock function to prevent settings from being changed.

PWR-01	Hold down LOCK (SHIFT+PWR DSPL) to lock or unlock. The LOCK LED is lit while the keys are locked
PWR	Hold down LOCK to lock or unlock. The LOCK switch is lit while the panel lock is enabled
PAS	Hold down LOCK to lock or unlock. The LOCK switch is lit while the panel lock is enabled

Configuring the Electronic Load

To protect the connected devices, set the protection function of the electronic load. Configure external analog control to enable the electronic load to be controlled from the PFX2512. When the Electronic load is connected in parallel operation, assign the master unit and the slave unit.

 PLZ-5W, PLZ-4W

After configuration, we recommend that you lock the panel. This will prevent the settings from being changed accidentally.

Electronic load configuration procedure

1 Initialize the Electronic load to its factory default settings.

PLZ-5W : Press **SYSTEM > Admin > Sanitize > Execute** to show a confirmation screen. Select **OK**, and press **ENTER**

PLZ-4W : While holding down **ENTER**, turn the **POWER** switch on

The contents in memory will also be cleared.

 p. 50

2 Configure the protection function.

Set the overcurrent protection (OCP).

 p. 50

3 Set the slew rate.

Set the slew rate value.

 p. 50

4 Configure external analog control.

Set the external voltage control, response, load on / off logic, and EXT CONT.

 p. 52

5 When the PLZ-4W series is connected in parallel, assign the master unit and the slave unit.

 p. 52

6 Enable the panel lock.

Set the lock function.

NOTE

- Even when the panel is locked, the load on / off operation is not locked. Note that if you turn on or off the load during a charge / discharge test, it could destroy the test data.
- No adjustment is necessary between connected devices.

Setting Protection Functions

Configure the protection function.

PLZ-5W	Set to 110 % of the maximum discharge current for overcurrent protection value (OCP).
PLZ-4W	Set to 105 % of the maximum discharge current for overcurrent protection value (OCP).

See p. 70

If the Electronic load OCP or other alarm is activated during a charge / discharge test, CD/B alarm occurs on the PFX2512, and the load is turned off. Press ENTER on the Electronic load and eliminate the cause of the alarm. Then, clear the alarm from BPChecker3000.

For details on the setup procedure, a description of the alarm that occurs when a protection function is activated, and how to clear the alarm, see the operation manual of the electronic load that you are using.

Setting the Slew Rate

Configure the slew rate.

PLZ-5W	Press SOURCE > Level > Slew Rate, and then use the numeric keypad or the rotary knob to set the maximum value
PLZ-4W	Press SLEW RATE, and then use the rotary knob to set the maximum value

Configuring External Analog Control

■ Configuring the PLZ-5W

1 Use the Menu key.

- CC/ CR/ CC control
SOURCE > MORE > External Control > CC/ CR/ CC > Edit : Enable
- Load on/ off control
SOURCE > MORE > External Control > Input Logic > Edit : Negative

Specifying the master unit and slave units of the parallel operation

On the PLZ-5W, the master unit, slave units, and the number of units are automatically set according to the connection status.

On the PLZ-4W, follow the procedure below.

1 By the setting menu concerning to the master slave parallel operation, set the following conditions respectively.

•Master unit: Menu > Configuration > Master/Slave > Operation : Master

•Slave unit: Menu > Configuration > Master/Slave > Operation : Slave

2 On the master unit, specify the connecting number of slave units.

•Two units: Menu > Configuration > Master/Slave > Parallel : 2

For details on the setup procedure, see the operation manual of the electronic load that you are using.

Setting the Lock Function

Set the lock function.

PLZ-5W	Hold down KEY LOCK to lock or unlock. While the keys are locked, a key icon is shown in the upper right of the display according to the key lock level.
PLZ-4W	Hold down LOCK (SHIFT+LOCAL) to lock or unlock the panel. While the panel is locked, a key icon is shown in the display.

For details on the setup procedure, see the operation manual of the electronic load that you are using.



3

PC Connection and Hardware Configuration

This chapter explains hardware configuration using application software BPChecker3000 for connecting to a PC and performing charge / discharge tests.

Connecting to a PC

PFX2512 is controlled using application software BPChecker3000.
PFX2512 is connected to a PC through the LAN interface and assigned an IP address.

The following three connection methods are available.

The LAN cable can be a straight cable or a crossover cable.

PFX2512 connections	IP address setting	Necessary cable and device	Features
1	Fixed IP address	<ul style="list-style-type: none"> LAN cable 	Connecting the devices is easy.
1 to 7	Automatic IP address assignment	<ul style="list-style-type: none"> LAN cable Wired router 	Multiple PFX2512s can easily be connected.
	Fixed IP address	<ul style="list-style-type: none"> LAN cable Switching hub 	This method is useful when you want to use specific IP addresses or when there will be no changes to the system.

Assigning the IP address automatically (connecting through a router)

If you connect through a router that has a DHCP server feature, the IP address is assigned automatically.

If you are using several PFX2512s, be sure to set the channel numbers before connecting them.

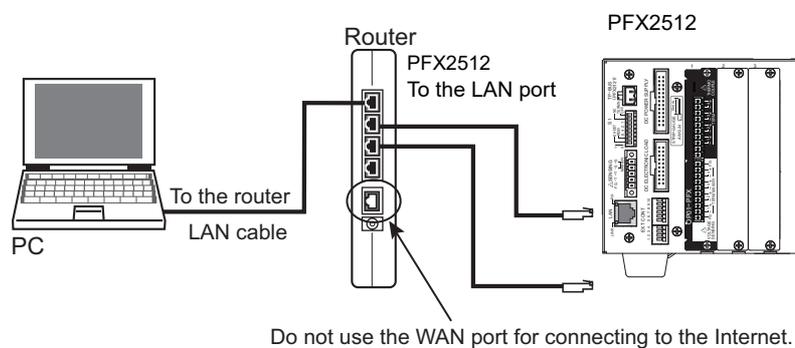
See p. 46

Recommended routers

Model	Manufacturer	Number of ports	Note
BBR-4MG	BUFFALO INC.	4	100BASE-TX
MR-OPT100E	Micro Research Ltd.	4	100BASE-TX

Connection

Use standard LAN cables to connect to the router.

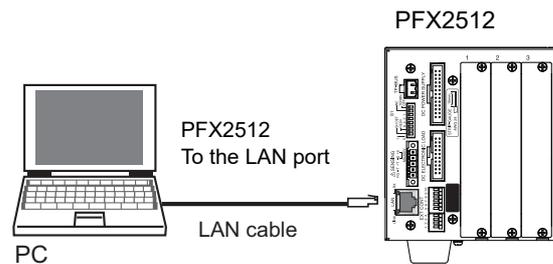


Using a fixed IP address (connecting directly or through a switching hub)

If the IP address is already decided, you can connect using a fixed IP address.
You can connect directly (a single unit) or connect through a switching hub (multiple units).

Connecting directly to a PC (only when using a single unit)

If you will use only a single unit, use a LAN cable to connect it to the PC.



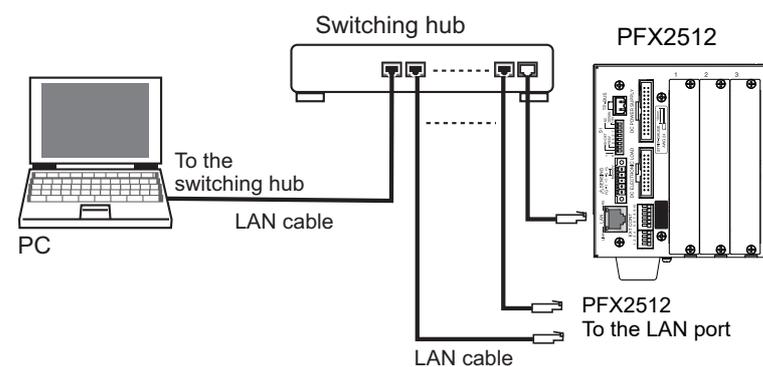
Connecting units through a switching hub (when using multiple units)

If you will use multiple units, use LAN cables to connect them to the PC through a switching hub. Be sure to set the channel numbers with the S1 switch on the rear panel before connecting them.

See p. 46

Recommended switching hubs

Model	Manufacturer	Number of ports	Note
LSW4-TX-5NS/WHD	BUFFALO INC.	5	Internal power supply type Can be mounted on a surface with magnets
ETX-ESH16NC	I-O DATA DEVICE, INC.	16	Internal power supply type; metal case Can be mounted on a 19-inch rack



Assigning IP Addresses

Assigning an IP address to the PC

You can automatically assign an IP address to the PC or assign a fixed address.

Automatic IP address assignment (connecting through a router)

- 1** Windows 7
Open the Control Panel, and then View network status and tasks under Network and Internet.
Windows 8
In the Control Panel, double-click System and then Network and Sharing Center.
- 2** Windows 7
Click the Local Area Connection property.
Windows 8
Click the Ethernet Status property.
- 3** **Select the Internet Protocol Version 4 (TCP / IPv4) check box, and then click Properties.**
- 4** **Click Obtain an IP address automatically.**

Assigning a fixed IP address (connecting through a switching hub)

You have to set the IP address and subnet mask on the PC that you are using to values that match the IP address range of the PFX2512. If the PC's IP address and subnet mask are not set correctly, you will not be able to connect to the PFX2512.

In the factory default settings, a value in the range of 192.168.1.101 to 192.168.1.107 is assigned to the PFX2512 address. The lowest digit of the IP address varies depending on the channel number of the PFX2512.

Example: If the channel number is 1, the IP address is 192.168.1.101.

- 1** Windows 7
Open the Control Panel, and then View network status and tasks under Network and Internet.
Windows 8
In the Control Panel, double-click System and then Network and Sharing Center.
- 2** Windows 7
Click the Local Area Connection property.
Windows 8
Click the Ethernet Status property.

3 Select the Internet Protocol Version 4 (TCP / IPv4) check box, and then click Properties.

4 Click Use the following IP address.

5 Enter the IP address and subnet mask.

If you want to connect to a PFX2512 that has the factory default IP address, set the IP address to 192.168.1.10 and the subnet mask to 255.255.255.0.

Assigning PFX2512 IP addresses

To use a fixed IP address (when connecting through a switching hub or when connecting directly), set the PFX2512 IP addresses using IO Config of BPChecker3000.

If you are using automatic IP address assignment (connecting through a router), you do not have to set this address.

In the factory default settings, a value in the range of 192.168.1.101 to 192.168.1.107 is assigned to the PFX2512 address. Duplicate IP addresses cannot be used.

For details, see the help file for IO Config of BPChecker3000.

1 Turn on the switching hub, PC, and then the PFX2512.

2 Start IO Config.

3 Click the channel selection search button, check that the PFX2512 you want to configure is displayed, and then click Connect.

If it is not displayed correctly, it may not be connected correctly, or the channel number may be overlapping.

4 Select the channel you want to configure, and open the IP address tab. Enter the IP address, subnet mask, and default gateway.

Specify an IP address that is not being used by another device.

5 On the IP address tab, click Send.

The IP address is sent to the selected PFX2512.

IP address assignment is complete.

6 If you have other channels you want to use, repeat step 4 to step 5.

7 When you finish configuring all the channels, turn the PFX2512 off and then back on.

 p. 58

To verify whether the IP address has been set correctly, check using the PFX2512 panel.

Checking the IP address

The indication on the display varies depending on how the IP address is assigned.

★ Memo

If you do not turn the router on first, the IP address may not be obtained automatically.

1 Turn on the router or switching hub, PC, and then the PFX2512.

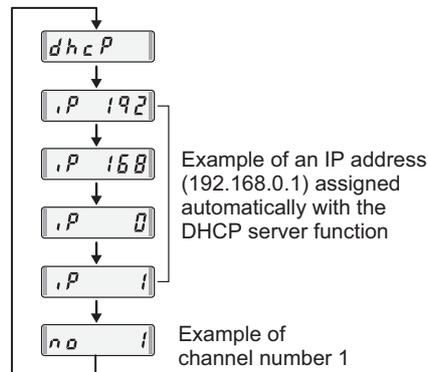
The voltage display appears on the PFX2512.

2 Using the SELECT key, switch the display until the ADDRESS LED on the panel lights.

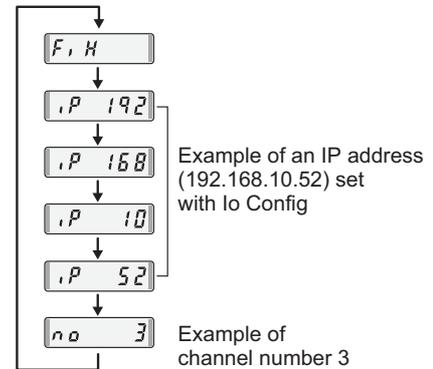
The displays IP address information in the following order: [d h c P] or [F, H], IP address, and then channel number.

This sequence is repeatedly displayed until you press SELECT.

Operation with an automatically assigned IP address



Operation with a fixed IP address



If the settings are displayed in the order explained above, the connection is complete.

If the settings are not displayed correctly when the IP address is obtained automatically, check whether the router is configured as shown below.

DHCP server feature	Enabled
---------------------	---------

Setting the Model ID

See p. 19

Set the model ID, which identifies the combination of DC power supply and electronic load that are connected to the PFX2512, in the PFX2512.

model ID	DC power supply	Electronic Load	Maximum charge power ¹	Maximum discharge power
7101 ²	PWR800L	PLZ1004W (H range)	800 W	1 000 W
7102	PWR800L	PLZ1004W (M range)	800 W	1 000 W
7103	PWR1600L	PLZ1004W (2 in parallel)	1 600 W	2 000 W
7104	PWR800L	PLZ334W (H range)	800 W	330 W
7105 ³	PAT60-67T	PLZ1004W+PLZ2004WB (M range)	3 000 W	3 000 W
7106	PWR1600L	PLZ1004W (H range)	1 600 W	1 000 W
7107	PAS10-70	PLZ1004W (H range)	700 W	1 000 W
7108	PAS20-36	PLZ1004W (H range)	720 W	1 000 W
7109	PAS20-54	PLZ1004W (H range)	1 080 W	1 000 W
7110	PAS40-27	PLZ1004W (H range)	1 080 W	1 000 W
7111	PWR800L	PLZ164W (H range)	800 W	165 W
7112	PAS10-35	PLZ334W (H range)	350 W	330 W
7113	PWR400L	PLZ164W/ PLZ164WA (H range)	400 W	165 W
7114	PWR400L	PLZ1004W (H range)	400 W	1 000 W
7115	PWR800L	PLZ1004W+PLZ2004WB (M range)	800 W	3 000 W
7116	PAS20-36	PLZ334W (H range)	720 W	330 W
7118	PWR800L	PLZ664WA (H range)	800 W	660 W
7119	PWR1600L	PLZ1004W+PLZ2004WB (M range)	1 600 W	3 000 W
7121	PWR400L	PLZ334W (H range)	400 W	330 W
7122	PAS60-12	PLZ664WA (H range)	720 W	660 W
7123	PWR400L	PLZ664WA (H range)	400 W	660 W
7124	PAS40-9	PLZ1004W (H range)	360 W	1 000 W
7125	PWR1600L	PLZ664WA (H range)	1 600 W	660 W
7126	PWR801L	PLZ1004W (H range)	800 W	1 000 W
7127	PWR801ML	PLZ1004W (H range)	800 W	1 000 W
7128	PWR1201L	PLZ1004W (H range)	1 200 W	1 000 W
7151	PWR401L	PLZ205W (H range)	400 W	200 W
7152	PWR401ML	PLZ205W (H range)	400 W	200 W
7153	PWR401L	PLZ405W (H range)	400 W	400 W
7154	PWR401ML	PLZ405W (H range)	400 W	400 W
7155	PWR801L	PLZ1205W (H range)	800 W	1 200 W
7156	PWR801ML	PLZ1205W (H range)	800 W	1 200 W
7157	PWR1201L	PLZ1205W (H range)	1 200 W	1 200 W
7158	PWR1201ML	PLZ1205W (H range)	1 200 W	1 200 W
7159	PWR1201ML	PLZ1205W+PLZ1205W (H range)	1 200 W	2 400 W
7160	PWR1201ML	PLZ1205W+PLZ2405WB (M range)	1 200 W	3 000 W

- 1 It may not be possible to use up to the power specified here due to loss in cables. ([See](#) p. 21)
- 2 Factory default settings
- 3 A separate cable is required. For details, contact your Kikusui agent or distributor.

NOTE

If the combination and the selected model ID do not match, you will not be able to execute charge / discharge tests. Be careful when setting the model ID.

Set the model ID using IO Config of BPChecker3000.
For details, see the help file for IO Config of BPChecker3000.

- 1 Turn on the router or switching hub, PC, and then the PFX2512.**
- 2 Start IO Config.**
- 3 Click the channel selection search button, check that the PFX2512 you want to configure is displayed, and then click Connect.**
If a different channel is displayed, select the appropriate channel.
- 4 On the Model ID tab, click Select.**
The Setting of Model ID dialog box appears.
- 5 Select the check boxes for the DC power supply and electronic load to use.**
The available model IDs are displayed.
- 6 Select the model ID you want to use, and click OK.**
The Setting of Model ID dialog box closes, and the model ID is displayed.
- 7 Click Send.**
The model ID is sent to the selected PFX2512. Setting of the model ID is complete.
You can check whether the ID has been assigned correctly by clicking Search under Select Ch.

Configuring Temperature Chambers

If you want to use temperature chambers, use IO Config of BPChecker3000 to set the temperature chamber driver, VISA resource, and the number of temperature chambers.

To use temperature chambers, a VISA library must be installed in your PC.

For details, see the help file for IO Config of BPChecker3000.

- 1 Turn on the router or switching hub, PC, and then the PFX2512.**
- 2 Start IO Config.**
- 3 Click the channel selection search button, check that the PFX2512 you want to configure is displayed, and then click Connect.**

If a different channel is displayed, select the appropriate channel.
- 4 From the Driver list, select the temperature chamber driver.**
- 5 From the VISA list, select the VISA resource.**

If you are using RS232C to communicate, specify the serial port COM number.
(Example) For serial port COM1, select ASRL1::INSTR.
- 6 From the MAX Ch list, select the number of temperature chambers.**

You can connect up to seven temperature chambers.
The temperature chamber configuration is complete.



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4

Panel Operation and Protection Function

This chapter explains how to turn on the power and how to select displays; provides an overview of external control and monitoring; and describes the protection function and warning function.

Turning the Power On and Off

There is no specific order that you need to turn on the system components, namely the PFX2512, DC power supplies, electronic loads, and other peripheral devices.

Ensure safety before turning the power on or off.

Turning the POWER switch on

NOTE

Turn on the POWER switches before connecting the DUT (battery).

If there is a problem, the warning function ([See](#) p. 70) may be able to prevent failure from occurring.

1 Check that the power cords and cables of each device are correctly connected.

2 Turn on the POWER switches of the DC power supplies and electronic loads.

Check that the protection function and external analog control of each device are configured properly. If several electronic loads are connected in parallel, specify the master unit and slave units.

3 Press the POWER switch on the front panel of the PFX2512 to turn it on (I).

4 Check the firmware version on the display.

All the LED on the front panel light for a few seconds, and then only the POWER/STANDBY LED remains lit.

The display shows the firmware version for a few seconds and then the channel number for another few seconds. Finally, the display enters voltage display mode.

The PFX2512 is ready to execute tests (POWER state) and can receive commands from BPChecker3000.



Example of model ID 7101

↓ A few seconds later



Example of firmware version 1.00

↓ A few seconds later



Example of channel number 1

[See](#) p. 47 , p. 49

[See](#) p. 19

If the POWER switch is turned on for the first time after purchase, the PFX2512 starts up using factory default settings.

[See](#) p. 68 , p. 135

If the ALARM/WARNING LED is lit, an alarm or protection function may be activated.

Turning off the POWER switch

CAUTION

Risk of malfunction.

