

POWER-GATE INSTALLATION INSTRUCTIONS

RR- Rectifier/Relay Ideal Diode GEN 4.1 v3

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 Rectifier-Relay
- Control Harness, 1 meter length (optional)
- Nylon insert nuts, 5/16-18 (2)
- Brass washers, 5/16 hole size (2)
- Ground ring terminal w/ 6-32 screw
- Installation and Data sheets

WHAT YOU WILL NEED:

- Copper lugs for cable terminations
- Protection fuses or breakers as needed
- Drill and appropriate mounting hardware
- Digital multi-meter
- Torque wrench
- 16 AWG black wire for ground extension
- Wire stripper
- Lug crimper
- Soldering torch, solder, and flux



MOUNTING: Mount module on a flat surface. Failure to do so may cause "twisting" of the internal assembly and lead to mechanical breakdown.

CONNECTING LUGS TO CABLES

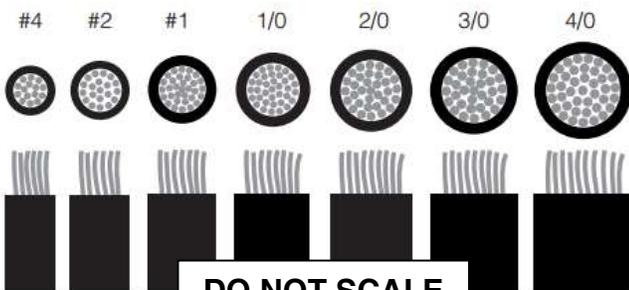
POWER-GATE™ is engineered to transfer electricity at peak performance levels approaching 99.9%. Unfortunately, most installers often overlook electrical joints between cables, lugs, and battery terminals. POWER-GATE™ is one part of a complete electrical system; cables and connection points require just 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.
- RR100 thru RR300, use at least #4 cable and preferably larger for better efficiency.
- RR400 applications, use at least 2/0 cable.
- RR500 applications, use at least 3/0 cable.
- RR600 applications, use at least 4/0 cable.
- Don't guess the correct cable size.
- Lugs made of copper, silver-plated copper, or tin-plated copper are good conductors.

Creating a good joint between cables and connectors ensures efficient transfer of electricity. Lugs should be soldered to cables or hydraulically crimped with industry standard crimping equipment. 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 multi-meter to insure connection is efficient at elevated current.



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 connection posts provide optimum surface area contact for two reasons: proper cooling and proper current conductivity.



Nut

Washer

Lug

Brass Flange

CRITICAL TORQUE VALUE

It is critical that a calibrated torque wrench is utilized when attaching nylon insert nuts to brass posts. Improper under-torque may cause unnecessary electrical resistance while improper over-torque may spin the brass assembly internally or possibly break off the brass post.

Use 5 foot-pounds on the 2 primary connection posts.

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 Module; keep the following points in mind:

- Distance to the alternator and batteries
- 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 device on a flat surface using the four mounting holes being careful not to exceed 5 foot-pounds of torque and appropriate hardware for your given installation. **Uneven twisting or torsional stress may cause damage to the internal electronics assembly.**

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

Step 5 Connect Pin 2 (**RED**) (device trigger input) to control or activation voltage.

Step 6 Connect cable(s) to POWER-GATE SOURCE and LOAD as shown in diagram. **FUSE** and insulate appropriately. Torque nylon insert nut to 75 inch-pounds +5/-0 (8.5 newton-meters).

Step 7 Connect cable(s) to POWER-GATE cathode as shown in diagram and insulate appropriately. Torque nylon insert nut to 75 inch-pounds +5/-0 (8.5 newton-meters)

Step 8 **BEFORE RECONNECTING BATTERIES**, verify that your installation matches the RR-Series diagram.

POST INSTALLATION CHECKOUT

Assumptions:

- Appropriate system trigger or control voltage is applied to Pin 8.
- SOURCE voltage the same or higher than LOAD voltage as referenced to the same ground.
- Cables and connections are pristine and electrically sound, not poor, corroded, or high resistance.

Using your digital multimeter, perform the following checks:

1. Read the DC voltage from the SOURCE post to ground. This should reflect the DC voltage of the SOURCE.
2. Read the DC voltage from the LOAD post to ground. This should reflect the DC voltage of the LOAD.
3. With one probe on the SOURCE post and one probe on LOAD post, the multimeter will reflect the difference between these two points and should reflect less than **0.05 volts**. If greater, disconnect batteries, as this indicates excessive current being transferred from the AUXILIARY battery to the MAIN battery. There should never be more than **0.05 volts** drop between the anode and cathode blades at **maximum rated current**.

