

**28 YEARS**  
of total energy solutions

# Endless Source of Energy

- ☐ ELECTRIC AND ELECTRONIC INDUSTRIAL MANUFACTURES
- ☐ AUTOMATIC CONTROL PANELS
- ☐ MANUFACTURING OF LOW AND MEDIUM VOLTAGE PANELS
- ☐ UNINTERRUPTIBLE POWER SUPPLIES (U.P.S.)
- ☐ GENERATING SETS
- ☒ TELECOMMUNICATION RECTIFIER SYSTEMS
- ☐ RENEWABLE ENERGY SOURCES



**IL.VIO.KAT.**


# CONTENTS

1.	DESCRIPTION.....	7
1.1.	Introduction.....	7
1.2.	Overview.....	10
1.3.	Rated voltage and current.....	11
1.4.	Block diagram.....	12
1.5.	Technical Specifications.....	13
1.6.	Composition.....	14
1.6.1.	SCU Section.....	14
1.6.2.	RD Module.....	15
1.7.	Identification label.....	16
2.	INSTALLATION REQUIREMENTS.....	17
2.1.	Electrical plant.....	17
2.2.	Installation site.....	17
2.2.1.	Access.....	17
2.2.2.	Load imposed on the floor.....	17
2.2.3.	Climatic requirements.....	18
3.	CONNECTIONS.....	19
3.1.	Preliminary operations.....	19
3.2.	Protection earth.....	20
3.3.	Mains input.....	20
3.4.	Output cables connection.....	21
3.5.	Batteries connection.....	22
3.6.	Positive pole connection to the earth.....	22
3.7.	Remote-alarms connection.....	23
3.8.	Temperature probe.....	23
4.	STARTING UP THE SYSTEM.....	24
4.1.	RD Module insertion.....	24
4.2.	Functional verification.....	25
4.3.	Recorded alarms.....	26
4.3.1.	LEDs configuration.....	26
4.3.2.	Relays configuration.....	26
4.3.3.	Battery alarms.....	26
4.3.3.1	To modify the battery minimum voltage threshold, select the path:.....	26
4.3.3.2	To modify the battery minimum voltage pre-alarm threshold, select the path:.....	26
4.3.3.3	To modify the battery maximum temperature threshold, select the path:.....	26
4.3.3.4	To modify the battery maximum voltage threshold, select the path:.....	27
4.3.4.	Battery thresholds.....	28
4.3.4.1	To modify the battery BOOST voltage threshold, select the path:.....	28
4.3.4.2	To modify the battery MAINTENANCE/FLOATING voltage threshold, select the path:.....	28
4.4.	Clock setting.....	28
4.5.	Language setting.....	28
4.6.	Alarms texts.....	28
5.	SYSTEM PARAMETERS SETTING.....	29
5.1.	Temperature compensation.....	29
5.2.	Battery parameters.....	29
5.2.1	Number of battery branches.....	29
5.2.2	Type of battery.....	29
5.2.3	Battery capacity.....	29
5.2.4	Battery current limitation.....	30
5.2.5	Maintenance to Boost current threshold.....	30
5.2.6	Boost to Maintenance current threshold.....	30
5.3.	Password modification.....	30
6.	MAINTENANCE.....	31
6.1.	RD Module replacement.....	31
7.	SOFTWARE CONFIGURATION.....	32
7.1.	Function Keys.....	32
7.2.	Software Menu.....	34
8.	ACRONYMS AND DEFINITIONS.....	35
9.	ELECTRICAL DRAWINGS.....	36

## CONTROL SECTION


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### References

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## **SAFETY ADVICE AND RESPONSIBILITY**

THIS DOCUMENT IS A FUNCTIONAL DESCRIPTION, NOT A USER'S MANUAL.

BEFORE INSTALLING OR OPERATING THE DESCRIBED DEVICE, PLEASE READ CAREFULLY THE INSTRUCTIONS CONTAINED IN THE USER'S MANUAL AND MAKE SURE THEY ARE OBSERVED BY THE TECHNICAL STAFF.

