DC/AC Inverter Power Supply DA10SA0-100U Directions for use

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SANYO DENKI Co., Ltd.

DWG. No. M0005297B
(No. M0005238B-EG)

- M E M O -

INTRODUCTION

Thank you for purchasing our power system.
This document contains important safeguards for the user and the service technician.
In order to use the system correctly and effectively for a long period of time, please read this Directions for use carefully. Please keep the manual in an easily accessible place after reading it.

SAFETY PRECAUTIONS

Please read each of the Directions for use and other accompanying documents carefully before installation, operation, maintenance and inspection of the system, and confirm how to handle the equipment, safety information, and other important safeguards.
In this Directions for use, safety precautions are categorized into Warning and Caution.



WARNING: This indicates a possible risk of a dangerous situation in which loss of life or serious injury may occur as a result of mishandling.



CAUTION: This indicates a possible risk of a dangerous situation in which a minor to non-serious injury, or only property damage may occur as a result of mishandling.

However, the descriptions under 

(CAUTION) may pose a risk of causing a serious situation depending on a circumstance.
Both indications are very important, and please observe them strictly. Prohibited and mandatory actions are noted with the following symbols:


This indicates a prohibited action.


This indicates grounding is required. Make sure grounding is done properly.

1. Important Safeguards about Installation (See pages 7 and 12)

注意 CAUTION	Ref. pages
● Only professional technicians should perform installation. Improper installation may result in an electric shock, injury, and/or fire.	7,12
● Never operate or store the system in the following environment. Fire may occur as a result of failure of, damage to, and/or deterioration of the system. ■ Environment that is not specified in the catalogue and Directions for use. (Environment with high/low temperature, high humidity; i.e. the temperature is outside the range of 0 to 40°C, relative humidity outside the range of 30-90%). ■ Environment where the system may susceptible to direct heat from a heating device. ■ Environment where vibrations and shock may be applied. ■ Near a device which may cause sparks. ■ Environment with dust, salt, and/or corrosive gas. ■ Outdoor	12
● Do not obstruct exhaust and suction holes. ● Make sure there is at least 20-cm clearance between the wall and the system. ● Internal temperature may rise and fire may result when the exhaust and suction holes are obstructed.	7
● Provide ventilation around the device.	7,12
● Follow the manual and install the system in a location which withstands the system's weight (approx. 10kg). ● Improper installation may cause the system to topple over and injury may result. Make sure you protect your lower back when handling the system.	7,12

2. Important Safeguards about Wiring (See page 12～14)

注意 CAUTION	Ref. pages
● Only professional technicians should perform wiring. Improper wiring may result in an electric shock, injury, and/or fire.	12～14
● Only the cables specified for the system must be used for connection. The system requires Class D grounding. Failure to ground in accordance with the specified class may result in an electric shock.	12～14
● Grounding of the load connected at the system's output side must be connected to the output socket. Failure to connect the grounding of the load may result in an electric shock.	12～14

3. Important Safeguards about Operation (See pages 7 and 8)

 **危険** WARNING	Ref. pages
● Stop the system immediately when it fails and foreign odor/noise occur. Fire may result. ● Do not open the cover of the system. An electric shock may occur.	7,8

 **注意** CAUTION	Ref. pages
● Provide ventilation around the system. ● Check the safety of the load side before initializing the system, and follow the Directions for use when operating the system. Unnecessary power supply may cause an electric shock and/or accident.	7

 **禁止** Prohibited actions	Ref. pages
● Following uses/applications of the system are strictly prohibited: ■ Equipment such as medical devices which may directly affect human life. ■ Control device for such equipment such as trains and elevators, which has a risk of causing human injuries. ■ Computer systems which is socially and publicly critical. ■ Other similar devices. ● If a load applies to any of the above, consult the manufacturer in advance. Special consideration must be given to operation, maintenance and management of multiplexing of the system, an emergency generator unit, etc., when using an equipment that affects human safety and is critical to maintaining public functions. ● Do not smok or use fire near the system. Injury and/or fire may occur due to an explosion and/or damage. ● Do not place a container, such as a flower vase, that contains water on the system. Spiled water, when such a container topples over, may cause an electric shock and/or fire within the system. ● Do not sit on the system or climb on it and use it as a step.	–

4. Important Safeguards about Maintenance and Inspection (See page 22)

注意 CAUTION	Ref. page
● Only professional technicians should perform internal inspections and repairs. An electric shock, injury, burn, smoke, and/or fire may occur.	22
● When a repair of the system or a replacement of a part is necessary, please contact the store from which you purchased the system or a service company.	22
● Opening the cover of the system may result in an electric shock and/or burn.	22
● Do not insert a metal rod or a finger in the system's output outlet. An electric shock may result.	22

5. Important Safeguards about moving and transporting the system (See page 12)

注意 CAUTION	Ref. page
● Do not topple over or drop the system while moving/transporting it. Injury may occur. ● Protect your lower back when handling the system.	12

6. Other Important Safeguards (See the appendix)

注意 CAUTION	Ref. pages
● Please consult for use outside Japan. Using a product specified for use in Japan abroad may cause smoke and/or fire due to different voltages and usage environment. ● This system must be disposed of as a industrial-waste.	Appendix

Warranty

The system carry one-year limited warranty from the date of purchase, and during the warranty period, repairs are provided at no charge according to the terms described below. Repairs are provided at cost after the warranty period expires.

Warranty service at no charge

1 During the warranty period, repairs are provided for failure caused by normal use in accordance with Directions for use.

2 In case of a failure, contact the store from which you purchased the system, or our headquarters or branch offices (see Appendix).

3 Repairs for the following problems are provided at cost even during the warranty period:

(1) Failure or damage caused by mishandling, inappropriate repair attempt or modification, incorrect connection.

