M0006009B

SANUPS ASE-H

ASE10S1HU002-08
ASE10S1HU002-20
ASE10S1HU002-30
ASE10S1HU002-40

Uninterruptible Power Supply Unit

PDASEU02

UPS Power Distribution Unit

200V Type

Installation/Maintenance Manual

SANYO DENKI

Introduction

Thank you for choosing the Model ASE10S1HU002-08,-20,-30,-40 and PDASEU02 UPS System.

SAVE THESE INSTRUCTIONS

This Manual contains important instructions for operating and maintaining the ASE10S1HU002 and PDASEU02 UPS System to protect the safety of the service technician and the customers. Read it carefully before operating or maintaining the UPS system, to ensure personal safety and proper device usage.

After reading, keep it in a place where it is easily accessible for reference.

This device is intended to be installed in a temperature-controlled indoor environment free of conductive contaminants.

- Operating temperature: 0 to 40°C (32 to 104°F)

UPS is an abbreviation for Uninterruptible Power Supply

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1. Safety Precautions

PRECAUTIONS (IMPORTANT SAFETY INSTRUCTIONS) SAVE THESE INSTRUCTIONS

Before installing, operating, performing maintenance or inspecting the UPS, be sure to read this manual and accompanying documents carefully to obtain a clear understanding of the information related to its operation, safety and important precautions.
This manual described two warning levels, DANGER and CAUTION, as described below.

Denotes immediate hazards which WILL probably cause severe bodily injury or death, as a result incorrect operation.

Denotes hazards which COULD cause bodily injury and product or property damage, as a result incorrect operation.

Additionally, even those hazards denoted by ⚠ CAUTION could lead to a serious accident, so the instructions should be strictly followed.

The following labels indicate particularly important instructions which must be carefully followed. The graphic symbols indicate prohibited and mandatory actions.

Indicates actions that must not be allowed to occur (prohibited actions).

Indicates actions that must be taken (mandatory actions).
This example signifies that the equipment must be securely grounded.

1. Installation Precautions

⚠ CAUTION

- The UPS should be installed only by technically qualified personnel. Improper installation can result in electric shock, bodily injury, and/or fire.
- Never operate or store the UPS in the following environmental conditions. Doing so may cause the UPS to malfunction, sustain damage or deteriorate, which could result in a fire.
  a. In ambient environmental conditions other than those specified in the product brochure and instruction manual (temperature 0 to 40°C(32 to 104°F), relative humidity 30 to 90%), such as in extremely high or low temperature and high humidity.
  b. Where the UPS is exposed to direct sunlight.
  c. Where the UPS is directly exposed to the heat from a heat source, such as a stove.
  d. Where the UPS may be subject to vibration or physical shock.
  e. Near a device that may emit sparks.
  f. In the presence of dust, salt or corrosive or flammable gas.
  g. Outdoors
- Do not allow the air intake or exhaust vents to be obstructed. Keep the front and back of the UPS at least 20 cm(7.88in) away from the wall. If the air intake or exhaust vent is blocked, the internal temperature of the UPS rises, which could cause battery deterioration resulting in a fire. During maintenance, the UPS requires at least 1 m (39.4in) space at the front and 50 cm(19.69in) at the back.
- The space around the UPS must be ventilated. Unless the specified ventilation airflow (5 m^3/h) is maintained, gas produced by battery charging could result in rupture or explosion of the case.
- Install the UPS on a stable surface capable of bearing the weight of the UPS in the correct manner specified in this manual.
- If the UPS is installed incorrectly, impact or vibration could cause it to fall or move inadvertently, resulting in bodily injury. Be careful to avoid back strain.
- UL-Listed Branch circuit type overcurrent protection device rated min.250Vac, “2 Units Par.:15A, 3 Units Par.: 20A, 4 Units Par.: 30A, 5 Units Par.: 30A” must be provided for the input ac circuit by qualified personnel .
- UL-Listed Branch circuit type overcurrent protection device rated min.250Vac, “2 Units Par.:15A, 3 Units Par.: 20A, 4 Units Par.: 30A, 5 Units Par.: 30A” must be provided for protection of the output and input ac circuit by qualified personnel .

2. Wiring Precautions

⚠ CAUTION

- Wiring should be performed only by technically qualified personnel. Incorrect wiring can result in electric shock and/or fire.
- Wire with the specified wire and the specified torque surely.

Terminals	Minimum Wire Size				Temperature and Material	Torque
Type	No. of Parallel-Connected UPS Units					
	2 Units	3 Units	4 Units	5 Units		
Input/Output/Ground	14 AWG	12 AWG	12 AWG	10 AWG	Min. 75℃ copper 3wire	1.5-1.8 N-m

- Connect the grounding cable securely in the manner specified. Failure to connect the grounding cable may result in electric shock.
- The grounding cables of all load devices* connected to the output of the UPS must be securely connected to the grounding terminal. Failure to connect the grounding cables correctly may result in electric shock.

* Load devices are devices such as computers that are connected to the UPS.

3. Operating Precautions

DANGER

- Immediately shut the UPS off if it malfunctions, or if an unusual odor or noise is observed. Failure to do so may result in a fire.
- To avoid electric shock, do not open the cover of the UPS.

CAUTION

- The space around the UPS must be well ventilated. Otherwise, gas produced by battery charging could result in rupture or explosion of the case.
- Before starting the UPS, make sure that the load side is safe. Be sure to refer to the instruction manual while operating the UPS. The operating state of the UPS, as determined by the ON/STAND BY switch, is indicated by the LEDs as shown the table below. Check these indicators when operating.
  Be careful when operating the ON/STAND BY switch. If power is supplied incorrectly, an electric shock or bodily injury could result.

UPS status	LEDs
STAND BY	INPUT (on-green), OUTPUT (off-green)
ON	INPUT (on-green), OUTPUT (on-green)

- Avoid inserting sharp objects or fingers into the fan. Doing so may result in bodily injury.

PROHIBITED

- Never use the UPS for the following types of loads:
  a. Medical instruments used for life support.
  b. Control units for trains or elevators, failure of which could cause bodily injury.
  c. Computer systems upon which social or public infrastructure depends.
  d. Devices which serve applications related to the above.
  Contact your sales representative if you need to use the UPS in an application like the above. Special equipment, such as redundant devices or an emergency generator must be incorporated when operating, maintaining and controlling systems in which a UPS is used with loads affecting life-support or public infrastructure-dependent applications.
- Do not smoke or use an open flame near the UPS, as it could cause the UPS to explode or rupture, resulting in injury or fire.
- Do not place containers of liquid, such as a flower vase, on the UPS. If the container was to spill, the liquid could cause a short circuit, resulting in sparks or fire inside the UPS.
- Do not sit, step or lean on the UPS, as bodily injury could result if the UPS was to fall.

4. Maintenance and Inspection Precautions

CAUTION

- Maintenance and repair of the inside of the UPS should be performed only by technically qualified personnel. Electric shock, bodily injury and burns, fuming, or fire could otherwise result.
- Contact your nearest sales representative or authorized service center to have the UPS checked out or to replace defective parts. Opening the cover carelessly can result in an electric shock or burn.
- Replace the batteries periodically (once every 4.5 years when operated at 25°C(77°F). Using batteries after their service life has expired may cause a fire.
- Do not allow sharp metallic objects or fingers to touch the battery connectors of the UPS. Doing so may result in an electric shock.
- Do not touch any parts inside the UPS, even when AC input is removed. Voltage produced from the batteries can still cause an electric shock.

5. Relocation and Transportation Precautions

⚠ CAUTION

- Be careful to avoid falling or dropping the UPS during relocation or transportation, as bodily injury could result.
- Be careful to avoid back strain when handling the UPS.
- To avoid bodily injury caused by dropping the UPS, do not tilt it more than specified degrees to either side when moving it. Take preventative measures to avoid dropping the UPS if it must be tilted more than specified degrees when moving it.

Equipment type name	No. of Parallel-Connected UPS Units			
	2 Units	3 Units	4 Units	5 Units
Angle of inclination (degree)	30	40	50	55

6. Battery Handling Precautions

⚠ CAUTION

- Battery servicing should be performed or supervised by technically qualified personnel knowledgeable about batteries and the required precautions. Keep unqualified personnel away from batteries.
- Nominal battery voltage is 36 volts DC.
- Replace batteries only with the same model and brand: HF7-12 manufactured by Shin-Kobe Electric Machinery Co., Ltd.
- Customers should not dispose of used batteries themselves. Contact your nearest sales representative, authorized service center or sales office to dispose of used batteries.
- Do not use batteries after their service life has expired. Doing so may result in fuming or fire. Additionally, the battery backup function may fail to operate with such batteries, so that power will not supplied to the load when a power outage occurs.
- Batteries pose hazards for electrical shock and dangerous short-circuit current. The following precautions should be observed when working with batteries:
  a. Remove watches, rings and other metal objects.
  b. Use insulated tools.
  c. Wear rubber gloves and boots.
  d. Do not lay tools or metal parts on top of batteries.
  e. Disconnect the charging source prior to connecting or disconnecting battery terminals.
  f. Determine whether the batteries have been inadvertently grounded, and if so, remove the source of grounding. Contact with any part of a grounded battery can result in electric shock.
- Do not attempt to open or disassemble batteries. The electrolyte is harmful to the skin and eyes. The battery contains diluted sulfuric acid, which is extremely toxic. If a battery leaks, take appropriate measures to prevent any battery fluid contacting your skin or clothing. Diluted sulfuric acid may cause blindness if it gets into the eye, may burn skin upon contact. It is electrically conductive and corrosive. Observe the following procedures if electrolyte spills:
  a. Wear full eye protection and protective clothing.
  b. If sulfuric acid contacts the skin, wash it off immediately with water.
  c. If sulfuric acid contacts the eyes, flush thoroughly and immediately with water, and seek medical attention.
  d. Spilled sulfuric acid should be washed down with a suitable acid-neutralizing agent, such as a solution of approximately one pound (500 grams) bicarbonate of soda in one gallon (4 liters) of water. The bicarbonate of soda solution should be applied until evidence of reaction (foaming) has ceased. The resulting liquid should be flushed with water and the area dried.
- Lead acid batteries can present a risk of fire due to generation of hydrogen gas. The following procedures should always be followed:
  a. DO NOT SMOKE when near batteries.
  b. DO NOT allow flames or sparks near batteries.
  c. Before working with batteries, discharge static electricity from the body by first touching a grounded metal surface before touching the batteries.
- Do not dispose of batteries in fire, as they could explode.
- If a fire occurs near a battery, do not use water to extinguish it. Use only a powder-distinguishing agent (ABC). Using water can cause the fire to spread.
- Strictly observe the following precautions when handling the batteries. Failure to do so may cause battery leakage, overheating or explosion.
  a. Do not solder to any part of the battery directly.
  b. Do not charge the battery with reversed positive (+) and negative (-) terminal polarity.
  c. Do not mix different battery types, brands or versions.
  d. Do not attempt to peel off or break the outer covering of a battery.
  e. Do not subject batteries to strong physical shock, or throw them away.
  f. Clean batteries with water-moistened cloth. Do not use organic compounds such as gasoline, thinner, benzene or detergent.
  g. Electrical energy may remain in a battery even after its service life has expired. Do not allow sparks near used batteries, and protect them from short-circuiting.

2. Considerations for Proper Operation

◆ 2.1 Input Power Considerations

(1) The UPS version should match the AC line voltage (208, 220, 230 or 240 VAC ±15%, and 50 or 60 Hz ±5%). Specific voltages and corresponding versions are as follows:
(2) The current capability of the AC supply must meet the requirements of the UPS (0.9 kVA to 4.5kVA).However, the circuit breaker in the source distribution panel should be rated one grade higher than the load demand.
(3) Install the breaker (2 Units Par.:15A, 3 Units Par.: 20A, 4 Units Par.: 30A, 5 Units Par.: 30A) for the distribution board of the UL authorization.

◆ 2.2 Installation Considerations

(1) Carefully consider the leakage current when a leakage circuit breaker is installed at the input side. The leakage current of the UPS system is maximum 9 mA (5 UPS Units in parallel).
(2) Keep the UPS at least one meter away from CRT displays. Other devices which may be sensitive to magnetic flux should be kept away from the UPS, as it emits a slight amount of magnetic flux.
(3) The UPS utilizes a fan for forced-air cooling. Provide at least 20 cm(7.88in) clearance at the front and back of the UPS to permit free airflow at the air intake and exhaust vents. For maintenance purpose, a space of at least one meter (39.4in) in front and 50 cm (19.69in) in the back of the UPS is needed. See "§6.3 Installation Space" for details.
(4) If the AC source has one side grounded, the N terminal (phase) of the UPS must be the grounded phase.
(5) If possible, avoid grounding the output (load) side. If one side must be grounded, the V terminal (phase) should always be the grounded phase (to avoid short-circuiting power to ground).

◆ 2.3 Usage Considerations

(1) Never short-circuit the output terminals, or connect a load which draws short-circuit current. Doing so causes protective functions or fuse opening to prevent output.
(2) Unsuitable load devices
Do not connect laser printers, plain paper fax machines, copy machines or overhead projectors as load devices. Such devices typically include heating elements that draw high current. This may cause an overload that could prevent battery backup operation when an outage occurs, or damage the UPS.
(3) Power supply environment
If the UPS is used in an environment subject to long and frequent power outages (more than once a week), the batteries may not receive sufficient charge, which could result in foreshortened battery life and premature battery failure.
(4) If the UPS is not operated for 6 months or more, the battery may require charging before use. Operate the UPS with no load for at least 20 hours once every 6 months.
(5) Insulation testing
Before testing indoor wiring insulation, shut down the UPS and disconnect the input and output cables. Conducting an insulation test with the UPS connected may damage electronic components such as the built-in arrester.
(6) The UPS is designed to be installed horizontally. However, if it must be installed vertically, the left side should be the lower side (the indicators at the higher side), and mounting brackets should be installed if needed. Refer to "§6.4 Coupling Bracket Installation" for details.
For rack mounting, an optional mounting bracket is required. Please contact your sales representative for details.

◆ 2.4 In Case of Trouble with the UPS

If one of the following trouble indications occurs, contact your nearest sales representative.

(1) The ALARM indication lamp lights red (except when the UPS shuts down during a long power outage).
(2) The INV ON/STAND BY, INPUT and OUTPUT indicators don't light green during normal operation.
(3) When any other symptom suspected to be a sign of trouble is observed.

3. Confirming Package Contents

When opening the package, please confirm the proper contents and contact your nearest sales representative if you find any discrepancy.

The package cartons are UPS Power Distribution Unit 1 set and Uninterruptible Power Supply Unit (hereinafter referred to as UPS Unit) 2 to 5 set. (The set number of UPS Unit depends on the unit number of parallel connection.)

The contents of each package are as follows.

(1) Package contents of UPS Power Distribution Unit (PDASE) per set

(a) UPS Power Distribution Unit		1 unit
(b) Accessories	*Instllation and Maintenance Manual* (this booklet)	1 copy
	Instruction Manual	1 copy
	Setting Manual	1 copy
	PC Interface cable	1 pcs
	Input/Output cable	5 pcs
	Terminal cover A	1 pcs
	Terminal cover B (Set in terminal cover A)	1 pcs
	Cable cover (For UPS Unit)	1 pcs
	Cable cover (For UPS Power Distribution Unit)	1 pcs
	Screw for cable cover	1 pcs
	Leg for vertical installation	4 pcs
	Manual for leg	1 copy

(2) Package contents of UPS Unit (ASE10S1H) per set

(a) UPS Unit		1 unit
(b) Accessories	Unit Interface cable	1 pcs
	Coupling bracket	1 pcs
	Screw for coupling bracket	2 pcs
	Bypass Fuse 8A	1 pcs
	Cable cover	1 pcs
	Screw for cable cover	1 pcs
	Ground plate	1 pcs
	Leg for vertical installation	4 pcs
	Manual for leg	1 copy

4. Overview

This uninterruptible power supply is designed to provide reliable and stable AC power to critical equipment that requires continuous uninterrupted power.

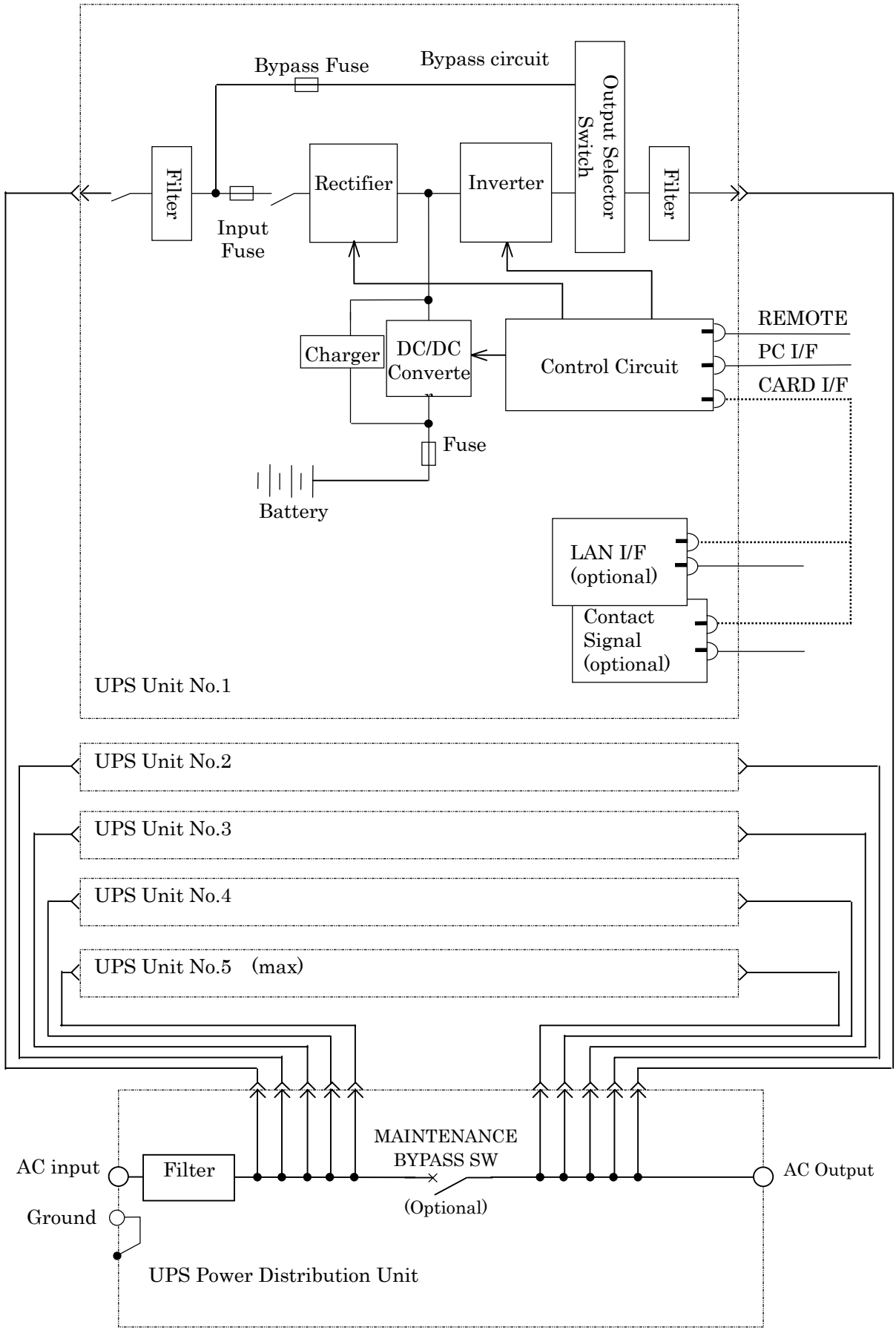
This UPS system consists of 2 to 5 based 1kVA UPS Unit connected in parallel. According to this configulatin, when customer system requires greater power capacity due to load expansion, this UPS system capacity can be easily expanded by installing the additional UPS Units in the range from 2 to 5 kVA.

Moreover, This system has a high reliability for uninterruptible power supplying to be able to configure a N+1 operation for the "1-4kVA" load.

The UPS Unit consists of rectifier, charger, inverter, battery and utility power transfer (bypass) circuits. In the event of failure of the AC source (utility power), inverter operation is sustained by converted DC power supplied from the batteries. When the utility power recovers, inverter operation continues while the battery is recharged. The UPS system is therefore able to supply completely uninterruptible AC power to connected loads without so much as a moment of power loss.

If a fault occurs in an inverter or the UPS output is overloaded, the output automatically switches the source of AC power to the bypass circuit, without interruption, the utility power is supplied to connected loads.

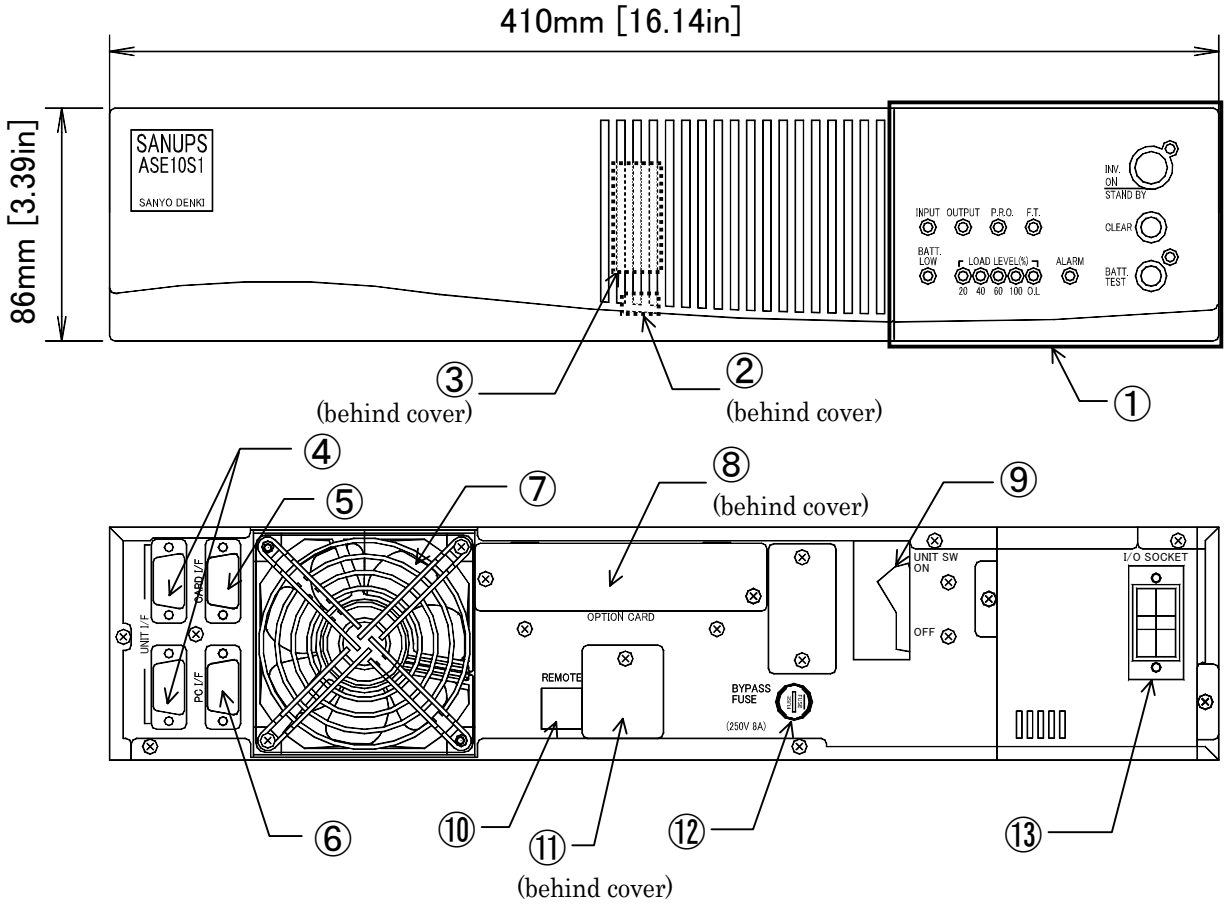
This UPS system consists of the basic 1 kVA UPS Unit including the batteries, up to 5 unit, and UPS Power Distribution Unit.



