

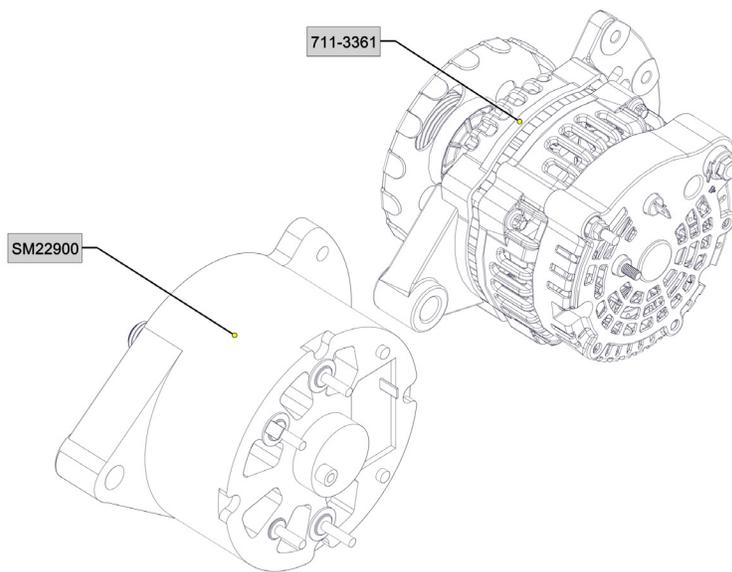
# TECHNICAL PROCEDURE

## Alternator Testing

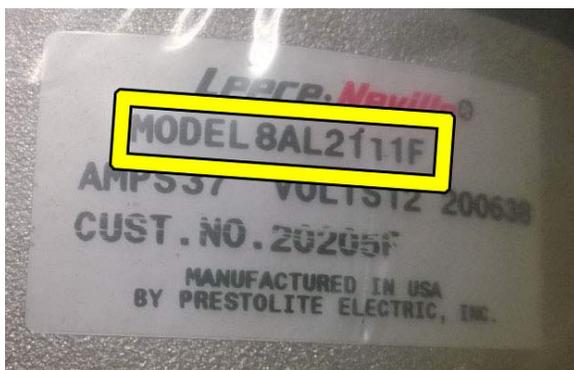
Applies to: 7000PT + SM916 + SM5 (150005) + Gauntlet (150015) + 8G (9-5250, 9-5270)

**Enhanced Images:** Pictures can be zoomed in to any level for detail. Use the standard zoom tools for your platform to zoom in.

This document details the procedure for troubleshooting and testing a suspected bad alternator. It applies to any unit that uses the [SM22900](#) or SM20205 (not available from Core) alternator as well as the newer [711-3361](#) alternator assembly on the 8 Series units that include the 260-0952 alternator. The 260-0952 alternator within the 711-3361 assembly is interchangeable with the SM22900 alternator.



**Note:** The older SM20205 alternator was used on the 7000PT and SM916 units and can be replaced by the SM22900 alternator, however light users will have difficulty making the steps move on those units. To verify the type of alternator on an older machine, check the manufacturer's label on it.



