

GMC Motor-Home House Electrical AC Systems- General Maintenance, Troubleshooting & SAFETY

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Electrical Safety:

First and foremost, we should all consider electrical safety to be of paramount concern and the reason to perform a few inspections on a regular basis. We should first establish a few safety rules before working on equipment:

1. Do not work on "LIVE" electrical equipment unless absolutely necessary and then, only with the proper safety equipment and a helper.
2. Do not use damaged electrical equipment, connectors, cords etc.
3. Do not use ungrounded power sources.
4. Do not remove protective coverings from circuit panels.
5. ALWAYS measure before working on any electrical equipment.
6. Treat all equipment as if it were energized.

Electrical Visual Inspections:

A few simple visual and meter reading inspections will ensure that your GMC's AC electrical system will perform at its optimum level:

Note: We will investigate problems later in this section

1. Unplug your coach and check your primary power cable for signs of cracking or separation of the insulating boot on the plug end. You should see no cracking of the rubber boot or any of the internal wiring visible. If you see any of the internal conductors or have broken/ damaged connector pins, **DO NOT USE YOUR CABLE!!!**
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.



Primary Power Connector, Replace!

2. Continue by checking your cable from the plug end to the strain relief to ensure there are no visible cuts or abrasions in the insulation of the cable. If you find any, inspect for damaged conductors, if none are damaged, a *TEMPORARY* repair can be performed by taping over the damaged portion of insulation. You should replace your primary cable as soon as feasible.



Damaged Cable Insulation
(permissible to repair)



Repaired Cable

3. Visually inspect your primary cable's strain relief. You should see no signs of insulation fatigue. (located on the back of the electrical panel)



Do not use or repair this cable



Strain relief on back of circuit panel
If the insulation is fatigued or cracked,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

4. Visually inspect all outlets and cover plates for damage. Replace any needing attention



Look for cracks and missing covers

5. Check Your converter cable for insulation damage, missing pins etc.



Cable on power converter

Visual Test Troubleshooting:

If any of the visual tests fail, look at the following steps:

1. Separated insulation or damaged connector:
 - ✓ Replace the connector observing the proper pin orientation and screw terminal torques.
 - ✓ Available from most home building centers as dryer and range plugs.



New Connector

2. For simple insulation nicks and cuts:
 - ✓ Two layers of electricians tape over damaged insulation

For exposed and damaged conductors:

- ✓ Replace power cable by removing from back of circuit breaker box.



Taped Insulation

3. If the Outer insulation has split or separated:
 - ✓ Loosen the cable grip and push 1/2 to 3/4 inch of cable into the back of the circuit breaker box and retighten cable grip

If the conductors are showing:

- ✓ Remove the cable from the circuit breaker box observing proper connection points.
 - ✓ Shorten cable beyond damaged area.
 - ✓ Reinstall as removed
4. If any outlets or covers are damaged or missing:
 - ✓ Replace as necessary
 5. If your converter cable or plug is damaged:
 - ✓ Replace with new cable/plug assembly



Circuit breaker panel

Now, let's gather a few simple tools for some measurement tests:

- Straight blade screwdriver- med size
- Phillips Screwdriver- #1 or #2
- Digital VOM- preferably a category 2 or 3
- Outlet Tester- from a building supply store
- Helper if one is available



Required tools

Electrical Continuity Tests:
Safety Grounds Breakers OFF

***Note: Troubleshooting starts on Page 11,
steps are in the same order as the test
steps.***

1. With your coach unplugged, all circuit breakers OFF and the generator OFF: Check continuity between the round GROUND pin and the metal chassis of the GMC with your Digital VOM. The door striker plate works well for this test.
There should be NO resistance (0 Ohms) Wiggle the cable while performing this test to make sure the plug is not internally broken.



Testing the primary power connector
If you see more than 10 OHMS of resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

2. Continue checking the ground between the round ground pin of the primary power cable and each AC outlet ground. Again, there should be NO resistance (0 Ohms)



Testing the outlet ground connections
If you see more than 10 OHMS of resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

3. Continue by checking for continuity between the round Ground pin and the center flat pin.(Neutral) There should be a very high resistance (infinite Ohms)



Testing for Neutral to Ground Short
If your meter does not read a high resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

Electrical Continuity Tests:
Safety Grounds Cont Breakers OFF.

