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P.M. Alternator/Regulator Troubleshooting Guide

The B&C Specialty products Permanent Magnet alternators are simple and extremely reliable. Occasionally harsh environments or improper installation may cause the system to not work properly. This trouble shooting guide addresses the most frequent areas of problems and provides some theory of operation to aid in diagnosis of the system.

Refer to Figure 1. All of B&C's "PM" alternators incorporate fixed stators around which a permanent magnet (PM) housing revolves to generate electrical energy. Since the winding is stationary, there are no brushes required to transfer electrical energy. This makes the alternators extremely reliable. Continuity of the winding may be checked with an ohmmeter to detect any broken wires in the leads or winding. Also check the drive coupling to make sure that the magnetic housing rotates with the engine crankshaft. If the housing rotates and the wiring is continuous there must be A.C. output. The A.C. output voltage varies with RPM as indicated in the figure.

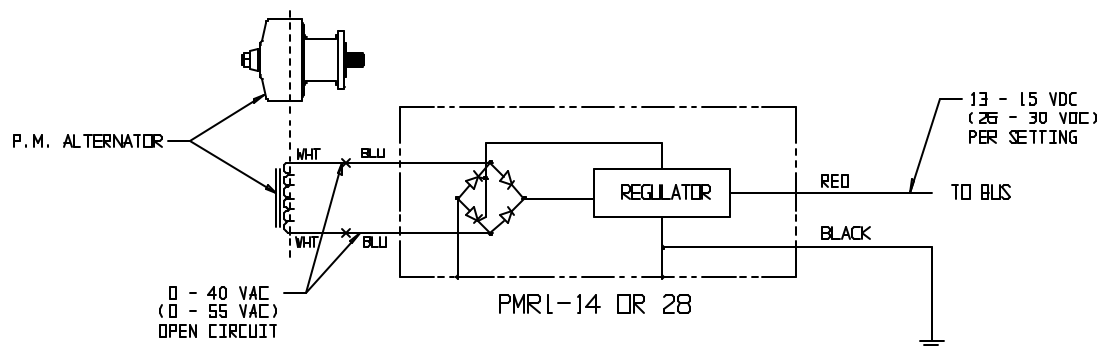


Figure 1

The PMR1-14/28 regulators are simple and solid state in design. They consist of a controllable full-wave bridge rectifier and regulator circuitry for controlling the bridge. The PMR1 changes the A.C. output of the alternator to D.C. for the bus at the desired set point. The black wire exiting the PMR1 case is connected to the case internally and should be connected to the negative (-) side of the battery according to the wiring diagram furnished with the PMR1. The red wire should go through a breaker and switch to the BUS and positive (+) terminal of the battery. Note that battery voltage must be applied across the red and black wires to power the regulator portion of the PMR1 before it is able to switch the bridge rectifier on.

The PMR1 set point is adjusted to 14.4V (28.8V) before it leaves the factory. If you are using a B&C battery, the regulator should not need to be adjusted at installation. Should adjustment be required, a .09" diameter screw provided in one corner of the PMR1 may be used for adjustment.

The voltage set point will vary at the rate of approximately 0.16 V (0.32V) per turn and rises with clockwise rotation.

The PM alternator system should reach minimum speed for regulation somewhere near run-up RPM depending on the set point and engine/alternator type. Rated output will not be achieved until approximately cruise RPM. Typically, any increase in BUS voltage after engine start would indicate that the system is working. As the load on the system increases, the bus voltage will decrease from the set point. The system should reach the set voltage point at less than 2 amps load. Rated load is based on a voltage of 13 volts or more.

Following are some trouble shooting hints:

NO OPERATION:

1. The shear coupling may be broken and the magnetic housing not turning with the engine.
2. The battery may be disconnected from the PMR1 thereby disabling the regulator circuitry.
3. The connectors may not be making a good connection. Connectors may have been damaged by engine cleaning solvents, excessive temperature or oil contamination.
Also, occasionally, using nylon wire ties to lock connectors together will tension the connectors in such a way as to break the connection. If necessary, remove the connectors and use positive "butt splices" to make the connections.
4. Engine speed too low. Check for output at a higher speed.
5. Bad regulator. Replace the regulator.
6. Open circuited alternator (least likely).

LOW VOLTAGE:

1. Engine speed too low.
2. Battery very low. A very low battery will take a relatively long period of time to charge to full voltage with this small alternator. Successive short flights coupled with hard starts will gradually deplete the battery and seem to indicate charging system faults.
3. Bad battery. A shorted cell will decrease the Bus voltage. This may be reflected as undetected alternator load.
4. Load in excess of alternator rating.

HIGH VOLTAGE:

1. Bad battery. A battery that is open or has "sulfated" plates acts as a poor filter. The PMR1 will regulate the voltage higher if there is little filtering on its output. This is caused by the regulator trying to maintain the average output voltage above the set point. Try a new battery and/or check battery connections.
2. Regulator adjustment. A regulated voltage that is slightly high for the type of battery being used in the system may be re-set lower with the above procedure.
3. Bad regulator. Replace regulator.

Since the PM alternator does not have a controllable field, regenerative over-voltage failures are not possible. Over voltage protection is not provided in the PMR1. Over-voltage protection is available as installation of the B&C PMOV-14/28 kit appropriate for the system voltage.