

Stairmaster Stepmill Resistance Diagnostic Steps

7000PT (200XX), SM916 (155001/14001), SM5 (150005), Gauntlet (150015)

This document reviews the process of troubleshooting for resistance issues on the Stairmaster Stepmill models listed above.

Tools Required

- Jumper wire
- ½" socket
- ¼" socket
- Multi meter

Alternator/ Resistance Testing

The colored connections to the alternator are as follows:

White-B+ - Alternator output voltage

Brown - Field, Alternator Control Current

Black - Ground, Alternator return

Blue - Tachometer, velocity signal back to console

Resistance over gravity is performed by the alternator in the StepMill. 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 lower board and wired into the alternator's field terminal. Under this condition, the console should also be driving the lower board's J1 pin 1 low, switching the .Sohm load resistor onto the alternator's B+.

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 at maximum, and the step rate should be at a 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.

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

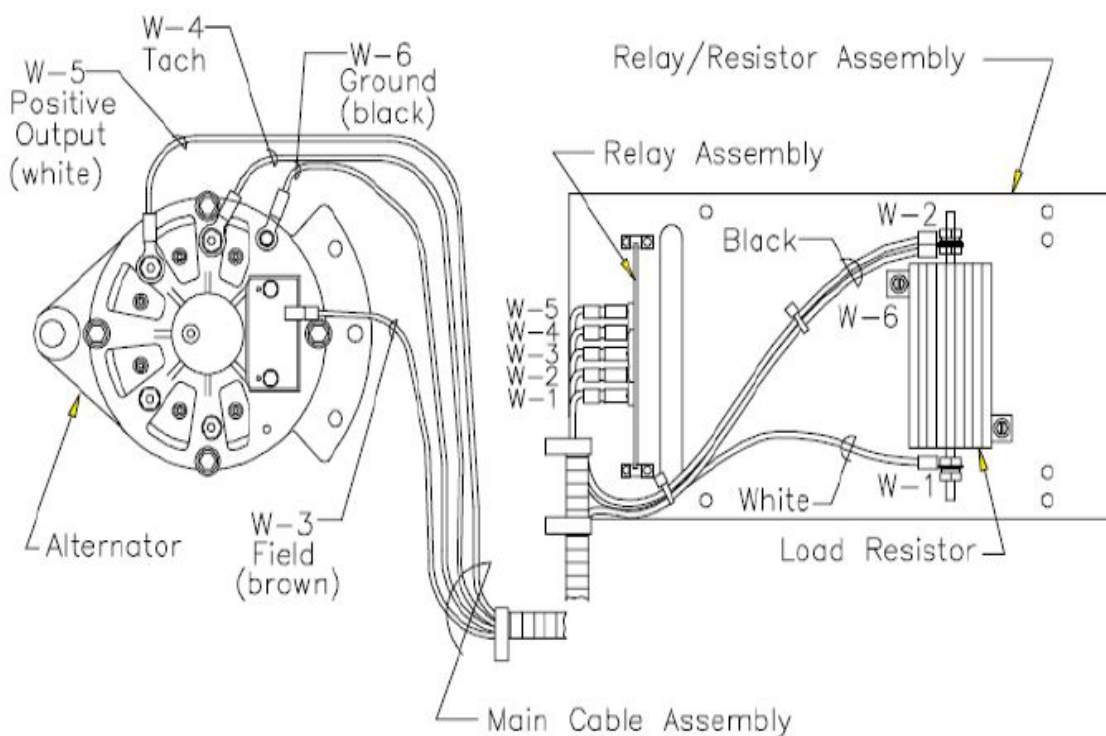
Power entry is at the bottom of the unit. The 12V 2.5A supply enters via the main power harness, and

enters into the PCB via J2. LED2 indicates power is present, but 12V should still be confirmed with a volt meter.

Power and control interface to the console is provided at location J 1. 12V is provided up to the console at J 1 pin 4, and GND pin 5.

In addition to alternator field current, the console controls the loading of the alternator's B+ with the .5 ohm resistor which is switched by the lower board's re lay. 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 .5 ohm. 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 J 1 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.



Power to unit but no resistance (Staircase freewheels and field LED does not light):

Check alternator brush length:

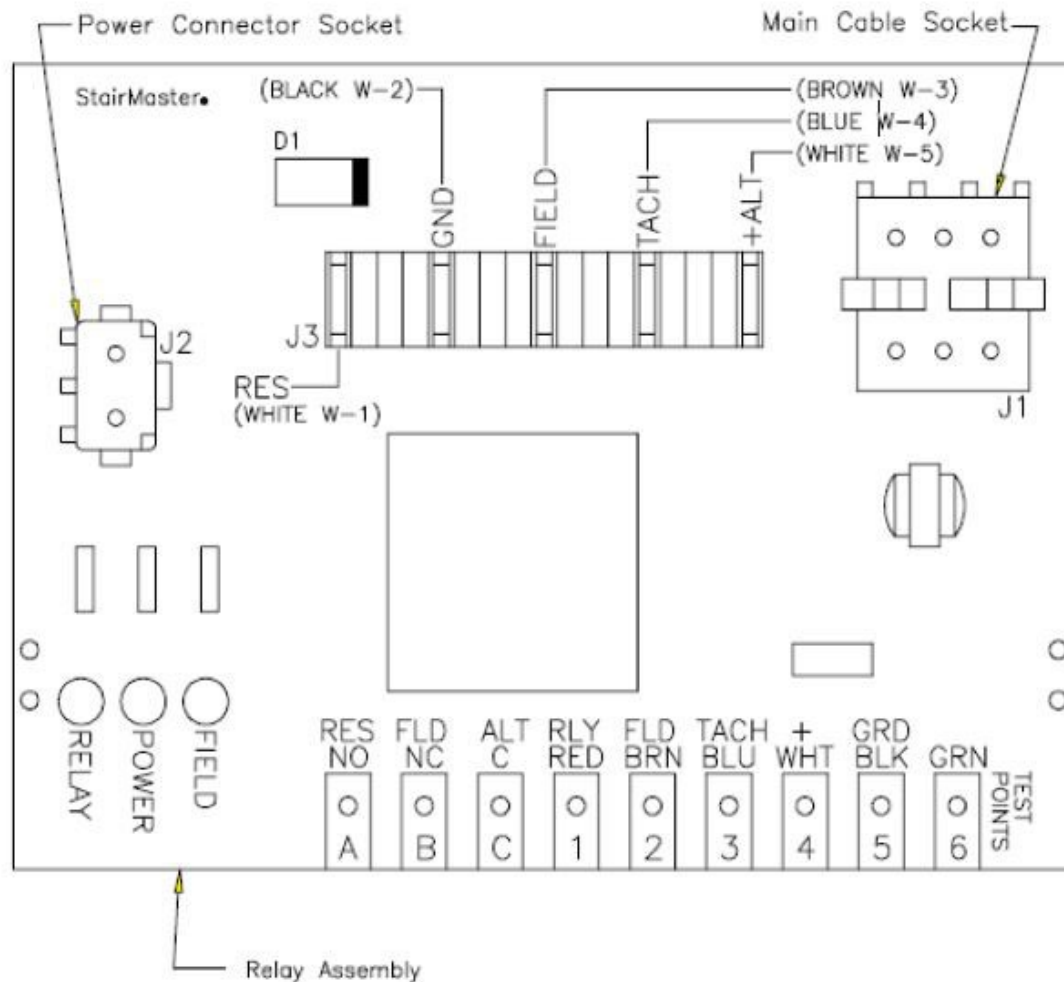
1. Remove user-right side cover
2. Remove brown wire from W3 (FLD BRN) post of alternator.
3. Loosen ¼" bolts on W3 post.
4. Remove and verify brush length and quality. We recommend replacing brushes that are ¼" or less.

Perform tach test by entering diagnostics, if there is no tach signal from the alternator:

- Check for .6 to .7 volts AC at the W-4 (Tach) terminal of the alternator.
- If no voltage, remove the blue tach wire from the alternator, while staircase is moving.

Touch the tach wire to the field terminal:

- If the field LED lights, replace the alternator.
- If the voltage checks good, remove the blue connector from the W-4 (Tach) terminal of the alternator. Lightly scrape the connector and re-install. Re-check.
- If still bad, replace the console.

**Test relay board:**

1. Disconnect the main cable from relay board J1 terminal.
2. With power on, place jumper across GND/BLK and RLY/RED test points. The Relay LED should light. If not, replace lower PCB board.
3. With power on, place jumper across +/WHT and FLD/BRN test points. The Field LED should light. If not, replace lower PCB board.
4. Disconnect the black W-2 ground wire. With power on now, 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. Once the test is completed, reattach the black W-2 ground wire and the J-1 main cable socket which was removed at the beginning of the relay board test. The Field LED should light. If not, replace lower PCB board.

Other Key Points:

- Remember that 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.

- 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.
- The Field LED on the relay board will flicker at higher speed levels. This is the PWM signal from the console 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 .5 ohms. If the resistor reads anything less than .5 ohms, then replace the load resistor.
- Always perform mechanical troubleshooting in addition to electrical trouble shooting for resistance problems.

SPEED CONTROL PROBLEMS

If you have problems with erratic speed control while operating the machine, the cause may be either electrical or mechanical in nature. You will have to remove the side covers to conduct most of these tests.

A. Perform a visual check of the machine. Check the following things first:

1. Inspect the Poly- Vbelt for proper tension and excessive wear. A loose belt will cause excessive noise and wear. The machine will run sluggishly if the belt is too tight.
2. Replace a worn or frayed Poly-Vbelt. Adjust the belt so that there is 1/10" (0.1 cm) deflection at a point midway between the alternator and transmission pulleys with fingertip pressure (refer to Figure 14).
3. Check for proper wire connections on the alternator, relay assembly circuit board, and load resistor (refer to Wiring Diagram 3).
4. Replace or exchange the console with another console you know is good and retest the machine.

