1 Configuration - Model Name Construction

The RB series has Order Name which is used for the ordering aside from Model Name. Please order at Order Name.
The Order Name will be assigned after the product is configured.

■Model Name Construction

RB ① C ② □ ③ F ④ – 3 □ ⑤ 2 □ ⑥ 1 □ ⑦ – □ ⑧

①Series name
RB=RB series
②Multiple output
③Abbreviation maximum output power
200=207W
300=303W
④Universal input
⑤Slot 3 module code
⑥Slot 2 module code
⑦Slot 1 module code
⑧Optional code

<Model Name Example>

RBC 200 F – K J Y – SN
- with Chassis & cover
- Slot 1 Module Y (24V 6A)
- Slot 2 Module J (12V 2.5A)
- Slot 3 Module K (16.5V 1.9A)
- RB series 207W (RBC200F)

■Order Name Construction

① through ⑦ have the same rules as Model Name, after that add management alphanumeric character (6 digits).
Optional codes are not listed on Order Name.

<Order Name Example>

RBC200F - K J Y - 1 2 3 4 5 6
"1 2 3 4 5 6" is an example of management alphanumeric character.

■Output of slot

Slot 1 output is connected to +V1, G1.
Slot 2 output is connected to +V2, -V2 and G2.
Slot 3 output is connected to +V3, G3.

●Configuration rules

(1) The code of the module installed in Slot 1 is selected from Slot 1 output module specifications.
(2) Slot 1 has to have a module selected.
(3) The code of the module installed in Slot 2 is selected from Slot 2, Slot 3 output module specifications and Slot 2 dedicated output module.
(4) The code of the module installed in Slot 3 is selected from Slot 2, Slot 3 output module specifications.
(5) It is possible to configure Slot 2, Slot 3 as an empty slot. (Refer to Fig.1.1, Fig1.2)
If you do not install a module, code "O" (blank code) should be selected.
However, It is not possible to configure both Slot 2 and 3 as "O".
<RBC200F>
If you configure Slot 2 as "O" , pin no.5 to 7 of CN2 is NC.
If you configure Slot 3 as "O" , CN3 is not installed.
<RBC300F>
If you configure Slot 2 as "O" , CN3 is not installed.
If you configure Slot 3 as "O" , CN4 is not installed.
(6) Series operation is possible only if Slot 2 and Slot 3 are the same module. Please refer to section 3.1

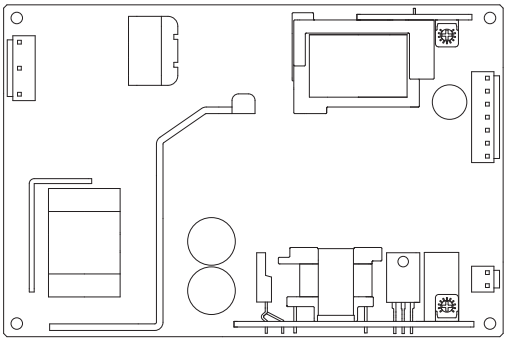


Fig.1.1 Schematic, if you configure Slot 2 as "O"
(Model Name : RBC200F-□O□)

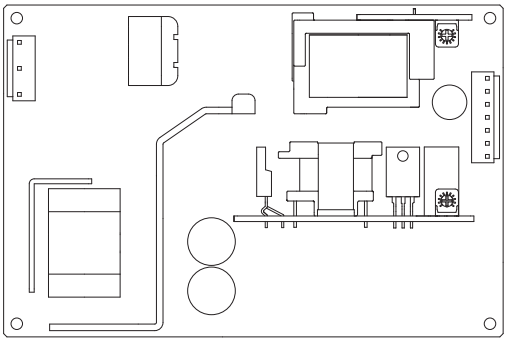


Fig.1.2 Schematic, if you configure Slot 3 as "O"
(Model Name : RBC200F-O□□)

2 Function

2.1 Input voltage range

■The range is from AC85V to AC264V. (please see SPECIFICATIONS for details).

■In cases that conform with safety standard, input voltage range is AC100 - AC240V (50/60Hz).

■If input value doesn't fall within above range, the unit may not operate in accordance with specifications and/or start hunting or fail.
If you need to apply a square waveform input voltage, which is commonly used in UPS and inverters, please contact us.