**Model: 8AL2111F**  
SM20205 Alternator - 7000PT & SM916



**Model: 8AL2117F**  
[SM22900](#) Alternator - (all units)

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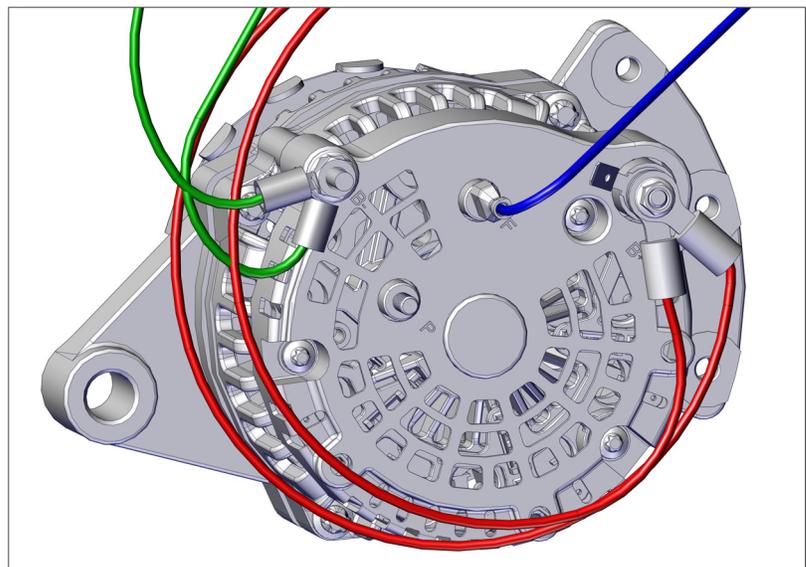
### Tools Required

- Jumper wire
- 1/2" socket
- 1/4" socket
- [Multimeter](#)

### General Alternator Troubleshooting

The alternator is connected to the relay board/LCB by a wire harness. The SM22900 alternator when used on an 8G unit has different wiring than that used on an earlier unit. See the options below:

1. 260-0952 Alternator (8G Only)
  - Blue to F
  - Red to B+
  - Green to B-

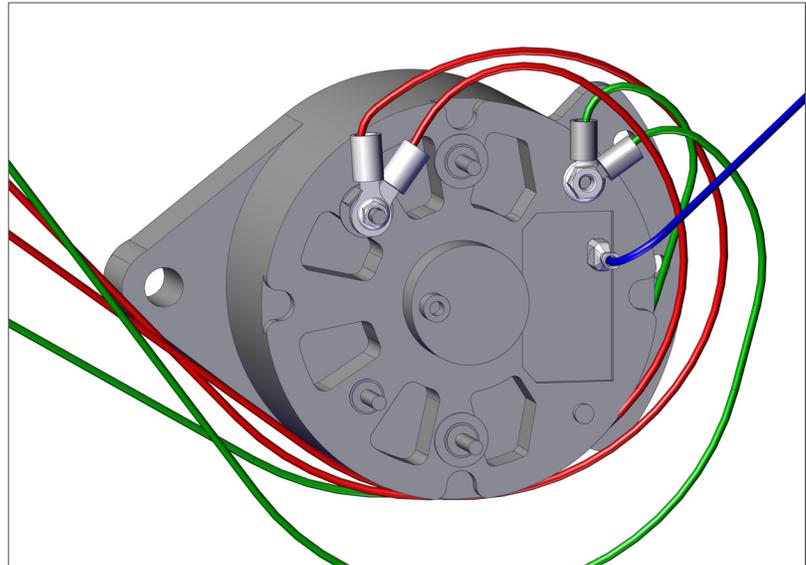


260-0952 with 711-3351 harness

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2. SM22900 Alternator  
(8G Only)

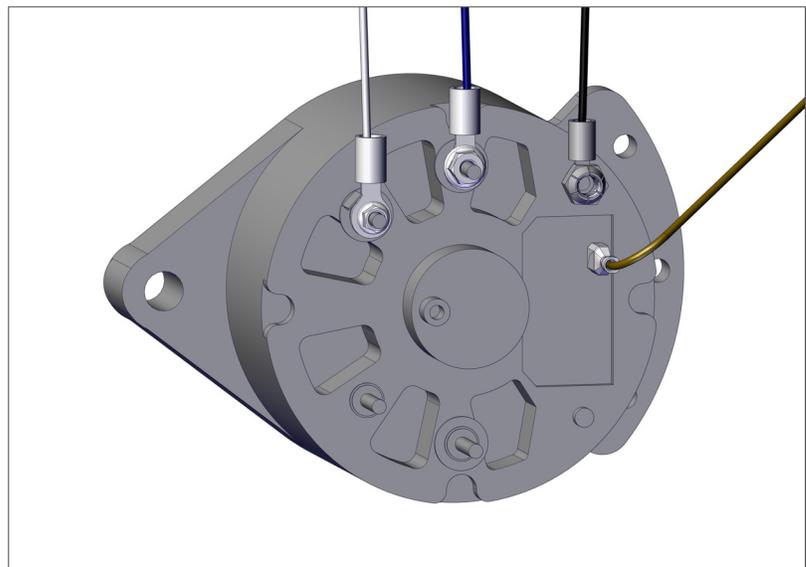
- Blue to FLD (BRN)
- Red to B+
- Green to GND