(2) Failure or damage caused by natural disaster such as fire, earthquake, wind and flood, lightning, as well as environmental pollution, seawater, gas such as sulfide gas, abnormal voltage and use of power supply at other voltage than specified for the system.

(3) Failure or damage caused by mishandling and/or dropping of the system during transport and moving after the purchase.

Before using the system

Please check the contents of the package upon unpacking. Contact the store or our sales office if you find any problems.

Contents:

(1) A rack-mount DC/AC Inverter Power Supply System (DA10SA0-100U).

(2) Installation manual (This manual)

(3) Installation manual (Japanese manual)

(4) Special cable for AC input terminal 「MAIN」

Note：Neither the screw nor the support angle for fixation in the rack mount are appended to this device.

1 FOR SAFE OPERATION

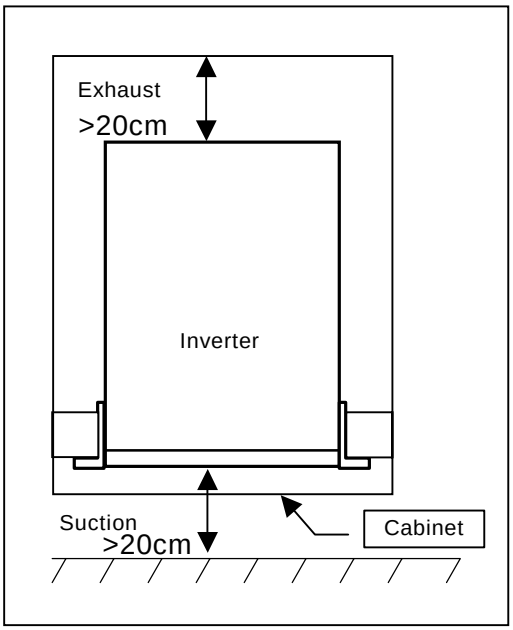
1.1 Input power supply

(1) This equipment is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor at the equipment.

(2) AC input power must match the system's ratings(100-120V, 50/60Hz±5%).

(3) Input power capacity must be the system's capacity requirement of 1kVA or more.

1.2 Installation



(1) Installation must be in accordance with the National Electric Code, Articles 110-16, 110-17 and 110-18.

(2) This DC/AC power supply is to be installed into the lockable rack, considered as restricted access location and used for IT equipment under IEC 60 950.
Please refuse the touch people except the service member.

(3) Please install the protective device of ratings DC60V, 30-40A before the DC input of this device.

(4) Please install the protective device of ratings AC250V, 15-20A before the AC input of this device.

(5) Please be cautious when installing an earth leakage breaker on the AC mains side. The system's leakage current is approximately 3mA.

(6) There is a slight leakage flux. Please keep a distance between the system and magnetic flux sensitive devices. Especially the CRT display must be at least 1m away from the device. The inverter is forced-air cooled by a cooling fan. Allow at least 20cm clearance both on the front and back of the inverter for exhaust and suction.

(7) About the selection of the DC fuse when the installation is confirmed.
Rush current of approx. 20A flows in this device between about 150msec when the DC input is received. Please select the fuse that this current can be endured.

1.3 Safety Caution on Usage

(1) Avoid a short circuit or connecting a load with short circuit current on the output circuit. The circuit will be disconnected by an input circuit breaker and the output power will Note be supplied.

(2) Do not connect equipment such as a laser printer, a plain-paper facsimile, a copier, an OHP, a drill, and a cleaner. These devices will cause over-current due to over heating and connected devices may not work properly.

(3) When conducting an insulation test for indoor wiring, first disconnect the inverter by removing the mains input connector (for commercial AC mains), and disconnect the input/output wiring. Testing without disconnecting the wiring may cause damage to electronic components, such as an internal arrestor.

(4) This inverter is for rack-mounted use only. Please consult our sales office or your distributor when the device needs to be removed from the rack.

(5) Please use the support angle to support the mass of the device (approx. 10kg) when this device is stored in the rack.

(6) Circuit Breaker "MAIN" protects two poles of the AC circuit.
Please note that the voltage remains in the outlet at a while at the circuit of open.

1.4 In Case of Failure

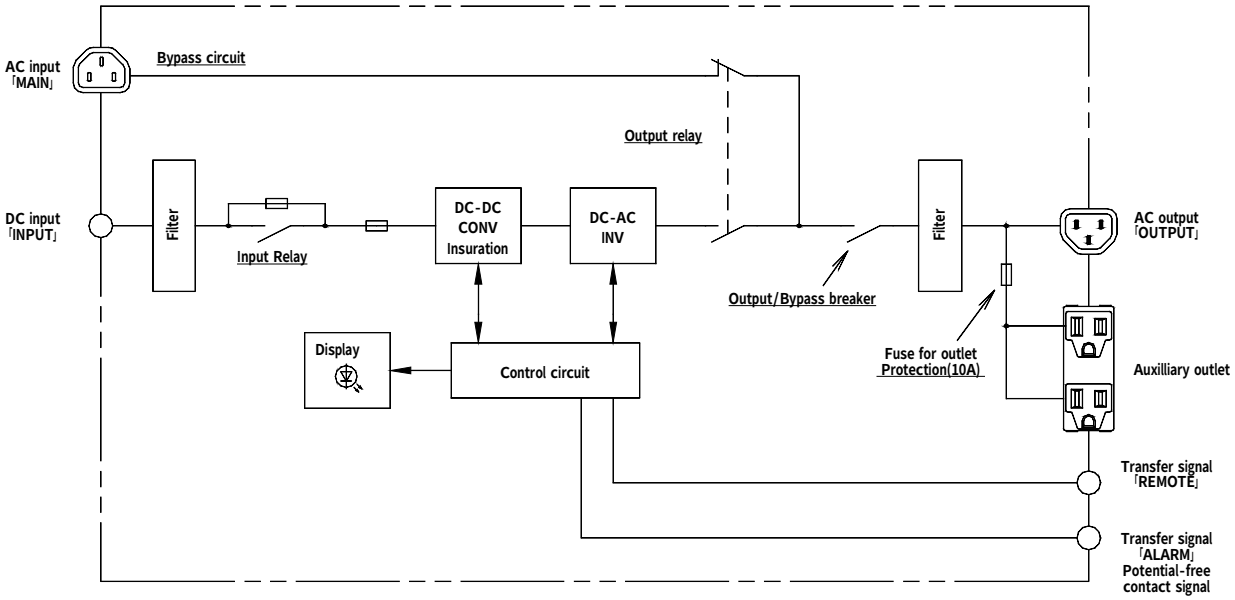
Please contact our sales office or your distributor when:

i. ”POWER” in green is not lit on the display (on the front of the device).
ii. ”ALARM” in red is lit.
iii. Other abnormalities (forgign odor, abnormal sound, etc.) occur.

Please see 7.1.4 In Case of Failure (p.20).

2 OVERVIEW

This device is a DC/AC inverter power supply system to provide a high-quality, stable AC power. This system combines a converter, an inverter and a commercial bypass circuit.
In normal operation, DC input is converted to AC power and supplied to the load.
In case of DC input failure, the commercial bypass circuit provides AC power to the output.



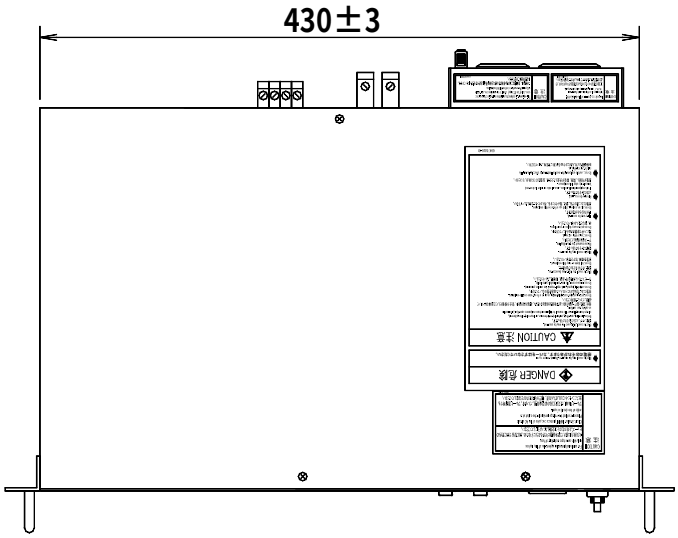
CIRCUIT DIAGRAM

3 DIMENSIONS AND PARTS

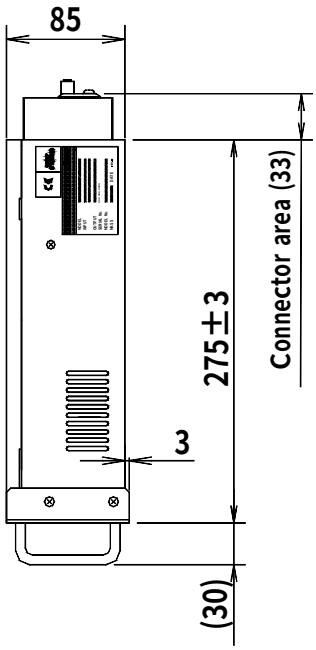
1kVA DC/AC Inverter Power Supply

88 x 480 x 310 (H x W x D) mm
Weight: Approx. 10 kg

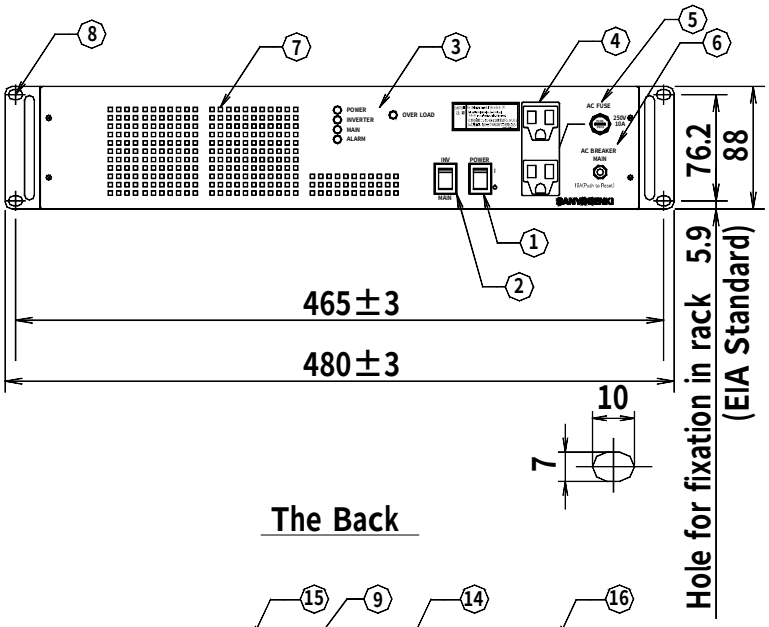
The Upper



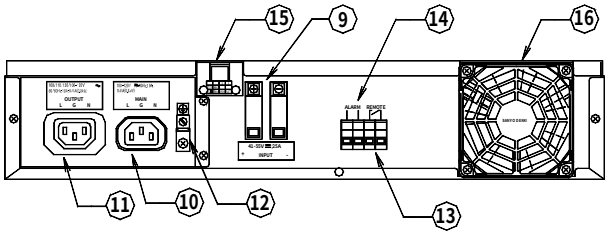
The Side



The Front



The Back



No.	Name	Indication		Function
1	Start-up switch	POWER | ／ ⏻		Turns on the system
2	INV/MAIN switch	INV/MAIN		Manually switches inverter operation and commercial bypass operation
3	LED display	POWER INVERTER MAIN ALARM OVER LOAD		Lit when: – output power is on – operated by the inverter – operated by the commercial bypass – a failure occured – the system is overloaded
4	Auxiliary outlets	–		Reserve outlets (two) Note: Must not exceed 1kVA including the output on the rear of the device.
5	Fuse for aux. outlet protection	AC FUSE		Fuse for aux. outlet protection (10A)
6	AC breaker	AC BREAKER MAIN		Protects commercial circuit and output circuit (15A)
7	Suction holes	–		For cooling
8	Mounting section	–		Screw holes (four) to fix the device on the rack; handles
9	DC input	INPUT (+, -)		Terminal block for DC48V input
10	AC input	MAIN		Socket for commercial bypass supply
11	AC output	OUTPUT		Socket for output power
12	Earth terminal	⏚		
13	Remote terminal	REMOTE		ON-OFF control Attention!：Do not impress the voltage to this terminal.
14	External transfer signal's terminal	ALARM		Potential-free contact signal
15	Frequency and Output Voltage switch Note1,2	1	50⇔<u>60Hz</u>	Sets frequency of AC output Note:Factory setting is 60Hz
		2	110V	Sets 110V of AC output
