TS-2000 Detailed Fan Modification with Photos

Author: Bob Armstrong

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Bob Armstrong
K0BT

The fan in the TS-2000 switches between off and full speed every few minutes. A simple modification will make the fan run at a low speed on receive without otherwise affecting the normal fan operation. The end result is a much quieter radio that still cools properly on transmit or when the ambient temperature rises.

This modification inserts a 100 ohm 1W resistor between the black fan wire and ground. This resistor is wired in parallel with the existing fan switch transistors and does not affect operation of the exiting fan circuitry.

This modification presumes some familiarity with working on electronic equipment.

The procedure appears long, but that is only because I have tried to detail every single step for those who are less comfortable doing this type of work. It's a very simple modification. Please read through it before you begin.

Parts needed

- One 100 ohm, 1/2 or 1 watt resistor (Any value from 82 to 100 ohms will work. 100 ohms is a bit quieter and works well for me.)
- 1" piece of 1/4" diameter heatshrink tubing

Procedure

- Please look at the photos below before you begin.
- To avoid scratching the radio, put down a folded towel or a carpet scrap on which to work.
- Disconnect the power cable from the radio.
- Remove the bottom cover.
- Remove the top cover.
- Remove the 10 screws that hold the metal RF shield in place.
- Gently remove the RF shield and put it aside. Be careful of the foam that goes around the speaker.
- Locate the fan at the front left side of the radio.
- Identify the red/black wires that go to the fan.
- Gently pull the fan wires loose from where they are tucked away.
- Cut the black fan wire in the center and unravel them from the red wire .
- Strip 1/4 inch of insulation from each of the new cut ends of the black fan wire.
- Twist the two wire ends together and solder them as shown in Photo-1.
- Bend the wire ends to form a small U-shaped loop.
- Prepare a 100 ohm resistor as shown in Photo 1 and Photo-2.
    - Cut one lead to 1/4 inch.
    - Form a small U-shaped loop in the 1/4" cut lead.
    - Cut the second lead to 3/4 inch.
    - Form a small U-shaped loop of about 1/8" in the end of the 3/4" cut wire
    - Bend the 3/4" wire at the resistor 90 degrees to make it look like it does in the photo.
- Slip a 1" piece of 1/4" heatshrink tubing over the black fan wires.
- Insert the pre-tinned black wire ends into the loop you formed in the 1/4" resistor lead.
- Squeeze the two loops shut to create a physical connection between the resistor and the black

fan wire.
- Solder the connection between the resistor and the black fan wire.
- Slide the heatshrink tubing over the resistor and apply heat as required to shrink the tubing.
- Locate the circuit board mounting screw that is directly behind the fan. (Photo 6)
- Loosen the screw two turns, or remove it.
- Slide the loop in the unused end of the resistor under the screw head and hook it in place.
- Position the resistor in parallel with the circuit board as shown in Photo 6.
- Tighten the screw.
- Carefully verify that the resistor lead does not touch anything except the ground pad and screw.
- Neatly tuck the fan wires away like they were when you started.
- Make certain that the fan turns freely and that none of the wires will interfere with it.
- Clean up your workspace and make certain that nothing has fallen into the radio.
- Test your work before you reassemble the radio. Power the radio on and make sure it works.
- Remove power again.
- Mount the speaker. You will probably have to gently bend the speaker tabs to work around the resistor. Be gentle and careful!
- Test again. Make certain that no wires interfere with the speaker, that the fan works as expected, and that the speaker works.
- Replace the RF shield.
  NOTE: When installing self tapping sheet metal screws, gently and slowly turn them counterclockwise until you feel them "click" into place. Then gently turn clockwise. You should feel the screw threads catch into the original threads they cut into the holes when they were first installed. This way, you don't cut new threads and you keep the screw holes nice and neat.
- Replace the radio top and bottom covers.

You are now done. The resistor is installed directly in the airflow of the fan, which will keep it cool. When you power the radio on, the fan should spin up to full speed for about one second, as usual, and then should drop to a nice low RPM. The slow flow of air across the components should keep the inside of the radio cool and should eliminate the usual on/off fan cycle. If the radio gets warm, the fan will come on at full speed as it did before and the fan will also operate on transmit just as it did before.



Photo-1: Black fan wire cut in half and ends soldered together.