UPS system Block Diagram

5. External Dimensions and Parts Names

◆ 5.1 UPS Unit

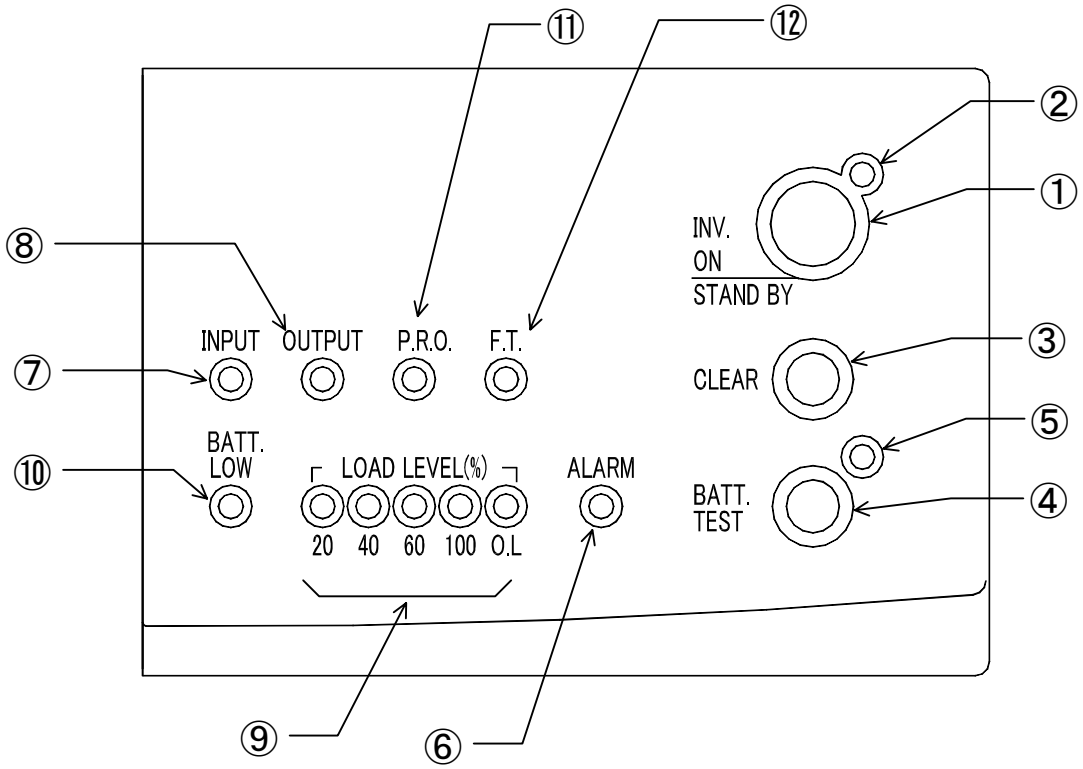


Depth: 435 mm (17.13 in)

Weight: 19 kg (41.89 lbs)

No.	Name	Marking	Function
①	Control Panel, Indicators	–	Operating controls and indicators
②	Forced Bypass Switch	Forced Bypass	Enables the bypass circuit during maintenance
③	Battery Connectors	-	For connecting the batteries
④	Unit Interface	UNIT I/F	For inter-unit connections with Unit Interface Cables
⑤	Card Interface	CARD I/F	For connecting external communications and card options
⑥	PC Interface	PC I/F	For PC or workstation communications
⑦	Cooling Fan	-	Cooling
⑧	Optional Card Slot	OPTION CARD	Compartment for installing optional card
⑨	Unit Switch	UNIT SW	Input power on/off for UPS Unit
⑩	Remote On/Off Connector	REMOTE	Connection terminal for remote On/Off switch
⑪	DIP Switches	DIP SW	Setting switches
⑫	Bypass Fuse	BYPASS FUSE	Bypass circuit protection fuse
⑬	Power Connectors (In/Out)	I/O SOCKET	For connecting the UPS Power Distribution Unit

◆ 5.2 Control Panel/Indicators

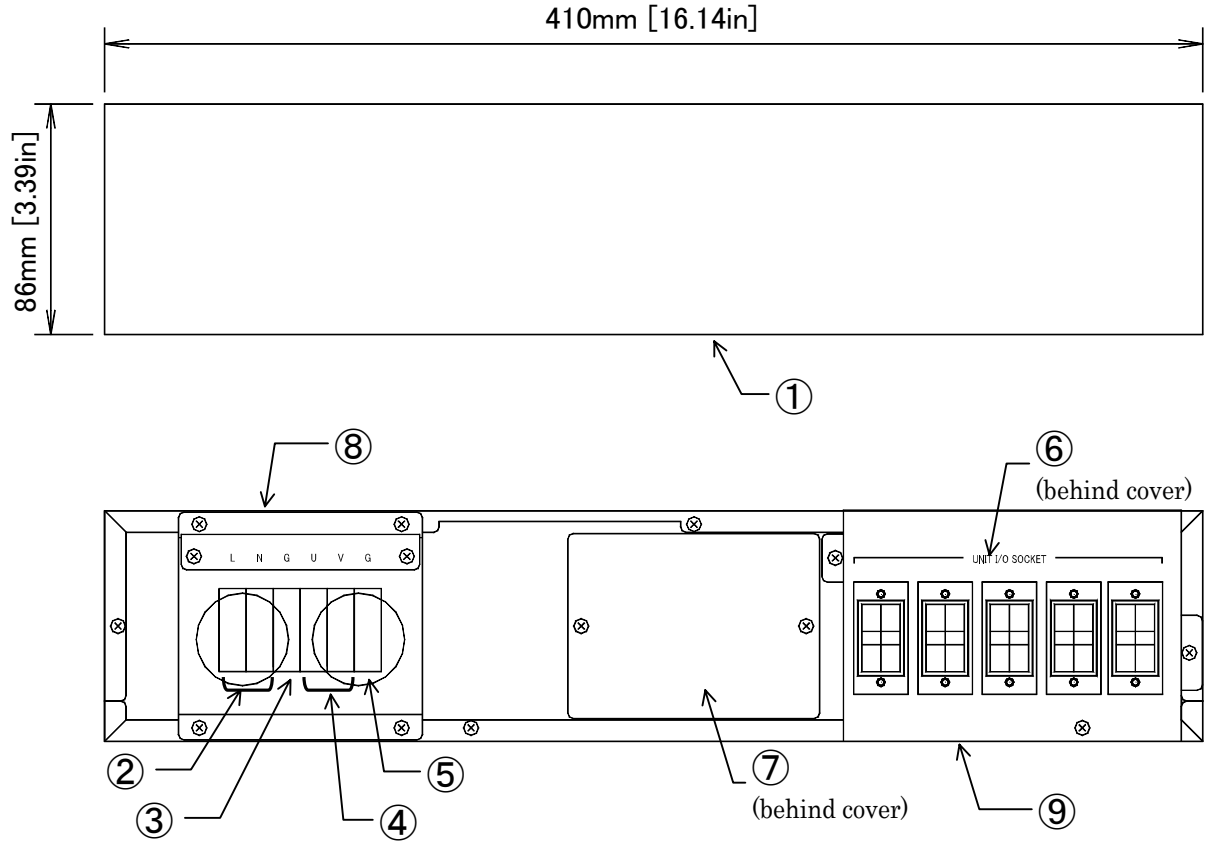


No.	Name	Marking	Function
①	INV ON/STAND BY Switch	INV ON/STAND BY	Switches inverter operation on/off
②	INV ON/STAND BY Indicator	-	Lights (green) when power is supplied through the inverter, and blinks when supplied through the bypass circuit
③	Clear Switch	CLEAR	Silences the beeper and clears battery test results
④	Battery Test Switch	BATT.TEST	Starts and stops a battery test
⑤	Battery Test Indicator	-	Blinks during battery test Indicates battery test results: LED on = normal result, LED blinking = abnormal, LED off = stopped
⑥	Alarm Indicator	ALARM	Lights (red) if the UPS fails, and when the batteries are discharged below minimum operating voltage
⑦	Input Indicator	INPUT	Lights (green) when input utility power is normal, and blinks when input power is abnormal
⑧	Output Indicator	OUTPUT	Lights (green) when output power is supplied through the inverter, and blinks when supplied through the bypass circuit
⑨	Load Level Indicator	LOAD LEVEL	Indicates the load level (20, 40, 60, 100% or O.L [Overload])
⑩	Battery-Low Indicator	BATT.LOW	Lights when battery voltage is low
⑪	Parallel Redundancy Operation Indicator	P.R.O.	Turns off when abnormal communications between units occurs, or if the No. of Units is incorrectly set
⑫	N+1 Redundancy Operation Indicator	F.T.	Lights during N+1 redundancy operation (lit when load level is below (N-1) kVA)

In this manual, switch names are denoted as [ ] (e.g.: [INV ON/STAND BY]).

The status of LEDs on the control panel are indicated as  for lit, and  for blinking.

◆ 5.3 UPS Power Distribution Unit



Depth: 410 mm (16.14 in)

Weight: 7 kg (15.43 lbs)

No.	Name	Marking	Function
①	Front Panel	-	-
②	Input Terminals	L N	AC input cable connections
③	Input Ground Terminal	G	Ground wire connection
④	Output Terminals	U V	AC output cable connections
⑤	Output Ground Terminal	G	Ground wire connection
⑥	Unit I/O Sockets	UNIT I/O SOCKET	Power connections for each UPS Unit in the system
⑦	Maintenance Bypass Switch (Optional)	MAINTENANCE BYPASS SW	Molded case cam switch for maintenance (normally OFF)
⑧	Terminal Brock Cover	-	-
⑨	Cable Cover	-	-

6. Carrying and Installation

⚠ CAUTION	Each UPS Unit weighs about 19 kg (41.89 lbs), and the UPS Power Distribution Unit weights about 7 kg (15.43 lbs). • Install the UPS on a stable surface that can bear the weight of all units. • This surface should be flat, so the UPS cannot fall and cause bodily injury. • The possibility of vibration and shock should be minimized at the installation location. • Be careful to avoid lower back strain when carrying and installing. • The UPS might fall or be dropped during relocation or installation. Always hold the UPS Units securely by the upper corners. Bodily injury could result if a UPS falls to the floor.

◆ 6.1 Environment

Do not install the UPS in the following locations:

- Where the ambient temperature exceeds 40°C (104°F).
  For optimum battery life, install the UPS where ambient temperature stays between 20 and 25°C (68 and 77°F).
- Where high humidity may occur.
- Where corrosive gas or salt spray may be present.
- Where it may be subject to vibration and shock.
- Where dust may accumulate.

◆ 6.2 Carrying

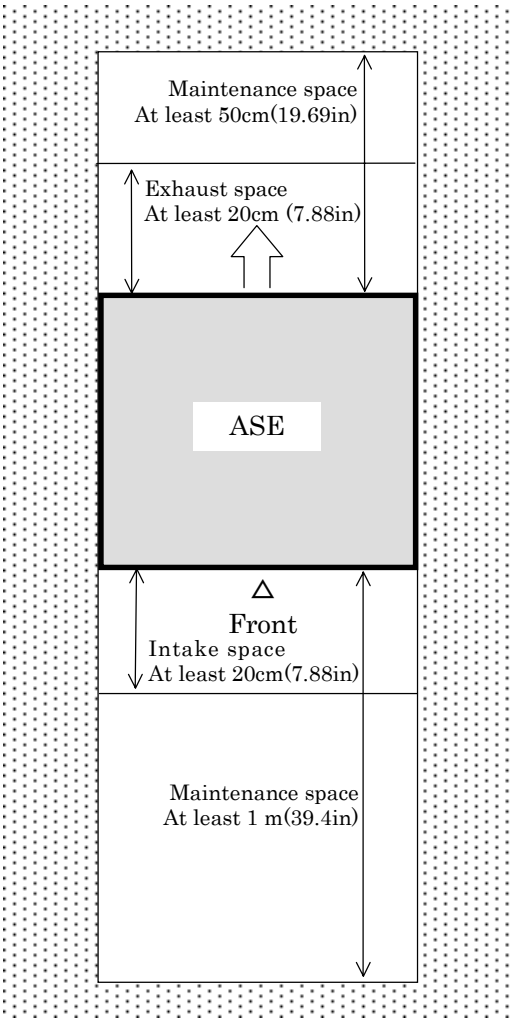
Carry the UPS within its packing cartons, removing only when near the installation location.

⚠ CAUTION	• To avoid bodily injury from dropping a UPS Unit, do not tilt it more than specified degrees to either side when moving it. Take preventative measures to avoid dropping a UPS if it must be tilted more than specified degrees when moving it.

Equipment type name	No. of Parallel-Connected UPS Units			
	2 Units	3 Units	4 Units	5 Units
Angle of inclination (degree)	30	40	50	55

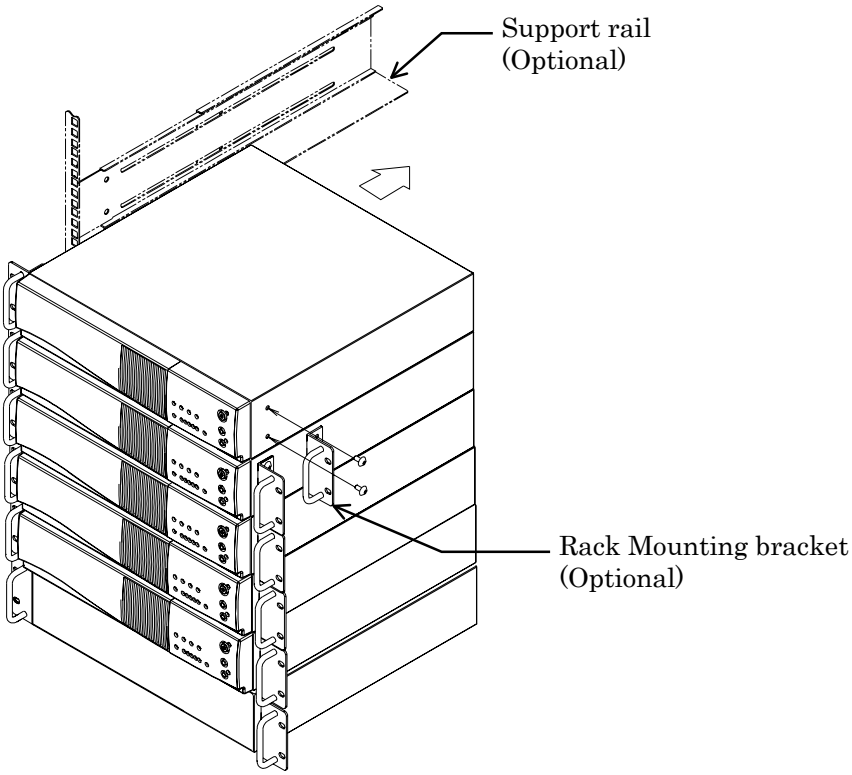
◆ 6.3 Installation

The UPS is designed to be installed either horizontally in a rack or vertically on the floor. When installed vertically, the left side (as viewed from the front) should always be the lower side (with the control panel at the upper side), and the coupling brackets should be installed. Refer to "§6.4 Coupling Bracket Installation" for the mounting procedure.
Provide the following space around the UPS system.



- At least 20 cm(7.88in) at the front as air intake space for the cooling fan.
- At least 20 cm (7.88in) at the back as air exhaust space for the cooling fan.
- At least 1 meter(39.4in) at the front and 50 (19.69in)cm at the back for maintenance when needed
- At least 1 meter(39.4in) from CRT displays to allow for slight leakage of magnetic flux. Allow some space from devices which might be affected by magnetic flux.

When UPS system is installed horizontally, mount to the 19 inch rack by using a support rail, as follows.



◆ 6.4 Coupling Bracket Installation

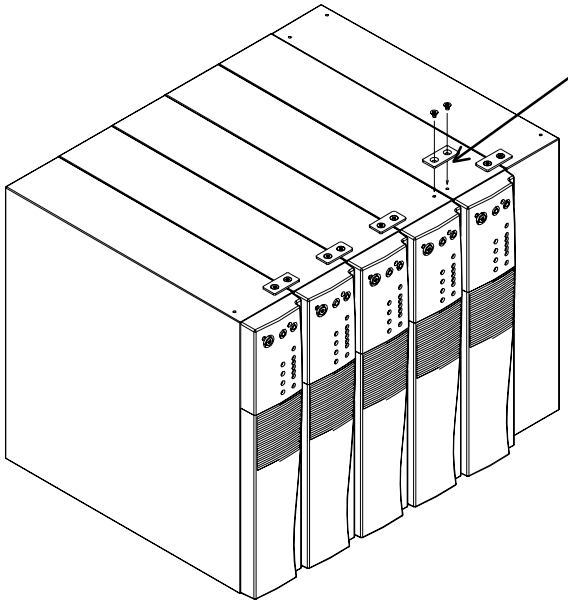
Install the coupling brackets as follows.

① Arrange the UPS Units (up to five) together at the installation location with their left sides down (as viewed from the front), and their control panels nearest the top.

② Place the UPS Power Distribution Unit at the right side (as viewed from the front).

③ Affix the supplied coupling brackets using the screws provided in the mounting holes at the top (control panel side).

Always install with the left side downwards and the control panels nearest the top.



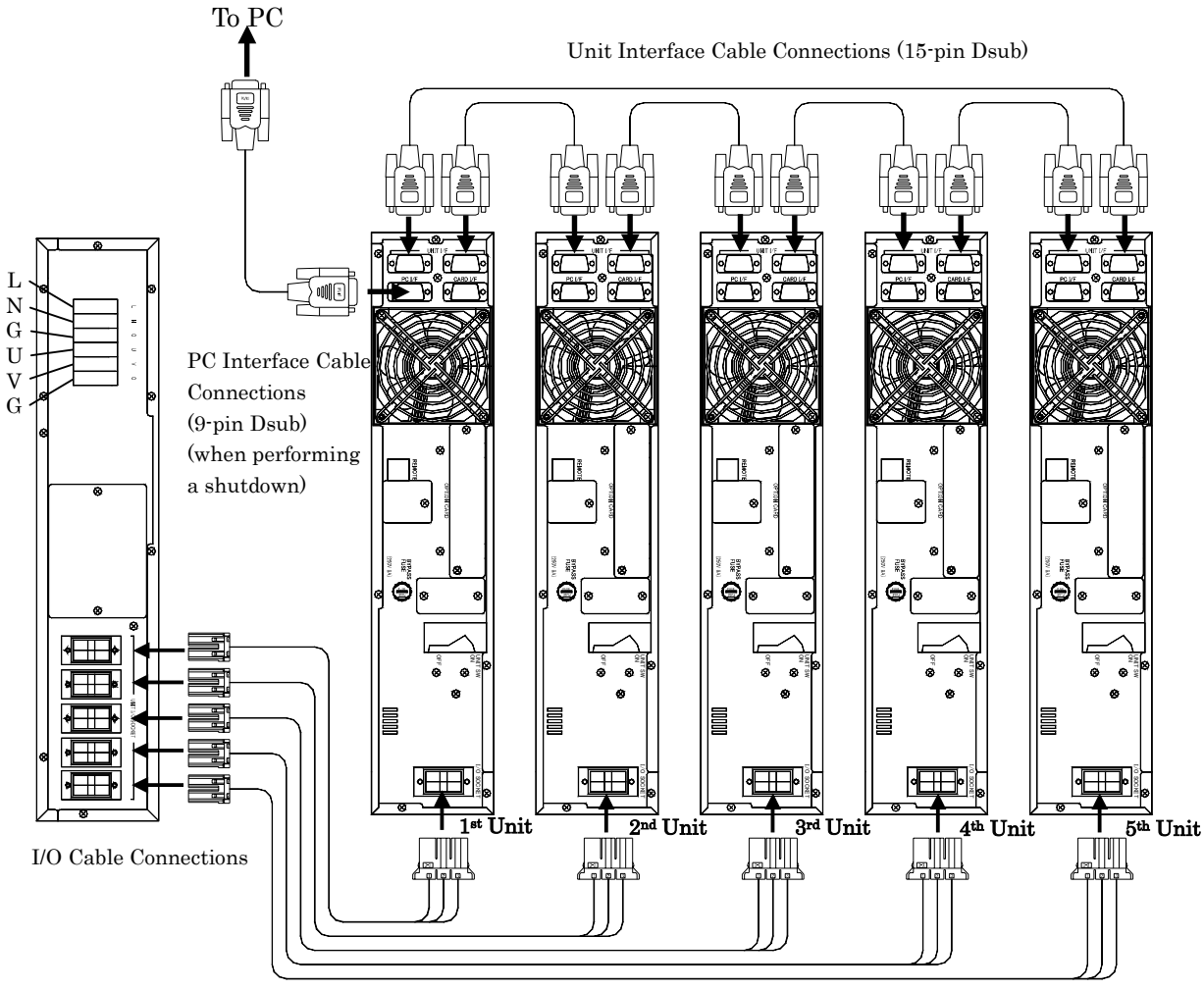
⚠ CAUTION	• If the brackets are not securely attached, bodily injury could occur if the UPS was to fall over from shock or vibration. • Be careful not to pinch your fingers when mounting

7. Unit Settings and Wiring

CAUTION	• Obtain the assistance of technically qualified personnel for wiring. Incorrect wiring can result in electric shock, injury or fire. • Make sure the input and output terminals and external control plugs are firmly connected. A loose connection can cause smoke or fire. • Make sure the ground terminal is connected to earth ground. Otherwise, there is danger of electric shock.

◆ 7.1 Setting and Wiring Overview

The following settings are required for each UPS Unit: "Input/Output Voltage", "Unit ID" and "No. of Units". The example below shows the "Unit ID" and "No. of Units" settings and wiring diagram when connecting five UPS Units.



Setting Example for Connecting Five UPS Units

	1st Unit	2nd Unit	3rd Unit	4th Unit	5th Unit
Unit ID	ID = 1	ID = 2	ID = 3	ID = 4	ID = 5
No. of Units setting	Units = 5	Units = 5	Units = 5	Units = 5	Units = 5

◆ 7.2 About Input and Output Voltage Settings

The rated input/output voltage of the UPS can be set to one of four values: 208, 220, 230 or 240 V. Set to match the nominal input line voltage.
Refer to "§7.4 Setting Procedures" for the input/output voltage setting procedure.

◆ 7.3 About Unit ID and No. of Units Settings

The "Unit ID" and "No. of Units" settings are required to be made using the DIP switches on the rear of each UPS Unit, in order for the units to recognize themselves correctly.

The "Unit ID" must be unique for each UPS Unit in the UPS system (the same number cannot be used twice in the same UPS system). The ID values are normally assigned serially beginning with 1. The maximum allowable setting is 5.

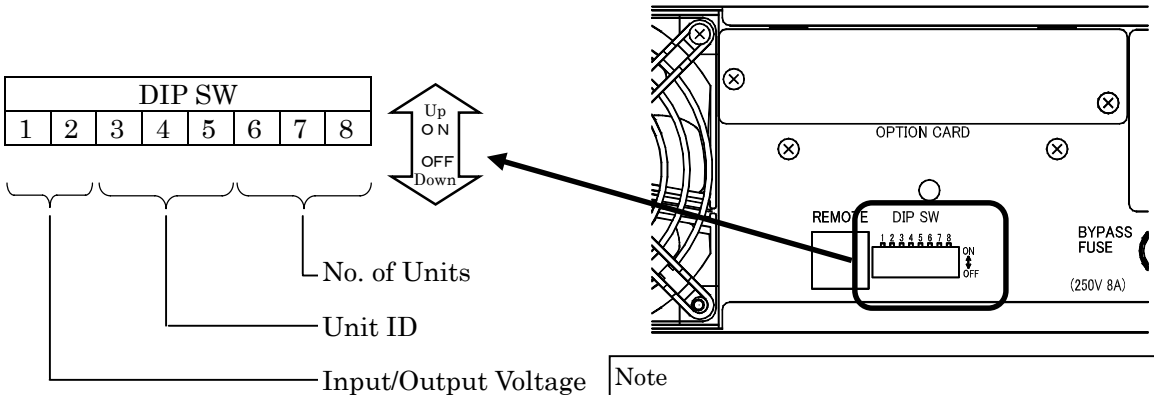
> Note
> Although "Unit ID" numbers do not have to be assigned in a specific sequence (e.g., it is possible to set the "Unit ID" of three units as 1, 3 and 5), we recommend assigning IDs serially beginning with 1 to minimize the possibility of mistakes during maintenance.

The "No. of Units" setting is the total number of UPS Units that are connected in parallel. The same setting must be made in all UPS units.
(For example, if three units are connected, the "No. of Units" setting in each unit is set to 3.)

Refer to "§7.4 Setting Procedures" for the "Unit ID" and "No. of Units" setting procedures.

◆ 7.4 Setting Procedures

The “Input/Output Voltage”, “Unit ID” and “No. of Units” settings are all made using the DIP switches on the rear of the UPS Units. Remove the DIP SW cover.
DIP switch settings are as follows:



Note
Changes to “Input/Output Voltage” and “Unit ID” settings do not become effective immediately when the DIP switches are set during operation. To make setting changes effective, the system must first be completely shut down (refer to §9.5 for the shutdown procedure).
However, although not frequently required, a change to the “No. of Units” setting can be made effective during operation by pressing the CLEAR after changing the DIP switch setting.