		3	<u>120V</u>	Sets 120V of AC output Note:This is factory setting
16	Exhaust holes and cooling fan	–		Holes for exhaust and a fan for cooling

Note1： If both of switches of No2 and No3 are turned "ON" (or "OFF"), the output becomes AC100V.

Note2： Please change in setting after intercepting the DC power supply.

4 TRANSPORT, INSTALLATION AND WIRING

4.1 Environment

(1) Ambient temperature may Not exceed 40°C.

Ventilation and cooling must be provided to the area where the system is installed to maintain the temperature at lower than 40°C in order to prevent a failure.

 注意 CAUTION Risk of failure and/or injury	● Do not use the system in an environment with high humidity, corrosive gas, or a large amount of dust. Failure may occur. ● Avoid installing in an environment prone to vibration and shock. Failure and/or injury may result.

4.2 Transport and installation (Service must be provided by professionals)

(1) Transport and delivery of the system must be handled by professionals.

(2) The system must remain packed during transport and delivery.

(3) Unpack the system near the installation site.

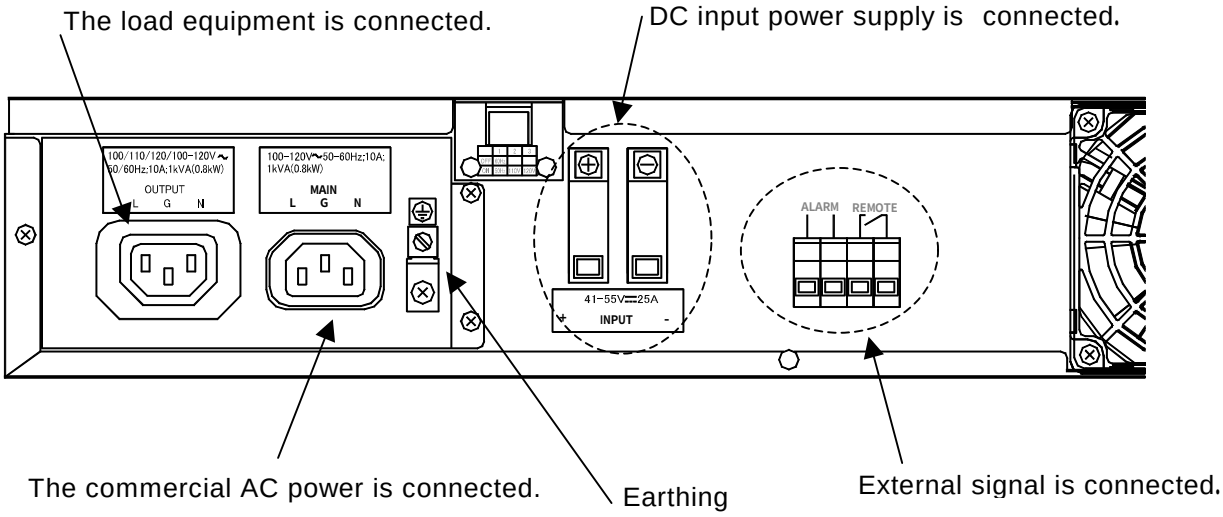
 注意 CAUTION Risk of failure and/or injury	● Install the system on a level surface to avoid injuries caused by the system's toppling over and falling. ● The system may topple over during transport and installation. Secure the system to prevent failures and injuries.

4.3 Wiring

External input/output wiring is connected at the DC input terminal,AC input socket,AC output socket, and external signal terminals.

 注意 CAUTION Risk of failure and/or injury	● Wiring must be handled by professionals. Incorrect wiring may result in an electric shock and/or fire. ● Connections to the input socket, output socket, and external signal connector must use the cables specified for the system. Cables must not have any slack. Failure and/or injury may result. ● The system requires grounding to protect against an electric shock. Failure to ground in accordance with the specified grounding may result in an electric shock. ● Grounding of the load connected at the system's output side must be connected to the output socket. Failure to connect the grounding of the load may result in an electric shock. 

