1 Connection for Standard Use

2 Wiring Input/Output Pin

2.1 Wiring input pin

2.2 Wiring output pin

3 Function

3.1 Overcurrent protection

3.2 Overvoltage protection

3.3 Thermal detection/Thermal protection

3.4 Inverter operation monitor

3.5 Remote ON/OFF

3.6 Remote sensing

3.7 Adjustable voltage range

3.8 Isolation

4 Series and Parallel Operation

4.1 Series operation

4.2 Parallel operation/Master-slave operation

4.3 N+1 redundant operation

5 Cleaning
1 Connection for Standard Use

In order to use the power supply, it is necessary to wire as shown in Fig.1.1 and external components in table 1.1.

Short the following pins to turn on the power supply.
- VIN RC1, +VOUT +S, -VOUT -S

The DBS Series handles only the DC input. Avoid applying AC input directly. It will damage the power supply.

Operate with the conduction cooling (e.g., heat radiation from the aluminum base plate to the attached heat sink).

Reference: "Derating"

Fig.1.1 Connection for standard use

Table 1.1 External components

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Component</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F1</td>
<td>Input fuse</td>
<td>2.1 (1) &quot;External fuse&quot;</td>
</tr>
<tr>
<td>2</td>
<td>C_Y</td>
<td>Primary decoupling capacitor</td>
<td>2.1 (2) &quot;Noise filter/Decoupling capacitor&quot;</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Noise filter</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cin</td>
<td>External capacitor on the input side</td>
<td>2.1 (3) &quot;External capacitor on the input side&quot;</td>
</tr>
<tr>
<td>5</td>
<td>Co</td>
<td>External capacitor on the output side</td>
<td>2.2 &quot;Wiring output pin&quot;</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Heatsink</td>
<td>&quot;Derating&quot;</td>
</tr>
</tbody>
</table>

2 Wiring Input/Output Pin

2.1 Wiring input pin

(1) External fuse

Fuse is not built-in on input side. In order to protect the unit, install the normal blow type fuse on input side.

When the input voltage from a front end unit is supplied to multiple units, install the normal blow type fuse in each unit.

Table 2.1 Recommended fuse (Normal-blow type)

<table>
<thead>
<tr>
<th>Model</th>
<th>DBS100A / 150A</th>
<th>DBS200B</th>
<th>DBS400B</th>
<th>DBS700B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current</td>
<td>5A</td>
<td>3A</td>
<td>5A</td>
<td>10A</td>
</tr>
</tbody>
</table>

(2) Noise filter/Decoupling capacitor

Install an external noise filter and a decoupling capacitor C_Y for low line-noise and for stable operation of the power supply.

Install a correspondence filter, if a noise standard meeting is required or if the surge voltage may be applied to the unit.

Install a primary decoupling capacitor C_Y, with more than 470pF, near the input pins (within 50mm from the pins).

When the total capacitance of the primary decoupling capacitor is more than 8800pF, the nominal value in the specification may not be met by the Hi-Pot test between input and output. In this case, it is that a capacitor should be installed between output and FG.

(3) External capacitor on the input side

Install an external capacitor Cin between +VIN and -VIN input pins for low line-noise and for stable operation of the power supply.

Table 2.1 Recommended fuse (Normal-blow type)

<table>
<thead>
<tr>
<th>Model</th>
<th>DBS100A / 150A</th>
<th>DBS200B</th>
<th>DBS400B</th>
<th>DBS700B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current</td>
<td>5A</td>
<td>3A</td>
<td>5A</td>
<td>10A</td>
</tr>
</tbody>
</table>

(4) Input voltage range/Input current range

The specification of input ripple voltage is shown as below.

Ripple voltage DBS100A / 150A: less than 10Vp-p

DBS200B / 400B / 700B: less than 20Vp-p

Make sure that the voltage fluctuation, including the ripple voltage, will not exceed the input voltage range.

Use a front end unit with enough power, considering the start-up current Ip of this unit.
(5) Operation with AC input
The DBS series handles only for the DC input. A front end unit (AC/DC unit) is required when the DBS series is operated with AC input.

(6) Reverse input voltage protection
Avoid the reverse polarity input voltage. It will break the power supply.
It is possible to protect the unit from the reverse input voltage by installing an external diode.

2.2 Wiring output pin
Install an external capacitor Co between +VOUT and -VOUT pins for stable operation of the power supply.
Recommended capacitance of Co is shown in Table 2.2.
Select the high frequency type capacitor. Output ripple and startup waveform may be influenced by ESR · ESL of the capacitor and the wiring impedance.
Install a capacitor Co near the output pins (within 100mm from the pins).