KEEP THE USER'S MANUAL WITH THE DEVICE FOR FUTURE REFERENCES.

ALL MAINTENANCE WORK MAY ONLY BE PERFORMED BY QUALIFIED TECHNICIANS.

THE RISK OF ACCIDENT DUE TO THE CONTACT WITH HAZARDOUS VOLTAGE SOURCES IS INCREASED WHEN YOU OPEN OR REMOVE THE PROTECTIONS OF THE DEVICE.

### **LEAKAGE CURRENT**

MAKE SURE THAT EARTHING HAS BEEN CARRIED OUT PROPERLY BEFORE CONNECTING THE DEVICE TO THE MAINS!

### **PACKAGING**

TO ENSURE CORRECT OPERATION, UNPACK AND POSITION THE DEVICE VERY CAREFULLY, AVOIDING OVERTURNING AND CRASHING.

**TO AVOID DAMAGING THE CIRCUITS FOLLOW CAREFULLY THE STEPS DESCRIBED INTO THE INSTALLATION AND COMMISSIONING PROCEDURE.**

# 1. DESCRIPTION

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## 1.1. Introduction

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The DC POWER SYSTEM DPS 100 O is designed to satisfy the typical requirements of outdoor telecommunication equipment:

In mains present condition the system ensures a stabilized and filtered supply to the loads as well as the full efficiency of the back-up batteries.

In case of a mains fault the system ensures that the loads are supplied from batteries, without any interruption.

The COSMOTE DC POWER SYSTEM **Mod. DPS 100 O ( 48V–100A )** is composed from one Outdoor Cabinet:



equipped with:

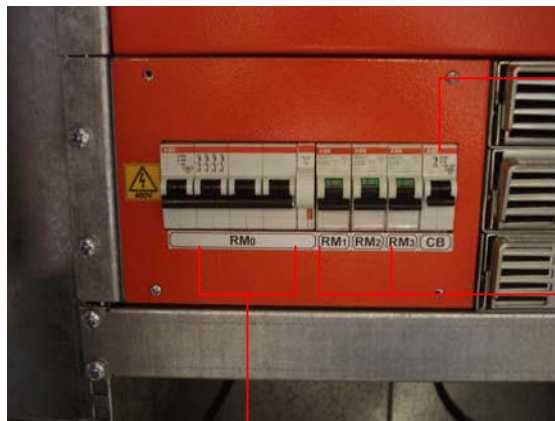
- System Control Unit (SCU).



- Input Surge Arrestors.



- General Input Main Switch 4P, input 1P+N MCB's to the rectifiers and input 1P MCB for auxiliary cabinet supply.



Input Auxiliary Cabinet MCB  
CB

Input MCB's to the rectifiers  
RM1, RM2, RM3.

General Main Switch  
RM0

- Rectifier Modules 48V-50A.

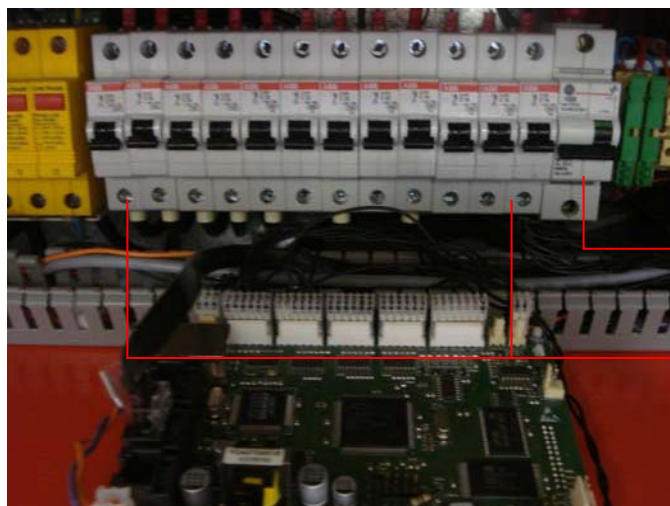


RM1  
Rectifier Module 1

RM2  
Rectifier Module 2

RM3  
Rectifier Module 3

- Output MCB's (F1 - F12) and Battery MCB (FB1).