* - Default Setting

Input/Output Voltage	SW1	SW2
208V *	OFF	OFF
220V	ON	OFF
230V	OFF	ON
240V	ON	ON

Unit ID	SW3	SW4	SW5	No. of Units	SW6	SW7	SW8
ID = 1 *	OFF	OFF	OFF	1 *	OFF	OFF	OFF
ID = 2	ON	OFF	OFF	2	ON	OFF	OFF
ID = 3	OFF	ON	OFF	3	OFF	ON	OFF
ID = 4	ON	ON	OFF	4	ON	ON	OFF
ID = 5	OFF	OFF	ON	5	OFF	OFF	ON

Caution

In the event of one of the following setting mistakes, an alarm condition occurs when the UPS system is started, so that even when INV ON/STAND BY is pressed, the UPS system does not operate (after a few seconds, the ALARM LED lights and the alarm sounds continuously). In this case, check the folllowing settings:

- If the “Input/Output Voltage” setting is not the same in all UPS Units (§7.4).
- If a “Unit ID” is the same in two or more UPS Units (§7.4).
- If the “Frequency Sync Range” setting is not the same in all UPS Units (§13.2.4).
- If the “Battery Starting Frequency” setting is not the same in all UPS Units (§13.2.8).

If one of the following setting errors is present, the UPS system can start, but the P.R.O. LED does not light, and after about 20 seconds, the alarm sounds (for 0.1 seconds once every 2 seconds). In this case, turn off the UPS system immediately and check the following settings:

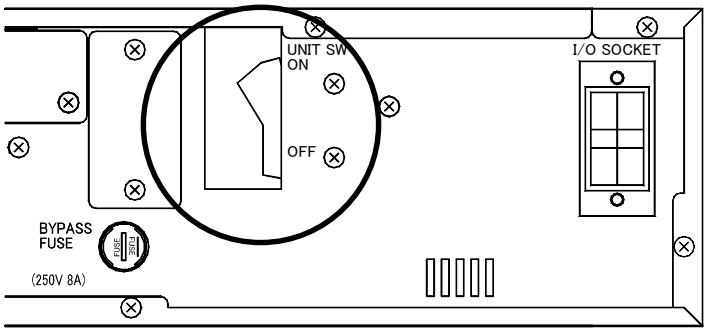
- If the “No. of Units” setting is not the same in all UPS Units in the same UPS system (§7.4).
- If the “No. of Units” setting does not match the actual number of UPS Units (§7.4).
- If the Unit Interface Cables are not connected correctly (§7.5.3).

◆ 7.5 Wiring

◆ 7.5.1 Preparations Before Wiring

① Verify that the UNIT SW on all UPS Units is turned OFF.

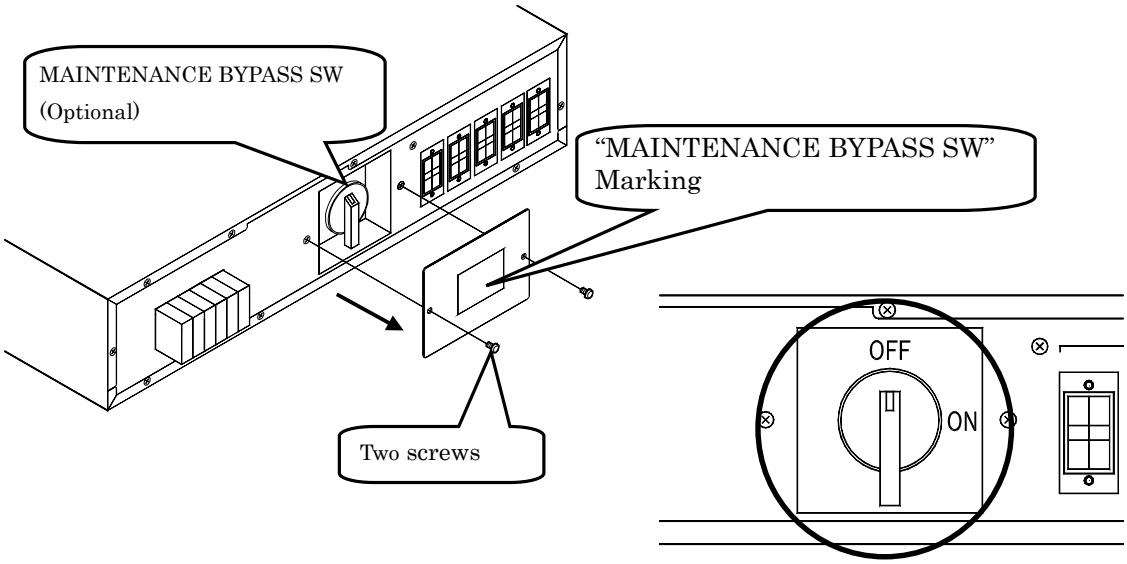
UPS Unit - Rear



If the "MAINTENANCE BYPASS SW" is marked on the cover,
its UPS is equipped with MAINTENANCE BYPASS SW. So, perform steps ② and ③.

② Remove the cover over the UPS Power Distribution Unit's MAINTENANCE BYPASS SW, and verify that the MAINTENANCE BYPASS SW is turned OFF.

UPS Power Distribution Unit - Rear

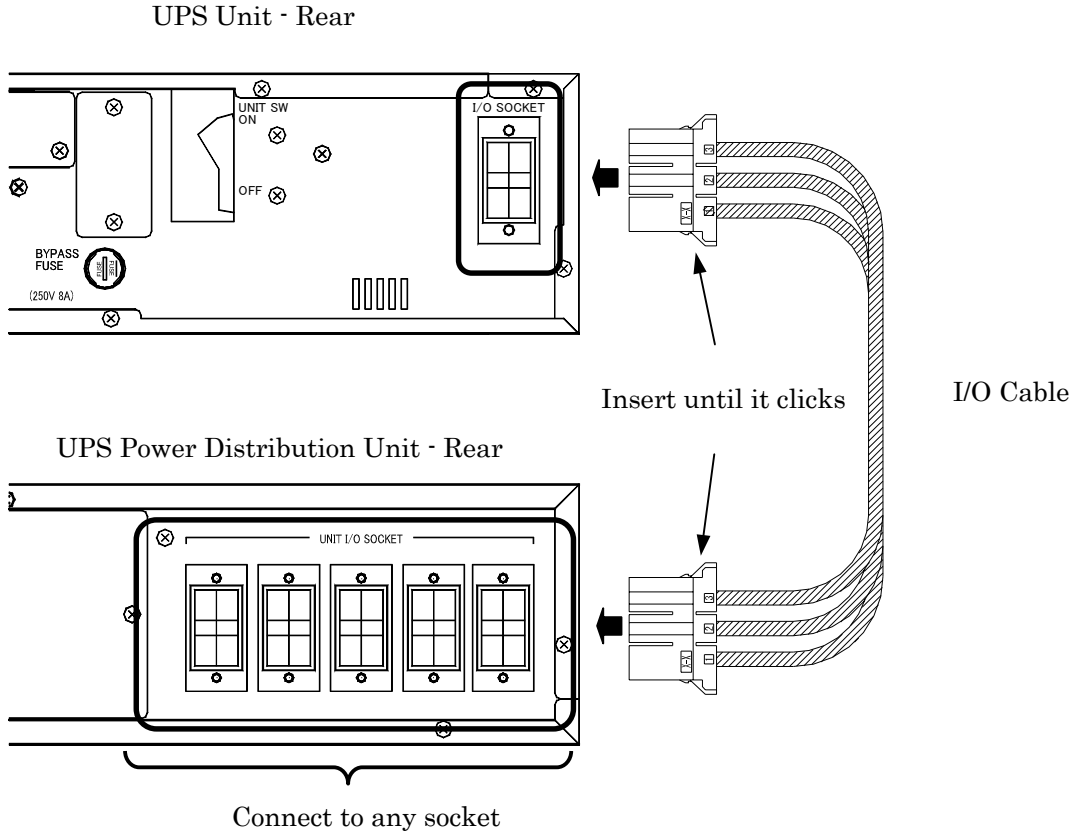


③ Replace the cover over the MAINTENANCE BYPASS SW .

◆ 7.5.2 Input/Output Cable Connection

The Input/Output Cables (5 kinds of cable length) are supplied with the UPS Power Distribution Unit.
Connect from the I/O SOCKET on each UPS Unit to the UNIT I/O SOCKET on the UPS Power Distribution Unit with these cables of fit length.
Depending on the UPS configuration, there are some unused cables.

When first unpacking the UPS Power Distribution Unit, three dummy plugs can be found installed in the UNIT I/O SOCKETs. When connecting three or more UPS Units, remove one or more dummy plugs as necessary to connect the cables. However, to prevent electric shock, dummy plugs should always be installed in any unused sockets. Be careful not to lose the plugs that are removed.

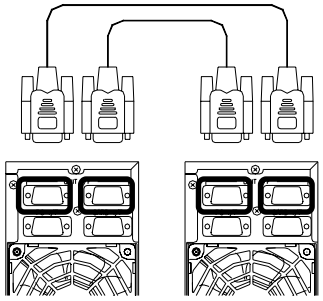


Note
Although there is no specific sequence for the UNIT I/O SOCKETs on the UPS Power Distribution Unit, we recommend connecting the UPS Units in the order that corresponds to their physical arrangement, to minimize the possibility of mistakes during maintenance.

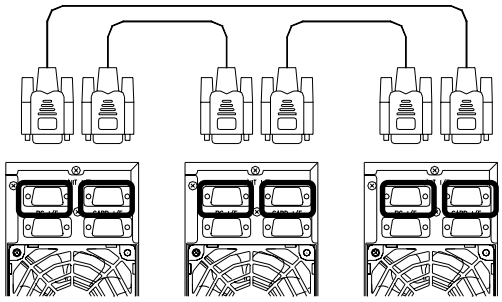
◆ 7.5.3 Unit Interface Cable Connection

Connect the Unit Interface cables supplied with each UPS Unit to the UNIT I/F connectors on the UPS Units. Wiring depends on the number of parallel-connected units, as follows:

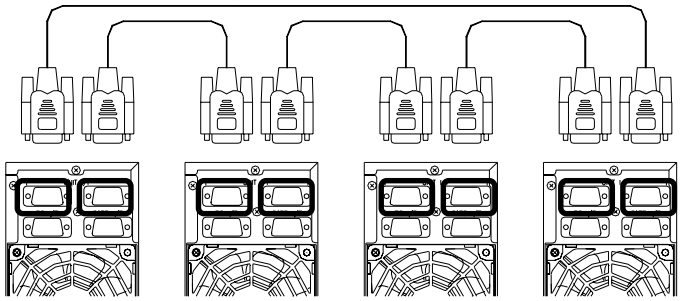
2 UPS Units in parallel



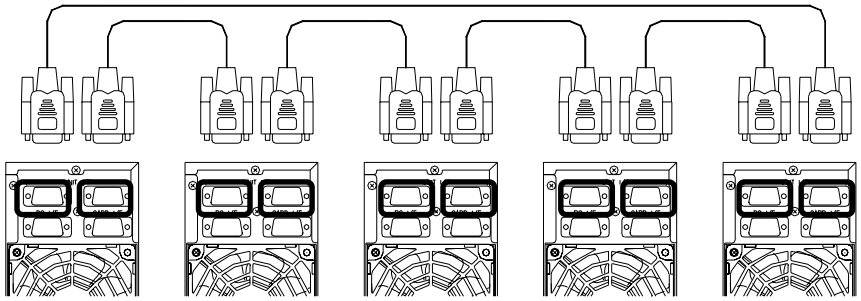
3 UPS Units in parallel



4 UPS Units in parallel



5 UPS Units in parallel



Note

If there is a fault in these connections, the UPS system may malfunction (power may not be supplied to the loads). When making connections, be certain to tighten the screws attaching the connectors, and after connecting, verify that the wiring is correct and that the connectors cannot be pulled out.

◆ 7.5.4 Commercial Power and Load Device Connections

Connect earth ground, input and output wires to the terminal block on the rear of the UPS Power Distribution Unit.
Refer to the following table and wiring information for the wire types to be used at each terminal.

Terminals	Marking	Torque	Temperature and Material	No. of Parallel-Connected UPS Units			
				2 Units	3 Units	4 Units	5 Units
Input terminals	L, N	1.5-1.8 N･m	Min. 75℃ copper 3wire	14 AWG 2-wire	12 AWG 2-wire	12 AWG 2-wire	10 AWG 2-wire
Output terminals	U, V	1.5-1.8 N･m	Min. 75℃ copper 3wire	14 AWG 2-wire	12 AWG 2-wire	12 AWG 2-wire	10 AWG 2-wire
Ground terminal	G	1.5-1.8 N･m	Min. 75℃ copper 3wire	14 AWG 1-wire	12 AWG 1-wire	12 AWG 1-wire	10 AWG 1-wire

Note
If capacity can be anticipated to be expanded in the future, use the wire size that corresponds to the capacity after the expansion.

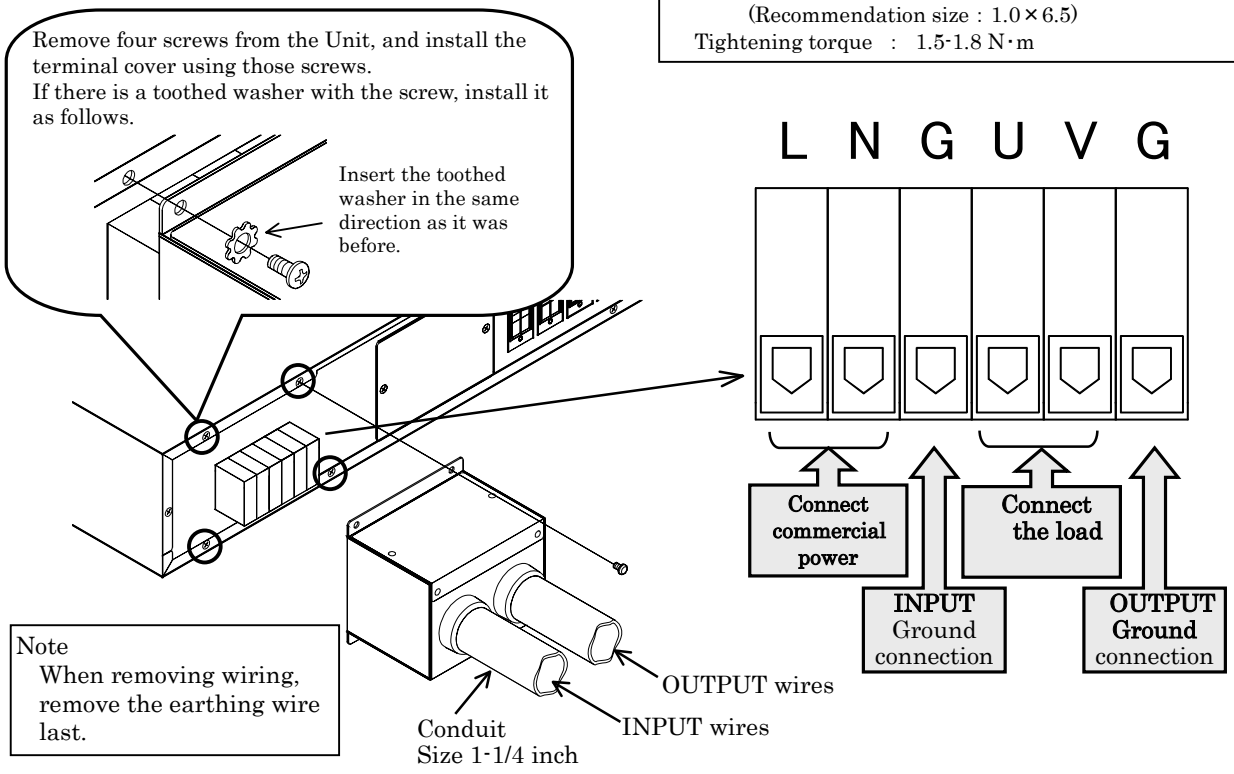
Connection procedure is as follows.

① Install a conduit in the hole of the terminal block cover. (Prepare the conduit by the customer.)
② Pass the electric wires through the conduit.
③ Connect input earth ground to the G terminal.
④ Connect commercial power to the L and N input terminals.
⑤ Connect output earth ground to the G terminal.
⑥ Connect the load to the U and V output terminals.
⑦ When finished wiring, install the terminal block cover with four screws.

Note
Before connecting commercial power to the input terminals, be certain to verify that no power is present. If power is present, an electric shock or fire could result.

The wiring method of all wire is as follows.
① Strip about 19mm(0.75in.) of insulation each wire.
② Insert the wire (19mm 0.75in.) into the terminals.
③ Tighten the screw hole in the upper of the terminal block with the specified tightening torque by using a flat-bladed screwdriver.

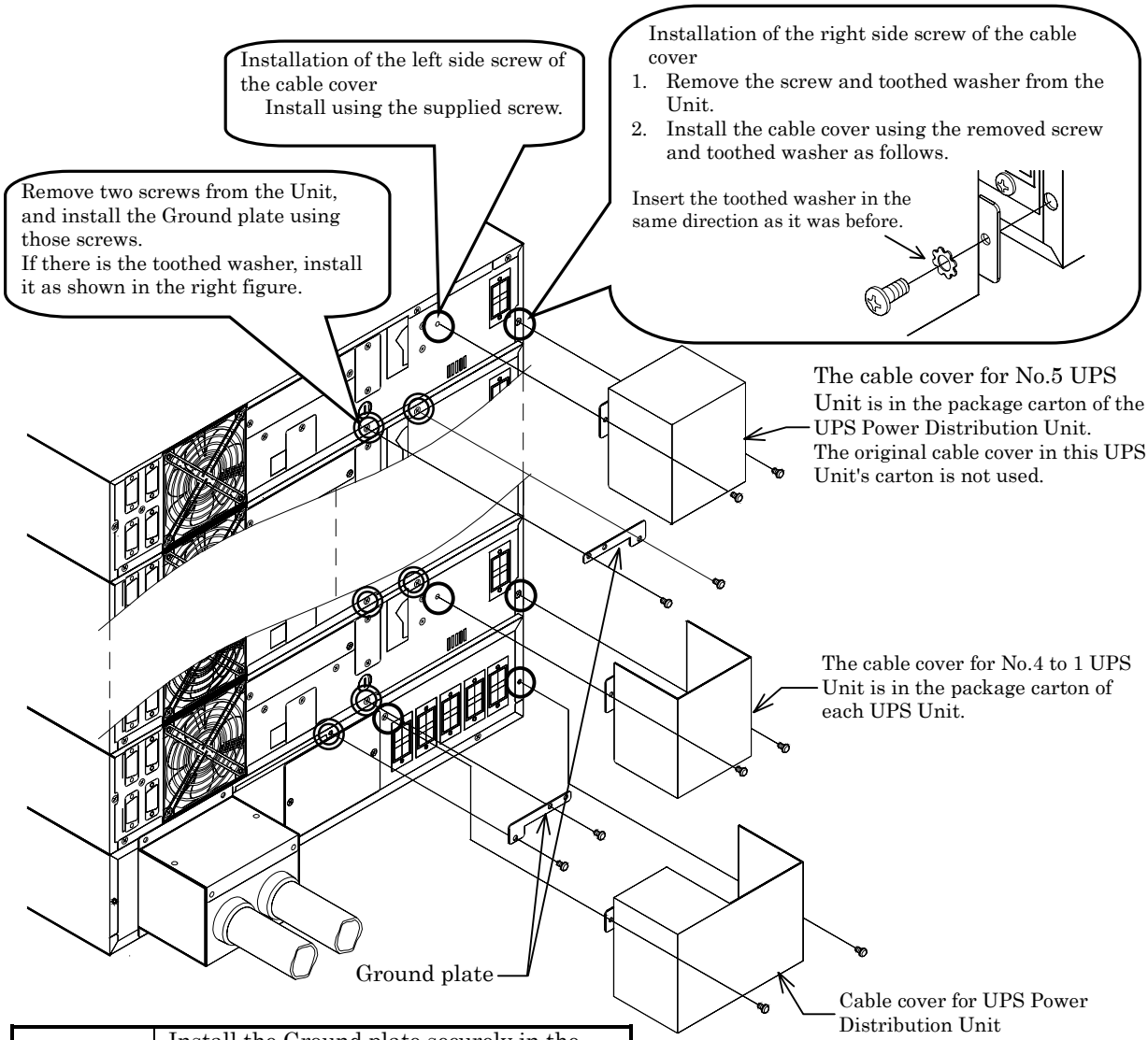
Tool : Flat-bladed screwdriver.
(Recommendation size : 1.0×6.5)
Tightening torque : 1.5-1.8 N･m



Note
When removing wiring, remove the earthing wire last.

◆ 7.5.5 Installation of cable cover and Ground plate.

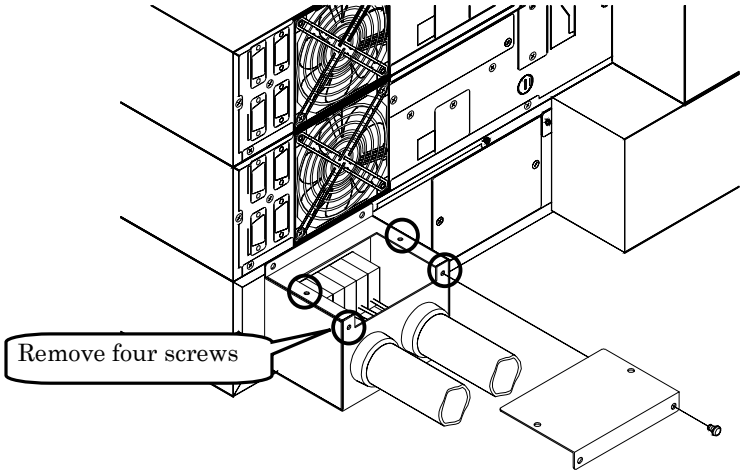
When finished wiring, install the Ground plates and the cable covers on the rear of the UPS Units and the UPS Power Distribution Unit as follows.



⚠ CAUTION	Install the Ground plate securely in the manner specified. Failure to install the Ground plate may result in electric shock.

◆ 7.5.6 Confirmation of terminal block wiring

When confirming of wire connections of terminal block, remove the terminal cover as follows.

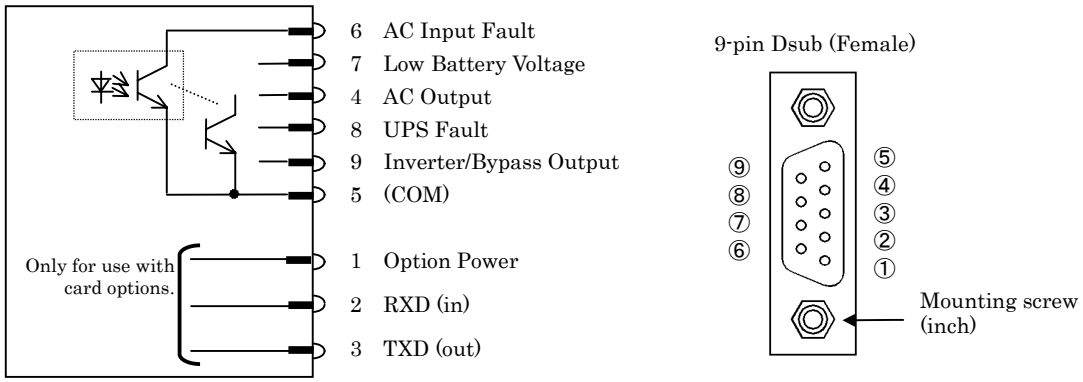


◆ 7.6 External Control Signals

(1) External Interface Connector (CARD I/F)

> Note
> This connector is designed for special use with our card options. If you wish to use this connector with other devices, please pay attention to the photocoupler specifications. If a non-voltage output contacts are needed, please use the optional Contact Interface Card.

The status signals shown in the table below are sent.
Use this connector for the card options (LAN Card, Contact Interface Card).



Signal Name		Description
Signal Output	AC Input Fault	This signal is output when battery operation is activated by a fault in the AC source.
	Low Battery Voltage	This signal is output when the battery voltage falls below a preset value.
	AC Output	This signal is output when AC output is supplied to the load devices.
	Inverter/Bypass Output	This signal is output when bypass output is supplied to the load devices.
	UPS Fault	This signal is output when a fault occurs in the UPS.

Note 1. Each signal is output through a photocoupler. The maximum rating is 35 V DC @15 mA. Please observe signal polarity.