- After you turn the PFX2512 POWER switch off, wait at least 10 seconds before you turn it back on. Do not turn the power on and off repeatedly.
- Do not turn off the POWER switch while a charge/discharge test is in progress.
- Do not leave the DUT connected after you turn off the PFX2512 POWER switch. If left in this condition for a long period, the PFX2512 may malfunction, or the DUT (battery) may discharge.

NOTE

Remove the DUT (battery) before turning off the POWER switch.

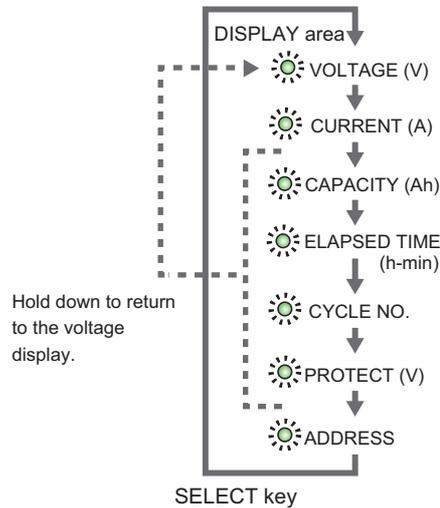
The protection function ([See](#) p. 68) may be able to prevent failure from occurring, such as when inadvertent voltage or current is flowing.

- 1 Stop the test from BPChecker3000, and check that current is not flowing through the DUT (battery).**
- 2 Remove the DUT (battery).**
- 3 Turn on the POWER switches of the DC power supplies and electronic loads.**
- 4 Turn off the PFX2512 POWER switch.**

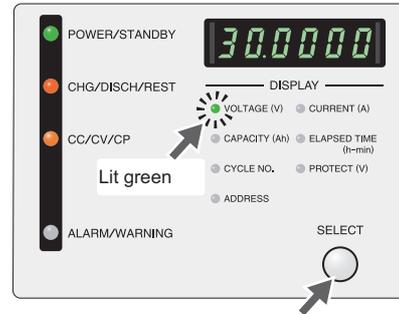
It is also possible to turn on and off all the devices simultaneously by using a rack mount system option or the like. For details on options, contact your Kikusui agent or distributor.

Selecting the Display

You can use the SELECT key on the front panel to select the value to show on the display. The display switches in the following manner each time you press SELECT. When you turn the power off and then back on, the display returns to show the voltage.



Example of voltage display selection



The display switches every time you press SELECT, and the LED for the displayed item lights green. You can return to the voltage display from any display by holding down the key.

Panel display	Display details
VOLTAGE (V)	Voltage.
CURRENT (A)	Current.
CAPACITY (Ah)	DUT (battery) capacity
ELAPSED TIME (h-min)	Elapsed time of the running cycle
CYCLE NO.	The display blinks during a test cycle or predischage.
PROTECT (V)	Displays the H_OVP and H_UVP preset voltages alternately
ADDRESS	Displays, in order, the connection method, IP address, and channel number of the LAN interface

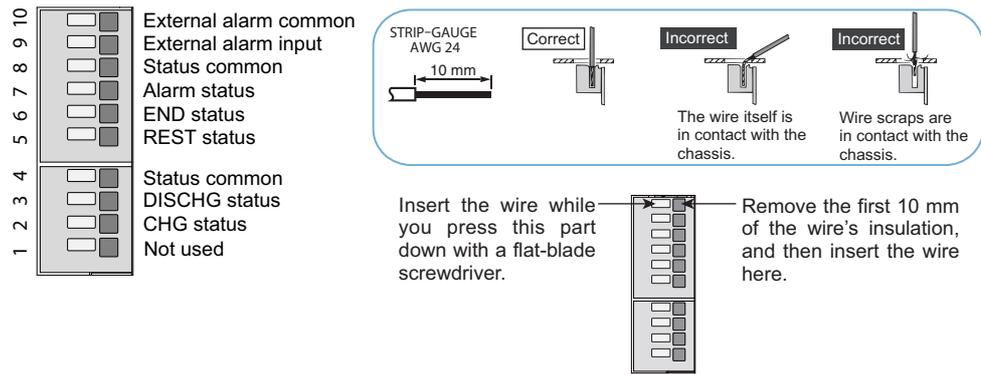
Overview of External Control

In addition to controlling the PFX2512 from the front panel, the EXT CONT terminal on the rear panel can be used to perform the following controls.

- External monitoring of the operating status
- Alarm input using an external contact

The maximum ratings for each signal terminal are as follows:

- Maximum voltage: 30 V
- Maximum current (sink): 8 mA



External monitoring of the operating status

Status outputs for monitoring the operating status using external contact are available. The outputs are open collector outputs of photocouplers; they are isolated from the internal circuits of the PFX2512.

The photocoupler isolation circuit of the status output has a 80 Vdc withstand voltage.

Alarm input using an external contact (ALM IN)

The PFX2512 output can be shut off through external contact.

To apply an alarm signal, short the contact switch for at least 0.5 s.

Pin no.	Signal	Description	Circuit
10	External alarm common	A common for external alarm.	
9	External alarm input	Apply a low level signal to abort test execution. ¹ This is pulled up to +5 V by 5.1 kΩ.	
8	Status common	A common for the status. ²	
7	Alarm status	This is set to low level when an alarm is activated. Open collector output	
6	END status	This is set to low level when the test ends. Open collector output	
5	REST status	This is set to low level when in rest mode. Open collector output	
4	Status common	A common for the status. ²	
3	DISCHG status	This is set to low level during discharge. Open collector output	
2	CHG status	This is set to low level during charge. Open collector output	
1	Not used	Do not connect anything to this pin.	

1 Shorting this pin with the external alarm common causes the PFX2512 to enter external alarm mode and the test to be aborted.
 2 Status common pins 4 and 8 are at the same electric potential.



The external alarm input and external alarm common are at the same electric potential as the internal circuit. Be sure to connect a circuit isolated from other electric potentials, such as a contact switch or photocoupler output. Improper connection can destroy the internal circuit.

Protection Function and Warning Function

If a protection function is activated during a test, the ALARM/WARNING LED lights red, and the test is aborted.

The warning function is activated when a test is not being executed. In this case, the ALARM / WARNING LED lights orange. You cannot start a test in this condition.

In case of emergency, you can immediately stop all charge / discharge tests.

See p. 139

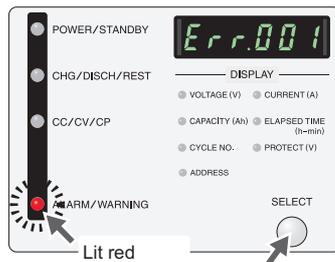
If a charge/discharge test is suddenly aborted due to a power outage or other reason, you may be able to resume the test. Depending on the condition, restoring the test may not be possible.

For details on the setup and handling of the protection function, restarting of tests, emergency stop, and so on, see the help file for Test Executive of BPChecker3000.

Alarm occurrence

Help
Test Condition Editor
Test Executive

Example of alarm indication for wiring error detection



Press to return to the normal display for about 10 seconds.

PFX2512 has the following protection function.

If an alarm is received, an error is detected, or a protection function is activated, the ALARM/WARNING LED lights red, and an error number is shown in the front panel display. When an error number is displayed, pressing SELECT will return the display to normal for about 10 seconds, but after that, the error number is displayed again.

Normal display returns when you release the alarm.

To the PFX2512 and the connected devices, we recommend that you set the voltage protection functions.

An error in the two hundreds (Err. 2xx) indicates an internal error. It can be caused by power supply line or communication noise. Restart the PFX2512 and BPChecker3000 to see if the error clears. If such errors occur frequently, check the error number, and contact your Kikusui agent or distributor.

Setting: "PFX" indicates that it is set on the PFX2512. "BPC" indicates that it is set with BPChecker3000. "Fixed" indicates that it is always detected.

Panel display	Cause of alarm and description		See	Behavior	Setting	
 Err.001	Conn	Wiring error detection, DUT connection error	<i>p. 129</i>	ALARM LED on	BPC	
 Err.002	S_OVP	Software overvoltage (overcharge) protection ^{1 2}	<i>p. 137</i>	ALARM LED on Output off	BPC	
 Err.003	S_UVP	Software undervoltage (overdischarge) protection ^{1 2}	<i>p. 137</i>		BPC	
 Err.004	S_OCP	Software overcurrent protection ²	—		BPC	
 Err.005	OTP	Overheat/DUT (battery) overheat protection	—		BPC	
 Err.006	OAH	Overcharge, overcharge capacity, overdischarge capacity protection	—		BPC	
 Err.007	Comm	Communication error detection, command alarm error	<i>p. 137</i>		ALARM LED on	Fixed
 Err.008	AC_OFF	AC line error detection, power supply line alarm	<i>p. 137</i>	Alarm LED on Output off	Fixed	
 Err.009	H_OVP	Hardware overvoltage (overcharge) protection ¹	<i>p. 137</i>		BPC	
 Err.010	H_UVP	Hardware undervoltage (overdischarge) protection ¹	<i>p. 137</i>		BPC	
 Err.011	H_OCP	Hardware overcurrent protection	—		Fixed	
 Err.012	OHP	PFX2512 Overheat protection	<i>p. 137</i>		Fixed	
 Err.013	Shock_Det.	Vibration alarm	<i>p. 46</i>		PFX	
 Err.014	EXT_ALM	External trigger alarm	—		Fixed	
 Err.050	CD/B	PLZ_ALM	Electronic load alarm		<i>p. 138</i>	Fixed
 Err.051		PLZ_CONT	Electronic load's excessive control voltage		<i>p. 138</i>	Fixed
 Err.060	PS/B	PS_ALM	Power supply alarm		<i>p. 138</i>	Fixed
 Err.061		PS_CONT	Power supply's excessive control voltage		<i>p. 138</i>	Fixed
 Err.062		PS_OFF	No power input on the power supply (POWER off state)		—	Fixed
 Err.063		PS_Init	Initial charge current undetected alarm		<i>p. 138</i>	Fixed
 Err.100		Cell_S_OVP	Cell software overvoltage (overcharge) protection ¹		—	BPC
 Err.101	Cell_S_UVP	Cell software undervoltage (overdischarge) protection ¹	—	BPC		
 Err.102	Cell_BALANCE_V	Cell unbalanced voltage detection	<i>p. 130</i>	BPC		
 Err.103	OP_Comm	Option board communication error detection	—	Fixed		
 Err.104	Cell_OTP	Cell overheat/DUT (battery) overheat protection	—	BPC		
 Err.105	SLComm	SL01-PFX communication error detection	<i>p. 138</i>	Fixed		
 Err.108	IP Conflict	LAN communication circuit IP address collision detection	<i>p. 138</i>	Alarm LED on	Fixed	

1 Voltage protection function

2 A delay can be set for software protection functions (activation delay).

Clearing alarms



Test Condition Editor
Test Executive

You can check the displayed error number and eliminate the cause of the alarm, and then clear the alarm from BPChecker3000.

If an alarm still occurs even after you have corrected all the causes of alarms, the PCR-LE Series may be malfunctioning. Stop using the PFX2512 immediately, and contact your Kikusui agent or distributor.

Warning occurrences

Example of warning indication,
30 V voltage display



PFX2512 has the following warning function.

If there is a possibility of a protection function being activated during test execution, a warning occurs before the execution (during the idle state). The ALARM/WARNING LED lights orange. The front panel display does not change from what is shown before the warning occurs.

You cannot start a test when a warning occurs.

Setting: "PFX" indicates that it is set on the PFX2512. "Fixed" indicates that it is always detected.

Panel display	Cause of warning and description		Behavior	Setting
No change from before the occurrence	Idle (SH Detect Warning)	Inappropriate installation. The main unit is not installed horizontally or is installed in a location where vibration or the like is occurring. Activated only when the vibration sensor is set to on (See p. 46).	Warning LED on Test conditions cannot be entered. Tests cannot be started.	PFX
	Idle (Protection Warning)	DUT (battery) voltage is in the H_OVP or H_UVP activation range.		Fixed
	Idle (OHP Warning)	PFX2512 Overheat protection (OHP) is activated. Increased internal circuit temperature is persisting. (The cause of OHP activation has not been eliminated.)		Fixed

Clearing warnings

Remove the root cause of the warning.

If the warning still occurs even after you have corrected all the causes of the warnings, the PFX2512 may be malfunctioning. Stop using the PFX2512 immediately, and contact your Kikusui agent or distributor.



5

Specifications

This chapter provides the PFX2512's specifications and outline drawing.

PFX2512 Functional Specifications

- Static: General term to indicate CC charge, CC - CV charge, CC discharge, CC - CV discharge, CP discharge, and CP - CV discharge
- Pattern: General term to indicate pattern charge/discharge and I-V characteristics charge/discharge

Charge function

Static		
Constant voltage-constant current charge CC - CV	Setting	Constant current value (Current)
		Constant voltage value (CV Voltage)
		Constant cell voltage value (Cell CV Voltage) ¹
	Cutoff condition	Specified time after charge start (Charge Time)
		Battery temperature (Max Temp)
		Specified time after starting constant voltage operation (CV Time)
		Specified current after starting constant voltage operation (It Current)
	Rest	Specified time after current falls below It Current (It Time)
		Specified time after charge end (Rest Time)
	Constant current charge CC	Setting
Rest completion condition of the battery temperature (Rest Temp)		
Cutoff condition		Specified time after charge start (Charge Time)
		Battery voltage (Max Voltage)
		Battery voltage drop (-dV)
		Battery temperature (Max Temp)
Rest		Temperature rise per unit time (dT/dt)
		Specified time after charge end (Rest Time)
Rest	Rest completion condition of the battery temperature (Rest Temp)	

1. Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed.

Discharge function

Static		
Constant current discharge CC	Setting	Constant current value (Current)
		Cutoff condition
	Cutoff condition	Specified time after discharge start (Discharge Time)
		Battery voltage (Cutoff Voltage)
		Capacity calculation voltage (Capacity Voltage) ¹
		Battery temperature (Max Temp)
		Discharge capacity (Discharge Ah)
	Rest	Specified time after discharge end (Rest Time)
Rest completion condition of the battery temperature (Rest Temp)		
Constant voltage-constant current discharge CC - CV	Setting	Constant current value (Current)
		Constant voltage value (CV Voltage)
		Constant cell voltage value (Cell CV Voltage) ²
	Cutoff condition	Specified time after discharge start (Discharge Time)
		Discharge capacity (Discharge Ah)
		Battery temperature (Max Temp)
		Specified time after constant voltage operation (CV Time)
		Specified current after constant voltage operation (It Current)
		Specified time after current falls below It Current (It Time)
	Rest	Specified time after discharge end (Rest Time)
		Rest completion condition of the battery temperature (Rest Temp)
	Constant power discharge CP	Setting
Limit current (Limit Current)		
Cutoff condition		Specified time after discharge start (Discharge Time)
		Battery voltage (Cutoff Voltage)
		Capacity calculation voltage (Capacity Voltage) ¹
		Battery temperature (Max Temp)
		Discharge capacity (Discharge Ah)
Rest		Specified time after discharge end (Rest Time)
	Rest completion condition of the battery temperature (Rest Temp)	
Constant power-constant voltage discharge CP - CV	Setting	Constant power value (Wattage)
		Limit current (Limit Current)
		Constant voltage value (CV Voltage)
		Constant cell voltage value (Cell CV Voltage) ²
	Cutoff condition	Time since discharge start (Discharge Time)
		Discharge capacity (Discharge Ah)
		Battery temperature (Max Temp)
		Specified time after constant voltage operation (CV Time)
		Specified current after constant voltage operation (It Current)
		Specified time after current falls below It Current (It Time)
	Rest	Specified time after discharge end (Rest Time)
		Rest completion condition of the battery temperature (Rest Temp)

1. When the battery voltage goes below the capacity calculation voltage, discharge capacitance integration is stopped.
2. Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed.

Pattern charge/discharge function (seamless charge/discharge control)

Pattern		
Pattern constant current discharge CC Pattern	Setting	Step constant current value (Step Current)
		Step time (Step Time)
	Cutoff condition or limit	Time since pattern charge/discharge start (Total Time)
		Number of loops (Loop Count)
		Limit voltage (Limit; constant voltage control) or maximum voltage (Max Voltage)
		Minimum voltage (Min Voltage)
		Battery temperature (Max Temp)
		Integrated current [Ah] (Add Current)
		Integrated power [Wh] (Add Power)
		Constant cell voltage value (Charge) (Cell CV voltage (Chg)) ¹
		Constant cell voltage value (discharge) (Cell CV voltage (Disch)) ¹
	Rest	Specified time after pattern charge/discharge end (Rest Time)
		Rest completion condition of the battery temperature (Rest Temp)
Pattern constant power charge/discharge CP Pattern	Setting	Step constant power value (Step Power)
		Step time (Step Time)
	Cutoff condition or limit	Time since pattern charge/discharge start (Total Time)
		Number of loops (Loop Count)
		Limit voltage (Limit; constant voltage control) or maximum voltage (Max Voltage)
		Minimum voltage (Min Voltage)
		Charge-side limit current (constant current control) Limit Current (Upper)
		Discharge-side limit current (constant current control) Limit Current (Lower)
		Battery temperature (Max Temp)
		Integrated current [Ah] (Add Current)
		Integrated power [Wh] (Add Power)
		Constant cell voltage value (Charge) (Cell CV voltage (Chg)) ¹
	Constant cell voltage value (discharge) (Cell CV voltage (Disch)) ¹	
Rest	Specified time after pattern charge/discharge end (Rest Time)	
	Rest completion condition of the battery temperature (Rest Temp)	
I-V characteristic charge/discharge I-V Pattern	Setting	Step constant current value (Step Current)
		Step time (Step Time)
	Cutoff condition	Maximum voltage (Max Voltage)
		Minimum voltage (Min Voltage)
		Battery temperature (Max Temp)
	Rest	Rest completion condition of the battery temperature (Rest Temp)

1. Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed. Step time can be used in more than 500 ms.

Measurement function

Voltmeter and ammeter

Static		
Battery voltage		Average voltage every 100 ms (Voltage)
Charge/discharge current		Average current every 100 ms (Current)
Battery temperature		Simple thermometer function using a thermistor (Temperature)
Capacity		Integration of the measured current (average current) and the elapsed time (Ah)
Charge state		Calculated with a capacity ratio in which the specified capacity is the reference (SOC)
Electric energy		Integration of the measured value of the current / voltage over the elapsed time (Wh)
Time		Integration time from the start of charge or discharge during measurement (Time)
Data recording		
Delta time	Fixed time	Records data at the specified interval Time: 0.1 s to 999.9 s
	Automatic time	Automatically adjusts the recording interval so that the specified number of data values is recorded Number of data entries: Select from 1024/ 2048/ 4096/ 8192.
Delta voltage ¹		Records data when the specified voltage value changes 0.001 V to 0.999 V
Delta current ¹		Records data when the specified current value changes 0.001 A to 0.999 A

1. Data is recorded after the recording interval time that you specified with the delta time elapses.

High-speed sampling voltmeter/ammeter

Sampling time ¹		1 ms, 10 ms, or 100 ms
Measurement start trigger ²	Trigger voltage	When the specified voltage is reached
	Rising / Falling	When trigger voltage and the detection method (rising / falling) are the in agreement
	Delay	When the specified time elapses after the test starts
	Step number ³	When the specified step number is executed
Measurement time ⁴	1 ms sampling	Measured until up to 6 seconds elapse
	10 ms sampling	Measured until up to 60 seconds elapse
	100 ms sampling	Measured until up to 600 seconds elapse

1. You can only select 100 ms for cell voltage measurements (the value will be fixed to 100 ms even if you select 1 ms or 10 ms).
2. Set this for each test condition profile.
3. This is enabled when the pattern charge/discharge feature is in use.
4. Measures until the specified time elapses (varies depending on the sampling time)

Protection functions

Overvoltage (overcharge) protection	Software OVP	Detects overvoltage (overcharge) on the basis of the measured voltage (A/D-converted value) Output off
	Hardware OVP	Direct detection using a hardware comparator Output off
Undervoltage (overdischarge) protection	Software UVP	Detects undervoltage (overdischarge) on the basis of the measured voltage (A/D-converted value) Output off
	Hardware UVP	Direct detection using a hardware comparator Output off
Overcurrent protection	Software OCP	Detects overcurrent on the basis of the measured current (A/D-converted value) Output off
	Hardware OCP	Direct detection using a hardware comparator Output off
PFX2512 Overheat protection (OHP)		Detects abnormal temperature in the path switch When the temperature returns normal, the PFX2512 returns to the idle state.
Overcharge / overdischarge capacity protection (OAH)		Detects overcharge capacity using current integration judgment; turns output off
DUT (battery) over temperature protection (OTP)		Detects over temperature of DUT (battery) using thermistor temperature judgment Output off
DC power supply alarm (PS Alm)		Receives DC power supply alarms
Electronic load alarm (CD Alm)		Receives electronic load alarms
Connection check (Connection Error)		Detects DUT (battery) connection errors
Communication error		Detects internal communication errors
Watchdog timer (WDT)		Detects CPU errors; turns output off; aborts testing
Power supply line error (AC off)		Detects voltage drops and power interruptions lasting 50 ms or greater; turns output off
Vibration alarm (SH Detect)		Detects shaking or shock at a magnitude 5 level; aborts testing

Display function

Power supply state	POWER	Testing or ready to test POWER/STANDBY LED on (green)
Charge / discharge state	CHG	Charging state, CHG/DISCH/REST LED on (red)
	DISCH	Discharging state, CHG/DISCH/REST LED on (green)
	REST	Rest state, CHG/DISCH/REST LED on (orange)
Control mode	CC	Constant-current mode, CC/CV/CP LED on (red)
	CV	Constant-voltage mode, CC/CV/CP LED on (green)
	CP	Constant-power mode, CC/CV/CP LED on (orange)
Alarms	ALARM	Alarm detected or protection function activated ALARM/WARNING LED on (red)
	WARNING	Alarm detection warning. Warning when a protection function would be activated if a test is executed. State in which a test cannot be started ALARM/WARNING LED on (orange)
Display area	DISPLAY	6-digit LED display Switch the display (voltage / current / capacity / elapsed time / cycle No. / protection function setting / address information / alarm information / others) using the SELECT key.

