

POWER-GATE™ Solid-State Devices

Dual Rectifier

Specification Sheet

Generation 3.0



Made in U.S.A



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

All devices, all voltages referenced to device ground, unless otherwise specified.

Symbol	Parameter	Min.	Max.	Units
V_A	Anode Voltage, Model DRxxxA	-0.3 ⁽²⁾	21 ⁽³⁾	Vdc
	Anode Voltage, Model DRxxxB	-0.3 ⁽²⁾	39 ⁽⁴⁾	
V_K	Cathode Voltage (anode voltage at min), Model DRxxxA	-0.6 ⁽²⁾	21 ⁽³⁾	Vdc
	Cathode Voltage (anode voltage at min), Model DRxxxB	-0.6 ⁽²⁾	39 ⁽⁴⁾	
$V_{R, \text{gndfloat}}^{(5)}$	Reverse Voltage (ground floating), Model DRxxxA	-	21	Vdc
	Reverse Voltage (ground floating), Model DRxxxB	-	39	
$I_{F, \text{gndfloat}}^{(5)}$	Forward Current (per rectifier, ground floating), DR050x	-	5	A
	Forward Current (per rectifier, ground floating), DR100x	-	10	
	Forward Current (per rectifier, ground floating), DR150x	-	15	
	Forward Current (per rectifier, ground floating), DR200x	-	20	
	Forward Current (per rectifier, ground floating), DR250x	-	25	
	Forward Current (per rectifier, ground floating), DR300x	-	30	
T_A	Ambient Temperature	-45	+110	°C
V_{ALTEXC}	Alternator Excitation Trigger Voltage	-39 ⁽⁶⁾	39 ⁽⁴⁾	Vdc

RECOMMENDED OPERATING CONDITIONS

All devices, all voltages referenced to device ground, unless otherwise specified.

Symbol	Parameter	Min.	Max.	Units
V_A	Anode Voltage, Model DRxxxA	7.5	18	Vdc
	Anode Voltage, Model DRxxxB	7.5	36	
V_K	Cathode Voltage (anode voltage at min), Model DRxxxA	7.5	18	Vdc
	Cathode Voltage (anode voltage at min), Model DRxxxB	7.5	36	
T_A	Ambient Temperature	-40	+105	°C
V_{ALTEXC}	Alternator Excitation Trigger Voltage	0	36	Vdc

ELECTRICAL SPECIFICATIONS

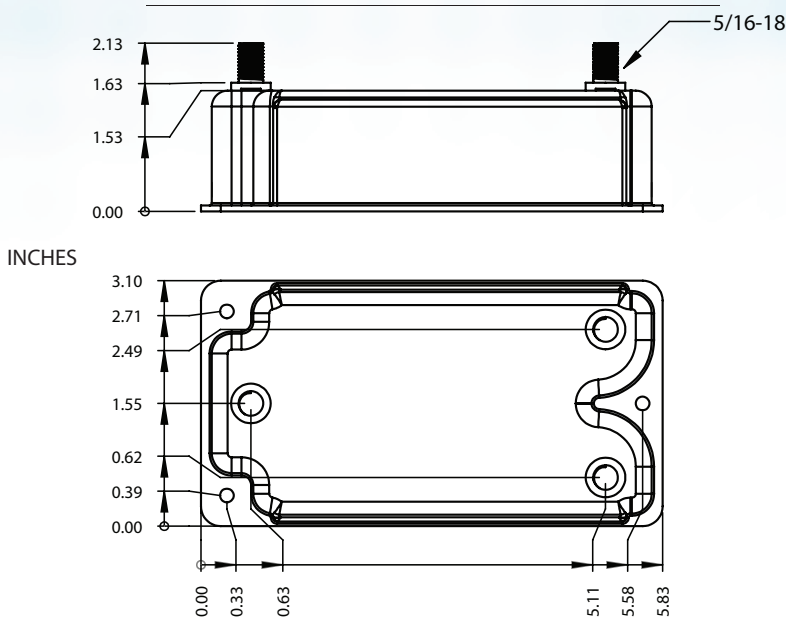
All devices, all voltages $T_A = +25 \pm 3 \text{ }^\circ\text{C}$, $7.5 \text{ V} \leq V_A$ (DRxxxA) $\leq 18 \text{ V}$, $7.5 \text{ V} \leq V_A$ (DRxxxB) $\leq 36 \text{ V}$,
All LEDs enabled, unless otherwise specified; all voltages referenced to ground.