■When the input voltage changes suddenly, the output voltage accuracy might exceed the specification. please contact us.

2.2 Inrush current limiting

■An inrush current limiting circuit is built-in.

■If you need to use a switch on the input side, please select one that can withstand an input inrush current.

■Relay technique is used in the inrush current limiting circuit. When you turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that the inrush current limiting circuit becomes operative.

■Surge current in the filter unit does not include (0.2ms or less).

2.3 Overcurrent protection

■An overcurrent protection circuit is built-in and activated at 105% of the rated current. A unit automatically recovers when a fault condition is removed.
Please do not use a unit in short circuit and/or under an overcurrent condition.

■Intermittent Operation Mode
Intermittent operation for overcurrent protection is included in a part of series. When the overcurrent protection circuit is activated and the output voltage drops to a certain extent, the output becomes intermittent so that the average current will also decrease.

■Output voltage shuts down when the output voltage continuously drops due to overcurrent protection.

■Output voltage recovers from overcurrent protection by shutting down the input voltage and waiting more than 3 minutes then turning on AC input again.

2.4 Overvoltage protection

■An overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage.

Remarks :

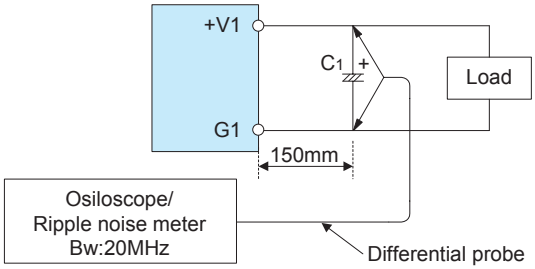
Please avoid applying a voltage exceeding the rated voltage to an output terminal. Doing so may cause a power supply to malfunction or fail. If you cannot avoid doing so, for example, if you need to operate a motor, etc., please install an external diode on the output terminal to protect the unit.

2.5 Output voltage adjustment range

■To increase an output voltage, turn a built-in potentiometer clockwise.
To decrease the output voltage, turn it counterclockwise.
When the slot is dual output, the potentiometer is turned clockwise then, +V increases and -V decreases at the same time.

2.6 Output ripple and ripple noise

■Output ripple noise may be influenced by measurement environment, measuring method Fig.2.1 is recommended.

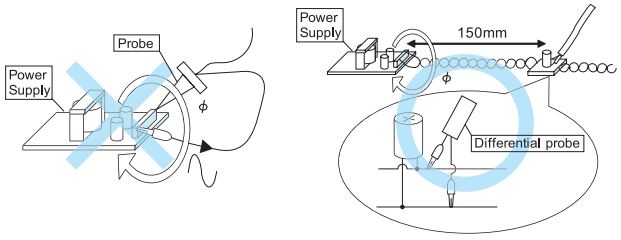


C1 : Aluminum electrolytic capacitor 22μF

Fig.2.1 Measuring method of Ripple and Ripple Noise
(Example of measurement with V1)

Remarks :

When GND cable of probe with flux of magnetic force from power supply are crossed, ripple and ripple noise might not measure correctly.
Please note the measuring environment.



Bad example Good example

Fig.2.2 Example of measuring output ripple and ripple noise

2.7 Isolation

■For a receiving inspection, such as Hi-Pot test, gradually increase (decrease) the voltage for the start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

■When you test a unit for isolation between the input and output, or between output and terminal FG, short-circuit between all outputs and function terminal.

■When you test a unit for isolation between output V1,V2, and output V3,short-circuit between output V1 and output V2.

2.8 Start/stop sequence

■The start / stop waveform changes due to external capacity, load current, etc, so please evaluate if start / stop sequence is required.

■Please contact us if start / stop sequence is required.

3 Series Operation and Parallel Operation

3.1 Series Operation

■Series operation is possible only if Slot 2 and Slot 3 are the same module. Fig.3.1 shows an example of wiring.

Remarks :

Please be sure to have enough cooling in case one of the slots stops due to activation of the protection circuitry.

In case of malfunction (Failure of protection circuit activation), please stop the operation.

The combined output voltage of series operation is 48 V.

If the combined output voltage exceeds 60V, the safety agency approvals are void.