Battery MCB  
FB1

Output MCB's  
F1,F2,F3,...F12

- Battery Low Voltage Disconnection device (LVDB).



- Battery string 48V-100Ah with ENERSYS type: 12V92F front terminal batteries.



The system redundancy, with one or more Rectifiers Modules (RD Modules) besides the nominal power requirements, improves the system reliability.

The system can be expanded, up-graded or maintained during the normal operation.



## 1.2. Overview

The DC POWER SYSTEM is powered by the input voltage:

- 400/230Vac 3 $\phi$ +N

The AC input cables are sectioned by the internal main circuit breaker downstream the input surge protections. The RD Modules are externally protected by independent magneto thermic circuit breakers and internally protected by fuses to selectively cut off the single faulty rectifier.

Ref.	In	Curve	Type	Icutoff
RM1 ÷ RM3	20A	C	1P+N	4,5Ka
RM0	40A	-	3P+N	6Ka



A power factor correction device assures a pure sinusoidal absorbed current from the mains.

The rectifiers output are paralleled, the load is equally shared among the rectifiers even in case of fault of the System Control Unit.

The DC outputs to the loads are selectively protected by MCBs, the batteries are selectively protected by MCB and by battery Low Voltage Disconnection device (LVDB).



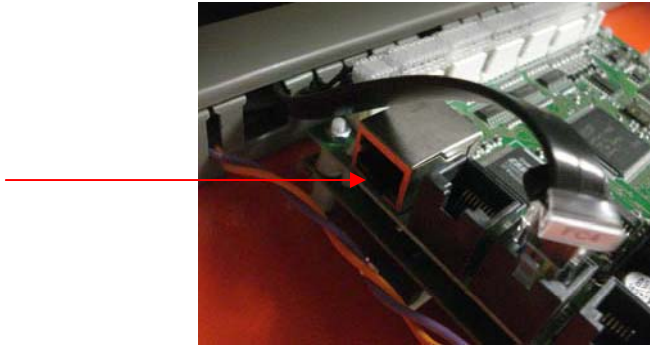
The battery charging current is set and controlled independently on each Bank.

When the input phase voltages exceed some configurable thresholds the RD Modules are halted with the consequent discharge of the battery. When the correct parameters of the mains are restored, the RD Modules are restarted and the battery charged with a controlled current configurable according to the battery capacity.

The system is entirely managed by a microprocessor System Control Unit (SCU), which concurrently monitors all the operating steps of the paralleled rectifiers, it signals the failures and manages all the parameters and the operating thresholds of the system. The whole configuration is software up-gradable.



An isolated interface, like CAN BUS, connects all the RD Modules to the System Control Unit. The LAN Ethernet 10 Base T interface provides the LAN connection and allows the system remote management and monitoring from a standard personal computer via a common WEB browser.



Every detected event or alarm can be locally signaled by means of LED indications and remotely transmitted through potential-free relay contacts or automatic e-mail and SMS.

#### Separation between AC and DC circuits

The AC wire path is completely separated from the DC one.