4. Continue by checking for continuity between the center flat pin (Neutral) and any of the other flat pins.(Hot) There should be a very high resistance (infinite Ohms)



Testing for Neutral to Hot Short
If your meter does not read a high resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

5. Continue by checking for continuity between the round Ground pin and any of the other flat pins.(Hot) There should be a very high resistance (infinite Ohms)



Testing for Ground to Hot Short
If your meter does not read a high resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

6. Continue by unplugging your converter and turning on all of the circuit breakers:



Converter Unplugged, Breakers all on

Electrical Continuity Tests:
Safety Grounds Continuity -- Breakers ON.

7. Repeat step 4, There should be a very high resistance (infinite Ohms) on one Hot leg to Neutral and a low resistance on the other Hot leg to Neutral. (10 to 100 Ohms) If not, try turning OFF the water heater circuit breaker and repeat the test. Both Hot legs to Neutral should read a high resistance (Infinite Ohms) with the breaker OFF.

Meter is reading hot water heater element – that's OK!

(Note: if you have a gas water heater, you will have a high reading on both legs to Neutral)

8. Repeat step 5, There should be a very high resistance (infinite Ohms)

(Note: If you are reading a low resistance, you may have a shorted water heater element)

9. With generator OFF, Plug primary cord into generator outlet. Measure between Ground and Neutral in galley outlet. You should measure 0 Ohms



Testing for Neutral to Hot Short
If your meter does not read correctly,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.



Testing for Ground to Hot Short
If your meter does not read a high resistance,
DO NOT USE YOUR CABLE!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.



Galley outlet Neutral to Ground
If your meter does not read a LOW resistance,
DO NOT USE YOUR GENERATOR!!!
YOU COULD BE ELECTROCUTED!
Investigate problem immediately.

If all test performed correctly, let's test the coach under power and perform some additional checks:

1. Turn OFF MAIN circuit breaker
2. Plug in coach to known good 50A 125/250VAC power Source
3. Turn ON MAIN circuit Breaker
4. Plug in OUTLET TESTER and observe lights for each outlet in the GMC. IF all outlets test OK, you are done! If not, make necessary corrections.



Outlet tester

5. Plug in DC power converter

Enjoy your RV electrical system!

Perform checks on a regular basis!

Handy Formulas:

Formula for power

$$P=I \cdot E$$

Power (Watts)= Current (Amps)*Voltage (Volts)

So

$$P/E=I$$

Look at the that big toaster @ 1800W with the line voltage @ 117V

Look at the TV @ 110W + two lamps @ 60W each

Ohm's LAW

1800/117= 15.38A, Too much current for a 15A circuit breaker!

(110 + 60 + 60)/ 117 = 1.967A, Fine for one 15A outlet.

$$E=I \cdot R$$

Voltage (Volts) = Current (Amps)* Resistance (Ohms)

So

$$I= E/R$$

And

$$R = E/I$$

Meter Test Troubleshooting

If any of the electrical meter tests fail from pages 6-9, look at the following steps:

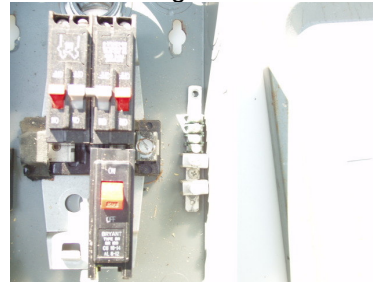
(Note: These steps follow in order the meter tests from pages 6-9)

1. High resistance or more than 10 Ohms:

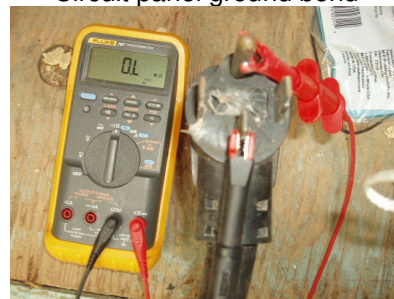
- ✓ Look at the ground bond connection to the chassis and tighten with flat blade screwdriver.
- ✓ Look at the ground bond between the chassis and the circuit panel, tighten with flat blade screwdriver.
- ✓ Check the ground pin for looseness, replace the connector if necessary



Chassis ground bond

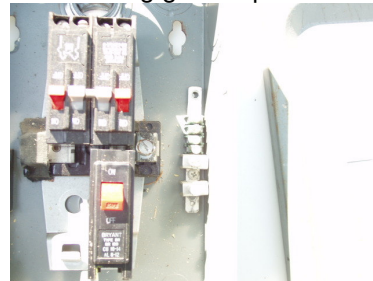


Circuit panel ground bond



Plug ground pin

2. If the meter reading is more than 10 Ohms:
 - ✓ Check the screw connections on the rear of the outlet.
 - ✓ Check the ground bar connections inside the circuit breaker panel.



