REPLACING AND DIAGNOSING CHARGING SYSTEM UNDERHOOD GENERATOR TROUBLESHOOTING CHECK LIST FOR 12 VOLT SYSTEMS



NEW 12 VOLT DIRECT CURRENT G/U

Various Models include:

MERCEDES-280-XP

MERCEDES-280XP-ER-L

PROMASTER-280XP-SE

PROMASTER-280XP-ER-L

8237-280XP-SE (Chevrolet)

8237-280XP-ER-L



ALTERNATOR Technology Evolved

Today's charging system technology has eclipsed anything ever thought possible 10 years prior. With internal fans, temperature compensation, denser flat wire hairpin windings, 6 phase 12 diode rectifiers and available multi step variable voltage programmable regulators they are able to charge harder and smarter than ever before. Nations has harnessed this technology and adapted it into an elegant fit for the RV Industry. We use customized CNC billet housings, regulators, wiring harness assemblies and pulleys to make it possible to install this type of charging system to run independently from the vehicle. The factory alternator does what it is intended to do by the original manufacturers while the auxiliary alternator (g/u) takes care of the separate battery bank that supplies power to the added on accessories. This makes the vehicle more dependable and increases the available electrical capacity.









ROADTREK G/U



- Light Weight
- Efficient Idle Output
- Durable
- Low Maintenance



NEW DESIGN ALTERNATOR CONCEPT



Square Wire Allows a Denser Windings creating higher output with less drag increasing fuel efficiency and decreasing wear on belt, bearings and engine components.

Unique design using modern materials and engineering allows the g/u to produce remarkable output at idle and cruising speeds increasing battery life and ability to recharge. Segment Conductor Alternator Technology out performs traditional style alternators:

- High Output, High Efficiency, Lightweight, Low Noisemagnetic pulsation (the source of electrical noise) is reduced 90%.
- Unmatched reliability under harsh environments- Military Grade tested in the field and surpassed military standards.
- 20 percent lighter weight with 50 percent more output than traditional style alternators making it capable of recharging batteries without burning up.



REQUIREMENTS FOR PROPER FUNCTION OF ENGINE DRIVEN GENERATOR SYSTEM

1. Voltage present at alternator output post and batteries fully charged? Battery voltage should be the same at batteries and alternator post. Without voltage the alternator will not engage and is designed to maintain partially to fully charged batteries. If the battery voltage is less than 12 volts charge and test batteries according to battery manufacturer specs.

2. Voltage present at alternator regulator? The yellow/brown wire to the regulator is activated through the ignition system and should have 12 volts with the key on. If there is no current, check wire connection terminals and red activation wire on relay side of the harness that it has 12 volts with ignition. Without the regulator wire having current, the alternator will not charge.

3. Visually inspect connections to make sure they are tight and clean. If the ground cables from battery bank, connections at fuse, etc. are loose or not connected the alternator cannot function. Also inspect alternator for burned internal wiring that may indicate it has been overworked.

4. Belt tightness and alignment. Shims in front of alternator to make sure belt is fully under idler pulley (Sprinter 1st Gen Models). Visually inspect belt and alternator for any signs of belt slippage (black dust). If the belt or tensioner is faulty replace and retest.

With correct voltage at all necessary terminals and secure mounting and belt tightness, the alternator should produce between 13.5-14.7 volts at the battery depending on battery state of charge, regulator type, vehicle electrical loads and temperature.



Before you begin analyzing the charging system make sure batteries are at least 75% charged or the testing may not be accurate. You also need to inspect the belt for proper tension. A loose belt will slip and not turn the rotor. If the system is charging but making a noise, rattle or squeal- Remove the belt and determine the cause- It will usually be a faulty belt tensioner or idler pulley.

If the tensioner and and pulleys are good replace the belt. Dirt and debris on the belt can cause it to chirp or squeal.







1st Generation Sprinter Kit alignment was corrected by adding shims in the bracket to space back the g/u alternator placing the belt entirely on the intermediate idler pulley.

The underhood generator harnesses the mechanical power off the belt system to create the D.C. electrical power to charge system. Belt tightness & alignment are crucial to prevent belt slippage or system failure.