2.2 Wiring output pin

<table>
<thead>
<tr>
<th>Model</th>
<th>DBS100A</th>
<th>DBS150A</th>
<th>DBS200B</th>
<th>DBS400B</th>
<th>DBS700B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage (V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>—</td>
<td>2200</td>
<td>6800</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>2200</td>
<td>2200</td>
<td>4700</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>7.5</td>
<td>—</td>
<td>2200</td>
<td>4700</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>1000</td>
<td>1000</td>
<td>2200</td>
<td>2200</td>
<td>—</td>
</tr>
<tr>
<td>13.8</td>
<td>1000</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>15</td>
<td>1000</td>
<td>—</td>
<td>2200</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>18</td>
<td>—</td>
<td>—</td>
<td>2200</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>24</td>
<td>470</td>
<td>—</td>
<td>820</td>
<td>2200</td>
<td>—</td>
</tr>
<tr>
<td>28</td>
<td>—</td>
<td>—</td>
<td>820</td>
<td>2200</td>
<td>—</td>
</tr>
<tr>
<td>36</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>2200</td>
<td>—</td>
</tr>
<tr>
<td>48</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1000</td>
<td>—</td>
</tr>
</tbody>
</table>

* When using power supply at -20°C or less, the recommended capacitance becomes 3 times.

The specified ripple and ripple noise are measured by the method introduced in Fig.2.5.

3 Function

3.1 Overcurrent protection
Overcurrent protection is built-in and comes into effect over 105% of the rated current.
Overcurrent protection prevents the unit from short circuit and overcurrent condition. The unit automatically recovers when the fault condition is cleared.
When the output voltage drops at overcurrent, the average output current is reduced by hiccup operation of power supply.

3.2 Overvoltage protection
- The overvoltage protection circuit is built-in. The DC input should be shut down if overvoltage protection is in operation. The minimum interval of DC recycling for recovery is for 2 to 3 minutes.
- The recovery time varies depending on input voltage and input capacity.

3.3 Thermal detection/Thermal protection
- Thermal detection(TMP) and protection circuit are built-in.
- When overheat is detected, thermal detection signal(TMP) turns "L" from "H". TMP circuit is designed as shown in Fig.3.1, and specification is shown as in Table 3.1.
- When overheating continues after detecting the TMP signal, the output will be shut down by the thermal protection circuit.
- When this function comes into effect, input voltage should be shut off, and eliminate all possible causes of overheat condition and lower the temperature of the unit to the normal level.

3.4 Inverter operation monitor
- By using the inverter operation monitor(IOG), malfunction of the inverter can be monitored.
- When inverter operation is in following mode: 1. Malfunction of inverter.
- 2. The output voltage drops by 60% or less of the rated voltage.
- 3. When output wattage is decreased radically to less than 10% of rated wattage.

### Table 3.1 Specification of TMP, IOG

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>TMP</th>
<th>IOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Function</td>
<td>Normal operation &quot;H&quot;</td>
<td>Normal operation &quot;L&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overheat detection &quot;L&quot;</td>
<td>Malfunction of inverter &quot;H&quot;</td>
</tr>
<tr>
<td>2</td>
<td>Base pin</td>
<td>-S</td>
<td>-S</td>
</tr>
<tr>
<td>3</td>
<td>Level voltage &quot;L&quot;</td>
<td>0.5Vmax at 5mA</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Level voltage &quot;H&quot;</td>
<td>5V typ</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Maximum sink current</td>
<td>10mA max</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Maximum applicable voltage</td>
<td>35V max</td>
<td></td>
</tr>
</tbody>
</table>

3.5 Remote ON/OFF
- Remote ON/OFF circuit is built-in on both side of input(RC1) and output(RC2 - RC3).
- Output can be controlled by either circuit.

1) Input side remote ON/OFF(RC1)
- The ground pin of input side remote ON/OFF circuit is "-VIN" pin.
- Between RC1 and -VIN: Output voltage is ON at "Low" level or short circuit(0 - 1.0V).
- Between RC1 and -VIN: Output voltage is OFF at "High" level or open circuit(3.5 - 7.0V).
- When RC1 is "Low" level, fan out current is 0.3mA typ. When Vcc is applied, use 3.5 \[\leq Vcc \leq 7V\].
- When remote ON/OFF function is not used, please short between RC1 and -VIN.
- When the DPF - DPG series(Power factor & harmonic corrector module) is used as a front end unit, connect between RC1 pin and ENA pin on DPF - DPG for the start-up time of the DBS200B/400B/700B control. Please contact us for details.