SM22900 with 711-3351 harness

3. SM22900 Alternator  
(All Other Units)

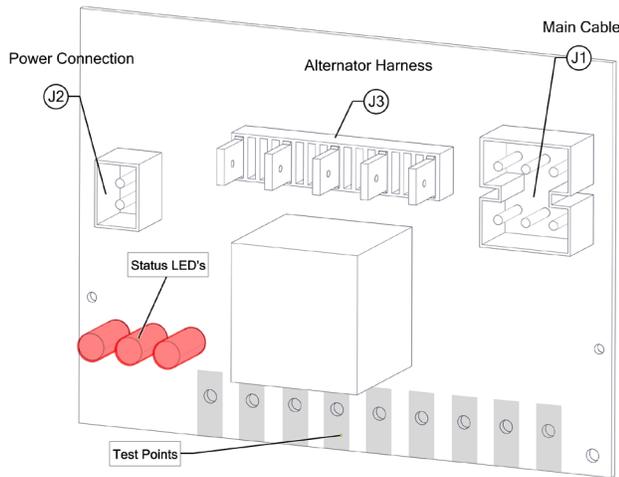
- W3 - Brown to FLD
- W4 - Blue to TACH (BLU)
- W5 - White to B+
- W6 - Black to GND



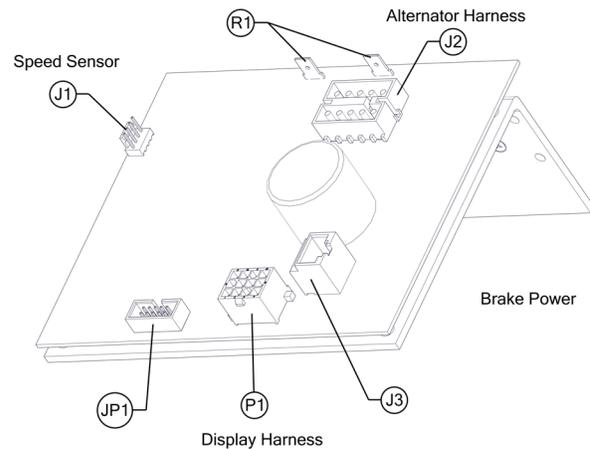
SM22900 with SM22935 or 050-0255 harness

The alternator is connected to either a relay board or a LCB depending on the unit. See below for board callouts.

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SM23545 - Relay Board



711-3461 - 8G LCB

Resistance over gravity on Stairmills is performed by the alternator. For units without a brake, when the console senses a user with staircase movement, the console should be enabling full field current to the alternator. Field current is provided from the external power supply, through the console, into the LCB/Relay Board and wired into the alternator's field terminal. In use the console should also be switching the .5ohm load resistor onto the alternator's B+. Units with a brake have initial resistance from the brake itself

The alternator's B+ should rise as a result of field current, but its voltage will depend on the weight of the user and resulting velocity. Resistance is achieved by the oppositions of internal magnetic fields when field current is applied. The user's weight will affect the alternator's RPM under this condition, and under full field current conditions the voltage is not controlled. But, with the large gear ratio and full field current applied, the resistance should be maximum, and the step rate should be minimum.