AUXILIARY ENGINE DRIVEN GENERATOR ON MERCEDES SPRINTER 3.0L DIESEL ENGINES

| 2ND GENERATION MOUNTING KIT |

SPRINTER MERCEDES-280XP Relay activation Harness

Yellow wire to regulator activates charge with ignition activation to relay.



Should have 12V with key on.



PROMASTER 3.6L MOUNTING KIT



VIEW OF EXPOSED COMPONENTS WITH COVERS REMOVED ON 3.6L ENGINES

<u>A2-0070 DODGE PROMASTER</u> 3.6L MOUNTING KIT AUXILIARY BELT ROUTE





Belt Part #: 535K-6 Tensioner Part #: 89241

The belt system runs independent of the factory belt on its own added crank pulley.





MC-614 BALMAR TROUBLESHOOTING

No output from Alternator / Battery not charging

1. Does the MC-614 Balmar light up with ignition?

NO - Test 10A power & ignition wire.

If 10A fuse blows after replacing it is the regulator at fault.

YES - MOVE TO STEP 3.

2. What is the reading on the MC-614 display for BV?

- If it is the same as the Battery Voltage at the G/U Alternator post - MOVE TO STEP 3.

- If 0.00 check #9 wire & 1A fuse (Can replace with 5)

MC-614 BALMAR TROUBLESHOOTING

No output from Alternator / Battery not charging

3. What is the voltage at the blue field wire with the engine running? Normal voltage is 8-12 volts depending on output.

4. If the voltage is present at the power, sense and ignition terminals, LCD display is on then you can full field the alternator.

To do this turn off all lithium modules. Connect a volt meter to the AGM battery, disconnect 4 pin terminal from the Balmar MC-614 and use a small 14 Gauge wire to jump from power (red wire) to field (blue wire).

If the alternator, wiring and battery are good the voltage should spike up rapidly. So, do this only momentarily! If the voltage does not move (all mechanical parts have been verified good) then the g/u alternator & harness need to be replaced. - This process is outlined in the trouble shooting guide.



Shop: (573) 334-2632 Toll Free: (888) 334-2632

2210 Broadway Cape Girardeau MO 63701 www.NationsStarterAlternator.com

TESTING THE MC-614 BALMAR EQUIPPED ALTERNATOR

1. Does the Balmar MC-614 light up with ignition?

If YES, go to STEP 2.

If NO, test 10A power & ignition wire. If 10A fuse blows after replacing, it is the regulator at fault.

2. What is the reading on the MC-614 display for BV?

If it is the same as the Battery Voltage at the G/U alternator post, go to STEP 3. If 0.00, check #9 wire & 1A fuse (can replace with 5)

3. What is the voltage at the blue field wire with Engine running?

Normal voltage is 8-12 volts, depending on needed output. No voltage = bad regulator.

4. If the voltage is present at the power, sense and ignition terminals, & LCD display is on, then you can full field the alternator.

To do this, turn off all lithium modules.

Connect a volt meter to the AGM battery.

Disconnect 4 pin terminal from the Balmar MC-614 and use a small 14 gauge wire to jump from power (red wire) to field (blue wire).

If the alternator, wiring and battery are good the voltage should spike up rapidly. So, do this only momentarily! If the voltage does not move (all mechanical parts have been verified good) then the g/u alternator & harness need to be replaced. This process is outlined in the trouble shooting guide.

Please refer to the trouble shooting guide for an in depth testing procedure for the system. *This is only one part of the power system.



www.balmar.net / Customer Service: +1 (360) 435-6100 x1 / Technical Support: +1 (360) 435-6100 x3 Tech Service is available Monday - Friday (8:30am - 7:30pm EST)

System Troubleshooting Regulator Troubleshooting

The majority of charging difficulties can be attributed to damage, corrosion or wear at wiring, fusing or wiring connections. Before attempting to troubleshoot alternator or regulator issues, be sure to address the following:

- Remove and clean all charging system electrical connections (positive and negative). Check the voltage regulator's harness for continuity. Wires and terminals can and will become corroded, and need to be cleaned or replaced. Ensure that the regulator's ground wires are provided with a clean connection to system ground.
- Inspect and replace 10A and 1A ATC type fuses in the regulator wiring harness if fuse appear to be damaged or corroded. Ensure that the fuse holder is also free of corrosion.
- Charge all batteries to their proper fully charged state, and determine if they are serviceable. If your batteries are flooded-type, use your hydrometer to determine their condition.
- 4. Check and tighten alternator belt. If the belt show signs of wear or damage, replace it. Always replace existing belts with the finest quality replacements available.