(2) Output side remote ON/OFF(RC2 - RC3)

### Table 3.2 Specification of output side remote ON/OFF(RC2 - RC3)

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>RC2 - RC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wiring method</td>
<td>Fig.3.3 (a)</td>
</tr>
<tr>
<td>2</td>
<td>Function</td>
<td>Power ON &quot;H&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power ON &quot;H&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power ON &quot;L&quot;</td>
</tr>
<tr>
<td>3</td>
<td>Base pin</td>
<td>RC2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-S</td>
</tr>
<tr>
<td>4</td>
<td>Power ON</td>
<td>Open (0.1mA max)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short (0.5V max)</td>
</tr>
<tr>
<td>5</td>
<td>Power OFF</td>
<td>Short (3mA min)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open (0.1mA max)</td>
</tr>
</tbody>
</table>
Make sure that sink current of output side remote ON/OFF circuit should be less than 12mA.

(3) Auxiliary power supply for remote ON/OFF(AUX)
- AUX is built in for operating the output side remote ON/OFF (RC2 - RC3).
- If AUX is not used for RC2 - RC3, AUX can be used for IOG or TMP signal output by opto coupler.
- Short protection resistance(2.2kΩ) is built in.
- Output voltage decreases as the output current increases.
  (AUX voltage at open circuit: 15V max)

3.6 Remote sensing
(1) When the remote sensing function is not in use
- When the remote sensing function is not in use, it is necessary to confirm that pins are shorted between +S & +VOUT and between -S & -VOUT.
- Wire between +S & +VOUT and between -S & -VOUT as short as possible.
  Loop wiring should be avoided.
  This power supply might become unstable by the noise coming from poor wiring.

(2) When the remote sensing function is in use
- Twisted-pair wire or shield wire should be used for sensing wire.
- Thick wire should be used for wiring between the power supply and a load.
  Line drop should be less than 0.5V.
  Voltage between +VOUT and -VOUT should remain within the output voltage adjustment range.
- If the sensing patterns are short, heavy-current is drawn and the pattern may be damaged.
  The pattern disconnection can be prevented by installing the protection parts as close as a load.

3.7 Adjustable voltage range
- Output voltage is adjustable by the external potentiometer or by applied voltage externally.
  The adjustable range is 60 - 110% of the rated output voltage.
- When the output voltage adjustment is used, note that the over-voltage protection circuit operates when the output voltage sets too high.

(1) Adjusting method by external resistor
- By connecting the external potentiometer(VR1) and resistors(R1, R2), output voltage becomes adjustable, as shown in Fig.3.6, recommended external parts are shown in Table 3.3.
  - The wiring to the potentiometer should be as short as possible.
  - The temperature coefficient becomes worse, depending on the type of a resistor and potentiometer. Following parts are recommended for the power supply.
    Resistor ------Metal film type, coefficient of less than ±100ppm/°C
    Potentiometer --Cermet type, coefficient of less than ±300ppm/°C
- When the output voltage adjustment is not used, open the TRM pin and VB pin respectively.

![Fig.3.6 Output voltage control circuit](image-url)
4.1 Series operation
Series operation is available by connecting the outputs of two or more power supplies, as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

![Series Operation Diagram](image)

4.2 Parallel operation/Master-slave operation
Parallel operation is available by connecting the units as shown in Fig.4.2.
As variance of output current drew from each power supply is maximum 10%, the total output current must not exceed the value determined by the following equation.

\[(\text{Output current in parallel operation}) = (\text{the rated current per unit}) \times (\text{number of unit}) \times 0.9\]

When the number of units in parallel operation increases, input current increase at the same time. Adequate wiring design for input circuitry is required, such as circuit pattern, wiring and current capacity for equipment.

In parallel operation, the maximum operative number of units is 11.
5 Cleaning

Clean the product with a brush. Prevent liquid from getting into the product.

Do not soak the product into liquid.

Do not stick solvent to a name plate or a resin case.

(If solvent sticks to a name plate or a resin case, it will cause to change the color of the case or to fade letters on name plate away.)

After cleaning, dry them enough.

4.3 N+1 redundant operation

It is possible to set N+1 redundant operation for improving reliability of power supply system.

Purpose of redundant operation is to ensure stable operation in the event of single power supply failure.

Since extra power supply is reserved for the failure condition, so total power of redundant operation is equal to N-1.