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_{F,MAX}$	Maximum Forward Continuous Current (per rectifier)	-	-	50	A	Model DR050x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
		-	-	100		Model DR100x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
		-	-	150		Model DR150x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
		-	-	200		Model DR200x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
		-	-	250		Model DR250x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
		-	-	300		Model DR300x, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
$I_{SURGE,MAX}$	Maximum Forward Surge Current (per rectifier)	-	-	$5 \times I_{F,MAX}$	A	Pulse width = 2 s, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
V_F	Forward Voltage Drop	-	30	40	mV	DR050x, DR100x, DR150x, Forward Current = $I_{F,MAX}$
		-	40	45		DR200x, DR250x, Forward Current = $I_{F,MAX}$
		-	45	50		DR300x, Forward Current = $I_{F,MAX}$
		-	-	90		Forward Current = $I_{F,MAX}$, $-40 \text{ }^\circ\text{C} \leq T_A \leq +105 \text{ }^\circ\text{C}$
I_S	Operating Current (per rectifier) ⁽⁷⁾	0.77	-	-	mA	$V_K = 7.5 \text{ V}$, $V_A = V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	0.84	-		$V_K = 12 \text{ V}$, $V_A = V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	-	0.95		$V_K = 18 \text{ V}$, $V_A = V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	1.01	-		Model DRxxxB, $V_K = 24 \text{ V}$, $V_A = V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	-	1.25		Model DRxxxB, $V_K = 36 \text{ V}$, $V_A = V_{ALTEXC} = 0 \text{ V}$, Combine not active
		22.5	-	-		$V_A = 7.5 \text{ V}$, $V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	22.9	-		$V_A = 12 \text{ V}$, $V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	-	23.5		$V_A = 18 \text{ V}$, $V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	23.7	-		Model DRxxxB, $V_A = 24 \text{ V}$, $V_{ALTEXC} = 0 \text{ V}$, Combine not active
		-	-	24.4		Model DRxxxB, $V_A = 36 \text{ V}$, $V_{ALTEXC} = 0 \text{ V}$, Combine not active
I_R	Reverse Leakage Current	-	-	10	μA	DRxxxA, $V_K = 7.5 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	30		DRxxxA, $V_K = 12 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	140		DRxxxA, $V_K = 18 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	7		DRxxxB, $V_K = 7.5 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	15		DRxxxB, $V_K = 12 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	30		DRxxxB, $V_K = 18 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	75		DRxxxB, $V_K = 24 \text{ V}$, $V_A = 0 \text{ V}$
		-	-	1.2		DRxxxB, $V_K = 36 \text{ V}$, $V_A = 0 \text{ V}$
		$V_{ALTEXC,ON}$	Alternator Excitation Trigger On Voltage	1.8	-	-
$V_{ALTEXC,OFF}$	Alternator Excitation Trigger Off Voltage	-	-	1.7	V	
I_{ALTEXC}	Alternator Excitation Trigger Current	-	10	-	μA	$V_{ALTEXC} = 1.8 \text{ V}$
		-	60	-		$V_{ALTEXC} = 12 \text{ V}$
		-	170	-		$V_{ALTEXC} = 24 \text{ V}$
		-	290	-		$V_{ALTEXC} = 36 \text{ V}$
$t_{ALTEXC,DELAY}$	Alternator Excitation Delay Time	-	4	-	s	
$t_{ALTEXC,ACTIVE}$	Alternator Excitation Active Time	-	60	-	s	

NOTES:

- 1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. Exposure to any absolute maximum rating condition for extended periods may affect device reliability and lifetime.
- 2) Larger negative voltages will blow internal fuse. If fuse blows, as long as V_A is not more negative than -21/-39 V for model DRxxxA/DRxxxB, respectively, and is less than V_{KR} , no damage to device will occur. Call manufacturer to replace blown fuse.
- 3) Transient-protected to 40 V. Additional external protection may be required in some applications.
- 4) Transient-protected to 60 V. Additional external protection may be required in some applications.
- 5) Using the rectifier with the device ground disconnected is not recommended. Exceeding any of these ratings will cause excessive heat buildup, leading to MOSFET failure.
- 6) Transient-protected to -60 V. Additional external protection may be required in some applications.
- 7) I_S sourced from cathode (anode), when $V_A < V_K$ ($V_A > V_K$).

MECHANICAL SPECIFICATIONS



ADDITIONAL INFORMATION

Electronic assembly inserted into ABS encapsulation shell then backfilled with black, flame retardent, filled epoxy specifically developed for the potting of electronic modules. Modules are non-serviceable and non-repairable.

Three integrated mounting holes pre-drilled to .180"

Brass mounting posts, 5/16-18 x .50" with provided brass washers and nylon insert 5/16-18 nuts. Mounting torque not to exceed 75 inch-pounds or 8.5 newton-meters.

