POWER-GATE™

Solid-State Relays and Switches

POWER-GATE™ is 99.9% efficient at full current.

You work hard and play hard. You need your equipment to do the same. At Perfect Switch, LLC, our goal is to manufacture products that provide better value through increased performance, reliability, and quality. Using tomorrow's engineering technology today, our dedicated team designed ***POWER-GATE*** ™ to be a reliable partner in the toughest conditions.

More efficient and reliable than mechanical contactors, switches, and solenoids, our solid-state, high-current relays and switches set the benchmark to which all others aspire. Utilizing a unique manufacturing process, we create products that reach plateaus of efficiency that elude the competition. We call it "The Perfect Switch," and that's precisely what ***POWER-GATE*** ™ is.

Need to switch electrical loads on boats, cars, RV's, buses, emergency vehicles, photovoltaic arrays or equipment? ***POWER-GATE*** ™ is the solution.

Need to switch 8 to 32 volt loads up to 500 continuous amperes with no arcing, no moving parts, and no degradation over time? ***POWER-GATE*** ™ is the solution.

Contact us and find out if ***POWER-GATE*** ™ **is the solution you've been searching for.**

Made in U.S.A. www.perfectswitch .com U.S. & Foreign Patents Pending

Technical Specifications

Applications:	Military, aeronautic, automotive, marine, industrial machinery, photovoltaic, fleet utility.
DC Current Capacity:	10 to 32 VDC Up to 500 amperes continuous. 28 to 60 VDC Up to 300 amperes continuous. (see figure 1)
ON-Resistance:	50 to 100 millionths of an Ohm. This is equivalent to 2.5 to 4 inches of 4AWG welding cable.
Control Voltage:	Factory configured 5 to 48 VDC required to activate switch. Input resistance for control voltage is 10k ohms.
Turn-on Time:	Less than one millisecond (see figure 2).
Turn-off Time:	Less than twenty milliseconds (see figure 3).
Temperature Rise:	< 25 degrees C above ambient temperature.
Leakage Current:	Leakage current to the load (relay off) is < 1mA, typically <1uA.
In-Rush Current:	Four times rated continuous current decaying to the rated current level within fifteen milliseconds. Will permit 300% of rated current for up to 250 milliseconds, once per 30 seconds.
Under-Voltage:	The device will shut down when the supply voltage drops below 7.75 volts.
Transient Voltages:	When transient voltage spikes, the device will turn on until the spike is absorbed.
Over-Current:	Current greater than the continuous rating for 500 milliseconds may cause the device to latch off, requiring the control voltage to be toggled off and back on to restore operation.
Efficiency Rating:	99.9 % at full current.
Weight:	18.56 oz (0.526kg)
Enclosure:	Stainless steel shell with full epoxy encapsulation.
Terminals:	3/16" x 1.5" silver-plated copper buss with 5/16-20 x 5/8" hex-head bolt/washer/nut.
Other Information:	Single external black ground wire for control circuit. Operating temperature -20°C to +85°C. Remote switch w/ wire harness or built-in micro-switch. Remote LED status display (optional). No heat-sinking required. Water-proof, shock-proof, vibration-proof, bomb-proof. Custom configurations welcome. Made in the U.S.A.

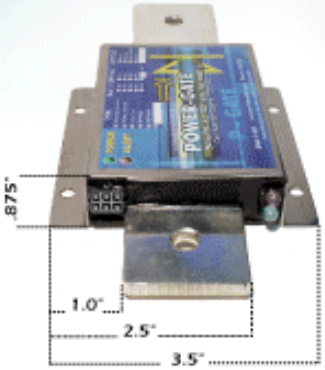


Figure 1

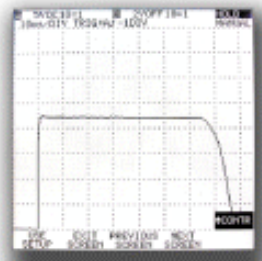


Figure 2

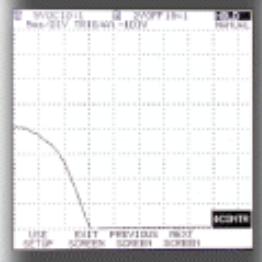
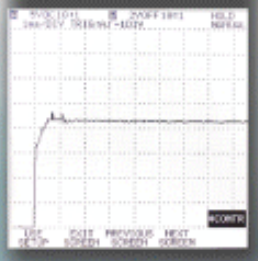