Other functions

Range switching		
Voltage range	6 V	-1.0000 to 6.0000 The display resolution is 100 μ V.
	60 V	-6.0000 to 60.0000
Pattern charge/discharge function (seamless charge/discharge control) ¹		Response within 50 ms (TYP) ²

1. Can control DC power supplies and electronic loads at the same time in order to seamlessly switch between charge and discharge.
2. Indicates the current response speed when the waveform changes from charging to discharging and discharging to charging at the rated current.
It is defined as the time for the charge/discharge current to change from 10 % to 90 % of the preset value (rated value).

Interface

DC power supply I/F	Kikusui's dedicated DC power supply connector ¹	1 channel, 26-pin connector, isolation I/O
Electronic load I/F	Kikusui's dedicated electronic load connector ²	1 channel, 20-pin connector, isolation I/O
System communication	LAN (Ethernet)	1 channel; use BPChecker3000 10Base-T/100Base-TX ³ RJ45 connector (Can be a straight cable or a crossover cable)
External control	REST status signal output	Low level when resting; isolated open collector output ⁴
	END status signal output	Low level when a test finishes; isolated open collector output ⁴
	ALM status signal output	Low level in alarm state; isolated open collector output ⁴
	CHG status signal output	Low level when charging; isolated open collector output ⁴
	DISCHG status signal output	Low level when discharging; isolated open collector output ⁴
	External alarm input	Low level to abort testing. Pulled up to +5 V by 5.1 k Ω .
	Expansion slots	3 slots for optional boards

1. Can be connected directly to PWRs and PASs, can be connected to the PWR-01 using the SC07-PFX I/F cable (option)
2. Can be connected directly to PLZ-4Ws, can be connected to the PLZ-5W using the SC05-PFX I/F cable (option)
3. The IP address is assigned automatically through DHCP or set manually through IO Config.
4. Withstand voltage is 80 Vdc against other circuits. Application voltage 30 Vmax, sink current 8 mAmax

PFX2512 Electric Specifications

Unless specified otherwise, the specifications are for the following settings and conditions.

- The warm-up time is 30 minutes.
- TYP (typical) values do not guarantee the performance.
- reading: Indicates the readout value.
- set: Indicates the setting value.
- rating: Indicates the rated.
- Static: General term to indicate CC charge, CC - CV charge, CC discharge, CC - CV discharge, CP discharge, and CP - CV discharge
- Pattern: General term to indicate pattern charge / discharge and I - V characteristics charge / discharge

Rated Output

Number of outputs		1 ch
Charge current range ¹		0.000 A to 50.000 A
Charge voltage range ¹	60 V range	0.000 V to 60.000 V
	6 V range	0.000 V to 6.000 V
Discharge current range ¹		0.000 A to 50.000 A
Discharge voltage range ^{1 2}	60 V range	0.000 V to 60.000 V
	6 V range	0.000 V to 6.000 V

1. The range varies depending on factors such as the connected DC power supplies and electronic loads, the wiring configuration of the system, and the charge/discharge operation.
2. The minimum voltage that can be discharged varies depending on factors such as the connected electronic load models and the wiring configuration.

Setting accuracy

Static				
Constant current charge/discharge	Range ¹		0.000 A to 50.000 A	
	Accuracy ²		3	
	Resolution		1 mA	
Constant voltage charge/discharge	Range ¹	60 V range	0.000 V to 60.000 V	
		6 V range	0.000 V to 6.000 V	
	Accuracy ²		3	
	Resolution		1 mV	
Constant cell voltage Charge/discharge ⁴	Range ¹		0.000 V to 20.000 V	
	Accuracy ²		3	
	Resolution		1 mV	
Constant power discharge	Range ¹		0.1 W to 3 000.0 W	
	Accuracy ²		±(0.5 % of set + 1 W) ⁵	
	Resolution		10 mW	
Pattern ⁶				
Pattern constant current	Range ¹		-50.000 A to 50.000 A (Negative values are discharge currents)	
	Accuracy ²		3	
	Resolution		1 mA	
	Number of settings		10000 (Maximum number of steps)	
	Time width	Range		0.1 s to 9999.9 s (the time width per step)
		Accuracy ²		±(0.05 % of set + 10 ms)
Resolution		100 ms		
Pattern constant power	Range ¹		-3000.00 W to 3000.00 W (Negative values are discharge power)	
	Accuracy ^{2 7}		±(0.5 % of set + 1 W) ⁵	
	Resolution		10 mW	
	Number of settings		10000 (Maximum number of steps)	
	Time width	Range		0.1 s of 9999.9 s
		Accuracy ²		±(0.05 % of set + 10 ms)
Resolution		100 ms		

1. The range varies depending on factors such as the connected DC power supplies and electronic loads and the wiring configuration of the system.
2. Ambient temperature at 18 °C to 28 °C.
3. The external devices are controlled through software so that the measured values are equal to the settings. The accuracy of the settings is the same as the measurement accuracy. Because this is dependent on the control cycle, correct control may not be possible for a DUT (battery) with high impedance or a DUT whose circuit is open.
Control cycle for constant current / constant voltage control is 1 ms and for constant cell voltage control is 100 ms.
4. Can be set only when the optional Volt / Thermometer Unit OP02-PFX or OP03-PFX Voltmeter Unit is installed.
5. The battery voltage is measured, and the control current (constant current control) is calculated from the set power value through software calculation. The time required to process one calculation (from the voltage measurement to the output setting) is approximately 1 ms.
6. The operating voltage range is 1 V or more (when the TL08-PFX is being used; regardless of whether a bias DC power supply is being used).
7. With battery voltage of 2 V or more.

Measurement accuracy

Static			
Charge/ discharge current measurement	Range	0.0000 A to 50.0000 A ¹	
	Accuracy ²	±(0.15 % of reading + 0.02 % of rating)	
	Resolution	0.1 mA	
Voltage measurement	Range	60 V range	-6.0000 V to 60.0000 V ³
		6 V range	-1.0000 V to 6.0000 V ⁴
	Accuracy ^{2,5}	60 V range	±(0.05 % of reading + 0.02 % of rating)
		6 V range	±(0.05 % of reading + 0.04 % of rating)
	Resolution ⁵		0.1 mV
Power measurement	Range	0.000 W to 3000.000 W	
	Accuracy	Software calculation (Voltage measurement × current measurement)	
	Resolution	1 mW	
Current capacity calculation	Range	0.000 Ah to 2000.000 Ah	
	Accuracy ²	Depends on the current measurement accuracy and the time accuracy	
	Resolution	1 mAh	
Power capacity calculation	Range	0.000 Wh to 120000.000 Wh	
	Accuracy ²	Depends on the voltage measurement accuracy, current measurement accuracy and the time accuracy	
	Resolution	1 mWh	
Time ⁶	Accuracy ^{2,7}	±10 ppm (TYP)	
Pattern			
Charge/ discharge current measurement	Range	-50.0000 A to 50.0000 A ¹ (Negative values are discharge currents)	
	Accuracy ²	±(0.2 % of reading + 0.03 % of rating)	
	Resolution	0.1 mA	
	Measured value	Average current; updated every 1 s (Consecutive measurements)	
Voltage measurement	Range	60 V range	-6.0000 V to 60.0000 V ³
		6 V range	-1.0000 V to 6.0000 V ⁴
	Accuracy ²	60 V range	±(0.05 % of reading + 0.02 % of rating)
		6 V range	±(0.05 % of reading + 0.04 % of rating)
	Resolution ⁵		0.1 mV
Power measurement	Range	-3000.000 W to 3000.000 W (Negative values are discharge power)	
	Accuracy ²	Software calculation (Voltage measurement × current measurement)	
	Resolution	1 mW	
Current capacity calculation	Range	-2000.000 Ah ~ 2000.000 Ah (Negative values are discharge capacities)	
	Accuracy ²	Depends on the current measurement accuracy and the time accuracy	
	Resolution	1 mAh	
Power capacity calculation	Range	-120000.000 Wh ~ 120000.000 Wh (Negative values are discharge capacities)	
	Accuracy ²	Depends on the voltage measurement accuracy, current measurement accuracy and the time accuracy	
	Resolution	1 mWh	
Time ⁶	Accuracy ^{2,7}	±10 ppm (TYP)	

Measurement accuracy (continued)

High-speed sampling			
Current measurement	Range ⁸		-50.0000 A to 50.0000 A
	Accuracy ^{2 8 9}	1 ms sampling	±(0.2 % of reading + 0.5 % of rating)
		10 ms sampling	±(0.15 % of reading + 0.05 % of rating)
		100 ms sampling	±(0.15 % of reading + 0.02 % of rating)
Resolution		1 mA. The same for all sampling settings.	
Voltage measurement	Range ⁸	60 V range	-6.0000 V to 60.0000 V ³
		6 V range	-1.0000 V to 6.0000 V ⁴
	Accuracy ^{2 8 9}	1 ms sampling ⁵	±(0.1 % of reading + 0.1 % of rating)
		10 ms sampling ⁵	±(0.1 % of reading + 0.05 % of rating)
		100 ms sampling	60 V range: ±(0.05 % of reading + 0.02 % of rating)
	6 V range: ±(0.05 % of reading + 0.04 % of rating)		
Resolution		0.1 mV. The same for all sampling settings.	

1. Measurable range: -52.500 A to 52.500 A (TYP). However, the accuracy is not guaranteed for values outside of the range listed in the table.
2. Ambient temperature at 18 °C to 28 °C.
3. Measurable range: -6.500 V to 65.000 V (TYP). However, the accuracy is not guaranteed for values outside of the range listed in the table.
4. Measurable range: -6.500 V to 6.500 V (TYP). However, the accuracy is not guaranteed for values outside of the range listed in the table.
5. The same for the 6 V range and 60 V range.
6. Accuracy of the elapsed time (Cutoff condition) when charging / discharging or resting.
7. Monthly error: approximately 30 seconds.
8. The accuracy is not guaranteed for values outside of the rated output range.
9. The wavering caused by the ripple noise and AC line noise (50 Hz/ 60 Hz) of the DC power supply that you are using is not included.

Temperature measurement

Thermistor 103AT-2 (by SEMITEC Corporation) is used for the temperature detector.

Resistance (temperature) measurement section ¹	
Measurable range	-40.0 °C to 100.0 °C
Measurement resolution	0.1 °C
Measurement accuracy ^{2 3}	±0.5 °C (Measurement temperature at 0 °C to 40.0 °C)
	±1 °C (Measurement temperature at -20 °C to 80 °C)
Reference (thermistor 103AT)	
Model	103AT-2 by SEMITEC Corporation
R25	Nominal zero-load resistance at 10.0 kΩ, 25 °C
Operating temperature range	-50.0 °C to 110.0 °C
Temperature accuracy ³	±0.5 °C (Measurement temperature at 0 °C to 40.0 °C)
Tolerance	±1 %
Constant B	3435K±1 % (Measurement temperature at 25 °C)

1. The temperature measurement does not trace the absolute temperature. Temperature converted from resistance.
2. Excludes temperature detector errors.
3. Ambient temperature at 18 °C to 28 °C.

Protection functions

Overvoltage (overcharge) protection			
Software OVP	Setting range	0 % to 105 % of rating	
	Setting accuracy ¹	60 V range	Depends on the voltmeter accuracy
		6 V range	Depends on the voltmeter accuracy
	Resolution	1 mV	
	Activation time	150 ms max. From overvoltage detection to output off.	
	Delay	0 ms to 5000 ms. Detection delay timer setting	
Hardware OVP	Setting range	0 % to 110 % of rating	
	Setting error ¹	±0.5 % of rating	
	Resolution	100 mV	
	Activation time ¹	10 ms (TYP). From overvoltage detection to output off.	
Undervoltage (overdischarge) protection			
Software UVP	Setting range	-10 % to 95 % of rating	
	Setting accuracy ¹	60 V range	Depends on the voltmeter accuracy
		6 V range	Depends on the voltmeter accuracy
	Resolution	1 mV	
	Activation time	150 ms max. From undervoltage detection to output off.	
	Delay	0 ms to 5000 ms. Detection delay timer setting	
Hardware UVP	Setting range	-10 % to 100 % of rating	
	Setting error ¹	±0.5 % of rating	
	Resolution	100 mV. Set using the application software.	
	Activation time ¹	10 ms (TYP). From undervoltage detection to output shutoff.	
Overcurrent protection			
Software OCP	Setting range ²	A value obtained by adding 1 A to the preset current.	
	Setting accuracy ¹	Depends on the ammeter accuracy	
	Activation time	150 ms max. From overcurrent detection to output off.	
	Delay	0 ms to 5000 ms. Detection delay timer setting	
Hardware OCP	Setting range	55 A (TYP) fixed	
	Activation time ¹	100 ms (TYP). From overcurrent detection to output shutoff.	
Load short-circuit protection		Using a 60 A output terminal fuse	
Capacity (overcharge/overdischarge) protection			
Software OAH	Setting range	100 % to 1000 % of the nominal capacity	
	Setting accuracy ^{1 3}	Depends on the ammeter accuracy and the main CPU clock accuracy	
	Resolution	1 % 1 mAh or higher	
Overheat protection (DUT)			
Software OTP	Setting range	-40.0 °C to 100.0 °C	
	Setting accuracy ¹	Depends on the temperature measurement (thermistor) accuracy	
	Resolution	0.1 °C	

1. Ambient temperature at 18 °C to 28 °C.
2. For the software OCP, the application software automatically sets a value obtained by adding 1 A to the preset current.
3. The application software calculates the value by multiplying the nominal capacity by the preset percentage and sets the capacity.

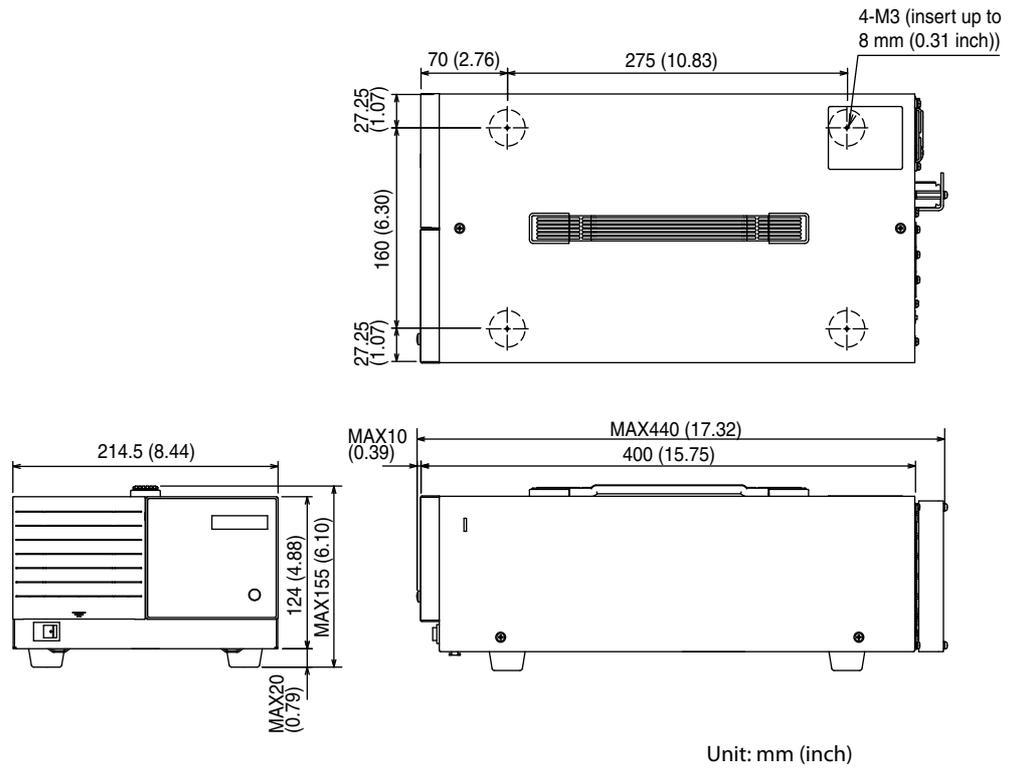
General specifications

Nominal input rating		100 Vac to 240 Vac, 50 Hz/ 60 Hz
Input voltage range		90 Vac to 250 Vac
Power consumption		60 VAm _{ax} (when three OP02-PFXs are installed: 80 VAm _{ax})
Operating temperature and humidity range		0 °C to 40 °C (32 °F to 104 °F), 20 %rh to 85 %rh (no condensation)
Storage temperature and humidity range		-10 °C to 60 °C (14 °F to 140 °F), 0 %rh to 90 %rh (no condensation)
Operating environment		Indoors, overvoltage category II
Altitude		Up to 2000 m
Isolation voltage	I/O terminals ↔ chassis	±70 V _{max}
Insulation resistance	Primary ↔ chassis	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less
	Primary ↔ I/O terminals	
Withstanding voltage	Primary ↔ chassis	No abnormalities at 1500 Vac for 1 minute
	Primary ↔ I/O terminals	
Safety ¹		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU ² EN 61010-1 (Class I ³ , Pollution Degree 2 ⁴)
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 ⁵) EN 55011 (Class A ⁵ , Group 1 ⁶) EN 61000-3-2 EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the PFX2512 is less than 5 m.
Dimensions, weight		See the outline drawing. Approx. 17 kg (37.48 lb)
Weight		Approx. 7 kg (15.43 lb)
Accessories	Power cord ⁷	1 pc.
	Cable with Solderless terminal	4 pcs. (Red : 2 pcs., White: 2 pcs) 45 cm each (17.72 inch)
	26-core flat cable	1 pc. DC power supply connection I/F cable
	Ferrite core for 26-core flat cables	1 pc.
	20-core flat cable	1 pc. Electronic load connection I/F cable
	Ferrite core for 20-core flat cables	1 pc.
	Sensing connector	1 pc.
	Thermistor	1 pc.
	Lock lever	2 pcs.
	LAN cable	1 pc. Straight type
	Operation manual (this manual)	1 copy

- Does not apply to specially ordered or modified PFX2512s.
- Limited to products that have the CE mark on their panels.
When the optional OP03-PFX Voltmeter Unit is used, compliance is achieved by using the optional TL12-PFX sensing cable (length: approx. 3 m, connector area: with cover, with core).
- This is a Class I equipment. Be sure to ground the PFX2512's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.
- 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.