If batteries and wiring are in suitable condition, use the following tests to determine if charging problems are a result of a faulty alternator or regulator. These tests provide an opportunity to isolate the alternator, regulator and wiring harness in order to determine the problem source. In order to perform these tests, you will need an independent DC meter (preferably a digital type). In an emergency, a 12V light bulb or test light can be used to help determine if power or working grounds exist. An amp meter and a battery hydrometer with a thermometer are also helpful diagnostic tools.

Voltage Regulator Testing

Set your voltmeter to 12VDC and connect the negative lead to the BLACK ground wire at the regulator as shown at the diagram at right.

1. With the ignition turned OFF, check voltage on the RED (power), Voltage Sense (Terminal #9), BLUE (field) and BROWN (Ignition) wires in the regulator plug.

Voltages should be as follow:

- · RED wire equal to battery voltage
- · Terminal #9 RED wire equal to battery voltage
- BLUE wire zero volts
- BROWN wire zero volts
- With the ignition in the ON position (engine not running), check voltage on the RED (power), Secondary RED on Terminal #9 (voltage sense) BLUE (field) and BROWN (ignition) wires in the regulator plug:
- RED wire equal to battery voltage
- Terminal #9 RED wire equal to battery voltage
- BLUE wire between 4V and 11V
- · BROWN wire equal to battery voltage



PLEASE NOTE: In systems where the ignition (BROWN) wire is supplied power via an oil pressure switch, jump directly from test #1 to test #3.

- 3. With the ignition in the ON position (with engine running at 1,400 rpm fast idle), check voltage on the RED (power), Secondary RED on Terminal #9 (voltage sense) BLUE (field) and BROWN (ignition) wires in the regulator plug. Voltages should be as follows:
- RED wire equal to battery voltage
- Terminal #9 RED wire equal to battery voltage
- BLUE wire between 4V and 11V
- BROWN wire equal to battery voltage

If voltage is not present on the RED, the BROWN and the Positive Battery Sense Wire, the regulator will not work. If voltage is as expected at the RED the BROWN and Positive Battery Sense wire, and there is zero, or an unexpected voltage reading at the BLUE wire, contact our technical support staff at +1(360) 435-6100, or e-mail us at balmar@balmar.net.

If all voltages at the regulator meet expectations, yet the alternator is not producing charging current, test the alternator. The following tests are recommended for determining alternator functionality.

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Alternator Testing

TEST #1 - The following test is used to isolate the alternator and determine if the failure is a result of the alternator. Once again, testing at either the alternator or regulator is only effective if the wiring, fusing and batteries have been determined to be in correct working order. The alternator and regulator can be tested for function by determining if a magnetic field exists at the alternator's pulley shaft or rear bearing. To test:

- With the ignition in the OFF position, place the tip of a non-magnetic steel screwdriver near the nut on the pulley shaft or near the rear bearing of the alternator. There should be no evidence of a magnetic field pulling the screwdriver toward the alternator. (A slight amount of magnetism may be present, due to residual voltage in the alternator).
- Engage the ignition, without starting the engine, to activate the voltage regulator. If an oil pressure switch is used, a jumper between the RED and BROWN wires in the Ford-style plug will activate the regulator.
- 3. After allowing time for the regulator's start-up delay, place the head of a steel screwdriver near the nut on the pulley shaft or near the rear bearing of the alternator. There should be substantial magnetic pull. If a magnetic field is present, the voltage regulator, alternator brushes and rotor are likely to be working properly.

If there is little or no magnetic pull at the pulley shaft or at the rear bearing, initiate the following test:

With the key off and the engine off, remove the large harness plug from the regulator.