4.3.1Layout of terminal block and connector



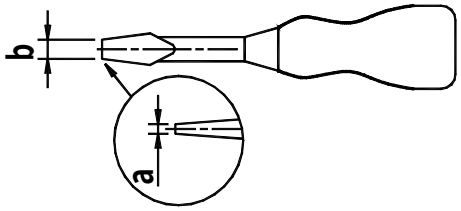
About recommended wiring

Name of terminal	Recommended electric wire size	Size to take off coating of electric wire	Tightening torque of terminal	Size of recommended tool a×b (Note 3)
INPUT	AWG12～4	16mm	2～2.3Nm	1.0×4.0mm
Earth	AWG14～6	10mm	-	1.0×4.0mm
MAIN	Attached cable (Note 1)	-	-	-
OUTPUT	Cable for outlet on the market (Note 2)	-	-	-
ALARM and REMOTE	AWG22～10	9mm	0.6～0.8Nm	0.6×3.5mm

Note 1. The length of the cable for commercial AC power connector "MAIN" attached to this device is about 3m.
Please select the cable, which suits this connector (Echo electronics co ltd AC-F01FB01) when the cable is prepared for the customer.

Note 2. Please buy and wire for the cable which suits AC output connector "OUTPUT" (Echo electronics co ltd AC-P03CS05)

Note 3. Size of recommended tool



4.3.2 Input and output

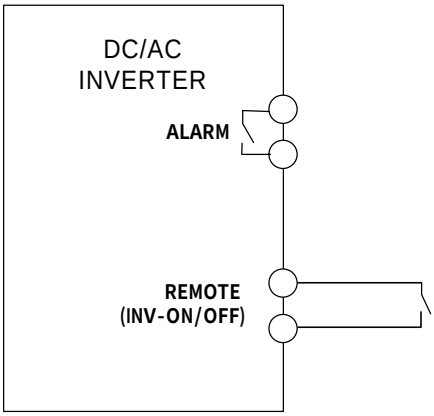
(1) Make sure the input connectors (INPUT for DC; MAIN for AC) are securely connected.

Note: MAIN needs not be connected when not in use. No switching to the commercial bypass circuit is available in this case.

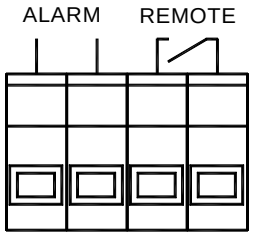
(2) Make sure the system's output socket and the input plug of the load are securely connected.

(3) Please connect the earth terminal of the device with the earth terminal of the rack with the electric wire.

4.3.3 External transfer signal (potential-free contact signal)、Remote signal



Pin layout (back of the device)



Name	Definition
ALARM	ALARM-Terminal is forms the open circuit when in normal operation. This terminal forms looped when failure occurs. The contact capacity of the terminal ALARM is DC60V/0.1A.
REMOTE	The terminal REMOTE can stop the INV output if continuously short-circuited. (The current flows by about 10mA) Condition：The DC input is normal, and for the INV mode Attention! Please do not impress the voltage to this terminal.

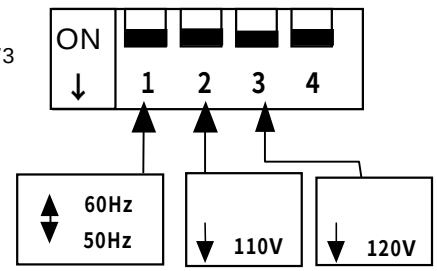
5 BEFORE USING THE SYSTEM

(1) Check the following before operating the system:

ITEM	Description		
Input power	This system is for DC48V and commercial power AC100-120V; 50/60Hz.		
Visual inspection	Make sure no visible damage or distortion.		
Device	1	Start-up switch	Make sure it is OFF.
	2	INV/MAIN	Makes sure it is INV.
	3	SW1: 50/60Hz Selection switch	Set to the commercial frequency you are using. Note: Factory setting is 60Hz.
		SW2: 110V Selection switch	Set to the output voltage you are using.
		SW3: 120V Selection switch	Set to the output voltage you are using. Note: This is factory setting.

If both of switches of No2 and No3 are turned “ON” (or “OFF”), the output becomes AC100V.

SW1-SW3



6 OPERATIONAL PROCEDURES

(1) Initial operation

	Procedure	Status	LED indication on the system
1	Connect DC input(INPUT) Terminal block.	Inverter is not in operation.	All off.
2	Connect AC input (MAIN).	Same as above.	Same as above
3	Turn on the Start-up switch (POWER).	Inverter starts operation. Cooling fan starts operation.	POWER (green) is lit. INVERTER (green) is lit.

Note: When AC input is supplied without DC power supply, shortage of DC input is detected and the commercial AC power is supplied to the output via the bypass circuit from the mains. In this case, do the decrease in lights of LED indication.

Attention! There is no protection against the reverse-connection of the DC input.

(2) Shutting down supply to the output

	Procedure	Status	LED indication on the system
1	Turn off the Start-up switch (POWER).	Output and cooling fan shut down.	POWER (green) turns off. INVERTER (green) turns off.
2	Unplug AC input connector (MAIN)*****.	Same as above.	Same as above.
3	Turn off DC breaker for this device. (Switchboard)	Same as above.	Same as above.

***WARNING:** The DC breaker is turned off before disconnecting the MAIN connector, shortage of DC input is detected and the commercial AC power is supplied to the output via the bypass circuit from the mains.