Figure 3



ACTUAL SIZE

POWER-GATE INSTALLATION INSTRUCTIONS
RY-Series Relay

REV 2, UPDATED 7.23.07

Congratulations on your POWER-GATE purchase! POWER-GATE is designed to provide years of trouble-free operation. Please read the instructions in their entirety prior to undertaking installation. Like any work performed around batteries, electrical circuits, vehicles, and moving parts, exercise caution to insure safe installation and use. If you are not familiar with batteries, electrical circuits, or basic auto/marine-electrical architecture, seek the assistance of a professional installer. Failure to install POWER-GATE correctly may cause poor performance, premature product failure, personal injury, or possibly damage to the vehicle or vehicle accessories.

The manufacturer is not responsible for damage incurred due to improper installation.

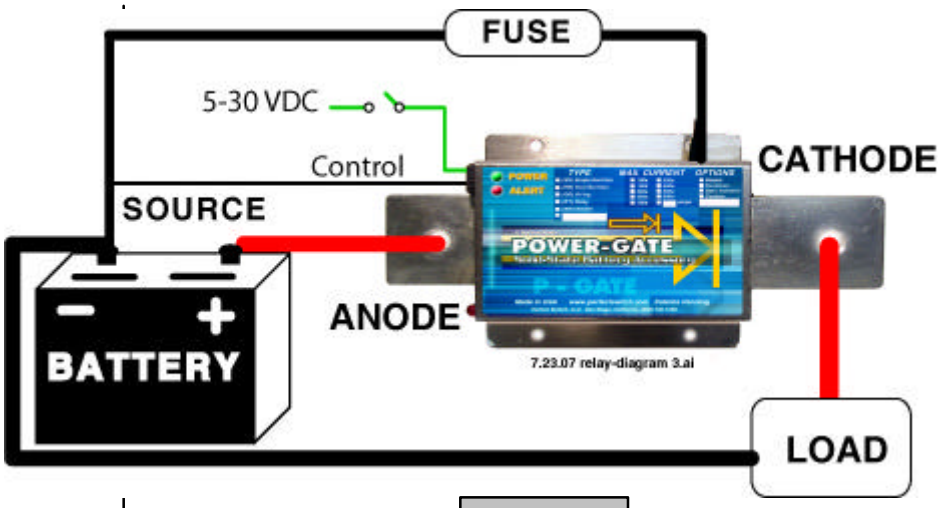
PRE-INSTALLATION

PACKING LIST:

- POWER-GATE Relay
- Self-tapping mounting screws, #6 x 1/2 (4)
- Vinyl blade insulators (2)
- Brass bolts, 5/16-20 x 3/4 (2)
- Brass nuts, 5/16-20 (2)
- Brass washers, 5/16 (2)
- Ground lead
- Installation and Data sheets
- Control cable assembly

WHAT YOU WILL NEED:

- Copper lugs for cable terminations
- Digital multi-meter
- 1/4 inch nut driver
- 5/16 inch nut driver
- 5/16 end wrench
- 20 AWG black wire for ground extension
- Wire stripper
- Lug crimper
- Soldering torch, solder, and flux



See note below

INSTALLATION INSTRUCTIONS

Step 1 With engine off, remove all wires and cables from negative terminal of all batteries.

Step 2 Select desired location for POWER-GATE Relay; keep the following points in mind:

- Distance to the load (s) and battery.
- Easy access to POWER-GATE
- Footprint doesn't conflict with other wires, cables, reservoirs, rotating parts etc…
- Adequate distance from high-heat sources like exhaust manifold

Step 3 Mount POWER-GATE with provided #6 x ½ self-tapping screws.

Step 4 Connect POWER-GATE ground wire to good electrical ground (ex. battery negative terminal) **before proceeding to Step 5**.

Step 5 Connect cable(s) to POWER-GATE "BATTERY POS." and "LOAD(S)" as shown in the above diagram and insulate appropriately.

Step 6 Control or activation voltage is connected to pins 1(-) and 3(+) of the connector opposite the light emitting diodes. Connect control cable assembly as shown in diagram and insulate appropriately. **BLACK** wire to GROUND, **GREEN** wire to control voltage.

Step 7 **BEFORE RECONNECTING BATTERIES**, verify that your installation matches the diagram.

Step 8 Restore ground connections on both batteries.

NOTE:
Part Number 500613D, Control voltage is 18 to 32 VDC and has a red signal wire in the Molex wire harness.