5. This is a Class A equipment. The PFX2512 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.
6. This is a Group 1 equipment. The PFX2512 does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
7. Because the power cord does not comply with CE, it may not be included depending on the shipment destination.

Outline drawing





6

Volt / Thermometer Unit OP02-PFX (Option)

This chapter describes how to install the optional Volt/Thermometer Unit OP02-PFX and how to connect the DUT (battery) to the unit and contains the unit's specifications.

Installing the Volt/Thermometer Unit OP02-PFX

By installing an Volt/Thermometer Unit OP02-PFX in an option slot on the PFX2512, you can increase the number of voltmeter and thermometer measurement points.

If OP02-PFX units are installed in all option slots, voltage and temperature measurement points can be expanded to 12 points.

After you remove an OP02-PFX, attach a slot cover over the empty slot using screws.

Number of units that can be installed	Up to 3 OP02-PFXs
---------------------------------------	-------------------



- **Risk of electric shock. Be sure to turn the POWER switch off before you install an OP02-PFX or connect the DUT (battery).**
- **Before installing or removing an OP02-PFX, remove the connector plug that is connected to the DUT (battery).**



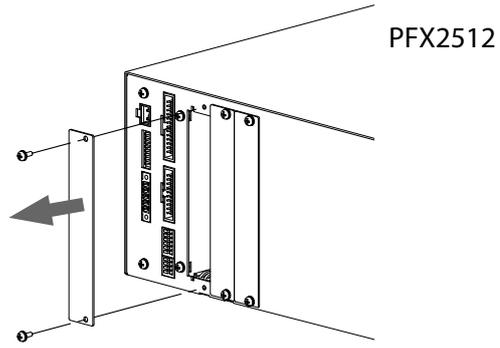
Install OP02-PFX units in adjacent option slots starting from the leftmost slot. To install an EX01-PFX, install the OP02-PFX units in adjacent option slots starting from the leftmost slot, and then install the EX01-PFX in the open slot on the right.

- 1 Check that all devices that you will connect are turned off.**
- 2 Touch a grounded metal object (for example, the metal parts of the rear panel) to discharge any static electricity from your body.**
- 3 Remove the screws that are holding the slot covers in place on the rear panel to PFX2512, and remove the covers from the panel.**
- 4 Hold the panel area of the OP02-PFX so that the connector area of the printed circuit board is facing right.**
- 5 Insert the OP02-PFX into the leftmost slot (slot 1) so that the printed circuit board's connector is inserted into the connector at the back of the slot.**

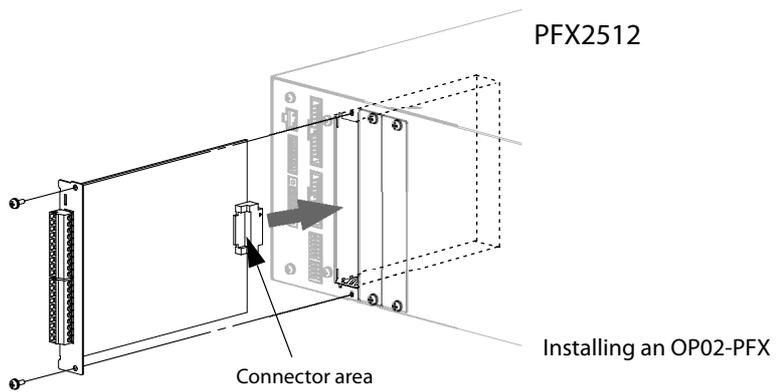
If you are installing multiple OP02-PFX units, install them from the leftmost slot (from slot 1 as they are displayed on the rear panel).
- 6 Insert the OP02-PFX all the way into the slot.**
- 7 Using the screws included with the OP02-PFX,**
- 8 fix the board to the panel.**

Be sure to use the included screws.
- 9 The first time that you install OP02-PFX units after purchase, use the Test Condition Editor of BPChecker3000 to set the number of OP02-PFX units.**

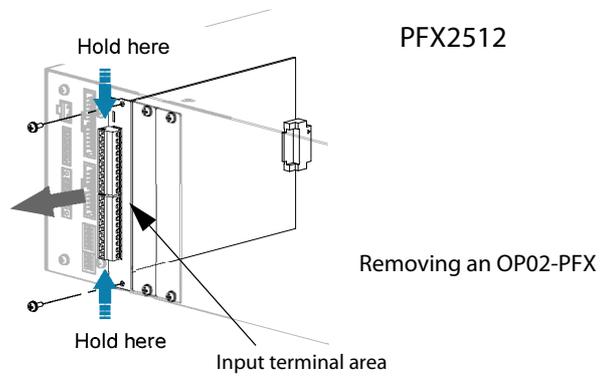
Remove the cover.



Insert the board.



To remove an installed OP02-PFX, unfasten the screws, and pull the board out by holding the input terminal area.

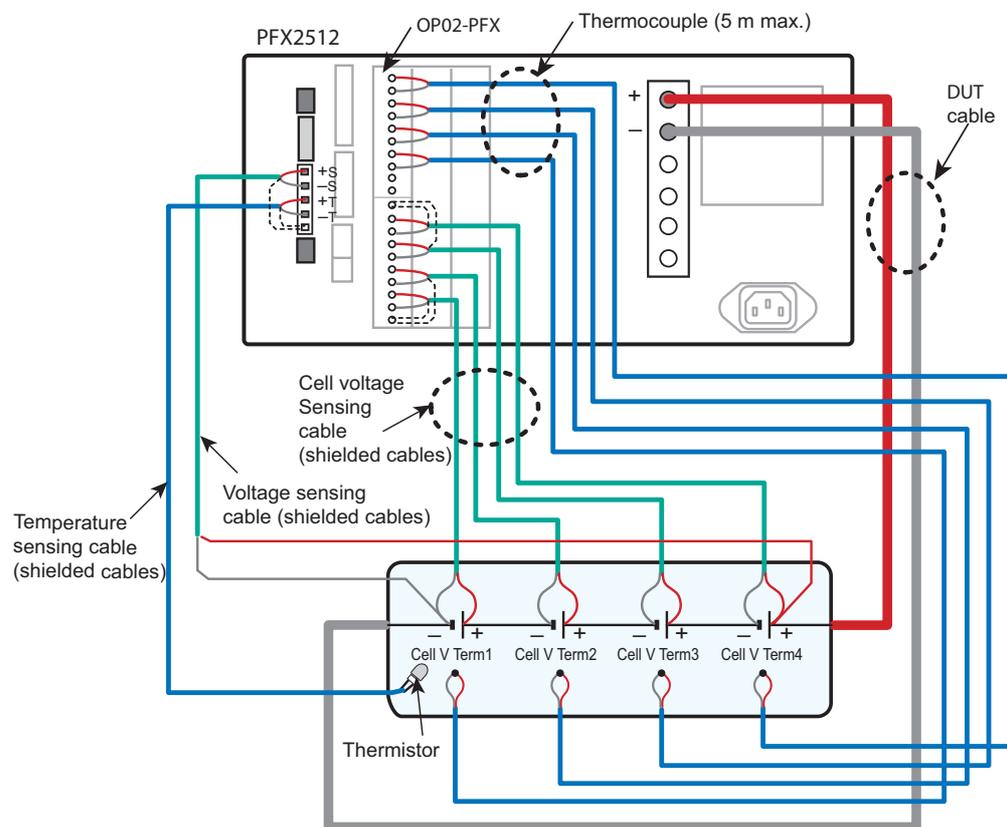


Preparing to Connect the DUT (Battery)

Cables¹ for connecting the OP02-PFX and the input terminal to the DUT (battery) are not included. Prepare the following cables.

■ Cables and tools that are necessary to make the connection

Cable	DUT cable	Cable for running charge/discharge current between the PFX2512 and DUT (battery)	See p. 41
	Voltage sensing cable	Cable for sensing the electrode voltage of the DUT (battery)	
	Temperature sensing cable	Cable for sensing the temperature of the DUT (battery)	
	Thermocouple (type K)	Element-wire diameter: 0.20 mm ² or more	
	Cell voltage sensing cable	Cable for sensing the cell electrode voltage of the DUT (battery) cable 0.20 mm ² (AWG24) to 0.52 mm ² (AWG20), shielded cable	
	Flat-blade screwdriver	Core diameter: Ø3, tip width: 2.6 mm	
	Wire stripper	A wire stripper that matches the wires listed above	

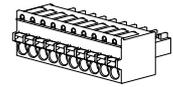


Example of an Volt/Thermometer Unit OP02-PFX installed in slot 1; only the wiring between the PFX2512 and the DUT (battery) is shown

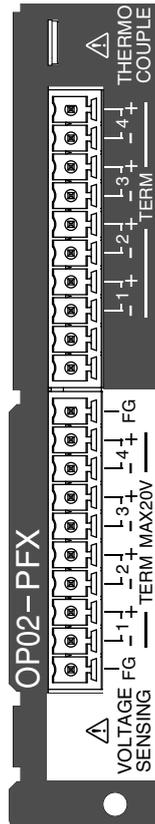
1 The TL09-PFX option consists of a dedicated voltage sensing cable and thermocouple for connecting the DUT (battery) to a PFX2512 in which an OP02-PFX is installed. (See p. 123)

Input terminal (connector MC1.5/10-G: Phoenix Contact)

When the PFX2512 is shipped from the factory, connectors are attached to the input terminals. If they are damaged or lost, contact your Kikusui agent or distributor.



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Temperature measurement (THERMOCOUPLE)

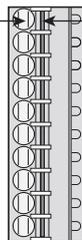
Terminal number	Signal	Description
4	Cell T Term4+	Thermocouple connection terminal 4+
	Cell T Term4-	Thermocouple connection terminal 4-
3	Cell T Term3+	Thermocouple connection terminal 3+
	Cell T Term3-	Thermocouple connection terminal 3-
2	Cell T Term2+	Thermocouple connection terminal 2+
	Cell T Term2-	Thermocouple connection terminal 2-
1	Cell T Term1+	Thermocouple connection terminal 1+
	Cell T Term1-	Thermocouple connection terminal 1-
—	NC	Not connected (reserved)
—	NC	Not connected (reserved)

Voltage measurement (VOLTAGE SENSING)

Terminal number	Signal	Description
—	FG	Shield electric potential
4	Cell V Term4+	Cell voltage sensing connection terminal 4+
	Cell V Term4-	Cell voltage sensing connection terminal 4-
3	Cell V Term3+	Cell voltage sensing connection terminal 3+
	Cell V Term3-	Cell voltage sensing connection terminal 3-
2	Cell V Term2+	Cell voltage sensing connection terminal 2+
	Cell V Term2-	Cell voltage sensing connection terminal 2-
1	Cell V Term1+	Cell voltage sensing connection terminal 1+
	Cell V Term1-	Cell voltage sensing connection terminal 1-
—	FG	Shield electric potential

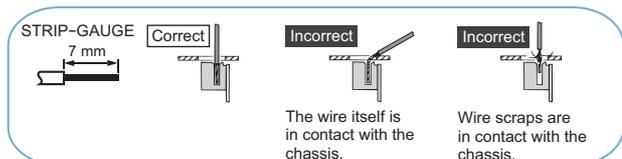
Using AWG 24 to 20 (0.20 mm² to 0.52 mm²) cables, construct the following cable assembly.

Remove the first 7 mm of the wire's insulation, and then insert the wire here.



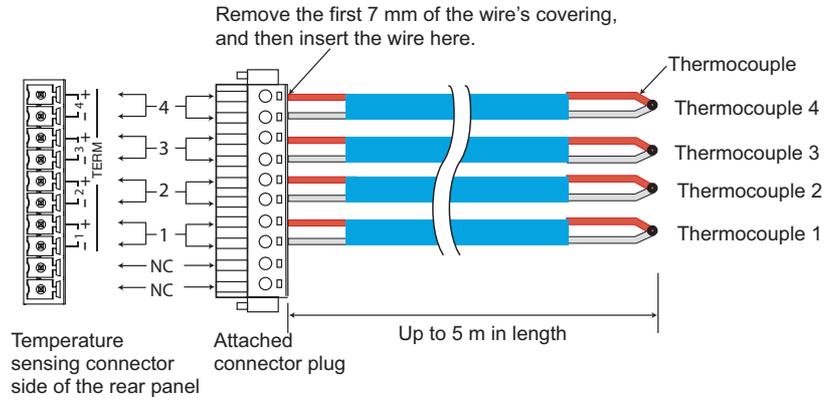
Sensing connector plug

Insert the wire while you press this part down with a flat-blade screwdriver.



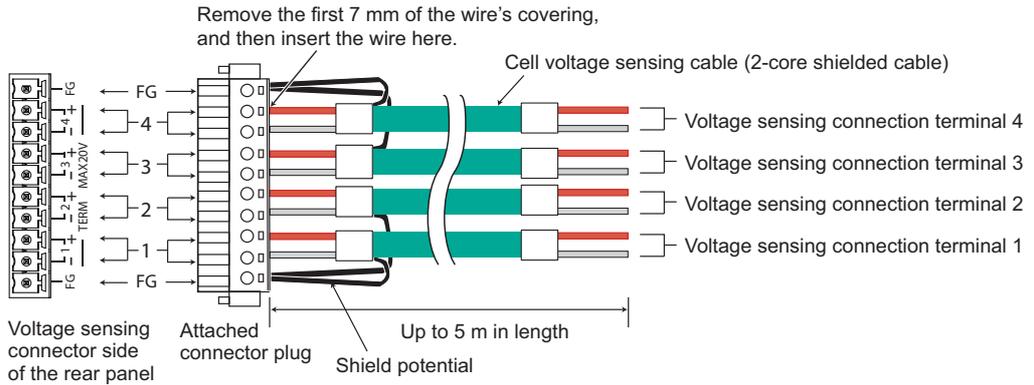
Connecting the thermocouple to the connector plug

Connect type K thermocouples directly to the connector plug.



Constructing cell voltage sensing cables

Connect shielded cables directly to the connector plug.



Connecting the DUT (Battery)



WARNING

Risk of electric shock.

- Be sure to turn the PFX2512 POWER switch off before connecting OP02-PFX units to the DUT (battery).
- After connecting the devices, connect the OP02-PFX to the DUT (battery). Connect the OP02-PFX side first.



CAUTION

- Risk of incorrect voltage measurement or malfunction. Be sure to connect the cell voltage sensing cable to both ends of the cell. (See p. 130)
- CC-CV, CP, and CP Pattern are controlled by the PFX2512 voltage sensing function. Be sure to connect the PFX2512 voltage sensing cables to the DUT.
- Risk of damaging the DUT.
If you leave the cell voltage sensing cables connected to the DUT, the DUT will continue to discharge a minute current. (the input impedance of cell voltage sensing is 10 MΩ).
- Risk of incorrect temperature measurements or thermometer malfunction. Do not connect the thermocouple element wires (the conductive parts) to the positive and negative terminals of the DUT (battery).

See p. 44

- 1 Check that the POWER switches of all connected devices are off.**
- 2 Connect DUT cables to the positive and negative DUT terminals of the PFX2512.**
Run the cables out as horizontal as possible, and fix them in place with screws.
- 3 Connect the other end of the DUT cables to the DUT (battery). Connect DUT + to the positive terminal and DUT - to the negative terminal.**
- 4 Insert the assembled thermocouple and cell voltage sensing cable connectors into the OP02-PFX input terminals.**
- 5 Connect the other end of the cell voltage sensing cables to the DUT (battery). Connect the positive cell voltage sensing terminal to the DUT (battery) positive terminal and the negative cell voltage sensing terminal to the DUT (battery) negative terminal.**
- 6 Fix the other end (the end that is used to measure the temperature) of the thermocouple to the DUT (battery).**
Use tape, or another appropriate adhesive, to firmly fix the thermocouple to the DUT.
- 7 Insert the assembled sensing connector into the PFX2512 SENSING connector.**
- 8 Connect or attach a voltage sensing cable and thermistor to the DUT (battery).**

See p. 42

Volt/Thermometer Unit OP02-PFX Specifications

Items not listed are the same as those of the PFX2512.

- reading: Indicates the readout value.
- set: Indicates the setting value.
- rating: Indicates the rated.
- Static: General term to indicate CC charge, CC - CV charge, CC discharge, CC - CV discharge, CP discharge, and CP - CV discharge
- Pattern: General term to indicate pattern charge / discharge and I - V characteristics charge / discharge

Charge function

Static		
Constant voltage-constant current charge CC-CV	Cutoff condition	Cell voltage (Cell Max Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
Constant current charge CC	Cutoff condition	Cell voltage (Cell Max Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹

¹ The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Discharge function

Static		
Constant current discharge CC	Cutoff condition	Cell voltage (Cell Cutoff Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
Constant current-constant voltage discharge CC-CV	Cutoff condition	Cell voltage (Cell Cutoff Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
Constant power discharge CP	Cutoff condition	Cell voltage (Cell Cutoff Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
Constant power-constant voltage discharge CP-CV	Cutoff condition	Cell voltage (Cell Cutoff Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹

¹ The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Pattern charge / discharge function and I-V characteristic charge/discharge function

Pattern		
Pattern constant current charge/discharge CC Pattern	Cutoff condition	Cell voltage (Cell Max Voltage and Cell Min Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
Pattern constant power charge/discharge CP Pattern	Cutoff condition	Cell voltage (Cell Max Voltage and Cell Min Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹
I-V characteristic charge/discharge I-V Pattern	Cutoff condition	Cell voltage (Cell Max Voltage and Cell Min Voltage)
		Cell temperature (Cell Max Temp)
		Cell unbalance (Cell Unbalance) ¹

1 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Cell measurement function

Static	
Cell voltage	Average voltage every 100 ms (Cell Voltage)
Cell Temperature	Thermometer function using a thermocouple, updated every second (Cell Temperature)

Cell protection function

Cell overvoltage (overcharge) protection		Detects overvoltage (overcharge) on the basis of the measured voltage (A/D-converted value) Output off
Cell software OVP	Setting range	0 % to 105 % of the measurable range
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	150 ms max.
Cell undervoltage (overdischarge) protection		Detects undervoltage (overdischarge) on the basis of the measured voltage (A/D-converted value) Output off
Cell software UVP	Setting range	-10 % to 95 % of the measurable range
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	150 ms max.
Cell overheat protection		Detects the temperature through a thermocouple, output off
Cell OTP	Setting range	-100.0 °C to 400.0 °C
	Setting accuracy ¹	Depends on the temperature measurement (thermistor) accuracy
	Resolution	0.1 °C
Cell unbalance protection		Detects the difference between the maximum and minimum cell voltages ² , output off
	Setting range	10 mV to 5 000 mV ³
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	1 s max.
Option communication error		Communication error of Option board, output off

- 1 Ambient temperature at 18 °C to 28 °C.
- 2 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and an alarm occurs when the difference between these two values exceeds the set value.
- 3 The voltage difference setting. Voltage difference = Vcell_Max - Vcell_Min

Cell voltage measurement

Static	
Number of measured terminals	4
Measurement range ¹	-2.0000 V to 20.000 V
Measurement accuracy ²	±(0.05 % of reading + 0.02 % of rating)
Resolution	0.1 mV
Measured value	Average voltage every 100 ms
Measurement interval	100 ms

- 1 You can apply a voltage from -20 V to 22 V.
- 2 Ambient temperature at 18 °C to 28 °C.