Note 2. Set the User settings as follows when using the photocoupler outputs.
PC I/F Setting: Stand-Alone Mode (§13.2.1)
Ring Signal Start Setting: Disabled (§13.2.7)

When using card options (LAN Card or Contact Interface Card)
Although a CARD I/F connector is provided on each UPS Unit, only one card option can be connected per UPS system.
Note that operation cannot be guaranteed when more than one card is connected to the same UPS system.
The card may be installed in any UPS Unit in the UPS system.

Setting for using card options
When using card options, set each setting item to the value as shown in the table.

Using Card Option	Setting item	
	PC I/F setting (§13.2.1)	Ring Signal Start Setting (§13.2.7)
	Setting value	Setting value
LAN Card	W/S	Enabled or Disabled
Contact Interface Card	Stand Alone	Disabled

(2) PC/Workstation Interface Connector (PC I/F)

① This connector can be used to control power by external communications from a computer (such as a PC or workstation) using the optional SanGuard power control software. Use the communications cable supplied with the UPS Power Distribution Unit.

PC I/F Setting: W/S Mode (§13.2.1)

② Signals are supported by the UPS monitoring functions of network operating systems (such as Netware and Windows NT).

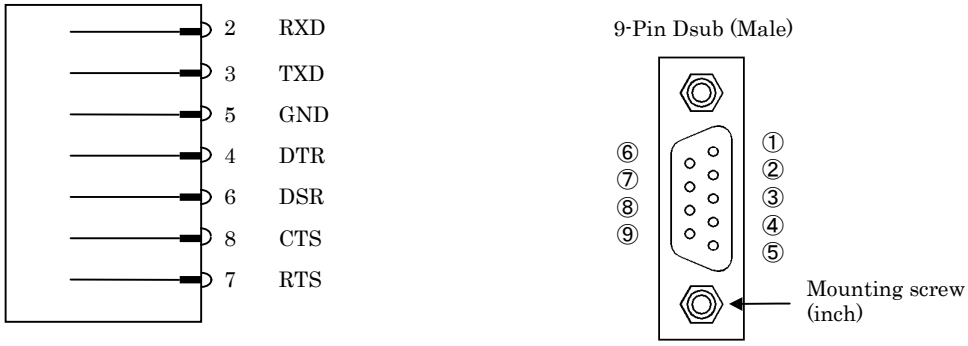
By connecting a computer (PC or workstation) with the communications cable supplied with the UPS Power Distribution Unit, automatic shutdown can be controlled by the UPS services in Windows NT.

PC I/F Setting: Stand-Alone Mode (§13.2.1)

Precautions for using UPS monitoring functions

In the UPS Configuration window of the operating system, the Remote UPS Shutdown setting should be set to Positive. Refer to the documentation for your network operating system for details.

If the operating system does not support UPS monitoring functions (such as Windows 95 and 98), do not use the communications cable supplied with the UPS Power Distribution Unit, as backup will not occur in the event of a power outage.



Precautions when using the communications cable supplied with the UPS Power Distribution Unit

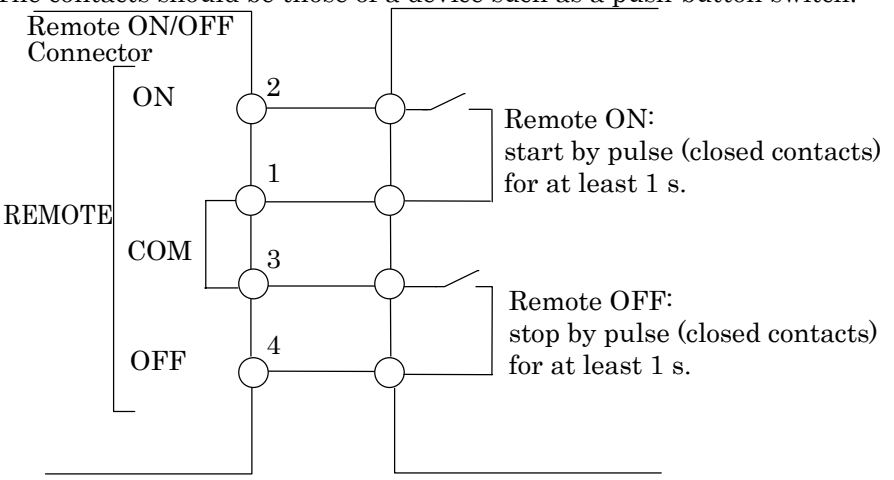
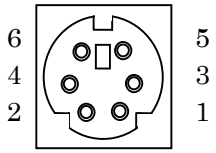
Although a PC I/F connector is provided on each UPS Unit, only one unit in the UPS system can be connected to a PC.

Note that operation cannot be guaranteed when more than one unit in the same UPS system is connected to a PC.

The PC may be connected to any UPS Unit in the UPS system.

(3) Remote ON/OFF Connector

This connector can be used for optional remote ON/OFF switching control.

	Signal Name	Description
Signal Input	Remote ON/OFF	The UPS can be remotely switched on and off by closed-circuit contact switching signals. The contacts should be those of a device such as a push-button switch.  Circuit Voltage: 5V DC Switching Current: about 12 mA Mini DIN 6P 

Operation is as follows according to the interface setting:

- Stand-Alone Mode: Remote ON/OFF
- Workstation Mode: Remote ON/One-Touch Shutdown

Precautions for using Remote ON/One-Touch Shutdown

In this case, an optional switch must be connected to the Remote ON/OFF connector of the unit that connects to the PC. If the Remote ON/OFF switch is connected to a unit that is not connected to the PC, One-Touch Shutdown is not available.

Note 1. The Stand-Alone and Workstation Modes are selected fron the front panel. See §13.2.1, “PC Interface Selection” for details.

8. Preparations Before Operation

Check the following items before starting operation.

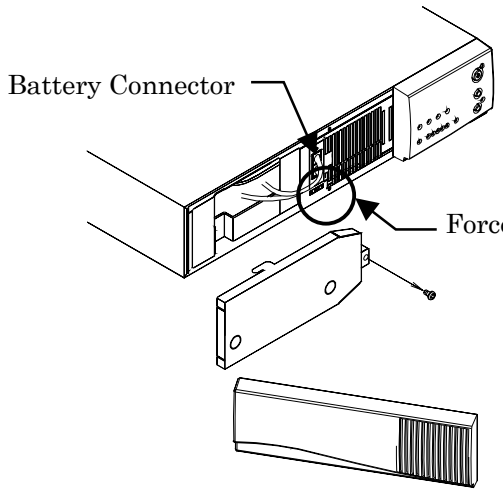
① Visually inspect the units to verify that there is no visible damage.

② Connect the UPS to a utility power source that meets the input specifications.

③ Verify that the UNIT SW on all UPS Units is turned OFF.

④ Verify that the Forced Bypass Switch on all UPS Units is in the INV position.

⑤ The Battery Connectors in all UPS Units should not be loose.



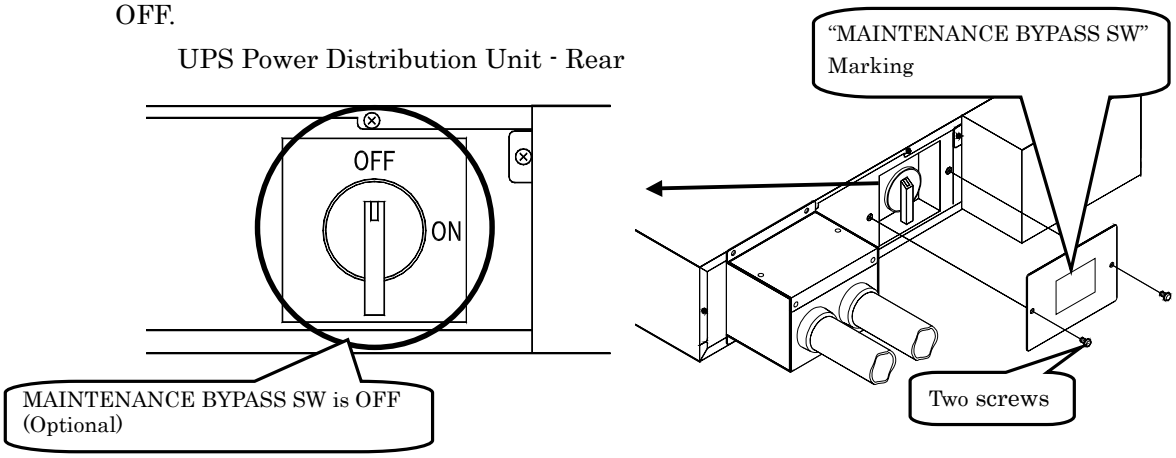
Caution
The Forced Bypass Switch should normally be kept in the INV position, and not be switched.

Front Panel Removal
① Pull the right side of the panel forward, then remove the left side.
② Remove the screw at the right side of the battery compartment cover.
③ Slide the battery compartment cover to the right to remove it.

For a Model equipped with the "MAINTENANCE BYPASS SW", verify step ⑥.

⑥ The MAINTENANCE BYPASS SW on the UPS Power Distribution Unit should be OFF.

UPS Power Distribution Unit - Rear



⑦ The input and output cable connectors should not be loose, and must be connected correctly.

⑧ The Unit Interface cable connectors on each UPS Unit should not be loose, and must be connected correctly.

⑨ The input and output terminal block wiring on the UPS Power Distribution Unit should not be loose, and must be connected correctly.

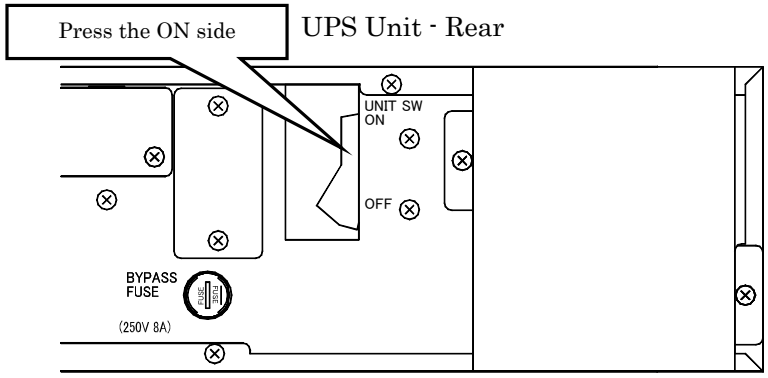
⑩ The DIP switches on the rear of the UPS Units should be set correctly:
Refer to §7.4, "Setting Procedures", verify that "Input/Output Voltage", "Unit ID" and "No. of Units" are set correctly.

9. Operation

◆ 9.1 Starting Operation (Normal Start)

① Turn ON the distribution panel breaker of the AC source.

② Turn ON the UNIT SW on all UPS Units.

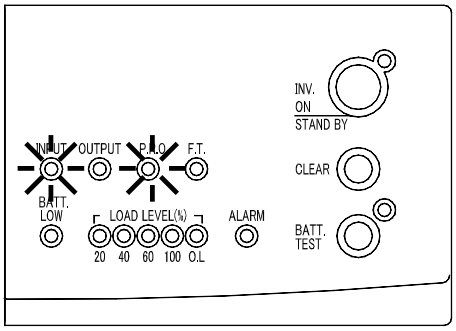


Caution

Always turn on the UNIT SW on all UPS Units. If a UPS Unit is not switched on, problems may occur as a result of inadequate power capacity.

UPS Unit - Front

Device Status	LED	
Cooling fan rotation, rectifier and charger starting, battery charge starting	INPUT (green)	On
	P.R.O. (green)	On



In this manual, switches are depicted as [ ] (e.g.: [INV ON/STAND BY]).

The status of LEDs on the control panel are indicated as ✳ for lit, and ✳ for blinking.

AT THIS TIME …

If the LEDs do not light as above, the alarm sounds after a few seconds, indicating that settings or connections may have been made incorrectly. First check the following:

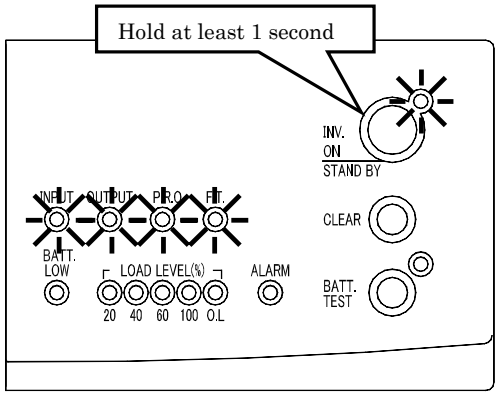
- Are the Unit Interface Cables connected correctly between UPS Units? (§7.5.3)
- Is the "Unit ID" setting on each UPS Unit unique? (§7.4)
- Are the "Input/Output Voltage" settings on all UPS Units the same? (§7.4)
- Are the "Frequency Sync Range" settings on all UPS Units the same? (§13.2.4)
- Are the "Battery Starting Frequency" settings on all UPS Units the same? (§13.2.8)

However, if the LEDs do not light and the alarm does not sound as above, another problem may be present. In that case, please contact your nearest sales representative.

③ Press the [INV ON/STAND BY] switch of any UPS Unit for at least one second (which unit does not matter).

Beeper Sound - beep

Device Status	LED	
Cooling fan rotation, rectifier and charger starting, battery charge starting	INPUT (green)	On
	P.R.O. (green)	On
After a second or two, the inverter starts	INPUT (green)	On
	INV ON/STAND BY (green)	On
	OUTPUT (green)	On
	P.R.O. (green)	On
	F.T. (green)	On



Note: The on/off state of the F.T. LED and LOAD LEVEL LED depends on the load level.

Caution

Do not press the [INV ON/STAND BY] switches of more than one UPS Unit at the same time.

Otherwise, problems such as abnormal startup may occur.

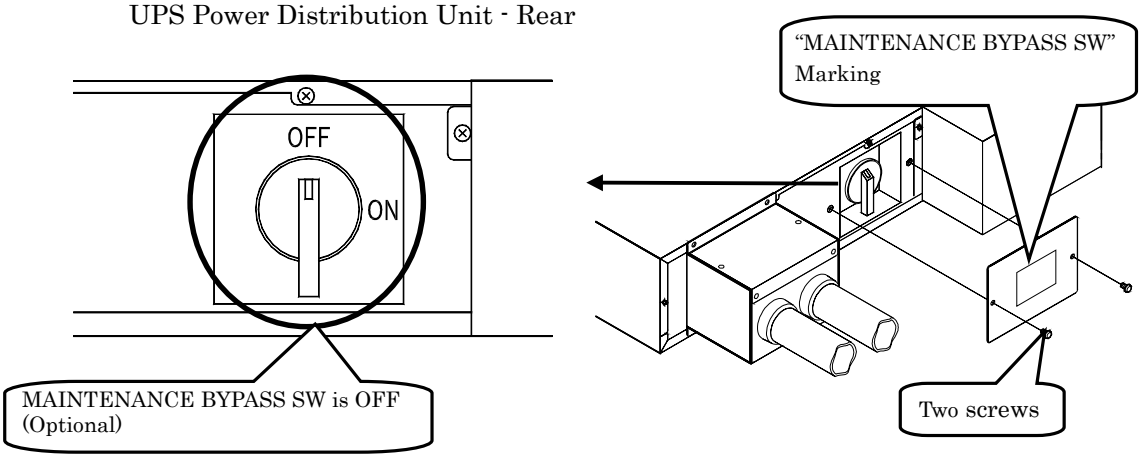
◆ 9.2 Starting Operation (Battery Start)

If the status of AC source is abnormal (such as an outage or low voltage), the UPS system provides AC power output from the batteries through the inverter.

For a Model equipped with the "MAINTENANCE BYPASS SW", verify step ①.

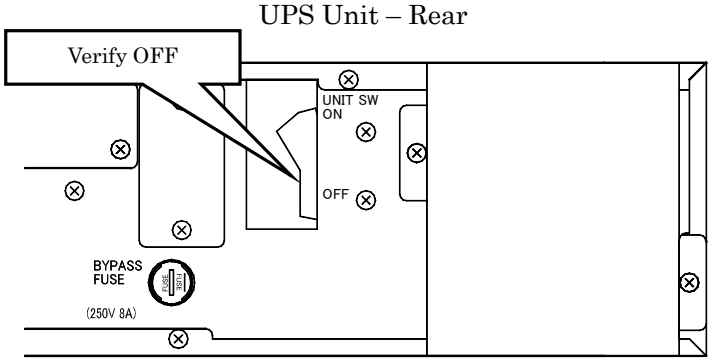
① Verify that the MAINTENANCE BYPASS SW on the rear panel is turned OFF.

UPS Power Distribution Unit - Rear



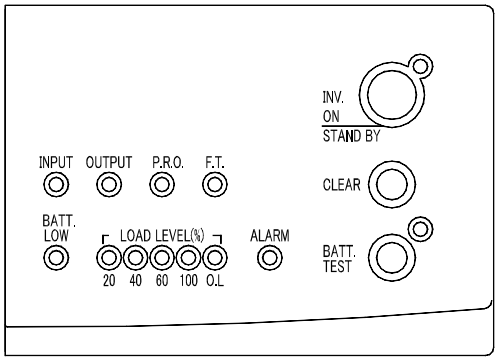
② Verify that the UNIT SW on every UPS Unit is OFF.

UPS Unit – Rear



Device Status	LED
All stopped	All Off

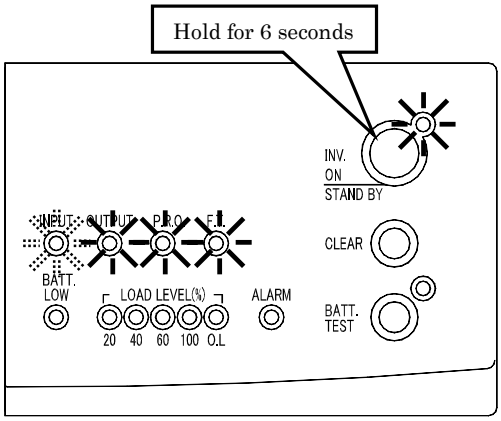
UPS Front



③ Press INV ON/STAND BY on every UPS Unit for at least 6 seconds.

Beeper sound "Beep"
↓
Beep-beep…beep-beep…

Device Status	LED	
Inverter operating from battery	INPUT (green)	Blinking
	INV ON/STAND BY (green)	On
	OUTPUT (green)	On
	P.R.O.	On
	F.T.	On



Note: The on/off state of the F.T. LED and LOAD LEVEL LED depends on the load level.

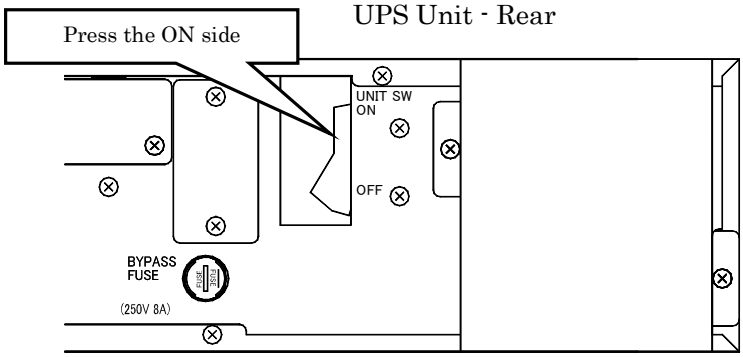
Note

The INPUT LED blinking and beeper sound timing may not always match for all UPS Units, but this does not indicate an abnormality.

Caution

When using this method to start the UPS system, connect and start the load only after all UPS Units have been started. The UPS system may not start correctly if started with a load already connected.

④ Turn on the UNIT SW on the rear of all UPS Units.



Caution

When the UNIT SW is not turned ON, even when utility power (AC input) returns to normal, the UPS cannot switch from the internal supply back to the utility power, so operation is the same as during an extended outage, and the batteries will be discharged. Be aware that, when restarting from this condition, the UPS system backup function will not be fully operational until the batteries have had time to recharge.

◆ 9.3 Power Outage Simulation Test

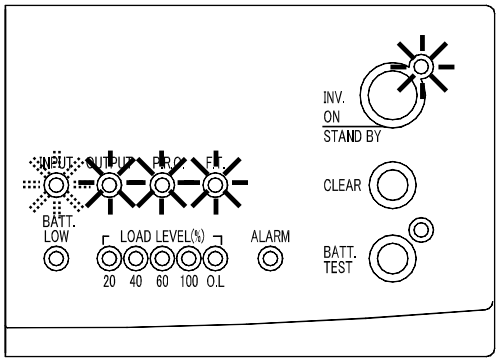
The power outage simulation test is performed to verify that the UPS system is functioning properly. This test is not needed when starting from the batteries (§9.2). The following indicates normal conditions.

> Note
> Perform this test before turning on connected loads.

① Turn OFF the distribution panel breaker of the AC source.

Beeper sound: Beep-beep…beep-beep…

Device Status	LED	
Inverter operating from battery, Output supply continues	INPUT (green)	Blinking
	INV ON/STAND BY (green)	On
	OUTPUT (green)	On
	P.R.O. (green)	On
	F.T. (green)	On

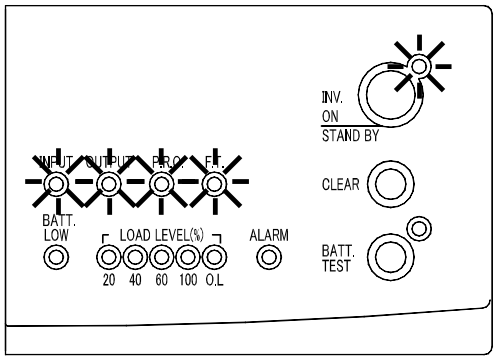


> Note
> The INPUT LED blinking and beeper sound timing may not always match for all UPS Units, but this does not indicate an abnormality.

② Turn the distribution panel breaker back ON.

Beeper sound: stops

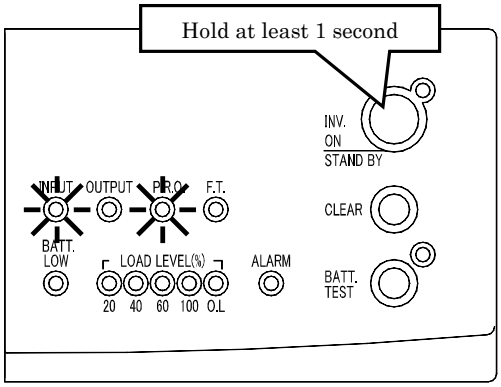
Device Status	LED	
Rectifier, Charger start	INPUT (green)	On
Battery charging starts	INV ON/STAND BY (green)	On
	OUTPUT (green)	On
	P.R.O. (green)	On
	F.T. (green)	On



◆ 9.4 Operation Shutdown (Daily)

① Press and hold INV ON/STAND BY on any UPS Unit for at least one second.

Device Status	LED	
Inverter stopped	INPUT (green)	On
OUTPUT: stopped	INV ON/STAND BY (green)	Off
Rectifier, charger	OUTPUT (green)	Off
operation continue	P.R.O. (green)	On
	F.T. (green)	Off

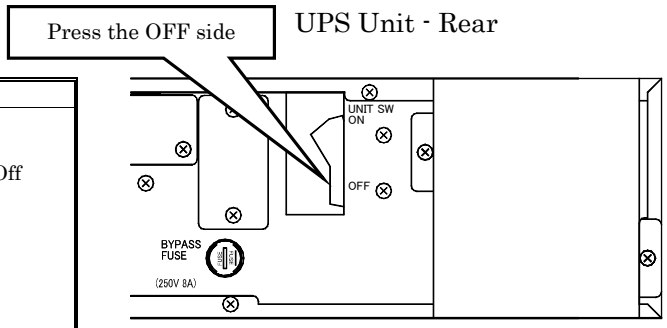


Caution
For daily shutdown, the UNIT SW should be kept ON (not used).

◆ 9.5 Operation Shutdown (If UPS is not to be used for a week or more)

① Press and hold INV ON/STAND BY on any UPS Unit for at least one second.
② Turn OFF the UNIT SW switches on all UPS Units.