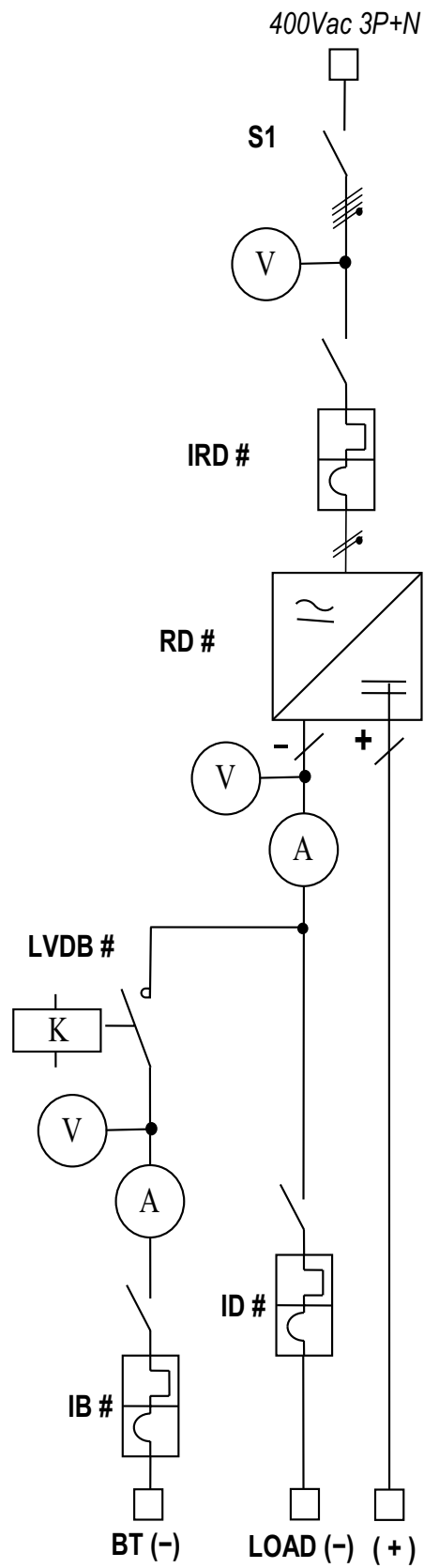
### **1.3. Rated voltage and current**

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The system rated voltage is 48Vdc, the total rated current is 100A.

## 1.4. Block diagram

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## 1.5. Technical Specifications

ENVIRONMENTAL FEATURES			
STORAGE			
Relative humidity		Class F as per DIN 40040	
Temperature		-25°C ÷ +70°C	
OPERATION			
Relative humidity		Class F as per DIN 40040	
Temperature		-10°C ÷ +55°C	
Altitude		3000m above sea level	
Protection Degree		IP20	
ELECTRICAL FEATURES			
INPUT			
Input voltage		400/230Vac 3φ+N	
Max variation on input voltage without power de-rating		-20% ÷ +20%	
Max variation on input voltage with power de-rating		-60% ÷ +35%	
Frequency		50/60Hz ± 5Hz	
Input current (per phase) with 3φ input 230Vac		≤ 16,3A	
Power factor		≥ 0,99	
Absorbed current distortion THD		≤ 4,5% (according to EN 61000-3-2)	
OUTPUT			
Rated output voltage		48Vdc	
Floating-charge voltage (hermetic AGM batteries at 20°C)		54,48Vdc (AGM)	53,52Vdc (GEL)
Voltage stability (steady state)		< 1%	
Alternate residual ripple		0.7mV psophom	50mV eff100mVpp
Rated output current		100A plus 50A redundancy	
Max output current (overload)		105% of the rated current	
Load sharing among the RDs without SCU		≤ 15% of the RD Module rated current	
Load sharing among the RDs with SCU		≤ 5% of the RD Module rated current or better	
Response for dynamic mains variations from -15% to +10%		≤ 8% for 5ms	
Response to dynamic load change of 50%		≤ 8% for 5ms	
THERMAL FEATURES			
Dissipated Power		521kcal/h	
Cooling		Independent cabinet ventilation system by two (2) ebmpapst fans 9956, 230V – 14W.	
MECHANICAL FEATURES			
Dimensions W x D x H		740 x 625 x 940 mm	
Weight (rectifiers and battery included)		258 Kg , approximately	
Load imposed on the floor (rectifiers and battery included)		717 Kg/m²	
STANDARD REFERENCES			
Safety		EN 60950	
Conducted emissions		EN55022	
Harmonics emissions		EN 61000-3-2	
Electrostatic discharge immunity		EN 61000-4-2	
RF radiated field immunity		EN 61000-4-3	
Fast transient / burst immunity		EN 61000-4-4	
Surge immunity		EN 61000-4-5	

## 1.6. Composition

### 1.6.1. SCU Section

The System Control Unit (SCU Card) manages the whole system and includes the following parts:

- Analogue input signal section.
- CAN BUS communication section.
- Real Time Clock (RTC).
- Power Supply section.
- Operator Interface section.
- LAN Ethernet 10 Base T interface section.