Cell temperature measurement

Thermocouple voltage (temperature) measurement block ¹	
Number of measured terminals	4
Thermocouple type	K type
Measurement range ²	-100.0 °C to 400.0 °C
Measurement accuracy ^{3 4}	±1.5 °C (TYP)
Reference junction compensation ^{3 5}	±0.5 °C (TYP)
Resolution	0.1 °C
Measurement interval	1 s

- 1 The temperature scale conforms to JIS C 1602-1995 (ITS-90). (ITS-90 is an international temperature scale.)
- 2 Depending on your thermocouple's specifications (thermocouple class, wire diameter, and insulation), the usable temperature range will vary.
- 3 Ambient temperature at 18 °C to 28 °C.
- 4 When the voltage that the thermocouple calibrator produces is measured
- 5 Shows the internal sensor performance. This indicates the temperature measurement accuracy of the thermocouple connector.
Thermometer accuracy = Measurement accuracy + reference junction compensation + thermocouple tolerance

General specifications

Isolation voltage	Input terminals ↔ chassis	±70 Vmax ¹
Insulation resistance ²	Input terminals ↔ DUT terminals ³	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less ¹
	Input terminals ↔ Input terminals ⁴	
Dimensions	Approx. 105W mm x 15H mm x150D mm (4.13W inch x 0.59H inch x 5.91D inch)	
Accessories	Screws	2 pcs.
	Handling of the product	1 copy

- 1 When installed in the PFX2512.
- 2 Shared with the voltage/temperature sensing input terminal.
- 3 Indicates the terminals for connecting the DUT (the DUT's positive terminal and the DUT's negative terminal).
- 4 This indicates the resistance between measurement terminals.



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7

8Slot Unit SL01-PFX (Option) Voltmeter Unit OP03-PFX (Option)

This chapter describes how to connect the optional 8Slot Unit SL01-PFX, how to install the Voltmeter Unit OP03-PFX, and how to connect the DUT (battery) and contains the specifications.

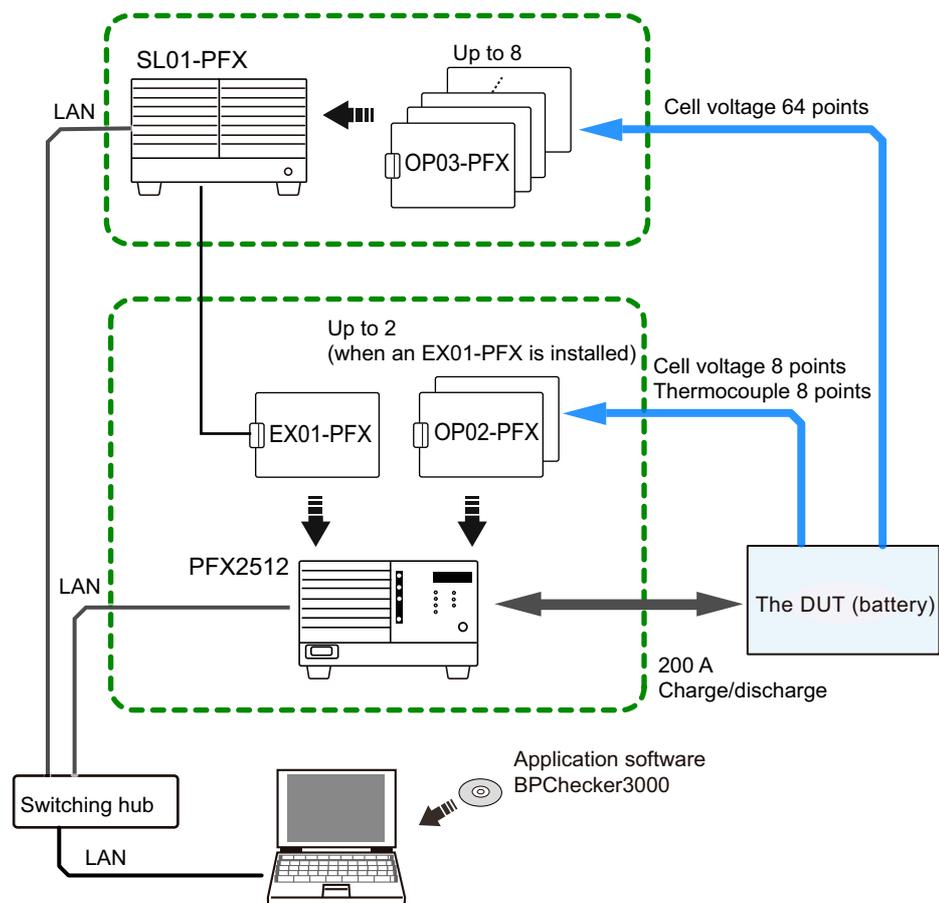
SL01-PFX 8Slot Unit

The 8Slot Unit SL01-PFX is connected to the PFX2512 Charge/Discharge System Controller to expand the voltage measurement points. For this connection, an EX01-PFX connection board is installed into the PFX2512.

It enables highly accurate evaluation of cell voltage disparity measurements, which is indispensable for evaluation testing of large capacity battery modules.

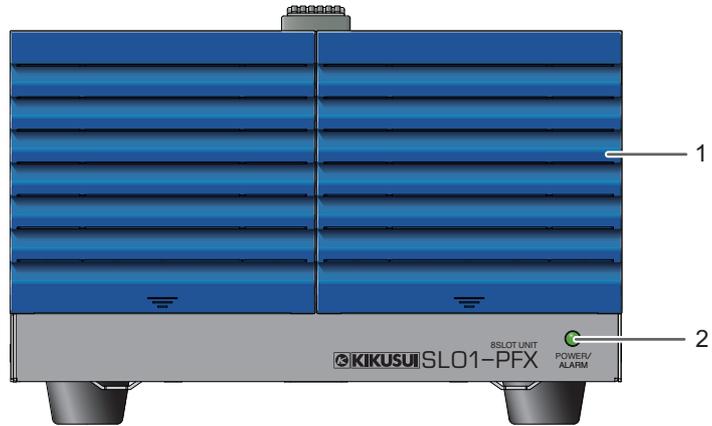
If Voltmeter Units OP03-PFX are installed in all SL01-PFX slots, voltage measurement points can be expanded to 64 points.

Further, by installing Volt / Thermometer Units OP02-PFX in the PFX2512, you can increase the number of measurement points to 72.



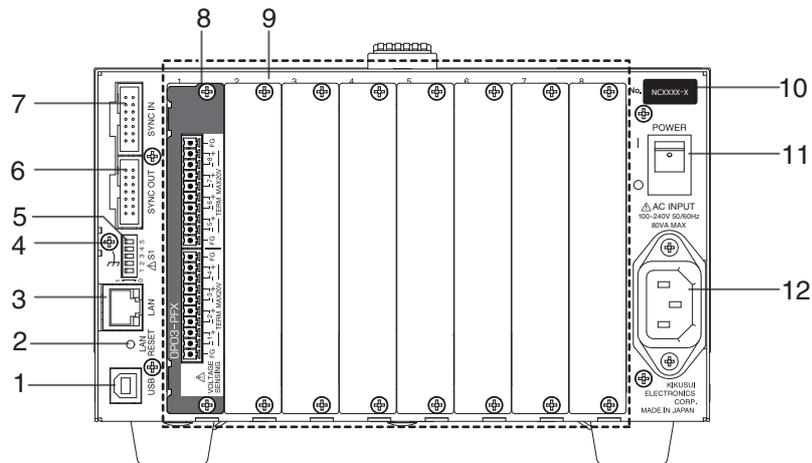
Component Names

Front panel



No.	Name	Function	See
1	Louver	For cooling.	—
2	POWER/ALARM LED	Lights when the power is on (POWER: green) and when a slot alarm is detected (ALARM: red)	p. 112

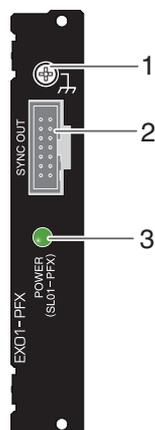
Rear panel



No.	Name	Function	See
1	USB port	For maintenance	—
2	LAN RESET switch	For maintenance	—
3	LAN port	A port for communicating with BPChecker3000.	p. 103
4	Chassis terminal	A connector for grounding the output.	p. 101
5	S1 switch	Use with the factory default settings.	p. 103
6	SYNC OUT connector ¹	Not used. A connector for using multiple units.	—
7	SYNC IN connector	Connector for the EX01-PFX (PFX2512 main unit)	p. 102
8	Voltmeter Unit (OP03-PFX)	An option board for expanding the number of voltage measurement points	p. 106
9	Option slot	Slot for installing an optional board. Slot 1 to 8, counted from the left	p. 106
10	Serial number	—	—
11	POWER switch	Turns the power on and off.	p. 112
12	AC INPUT connector	AC inlet	p. 101

1 A connector cover is attached when the product is shipped from the factory.

EX01-PFX



No.	Name	Function	See
1	Chassis terminal	A connector for grounding the output.	p. 101
2	SYNC OUT connector	Connector for the SL01-PFX	p. 102
3	POWER LED	Lights green when tests can be executed.	—

Connecting the Power Cord



WARNING

Risk of electric shock.

- The 8Slot Unit SL01-PFX conforms to IEC Safety Class I (equipment that has a protective conductor terminal). Be sure to earth ground the product to prevent electric shock.
- The 8Slot Unit SL01-PFX is grounded through the power cord ground wire. Connect the protective conductor terminal to earth ground.

NOTE

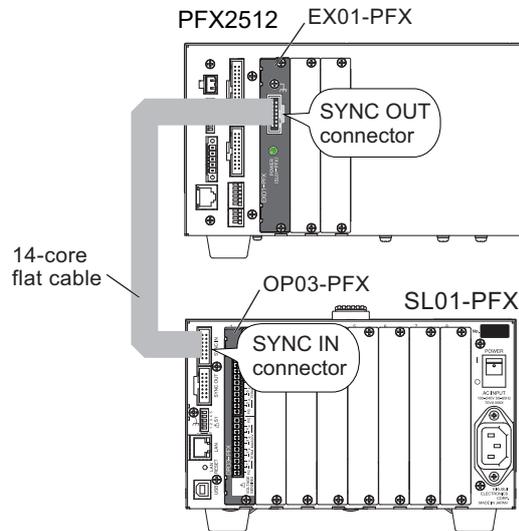
- Use the included power cord to connect to the AC line. If the included cord cannot be used because the rated voltage or the plug shape is incompatible, have a qualified engineer replace it with an appropriate power cord that is 3 m or less in length. If obtaining a power cord is difficult, contact your Kikusui agent or distributor.
- The power cord with a plug can be used to disconnect the SL01-PFX from the AC power line in an emergency. Connect the plug to an easily accessible power outlet so that the plug can be removed from the outlet at any time.
- Do not use the included power cord with other instruments.

The SL01-PFX conforms to IEC Overvoltage Category II (energy-consuming equipment that is supplied from a fixed installation).

- 1 Turn the POWER switch off.**
- 2 Check that the AC power line meets the nominal input rating of the SL01-PFX.**
The SL01-PFX can receive a nominal line voltage in the range of 100 Vac to 240 Vac at 50 Hz or 60 Hz.
- 3 Connect the power cord to the AC INPUT inlet on the rear panel.**
Use a power cord that conforms to the rated AC input voltage and current.
- 4 Connect the power cord plug to a properly grounded outlet.**

Connecting to the PFX2512

Using the included 14-core flat cable and the EX01-PFX connection board, connect the SL01-PFX to the PFX2512.

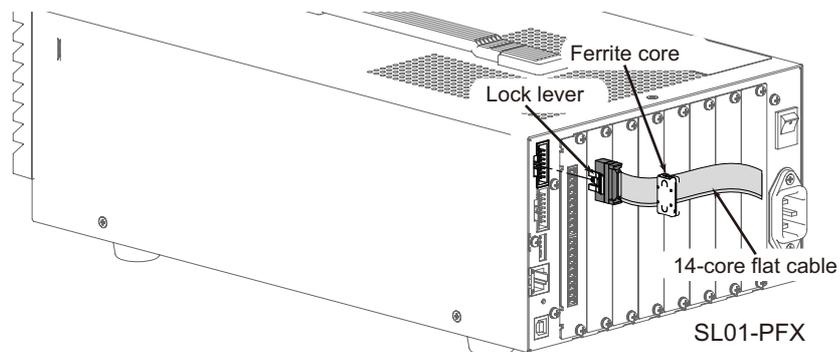


NOTE

Install the EX01-PFX in the leftmost available option slot of the PFX2512.

If OP02-PFX units are installed, install the EX01-PFX in the leftmost available slot to the right of the OP02-PFX units.

- 1 Check that all devices that you will connect are turned off.**
- 2 Install the EX01-PFX in the leftmost available option slot on the PFX2512.**
If OP02-PFX units are installed, install the EX01-PFX in the leftmost available slot to the right of the OP02-PFX units.
- 3 Attach the included lock lever and ferrite core to the included 14-core flat cable.**
The connector may fall out if you do not attach the lock lever.
- 4 Connect the ferrite core end of the 14-core flat cable to the SYNC IN connector on the SL01-PFX rear panel.**
Check that it does not fall out.



5 Insert the other end of the 14-core flat cable into the SYNC OUT connector of the EX01-PFX installed in the option slot of the PFX2512.

Use the lock lever to secure it. Check that it does not fall out.

Connecting to a PC

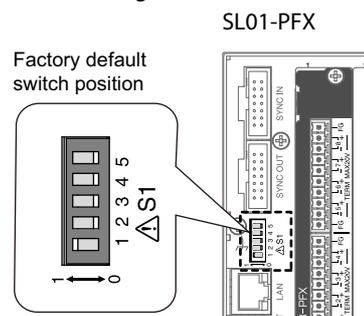
To increase the number of voltage measurement points by inserting an OP03-PFX into the SL01-PFX, you need to use the LAN interface.

You do not need to change the S1 switch on the rear panel from the factory default setting.

IP address is automatically assigned regardless of whether auto IP address assignment (connect via a router) is used or a fixed IP address (connect via a switching hub) is used.

Necessary cable and device

- LAN cable
- Switching hub or router



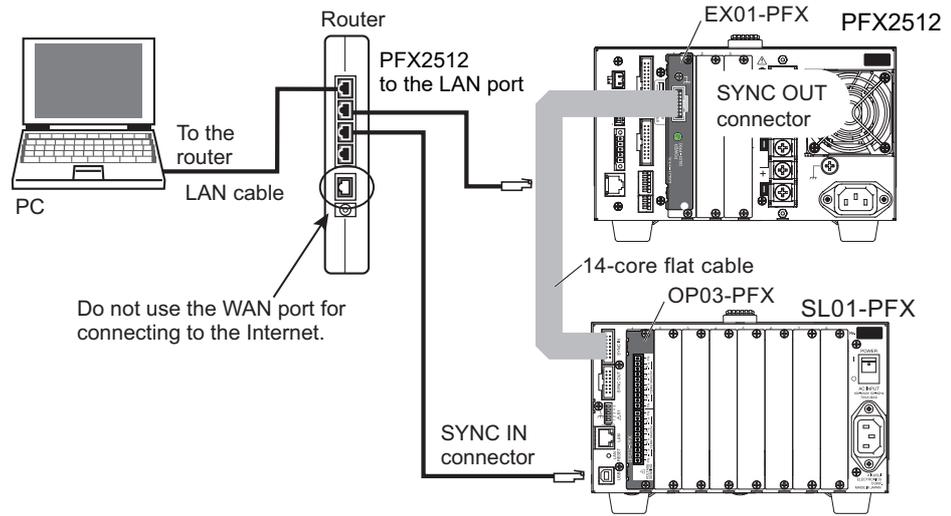
Signal name	Logic	Notes	Factory default
5	TEST: Always set to 0.	For maintenance	0
4		Not used	0
3	RESV: Always set to 0.		0
2			0
1	IP: Always set to 1.	—	1

Assigning the IP address automatically (connecting through a router)

See p. 54

If you connect through a router that has a DHCP server feature, the IP address is assigned automatically.

Connection



Using a fixed IP address (connecting through a switching hub)

See p. 56

If the IP address is already decided, you can connect using a fixed IP address.

The IP address is set to the number obtained by adding 20 to the xxx section of the PFX2512's IP address xxx. xxx. xxx. xxx.

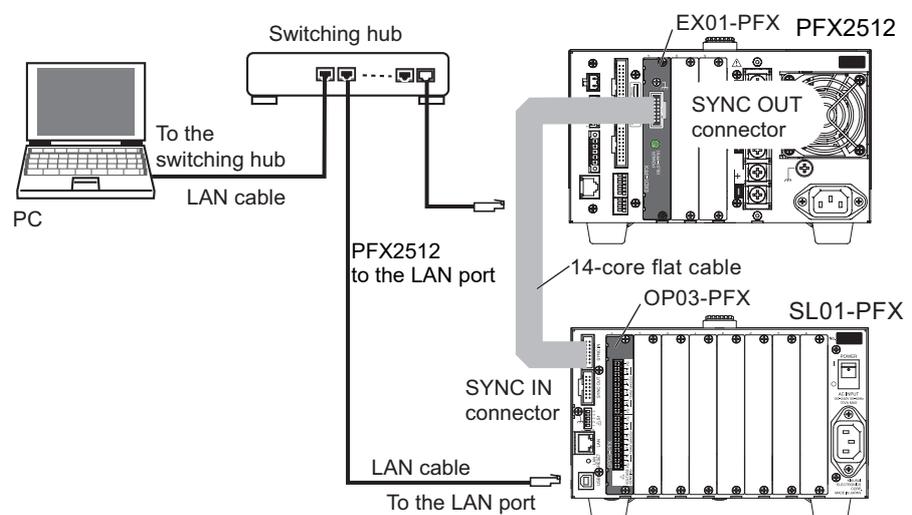
Example 1: PFX2512's IP address: 192.168.1.101 ← Factory default setting

SL01-PFX's IP address: 192.168.1.121 ← Automatically assigned

Example 2: PFX2512's IP address: 123.456.7.8 ← Assigned using BPChecker3000 (Io Config)

SL01-PFX's IP address: 123.456.7.28 ← Automatically assigned

Connection



Installing the Voltmeter Unit OP03-PFX

By installing an Voltmeter Unit OP03-PFX in an option slot on the SL01-PFX, you can increase the number of voltmeter measurement points.

If OP03-PFX units are installed in all option slots of the SL01-PFX, voltage measurement points can be expanded to 64 points.

After you remove an OP03-PFX, attach a slot cover over the empty slot using screws.

Number of units that can be installed	Up to 8 OP03-PFXs
---------------------------------------	-------------------



- **Risk of electric shock. Be sure to turn the SL01-PFX POWER switch off before you install an OP03-PFX or connect the DUT (battery).**
- **Before installing or removing an OP03-PFX, remove the connector plug that is connected to the DUT (battery).**



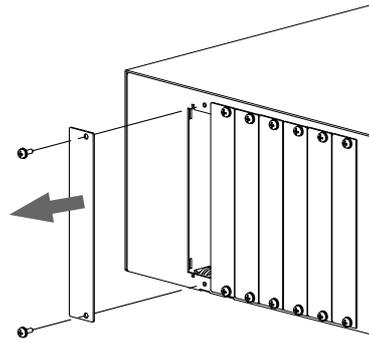
Install OP03-PFX units in adjacent option slots starting from the leftmost slot of SL01-PFX.

- 1 Check that all devices that you will connect are turned off.**
- 2 Touch a grounded metal object (for example, the metal parts of the rear panel) to discharge any static electricity from your body.**
- 3 Remove the screws that are holding the slot covers in place on the rear panel, and remove the covers from the panel of SL01-PFX.**
- 4 Hold the panel area of the OP03-PFX so that the connector area of the printed circuit board is facing right.**
- 5 Insert the OP03-PFX into the leftmost slot (slot 1) so that the printed circuit board's connector is inserted into the connector at the back of the slot.**

If you are installing multiple OP03-PFX units, install them from the leftmost slot (from slot 1 as they are displayed on the rear panel).
- 6 Insert the OP03-PFX all the way into the slot.**
- 7 Using the screws included with the OP03-PFX, fix the board to the panel.**

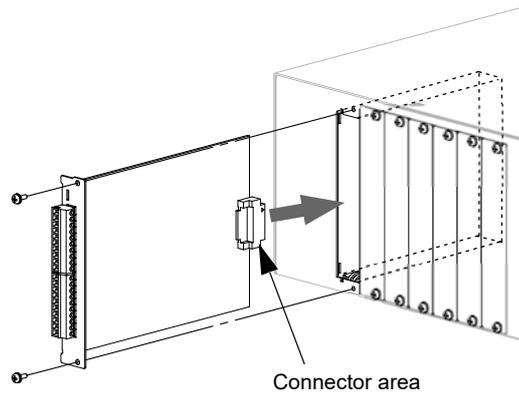
Be sure to use the included screws.
- 8 The first time that you install OP03-PFX units after purchase, use the Test Condition Editor of BPChecker3000 to set the number of OP02-PFX units.**

Remove the cover.