HOW POWER-GATE™ FUNCTIONS

The POWER-GATE™ Module is an extremely efficient electrical switch. When activated, it conducts more efficiently than the cables attached to it. Its operation is similar to other relays, but with three MAJOR differences: The contact voltage drop is extremely low and MOST importantly remains low with continued operation; the energy required to activate the relay is extremely low….less than 1% of most solenoid switches and electrical relays, and there is no arc when the switch opens!

The **GREEN** LED will illuminate when the control voltage is activated. The Green LED may flash when the supply voltage is initially connected.

The **RED** LED will flash in the event of a transient voltage spike that exceeds 38 volts with respect to ground.

POWER-GATE™ is encapsulated to provide rigidity, and protection from chemicals, dirt, and moisture. It is non-serviceable and non-repairable.

See reverse side for more information…..

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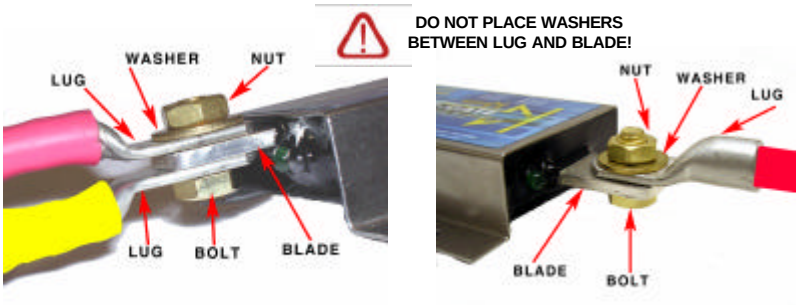
MADE IN THE USA

CONNECTING CABLES TO POWER-GATE™

POWER-GATE™ does not use cooling fins commonly present on high-current switches. It is critical that cable connections to anode and cathode provide optimum surface area contact for two reasons: proper cooling and proper current conductivity. Orient cable lugs on anode and cathode as indicated in the pictures below:



AWG Size American Wire Gauge	Resistance in Milliohms per foot	Voltage Drop Per Foot	
		at 100 amps	at 400 amps
00	.078	.0078V	.078V
0	.098	.0098V	.098V
1	.124	.0124V	.124V
2	.156	.0156V	.156V
3	.197	.0197V	.198V
4	.249	.025V	.25V
6	.395	.039V	.39V
10	.999	.1V	1.0V

For current levels exceeding 250 amperes, we recommend using specially manufactured, high-current flat cabling with integrated fusion lugs specifically designed for low voltage-loss, high-current applications.

CONNECTING LUGS TO CABLES

POWER-GATE™ is engineered to transfer electricity at peak performance levels approaching 99.9%. Unfortunately, most installers often overlook electrical joints between cables, lugs, and battery terminals. POWER-GATE™ is one part of a complete electrical *system*; cables and connection points require just as much attention as the connections to POWER-GATE™ itself.

- Cables should be flexible, free of oxidation, and coated with neoprene or some sort of insulation
- Cable cross-section should be appropriately sized for the distance and peak current being transferred.
- Lugs made of copper or silver-plated copper are good conductors.

Creating a good joint between cables and connectors insures efficient transfer of electricity. Lugs should be soldered to cables; hand crimping *does not* provide enough compression for a good joint. To properly connect cable to lug:

1. Strip cable's insulation material exposing copper strands of cable.
2. "Tin" copper strands by first covering with solder flux. Heat copper strands with torch until solder melts into copper strands. The goal is to pre-saturate or solder-pot the copper strands with solder.
3. Insert solder slugs into lug barrel followed by tinned cable.
4. Use torch to heat lug and cable. When the solder slugs melt, molten solder from tinned cable and solder slugs will combine while inserting cable into lug.
5. Remove heat and allow lug and cable to cool.
6. Once cool, use heat shrink wrap or electrical tape to create moisture barrier between cable insulation and lug.

This method should produce a sound electrical joint. Later, use a digital multimeter to insure connection is less than .01 volts at 100 amps.

Example: five and one-half feet of 4AWG drops .34 volts at 250 amps.
Reminder: Don't forget to include all cables in determining length; positive cables and ground cables. The resistance of each connection adds to the total voltage drop and typically will exceed the drop in the cables.