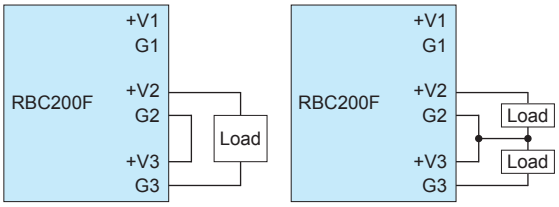


Fig.3.1 Examples of wiring in series operation

3.2 Parallel Operation

■Parallel operation and redundancy operation are not possible.

4 Temperature Measurement Point

■For reliable and safe operation, please make sure the maximum component temperature rise given in table 4.1 is not exceeded.

Please allow enough ventilation for the power supply.

Temperature of points ① through ⑤ should be lower than the upper limit temperature.

The expectancy life in the upper bound temperature (Points ① through ⑤) is 3 years or more. Please refer to 8 if you want to extend the longevity.

■Test Measuring points

Be aware of the conductive parts during the measurements.

Please contact us for more detail.

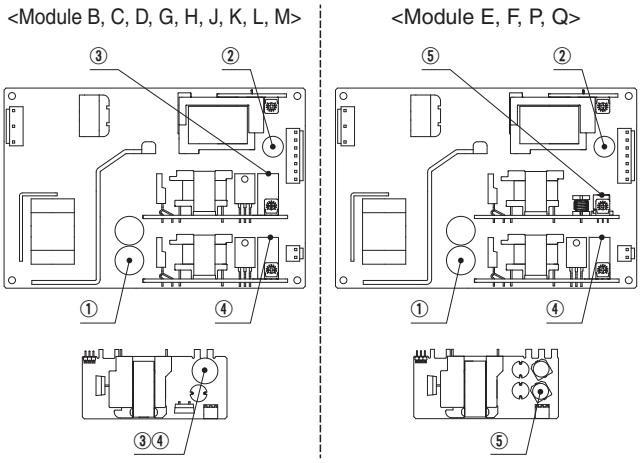


Fig.4.1 Measurement points locations (RBC200F)

Table 4.1 Maximum temperature of measurement points (RBC200F)

Installation condition	Cooling Method	Load factor	Maximum temperature [℃]				
			① : Capacitor	② : V1 Capacitor	③ : V2 Capacitor	④ : V3 Capacitor	⑤ : V2 Capacitor
A	Convection	75%<Po≦100%	81	79	80	79	90
		Po≦ 75%	86	84	84	84	93
B		75%<Po≦100%	66	72	75	70	85
		Po≦ 75%	78	81	84	80	92
C		75%<Po≦100%	70	61	73	79	83
		Po≦ 75%	78	73	81	83	89
D		75%<Po≦100%	73	66	68	67	78
		Po≦ 75%	81	77	79	78	87
E		75%<Po≦100%	68	72	81	79	91
		Po≦ 75%	75	80	84	83	93
F		75%<Po≦100%	65	67	74	72	84
		Po≦ 75%	79	79	84	82	92
A,B,C, D,E,F	Forced air	75%<Po≦100%	79	82	83	80	83
		Po≦ 75%	82	82	83	80	83

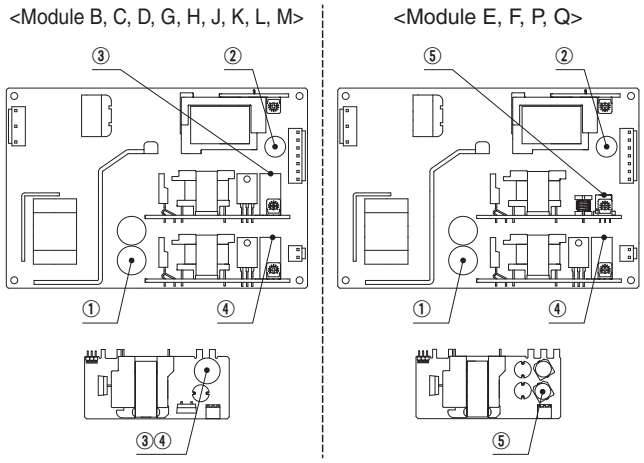


Fig.4.2 Measurement points locations (RBC300F)