Once a user starts a workout, the console controls the alternator's field current attempting to maintain the desired step rate. This signal is Pulse Width Modulated (PWM) from 0V to 12V, the level of the loaded external supply. If the step rate is fast, the console will deliver field current longer, if the step rate is slow, it will deliver less field current.

The only situation where no field current would be present during a workout, is if a very light weight person was attempting to achieve a step rate that could not be achieved by their weight overcoming the frictional resistance of the system. In this case, the console would keep field current off, or no induced resistance. For additional information relating to these Step Rate issues as well as specific directions to correct, please refer to document [637-4522](#).

During workouts the alternator's B+ voltage increases as a function of speed and user weight. For high level workouts with heavy weight users, B+ levels of 20V could be witnessed.

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In addition to alternator field current, the console controls the loading of the alternator's B+ with the .5ohm resistor which is switched by the Relay Board. When the console detects a user has stepped on the staircase, it immediately applies full field current, and turns on the power relay to load B+ with .5ohm. LED1 is an indicator the console is attempting to close the relay, but this should be confirmed with a VOM.

If no resistance is felt, confirm 10V to 12V is being applied to the alternator's field. This should always be present once a user is detected, and before a workout has begun. Confirm the additional load is being switched also, which is controlled by a low voltage on J1 pin 1. The operation of the power relay can be confirmed by unplugging the unit, and removing the console connection at J1. Install external power again, and an ohmmeter should show continuity from B+ to

field on the 23545's terminal strip. With a test jumper, connect J1 pin 1 to J1 pin 5, and the ohmmeter should now show continuity from the terminal strip's B+ to RES. If this test passes with no resistance felt, and full field current has been confirmed, replace the alternator. If the above test fails, replace the SM23545 PCB. If no field current is detected, or LED1 does not light when a user steps on the staircase, check the interface cable continuity to the console. If this checks, replace the console.

If no increase in step rate is detected when instructed by the console, confirm the field line is not at 12V continuously. If the field is continuously at 12V, the console's field control has probably shorted.

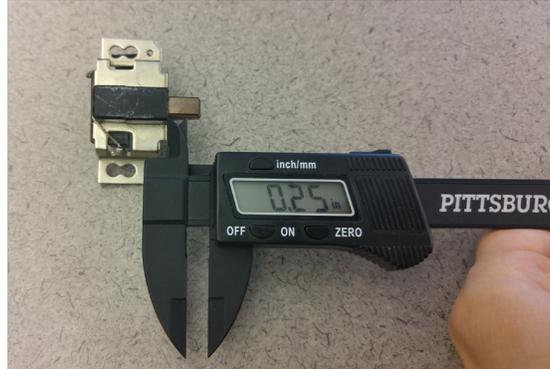
### Specific Troubleshooting (7000PT, SM916, SM5, and Gauntlet **ONLY**)

#### No Resistance When Stepping

If no resistance is felt, regardless of whether the console is powered, prior to proceeding with tests below, perform continuity checks on the alternator connections, load resistor connections, and confirm these connections are secure into the LCB/Relay Board. Confirm the load resistor measures .5ohm or greater. For the 8G, each load resistor should be independently measured for resistance.

1. Check alternator brush length
  - a. Remove user-right side cover
  - b. Remove wire from W3 (FLD BRN) post of alternator.
  - c. Loosen ¼" bolts on W3 post.
  - d. Remove and verify brush length and quality. We recommend replacing brushes that are ¼" or less.