Device Status	LED	
Inverter stopped	INPUT (green)	On
OUTPUT: stopped	INV ON/STAND BY (green)	Off
Rectifier, charger	OUTPUT (green)	Off
operation continue	P.R.O. (green)	On
	F.T. (green)	Off
↓ after about 10s	↓ after about 10s	
All shut down	All turn off	



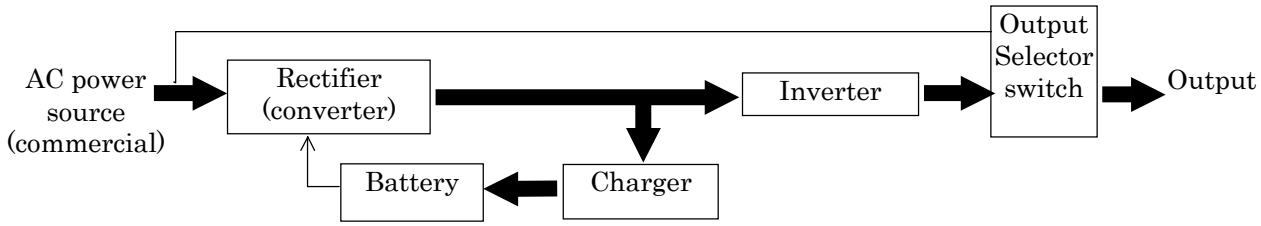
Note
If the input supply is removed while the UPS system is on, the batteries are discharged the same as during an extended outage. Be aware that when the input supply is restored, the full capacity of the backup function will not be available until the batteries have had time to recharge.

10. Operating and Protective Functions

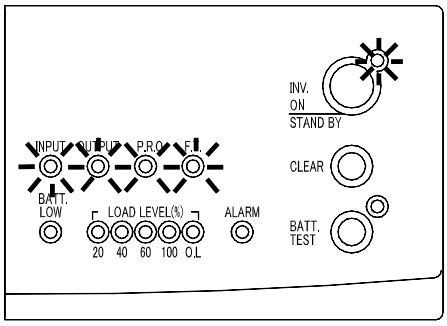
◆ 10.1 Basic Operation

(1) Under normal conditions

Basically, the UPS converts AC power from the commercial source (AC input) into DC power through the rectifier, and reconverts this DC power back into AC power through the inverter. The reconverted AC power is synchronized with the commercial source to ensure a stable power supply to the loads. The batteries are kept continually charged and ready in case a problem (outage or voltage drop) occurs in the commercial power supply.



Power supply route in normal operation



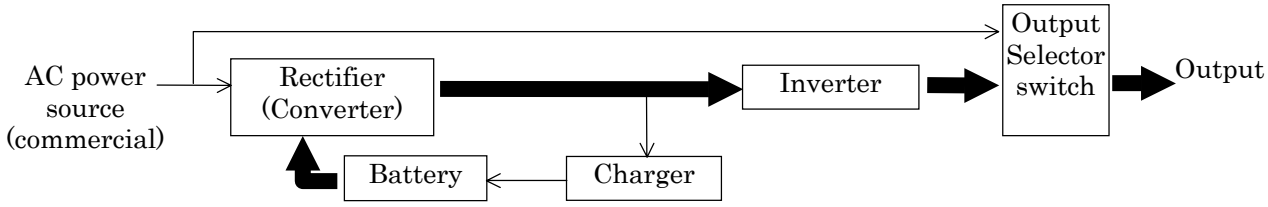
Note: The on/off state of the F.T. LED and LOAD LEVEL LED depends on the load level.

Indicator status (All UPS Units)

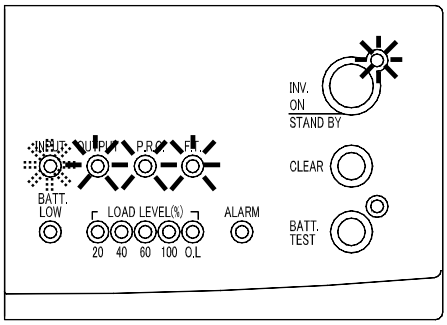
(2) Upon failure of commercial power

When a fault or an outage occurs in the commercial power source, the rectifier and charger cease operating while inverter operation continues, now using the batteries as a DC source, to ensure stable power supply to the loads without even a momentary power dropout. At this time, the battery operation beeper sounds and the green INPUT indicator lamp blinks. Pressing CLEAR silences the beeper.

Also, because each UPS Unit has its own CLEAR button, it must be pressed on every unit.



Power supply route upon failure of commercial power



Note: The on/off state of the F.T. LED and LOAD LEVEL LED depends on the load level.

Indicator status upon failure of commercial power

(3) When battery voltage becomes low

If the commercial power abnormality or outage persists, the BATT.LOW (low battery voltage) indicator on the panel lights when battery voltage falls below 1.85 volts per cell.

(4) Upon recovery of commercial power

When normal commercial power recovers, rectifier and charger operations resume automatically, returning to the normal operating state described in (1).

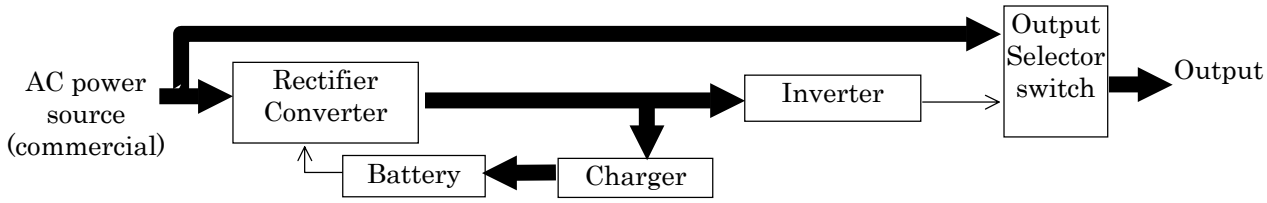
(5) Extended power outage

If a power outage persists and the battery voltage reaches the final discharge level, a protective circuit shuts off the inverter to prevent overdischarging the batteries. When normal commercial power recovers after the inverter has been stopped automatically, operation is automatically resumed, returning to the normal operating state described in (1).

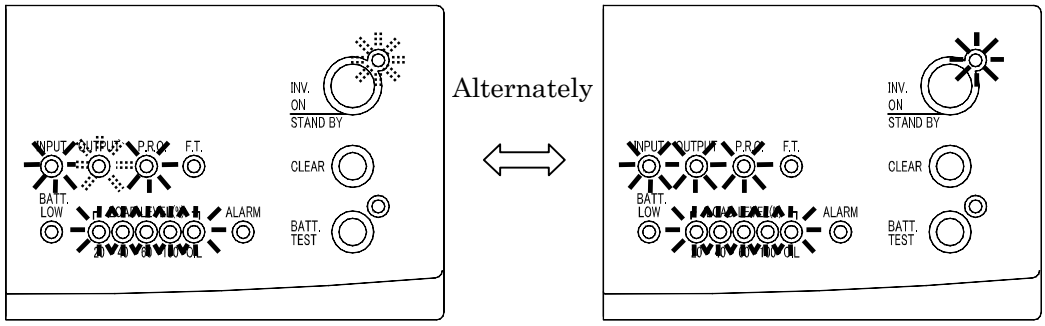
◆ 10.2 Protective Functions

(1) Overload Protection

If the UPS outputs are overloaded by exceeding the current capacity of the inverter, such as when a computer system boots up, the output selector switch automatically switches the source of AC power from the inverter to the bypass source without interruption. After a certain period of time has elapsed, the source of AC power is switched back to the inverter without interruption (auto return).



Power supply route in overload state



Bypass Supply Time Inverter Supply Time

Indicator status during overload

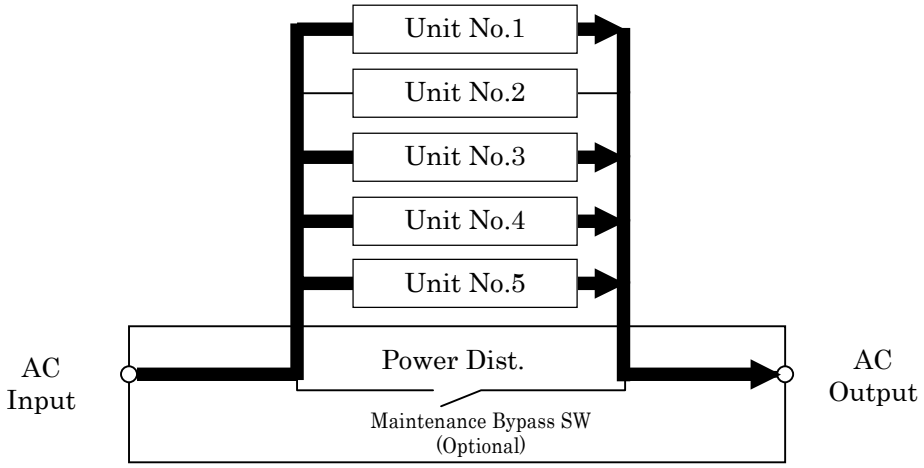
(2) Inverter Failure

If a fault occurs in an inverter, the faulty unit is automatically isolated as inverter supply continues from the normal unit(s). The (red) ALARM indicator on the faulty unit lights, and its beeper sounds. Press CLEAR to silence the beeper.

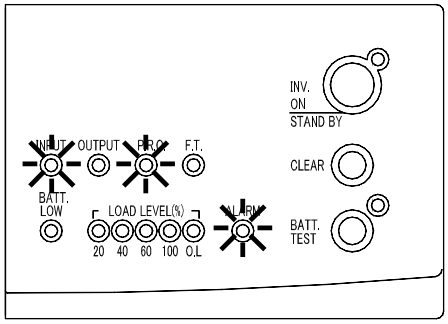
At that time, operation is as follows, depending on the size of the load current.

Case 1. If the load current does not exceed the capacity of the remaining normal units, inverter supply continues.

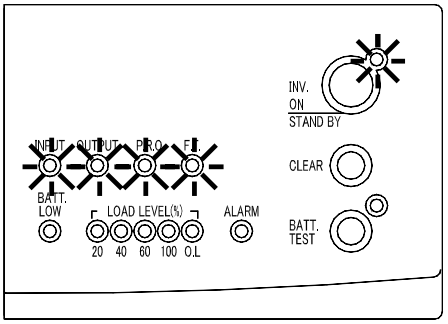
Case 2. If the load current exceeds the capacity of the remaining normal units, operation alternates back and forth (auto-return) between inverter and bypass supply.



Power supply route when a UPS Unit fails (Here, Unit No. 2)



Indicator status when a UPS Unit has failed (faulty Unit)



Indicator status when a UPS Unit has failed (normal Units): Case 1

For Case 2, operation is the same as the overload state

◆ 10.3 Protective Function Chart

The protective functions listed in this table protect the UPS system and connected devices.

○: Indicates a lamp lights, beeper sounds and an external signal is sent

Item			Control (front panel) indicators							Warning	External signal output: contact signal output (option)					Protective function (UPS operation)	Note
			INPUT (green)	OUTPUT (green)	ALARM (red)	O.L (red)	BATT.LOW (red)	P.R.O. (green)	F.T. (green)	Beeper (Note 1)	AC input Abnormal	Battery Voltage low	AC output	Bypass Output	UPS abnormal		
00	Preparation		○	-	-	-	-	○	-	-	-	-	-	-	-	Rectifier, charger operation	Receiving AC power
01	Normal		○	○	-	-	-	○	○ (*1)	-	-	-	○	-	-	Inverter operation	Receiving AC power, start
02	Serious error	Failed UPS Unit	○	-	○	-	-	○	-	○ (1)	-	-	○	-	○	Failed UPS Unit is turned off Inverter power supply is continued	When a UPS Unit has failed
		Normal UPS Units	○	○	-	-	-	○	-	-	-	-	○	-	○		
		All UPS Units	○	○ (blink)	○	-	-	○	-	○ (1)	-	-	○	○	○	Inverter is turned off Bypass power supply	When all UPS Units have failed
03	Overload (Effective value)		○	○ (blink)	-	○	-	○	-	○ (4)	-	-	○	○	-	Bypass power supply	Auto return
04	Forced bypass		○	○ (blink)	-	-	-	○	-	-	-	-	○	○	-	Bypass power supply	Manually switch to bypass AC power source
05	Input overvoltage		○ (blink)	○	-	-	-	○	○ (*1)	○ (2)	○	-	○	-	-	Rectifier and charger turned off Inverter power supply is continued	Battery operation
06	Input overvoltage (prolonged)		○ (blink)	○	-	-	○	○	○ (*1)	○ (3)	○	○	○	-	-	Rectifier and charger turned off Inverter power supply is continued	Battery operation Inverter turns off when battery discharged.
07	Power outage		○ (blink)	○	-	-	-	○	○ (*1)	○ (2)	○	-	○	-	-	Rectifier and charger turned off Inverter power supply is continued	Battery operation
08	Power outage (prolonged)		○ (blink)	○	-	-	○	○	○ (*1)	○ (3)	○	○	○	-	-	Rectifier and charger turned off Inverter power supply is continued	Battery operation Inverter turns off when battery discharged.
09	Input abnormal (Frequency)		○ (blink)	○	-	-	-	○	○ (*1)	○ (2)	○	-	○	-	-	Rectifier and charger turned off Inverter power supply is continued	Battery operation
10	Input abnormal (prolonged)		○ (blink)	○	-	-	○	○	○ (*1)	○ (3)	○	○	○	-	-	Rectifier and charger turned off	Battery operation Inverter turns off when battery discharged.
11	P.R.O. malfunction		○	○	-	-	-	-	-	○ (5)	-	-	○	-	○	Inverter power supply is continued	

Note 1. Pressing CLEAR on UPS Unit front panel silences the beeper. If such trouble occurs, contact your nearest sales representative.

Beeper alarm sounds:

(1) Beep ———— (continuous)

(2) Beep beep・・・・・・beep beep・・・・・・

(3) Beep beep beep beep・・・・・・

(4) Beep beep beep beep・・・・・・Beep beep beep beep・・・

(5) Beep ・・・・・・・・・・・・・・・ beep ・・・・・・・・・・・・・・・

*1. Turns off when the load is [(overall system capacity) – 1 kVA] or more.

11. Maintenance and Inspection

◆ 11.1 Daily Inspection

Observe the control panel LEDs to confirm that no abnormality is indicated.
No other particular inspection or maintenance is required.

◆ 11.2 Periodic Inspection

The following items should be inspected every six months.

⚠ **CAUTION**	• Internal maintenance and inspection should be performed only by technically qualified personnel. Electric shock, injury, burning, smoke or file could otherwise result. • Perform inspection only after the input power has been turned off and the UPS has completely stopped. Electric shock hazards may be present. • As electrical parts remain charged as long as the batteries are connected, never touch them. Electric shock hazards may be present.

(1) External Visual Inspection
Damage can occur if dust accumulates on internal components, so remove any dust or grime from the intake and exhaust vents.

(2) Internal Visual Inspection
Check for any signs of color change or corrosion of circuit components, particularly if the UPS system is installed in an environment with corrosive gases or high humidity.

◆ 11.3 Periodic Parts Replacement

The intended system service life is seven years. Parts that should be periodically replaced during the service life are as follows:

(1) Batteries Once every 4.5 years
Refer to §11.4, “Battery Maintenance and Inspection”, regarding battery replacement.

◆ 11.4 Battery Maintenance and Inspection

⚠ **CAUTION**	• Battery replacement should be performed only by technically qualified personnel. Electric shock, injury, burning, smoke or file could otherwise result. • Batteries should be replaced periodically. Batteries that have passed their service life may cause a fire. • Do not use organic solvents such as gasoline, thinner and benzene, or other cleaning compounds. These can adhere to seams in the battery casing, causing current leakage or fire.

(1) Battery Backup Confirmation

Battery backup capacity should be tested periodically (about once every 3 months), according to §13.1, "Battery Test". Replace the batteries as the test results indicate.

(2) Battery Replacement Period Prediction

Battery life is affected by operating conditions such as ambient temperature and number of discharges. Ambient temperature has a particularly strong influence as indicated in the following table (refer to the table to predict when batteries will need to be replaced according to ambient temperature). Using batteries after their life expectancy can cause leakage, and in the worst case damage may result, so we recommend changing batteries early as a preventative and protective step.

Ambient Operating Temperature	Life Expectancy	Battery Replacement Period
25°C (77°F)	5.0 years	4.5 years
30°C (86°F)	3.5 years	3.0 years
35°C (95°F)	2.5 years	2.0 years
40°C (104°F)	1.7 years	1.5 years

(3) Battery Specification

The batteries used in the UPS are specially designed for this application. Do not substitute with any other type, and do not mix brands or new and old batteries, as shortened battery life, fluid leakage and overheating could result.

(4) Used Battery Disposal

Batteries include poisonous lead substances, so to dispose of used batteries after replacement, please contact a waste disposal/recycling company, or return batteries to the place of purchase using the packaging in which the replacement batteries were supplied.

◆ 11.5 Battery Replacement

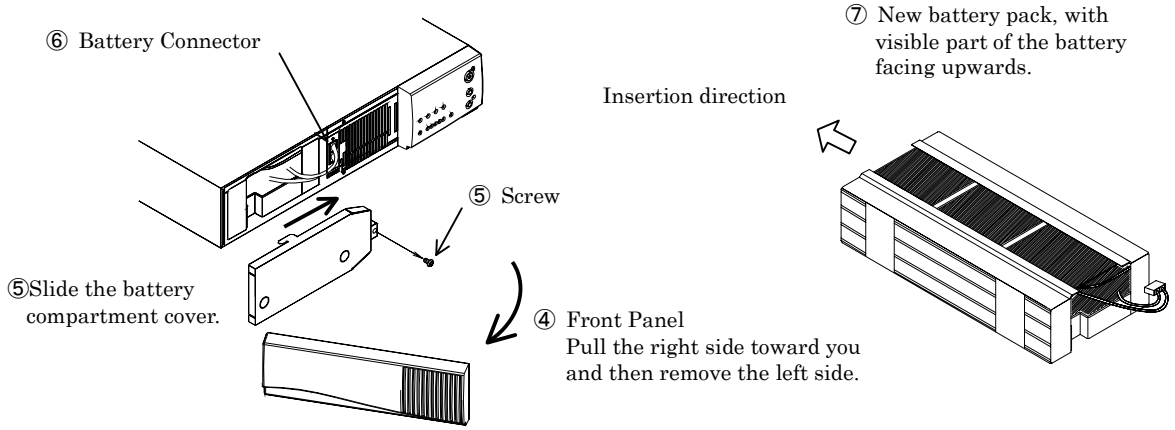
CAUTION	• Each battery pack weighs about 9.5 kg (20.94 lbs). Be careful not to drop it on or near your feet, as injury could result. • Protective measures should be taken when replacing batteries, such as wearing insulated gloves, as shock hazards are present. • Up to 41 V is always present at the battery terminals. Avoid touching the terminals with your fingers or causing a short circuit, as injury could result. • During replacement, be careful to avoid pinching your fingers.

We recommend shutting down the UPS completely while replacing batteries.

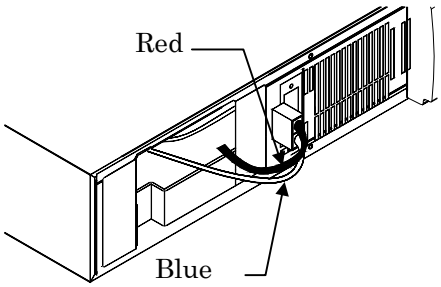
◆ 11.5.1 If the UPS can be shut down

If the UPS can be shut down completely, replace the batteries as follows.

① Press and hold [INV ON/STAND BY] on any UPS Unit for at least one second.
② Turn OFF the [UNIT SW] switches on all UPS Units.
③ Switch OFF the distribution panel breaker of the AC source.
④ Remove the front panel. (it may be difficult to remove if the UPS system is installed vertically, in which case you can remove the coupling brackets and pull the UPS Unit up slightly to remove the panel).
⑤ Turn the screw counterclockwise to loosen, and slide the battery compartment cover off.
⑥ Unplug the battery connector and pull out the battery pack. There is no stopper to prevent dropping, so pull it out slowly while supporting the bottom with one hand, and be careful not to drop it.



⑦ Insert the new battery pack with the connector towards the front.
⑧ Plug the plug from the battery pack to the battery connector on the UPS Unit until it clicks.



CAUTION	• Be sure to insert the battery connector in the proper direction. There is hazard of fire and shock. • Be careful not to pinch your fingers when replacing the cover.

⑨ After installing the battery compartment cover, turn the screw clockwise to tighten.
⑩ Replace the front panel
⑪ Start up the UPS system. See §9.1, "Starting Operation" for details.

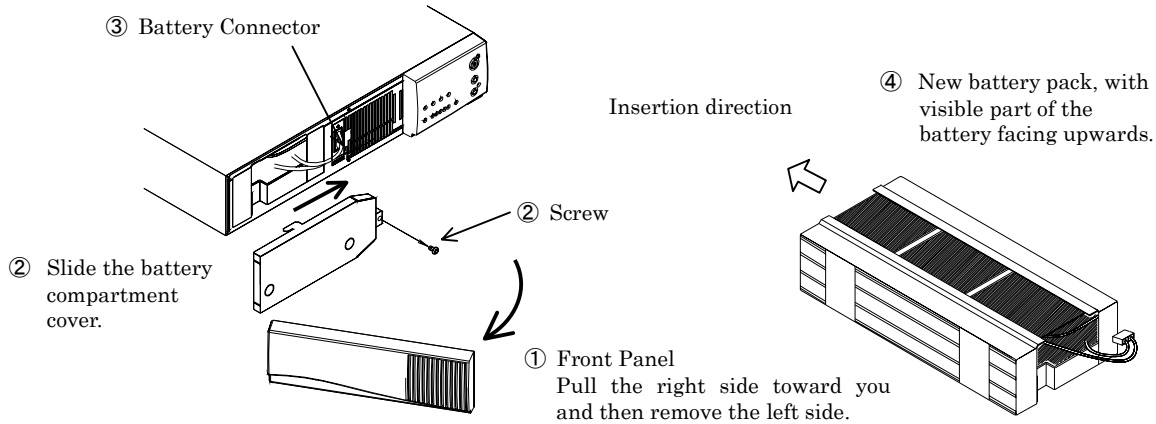
About Used Batteries

The batteries are a regulated industrial waste. They include poisonous lead substances, so to dispose of used batteries after replacement, please contact a waste disposal/recycling company, or return batteries to the place of purchase using the packaging in which the replacement batteries were supplied.

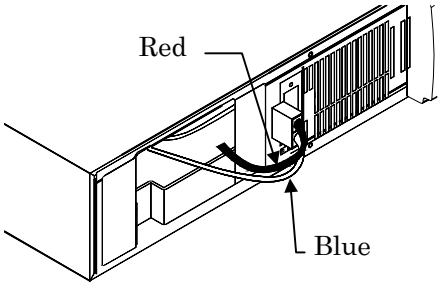
◆ 11.5.2 If the UPS cannot be shut down

If the UPS system cannot be allowed to be shut down, replace the battery packs one at a time with the following procedure. However, be aware that if an input abnormality such as a power outage occurs during this procedure, the remaining UPS Units must back up the load. In this case, if the F.T. LED is not lit, an overload will occur, and backup power will be unavailable. We therefore recommend performing the task while the F.T. LED is lit, or if it is not, concluding the procedure as quickly as possible.

① Remove the front panel (it may be difficult to remove if the UPS system is installed vertically, in which case you can remove the coupling brackets and pull the UPS Unit up slightly to remove the panel).
② Turn the screw counterclockwise to loosen, and slide the battery compartment cover off.
③ Unplug the battery connector and pull out the battery pack. There is no stopper to prevent dropping, so pull it out slowly while supporting the bottom with one hand, and be careful not to drop it.



④ Insert the new battery pack with the connector towards the front.
⑤ Plug the plug from the battery pack to the battery connector on the UPS Unit until it clicks.



⚠ CAUTION	• Be sure to insert the battery connector in the proper direction. There is hazard of fire and shock. • Be careful not to pinch your fingers when replacing the cover.

⑥ After installing the battery compartment cover, turn the screw clockwise to tighten.
⑦ Replace the front panel.

About Used Batteries

The batteries are a regulated industrial waste. They include poisonous lead substances, so to dispose of used batteries after replacement, please contact a waste disposal/recycling company, or return batteries to the place of purchase using the packaging in which the replacement batteries were supplied.

◆ 11.6 Fuse Replacement

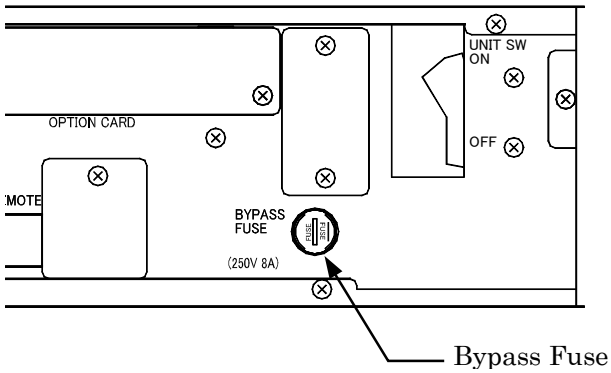
⚠ CAUTION	Always shut down the UPS before replacing a fuse. There is a shock hazard. Be careful to avoid injury.