Table 4.2 Maximum temperature of measurement points (RBC300F)

Installation condition	Cooling Method	Load factor	Maximum temperature [℃]				
			① : Capacitor	② : V1 Capacitor	③ : V2 Capacitor	④ : V3 Capacitor	⑤ : V2 Capacitor
A	Convection	75%<Po≦100%	83	85	80	79	90
		Po≦ 75%	84	86	84	84	93
B		75%<Po≦100%	76	76	75	70	85
		Po≦ 75%	85	84	84	80	92
C		75%<Po≦100%	82	77	73	79	83
		Po≦ 75%	87	79	81	83	89
D		75%<Po≦100%	80	75	68	67	78
		Po≦ 75%	87	82	79	78	87
E		75%<Po≦100%	81	83	81	79	91
		Po≦ 75%	86	85	84	83	93
F		75%<Po≦100%	70	69	74	72	84
		Po≦ 75%	86	79	84	82	92
A,B,C, D,E,F	Forced air	75%<Po≦100%	83	83	83	80	83
		Po≦ 75%	88	86	83	80	83

5 Peak current

(Applying module : T, U)

■Some output modules have the peak capability of the following conditions.

- t_1≦5sec (AC85～170V)
- t_1≦10sec (AC170～264V)
- I_p≦Rated peak current
- I_{rms}≦Rated current
- Duty $= \frac{t_1}{t_1+t_2} \times 100[\%] \leqq 70\%$
- $I_{rms}^2 = \frac{I_P^2 \times t_1 + I_L^2 \times t_2}{t_1+t_2}$

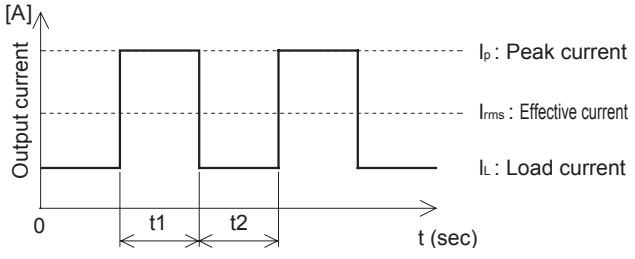


Fig.5.1 Peak current

6 Definition of load factor

■The definition of load factor is the following, suffix k means the k-th slot.

$$A_k = \frac{I_k \times V_k}{\text{(Rated output power of k-th module)}}$$

Rated output power : Depends on input

Load factor [%] = maximum value of A_1 to A_3

I_k, V_k : output current (effective current), output voltage

＊When the k-th slot is module E, F, P, Q, V_k is the voltage between +V and -V.

7 Ground

■When installing the power supply with your unit, ensure that the input FG terminal or mounting hole FG is connected to safety ground of the unit. However when applying the safety agency, connect the input FG terminal to safety ground of the unit.

＊It is recommended to electrically connect FG to metal chassis for reducing noise.

8 Life expectancy and warranty

■Life expectancy

Table 8.1 Life expectancy

Installation condition	Cooling Method	Average ambient temperature (yearly)	Life expectancy [years]	
			Po≦75%	75%<Po≦100%
A	Convection	Ta=40℃ or less	6	6
		Ta=50℃	6	4
B, D		Ta=30℃ or less	6	6
		Ta=40℃	6	4
C, E		Ta=25℃ or less	6	6
		Ta=35℃	6	4
F		Ta=20℃ or less	6	6
		Ta=30℃	6	4
A,B,C,D,E,F	Forced air	Ta=50℃ or less	6	6
		Ta=60℃	6	4

Remarks :

Estimated life expectancy can be calculated by point temperature ① through ⑤ shown in section 4. Please contact us for details.

■Warranty

Table 8.2 Warranty

Installation condition	Cooling Method	Average ambient temperature (yearly)	Warranty [years]	
			Po≦75%	75%<Po≦100%
A	Convection	Ta=40℃ or less	5	5
		Ta=50℃	5	3
B, D		Ta=30℃ or less	5	5
		Ta=40℃	5	3
C, E		Ta=25℃ or less	5	5
		Ta=35℃	5	3
F		Ta=20℃ or less	5	5
		Ta=30℃	5	3
A,B,C,D,E,F	Forced air	Ta=50℃ or less	5	5
		Ta=60℃	5	3

9 Option and Others

9.1 Outline of options

∗Please contact us for details of specifications and delivery timing.