TYPICAL PERFORMANCE

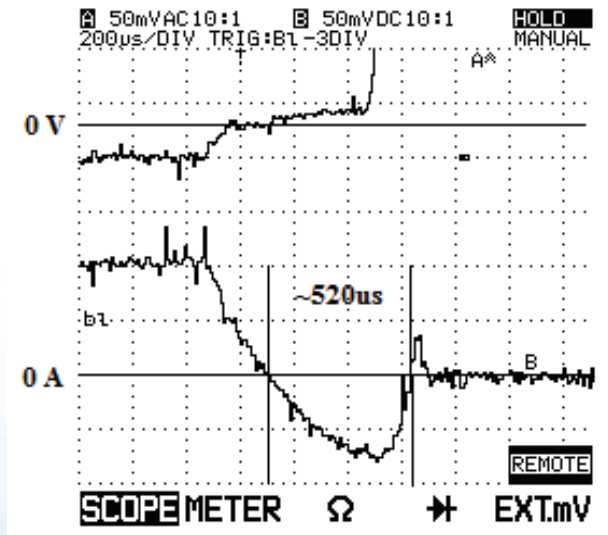


Figure 1: Reverse Current Shutdown Performance
Top Trace: $V_K - V_A$
Bottom Trace: Forward Current, I_F (50A/div)

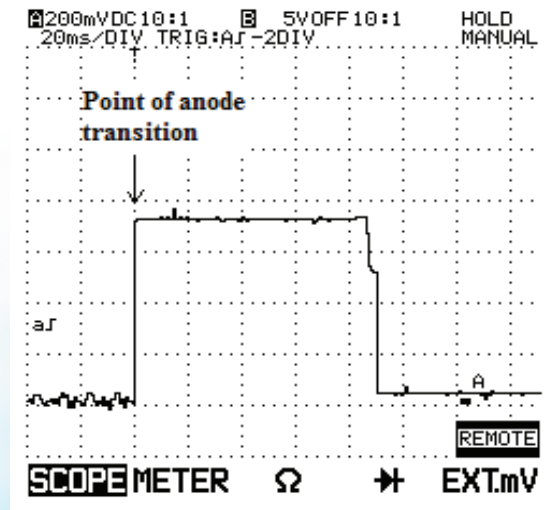


Figure 2: Start-Up Forward Voltage Drop
Trace: V_F
 V_A : 0 to 12.5 V, I_F = 100 A