◆ 11.6.1 Bypass Fuse Replacement

During bypass operation (OUTPUT LED blinking), if the red ALARM indicator is lit, a blown Bypass fuse may be suspected. After verifying the fuse is blown, replace with the supplied spare fuse as follows:

① Set the INV ON/STAND BY to STAND BY by pressing for at least 1 second.
② Set the UNIT SW on all UPS Units to OFF.
③ With a flat-bladed screwdriver, turn the Bypass Fuse holder on the rear panel counterclockwise.
④ Replace with a new fuse, reinsert the holder, and turn it clockwise.

UPS Unit - Rear



Used Bypass Fuse Disposal
Dispose of used fuses as non-combustible waste.

12. Adding and Replacing UPS Units

◆ 12.1 UPS Unit Replacement

◆ 12.1.1 Replacing a Normal Unit (for Maintenance)

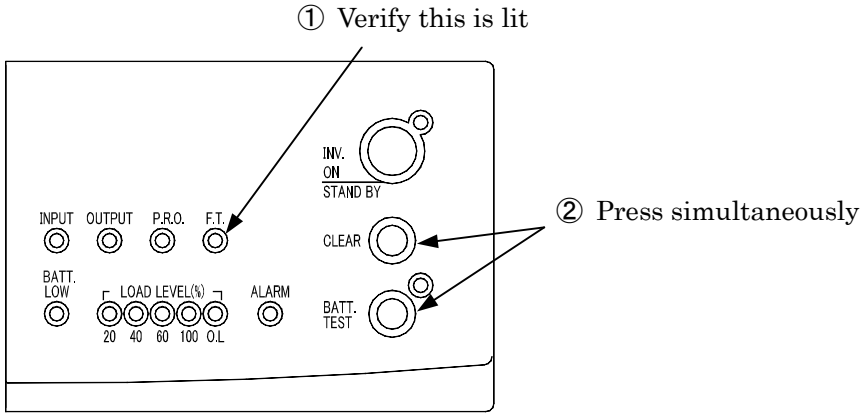
When operating in N+1 configuration (F.T. LED lit), UPS Units can be replaced while inverter supply continues. Replace using the following procedure.

Caution

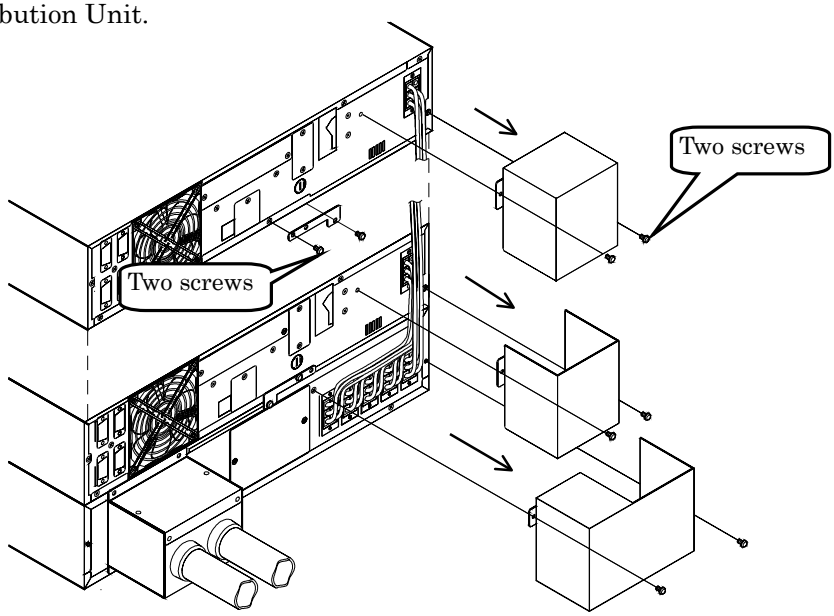
- If a UPS Unit is shut down while the F.T. LED is off, the remaining UPS Units may be overloaded, in which case the supply will alternate repeatedly between inverter and bypass operation (§10.2, "Protective Functions"). In this case, a UPS Unit can be replaced by switching to bypass operation with the Forced Bypass Switch, but if an outage occurs in this situation, power to the load is shut down.
- Please be careful to always follow these steps precisely. A mistake in a step may cause the power to the load to be shut down accidentally.

① Verify that the F.T. LED is lit.

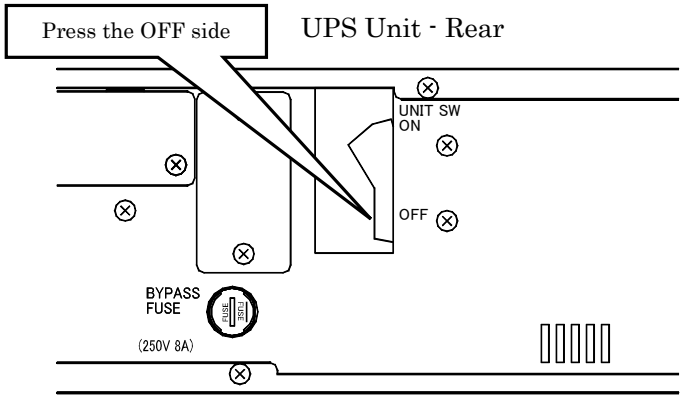
② On the UPS Unit being replaced, press the CLEAR and BATT.TEST buttons simultaneously for at least 2 seconds.



③ Remove the Ground plate and the cable covers of all UPS Units and UPS Power Distribution Unit.



④ On the UPS Unit being replaced, turn the UNIT SW OFF.

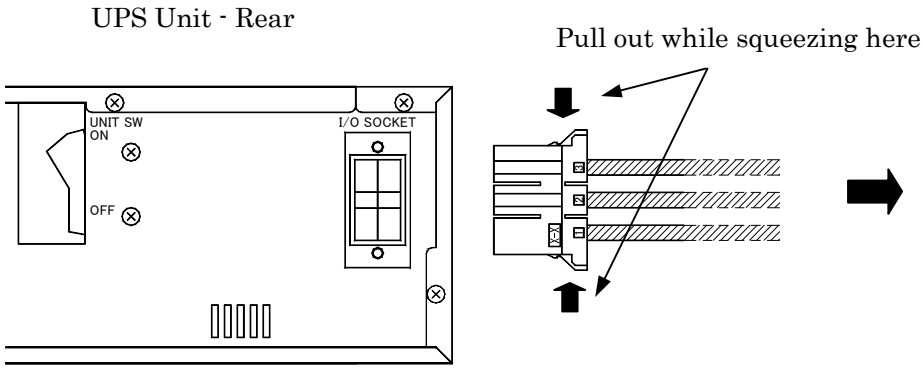


⑤ On the front panel of the UPS Unit being replaced, verify all LEDs are off.

Caution

If the P.R.O. LEDs on the front panels of the remaining units are off, an alarm sounds after about 20 seconds (§10.3). This is because after disconnecting a UPS Unit, the number of connected UPS Units no longer matches the "No. of Units" setting, although it is not a fault condition. Press the CLEAR buttons to silence the alarm. This button must be pressed on all UPS Units to silence the alarm.

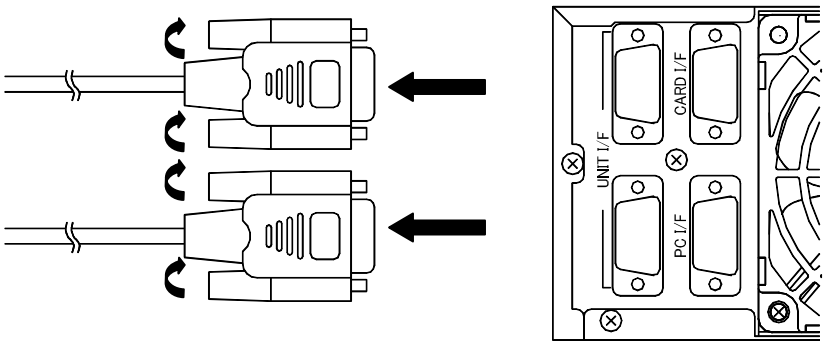
⑥ Remove the I/O Cable from the UPS Unit being replaced.



⚠ CAUTION	High voltage (AC 240V max) is present on the I/O Cable connector pins. Never touch them with your fingers.

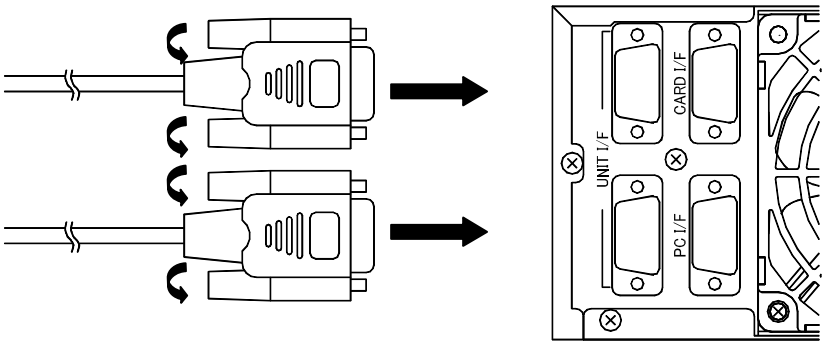
⑦ Remove the two Unit Interface Cables from the UPS Unit being replaced.

UPS Unit - Rear



⑧ In the new UPS Unit to be installed, set the "No. of Units" and "Unit ID" settings to match those of the unit being replaced (§7.4), and perform the replacement.
⑨ On the rear panel of the new UPS Unit, verify UNIT SW is OFF, and the Forced Bypass Switch is set to the INV position.
⑩ Connect the two Unit Interface Cables to the new UPS Unit.

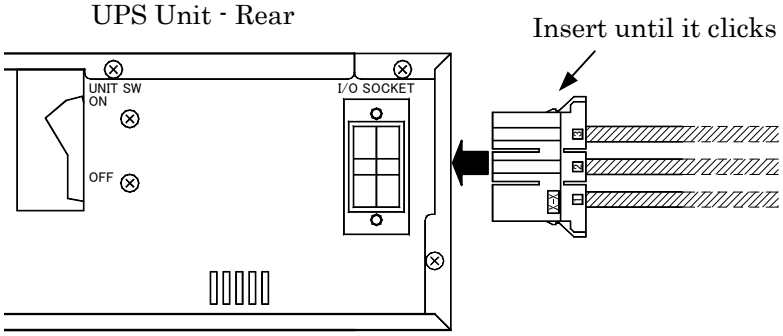
UPS Unit - Rear



⑪ Plug the I/O Cable into the new UPS Unit.

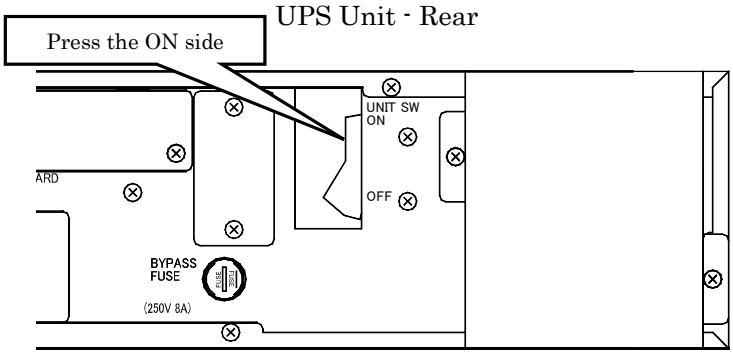
UPS Unit - Rear

Insert until it clicks



⑫ Replace the Ground plate and all the cable covers.

⑬ On the new UPS Unit, turn the UNIT SW to ON.



Caution

In the event of one of the following setting mistakes, the new UPS Unit will cause an alarm condition when the UPS Unit is started, and the UPS Unit will not operate when INV ON/STAND BY is pressed (a few seconds later, the ALARM LED lights and the alarm sounds continuously). In this case, check the following settings:

- If the "Input/Output Voltage" setting does not match the other UPS Units (§7.4)
- If the "Unit ID " setting is the same as that of another UPS Unit (§7.4)
- If the "Frequency Sync Range" setting does not match the other units (§13.2.4)
- If the "Battery Starting Frequency" setting does not match the other units (§13.2.8)

However, note that in this situation, the other UPS Units should continue to operate normally.

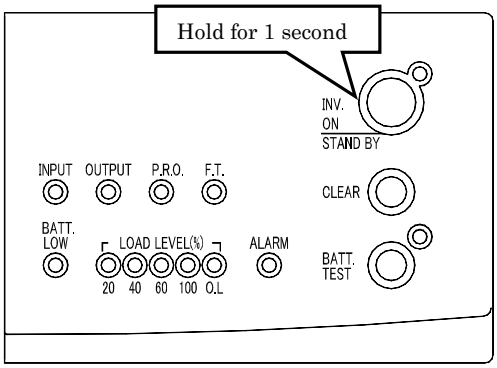
If one of the following setting errors is present, the new UPS Unit can start, but the P.R.O. LED does not light, and after about 20 seconds, the alarm sounds (for one short beep every 2 seconds). In this case, shut down the new unit immediately and verify the following settings:

Note that in this case, the new UPS Unit operation must be stopped by pressing the CLEAR and BATT.TEST buttons simultaneously. (refer to item ②of §12.1.1).

Be careful: pressing **INV ON/STAND BY** ***shuts down all outputs***.

- If the "No. of Units setting" is not the same in all UPS Units in the same UPS system (§7.4).
- If the "No. of Units" setting does not match the actual number of UPS Units (§7.4).
- If the Unit Interface Cables are not connected correctly (§7.5.3).

⑭ On the new UPS Unit, set the INV ON/STAND BY to ON by pressing for at least 1 second.

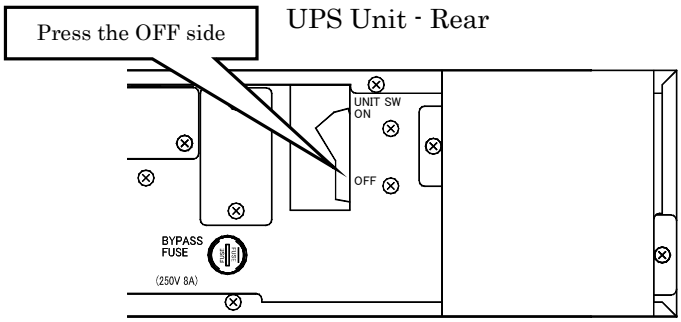


◆ 12.1.2 Replacing a Faulty Unit

When operating in N+1 configuration (F.T. LED lit), if one UPS Unit in the system is faulty, it can be replaced while inverter supply continues. Replace using the following procedure.

> Caution
> Please be careful to always follow these steps precisely. A mistake in a step may cause the power to the load to be shut down accidentally.

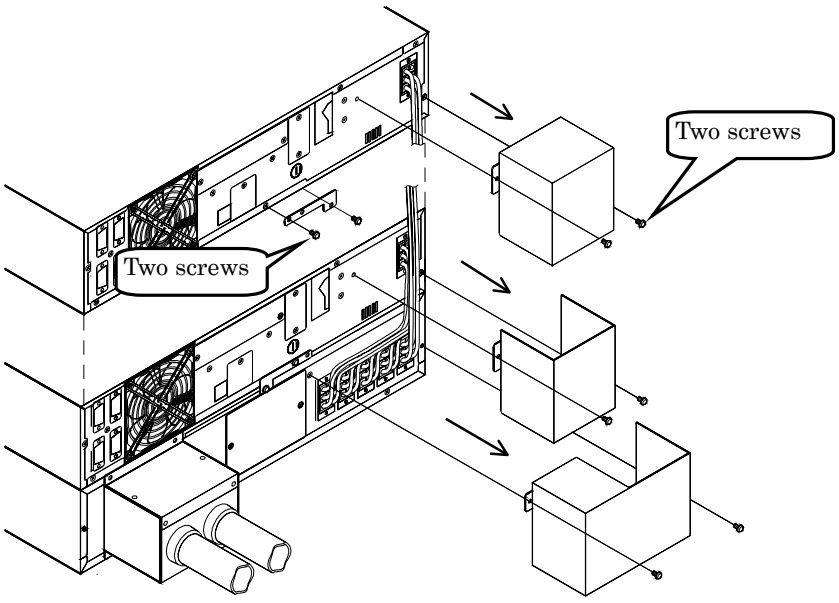
① Verify which UPS Unit is faulty (ALARM LED lit).
② Turn the UNIT SW of the faulty UPS Unit OFF.



③ On the front panel of the faulty UPS Unit, verify all LEDs are off.

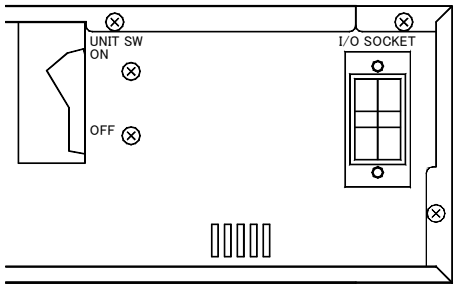
> Caution
> If the P.R.O. LEDs on the front panels of the remaining UPS Units are off, an alarm sounds after about 20 seconds (§10.3). This is because after disconnecting a unit, the number of connected UPS Units no longer matches the "No. of Units" setting, although it is not a fault condition. Press the CLEAR buttons to silence the alarm. This button must be pressed on all UPS Units to silence the alarm.

④ Remove the Ground plate and the cable covers of all UPS Units and UPS Power Distribution Unit.

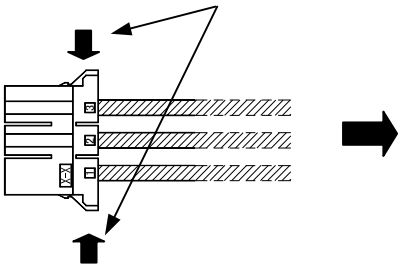


⑤ Remove the I/O Cable from the faulty UPS Unit.

UPS Unit - Rear



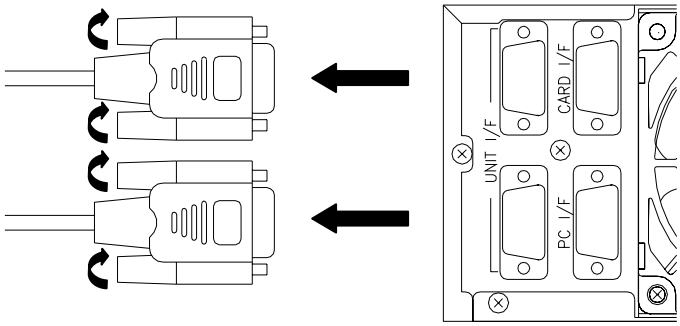
Pull out while squeezing here



⚠ CAUTION	High voltage (AC 240V max) is present on the I/O Cable connector pins. Never touch them with your fingers.

⑥ Remove the two Unit Interface Cables from the faulty UPS Unit.

UPS Unit - Rear

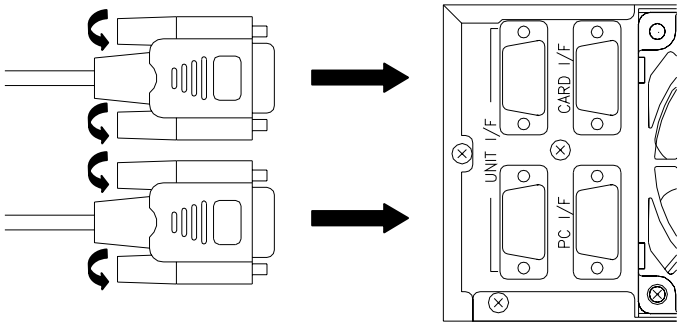


⑦ In the new UPS Unit to replace the faulty UPS Unit, set the "No. of Units" and "Unit ID" settings to match those of the faulty UPS Unit being replaced (§7.4), and perform the replacement.

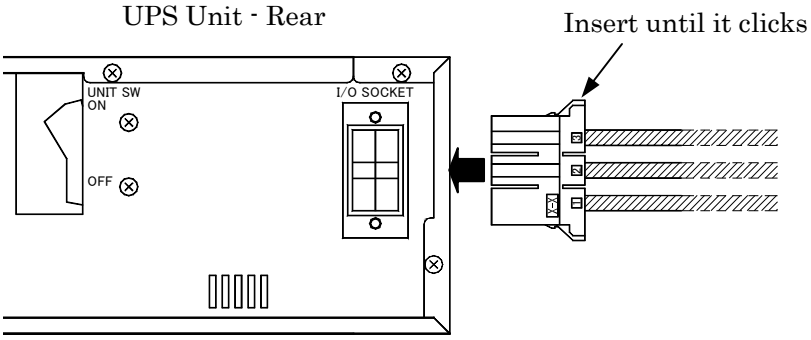
⑧ On the rear panel of the new UPS Unit, verify UNIT SW is OFF, and the Forced Bypass Switch is set to the INV position.

⑨ Connect the two Unit Interface Cables to the new UPS Unit.

UPS Unit - Rear

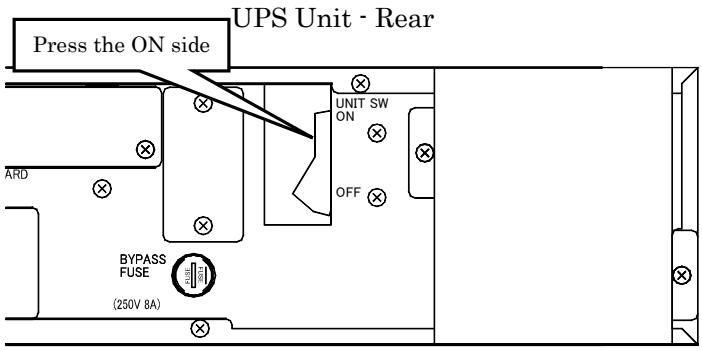


⑩ Plug the I/O Cable into the new UPS Unit.



⑪ Replace the Ground plate and all the cable covers.

⑫ On the new UPS Unit, turn the UNIT SW ON.



Caution

In the event of one of the following setting mistakes, the new UPS Unit will cause an alarm condition when the UPS Unit is started, and the UPS Unit will not operate when INV ON/STAND BY is pressed (a few seconds later, the ALARM LED lights and the alarm sounds continuously). In this case, check the following settings:

- If the "Input/Output Voltage" setting does not match the other UPS Units (§7.4)
- If the "Unit ID" setting is the same as that of another UPS Unit (§7.4)
- If the "Frequency Sync Range" setting does not match the other UPS Units (§13.2.4)
- If the "Battery Starting Frequency" setting does not match the other UPS Units (§13.2.8)

However, note that in this situation, the other UPS Units should continue to operate normally.

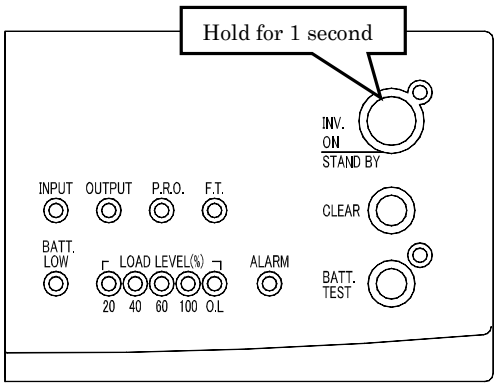
If one of the following setting errors is present, the new UPS Unit can start, but the P.R.O. LED does not light, and after about 20 seconds, the alarm sounds (for one short beep every 2 seconds). In this case, shut down the new UPS Unit immediately and verify the following settings:

Note that in this case, the new UPS Unit operation must be stopped by pressing the CLEAR and BATT.TEST buttons simultaneously. (refer to item ②of §12.1.1).

Be careful: pressing **INV ON/STAND BY** ***shuts down all outputs***.

- If the "No. of Units setting" is not the same in all UPS Units in the same UPS system (§7.4).
- If the "No. of Units" setting does not match the actual number of UPS Units (§7.4).
- If the Unit Interface Cables are not connected correctly (§7.5.3).

⑬ On the new unit, set the INV ON/STAND BY to ON by pressing for at least 1 second.