∗You can combine multiple options. Some options, however, cannot be combined with other options. Please contact us for details.

●-C

・Option -C units have coated internal PCB for better moisture resistance. The Input connector is hibox type (Mfr. J.S.T.).

Table 9.1 Coated internal PCB type (RBC200F)

I/O Connector	Part No.	Connector type
Input connector	CN1	VH（hibox type）
Output connector	CN2	
	CN3	

Table 9.2 Coated internal PCB type (RBC300F)

I/O Connector	Part No.	Connector type
Input connector	CN1	VH（hibox type）
Output connector	CN2	
	CN3	
	CN4	

●-G

・Option -G units are low leakage current type.

・Differences from standard versions are summarized in Table 9.3.

Table 9.3 Low leakage current type

Leakage Current (AC240V 60Hz)	0.15mA max
Conducted Noise	N/A
Output Ripple Noise	Please contact us for details about Ripple Noise

●-S, -SN

・-S indicates a type with chassis, and -SN indicates a type with chassis and cover (Refer to external view).

・The vibration resistance specification changes depending on the mounting method. Please contact us for detail.

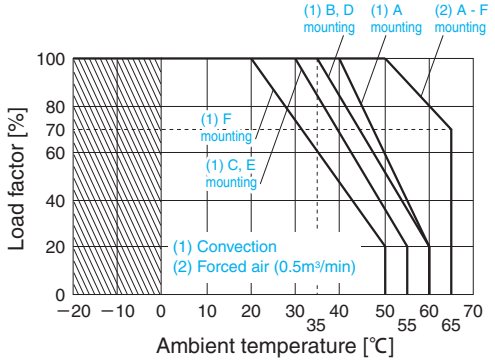
・“Maximum temperature of measurement points”, “Derating curve depends on ambient temperature”, “Expectancy life” and “Warranty” is different from standard version. Please refer to Fig.9.1, Table 9.4 to Table 9.7.

Table 9.4 Maximum temperature of measurement points (RBC200F-□-SN)

Installation condition	Cooling Method	Load factor	Maximum temperature [℃]				
			①: Capacitor	②: V1 Capacitor	③: V2 Capacitor	④: V3 Capacitor	⑤: V2 Capacitor
A	Convection	75%<Po≦100%	83	76	77	75	86
		Po≦ 75%	83	76	77	77	86
B		75%<Po≦100%	73	72	75	70	84
		Po≦ 75%	79	78	80	78	88
C		75%<Po≦100%	77	61	73	81	82
		Po≦ 75%	81	70	78	80	85
D		75%<Po≦100%	79	66	67	67	77
		Po≦ 75%	84	73	76	75	84
E		75%<Po≦100%	75	72	83	81	92
		Po≦ 75%	77	76	81	80	90
F		75%<Po≦100%	67	62	69	67	79
		Po≦ 75%	76	71	76	74	83
A,B,C, D,E,F	Forced air	75%<Po≦100%	74	77	79	75	79
		Po≦ 75%	72	75	76	73	76

Table 9.5 Maximum temperature of measurement points (RBC300F-□-SN)

Installation condition	Cooling Method	Load factor	Maximum temperature [℃]				
			①: Capacitor	②: V1 Capacitor	③: V2 Capacitor	④: V3 Capacitor	⑤: V2 Capacitor
A	Convection	75%<Po≦100%	87	76	77	75	86
		Po≦ 75%	88	80	77	77	86
B		75%<Po≦100%	78	83	75	70	84
		Po≦ 75%	87	84	80	78	88
C		75%<Po≦100%	83	73	73	81	82
		Po≦ 75%	84	75	78	80	85
D		75%<Po≦100%	80	74	67	67	77
		Po≦ 75%	87	78	76	75	84
E		75%<Po≦100%	85	84	83	81	92
		Po≦ 75%	83	82	81	80	90
F		75%<Po≦100%	81	74	69	67	79
		Po≦ 75%	85	78	76	74	83
A,B,C, D,E,F	Forced air	75%<Po≦100%	87	74	79	75	79
		Po≦ 75%	88	86	76	73	76



∗Specifications for ripple and ripple noise changes in the shaded area.