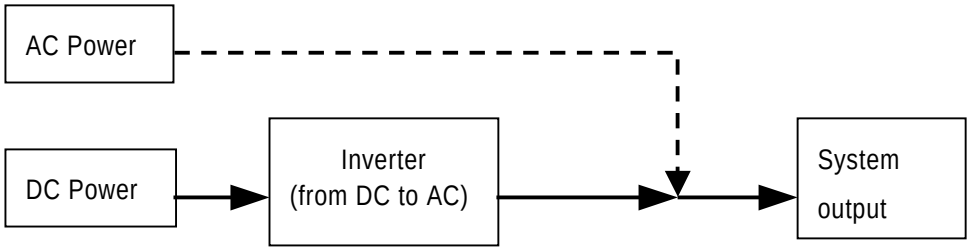
Note: Please turn off the breaker of the switchboard for safety when you stop the device for a long term.

7 OPERATION AND PROTECTION

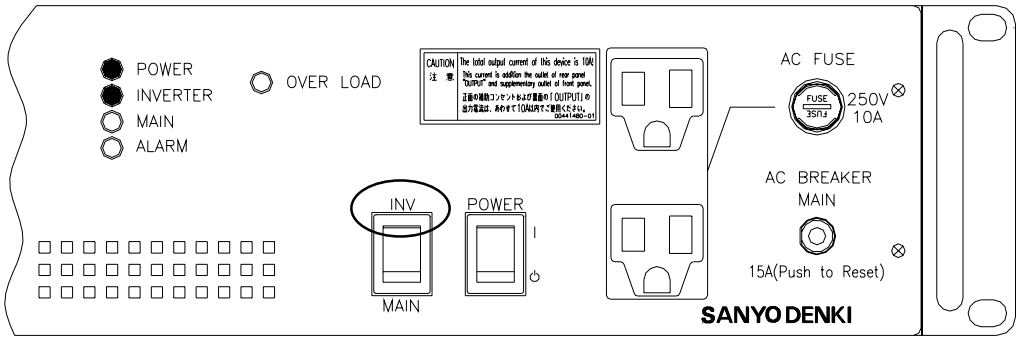
7.1 Basic Operation

7.1.1 Normal operation

In normal operation, DC power is supplied, inverted to AC power, and sent to the output.



Power supply in normal operation



● Lit
○ Not lit

Display in normal operation

7.1.2 Change operation of output mode (inverter power ⇔commercial by-pass power)

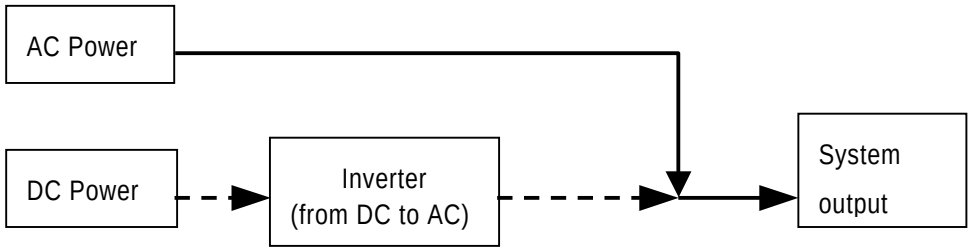
(1) Manual switch to change operation

The mode of the output voltage can be changed by operating switch INV/MAIN <In front of the INVERTER>.

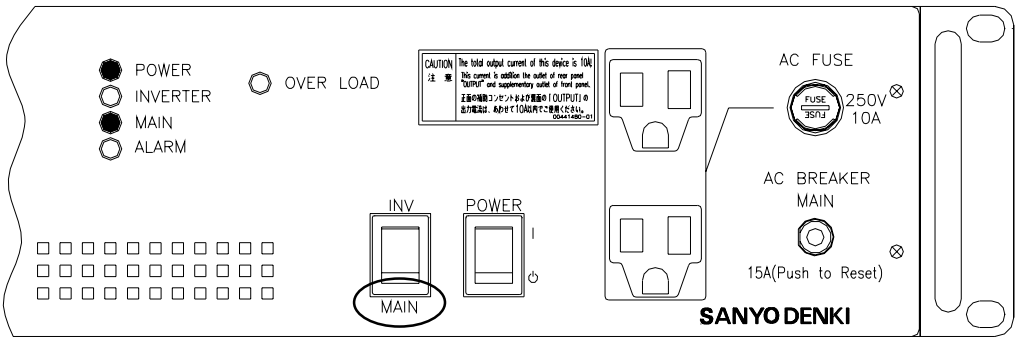
[INV]…Inverter output （POWER and INVERTER is lit in green.）

[MAIN]…commercial bypass output （POWER and MAIN is lit in green.）

When the mode of the output is changed with the switch, shuts down for approx. 20msec.



Power supply in manually switched commercial operation



Display in manually switched commercial operation

(2) Automatic switch to change operation
The shutdown time of the output voltage is different whether DC power failure and commercial by-pass power (MAIN) failure.

In case of DC power failure, the inverter automatically shuts down and the commercial by-pass power supplies the load.
(Output voltage shuts down for approx.25msec. POWER and MAIN is lit in green.)