◆ 12.2 Adding and Removing UPS Units

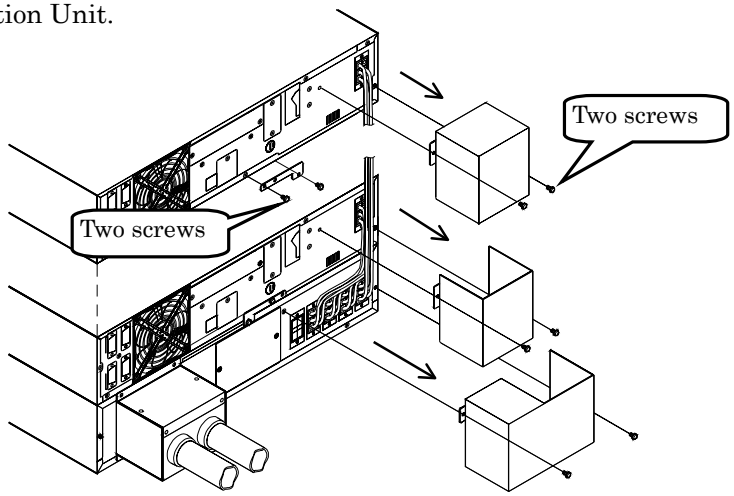
◆ 12.2.1 Adding Units

When your system requires greater power capacity due to load expansion or for other reason, you can install additional UPS Units (up to five) while continuing to supply power to the load.

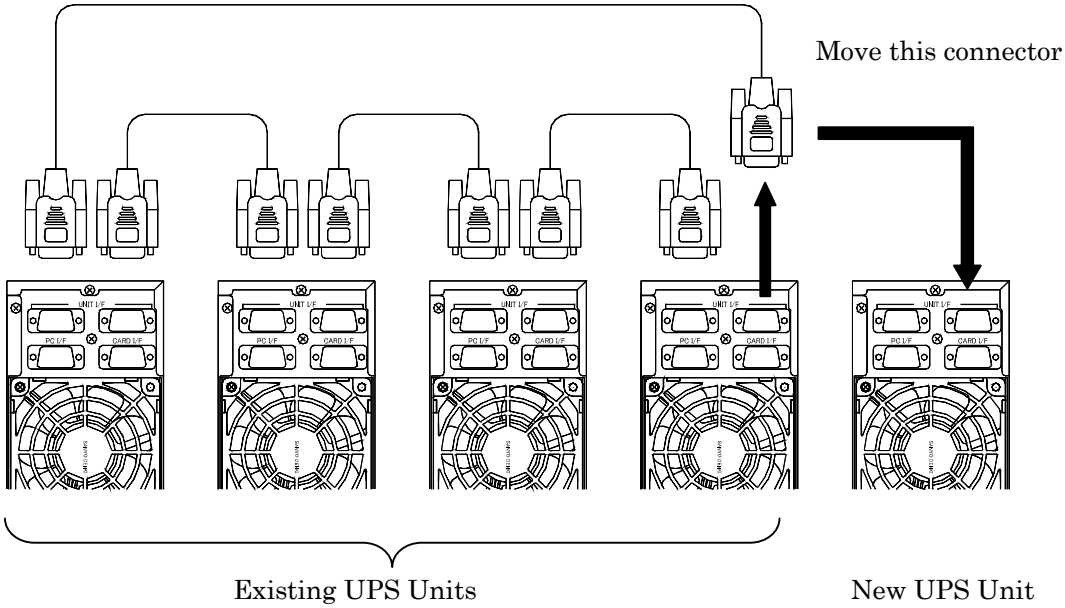
Caution

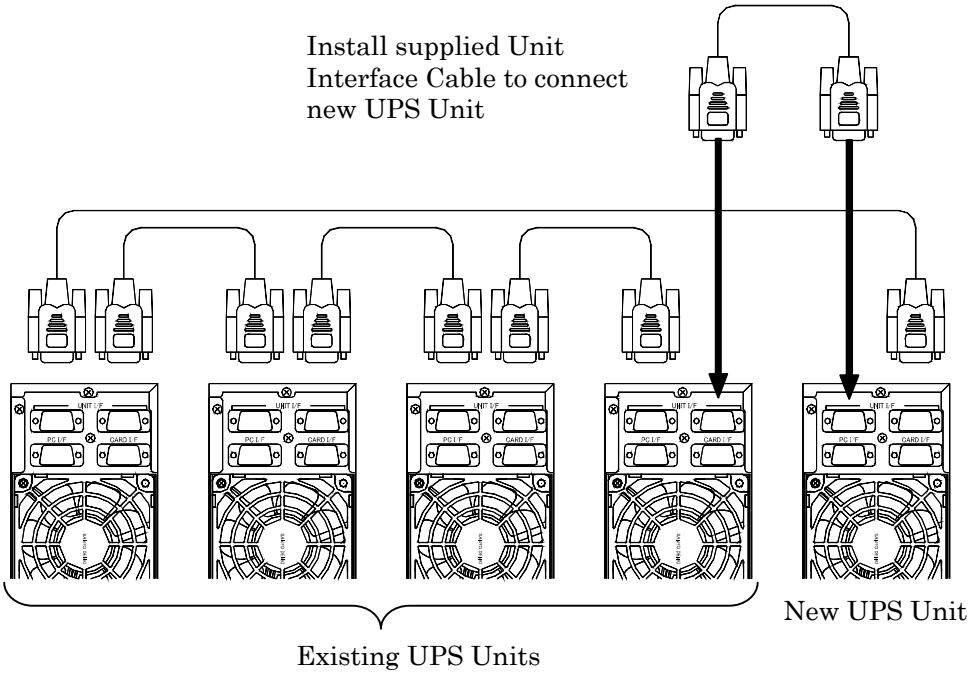
- Please be careful to always follow these steps precisely. A mistake in a step may cause the power to the load to be shut down accidentally.
- When the capacity is expanded, the wire that corresponds with the capacity after the expansion should be used. Verify the wire size. Refer to the table in §7.5.4 for details

① Remove the Ground plate and the cable covers of all UPS Units and UPS Power Distribution Unit.

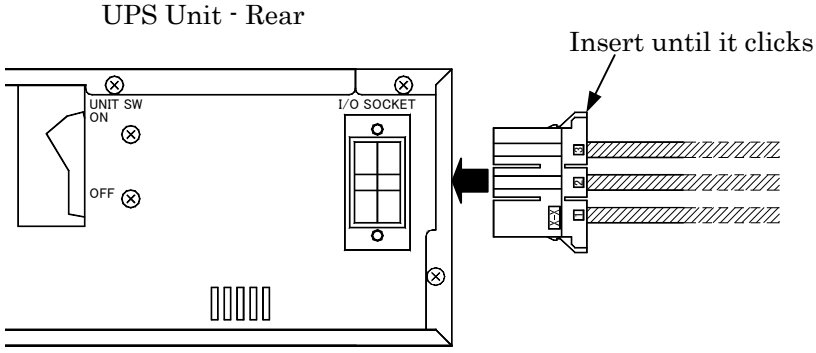


② Change the "No. of Units" setting (§7.4) in each of the existing UPS Units to the number of UPS Units after expansion.
③ Change the "No. of Units" setting (§7.4) in the new UPS Unit(s) to the number of UPS Units after expansion, and set the "Unit ID" of each new UPS Unit to a unique ID number from the existing units (we recommend setting sequential ID numbers).
④ Mount the new UPS Unit(s) (§6.4).
⑤ Connect the Unit Interface Cables to the new UPS Unit(s), as shown below.
(The diagrams presume one UPS Unit is being added to four existing UPS Units)

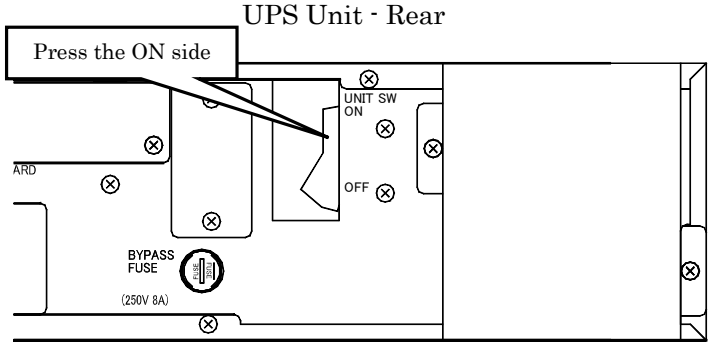




⑥ Connect an I/O Cable from the I/O Socket of the new UPS Unit to an empty I/O Socket on the UPS Power Distribution Unit.



⑦ Replace the Ground plate and all the cable covers.
⑧ On the new UPS Unit(s), turn the UNIT SW ON.



The P.R.O. LED on the operating units turns off, and after about 20 seconds, the alarm sounds. However, note that this does not occur on the new unit(s).

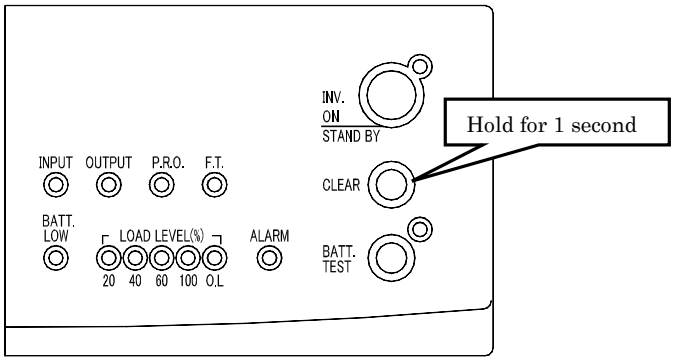
Caution

In the event of one of the following setting mistakes, the new UPS Unit will cause an alarm condition when the UPS Unit is started, and the UPS Unit will not operate when INV ON/STAND BY is pressed (a few seconds later, the ALARM LED lights and the alarm sounds continuously). In this case, check the following settings:

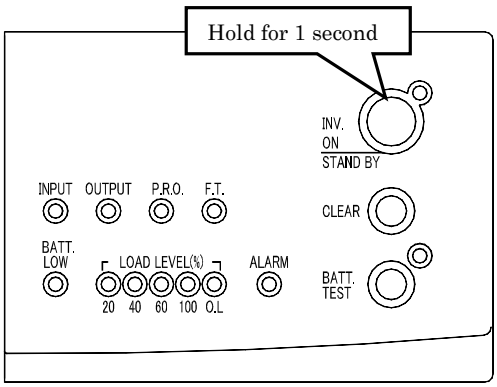
- If the "Input/Output Voltage" setting does not match the other UPS Units (§7.4)
- If the "Unit ID " setting is the same as that of another UPS Unit (§7.4)
- If the "Frequency Sync Range" setting does not match the other units (§13.2.4)
- If the "Battery Starting Frequency" setting does not match the other units (§13.2.8)

However, note that in this situation, the other UPS Units should continue to operate normally.

⑨ Press the CLEAR buttons on all UPS Units except the new one(s).
The P.R.O. LED turns on and the alarm to be silenced.
This operation causes each unit to recognize the new total number of UPS Units in the UPS system.



⑩ On the new UPS Unit(s), set the INV ON/STAND BY to ON by pressing for at least 1 second.



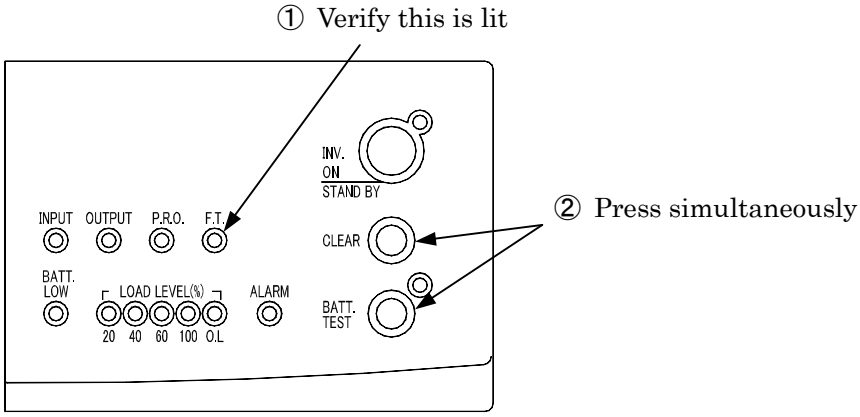
◆ 12.2.2 Removing Units

When the existing power capacity is no longer needed due to changes in circumstances, extra UPS Units can be removed while continuing to supply power to the load.

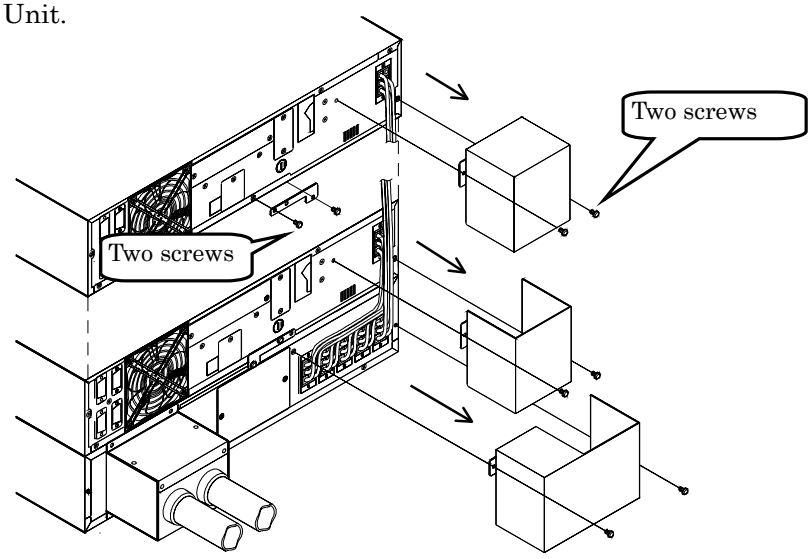
Caution
Please be careful to always follow these steps precisely. A mistake in a step may cause the power to the load to be shut down accidentally.

① Verify that the F.T. LED is lit. If it is not, a unit should not be removed (or the UPS system capacity will be exceeded, resulting in an overload).

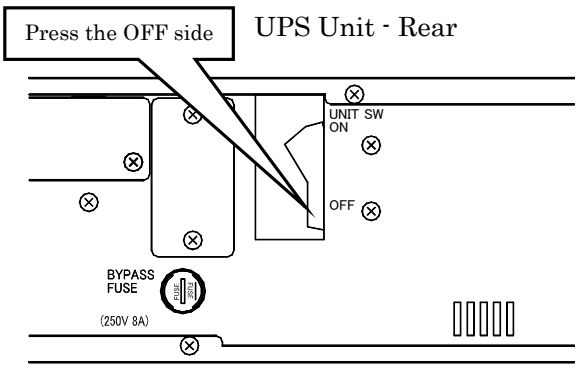
② On the UPS Unit to be removed, press the CLEAR and BATT.TEST buttons simultaneously. This operation allow shutting down only the output of the UPS Unit to be removed.



③ Remove the Ground plate and the cable covers of all UPS Units and UPS Power Distribution Unit.

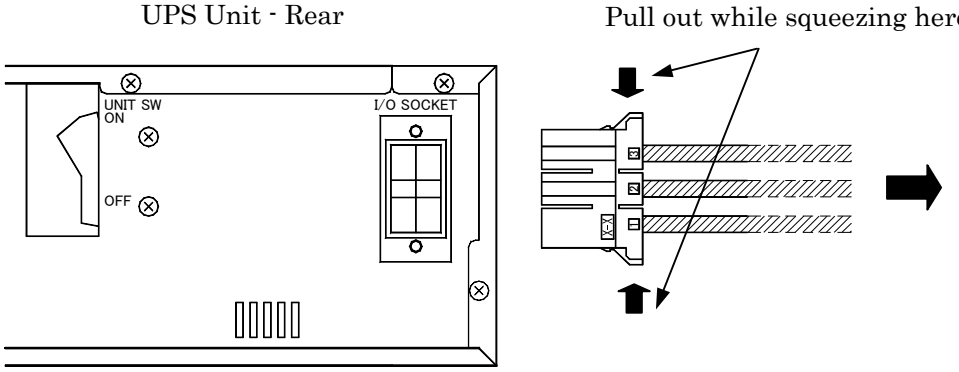


④ On the rear of the UPS Unit to be removed, turn the UNIT SW OFF.



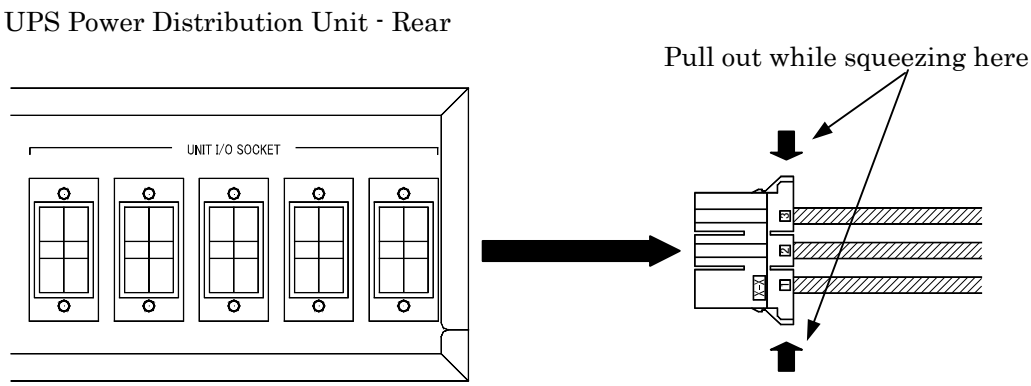
⑤ On the front panel of the UPS Unit to be removed, verify all LEDs are off.
The P.R.O. LEDs on the operating UPS Units turn off, and after about 20 seconds, the alarm sounds.

⑥ Remove the I/O Cable from the UPS Unit to be removed.



⚠ CAUTION	High voltage (AC 240V max) is present on the I/O Cable connector pins. Never touch them with your fingers.

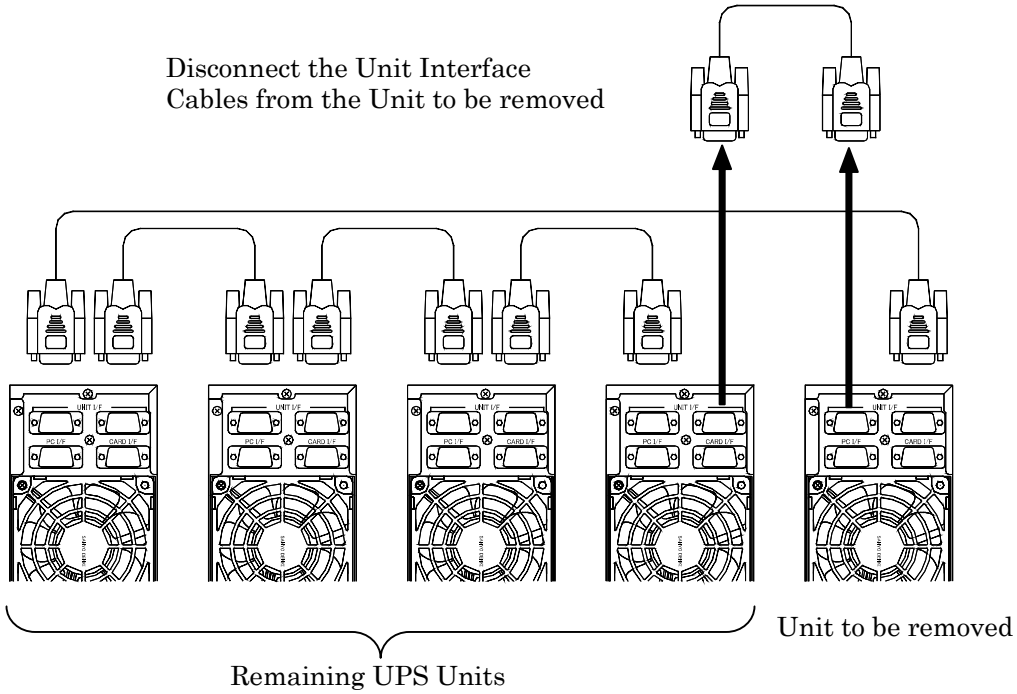
⑦ From the UPS Power Distribution Unit, remove the I/O Cable that was just disconnected from the UPS Unit being removed.

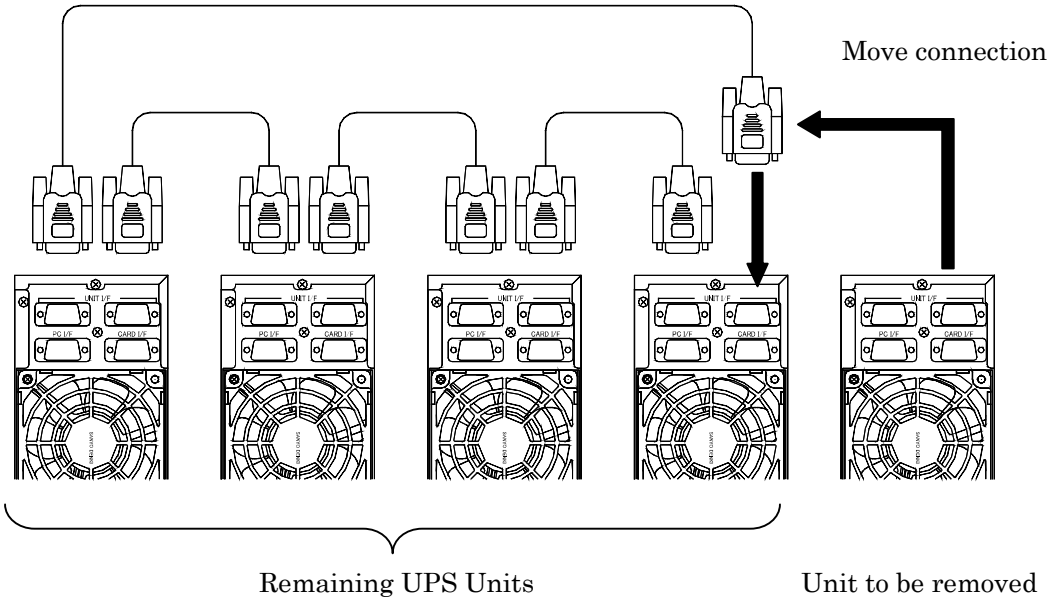


Caution
If the wrong connector is removed, power to the load may be shut down, so be careful.

⚠ CAUTION	High voltage (AC 240V max) is present on contacts in the I/O Sockets of the UPS Power Distribution Unit. Never touch them with you fingers.

⑧ Disconnect the Unit Interface Cables from the UPS Unit to be removed, as shown below.
(The diagrams presume one UPS Unit is being removed from five existing UPS Units)





⑨ Remove the UPS Unit(s).
⑩ Replace the Ground plate and all the cable covers.
⑪ Change the "No. of Units" setting (§7.4) in each of the remaining UPS Units to the number of UPS Units remaining after removal.
⑫ Press the CLEAR button on each remaining UPS Unit. The P.R.O. LED lights and the alarm is silenced as this step is performed on all UPS Units. This operation causes each unit to recognize the new total number of units in the system.

◆ 12.3 Maintenance Bypass

Caution
- This function is available only for the following condition UPS.
  "The Model equipped with the MAINTENANCE BYPASS SW and N+1 configuration."
  For the Model not equipped with MAINTENANCE BYPASS SW and N configuration, stop the loads and perform a maintenance.
- During this time, commercial power is supplied to the loads, so a power outage would result in interruption of power to the loads.

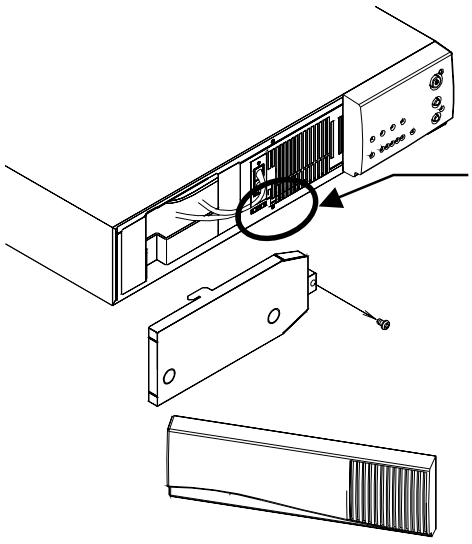
Even when the UPS system is not operating in N+1 configuration (F.T. LED off), maintenance bypass can be used to supply power to the loads through the bypass circuit during UPS Unit replacement and servicing.