THIS SPACE FOR NOTES

POWER-GATE ONE-YEAR LIMITED WARRANTY

Perfect Switch, LLC. warrants the POWER-GATE against all defects in materials and workmanship for a period of one year from the date of the original purchase, subject to the following terms and conditions:
This warranty does not apply if the serial number or housing of the product has been removed or if the product has been subjected to physical abuse, improper installation, water damage, corrosion due to sea salt, road salts, or de-icing chemicals, transient voltage spikes, or modification.

To obtain warranty service, please contact the manufacturer for a Return Materials Authorization (RMA) number. The product must be returned, insured and shipping prepaid, to Perfect Switch, LLC at the address below, in its original packaging or a suitable equivalent, along with the purchaser's receipt and written description of the problem.

Perfect Switch, LLC's responsibility under this warranty is limited to repair or replacement of the product or refund of its purchase price, at the sole discretion of Perfect Switch, LLC. Perfect Switch, LLC. disclaims all other warranties, expressed or implied, including warranties of merchantability and fitness for any particular purposes whatsoever, and no other remedy shall be available including without limitation, incidental or consequential damages, loss of time, inconvenience, or commercial loss. In no event shall Perfect Switch, LLC's liability exceed the purchase price of the product in question.

Some states do not allow the exclusion or limitation of incidental or consequential damages of how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific rights. You may have other legal rights which may vary from state to state. Perfect Switch, LLC. wants you to be satisfied with its products. Should you have any difficulties with the operation or performance of your POWER-GATE multi-battery accessory, please the manufacturer.

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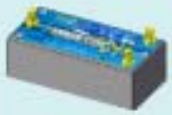
MADE IN THE USA

	Amperage 100	Amperage 150	Amperage 200	Amperage 250	Amperage 300	Amperage 350	Amperage 400	Amperage 500	Amperage 600
 **Single Rectifier Isolator**	278	298	318	333	348	363	378	408	448
 **Dual Rectifier Isolator**	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
 **Switch** (Built-In Micro Switch)	268	288	308	323	338	353	368	398	438
 **Relay** (Remote Switch)	290	310	330	345	360	375	390	420	460

Type	Current Rating in Amps	Options
SR = Single Rectifier DR = Dual Rectifier RY = Relay SW = Switch	100, 150, 200 250, 300, 350 400, 500, 600	B = Beeper O = Opto Isolation X = Custom

(example: RY-400-O relay configuration, 400 amp continuous, opto isolation)

25-99 units - 10% discount
100+ units - 15% discount

7/15/2006

Add $19 for opto-isolation.
Add $19 for Beeper.
All prices reflect U.S. dollars.
We reserve the right to adjust pricing without prior notice.
Shipping terms FOB, San Diego, California
Custom Engineering Available for Special Applications
For specifications and information on any of the products we manufacture, please visit our website at www.perfectswitch.com

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RELAY / LOW VOLTAGE / HIGH VOLTAGE

Some of the options(o) or features (#) (meaning characteristics that are available as standard) available on our devices are:

o Opto Isolation between the activation and the switching circuits

 # Lightning Rod will turn on the MOSFET array if the voltage appearing across the array itself approaches the avalanche or breakdown voltage thereby absorbing the transient energy safely, protecting other elements on the vehicle as well as the POWER-GATE itself

o Regulation transfer allows the operating voltage for the driver circuitry to consume minimum current while providing ultimate enhancement of the array

o Miller Killer prevents self turn-on of the array in the presence of high slew rate excursions on the Battery Positive terminal when the device is "off".

 # Current Surge monitoring to permit high current surges for a limited period of time and latching the unit off if the over current is sustained for greater than a selected time period, as well as establishing the level considered "over current".

 # Under-voltage and/ or over-voltage turn on or off the relay at customer specified levels between five and thirty-five volts DC.

o Time Delay will maintain the device in the on state for a specified time after the activation signal is turned off.

o Time Delay signaling provides an output to report the status of the array.

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POWER
ALERT
P-GATE
POWER-GATE
Solid-State Battery Accessory
SERIAL NUMBER
TYPE
(SR) Single Rectifier
(RY) Relay
(SW) Switch
(DR) Dual Rectifier
(LVD) Low V Disconnect
MAX. CURRENT
50a
75a
100a
150a
200a
250a
300a
350a
400a
500a
600a
OPTIONS
Opto Isolation
Combiner
Custom
12 Volts
24 Volts
Volts
TESTED AT
AMPS with a
mV DROP
Perfect Switch, LLC
www.perfectswitch.com
Made in USA
POWER-GATE™