Fig.9.1 Derating curve depends on ambient temperature (RBC200F-□-SN, RBC300F-□-SN) (Reference value)

Table 9.6 Expectancy life (RBC200F-□-SN, RBC300F-□-SN)

Installation condition	Cooling Method	Average ambient temperature (yearly)	Expectancy Life [years]	
			Po≦75%	75%<Po≦100%
A	Convection	Ta=30℃ or less	6	6
		Ta=40℃	6	4
B, D		Ta=25℃ or less	6	6
		Ta=35℃	6	4
C, E		Ta=20℃ or less	6	6
		Ta=30℃	6	4
F		Ta=10℃ or less	6	6
		Ta=20℃	6	4
A,B,C,D,E,F	Forced air	Ta=40℃ or less	6	6
		Ta=50℃	6	4

Table 9.7 Warranty (RBC200F-□-SN, RBC300F-□-SN

Installation condition	Cooling Method	Average ambient temperature (yearly)	Warranty [years]	
			Po≦75%	75%<Po≦100%
A	Convection	Ta=30℃ or less	5	5
		Ta=40℃	5	3
B, D		Ta=25℃ or less	5	5
		Ta=35℃	5	3
C, E		Ta=20℃ or less	5	5
		Ta=30℃	5	3
F		Ta=10℃ or less	5	5
		Ta=20℃	5	3
A,B,C,D,E,F	Forced air	Ta=40℃ or less	5	5
		Ta=50℃	5	3

●-R

- You can control the output ON/OFF remotely with Option -R units. To do so, connect an external DC power supply and apply voltage to connector, which is available as an option.
- Remote ON/OFF circuits (RC+ and SGND) are isolated from input, outputs and FG.
- All outputs (V1,V2,V3) are targets of remote ON/OFF.
- Targets of remote ON/OFF is selectable. Please contact us for details.

Built-in Resistor Ri[Ω]	Voltage between RC and SGND[V]		Input Current [mA]
	Output ON	Output OFF	
2200	4.5～12.5	0～0.5	6max

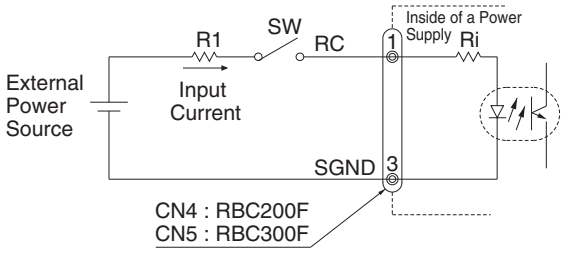


Fig.9.2 Example of using a remote ON/OFF circuit

∗If the output of the external power supply is within the range of 4.5 - 12.5V, you do not need a current limiting resistor R1.
If the output exceeds 12.5V, however, please connect the current limiting resistor R1.

R1 Recommended resister [Ω]	Ri : 2200Ω
$\frac{Vcc-(1.1+Ri\times0.003)}{0.003}$	

Table 9.8 Pin assignments of CN4 (RBC200F-□-R)

CN4

Pin No.	Function
1	RC
2	NC
3	SGND

Table 9.9 Pin assignments of CN5 (RBC300F-□-R)

CN5

Pin No.	Function
1	RC
2	NC
3	SGND
4	NC

∗Please wire carefully. If you wire incorrectly, the internal components may be damaged.

●-T

- Option -T units have vertically positioned screws on the terminal block

■RBC200F

- The size specification is different from standard version. (Refer to external view).
- If you configure Slot 2 as “O”, +V2, G2 and -V2 of TB2 is NC.
- If you configure Slot 3 as “O”, TB3 is not installed.

■RBC300F

- If you configure Slot 2 as “O”, TB3 is not installed.
- If you configure Slot 3 as “O”, TB4 is not installed.

●-U1

■By connecting the external capacitor unit CR-HUT (optional parts) to CN5, Hold-up time is extendable.