SL01-PFX

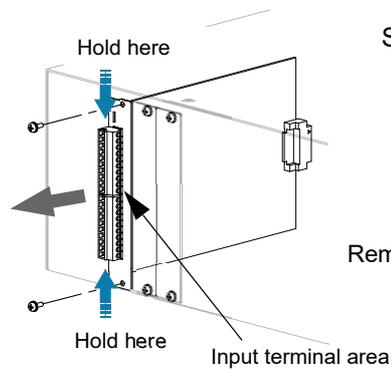
Insert the board.



SL01-PFX

Installing an OP03-PFX

To remove an installed OP03-PFX, unfasten the screws, and pull the board out by holding the input terminal area.



SL01-PFX

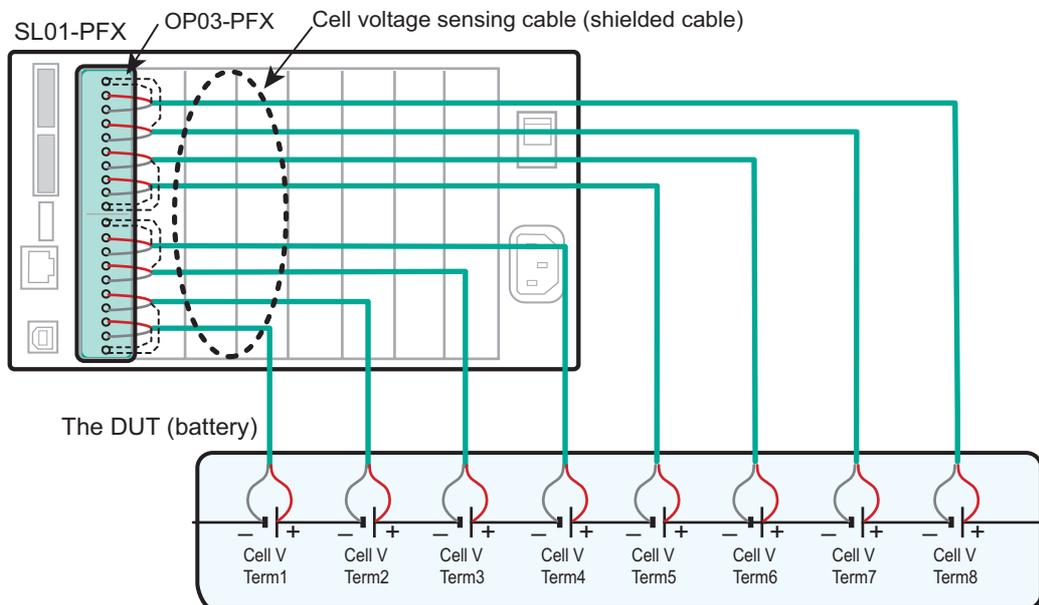
Removing an OP03-PFX

Preparing to Connect the DUT (Battery)

Cables¹ for connecting the OP03-PFX and the input terminal to the DUT (battery) are not included. Prepare the following cables.

■ Cables and tools that are necessary to make the connection

Wire	DUT cable	Cable for running charge/discharge current between the PFX2512 and DUT (battery)	See p. 41
	Voltage sensing cable	Cable for sensing the electrode voltage of the DUT (battery)	
	Cell voltage sensing cable	Cable for sensing the cell electrode voltage of the DUT (battery) 0.20 mm ² (AWG24) to 0.52 mm ² (AWG20), shielded cable	
Flat-blade screwdriver	Shaft diameter: Ø3, blade tip width: 2.6 mm		
Wire stripper	A wire stripper that matches the wires listed above		

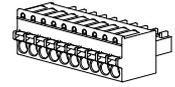


Example of connecting the DUT (battery) to an SL01-PFX after installing an Voltmeter Unit OP03-PFX

1 The TL11-PFX / TL12-PFX [CE compliant product] option consists of a dedicated voltage sensing cable and thermocouple for connecting the DUT (battery) to a PFX2512 in which an OP03-PFX is installed. ([See](#) p. 123 , p. 123)

Input terminal (connector MC1.5/10-G: Phoenix Contact)

When the PFX2512 is shipped from the factory, connectors are attached to the input terminals. If they are damaged or lost, contact your Kikusui agent or distributor.



84-61-7910

Voltage measurement (Voltage sensing)

Terminal number	Signal	Description
—	FG	Shield electric potential
8	Cell V Term8+	Cell voltage sensing connection terminal 8+
	Cell V Term8-	Cell voltage sensing connection terminal 8-
7	Cell V Term7+	Cell voltage sensing connection terminal 7+
	Cell V Term7-	Cell voltage sensing connection terminal 7-
6	Cell V Term6+	Cell voltage sensing connection terminal 6+
	Cell V Term6-	Cell voltage sensing connection terminal 6-
5	Cell V Term5+	Cell voltage sensing connection terminal 5+
	Cell V Term5-	Cell voltage sensing connection terminal 5-
—	FG	Shield electric potential

Terminal number	Signal	Description
—	FG	Shield electric potential
4	Cell V Term4+	Cell voltage sensing connection terminal 4+
	Cell V Term4-	Cell voltage sensing connection terminal 4-
3	Cell V Term3+	Cell voltage sensing connection terminal 3+
	Cell V Term3-	Cell voltage sensing connection terminal 3-
2	Cell V Term2+	Cell voltage sensing connection terminal 2+
	Cell V Term2-	Cell voltage sensing connection terminal 2-
1	Cell V Term1+	Cell voltage sensing connection terminal 1+
	Cell V Term1-	Cell voltage sensing connection terminal 1-
—	FG	Shield electric potential

Using AWG 24 to 20 (0.20 mm² to 0.52 mm²) cables, construct the following cable assembly.

Remove the first 7 mm of the wire's insulation, and then insert the wire here.

Sensing connector plug

Insert the wire while you press this part down with a flat-blade screwdriver.

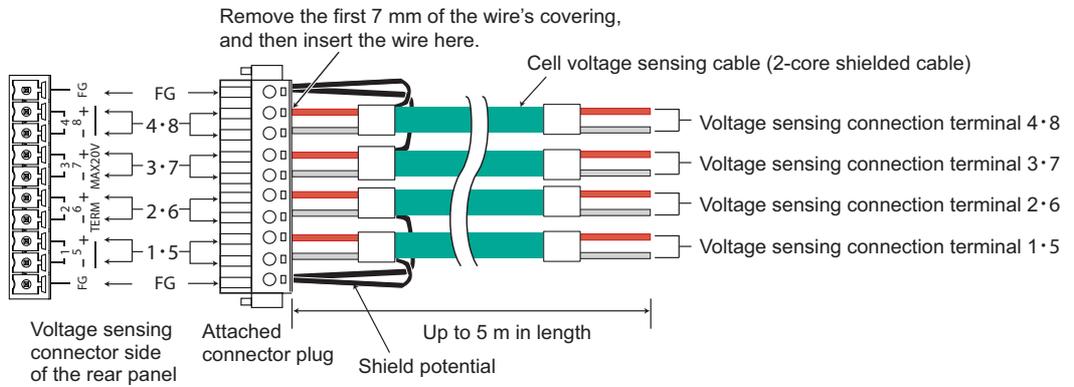
STRIP-GAUGE 7 mm

Correct: The wire itself is in contact with the chassis.

Incorrect: Wire scraps are in contact with the chassis.

Constructing cell voltage sensing cables

Connect shielded cables directly to the connector plug.



Connecting the DUT (Battery)



WARNING

Risk of electric shock.

- **Be sure to turn the SL01-PFX POWER switch off before connecting OP03-PFX units to the DUT (battery).**
- **After connecting the devices, connect the OP03-PFX to the DUT (battery). Connect the OP03-PFX side first.**



CAUTION

- Risk of incorrect voltage measurement or malfunction. Be sure to connect the cell voltage sensing cable to both ends of the cell. ([See](#) p. 130)
- CC-CV, CP, and CP Pattern are controlled by the PFX2512 voltage sensing function. Be sure to connect the PFX2512 cell voltage sensing cables to the DUT.
- Risk of damaging the DUT. If you leave the cell voltage sensing cables connected to the DUT, the DUT will continue to discharge a minute current. (the input impedance of cell voltage sensing is 10 MΩ).

[See](#) p. 44

- 1 Check that the POWER switches of all connected devices are off.**
- 2 Connect DUT cables to the positive and negative DUT terminals of the PFX2512.**
Run the cables out as horizontal as possible, and fix them in place with screws.
- 3 Connect the other end of the DUT cables to the DUT (battery). Connect DUT + to the positive terminal and DUT - to the negative terminal.**
- 4 Insert the assembled cell voltage sensing cable connectors into the OP03-PFX input terminals.**
- 5 Connect the other end of the cell voltage sensing cables to the DUT (battery). Connect the positive cell voltage sensing terminal to the DUT (battery) positive terminal and the negative cell voltage sensing terminal to the DUT (battery) negative terminal.**
- 6 Insert the assembled sensing connector into the PFX2512 SENSING connector.**
- 7 Connect the voltage sensing cable to the DUT (battery).**

[See](#) p. 42

7

8Slot Unit (Option) / Voltmeter Unit (Option)

Turning the SL01-PFX On and Off

There is no specific order that you need to turn on the system components, namely the PFX2512, DC power supplies, electronic loads, the SL01-PFX, and other peripheral devices.

Ensure safety before turning the power on or off.

Turning the POWER switch on

1 Check that the power cords and cables of each device are correctly connected.

2 Turn on the POWER switches of the DC power supplies and electronic loads.

See p. 47, p. 49

Check that the protection function and external analog control of each device are configured properly. If several electronic loads are connected in parallel, specify the master unit and slave units.

3 Press the (I) side of the rear panel POWER switch to turn the SL01-PFX on.

The POWER/ALARM LED on the front panel lights green.

4 Press the POWER switch on the front panel of the PFX2512 to turn it on (I).

See p. 64

5 Check the firmware version on the display.

All the LED on the front panel light for a few seconds, and then only the POWER/ALARM LED remains lit.

The display shows the firmware version for a few seconds and then the channel number for another few seconds. Finally, the display enters voltage display mode.

The PFX2512 is ready to execute tests (POWER state) and can receive commands from BPChecker3000.

See p. 59

If the POWER switch is turned on for the first time after purchase, the PFX2512 starts up using factory default settings.

See p. 68, p. 135

If the ALARM/WARNING LED is lit red, an alarm or protection function may be activated.

Turning off the POWER switch

⚠ CAUTION

Risk of malfunction.

- After you turn the PFX2512 POWER switch off, wait at least 10 seconds before you turn it back on. Do not turn the power on and off repeatedly.
- Do not turn off the POWER switch while a charge/discharge test is in progress.
- Do not leave the DUT connected after you turn off the PFX2512 POWER switch. If left in this condition for a long period, the PFX2512 may malfunction, or the DUT (battery) may discharge.

- 1 Stop the test from BPChecker3000, and check that current is not flowing through the DUT.**
- 2 Turn on the POWER switches of the DC power supplies and electronic loads.**
- 3 Turn off the PFX2512 and SL01-PFX POWER switches.**

It is also possible to turn on and off all the devices simultaneously by using a rack mount system option or the like. For details on options, contact your Kikusui agent or distributor.

8Slot Unit SL01-PFX Specifications

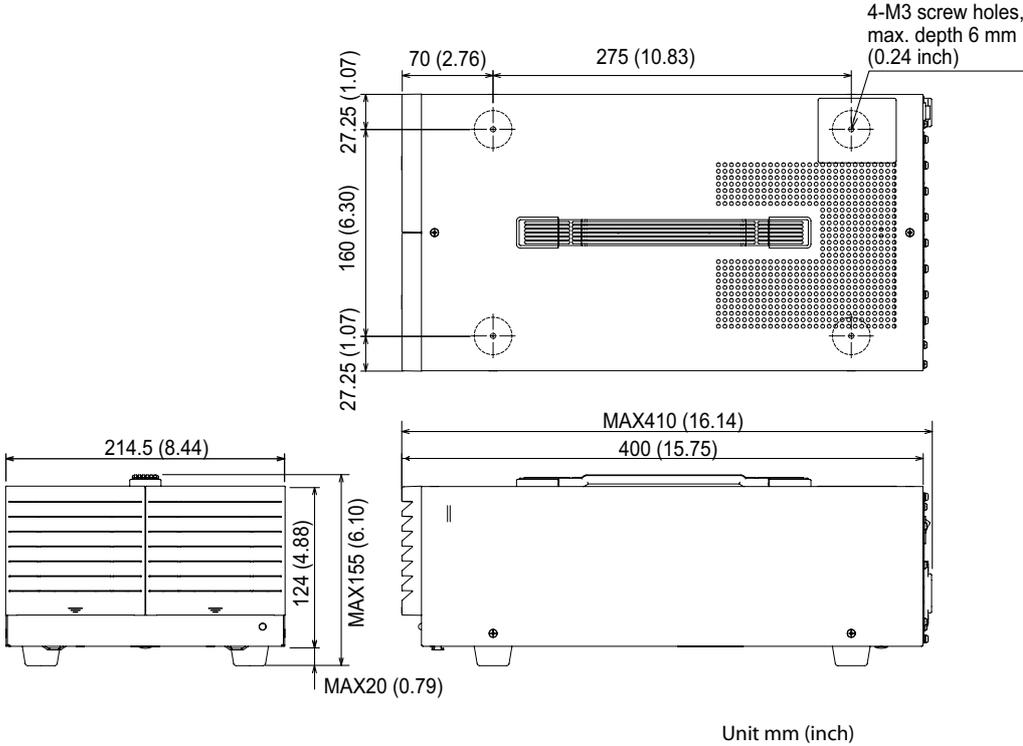
Items not listed are the same as those of the PFX2512.

Input voltage range		90 Vac to 250 Vac, 50 Hz/60 Hz	
Power consumption		60 VAm _{ax} (when 8 OP03-PFXs are installed: 80 VAm _{ax})	
Operating temperature and humidity range		0 °C to 40 °C (32 °F to 104 °F), 20 %rh to 85 %rh (no condensation)	
Storage temperature and humidity range		-10 °C to 60 °C (14 °F to 140 °F), 0 %rh to 90 %rh (no condensation)	
Operating environment		Indoors, overvoltage category II	
Altitude		Up to 2000 m	
Number of slots		8	
Compatible boards ¹		Voltmeter Unit OP03-PFX	
Interface			
LAN (Ethernet) ² PC connection	Protocol	TCP-IP 10Base-T/100Base-TX	
	Connector	RJ-45 Connection/link activity LED	
Sync connector EX01-PFX connection	Sync in	1 input; measurement sync signal input ³ 14-pin flat cable connector	
	Sync out	1 output; measurement sync signal output (option for unit cascade connection) 14-pin flat cable connector	
Safety ⁴		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU ⁵ EN 61010-1 (Class I ⁶ , Pollution Degree 2 ⁷)	
Electromagnetic compatibility (EMC) ^{4 5}		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A ⁸) EN 55011 (Class A ⁸ , Group 1 ⁹) EN 61000-3-2 EN 61000-3-3 Applicable under the following conditions The maximum length of all cabling and wiring connected to the SL01-PFX is less than 3 m.	
Dimensions, weight		See the outline drawing. Approx. 5 kg (11.02 lb)	
Accessories	Power cord	100 V System	1 pc.
		200 V System	1 pc.
	EX01-PFX ¹⁰		1 pc. extension board (for installing in a PFX2512 slot)
	LAN cable		1 pc. Straight type
	14-core flat cable		1 pc.
	Ferrite core for 14-core flat cable		1 pc.
	Lock lever		2 pcs.
	Handling of the product		1 copy

- 1 OP02-PFX cannot be installed.
- 2 IP address setting is either a fixed IP address (address that results by adding 20 to the PFX2512 address is automatically assigned) or an IP address automatically assigned by a DHCP server.
- 3 Connects to an extension board.
- 4 Does not apply to specially ordered or modified SL01-PFXs.
- 5 Limited to products that have the CE mark on their panels.
When the optional OP03-PFX Voltmeter Unit is used, compliance is achieved by using the optional TL12-PFX sensing cable (length: approx. 3 m, connector area: with cover, with core).
- 6 This is a Class I equipment. Be sure to ground the SL01-PFX's protective conductor terminal. The safety of this product is only guaranteed when the product is properly grounded.

- 7 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.
- 8 This is a Class A equipment. The SL01-PFX 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.
- 9 This is a Group 1 equipment. The SL01-PFX does not generate and/or use intentionally radio-frequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
- 10 Installed in the SL01-PFX by factory default.

Outline drawing



Voltmeter Unit OP03-PFX Specifications

Items not listed are the same as those of the PFX2512.

- reading: Indicates the readout value.
- set: Indicates the setting value.
- rating: Indicates the rated.
- Static: General term to indicate CC charge, CC - CV charge, CC discharge, CC - CV discharge, CP discharge, and CP - CV discharge
- Pattern: General term to indicate pattern charge / discharge and I - V characteristics charge / discharge

Charge function

Static		
Constant current-constant voltage charge CC-CV	Cutoff condition	Cell maximum voltage (Cell Max Voltage)
		Cell unbalance (Cell Unbalance) ¹
Constant current charge CC	Cutoff condition	Cell maximum voltage (Cell Max Voltage)
		Cell unbalance (Cell Unbalance) ¹

- 1 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Discharge function

Static		
Constant current discharge CC	Cutoff condition	Cell cutoff voltage (Cell Cutoff Voltage)
		Cell unbalance (Cell Unbalance) ¹
Constant current-constant voltage discharge CC-CV	Cutoff condition	Cell cutoff voltage (Cell Cutoff Voltage)
		Cell unbalance (Cell Unbalance) ¹
Constant power discharge CP	Cutoff condition	Cell cutoff voltage (Cell Cutoff Voltage)
		Cell unbalance (Cell Unbalance) ¹
Constant power-constant voltage discharge CP-CV	Cutoff condition	Cell cutoff voltage (Cell Cutoff Voltage)
		Cell unbalance (Cell Unbalance) ¹

- 1 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Pattern charge / discharge function and I-V characteristic charge/discharge function

Pattern		
Pattern constant current charge/discharge CC Pattern	Cutoff condition	Cell maximum voltage (Cell Max Voltage)
		Cell minimum voltage (Cell Min Voltage)
		Cell unbalance (Cell Unbalance) ¹
Pattern constant power charge/discharge CP Pattern	Cutoff condition	Cell maximum voltage (Cell Max Voltage/ Cell Min Voltage)
		Cell minimum voltage (Cell Min Voltage)
		Cell unbalance (Cell Unbalance) ¹
I-V characteristic charge/discharge I-V Pattern	Cutoff condition	Cell maximum voltage (Cell Max Voltage/ Cell Min Voltage)
		Cell minimum voltage (Cell Min Voltage)
		Cell unbalance (Cell Unbalance) ¹

1 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and charging finishes when the difference between these two values exceeds the set value.

Cell measurement function

Static	
Cell voltage	Average voltage every 100 ms (Cell Voltage)

Cell protection function

Cell overvoltage (overcharge) protection		Detects overvoltage (overcharge) on the basis of the measured voltage (A/D-converted value) Output off
Cell software OVP	Setting range	0 % to 105 % of the measurable range
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	150 ms max.
Cell undervoltage (overdischarge) protection		Detects undervoltage (overdischarge) on the basis of the measured voltage (A/D-converted value) Output off
Cell software UVP	Setting range	-10 % to 95 % of the measurable range
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	150 ms max.
Cell unbalance protection		Detects the difference between the maximum and minimum cell voltages ² , output off
	Setting range	10 mV to 5000 mV ³
	Setting accuracy ¹	Depends on the voltmeter accuracy
	Resolution	1 mV
	Activation time	1 s max.
Option communication error		Communication error of Option board, output off

- 1 Ambient temperature at 18 °C to 28 °C.
- 2 The maximum and minimum cell voltages are calculated for the cells in the object under measurement, and an alarm occurs when the difference between these two values exceeds the set value.
- 3 The voltage difference setting. Voltage difference = Vcell_Max - Vcell_Min

Cell voltage measurement

Static	
Number of measured terminals	8
Measurement range ¹	-2.0000 V to 20.0000 V
Measurement accuracy ²	±(0.05 % of reading + 0.02 % of rating)
Resolution	0.1 mV
Measured value	Average voltage every 100 ms
Measurement interval	100 ms

- 1 You can apply a voltage from -20 V to 22 V.
- 2 Ambient temperature at 18 °C to 28 °C.

