Questions and Answers for Single Rectifiers

1) Can I use two different batteries?

As a general rule, it's best to run batteries of similar size, age, and chemistry. If you want to run batteries of dissimilar size, age, or chemistry, the Dual Rectifier is a better choice as each battery is isolated on a separate cathode.

2) How do I know what size Single Rectifier is needed for my application?

We're experts in a discipline called "high ratio geometry" where we determine how many MOSFET semiconductors must be arrayed in order to reliably handle a specific amount of current and voltage, within a specific temperature range. In a typical automotive application, the alternator's peak output is generally used to determine how much current may travel from the input to the output of the single rectifier. We break devices into 50 amp increments and recommend you take the alternator's stated current rating, add 20% for short-term peak load conditions, and select the amperage rating above that number. For example, if the alternator is rated at 140 amps, add 20% which is roughly 170 amps during short-term peak loads. So the correct Single Rectifier would be a 200 amp device for an alternator rated at 140 amps.

3) Why can't I combine batteries and self-jump with a Single Rectifier?

When using a Single Rectifier, current is allowed to flow from anode (input) to cathode (output) depending on how POWER-GATE senses voltage on anode and cathode. If the main battery (cathode) is being discharged, it forces the voltage low on the cathode side causing the anode side to read slightly higher relative to ground. As such when the main battery is being discharged, the auxiliary battery (anode) is flowing current from a point of higher voltage to a point of lower voltage through the POWER-GATE. So in short, if the main battery is being discharged, the auxiliary battery will *also* be discharged. If you require self-jumping, the Dual Rectifier allows for the independent discharge of the main battery so you can self-jump from the unaffected auxiliary battery to the main battery.

4) Really? No heat sinks? How is that possible?

Aluminum heat sinks are expensive, bulky, and necessary if you must convey heat away from the assembly for self preservation purposes. Our internationally patented MOSFET assemblies do not create heat of any significance and therefore radiating excess heat through convection is fundamentally unnecessary. Efficient power transfer is what separates POWER-GATE from everything else.

5) How does a Single Rectifier module work for two batteries?

The Single Rectifier is a single, high current, perfect diode. When placed between two batteries, the "diode" will either conduct current or block current depending on voltage sensed at the input

and output of the device. When discharging the auxiliary battery, the single rectifier is forced into its "blocking" mode, disallowing current to flow from main battery (cathode) to feed the load(s) attached to the auxiliary battery (anode). When the vehicle is running and the alternator is creating output, the elevated voltage on the anode forces the device to conduct current causing charging current to flow to the main battery (cathode). The anode is common to both the alternator and the auxiliary battery so the aux. battery also gets charged while the vehicle is running. In a dual battery application where each battery is to be isolated from the other, you must use two rectifier assemblies to accomplish this….and that's where our Dual Rectifier shines. However, if you are not concerned about main battery discharge, and you intend to purposely discharge the auxiliary battery, then a Single Rectifier serves that purpose at a more moderate price-point.

6) Why is it critical to join the two battery negative terminals with a common ground cable?

Just because a ground cable is connected to metal doesn't necessarily mean a good electrical ground is present. The alternator's regulator is designed to share a common ground with the battery that is being charged. If two batteries are installed, it's critical that each battery's ground is referenced to the regulator accurately. Dissimilar grounds can cause a charging imbalance which can lead to undercharging or overcharging of one or both batteries. The easiest way to insure an accurate, common ground between the alternator and each of the batteries is to physically run cabling between the grounds on all three components. Do not depend on frame or body grounds as they can be deceptively quality connections. If you run a ground cable from the alternator casing to battery A ground, and connect battery A ground to battery B ground, then the alternator and both batteries will be grounded at the same level.

7) What is the purpose of the alternator excitation trigger?

Internally regulated alternator derives their turn-on power for the regulator from the alternator output post which, in a normal electrical system, is connector to the battery positive. If the alternator output is NOT common with a battery, the use of the excitation trigger may be necessary. Generally speaking, when both main and auxiliary batteries are located on the same vehicle, the installation causes the auxiliary battery to be common with the alternator, and therefore the excitation trigger is unnecessary. However, if the auxiliary battery is located in a trailer that gets uncoupled from the vehicle, the use of the alternator excitation is necessary. We use the excitation trigger signal to determine when the vehicle is being cranked so we know when to activate the temporary excitation circuit. When this circuit is activated, we convey downstream battery power to the upstream alternator so the regulator can turn on and start creating charging current for the batteries. The excitation circuit stays active for the first 60 seconds after engine-start as indicated by the yellow LED indication on the POWER-GATE. After 60 seconds, the circuit de-activates and normal charging and battery isolation continues.

8) What size high current fuses should I use and why are they necessary?

Anytime you have a battery that can discharge to ground, a protection fuse is used to disrupt current flow. The fuse(s) should be placed as close to battery positive as possible and fuse(s) should be rated sufficiently high enough to allow typical current to pass, but sufficiently low enough to blow open quickly in the case of an over-current or shorted condition. Remember that in a typical Single Rectifier installation, the fuse(s) handle current flowing from the alternator to the battery(s), while accessories connected to the output of the battery(s) don't

necessarily draw the same amount of current through the fuse. For example, your winch may draw 400 amps but if the alternator is rated at 130 amps, 400 amps of winch current won't pass through the fuse because the alternator can only create 130 to 150 amps to meet that 400 amp load. Remember that fuses are cheap insurance verses burning your vehicle to the ground. If you have questions about fusing, contact us for guidance.

9) When used as an ideal diode, how does POWER-GATE function?

POWER-GATE utilizes a large MOSFET array to achieve peak input-to-output efficiency. A comparator constantly monitors voltage on the anode and cathode relative to the device ground. If the anode is the same voltage or higher voltage than the cathode, the MOSFET gates are enhanced allowing current to flow from anode-to-cathode. If the voltage on the cathode becomes more positive than anode, the MOSFETS are de-energized causing the body-diode layer of the MOSFETS to block current from cathode-to-anode. Ultra-low on resistance makes POWER-GATE ideal diodes when compared to silicon or Schottky components.