B. Check the relay assembly circuit board while the console is in the ATIRACT mode. You will need an assistant to complete the test of the relay assembly circuit board.

1. Remove the right side cover. Locate the relay assembly circuit board located just inside the frame, midway between the top and bottom steps (refer to Wiring Diagram #1). There are three red indicator lights along the bottom edge of the circuit board. They are labeled, from top to bottom: Field, Power, and Relay. Ensure the black and white wire power connector (labeled J2 on the relay assembly circuit board) is securely connected to the relay assembly circuit board (refer to Wiring Diagram 2).
2. If the Power light is lit, go to step #3. If it is not, perform the tests as described in step C-5 of the "Console Fails to Power Up" section.
3. The relay indicator light should be lit. If it is lit, proceed to step #5. If it is not, use a jumper wire on the relay assembly circuit board. Jump the silver tabs #1 (labeled RLY/RED) and #5 (labeled GND/BLK) (refer to Wiring Diagram 3). The relay indicator should light up. If it does, go to step #4. If the relay indicator does not light up, the relay assembly circuit board must be replaced. Replace the relay assembly circuit board and retest the machine.
4. You must check the cable assembly for continuity if the relay indicator lit up when you jumped tabs #1 and #5.
 - a. Unplug the main cable from the position labeled J1 on the relay assembly circuit board. Disconnect the console cable from the back of the console. Set your multimeter to the continuity check mode; on most meters, this will be the resistance or ohms setting.

b. Place one lead of the multimeter on pin #1 at the console connector end of the console cable (refer to Wiring Diagram 1). Place the other lead on pin #1 at the end of the main cable you disconnected from the relay assembly circuit board. You will get a reading of near zero ohms if there is continuity in the cable assembly.

c. Check continuity in both ends of the main cable assembly at pin #5.

d. If there is no continuity in the cable assembly at either pin, replace the cable assembly and retest. If there is continuity in the cable assembly at both pins and the relay resistor indicator is not lit, the console is inoperable and must be replaced.

5. Have your assistant step on the staircase (leave the console in the ATIRACT mode) while you check the field indicator light. It should be flickering. If it is and you still have a speed control problem, go to step #6.

If it is not flickering, ensure the following: the console cable is connected to the console; the console/main cable connection is secure; the connector at position J1 on the relay assembly circuit board is securely connected; that there is continuity in the cable assembly. To check for continuity:

a. Unplug the connector at position J1 on the relay assembly circuit board. Disconnect the console cable from the back of the console. Set your multimeter to the continuity check mode; on most meters this will be the resistance or ohms setting.

b. Place one lead of the multimeter on pin #2 at the console connector end of the console cable (refer to Wiring Diagram 1). Place the other lead on pin #2 at the end of the main cable you disconnected from the relay assembly circuit board. You will get a reading of near zero ohms if there is continuity in the cable assembly.

c. If there is no continuity in the cable assembly, replace it and retest. If there is continuity in the cable assembly and the field indicator light is still not flickering, contact the Customer Service Department for further assistance.

6. If the field indicator was flickering while your assistant was on the machine and you still have a problem with speed control, you need to test the alternator (refer to Wiring Diagram 3).

a. Disconnect the white wire (labeled positive output on the alternator) and the brown wire (labeled "Field" on the alternator). Use a jumper wire to jump the Field and positive output terminals of the alternator.

b. Have your assistant step onto the staircase. Does the staircase slow down? If it does not, you need to replace the alternator. If the staircase does slow down, contact the Customer Service Department for further assistance.

C. Replace or exchange the alternator with another alternator you know is good and retest the machine.

D. Test the load resistor as outlined in the "Load Resistor Test" section of this Manual.

E. If the speed control problem still exists, contact the Customer Service Department for further assistance.

LOAD RESISTOR TEST

The alternators are heavy-duty models designed to withstand the rigors of commercial use. One possible reason for repeated failure is an inoperable load resistor.

To test the load resistor:

1. Unplug the AC power cord from the AC wall outlet.

2. Locate the load resistor mounted to the frame just under the staircase.

3. Disconnect one black wire from the resistor (refer to Wiring Diagram 3).

4. Set your multimeter for Rx1 or the lowest available resistance range. If you have an analog multimeter, touch the two leads together and adjust the meter for a zero reading.

5. Place one lead on Tab A and one lead on Tab 5 of the relay assembly circuit board (refer to Wiring

Diagram 2). You should get a reading of approximately 1.0 ohm or less.

6. Replace the load resistor if the reading is out of range and retest the new load resistor.

7. Reconnect the AC power cord and reinstall the right side cover.

The Field Tech app has libraries of assembly manuals, tech tips, and how-to's that will help technicians navigate daily tasks. Check us out @ fieldtechfitnesssolutions.com