General specifications

Isolation voltage	Input terminals ↔ chassis	$\pm 70 V_{max}^1$
Insulation resistance ²	Input terminals ↔ DUT terminals ³	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less ¹
	Input terminals ↔ Input terminals ⁴	
Dimensions	Approx. 105W mm x 15H mm x 150D mm (4.13W inch x 0.59H inch x 5.91D inch)	
Accessories	Screws	2 pcs.
	Handling of the product	1 copy

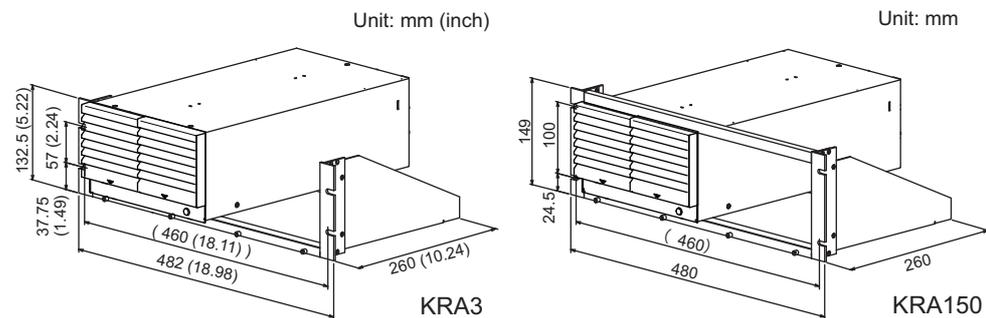
- 1 When installed in a SL01-PFX
- 2 Shared with the voltage sensing input terminal.
- 3 Indicates the terminals for connecting the DUT (the DUT's positive terminal and the DUT's negative terminal).
- 4 This indicates the resistance between measurement terminals.

Mounting to the rack

You can mount SL01-PFX to a rack. To rack mount the SL01-PFX, you need a rack mounting option. For information about options, contact your Kikusui agent or distributor.

Rack mount option

Name	Model	Note
Rack mount frame	KRA3	Inch rack EIA Standard
	KRA150	Milli rack JIS Standard



Remove the handle and rubber feet before you mount the SL01-PFX to a rack. For information on rack mounting, see the KRA3 or KRA150 operation manual. To support the main unit, attach an angle support to it that is appropriate for the rack.

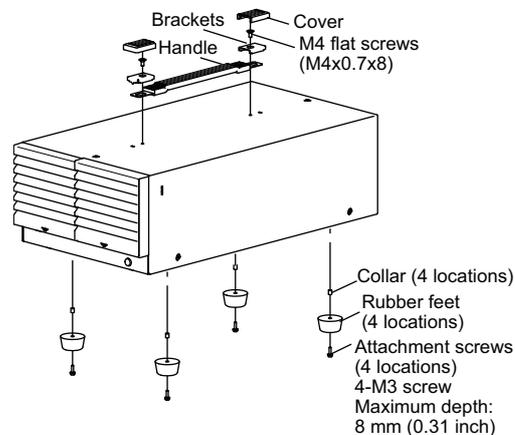
NOTE

To reinstall the handle that has been removed, use screw locking agent (e.g., 1401B by ThreeBond International, Inc.) to prevent screws from loosening.

■ Removing the handle and feet

We recommend that you keep all pieces that you have removed from the SL01-PFX. You will need these pieces if you remove the SL01-PFX from the rack.

If you remove the SL01-PFX from the rack, re-attach the original rubber feet.



- 1 Pull up the handle cover (two locations).**
- 2 Unfasten the two M4 flat countersunk head screws, and remove the entire handle.**
- 3 Loosen the screws to remove the rubber feet (in four locations).**



Appendix

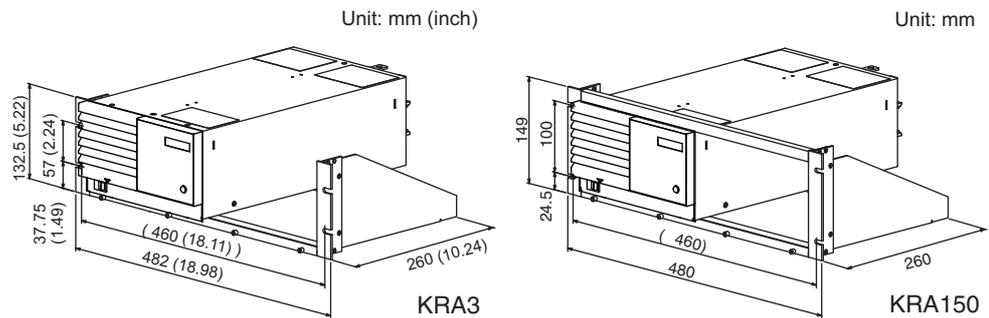
- A Options
- B Cleaning the Dust Filter
- C Characteristics of Digital CC/CV Control
- D Explanation of Functions
- E Connecting to a Bias power supply Reference Data
- F Reference Data
- G Troubleshooting

A Options

For information about options, contact your Kikusui agent or distributor.

Rack mount option

Name	Model	Note
Rack mount frame	KRA3	Inch rack EIA Standard
	KRA150	Milli rack JIS Standard



Remove the handle and rubber feet before you mount the PFX2512 to a rack.

For information on rack mounting, see the KRA3 or KRA150 operation manual.

To support the main unit, attach an angle support to it that is appropriate for the rack.

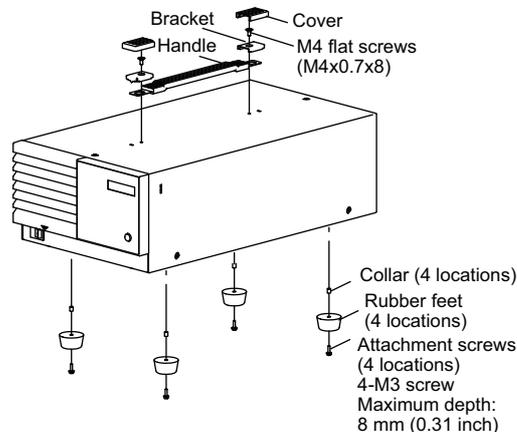
NOTE

To reinstall the handle that has been removed, use screw locking agent (e.g., 1401B by ThreeBond International, Inc.) to prevent screws from loosening.

We recommend that you keep all pieces that you have removed from the PFX2512. You will need these pieces if you remove the PFX2512 from the rack.

If you remove the PFX2512 from the rack, re-attach the original rubber feet.

■ Removing the handle and feet

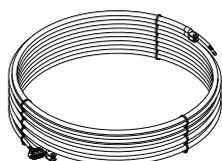


1 Pull up the handle cover (two locations).

2 Unfasten the two M4 flat countersunk head screws, and remove the entire handle.

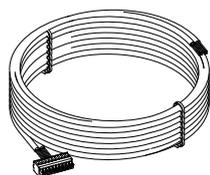
3 Loosen the screws to remove the rubber feet (in 4 locations).

Load cable TL08-PFX



This is a dedicated load cable for connecting the PFX2512 and the DUT (battery). Because the cables and sensing cables that are necessary for making this connection are already assembled, connection is easy.

Sensing cable set TL09-PFX (for OP02-PFX)



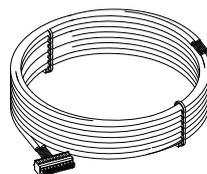
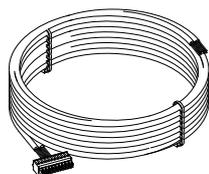
Voltage sensing cable
approx. 5m



K type Thermocouple
approx. 5 m

This cable set consists of a dedicated sensing cable and thermocouple for connecting the DUT (battery) to a PFX2512 in which an Volt / Thermometer Unit OP02-PFX is installed. This product supports 4 voltage and 4 temperature measurement points. Connectors are attached to these cables, so connection is easy.

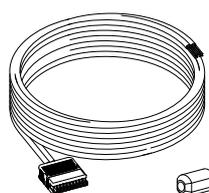
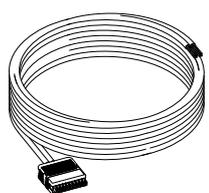
Sensing cable set TL11-PFX (for OP03-PFX)



Voltage sensing cable x 2 approx. 5 m each

This cable set consists of a dedicated sensing cable for connecting the DUT (battery) to an SL01-PFX in which an Voltmeter Unit OP03-PFX is installed. This product supports 8 voltage measurement points. Connectors are attached to these cables, so connection is easy.

Sensing cable set TL12-PFX (for OP03-PFX) [CE compliant product]



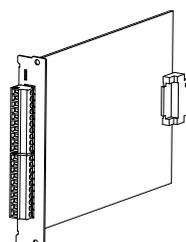
Voltage sensing cable x 2
(Connector area with cover)
approx. 3 m each

Core x 4

This cable set consists of a dedicated sensing cable for connecting the DUT (battery) to an SL01-PFX in which an Voltmeter Unit OP03-PFX is installed. This product supports 8 voltage measurement points. Connectors are attached to these cables, so connection is easy.

If a CE marking is indicated, using this cable will meet the relevant requirements.

Volt/Thermometer Unit OP02-PFX

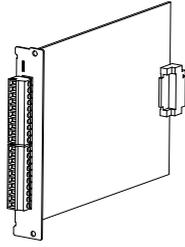


This is an expansion board for the measurement feature. It is installed in a PFX2512 for use.

You can increase the number of measurement points by 4 voltage and 4 temperature measurement points.

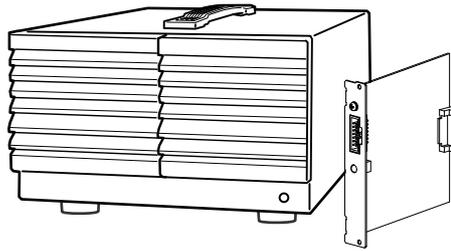
Up to 3 boards can be installed, so you can increase the number of measurement points of 12 voltage and 12 temperature measurement points. Up to 2 boards can be installed when you expand the system by connecting to the optional SL01-PFX.

Voltmeter Unit OP03-PFX



This is an expansion board for the measurement feature. It is installed in a 8Slot Unit SL01-PFX (sold separately). You can increase the number of measurement points by 8 voltage points. Up to 8 boards can be installed, so you can increase the number of measurement points of 64 voltage.

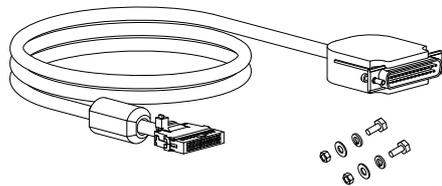
8Slot Unit SL01-PFX



This is an expansion slot for the measurement function. You can increase the number of voltage measurement points by connecting to a PFX2512 using the included EX01-PFX. It is used by installing OP03-PFX units (sold separately). Up to 8 boards can be installed.

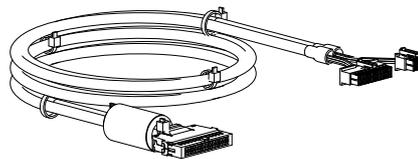
By installing 8 boards in an SL01-PFX and installing OP02-PFX 2 boards (sold separately) in the option board slot of the main unit, you can increase the number of measurement points of 72 voltage.

I/F cable SC05-PFX (Electronic load PLZ-5W)



This is a dedicated load cable for connecting the PFX2512 and the Electronic load PLZ-5W. Connectors are attached to these cables, so connection is easy.

I/F cable SC07-PFX (DC power supply PWR-01)



This is a dedicated load cable for connecting the PFX2512 and the DC power supply PWR-01. Connectors are attached to these cables, so connection is easy.

B Cleaning the Dust Filter



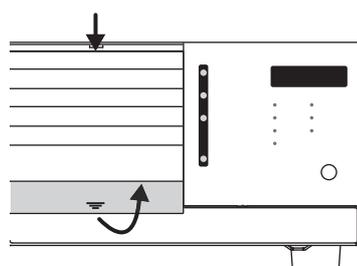
Risk of electric shock. When performing maintenance work, be sure to turn off the POWER switch and remove the power cord plug.

A dust filter is installed on the inside of the louver. Periodically clean the filter to prevent clogging.

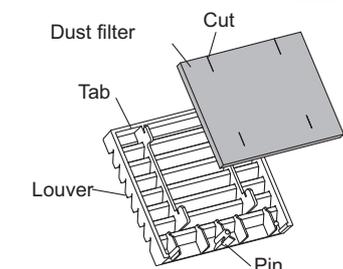


Clogging may lead to malfunction or the reduction of the product's service life.

- If the dust filter is clogged, the product's internal cooling capabilities will be reduced.
- When the PFX2512 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 the PFX2512 increases.



1 While pulling the bottom slat towards you, slide the top of the louver down, and remove the louver from the panel.

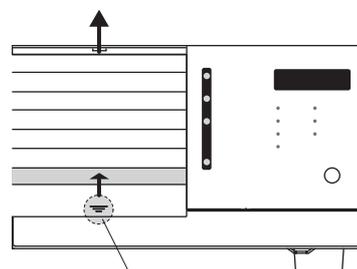


2 Remove the dust filter from the inside of the louver and clean it.

Use a vacuum cleaner to dispose of the dust and foreign particles that are attached to the dust filter. If the filter is extremely dirty, clean it using water-diluted neutral detergent, and dry it completely.

3 Attach the dust filter to the louver.

Attach the dust filter so that the louver's tabs pass through the cuts in the dust filter.



4 Insert the dust filter into the louver, and then attach the louver so that its tabs enter the slots in the panel. While pushing on the second slat from the bottom of the louver, slide the louver up to attach it.

The pin will lock in place.

Fix the pin inside the louver in place.

App.

C Characteristics of Digital CC/CV Control

The constant current (CC)/constant voltage (CV) control on the PFX2512 is performed digitally. This section describes the characteristics and operation principle of digital CC/CV control so that you can efficiently conduct evaluation tests.

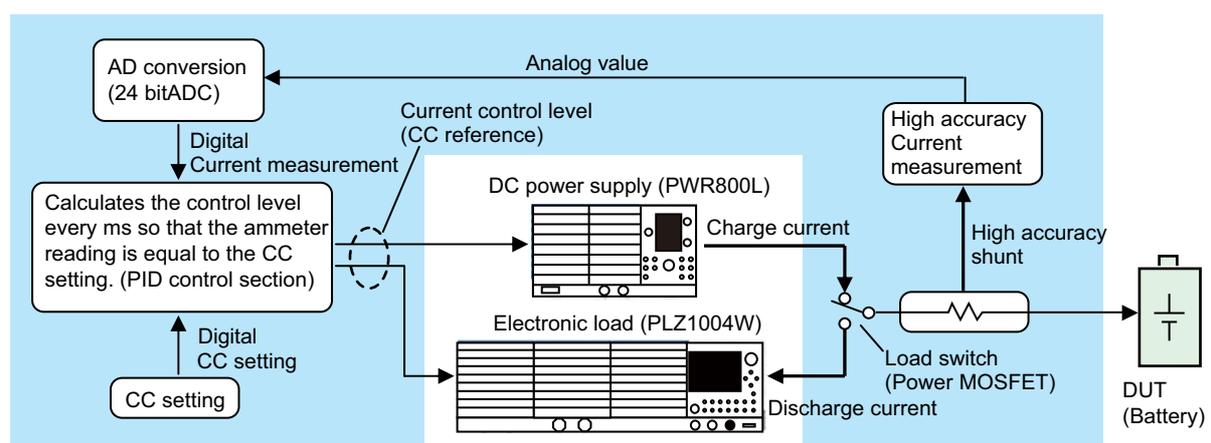
- **Digital CC/CV control is not susceptible to the performance of the connected DC power supplies or electronic loads and constantly enables high-accuracy CC/CV control.**
- **System adjustments based on the combination of DC power supplies and electronic loads are not necessary.**
- **Difference in performance in the measurement of charge capacity and discharge capacity is less likely to occur, and accurate charge/discharge efficiency measurement is possible.**

Explanation of operation

As an example, the operation principle will be briefly explained using digital CC control during charging.

In constant current charging, when a digital CC value is sent to the PID control section, and the operation starts, the PID control section changes the level of current control on the DC power supplies. The charge current is measured using a high-accuracy shunt, and a digital current measurement is obtained through a 24-bit A/D converter. The PID control section compares the digital CC value to the digital current measurement and calculates the current control level to make them equal. This sequence of operations is performed a 1 000 times per second.

Digital CC control explanatory diagram



If a DUT other than a battery is connected, the CC/CV control may not work properly.

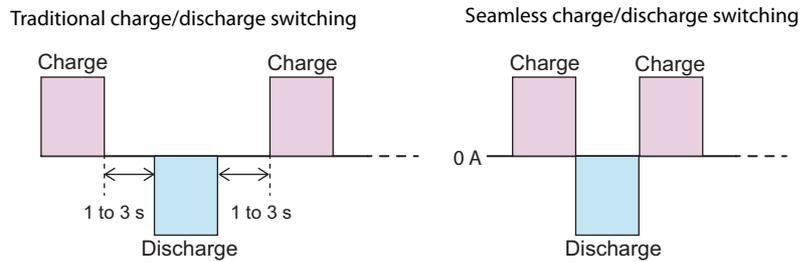
If there is no load (not connected) or if a battery with an abnormally high internal impedance is connected, CV mode may not work properly.

Even in CV or CP mode, the connected DC power supplies and electronic loads run in CC mode. This is because external devices are always running as current sources, so this is the correct behavior.

Pattern charge/discharge function (seamless charge/discharge control)

You can perform seamless charge/discharge switching only using with DC power supplies and electronic loads (without using bipolar power supplies or bidirectional power supplies). You can reduce the current capacity of the power supply or the loss of the electronic load at the switch point.

This supports the standard test patterns in which charging and discharging are performed consecutively such as the test patterns that are described in the IEC standards. This is a useful feature for the step operations that are required when you are simulating charge/discharge tests.



D Explanation of Functions

This section describes the characteristics and handling precautions of the measurement and other functions of the PFX2512 Charge/Discharge System Controller.

Description of the measurement function

The PFX2512 is equipped with a 24-bit resolution delta-sigma high-speed A/D converter for taking measurements. It can measure at high speed and with high accuracy over a wide measurement range of 60 V/50 A at a resolution of 100 μ V/100 μ A without changing the range.

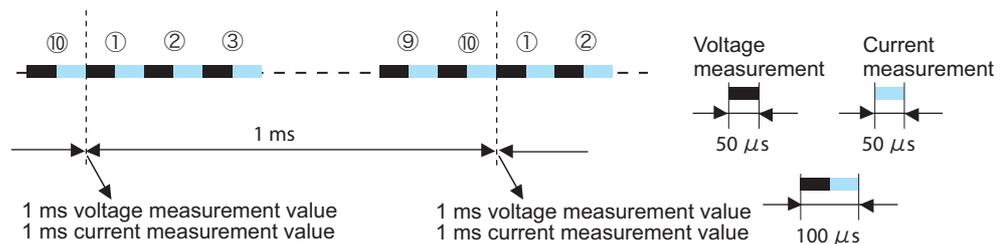
Utilizing the high-speed conversion performance through a software application, transient voltage response can be measured accurately during constant current, constant voltage, and constant power control and pattern charge/discharge.

