

Troubleshooting: HP LaserJet III Malfunction „50 SERVICE“

Version Info:

This is the second, optimized version of the troubleshooting description „HP-LaserJet-III_Repair.doc.pdf“ dated mid 2003.

Helping Internet Links:

Additional information concerning this item can be found in the Internet at the following links:

<http://www.johannes-schubert.de/LaserDrucker/seiten/index.htm>

<http://carnot.pathology.ubc.ca/laserjetiii.html>

<http://carnot.pathology.ubc.ca/fusercon.pdf>

<http://www.mxbtv.de/hp/hp.htm>

Error „50 Service“:

If the HP LaserJet III printer shows „50 SERVICE“ after power up and the fuser is o.k. ... then maybe the „AC Driver / Safety Circuit“ board of the „AC Power Module“ is defect. This PCB with part number „RG1-1438“ is made from cheap PCB base material which can render a conductive path between adjacent feedthrough holes if it is old or was over heated.

First Check:

- 1.) Switch off the printer and disconnect the power cord.
- 2.) Check the fuser module (see below) or replace it by a functioning one.
- 3.) If this does not help then replace the „AC Power Module“ or repair it as described below:

Remove the „AC Driver / Safety Circuit“ PCB „RG1-1438“ from the printer:

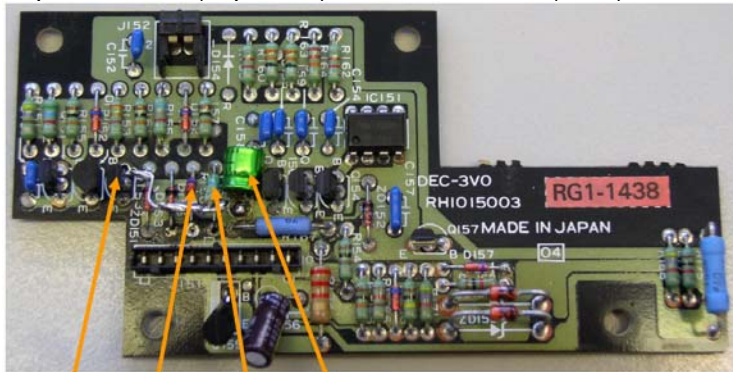
There is a good (but German) description with many photos from Johannes Schubert on how to open the printer. See: <http://www.johannes-schubert.de/LaserDrucker/seiten/index.htm>

- 1.) Switch off the printer and disconnect the power cord.
- 2.) Remove three screws (including washer) of the top cover.
- 3.) To remove the top cover firmly lift it on the back side (above power inlet) and press in (maybe with screwdriver) the right side panel (about six inches from backside) upper rim.
- 4.) Remove right side panel. See two screws (including washer), one near the power inlet and the other right, front side.
- 5.) Locate the „AC Power Module“ (right, back side) including the power inlet, power switch and fan unit.
- 6.) Remove the black plastic air deflector / air filter holder (two black screws including washer) in front of the fan.
- 7.) Remove the fan unit (three screws) and unplug the fan from the defective „RG1-1438“ PCB.
- 8.) Take away the upper, metal sheet (three black screws) which covers the „AC Power Module“.
- 9.) Remove the two remaining, black screws which hold the upper PCB named „RG1-1438“.
- 10.) Unplug the light blue cables (10 positions connector J151). Take out the PCB „RG1-1438“.
- 11.) Check and repair it as follows:

Check board „RG1-1438“ and prepare for repairing:

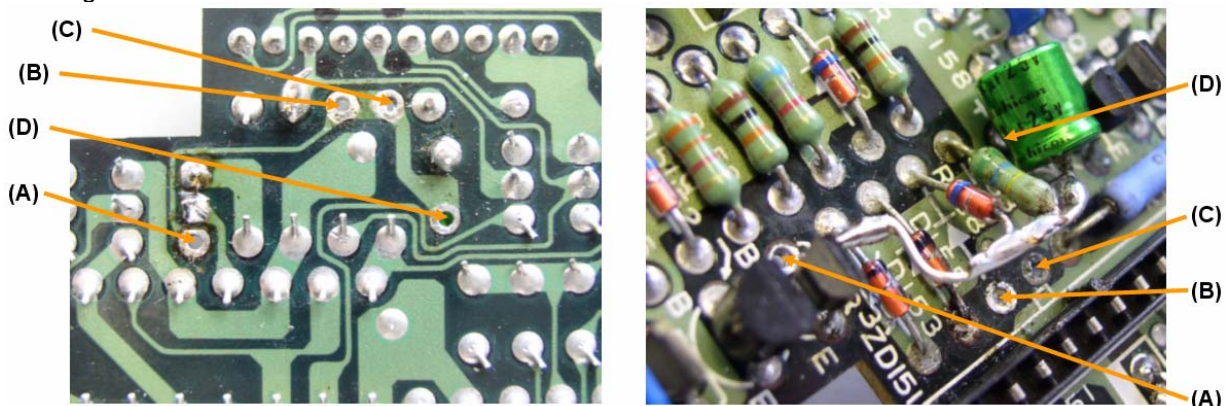
1.) Locate the following four circuits:

Capacitor **C153** (22 μ F/25V) Resistor **R158** (560k) Diode **D155** Transistor **Q153** (2SC1815)



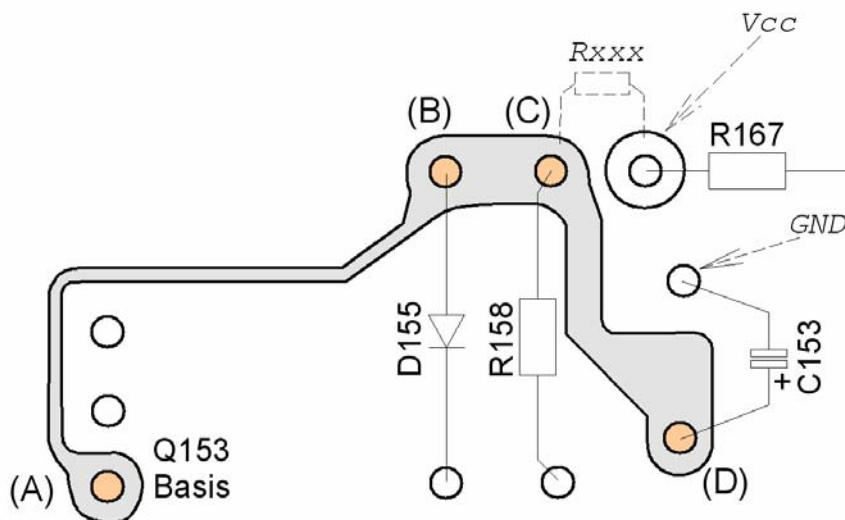
Q153 D155 R158 C153

2.) One leg of each of the circuit is connected to each other via one PCB track. Locate this track:



(A) = Basis of Q153 (B) = Anode of D155 (C) = R158 (D) = Plus of C153

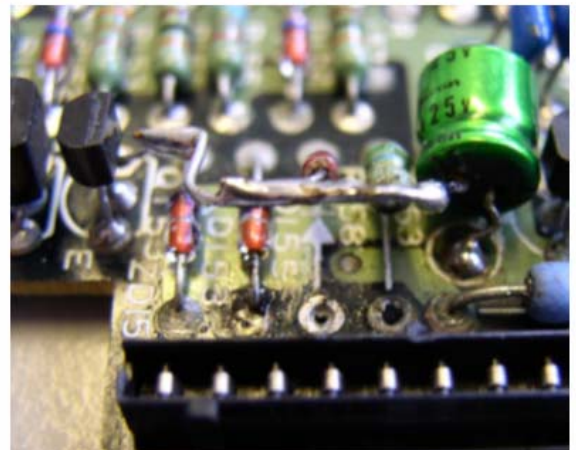
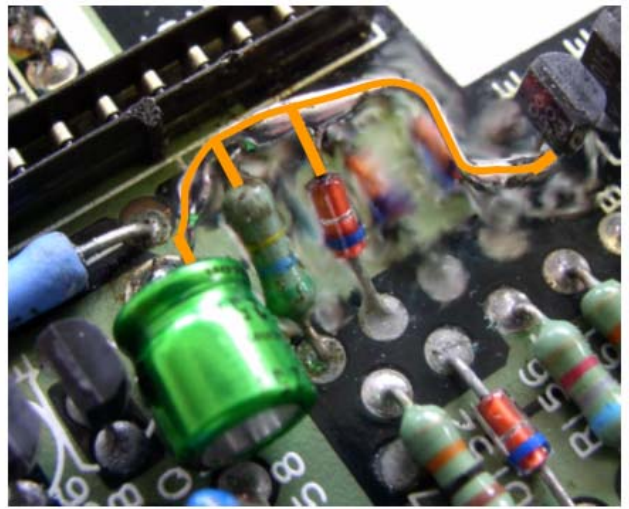
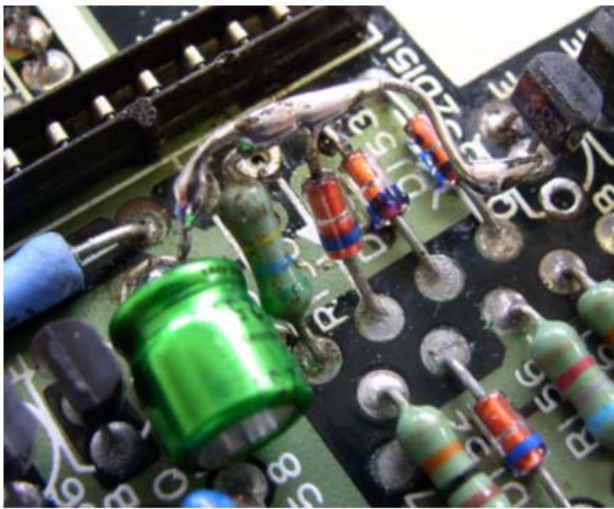
3.) Unsolder this one leg of each of the four circuits which goes to this one track. See colored marking and items (A), (B), (C) and (D). The capacitor C153 and the transistor Q153 need to be temporarily completely removed.



- 4.) After soldering let the PCB cool down to room temperature!
- 5.) Use an ohmmeter (10 or 20M Ω range) and measure the resistance (leakage current) from track which was connecting these four circuits (at base of Q153) to Vcc (pin 10 of connector J151 or R167).
- 6.) There should be absolutely high impedance as the track is not longer connected to any circuit. But if you measure a resistance of less than 5 M Ω (down to 170k typical), then there is a pseudo "resistor" R_{xxx} arisen within the PCB base material between the feed through holes of R158 and R167
- 7.) Repair PCB as described below:

Repair PCB „RG1-1438“:

- 1.) Do not use the track that was connecting the four circuits. Use a short piece of wire to connect the four loose legs (Basis of Q153, anode of D155, R158, plus of C153). The new wire is 'flying' above the PCB:
 - a. Take care to not stress the glass diode. Don't hardly bend or twist the legs of the diode.
 - b. The capacitor C153 needs to be removed completely before. Maybe replace it by a new one. Then turn and lay it down and solder the (-) side (black marking) back into the original position. Bend the (+) leg in vertical position to reach the new wire.
 - c. Also transistor Q153 needs to be removed completely before. Replace only the two other legs in the original place and bend the basis (marked with B) in vertical position to reach the new wire.
- 2.) Reinstall the PCB „RG1-1438“ into the printer. For a first test the metal cover and the fan need not to be mounted.
- 3.) If (because of any other reason) the „50 SERVICE“ is displayed again the printer must be powered down for at least 7 minutes interval before the next test.