FUNCTIONAL BLOCK DIAGRAM

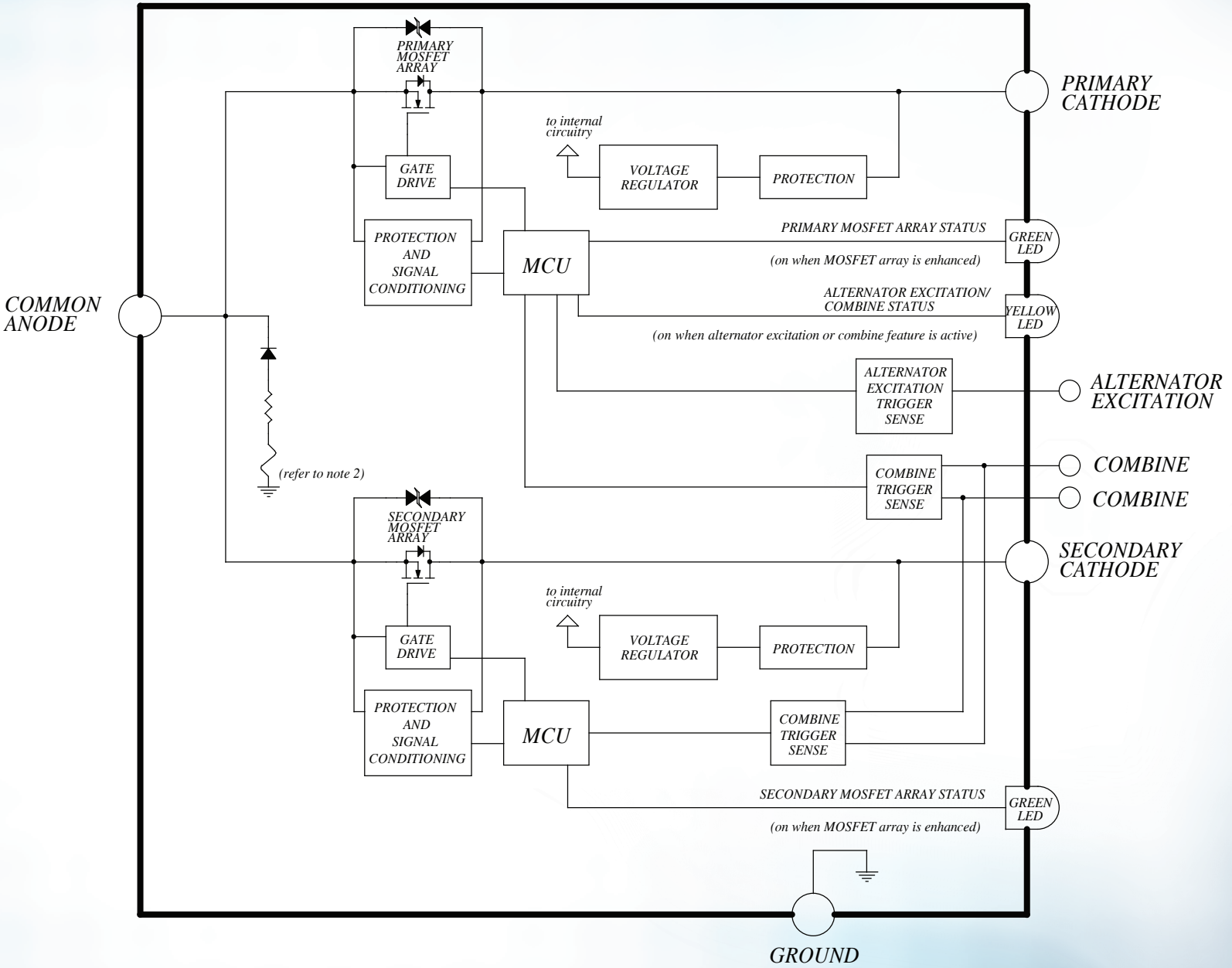
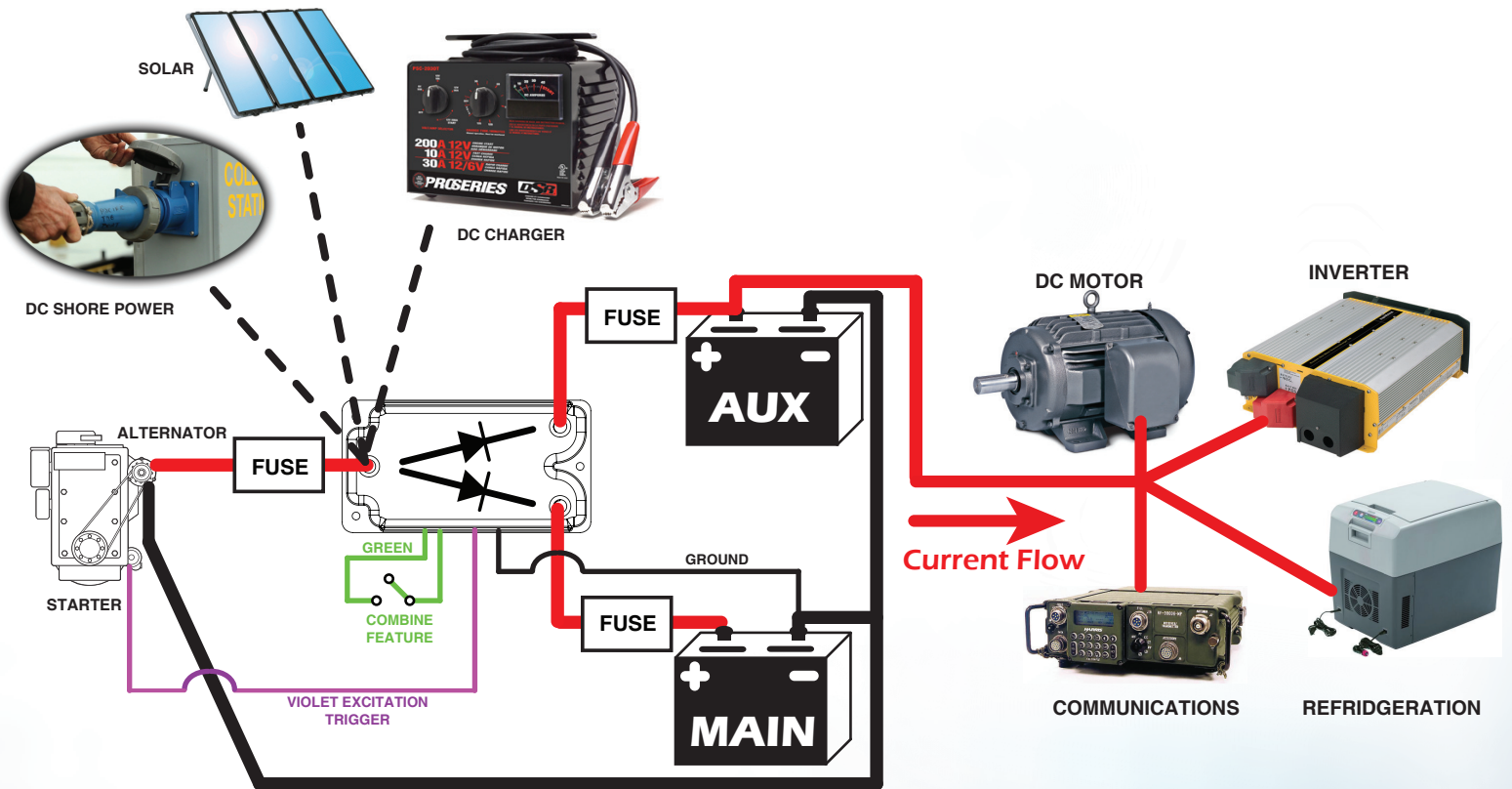