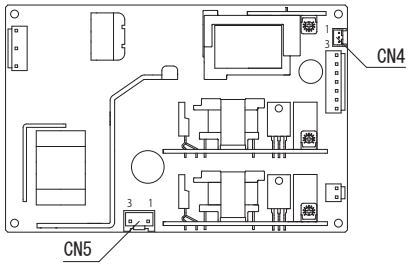


Fig.9.3 CN4 and CN5 locations (RBC200F-□-U1)

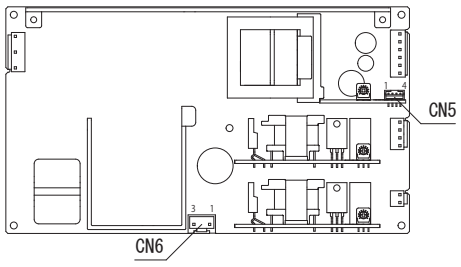


Fig.9.4 CN5 and CN6 locations (RBC300F-□-U1)

Table 9.10 Pin assignments of CN4, CN5 (RBC200F-□-U1)

CN4

Pin No.	Function
1	NC
2	ALM
3	SGND

CN5

Pin No.	Function
1	-Vbc
2	-
3	+Vbc

Table 9.11 Pin assignments of CN5, CN6 (RBC300F-□-U1)

CN5

Pin No.	Function
1	NC
2	ALM
3	SGND
4	NC

CN6

Pin No.	Function
1	-Vbc
2	-
3	+Vbc

Table 9.12 Mating connector

I/O Connector		Mating connector	Terminal
(CN5 RBC200F-□-U1)	BH2P3-VH-1	VHR-3N	Chain : SVH-21T-P1.1
(CN6 RBC300F-□-U1)			Loose : BVH-21T-P1.1

■Connection method

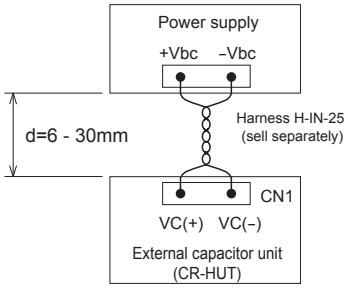


Fig.9.5 Connection method

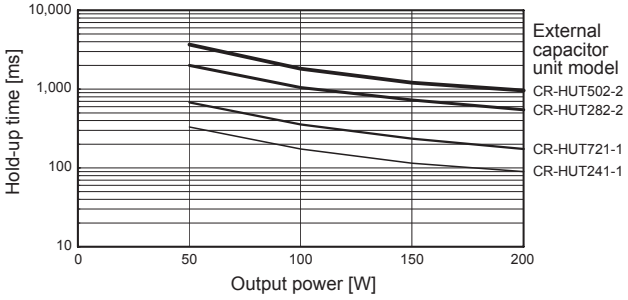


Fig.9.6 Hold-up time by RBC200F-□-U1 (Reference data)

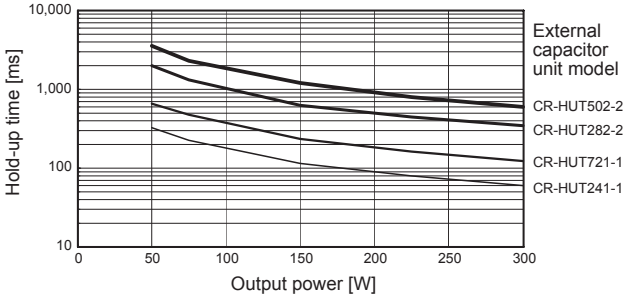


Fig.9.7 Hold-up time by RBC300F-□-U1 (Reference data)

●Caution

(1) Distance between the external capacitor unit and power supply unit must be secured more than 6mm.

(2) It must be 30mm or less, since the noise is generated from the wire which connects the external capacitor unit and power supply. It is necessary to twist the wire as short as possible.

(3) It is necessary to use wires which are rated for voltage of 600V or more.

(4) It must be used with the external capacitor unit (CR-HUT).

■This specification can output alarm of output shutoff at AC input drop.

When line voltage is low, the alarm outputs from CN4.

The signal output period might vary depending on input and load conditions. Please evaluate thoroughly.

