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Battery Isolator Overview

Motorhomes have been using battery isolators for many years, most are located under the bed / in the engine compartment. The Battery Isolator allows the engine alternator to charge both the house and starting batteries while isolating those battery banks from each other. By doing so, it will never allow you to discharge your starting batteries by using house lights or other appliances while not hooked up to shore power or running the generator.

The isolator accomplishes this by using a set of diodes that allow 12 VDC current to flow in one direction only. These diodes degrade and heat up as current flows through them. The hotter they get, the more resistance and less voltage they allow to pass through. In time, they will fail completely, not allowing the alternator to charge the batteries.

Isolator Details and Questions Answered

- It doesn’t matter how many batteries you have in a bank (Lets call Starting one “bank” and Coach another “bank”) if the batteries in a “bank” are connected plus to plus, negative to negative then it doubles the available amperage (if they are both 12 volt batteries then the result is still 12 volts) but the amperage is the sum of the batteries in the bank added together, you could have 2 or 200 batteries in parallel, It doesn’t matter. The voltage stays the same the available amperage increases.
- On the coach “bank” it's common to have 2 or more batteries to give you more AMP hours (Amps divided by load equal AMP hours available) IE: if we have 1000 amp hours capacity and use 10 amps of current per hour I have 100 hours use. But in reality we can only use 50% because we only want to discharge our batteries down to 50% to ensure long life.
- On the starting “bank” the reason we like more AMPS is that AMPS crank the motor over quickly. The voltage would drop considerably if we didn't have lots of amps to drive the starter. Starting batteries have different discharge rates than “coach ” batteries, IE: a starting battery can dump 600+ cranking amps to get the starter going but don't have long term reserve capacity.
- When you see a starting battery it says “reserve minutes” that’s the time that you supposedly can drive your car with the alternator failed and still have your headlights on to drive home at night and still keep the car running.
- The battery has NO bearing on the Isolator needed. The Isolator is only there to ensure that if one “bank” discharges due to use or failure – it doesn't take out the other bank down also, hence isolates the discharge of the “banks” You just don't want the isolator smaller than the rated output of the alternator for obvious reasons.
- The electricity you use to start or light your coach does not go through the Isolator. Only juice from the Alternator to battery “bank” goes through the Isolator.
- When you hit the Boost Solenoid it Parallels up the two bank's (Starting and Coach) to give you a huge boost in AMPS to get you started. It does this by when you activate the “boost” the solenoid (switch) closes and adds in the “coach” batteries to the positive terminal of the starting batteries before it gets to the starter. Since everything on the coach is a common ground, the negative sides of the coach batteries are already “paralled” up with the starting batteries.
- The reason your “Starting” bank does not charge from your inverter charger is that the same wire that connects the coach positive from the “coach” batteries to the Inverter to turn 12 volt to 110 is the same wire that charges the batteries when the inverter has shore power. It just reverses direction on the same wire. The inverter / charger does this internally.

Original Topic with further Discussion

Isolator Quick Test

Failure symptoms tend to follow a pattern of low voltage on the dashboard voltage meter one day, and then normal voltage the next. You may suspect the alternator or voltage regulator but often the Isolator is beginning to fail and not allow the voltage to pass through to the batteries.

A quick way to check an Isolator is to hook a volt meter from a battery ground source to the center post of the Isolator. Without the engine running you should have no voltage. If you have any voltage at all you have a diode failure, and the Isolator needs to be replaced.

Additional Testing Steps

The isolator can be further tested with a multimeter set on continuity; it should beep from the inner terminal out to each outer terminal. Should not beep across the two outer terminals and should not beep between the outer terminals and the inner terminals with the leads reversed from step one. The Isolator is a simple one way “valve” for electricity.

- First, measure the voltage at all three terminals of the isolator with the engine completely off. You should be able to read each battery voltage independently on each of the outside terminals. If there is voltage on the center terminal, one of the diodes in the isolator is faulty and the complete isolator must be replaced. (Some VOMs do have a diode test circuit to double check the diodes in the isolator). If voltage is only read on one of the two outside terminals, there is an open in one battery system.
- Next, start the engine and check the voltage at the center terminal of the isolator; it should be at least 13.8 volts and there should be an increase in the voltage measured at the two outside terminals, though it will be less than the center terminal. If you have access to a clamp-around DC ammeter, you will be able to measure the charging current on the alternator output wire.
- Additionally, be sure to check all the cable connections at each battery & in the circuit very carefully. I just ran across the same symptom as yours and found a corroded ground cable from the engine battery to the frame ground. If you are sure the alternator is functioning as it should and the isolator tests good, you just may have a cable problem.
- After checking the Isolator, I recommend getting out the wiring schematic and following each wire one by one to ensure that it is where it should go. Also check the continuity of the alternator Voltage Sense lead and make sure that it gets from the alternator to the positive terminal of starting batteries.
- Whether directly to the starting battery, the start battery terminal of the isolator or the start battery side of the Boost Solenoid, it doesn't matter which. Then check that the alternator has not lost its ground due to corrosion. Also remove the nut from the alternator excite terminal on the alternator, clean the connection thoroughly, tighten the nut that connects the stud to the alternator case and use an internal star tooth washer and a NYLOCK stainless steel nut to re-secure the Voltage Sense wire to prevent loosening and use Dielectric grease to prevent corrosion. In fact it's a good idea to clean each alternator terminal and use a star washer on each.
- If you need to replace the Isolator there is no particular order to removing or replacing the isolator. I would disconnect the negative on both the starting bank and the coach bank prior to any work, and make sure you are not on shore power, just to prevent arcs and sparks. The coach batteries are powerful enough to weld a wrench to the frame if the positive gets shorted to ground, that can be very dangerous.
- After getting the isolator replaced, then reconnect the negative battery terminals. You only need to disconnect the one negative terminal at the battery that goes to the frame on each bank. Not all the wires.
- You can use a three post isolator. It doesn't matter how many batteries you have, Just hook your alternator to the center post, the starting batteries to an outer post and the coach batteries to the other outer post. This is ALL you need. If the alternator needs remote volt sense then connect to start battery positive terminal . The boost solenoids “join” the battery banks external to the isolator. Just trace the wires one a time and you will

be fine. All you need is a three post isolator that exceeds the capacity of your alternator. IE: 160 amp alternator - 200 amp isolator.

- A 200 AMP isolator is fine, if you have a 180 amp alternator, only alternator current goes through the isolator, You will NEVER put 180 amps into the batteries, for one most batteries cannot handle 180 amp charge, and your alternator really only produces about 1/2 the rated output.