Measurement during normal operation

Acquiring and applying 1 ms measurements

The A/D converter takes 50 μ s for each conversion. Voltage and current are converted alternately. When 10 conversions are complete for each, the averages are calculated to derive a pair of 1 ms measurements. These measurements are used for digital CC/CV control and detection of protection function activation (SOVP, SUVP, SOCP).

Five hundred of these 1 ms measurements are averaged to derive 500 ms measurements. These measurements are continuously recorded by the application software as charge/discharge voltage/current data.

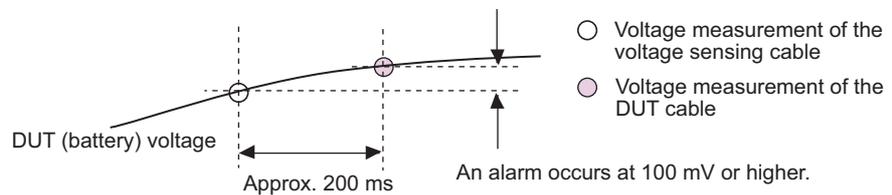


Connection check function

The connection check function measures the voltages in DUT cables connected to the DUT (battery) and voltage sensing cables. If there is a difference in the measurements, the function decides that the connection is not normal and cancels the execution of the test. It can prevent accidents when the voltage sensing cable is loose or when there is an error in the connections. The connection check function operates immediately before charging or discharging begins.

It takes about 200 ms to measure the voltages in the DUT cables and voltage sensing cables. If the DUT (battery) voltage changes during this measurement, an alarm may occur even when the connections are correct. In particular, this may occur if the rest time for switching between charging and discharging is short. If the DUT (battery) voltage changes drastically, turn off the connection check function.

Detection may be difficult for poor contact and other situations. In other words, the function does not check the connection status completely.



Unbalance detection function (only when an OP02-PFX / OP03-PFX is installed)

This function measures the voltages of all the cells in the object under measurement, and detects the maximum and minimum cell voltages. When the unbalanced voltage (the difference between the maximum and minimum cell voltages) exceeds the set value, an alarm occurs and the output is turned off. If you have set this as a cutoff condition, the charge/discharge operations stop (they are cut off).

The unbalanced voltage detection response time is approximately 1 second after the cell voltage measurement begins.

You can connect up to 72 (when two OP02-PFX units and eight OP03-PFX units are installed) objects under measurement.

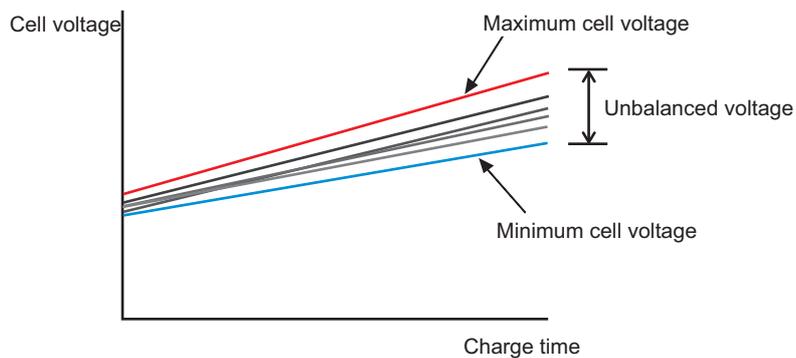
To set the unbalanced voltage function, use the BPChecker3000 application software.



Test Condition Editor

If the internal resistance of the DUT (battery) is high and the voltage fluctuates greatly during charge/discharge, this function may not operate correctly. Turn this function off during these situations.

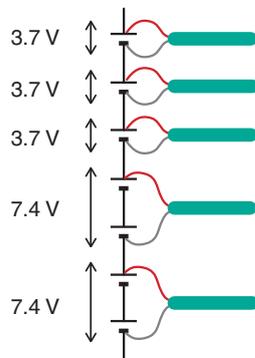
Example of the voltage measurement of six cells



Be sure to connect a sensing cable to each cell.

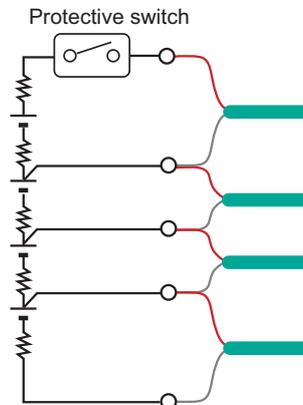
If you connect to the cells in one of the following ways, the unbalance detection function will not work properly. Doing so may lead to the abrupt interruption of tests or the generation of alarms.

Connecting to different voltages (Example of a prohibited connection)



The unbalance detection function only works on cells of the same type and same voltage.

Not connecting sensing cables to both ends of the cells (example of a prohibited connection)



The function is affected by the resistance between the cells and the protection switch resistance, and it cannot measure the correct cell voltages.

E

Connecting to a Bias power supply

See p. 23

If you want to perform discharge tests with a voltage lower than the minimum discharge operating voltage, connect a bias power supply.

This is useful when you want to evaluate a low voltage range, when you want to perform a charge/discharge test on a single cell, or in similar situations.

For the bias power supply, you can use variable-voltage power supplies or fixed-voltage power supplies.

By connecting a bias power supply of approximately 5 V between the PFX2512 and the electronic load, the voltage becomes “DUT voltage + bias power supply voltage,” which is a voltage within the operating area where specifications are guaranteed.

The current capacity of the PFX2512 is 50 A, so when you connect a 5 V bias power supply, configure the settings so that the power capacity is at least $5\text{ V} \times 50\text{ A} = 250\text{ W}$.

Regarding the power distribution of the PLZ-4W, the part for the bias power supply is consumed, so if you want to use the PLZ1004W and a 250 W bias power supply, the power range that can be used for DUT (battery) discharge is $1000\text{ W} - 250\text{ W} = 750\text{ W}$.

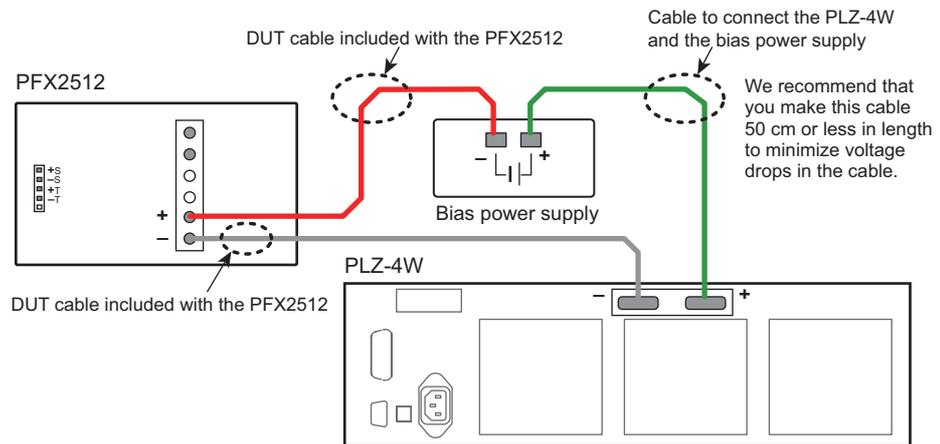
CAUTION

- Set the bias power supply so that it is always on (its output is on) when the charge/discharge system is on. If the discharge is started with the bias power supply off, the bias power supply may be damaged.
- Pay attention to the bias power supply settings and the permitted capacity (the current rating) to ensure that the bias power supply does not operate in constant current mode (current limit) during discharging. If the bias power supply enters constant current mode (current limit) during discharging, an alarm will occur.
- When a bias power supply is connected, the electronic load's panel displays a voltage of approximately 4 V even when the system is at rest, but this is not a malfunction.

App.

Wires and tools required for connection

Bias power supply	Output voltage: 5 V constant voltage operation Output current: greater than the discharge current
Cables	Cable to connect the PLZ-4W and the bias power supply 14 mm ² (AWG6) or more, 50 cm or less, See Table "Nominal cross-sectional area of wires and allowable currents (reference)" (p. 28)



PFX2512 pattern charge/discharge

The data is acquired under the following conditions.

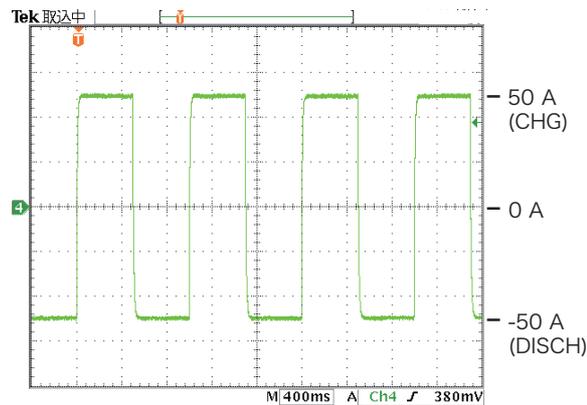
System requirements

Charge/discharge system controller	PFX2512
Power supply	PWR800L
Electronic Load	PLZ1004W
The DUT (battery)	Use a 14 mm ² cable with a length of 5 m to connect to a 25.9 V, 40 Ah Li-ion battery module.

Measuring conditions

Current probe	3274 (HIOKI)
Oscilloscope	TDS3032 (Tektronix)

Pattern current waveform (measured by the current probe)

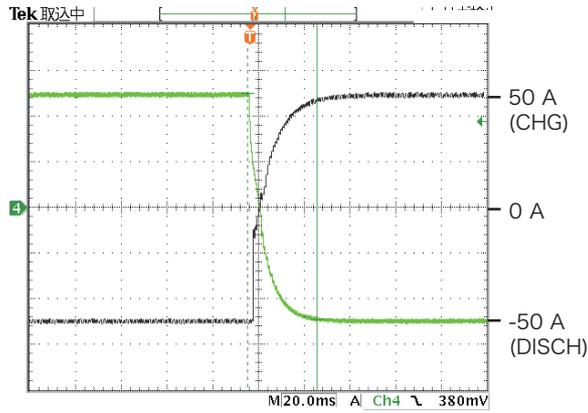


Setting conditions

2 values CC pattern charge/discharge	
Step 1	CHG: 50 A 500 ms
Step 2	DISCHG: 50 A 500 ms

App.

The rising and falling waveforms of the pattern current (measured by the current probe)



Setting conditions

2 values CC pattern charge/discharge	
Step 1	CHG: 50 A 500 ms
Step 2	DISCHG: 50 A 500 ms

G 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 listed here match your situation or if the remedy does not correct the problem, contact your Kikusui agent or distributor.

The power does not turn on

Symptom	Items to check and possible remedy	See
The POWER/STANDBY LED does not light even when the POWER switch is turned on.	Is the power cord connected properly?	p. 28
	Are the cables between the devices connected properly?	p. 30
The ALARM/WARNING LED is lit when the POWER switch is turned on.	In rare cases, the ALARM/WARNING LED lights red. This is due to a power interruption being detected depending on the timing of turning on the power switch. This is not an error. Turn off the power switch, wait at least 5 seconds, and then turn it on again.	—
	Is a protection function or warning function activated?	p. 68

The correct voltage/current is not displayed.

Symptom	Items to check and possible remedy	See
The displayed value is strange.	Is the front panel display showing the appropriate item that you want to view?	p. 66
The display error is large.	Error may be large immediately after turning the power on due to the initial temperature drift. Wait for the temperature to stabilize (about 30 minutes), and then check again.	p. 78
	If the dust filter is clogged and the internal temperature rises, errors will increase due to the temperature drift of measurement circuits and the like. Clean the dust filter.	p. 125
	If errors are large even under different conditions, the product adjustment may be off. Contact your Kikusui agent or distributor.	—
The voltage display is unstable.	If the connected DUT is not a battery or if the DUT is connected yet to another device, the voltmeter display may be unstable.	—
	Is the ground wire of the power cord grounded? If it is not grounded properly, the voltmeter display may fluctuate.	p. 28 p. 32
The test data results are unstable.	Is the chassis terminal connected? Connections between devices may be affected by noise. To prevent malfunction, acquire accurate test data, and perform charge / discharge tests safely, we recommend that you connect the chassis terminal.	p. 32

App.

The correct temperature is not displayed.

Symptom	Items to check and possible remedy	See
The display error is large.	Are you using the specified thermistor? If a capacitor or other component is connected to the thermistor, display error will become large. Use the specified thermistor.	p. 3
	Check how the thermistor is connected to the DUT. Even a minute gap will greatly affect measurement results.	p. 43

Tests cannot be performed properly.

Symptom	Items to check and possible remedy	See
Even when channels are searched for, none is found.	If you are using a new PC or Windows, Windows Update may not be installed. Perform Windows Update to install the latest update. If proper operation is verified, you do not need to perform additional updates.	—
Tests do not start.	Is the model ID set correctly?	p. 59
	Is the ALARM/WARNING LED lit orange?	p. 70
	The vibration sensor may be activated. Check whether the product is installed on a horizontal stable surface.	p. 46
	Is the cable connected to the DC power supply and Electronic load properly connected?	p. 36 p. 40
CC/CV operation is strange.	Is a DUT other than a battery connected? If a DUT other than a battery is connected, the CC/CV control may not work properly.	p. 126
	If there is no load (not connected) or if a battery with an abnormally high internal impedance is connected, CV mode may not work properly.	
	Is voltage sensing connected? The system will not work properly if it is not connected. Be sure to connect the voltage sensing cable.	p. 44
The DC power supply circuit breaker trips.	The DC power supply's protection function (OVP or OCP) may have been activated. Check the DC power supply's protection function settings. This behavior may also occur when there is no load or when current is not flowing through the DUT (battery) (protection circuit activation and the like).	p. 47
Even though option boards are installed, the number of measurement points has not been expanded.	Are option boards inserted properly?	
	Have you customized the model ID? The first time that you use the product after purchase, use BPChecker3000 to customize the model ID.  Io Config	p. 86 p. 106
	Did you set the number of OP02-PFX or OP03-PFX boards? Set the number of boards using BPChecker3000.  Test Condition Editor	

Symptom	Items to check and possible remedy	See
Tests stagnate or stop partway through their execution.	Are you executing a great number of tests over a long time? The PC may be overloaded. For details, see the BPChecker3000 setup guide for the PC system requirements.	p. 18
	Is the PC switching to sleep mode? If the PC enters sleep mode during test execution, the test may be aborted due to a communication error. Turn off the PC's sleep feature.	p. 18
	Is Windows Update set to auto? If an update starts during test execution, the test may stagnate. Set Windows Update to manual mode.	p. 18
	Is the system connected to the Internet, corporate LAN, or wireless LAN? If so, the system may be affected during test execution. After configuration is complete, do not connect the system to the Internet, corporate LAN, or wireless LAN during charge/discharge tests.	p. 18

An alarm is displayed.

Symptom	Items to check and possible remedy	See
When idling, the ALARM/ WARNING LED is lit orange.	The warning function can be activated even when a charge / discharge test is not being executed (in idle). Remove the root cause of the warning.  Test Condition Editor , Test Executive	p. 46 p. 70
After a test is started, the ALARM/WARNING LED is lit red.	An error was detected, and thus, the test was aborted and the alarm is displayed. Remove the root cause of the alarm.  Test Condition Editor , Test Executive	p. 68
Immediately after charging begins, <code>[Err.002]</code> or <code>[Err.009]</code> is displayed on the front panel.	The overvoltage protection may have been activated. Is the DUT connected correctly? Is the voltage sensing position correct? Is the charging circuit cut off by the battery protection circuit (BMS)? Is the internal impedance of the DUT high causing the voltage to increase due to the charge current?	p. 43 p. 44
Immediately after discharging begins, <code>[Err.003]</code> or <code>[Err.010]</code> is displayed on the front panel.	The undervoltage protection may have been activated. Is the DUT connected correctly? Is the voltage sensing position correct? Is the internal impedance of the DUT high causing the voltage to decrease due to the discharge current?	p. 43 p. 44
<code>[Err.007]</code> is displayed on the front panel.	Are the LAN cables between the devices connected properly? Are the cables disconnected?	p. 54
<code>[Err.008]</code> is displayed on the front panel.	If the AC power line is interrupted for 50 ms or longer or if the voltage is abnormal, an alarm (AC_OFF) occurs. If there is a regenerative device or the like on the same power line and the power line waveform is greatly distorted, this alarm may be triggered by mistake, or measurements may fluctuate. Install a line filter or the like if necessary.	p. 28 p. 68
<code>[Err.012]</code> is displayed on the front panel.	The PFX2512 overheat protection function of the power circuit may have been activated. The ambient temperature is exceeding the operating temperature, the air inlet or outlet port is blocked, the dust filter is clogged, or the fan may have malfunctioned. If it is lit when there is no problem with the operating environment, stop using the PFX2512 immediately, and contact your Kikusui agent or distributor.	p. 68 p. 83 p. 125

App.

Symptom	Items to check and possible remedy	See 
Err.050 is displayed on the front panel.	An alarm occurred on a connected electronic load. Are the electronic load's protection functions (e.g., OPP) set properly? Is the electronic load turned on?	p. 49 p. 68
Err.051 is displayed on the front panel.	Are the external analog control settings of the connected electronic load correct? Are the flat cables connected properly? Is there a problem with connection cables or DUT (battery)? This alarm may occur if discharging causes the rated power of the electronic load to be exceeded.	p. 40 p. 48 p. 68
Err.060 is displayed on the front panel.	An alarm occurred on a connected DC power supply. Are the DC power supply's protection functions (e.g., OVP, OCP) set properly? Is the DC power supply turned on?	p. 47 p. 68
Err.061 is displayed on the front panel.	Are the external analog control settings of the connected DC power supply correct? Are the flat cables connected properly? Is there a problem with connection cables or DUT (battery)? This alarm may occur if charging causes the rated power of the DC power supply to be exceeded.	p. 36 p. 40 p. 68
Err.063 is displayed on the front panel.	The initial current (load check current that is smaller than the set current) for checking the DUT status is not flowing when attempting to start a charge, pattern or IV characteristics test. Is the DUT connected correctly? Is the charging circuit cut off by the battery protection circuit (BMS)?	p. 43 p. 44
Err.105 is displayed on the front panel.	Are the LAN and flat cables connected properly?	p. 102 p. 103
Err.108 is displayed on the front panel.	A system with the same IP address was detected on the LAN communication circuit. When using fixed IP addresses, assign unique IP addresses using IO Config of BPChecker3000. If you are using several PFX2512s, be sure also to set the channel numbers.	p. 55
An I/O (Comm) alarm is displayed on the application window.	This appears when communication between the PC and the PFX2512 is not working. Check the system connections. This alarm also occurs if the PFX2512 power supply is cut off temporarily. For details on how to restore the system after a power outage, see the BPChecker3000 help file.  Test Executive	p. 68

The system suddenly stopped due to a power outage or some other cause.

Symptom	Remedy	See
The PC suddenly stopped or froze.	Is the PC in standby or sleep mode? Be sure to disable standby and sleep modes.	— —
	Restart the PC, and resume the test from BPChecker3000 Test Executive. There is no need to reconnect. For details, see “When a power failure occurs on the host PC side or on all devices” in “Recovery after Power Failures ” in the BPChecker3000 help file.  Test Executive	—
PFX2512 suddenly stopped.	BPChecker3000 status display shows “IOErr.” Restart the PFX2512 and reconnect. For details, see “When a power failure occurs on a charge / discharge unit” in “Recovery after Power Failures” in the BPChecker3000 help file.  Test Executive	—
The PC and PFX2512 suddenly stopped.	If both the PC and PFX2512 stop, restart the PFX2512 first and then the PC. For details, see “When a power failure occurs on the host PC side or on all devices” in “Recovery after Power Failures ” in the BPChecker3000 help file. For details, see the BPChecker3000 help file.  Test Executive	—
After a power outage, recovery or restarting the test does not work.	Are you using an uninterruptible power supply for the PC? An uninterruptible power supply is necessary for closing BPChecker3000 and Windows. If you do not use an uninterruptible power supply, damage may occur to the PC or Windows. Also, use the auto shutdown management software on the uninterruptible power supply to shut down the PC properly.	p. 18



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If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact your Kikusui agent or distributor. At that time, inform your agent or distributor of the "Part No." written on the front cover of this manual.

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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