The System Control Unit communicates with all the modules by means of a *CAN BUS* connection. All the modules are continuously monitored to detect alarms and events that are associated to time references and recorded (up to 1000 events can be recorded).

The System Control Unit continuously reads the output voltage and the battery parameters, and consequently adjusts the rectifiers voltage/current set-points.

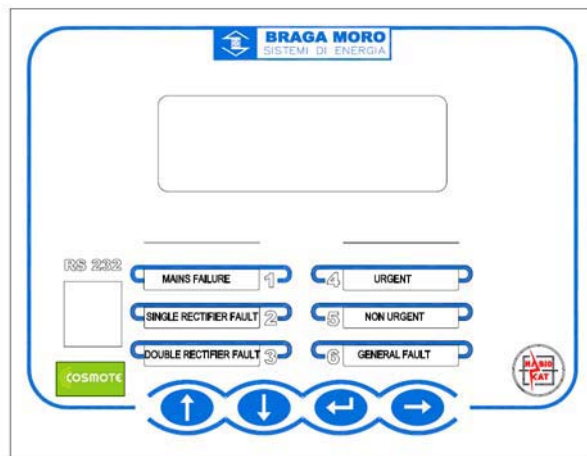
The Operator Interface allows the access to the system software configuration, it is composed of:

- One display.
- Six signaling LEDs.
- Four functions keys.

The remote-alarm interface is provided by potential-free contacts relays, fully software configurable, of the Relay Cards (RL Cards).

The standard configuration of the LEDs indicators on the Operator Interface controlled by the Control Unit is reported in the following table.

LED	Alarm / Event
LED 1	MAINS FAILURE
LED 2	SINGLE RECTIFIER FAULT
LED 3	DOUBLE RECTIFIER FAULT
LED 4	URGENT
LED 5	NON URGENT
LED 6	GENERAL FAULT



The LAN Ethernet 10 Base T interface allows the connection to the TLC network for the remote management of the system and the automatic transmission of SNMP traps, e-mail or SMS.

The System Control Unit provides the connection, protection and independent management of each battery string.

The System Control Unit measures the:

- Battery temperature.
- Battery voltage.
- Battery current.
- State of the protection MCBs.

These measurements are used to manage the battery charging/discharging phases, to control the currents and detect the alarms, and to calculate some important system parameters:

- Battery Available Capacity.
- Battery Discharge Condition.
- Battery Residual Capacity.
- Battery Discharge Level.

The battery floating voltage is adjusted according to the temperature and some software configurable parameters:

- start/stop temperature window.
- voltage adjusting step, measured in “mV/el/°C”, as reported in the batteries technical specifications.

### ***1.6.2. RD Module***

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The RD Module is an AC/DC converter, composed of an input rectifier bridge followed by a capacitive filter, a chopper section with power factor correction (PFC), and an inverter section that supplies the steady output voltage. The analogue regulation section allows the paralleling of the RD Modules outputs and includes all the protections. The power regulation is performed by means of a pulse width modulation signal. All the operation is under the control of a microprocessor.

The microprocessor on board configures the set-points and manages the start/stop procedure according to the current operation status and data received from SCU.

The RD Module is cooled by means of a controlled speed fan on board.

The Operator Interface includes n. 2 signaling LEDs:

<b><i>LED</i></b>	<b><i>Status</i></b>	<b><i>Description</i></b>
Upper LED	<i>GREEN</i>	RD Module ON
	<i>YELLOW</i>	Overload or over temperature
	<i>RED</i>	RD Module OFF
Lower LED	<i>RED</i>	Generic Alarm
	<i>OFF</i>	Normal operation

#### ***Features***

- Parallel operation.
- Load sharing.
- Selective disconnection in case of fault.
- Soft-start.
- Hot-plug.
- Plug and play.
- Current calibration and voltage limitation.

#### ***Protections***

- Internal AC input fuses.
- Overload protection: output continuous short circuit sustained.
- Output over voltage protection with selective disconnection.
- Slow front input over voltage protection: temporary shutdown when thresholds are exceeded.
- Steep front input over voltage protection: varistors protection.
- Over temperature protection: derating over the first temperature threshold, shutdown over the second temperature threshold.