Possible cause of the pseudo “resistor” Rxxx:

- Aging of the cheap PCB base material.
- Extensive heat generated by R167 or caused by low power fan of the first generation.
- To small distance of the feed through holes of R158 and R167.
- The design of the safety circuit around R157, R158 and C153 which is relatively high impedance.

How the pseudo “resistor” Rxxx causes the “50 SERVICE” malfunction:

- The problem occurs in the first 2 or 3 seconds after power up of the printer.
- As the fuser is not active it draws no current → Q154 pulls R158 to ground
- This should discharge the C153
- But the pseudo „resistor“ Rxxx charges the C153 up to 3 volts!
- With this the safety circuit around Q153, Q151 and Q152 switches the relay for the fuser in off state.
- With this the fuser has no supply and it is not warmed up → „50 SERVICE“
- The safety circuit can only be cleared with power down of the printer.
- The „50 SERVICE“error is not cleared until the printer has been powered down for seven minutes.

Comment: The pseudo „resistor“ Rxxx seems to change its resistance value with the temperature and the environment air humidity. And therefore it also changes when circuits are replaced because of the soldering heat. And this is why the “RG1-1438” seems to be repaired after replacing C153.

Comment: The above described repair also helps if the „50 SERVICE“ error is only sometimes seen and disappears if the following power up sequence is used:

- Power down the printer for a period of 7 minutes after display of „50 SERVICE“
- Power up the printer and wait till a second ‚click‘ occurs (about 3 ... 4 seconds after power up).
- Power down the printer, wait 1 or 2 seconds and power up the printer again → “50 SERVICE” gone

Fuser Malfunction Checks:

- 1.) Is the fuser assembly correctly seated into its connectors on the DC Controller PCB and the AC Power Module?
Visual inspection. Ensure the connectors are properly seated (no bent pins or pins outside their receptacles.)
- 2.) Is the circuit breaker on the AC Power Module tripped?
Reset breaker. Press the small light green button of the circuit breaker unit. This button is located directly below the black air filter (in front of the fan).
- 3.) Is the thermistor defective?
Perform the following thermistor Functional Check:
 - Remove the fuser assembly from the printer (4 fat Philips screws).
 - Remove the protective cover from the left side of the fuser assembly to access the Fuser PCB
 - Measure the thermistor resistance at J332 pins 1 and 2 (where the 2 white wires are connected).
 - At ambient room temperature the resistance should be approximately 1130 Kohms. If the printer has been operating for some time, the resistance value will be much lower.
 - If the thermistor appears to be either open or shorted, replace the Thermistor (Exit Sensor PCB)
- 4.) Is the Fuser Bulb open?
The Fuser Bulb and the thermoprotector are wired in series. To quickly check that neither assembly is open perform the following procedure:
 - Remove the fuser assembly from the printer (4 fat Philips screws).
 - Using an ohmmeter to check for continuity at the two pin connector at the right side of the fuser assembly.
 - If an open is detected, either the fusing bulb or the thermoprotector is defective.
 - To differentiate between fuser bulb an the defective thermoprotector proceed as follows:
 - ÷ Remove the screw securing the left side of the fuser bulb connector to the thermoprotector.
 - ÷ Verify the continuity of the bulb from the connector wire to the rear connector of the two pin connector.
 - ÷ If bulb is open, replace the completely fusing assembly.
 - ÷ If the bulb appears good yet the serial continuity measurement indicates an open, replace the thermo protector.
- 5.) Is the AC Power Module defective?
Replace the complete AC Power Module. Or replace only the upper PCB “RG1-1438”. Or try to repair the „RG1-1438“ as described above.
- 6.) If all this does not help ... then maybe the DC Controller PCB is defective ... replace.