- Insert the end of a short length of electrical wire to the RED connector slot of the regulator harness and the other end of the wire to the BLUE connector slot. This bypasses the regulator and tests the alternator and the harness.
- 2. Using your steel screwdriver, inspect for a magnetic field as described above.
- 3. With your voltmeter, check for voltage on the blue wire at the alternator. If voltage does not exist, the harness may be at fault. If voltage does exist at the harness, but no magnetism is present, the alternator is likely to be malfunctioning.
- If a magnetic field is present. Both harness and alternator brushes and rotor appear to be working properly. If no magnetic field is present, proceed with the next test.



Testing the actual output of the alternator is known as "Full Field Testing". This can be accomplished by jumping a positive 12VDC current to the field terminal at the rear of the alternator. This test eliminates both the regulator and the harness. making it easier to isolate your investigation to the alternator.

CAUTION: Ensure that all voltage sensitive equipment is turned off prior to starting the engine. Voltage is unregulated during this test and could damage sensitive electronics. DO NOT let the engine run any longer than necessary to detect charging. If the system is not charging, remove the alternator and have it inspected by a qualified alternator shop, or call Balmar for warranty evaluation. To test the alternator:

- Clip a jumper wire to the positive post of the alternator, or on the battery side of the isolator (if an isolator is in use). Use a SHIELDED alligator clip for post attachment. Unintentional contact between the alligator clip and the alternator case could result in damage to your electrical system.
- Disconnect the field wire from the rear of the alternator and attach the other end of the jumper wire to the alternator's Field terminal (F). CAUTION: Do not allow the wire to contact the case while it is attached to the positive post. The case may be grounded and severe damage could occur.
- 2. The regulator is now bypassed. When the ignition is engaged and the motor is started, the voltage should rise and charging current should be present.
- 3. The motor should be run long enough to determine that charging voltage is present. Unregulated voltage can rise quickly. Do not allow extended unregulated charging to occur without carefully monitoring voltage levels. If the alternator fails to generate voltage during field testing, a malfunction of the alternator is likely. Contact your local alternator repair shop or Balmar's technical service staff for recommendations.

Conclusion

If your readings differ substantially from the "expected Readings" listed in the troubleshooting charts, the regulator may be malfunctioning, or there may be a continuity problem. Contact our technical support staff at +1(360) 435-6100. If you determine that repair service is necessary for either your alternator or regulator, please gather the following information before contacting our service technicians: Make and model of alternator. Model of voltage regulator and date of mfg. (date punched on rear side label of regulator). Voltage readings on RED, BROWN and BLUE wire at regulator with engine off, key on. Voltage readings on RED, BROWN and BLUE wire at fegulator.

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DIAGNOSTIC CHECK LIST

- 1. Battery System Type Lithium or AGM
- 2. Battery Volts at G/U alternator post?
- Lithium Should be 13.0-13.2 Volts AGM should be 12.6-12.8 Volts
- 3. Verify belt condition and tightness.
- 4. Identify G/U Regulator type.
- Lithium should be MC614 external regulator equipped.
- 5. Test fuse condition and that connections are clean and tight.
- 6. Follow trouble shooting flow chart to check battery condition and for any excessive voltage drops or electrical resistance.





WARRANTY CHECKLIST

Please fill out and sign and return with warranty claim

Dealer Name:		Phone:		
Shipping Address:				
Email:	Email:Contact:			
Year/Make/Model of Vehicle:				
Barcode off Alternator:		_Current Mileage:		
Vin #:				
Reason for Claim:				
	1. Battery System Type Lithium	I AG	м	(CIRCLE ONE)
	2. Battery Volts at G/U Alternator Post:	Engine Off:	Eng	ine On:
	3. Verified Belt condition and tightness / Verified Mechanical Items in working order			
	4. Identify G/U Regulator MC614 Equipped Display Settings: Lithium should be MC614 external regulator equipped.			
	5. Test fuses condition and cable connections are clean and tight: YESNO			
Signature:Date:				
Print Name:				

Note: Parts that are returned unproperly diagnosed and in working condition are subject to Warranty denial



THANK YOU FOR YOUR TIME!

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