Note: The output voltage automatically changes into the inverter power if the DC power supplies returns normally.
(Output voltage shuts down for approx. 1.5sec, and, next, the inverter power supplies the output voltage to the load) ＜By soft-start mode＞

About the method of shortening time that the output shuts down!
However, there is a method of shortening the shutdown time to approx.20ms.
＜Procedure ＞

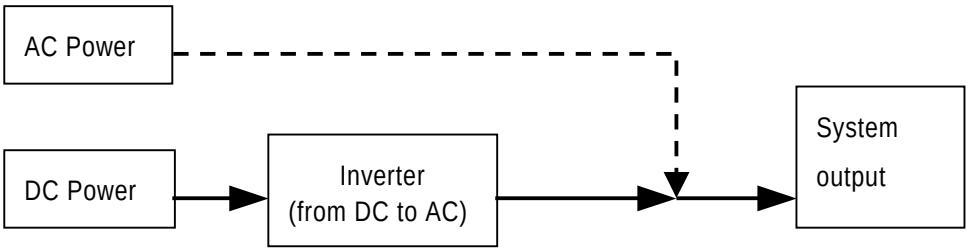
1. DC power failure. →The device is automatically switched to the commercial by-pass power.
2. Changeover switch ”INV/MAIN” is operated on the ‘MAIN' side.
→The device keeps supplying the commercial by-pass power to the load.
3. DC POWER returns normally.
→The device still keeps supplying the commercial by-pass power to the load.
4. Changeover switch ”INV/MAIN” is operated on the ‘INV' side.
→In this case, the output voltage supplied to the load is switched to the inverter feed at the time of 20ms.

In case of commercial AC power failure, the inverter automatically shuts down and the inverter power supplies the load
(Output voltage shuts down for approx.100msec. POWER and INV turns on in green.)

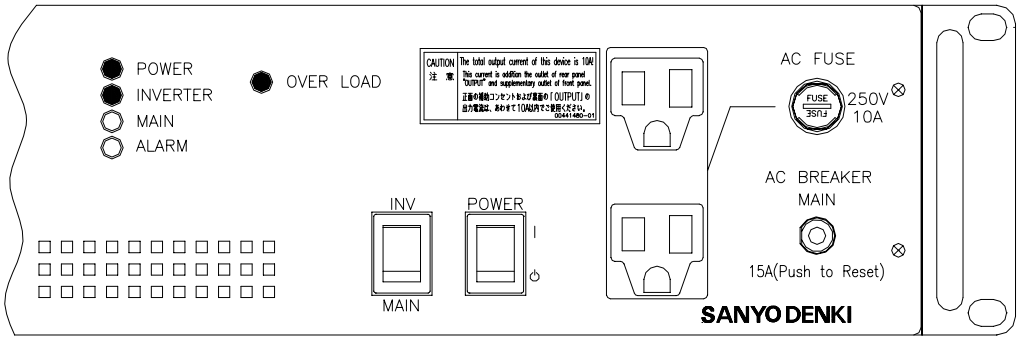
Note: The output voltage automatically changes into the commercial by-pass power if the commercial by-pass power supplies returns normally.
(Output voltage shuts down for approx. 25msec)

7.1.3 Overload

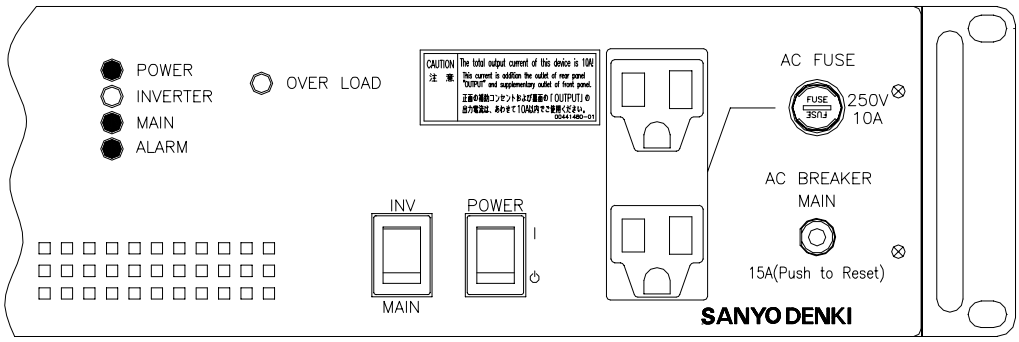
In case of overload in which the system's capacity is exceeded, OVER LOAD (In red) turns on. For safe operation of the system, please reduce the amount of load you are using. If the system continues to be overloaded, its protective function activates a drooping circuit, and the output power may be shut down due to the decreased output voltage.



The system is overloaded



The system continues to be overloaded.



Display when the system is overloaded

After the INV power is shut downed, the AC power of MAIN supplies the load when the MAIN connector is connected.

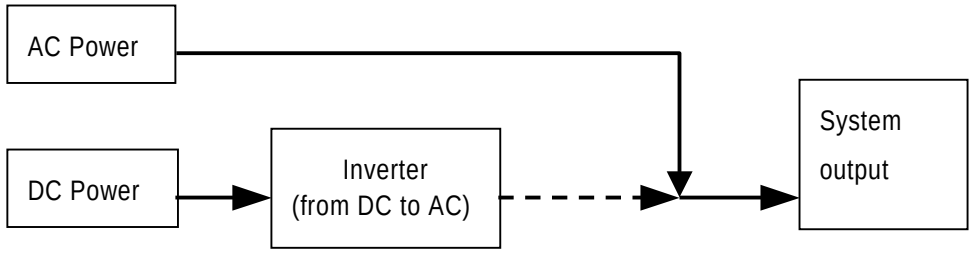
At this time, if the state of the overload continues, the AC breaker intercepts the output.

In this case, please turn off the power switch after reducing the load and turn on this switch again. The inverter drive can be restarted.

