

# At the Repair Bench – Para Dynamics Dummy Load

August 2024

It never ceases to amaze me that people will spend good money to repair equipment that is less expensive to replace than it is to repair. That was the case with the Para Dynamics PDC-50DL fifty-ohm one-hundred-watt dummy load that showed up at my door.

The complaint was that the owner smelled a “burnt electronics” odor from the dummy load, and when he measured the through-resistance of the load, it was no longer 50.1 ohms as it had been. Instead, it was closer to 54 ohms, and he wanted the unit repaired.

When I put it on the bench, the first thing that I did was to measure the through-resistance of the load, which came in at 53.8 ohms. Now this is clearly *not* fifty ohms as the load was labeled, but it was not terribly far from it. I decided to open it up and see what was what inside the unit.

Upon removal of the cover, I discovered that the architecture of the unit was a set of forty-eight 270-ohm 2W resistors configured as sixteen parallel sets of three resistors each, with each group of three resistors set up as individual series strings. Thus, we had 16 parallel resistances of 810 ohms each. Some simple mathematics shows that the total resistance would be 50.625 ohms

(810 divided by 16). However, the resistors were 5% types, meaning that each series string could have been anywhere from 769.5 ohms to 850.5 ohms. Taken at the high end, and assuming all were the same, we would now have 850.5 divided by 16, or a potential high resistance of 53.15625 ohms. I wondered just what his concern was until I looked at the other side of the PCB sandwich that comprised the

body of the dummy load. There, it was obvious that a resistor had gotten very hot, as the board was charred.

I attacked the unit with the soldering iron, first removing the dummy load body from its enclosure, and then removing the three resistors in the series string that was centered at the charred spot. What I found was that *all three of these resistors had failed catastrophically*, and that that particular series string was in fact not in circuit at all, but was fully open.

I had the same type and value resistors in stock, so it was a simple job to install three new resistors at that location in the array. I did so, and then I reassembled the dummy load. Now when measured with the ohmmeter, the resistance showed as 50.1 ohms from the SO-239 center pin to the body of the dummy load.

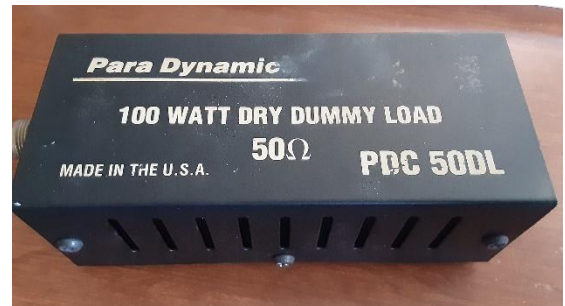


Figure 1 - Para Dynamics PDC-50DL dummy load



Figure 2 - Charred spot on PCB



Figure 3 - PCB with resistors removed

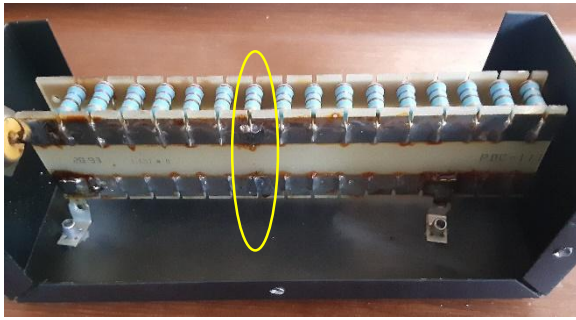


Figure 4 - Resistors replaced (opposite PCB)

So... why did these three resistors fail, and why did they fail in the manner in which they did? I cannot answer that with any degree of certainty. I can make the assumption, however, that excessive power was input into the load and that this failure was the result. Maybe they were the “weak link” in the resistor chain. Maybe the soldering at those resistors was poor and heat developed as a result. “Maybe” is a big and powerful word, because it can mean so much and so little at the same time. All that I know for sure is that

the dummy load is now back to its nominal fifty-ohm value, though in reality it was never very far off from that value, and was just barely outside of the tolerance range for the components used in its construction. Finally, I would like to mention that the 100-watt rating is a bit hopeful, as on its best day, two watts each at forty-eight resistors only provides for sinking 96 watts. What a slippery slope...

See you next month.