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Good Alternator Brush Length (>0.25")

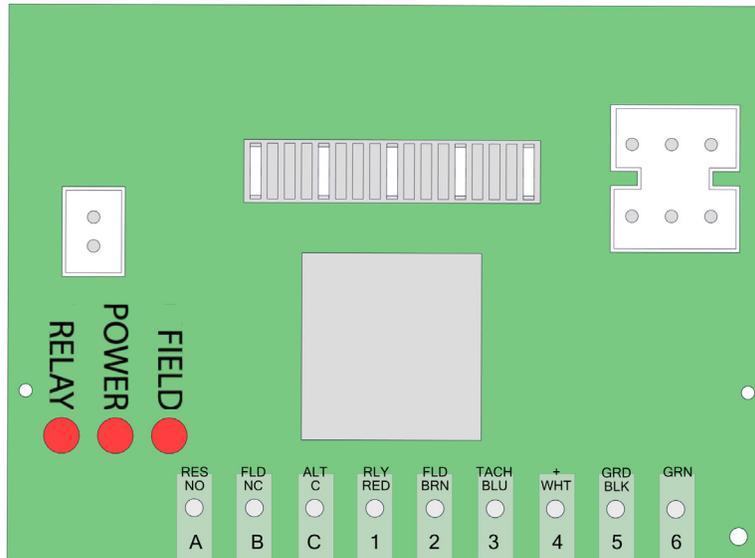
2. Remove the right side panel to view the three LED's on the lower PCB board.
3. Begin moving the staircase.
4. If all three of the red LEDs on the relay board are illuminated but there is no resistance, replace the alternator brushes ([SM24557](#)) if worn or the alternator.

### No Resistance and No Field Light

Use these instructions if you can freewheel the staircase and the field LED does **not** light on the relay board while the staircase is moving.

1. Perform tach test by entering diagnostics on the console.
2. If there is no tach signal sensed on console
  - e. Check for 0.6 to 0.7 volts AC at the W4 (Tach) terminal of the alternator.
  - f. If no voltage, remove the blue tach wire from the alternator, while staircase is moving.
    - i. Touch the tach wire to the field terminal.
    - ii. If the field LED lights, replace the alternator.
7. If the voltage checks good, remove the connector from the W4 (Tach) terminal of the alternator. Lightly scrape the connector and reinstall. Recheck.
8. If still bad, replace the console.

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## Relay Board Tests

Perform the following testing to verify the integrity of the relay board. Refer to the diagram above for the correct location of the test points and LED's. The test points are also printed directly on each relay board. These tests cannot be done on an 8G LCB, as the new generation boards do not have test points like the old board.