Circuit breaker panel ground bar

3. If the meter reading is low:
 - ✓ Be sure all breakers are OFF
 - ✓ Inspect for shorts inside of the electrical panel
 - ✓ Look for chafed wiring



Circuit breaker panel

4. If the meter reading is low:
 - ✓ Be sure all breakers are OFF
 - ✓ Inspect for shorts inside of the electrical panel
 - ✓ Look for chafed wiring
5. If the meter reading is low:
 - ✓ Be sure all breakers are OFF
 - ✓ Inspect for shorts inside of the electrical panel
 - ✓ Look for chafed wiring
6. NO TEST
7. If the reading is High on both legs with the breaker ON:
 - ✓ Suspect an open water heater element, replace with new.
 - ✓ Possible broken or loose wire on water heater
 - ✓ YOU HAVE A GAS WATER HEATER, IGNORE!
8. If the meter reading is low:
 - ✓ Inspect for shorts inside of the electrical panel
 - ✓ Look for chafed wiring
 - ✓ Suspect a shorted water heater element. Verify by turning OFF the water heater breaker and repeating test.
 - ✓
9. If the meter reading is high:
 - ✓ Suspect a broken Ground to neutral bond in the generator.
 - ✓ Suspect a broken or loose connection in the generator outlet box.

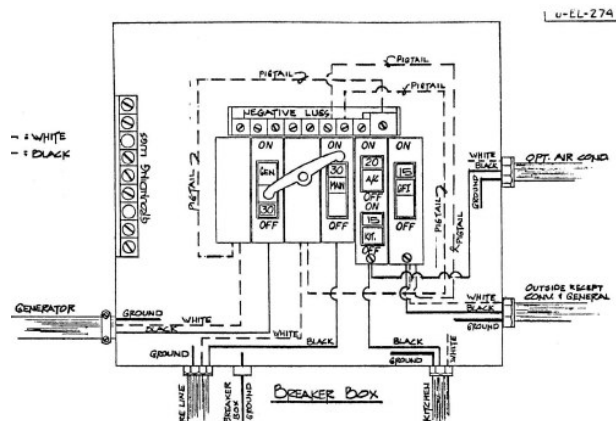
(The low resistance of one of the Hot legs to Neutral with the circuit breaker ON is the resistance of the water heater element. If readings are both HIGH, check your water heater element.)

SUPPLEMENT FOR 30A 3 Wire Coaches

30A Power Cord Equipped Coaches

For those equipped with a 30A 3 pole electrical system, please don't feel left out!

Here is a quick reference section for troubleshooting.



Ground

Measurements from the Ground (round pin) and the Neutral (lower left on picture) should yield the same results as the 50A plugs.

Measurements from the Ground (round upper pin) and Hot (Lower right blade in picture) should yield the same results as those of the 50A plugs as well.

The major difference between the 30A and 50A plugs is the 50A plugs have 2 hot wires and the 30A has only one.

You should still perform the same tests using your VOM as the 50A plugs.



Neutral

HOT

30A 120VAC 3 prong

Generator Neutral Bond Test:

One additional test:

With the generator OFF, the Circuit panel switched to GEN and the line cord unplugged:

Measure the resistance of any outlet between Neutral and Ground with your VOM, You should measure 0 Ohms.

If the reading is High or open:

- ✓ Suspect a broken Ground to neutral bond in the generator.
- ✓ Check the Neutral section of the Generator Circuit breaker in the electrical panel for continuity.



Galley outlet neutral to ground

If your meter does not read a LOW resistance,
DO NOT USE YOUR GENERATOR!!!
YOU COULD BE ELECTROCUTED! Investigate
problem immediately.