Diagram 1

POWER-GATE Dual Rectifier allows all batteries in the network to be charged. In Diagram 1, the alternator (or alternate charging source like DC shore power, solar array, or DC battery charger) is applying charging current to the anode (input) post of the rectifier. Current passes through two independent MOSFET arrays to Main Battery cathode and Auxiliary Battery cathode. Loads applied to the Auxiliary Battery are isolated from the Main Battery just as Main Battery loads are isolated from Auxiliary Battery.


The Violet alternator excitation circuit insures that internally regulated alternators are energized by the downstream battery during the engine cranking process, a necessity when placing an isolator between the alternator and the batteries.

The optional Battery Combine feature causes bi-directional current flow between the two batteries when the two Green wires are joined together. Should the Main Battery be discharged to a low, no-start condition, the Auxiliary Battery can be "jumped" to the Main Battery. The use of a momentary switch is recommended to insure the battery combine feature is disabled by default.



REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER (S)
0	02/28/14	Original Release	
1	05/20/14	Comprehensive Update	

 DANGER / PELIGRO / DANGER /GEFAHR / PERICOLO / PERIGO					
<p>HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH.</p> <ul style="list-style-type: none"> Disconnect all power before installing or working with this equipment. Verify all connections and replace all covers before turning on power. <p>Failure to follow these instructions will result in death or serious injury.</p>	<p>RIESGO DE DESCARGA ELECTRICA O EXPLOSION.</p> <ul style="list-style-type: none"> Desconectar todos los suministros de energia a este equipo antes de trabajar con este equipo. Verificar todas las conexiones y colocar todas las tapas antes de energizar el equipo. <p>El incumplimiento de estas instrucciones puede provocar la muerte o lesiones serias.</p>	<p>RISQUE DE DESCHARGE ELECTRIQUE OU EXPLOSION</p> <ul style="list-style-type: none"> Eteindre toutes les sources d'énergie de cet appareil avant de travailler dessus de cet appareil Vérifier tous connections, et remettre tous couverts en place avant de mettre sous <p>De non-suivi de ces instructions provoquera la mort ou des lésions sérieuses.</p>	<p>GEFAHR EINES ELEKTRISCHE N SCHLAGES ODER EINER EXPLOSION.</p> <ul style="list-style-type: none"> Stellen Sie jeglichen Strom ab, der dieses Gerät versorgt, bevor Sie an dem Gerät Arbeiten durchführen Vor der Inbetriebnahme alle Anschlüsse überprüfen und alle Gehäuseteile montieren. <p>Unterlassung dieser Anweisungen können zum Tode oder zu schweren Verletzungen führen.</p>	<p>RISCHIO DI SCOSSA ELETTRICA O DELL'ESPLOSIONE.</p> <ul style="list-style-type: none"> Spenga tutta l'alimentazion e che fornisce questa apparecchiatura prima del lavorare a questa apparecchiatura Verificare tutti i collegamenti e sostituire tutte le coperture prima della rotazione sull'alimentazione <p>L'omissione di seguire queste istruzioni provocherà la morte o di lesioni serie</p>	<p>RISCO DE DESCARGA ELÉTRICA OU EXPLOSÃO</p> <ul style="list-style-type: none"> Desconectar o equipamento de toda a energia antes de instalar ou trabalhar com este equipamento Verificar todas as conexões e recolocar todas as tampas antes de religar o equipamento <p>O não cumprimento destas instruções pode levar à morte ou lesões sérias.</p>