Table 9.13 Explanation of alarm

Alarm		Output of alarm
ALM	The ALM signal turns to "High"when output can not be maintained by AC input drop	Open collector method Good : Low (0.5V max at 1.5mA) Bad : High or Open 50V 1.5mA max

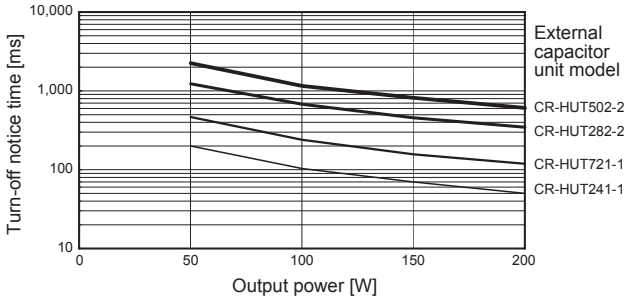


Fig.9.8 Turn-off notice time by RBC200F-□-U1(Reference data)

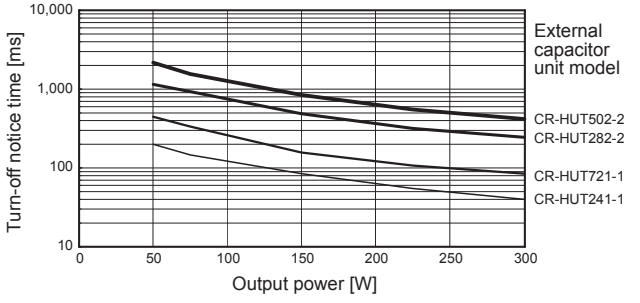


Fig.9.9 Turn-off notice time by RBC300F-□-U1(Reference data)

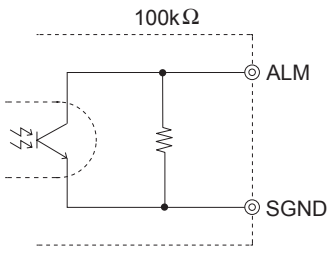


Fig9.10 Internal circuit of alarm

■Circuit of the alarm is isolated from input, output (V1, V2, V3) and FG.
■In case of operating over AC255V, start-up time value is 20 seconds.

●-I3

■The power supply provides an “Extended-UART” digital interface. Please use the connectors shown below to communicate by “Extended-UART”.
RBC200F : CN4
RBC300F : CN5
■Extended-UART is a communication protocol that enables singlewire, bidirectional, insulated, and multiple communication of UART, which is a general-purpose communication standard.
For details, please refer to the RB Series Extended-UART Manual.

Table 9.14 Pin assignments of CN4 (RBC200F-□-I3)

CN4

Pin No.	Function
1	NC
2	INFO
3	SGND

Table 9.15 Pin assignments of CN5 (RBC300F-□-I3)

CN5

Pin No.	Function
1	NC
2	INFO
3	SGND
4	NC

■Communication function terminal is isolated from input, output (V1, V2, V3) and FG.
■Do not connect anything to NC pins.

9.2 Output side attaching externally capacitance

■Depending on the capacitance of the external capacitor, resonance may occur due to ESR, ESL, and wiring inductance, so please be careful of ripple increase.
■If the capacitance of the external capacitor is too large, the output voltage may not rise.

Table 9.16 Connectable External capacitor on the output side [μF]

Module code	Capacitance [μF]
B	0 ～ 1,500
C	0 ～ 1,500
D	0 ～ 820
E	0 ～ 220
F	0 ～ 220
G	0 ～ 8,200
H	0 ～ 4,700
J	0 ～ 1,500
K	0 ～ 1,500
L	0 ～ 1,200
M	0 ～ 470
P	0 ～ 220
Q	0 ～ 220
S	0 ～ 3,900
T	0 ～ 3,300
U	0 ～ 680
V	0 ～ 1,500
W	0 ～ 1,500
Y	0 ～ 1,200
Z	0 ～ 680

9.3 Others

■High voltage exists in the power supply for a few minutes after input voltage stops. Please pay attention to this during maintenance.
■This power supply is manufactured by SMD technology. The stress to PCB like twisting or bending causes defects of the unit, so handle the unit with care.
・Notes for mounting
①All Mounting holes should be tight and secured.
②Power supply should be mounted parallel to the mounting surface.
③Avoid applying mechanical stress or shock to the power supply.
④Do not touch any SMD components on the unit.
■When power supply is energized or immediately after power supply stops working, the power supply is still very hot, so please handle with care.