◆ 12.3.1 Activating Maintenance Bypass Mode

This procedure activates the Maintenance Bypass Mode:

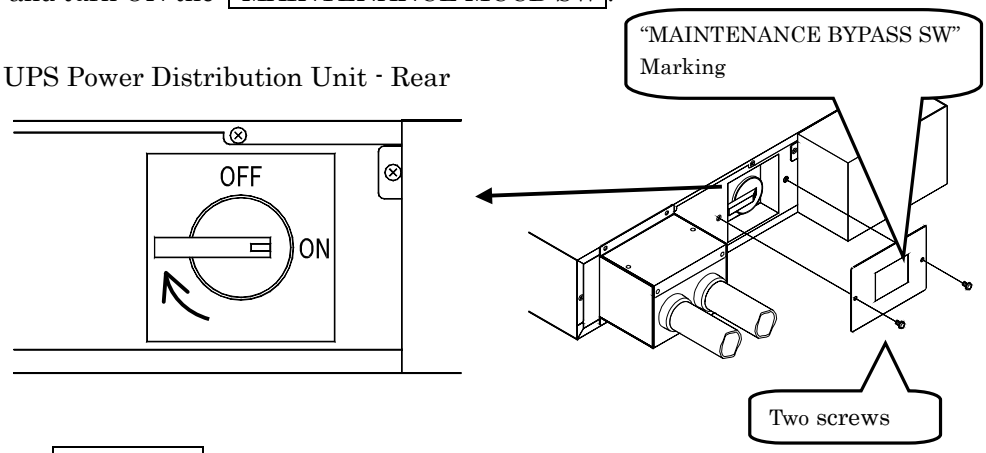
① Open the front panel of any UPS Unit (which one does not matter) except a UPS Unit to be maintained.

② Move the Forced Bypass Switch to the BYPASS position.
This operation switches all UPS Units to bypass supply.

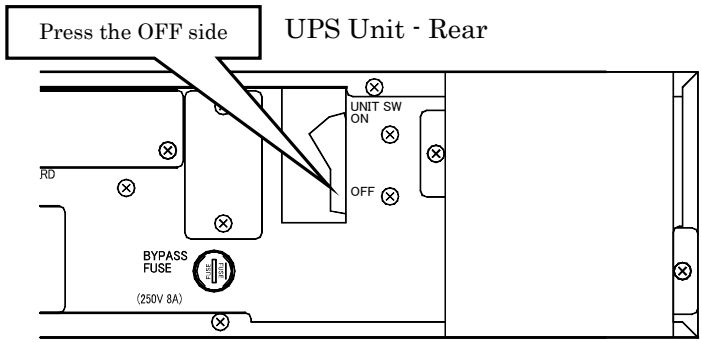


Front Panel Removal
① Pull the right side of the panel forward, then remove the left side.
② Remove the screw at the right side of the battery compartment cover.
③ Slide the battery compartment cover to the right to remove it.

③ On the UPS Power Distribution Unit, remove the MAINTENANCE MCCB SW cover, and turn ON the MAINTENANCE MCCB SW.



④ Turn the UNIT SW on all UPS Units OFF.



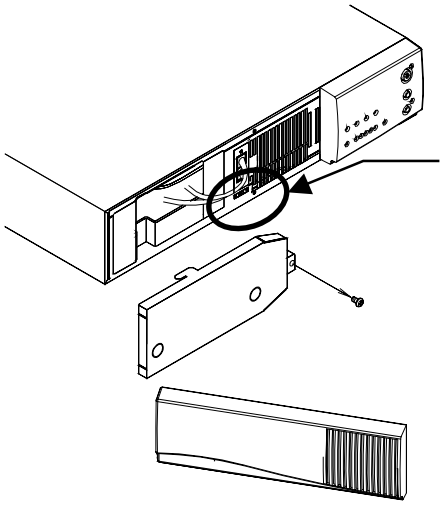
In this condition, power is supplied to the load through the maintenance bypass, so that each UPS Unit can be maintained.

⚠ CAUTION	High voltage (AC 240V max) is present on the contacts of the I/O Cable connectors and in the I/O Sockets of the UPS Power Distribution Unit. Never touch them with you fingers when removing.

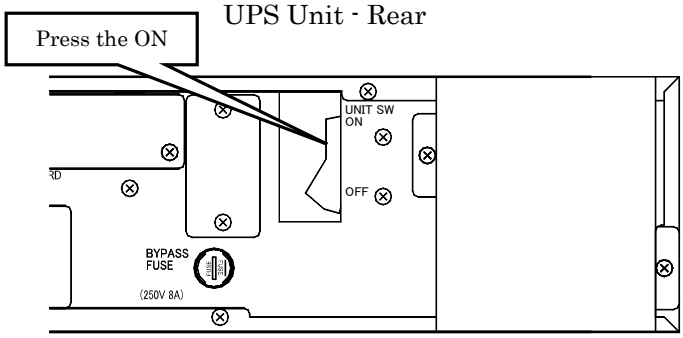
◆ 12.3.2 Recovering from Maintenance Bypass Mode

After UPS Unit replacement or maintenance, the procedure for recovering from the Maintenance Bypass Mode is as follows.
Verify that "Input/Output Voltage", "Unit ID" and "No. of Units" are set correctly (§7.4), and the cables should not be loose, and must be connected correctly.

① Verify the UPS Unit in which Forced Bypass switch has been set to the "BYPASS" position by procedure of "§12.3.1 Activating Maintenance Bypass Mode".

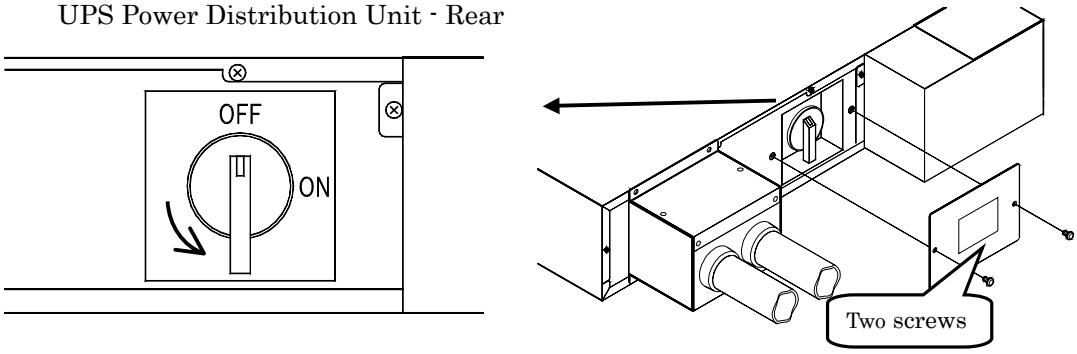


② Turn the UNIT SW on all UPS Units ON.
This causes all USP Units to operate in the Bypass Mode.



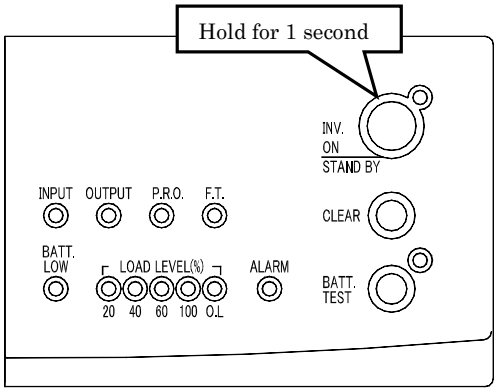
③ On the UPS Power Distribution Unit, turn the MAINTENANCE BYPASS SW OFF, and install its cover.

UPS Power Distribution Unit - Rear



④ On the UPS Unit verified by procedure ①, move the Forced Bypass switch to the INV position.

⑤ On any UPS Unit (which one does not matter), set the INV ON/STAND BY to INV ON by pressing for at least 1 second.



Caution

If any Forced Bypass switch is in the BYPASS position, switching to INV ON is not possible.

Therefore, if inverter operation cannot be activated, verify that the Forced Bypass switch on all UPS Units are in the INV position.

⑥ Replace the front panel and the MAINTENANCE BYPASS SW cover.

13. Special Functions

◆ 13.1 Battery Test

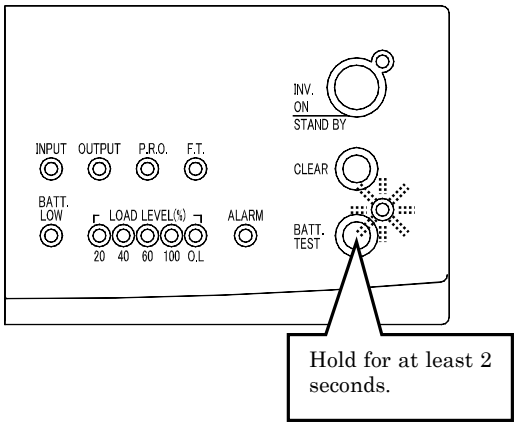
The battery backup time test checks whether the batteries are able to operate the existing load during a power outage. The test is performed without interrupting the load. We recommend that batteries be tested once every three months. The test should be performed after the batteries have been allowed to charge for at least 12 hours.
However, if the P.R.O. LED is off, the battery test cannot be performed.

① On any UPS Unit (which one does not matter), press BATT.TEST for at least two seconds.

UPS status

Beeper sound: Beep beep･･･beep beep･･･beep beep･･･
BATT.TEST (green) blinks

Battery operation for about two min.



All of the green BATT. TEST LEDs blink, as testing of all batteries starts at once

The test finishes after about two minutes, then normal operation resumes with results indicated by the LEDs on each UPS Unit.
However, if an abnormal UPS Unit is found, testing of the other UPS Unit(s) is aborted.

Battery Test Results

Indication	Backup confirmation time	Judgment
Lit	more than 2 min.	Batteries are normal.
Long blinking	less than 2 min.	Replace batteries soon.
Off	–	Battery test aborted.

② If necessary, press BATT.TEST to abort the battery test.
Normal operation resumes.

③ When finished the test and after verifying battery test results, press CLEAR on all UPS Units.
The LEDs turn off.

The battery test aborts if one of the following conditions occurs:

① Abnormal AC input (voltage, frequency)
② Fault
③ Bypass switch change
④ Output overload
⑤ INV ON/STAND BY is OFF.
⑥ When any UPS Unit is abnormal

Note
This test provides only rough information. Even if the test results indicate normal battery condition, please contact your service representative when the battery expiration date is near.

◆ 13.2 User Settings

The user can make the following settings with the front panel controls:

(1) PC Interface Selection (Stand-Alone or W/S Mode)
(2) Communications Baud Rate Selection (9600, 4800 or 2400 bps)
(3) Power Outage Beeper Setting (Beep/Silent)
(4) Frequency Sync Range Setting (1, 3 or 5%)
(5) Autostart after power recovery: Restart or Standby (Stop Output)
(6) Response time of INV ON/STAND BY button
(7) Ring Signal Start Setting (Enable/Disable)
(8) Battery Starting Frequency (50/60 Hz)

All settings are performed using the following procedure.

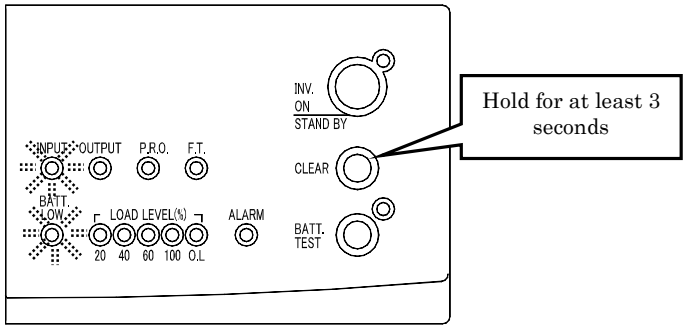
> Caution
> Front panel settings affect only the UPS Unit on which they are made (the other UPS Units are not affected). However, the same settings should be made on all UPS Units.

① During inverter or standby operation, press CLEAR for at least 3 seconds.

UPS status

"Beep beep‥‥" beeper sound
Setting mode

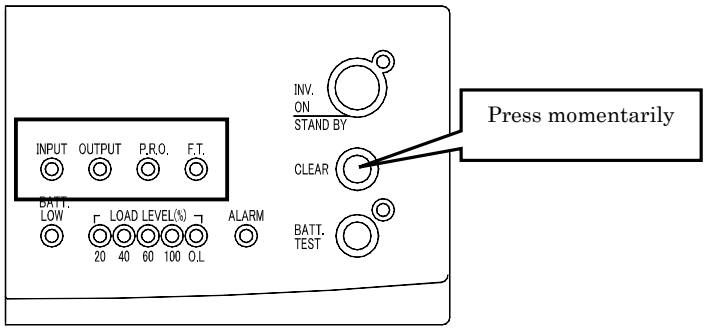
INPUT (green) blinking
BATT.LOW (red) blinking
(Status depends on settings)



② The blinking pattern of the upper four LEDs now indicates the item to be set (§13.2.1 to §13.2.8), selected by pressing CLEAR briefly (less than 3 seconds). The blinking position changes each time you press CLEAR, so press it as necessary to select the item to set.

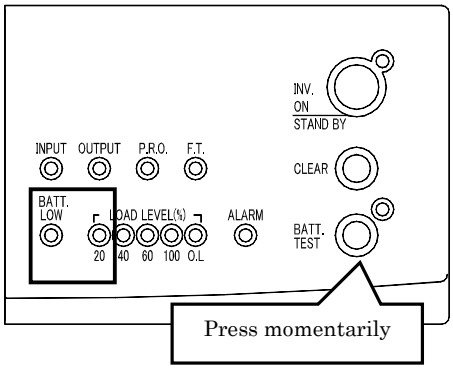
UPS status

The beeper sounds once at each press.
The pattern of blinking upper LEDs changes.



③ The blinking pattern of two of the lower LEDs indicates the current setting value (§13.2.1 to §13.2.8), selected by pressing BATT.TEST.
See the following pages for the specific indication corresponding to each setting value.
The blinking position changes each time you press BATT.TEST, so press it as necessary to select the desired setting value.

UPS status
The beeper sounds once at each press. The pattern of blinking lower LEDs changes.

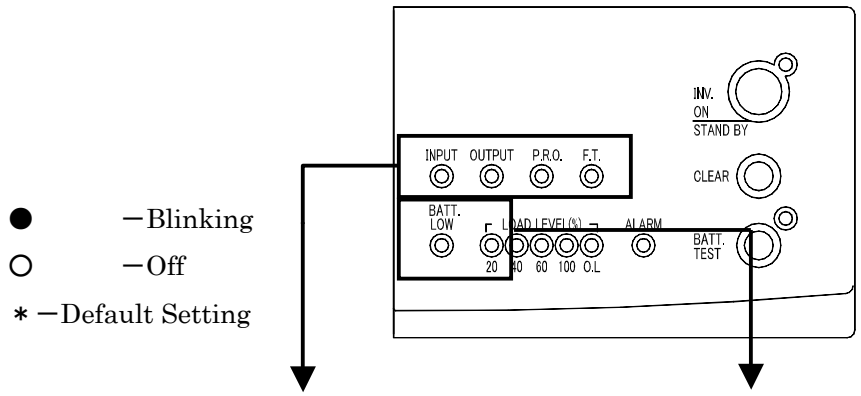


④ Press CLEAR for at least 3 seconds when finished making settings.
Two beeps sound, the setting status is memorized, and normal operation resumes.

Note
To reset all settings to their defaults (initial settings), press and hold CLEAR for more than 3 seconds after the beeper sounds in step 4 above.

◆ 13.2.1 PC Interface Selection

Selects the PC interface. Select the Stand-Alone mode to use the CARD I/F connector or a standard UPS service of a computer operating system, or select the W/S (Workstation) mode to use our optional power management software.



Setting item	Item LED indication	Setting value	Setting value LED indication
PC Interface setting	● ○ ○ ○	Stand-Alone*	● ○
		W/S	○ ●
		none	● ●

Caution

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

◆ 13.2.2 Communications Baud Rate Selection

Selects the communications baud rate for the PC interface.

Setting item	Item LED indication	Setting value	Setting value LED indication
Communications baud rate	○ ● ○ ○	9600*	● ○
		4800	○ ●
		2400	● ●

Caution

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

◆ 13.2.3 Power Outage Beeper Setting

Selects whether the beeper sounds during a power outage.

Setting item	Item LED indication	Setting value	Setting value LED indication
Power Outage beeper selection	● ● ○ ○	Beep*	● ○
		No beep	○ ●

◆ 13.2.4 Frequency Sync Range Selection

Set the range (%) of acceptable input frequency variation to be tracked by the output frequency. A smaller value provides better precision, but increases the likelihood of switching to battery power if the input frequency is unstable. Select a larger value if the UPS system is used with a device such as an EG (Engine Generator) that has wide frequency fluctuations.

Setting item	Item LED indication	Setting value	Setting value LED indication
Frequency tracking range	○ ○ ● ○	1%	● ○
		3%*	○ ●
		5%	● ●

Caution

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

◆ 13.2.5 Autostart After Power Recovery Setting

Set whether power output resumes automatically, or waits in standby with power output disabled, when power is restored after the UPS system has shut down during an outage under the following conditions:

① due to discharged batteries during backup operation

② while awaiting scheduled operation by the power management software

③ while awaiting the shut down function of the power management software.

Setting item	Item LED indication	Setting value	Setting value LED indication
Auto start after power outage	● ○ ● ○	Auto start*	● ○
		Stop Output	○ ●

◆ 13.2.6 INV ON/STAND BY Button Response Time Setting

Sets the response time of the INV ON/STAND BY button when the UPS Unit is set to the STANDBY state.

Setting item	Item LED indication	Setting value	Setting value LED indication
INV ON/STAND BY button response time	○ ● ● ○	1 second*	● ○
		3 seconds	○ ●

Caution

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

◆ 13.2.7 Ring Signal Start Setting

Sets Ring signal start capability. When a Ring signal is enabled, the PC can be started when the UPS system starts up.

Setting item	Item LED indication	Setting value	Setting value LED indication
Ring Signal Start	● ● ● ○	Enabled*	● ○
		Disabled	○ ●

Caution

This setting is effective only with PCs that support the Wake On Ring feature, and it must also be enabled in the settings on the PC.

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

◆ 13.2.8 Battery Starting Frequency Setting

Sets the AC output frequency when starting under battery power.

Setting item	Item LED indication	Setting value	Setting value LED indication
Battery starting frequency	○ ○ ○ ●	50 Hz*	● ○
		60 Hz	○ ●

Caution

After changing the setting, turn off the UNIT SW on Stand By operation for at least one minute to shut down the inverter, and then restart (changes do not take effect until after restarting).

14. Specifications

Item			Specifications/Characteristics				Remarks
Output capacity			2 kVA / 1.4 kW	3 kVA / 2.1 kW	4 kVA / 2.8 kW	5 kVA / 3.5 kW	Apparent Power / Effective Power
			1 kVA / 0.7 kW	2 kVA / 1.4 kW	3 kVA / 2.1 kW	4 kVA / 2.8 kW	Apparent Power / Effective Power (using N+1 configuration)
Cooling system			Forced-air cooling				
AC input	Number of phases/wires		Single-phase 2-wire				
	Voltage		208, 220, 230, 240 V within ±15%				Switch selectable (same as output voltage)
	Frequency		50 or 60 Hz ±1, ±3, ±5%				Tolerance is determined by output frequency accuracy setting (Note 1)
	Power consumption		1.8 kVA	2.8 kVA	3.6 kVA	4.5 kVA	Maximum consumption during battery recovery charging
	Input power factor		0.95 or more				At rated output (Note 2)
AC output	Number of phases		Single phase 2-wire				
	Voltage		208, 220, 230, 240 V				Switch selectable
	Voltage setting accuracy		Within ±5%				At rated load
	Frequency		50 or 60 Hz				Same as input frequency (automatic selection) (Note 3)
	Frequency accuracy		Rated frequency within ±3.0% (when synchoronized with commercial mains frequency)				1, 3, 5% (switch selectable) Internal oscillator accuracy ±0.5%
	Voltage waveform		Sine wave				
	Voltage waveform distortion		Linear load: 3% or less 100% rectifier load: within 8% or less				At rated output
	Transient voltage tolerance	Rapid load change	±10%				0 ⇔ 100% change or output change
		Power outage/recovery	±10%				At rated load
		Rapid voltage change on input	±10%				±10% change
	Response time		5 cycles or less				
	Load power factor		0.7 (lag)				Variation range 0.7 (lag) to 1.0
	Overcurrent protection function		Automatically switched to bypass circuit when more than 105%				Auto return function is provided
	Overload handling capacity	Inverter	105% or more				For 0.2 seconds
		Bypass	200%				For 30 seconds
			800%				For 2 cycles
Battery	Type		Small sealed lead-acid storage batteries				
	Rated capacity		7 Ah				20-hour rate
	Number of batteries		3 batteries (12V per battery)				Per UPS Unit
	Back-up time		700W for 5 minutes, 500W for 10 minutes				Ambient 25°C(77°F), at rated load
Ambient conditions			Ambient temperature: 0 to 40°C(32 to 104°F) Relative humidity: 30 to 90%				(Note 4)
Audible noise			40 dB or less	45 dB or less			1 m from the UPS front panel

Note 1. When AC input frequency is within ±3% (settable to ±1, 3 or 5%) of the rated frequency, and the AC input voltage is within ±15% of the rated voltage, inverter output is synchronized with the AC input. This makes possible switching of the power source without interruption. If the AC input frequency is outside of this range, battery operation is started.

Note 2. When voltage waveform distortion is less than 1%.

Note 3. When the basic frequency is changed (50 ⇔ 60 Hz), battery operation starts at once while the system synchronizes with the new frequency, then normal operation resumes. Also, if the basic frequency is changed during a power outage, the new frequency becomes effective after power is restored.

Note 4. Because the UPS includes batteries, do not operate it for long periods where the ambient temperature exceeds 30°C(86°F).

Note 5. If grounded, the ground phase of the input and output must match according to UPS specifications.

15. Warranty Conditions

The warranty period for this UPS is one full year after purchase. After one year, repair service is available at a charge, subject to the following conditions.

Free Warranty Conditions

1. If the product malfunctions under normal operating conditions as stated in this manual, repair is provided free of charge during the warranty period.

2. If the UPS breaks down, please contact your nearest sales representative.

3. The warranty coverage does not include the following conditions.

   (1) Defects or damages arising from improper repair, modification or wiring made by the customer.

   (2) Defects or damages arising from fire, earthquake, rain or water disaster, lightning or other natural disasters including pollution, salt disaster, gas disaster (chloride gas), unusual voltage or incorrect power sources other than those specified.

   (3) Defects or damages arising from improper handling, such as falling of the UPS during transportation or relocation by the customer after it has been delivered.

Appendix

Other Precautions

1. Operation when an Alarm Event Occurs

・Do not immediately press the INV.ON/STAND BY button when an alarm event occurs, as this could interrupt power to the load.
On the UPS Unit where the alarm event occurred, turn the UNIT SW OFF, and verify that all front panel LEDs are off before pressing the INV.ON/STAND BY button (at this time, the load should be in a state that will not result in a problem if the power is cut). UPS system output is shut off normally by this procedure. Afterwards, the UNIT SW on any other UPS Units can be turned OFF to completely shut down the UPS system.

・Refer to §12.1.2 to replace the faulty Unit.

・If the INV.ON/STAND BY button is pressed by mistake after an alarm event occurs, the UPS system does not shut down, but switches to the bypass circuit to continue supplying the load. However, from this state, it cannot switch back to the inverter output. In this case, turn the UNIT SW on each UPS Unit OFF to shut down the UPS system completely, then restart it.

2. Alarm at Startup

・If an alarm occurs when starting, before pressing the INV.ON/STAND BY switch, commercial power may be supplied through the bypass circuit. Do not attempt to change any wiring at the output side while the UNIT SW is ON.

3. Minor Faults in SANGUARD IV Lite

・If an increase in the load causes transition from N+1 to N operation, the F.T. LED turns OFF at the UPS system side, while “Minor Fault” is displayed in SANGUARD IV Lite. Be aware that this is not an actual fault.

4. Displaying Battery Test Results in SANGUARD IV Lite

・When battery test results are normal, “Normal” is displayed in SANGUARD IV Lite. Otherwise, “Undetermined” is displayed, which indicates either a battery abnormality or interruption of the test.

Front Panel Setting Checklist

For your convenience, use this checklist to record changes to settings, by placing checkmarks in the appropriate boxes.

Setting Item	LED Item Indication	Setting Value	LED Setting Indication
PC I/F Setting	●○○○	☐ Stand-Alone	●○
		☐ W/S	○●
		☐ None	●●
Communications Baud Rate	○●○○	☐ 9600	●○
		☐ 4800	○●
		☐ 2400	●●
Power Outage Beeper Selection	●●○○	☐ Beep	●○
		☐ No beep	○●
Frequency Tracking Range	○○●○	☐ 1%	●○
		☐ 3%	○●
		☐ 5%	●●
Auto Start After Power Recovery	●○●○	☐ Auto Start	●○
		☐ Stop Output	○●
INV ON/STAND BY Button Response Time	○●●○	☐ 1 Second	●○
		☐ 3 Seconds	○●
Ring Signal Start	●●●○	☐ Enabled	●○
		☐ Disabled	○●
Battery starting frequency	○○○●	☐ 50 Hz	●○
		☐ 60 Hz	○●