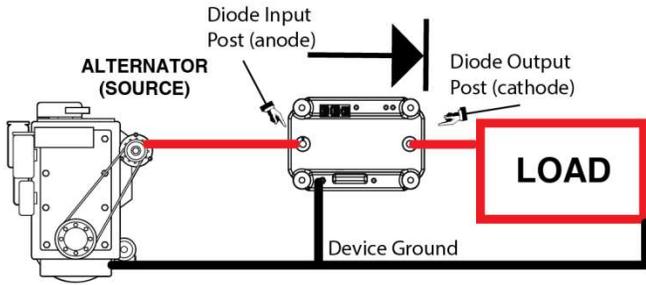
INSTALLATION INSTRUCTIONS

IDEAL DIODE

Module must be connected to a common system ground (battery or power supply negative) in order to function correctly.

Like a conventional diode, when anode voltage is more positive than cathode voltage, the MOSFET 'diode' will conduct. If cathode voltage becomes more positive than anode voltage, the device will go into 'diode' mode and cease to conduct current from cathode-to-anode.

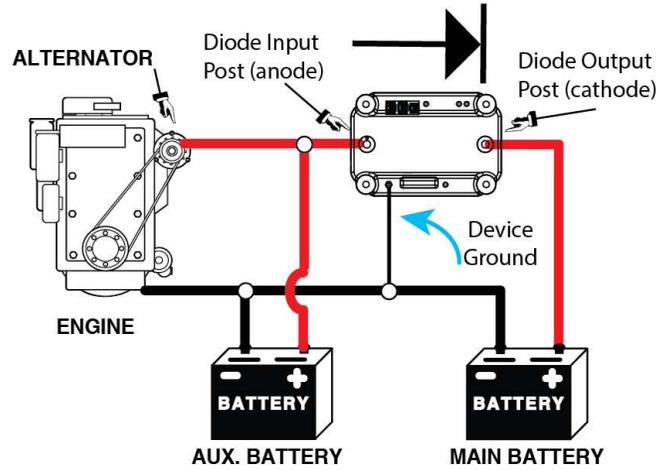
Ideal Diode sample diagram



Red LED will illuminate under these conditions:

- 1) Blinking RED LED indicates over-current. Amount of current exceeds device rating. Reduce current.
- 2) Steady-on RED LED indicates sensed fault condition. Remove device from service and contact manufacturer.

Dual Batteries sample diagram



HOW POWER-GATE™ FUNCTIONS

The POWER-GATE™ Module is an extremely efficient ideal diode. Current can always flow from the anode-to-cathode when the device is forward-biased, even if the device loses its ground connection which is required for the internal circuit board to operate properly. There is no way to stop the current flow in this case. The rectifier-relay has a modified MOSFET array that allows the user to trigger the device between two modes:

- 1) With the trigger not activated, current flow will be blocked in both directions (analogous to the operation of our bi-directional relay), even if the device is forward biased
- 2) With the trigger activated, the device will act like our standard single rectifier, allowing current to flow from anode-to-cathode when the device is forward biased, and blocking current from flowing from cathode-to-anode when the device is reverse biased.

You can think of the rectifier-relay as internally consisting of a bi-directional relay in series with a single rectifier.

The **GREEN** LED indicates the MOSFET array is enhanced and current can flow from anode-to-cathode.

If the **GREEN** LED is not illuminated, it means one or both of the following:

- the voltage at the cathode is more positive than the voltage at the anode and the device is in diode mode.
- trigger voltage is removed and the device is in its non-conducting mode

The **RED** LED will illuminate if the internal protection fuse is blown.

The **YELLOW** LED is not used in this configuration.

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

EXTERNAL LED HARNESS 6055 Rev C (Available upon request)

PIN	DESCRIPTION	LED COLOR
1	Array Status	Green
2	Empty	
3	Alternator Excite / Combine Active	Violet
4	Empty	
5	Empty	
6	Empty	
7	Empty	
8	Empty	
9	Array Fault	Red
10-18	Empty	

Connector housing Molex 51353-1800
Terminals Molex 56134-9000
Control harness, three meters, 24 AWG wires, -UL style 1007/1569
No strip on loose-wire end

All lines are active-low and should be voltage / current-limited to 60V / 50mA, respectively

CONTROL HARNESS 6057 Rev B (Available upon request)

PIN	DESCRIPTION	LED COLOR
1	Starter	Orange
2	Main Trigger + (not used for DR)	Red
3	Ignition	Violet
4	Empty	
5	Econo Trigger	Green
6	Empty	
7	Combine Trigger -	Brown
8	Combine Trigger +	Blue

Connector housing Molex 051353-0800
Terminals Molex 56134-9000
Control harness, two meters, 24 AWG wires, UL style 1007/1569
No strip on loose-wire end

Note to User: Depending on application, some wires shown may not be installed.

DEVICE FAILURE



Should POWER-GATE cease to function correctly for any reason, it is important to remove the device from the electrical circuit. Like any component in an electrical distribution circuit, if it is not functioning correctly, the POWER-GATE will dissipate heat as current passes through it. If ignored, heat related damage could result if a faulty device is not removed. Perfect Switch, LLC cannot be responsible in any way for ancillary damage to the vehicle and equipment installed in, on, or about the vehicle. Electronic components can cease to function at any time. It is the operator's responsibility to frequently assess the health of the electrical system to ensure a safe and reliable working environment.

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.