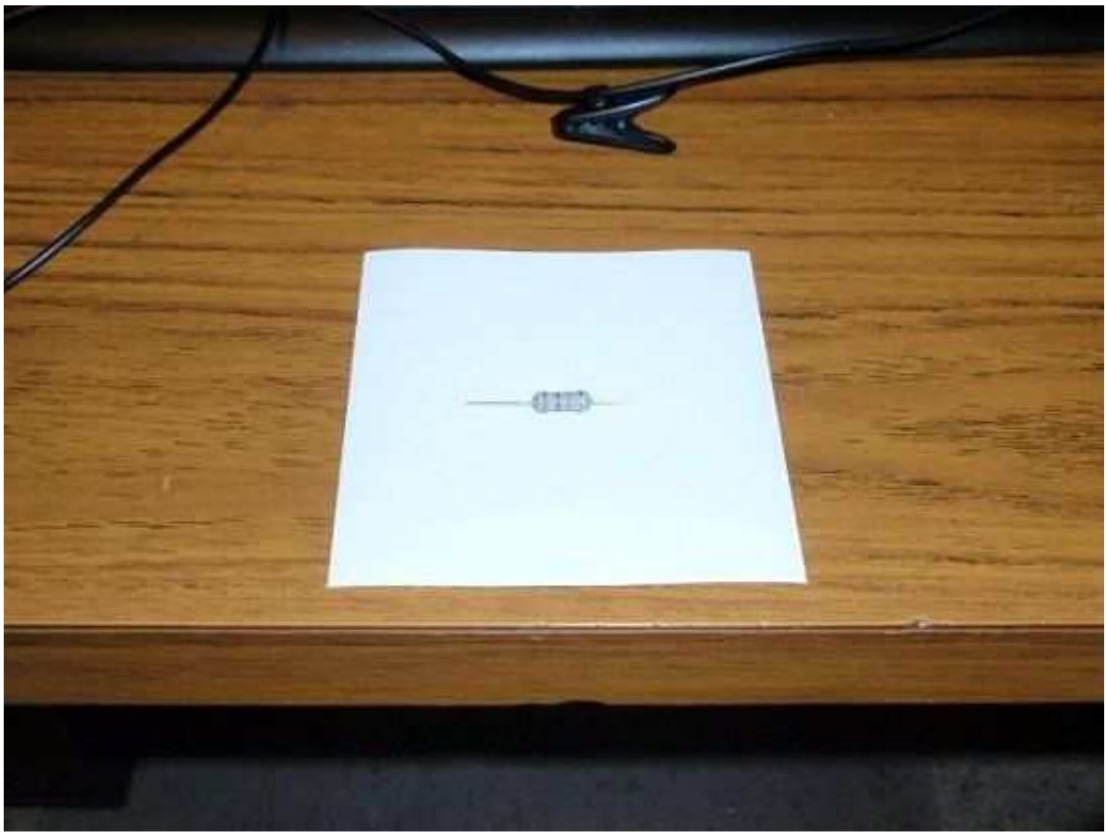

Photo-2: Resistor leads cut to 1/4" and 3/4"

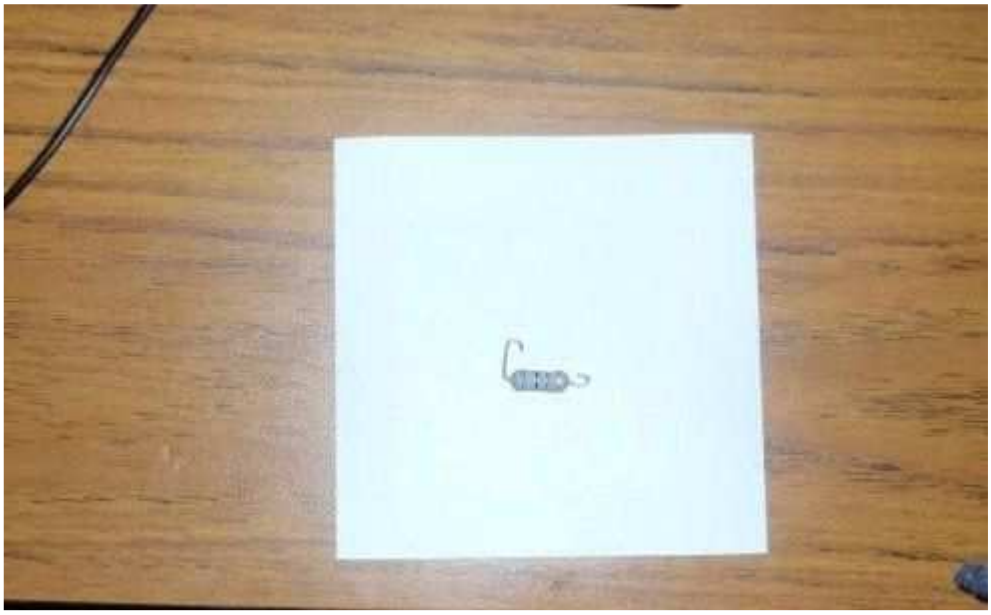

Photo-3: Resistor leads formed into loops. 3/4" lead also bent at right angle to resistor body.



Photo-4: Resistor attached to black fan wire. Note heatshrink tubing installed before soldering.



Photo-5: Assembly complete and heatshrink tubing shrunk into place over resistor and wires.



Photo-6: Resistor mounted in place and wires tucked out of the way.

73,
Bob
K0BT

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