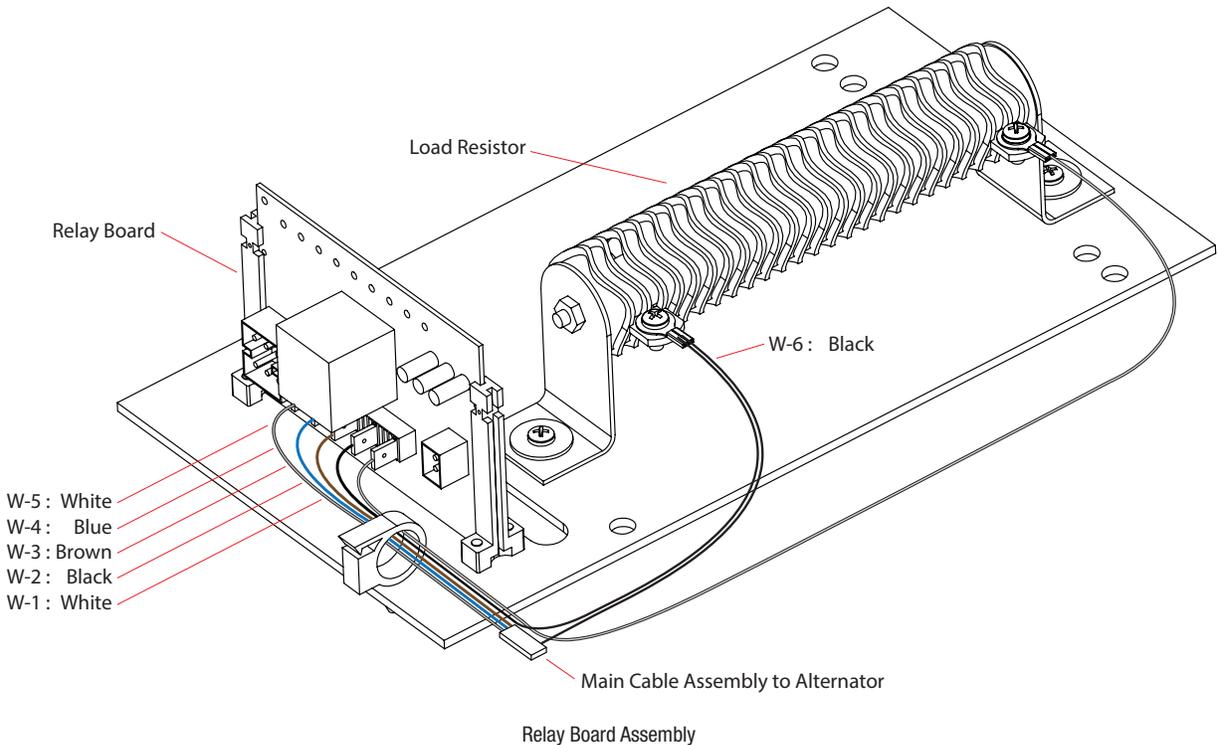


**Caution:** Jumping the wrong test points may destroy the relay board

The only signal that will prevent the field LED from lighting on the relay board is the tach signal from the blue wire. The console must receive an rpm signal to activate the field current to the alternator that is PWM controlled.

1. Disconnect the main cable from relay board J1 terminal.
2. With power on, place jumper across GND/BLK and RLY/RED test points.
  - i. Relay LED should light. If not, replace relay board.
3. With power on, place jumper across +/WHT and FLD/BRN test points.
  - j. Field LED should light. If not, replace relay board.
4. Disconnect the black W-2 ground wire. With power on, place a jumper on the +/WHT test point and with the other end touch the ALT/C test point, then jump the +/WHT to the FLD/NC test point, and then jump the =/WHT to the RES/NO test point.
  - k. Field LED should light. If not, replace relay board.
5. Once the test is completed, re-attach the black W-2 ground wire and the J-1 main cable socket which was removed at the beginning of the relay board test.

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### Staircase has Resistance but is Choppy During Exercise

Use these instructions if you have already cleared a mechanical inspection for parts interfering with the steps. **Generally, the issue with choppy/sticking steps is more commonly traced to a physical issue rather than an electrical one.**

1. Inspect Main Cable for Corrosion at all connections.
2. Check alternator brush length.
  - l. Remove user-right side cover
  - m. Remove brown wire from W3 (FLD BRN) post of alternator.
  - n. Loosen ¼" bolts on W3 post.
  - o. Remove and verify brush length and quality. We recommend replacing brushes that are ¼" or less.
3. Check Load Resistor for a reading of 0.5 to 0.6 Ohms ( $\Omega$ ). If lower than 0.5 Ohms, then replace the load resistor ([SM24989](#)).
4. If load resistor checks good, replace the alternator brushes ([SM24557](#)) if worn or the alternator ([SM22900](#)).

### Troubleshooting Notes

- If you suspect the alternator, disconnect all the wires and check the resistance across the field terminal and the alternator housing; a typical Alternator should read around 4 Ohms or higher. A reading of less than 2.9 Ohms would indicate a failed alternator.
- The Field LED on the relay board will flicker at higher speed levels. This is the PWM signal from the con-

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sole to the field terminal of the alternator to control resistance / speed. If you experience full resistance through all levels and the field light doesn't flicker; replace the console.

- To verify that the load resistor is working correctly, you must ohm the resistor out using your multi meter. The load resistor must read above 0.5 Ohms. If the resistor reads anything less than 0.5 Ohms, then replace the load resistor ([SM24989](#)).
- Always perform mechanical troubleshooting in addition to electrical trouble shooting for resistance problems.