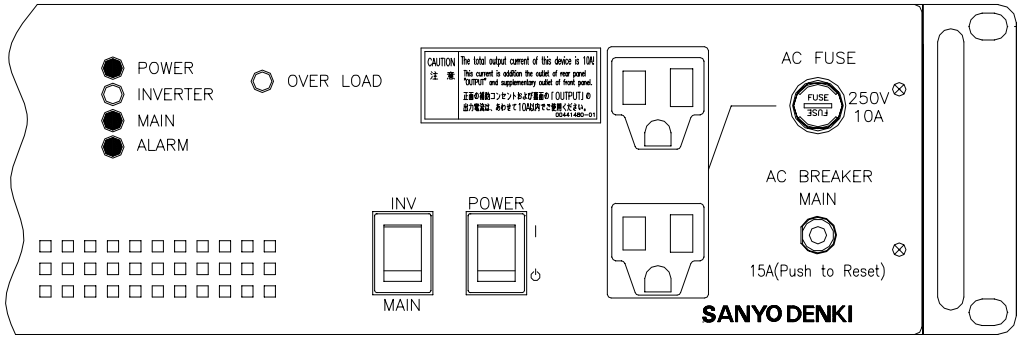
7.1.4. System failure

In case of a system failure, ALARM (in red) turns on.

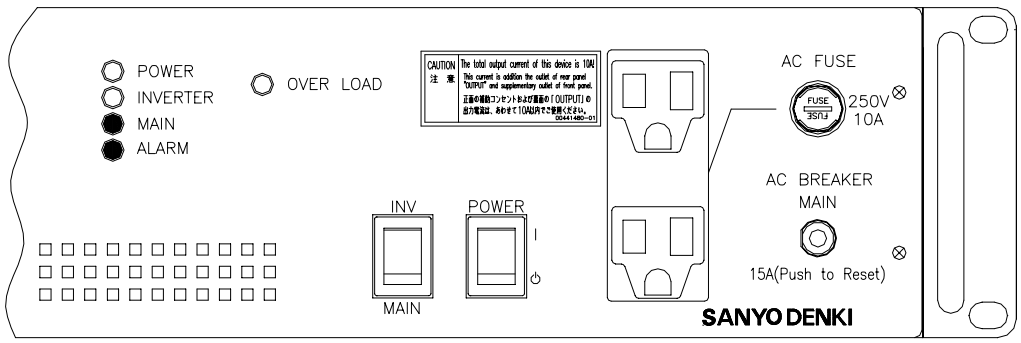
The system automatically switches to the mains and outputs power if the commercial power is in normal operation (with an interruption of approximately 20msec). The output is shut down if the commercial power is not available, or the voltage is too low.



Power supply in case of system failure



Display in case of system failure (with normal commercial power)



Display in case of system failure (with no commercial power, or under-voltage)

Note: When a failure occurs, please contact your maintenance personnel or our sales.

7.2 Functions and protections

This system is provided with the following functions and protections. "○" shows the indication is lit or transfer signal is sent.

Description		Indication on the front panel					Transfer signal	Function Protection	Remarks
		POWER (Green)	INVERTER (Green)	MAIN (Green)	ALARM (Red)	OVER LOAD (Red)	ALARM		
00	Incoming supply	–	–	–	–	–	–	–	–
01	Normal	○	○		–	–	–	Supplied by inverter.	With Start-up switch Incoming -> Start -> Supplied by inverter
02	Manual switch to MAIN (Front)	○	–	○ Note 1	–	–	–	Inverter stands by. Switched to the mains	Note 1 Cannot be switched when the mains input is not available.
03	System failure	○	–	○ Note 2	○	–	○	Inverter stopped. Supplied by the mains	Note 2 Applicable when the mains input is normal.
04	Overload (State 1) (Over approx. 11A)	○	○	–	–	○	–	Drooping function on inverter circuit activated.	
05	Overload (State 2) (Continuance the drooping function)	–	–	○ Note 3	○ Note 3	–	○ Note 3	Same as above.	Note 3 Alarm is sent by detection of shortage of output voltage when a serious overload occurs.
06	Abnormal DC input Mains input is normal	○	–	○	–	–	–	Control circuit stopped. Inverter circuit stopped.	There is no indication, but the mains input supplies power via commercial bypass operation.

8 MAINTENANCE AND INSPECTION

The system does not require special daily care; however, some of the components need to be replaced over a period of years. Please follow the procedures below.

8.1 Daily inspection.

Make sure all the indications are in the proper status.

Dust on the internal components may cause a failure. Make sure the system is in a clean environment.

8.2 Regular inspection (by professionals)

Have a professional maintenance personnel perform the following approximately every 6 month.

 注意 CAUTION Risk of failure Risk of injury	● Only professional personnel shall perform internal maintenance and inspection of the system. An electric shock, injury, burn, smoking, and/or fire may result. ● Inspection shall be performed after the system is completely stopped and shut down. An electric shock may occur.

9 STANDARD SPECIFICATION

Description			Unit	Rating/Characteristic	Comments
Rating	Model			DA10SA0-100U	
	Rating			Continuous	
	Cooling			Forced air	
DC input	Rated voltage		V	48	
	Voltage range		V	41 to 55	
	Max. input current		A	25	at rated output
	Feedback noise		mV	2	psophometric value (Liner load)
AC output	Rated capacity		kVA(kW)	1 (0.8)	apparent power (active power)
	Number of phases			single, 2-line	
	Rated voltage		V	100/110/120	sinusoidal output
	Voltage setting accuracy		%	<+/-3	
	Rated frequency		Hz	50/60	manual switching (by setting SW)
	Frequency accuracy		%	<+/-1.0	
	Waveform distortion	Linear load	%	<5	at rated operation
		Rectifier load	%	<10	at rated operation
	Transient voltage variation		%	<+/-10	0-100% load change
	Load power factor			0.8 (delay)	range 0.6 (delay) to 1.0
	Over-current protection		%	>105	
EMI/EMC				FCC part15 subB ClassA	EN55011:1998+A1:1999 Group1 classA、EN61000-6-2:1999
Noise			dB	<40	at 1m from the unit front; A-characteristic
Safety			UL,c-UL	UL1950	E203489

Appendix (a list of Sanyo Denki's Headquarters and branch offices) omitted.