ELECTRICAL FEATURES			
INPUT			
Input voltage	230Vac 1ϕ+n		
Max variation on input voltage without power de-rating	-20% ÷ +20%		
Max variation on input voltage with power de-rating	-60% ÷ +35%		
Frequency	50/60Hz ± 5Hz		
Input current	≤ 16,3A @ Vin = 195Vac		
Power factor	≥ 0.99		
Absorbed current distortion THD	≤ 4,5% (EN 61000-3-2)		
OUTPUT			
Rated output voltage	48Vdc		
Max output voltage	57.6Vdc		
Floating-charge voltage (hermetic AGM batteries at 20°C)	54,48Vdc (AGM)	53,52Vdc (GEL)	
Voltage stability (in static condition)	< 1%		
Voltage stability (in dynamic condition)	< 5%		
Transient duration	< 10ms		
Alternate residual ripple	0.7mV psophom	50mV eff	100mVpp
Rated output current	50A		
Max output current (overload)	105% of the rated current		
Load sharing among the RD Modules without SCU	< 15%		
Load sharing among the RD Modules with SCU	< 5% or better		
Response for dynamic mains variations from -15% to +10%	≤ 8% per 5ms		
Response to dynamic load change of 50%	≤ 8% per 5ms		
ACOUSTIC NOISE			
Measured in open field at 1.5 m from the EUT and at 1.3 m of height from the floor	≤ 50dB		
THERMAL FEATURES			
Dissipated Power	200 kcal/h		
Cooling	Four speed controlled fans on board		
MECHANICAL FEATURES			
Dimensions W x D x H	231 mm x 350 mm x 1U		
Weight	4Kg		
Electrical connection	HOT-PLUG (Input/Output/Signals) rear side		
Insertion	Frontal		

## 1.7. Identification label

The Identification Label provides the following information for each system:

- System description
- Type
- Contract Number
- AC Input Specifications
- DC Output Specifications
- Modular System Serial Number
- Production Date
- Years of Warranty
- End of Warranty

## 2. INSTALLATION REQUIREMENTS

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### 2.1. Electrical plant

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The system can be powered by a backup generator set or by the public energy distribution network.

The input cables section is fixed by the installer according to the absorbed current.

The maximum phase current absorbed by the fully equipped system is reported in the section 1.5.

NOTE: Kindly refer to : “INSTALLATION MANUAL”

### 2.2. Installation site

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The system can be placed on the floor, against the wall or back-to-back with other devices.

Close all the building work and accurately remove dust and waste, before starting the installation.

The installation site has to be dry and clean (humidity and dust can damage the equipment).

Do not install the modular system under hydraulic pipes or similar installations.

NOTE: Kindly refer to : “INSTALLATION MANUAL”

#### 2.2.1. Access

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The installation site access have to facilitate the introduction of the cabinet, whose dimensions are reported in the section 1.5.

#### 2.2.2. Load imposed on the floor

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Due to its modular structure, the system load imposed on the floor depends on the final configuration, dimensions and full equipment weights are reported in the section 1.5.

NOTE: Kindly refer to : “INSTALLATION MANUAL”



### ***2.2.3. Climatic requirements***

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The climatic specifications, reported in the section 1.5, have to be satisfied both in storage and operating conditions. The installation site has to assure the proper cooling of the equipment, taking also into account the power dissipated by system (see section 1.5).

To prevent critical ventilation conditions for the system, no heat source must be near the cabinet. The air temperature around the system should be as low as possible. No obstruction must interrupt the natural convective cooling air path through the vents on the front panel and on the roof of the cabinet.

If necessary, the protections against the fall of materials and dust on the roof and inside the system, must be placed at least at a distance of 0.5 m.

No object must be placed on the roof of the cabinet, it would reduces the air flow to the system.

<p><b><u>VIOLATING ANY OF THESE CAUTIONS COULD CAUSE THE LOCK-OUT OF THE SYSTEM BY ITS OVER-TEMPERATURE PROTECTION.</u></b></p>
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