

THE COMPUTER CORNER

No. 145. DIAGNOSING A COMPUTER'S ILLS

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The other day, my computer shut down all by itself. Hmm, I thought as it rebooted, what could be causing that? After it was back up and running, I just continued working away and finished my project. But, just in case, I carefully copied my work to the other four computers on my network (my wife's across the room, and three in the basement: my general ham computer "Ham", my Winlink 2000 computer "WLink" and the test computer I use for setting up ARES/RACES hard drives during rebuilding – "Basementest". As I have written before, all of my machines have stuff I create kept on the E: drive, and all five E: drives are identical. So, I was covered. I sat back in my chair feeling confident, and it happened again, right in front of me. One moment my usual desktop was there, and the next moment I viewed a black screen with the machine rebooting itself. A puzzlement!

Well, we had been having some significant storms come through (the big ones in June, as many of you are unfortunately well aware). There had been some flickering of lights in the office, but no flickering occurred at the moment of shutdown, so I scratched that from my list of possible culprits. I knew that spontaneous rebooting could also be caused by a bad power supply, but I had replaced mine about a year ago with a pretty hefty job and I did not think that was it. The other possibility that came to mind was overheating of the CPU (the Central Processing Unit; the "main" chip on the motherboard). In many machines, the BIOS (Basic Input/Output System – contained in another chip on the motherboard) will monitor the CPU temperature and will shut down the machine if the CPU gets too hot. Clearly, some bench testing was in order.

I took the whole machine down to my bench and fired it up there. I entered the BIOS setup, and used the "Computer Health" section to look at the voltages. They were clearly within range – 11.87 VDC for the 12 VDC buss, and so on. Then, I noticed on this same screen that the CPU temperature was climbing – it was already up to 55° C (131° F) and still going up rather fast. I shut the machine down because a climbing temperature like that is not good. Modern CPUs can easily draw more than 100 watts, and we all know how hot a 100-watt light bulb can get. A CPU is on the order of only 2 or 3 inches square, and perhaps 3/8 inches high, and that is not very much surface area to get rid of all that generated heat. So there is always a big metal heat sink on the CPU, with a fan on top to remove the heat so that the CPU does not cook itself. I had used SIW (System Information for Windows, a freebie I have mentioned before) to check the CPU fan just before shutting down, and it was working OK at about 3,000 rpm. No clues yet, so it was time to open the case for visual inspection.

Wow, a visual showed the problem! While the fan on top of the heat sink was certainly working, dust bunnies were clogging the perhaps 40 vertical, closely spaced fins of the heat sink. Those fins make quite a large surface area for heat dissipation, but only a small percentage of that surface area was dust free. That dust was clearly impeding the ability of the fan to blow heated air away from the CPU. I guessed (correctly) that this was the cause of the overheating.

To correct the problem, I unfastened the four screws holding the fan on the heat sink, and brushed the fan with a dry paintbrush while holding the fan over the end of my shop vac hose. When that was done, I used the paintbrush to gently release the dust from the fins of the heat sink, again keeping the shop vac hose close to the work area to suck up that dust. Finally, I blew the last traces of dust out of both the fan and the heat sink with canned air, and vacuumed out the entire computer case. After replacing the fan and the case panel, I booted up. The temperature climbed to only 52° C (125° F) and stayed there, nice and steady. My machine is back, working perfectly, and is being used to compose this article.

The point is, I solved a problem using a combination of simple tools and approaches. Before opening the case, I used the machine's own BIOS to check the voltages (though a DVM would have done that, too), and free third party software (SIW) to tell me the fan was operating properly. Then I opened the case and used plain old visual inspection, which did reveal a possible problem. I proved that the dust was indeed the problem by observing a cooler, steady CPU temperature after cleaning up the fan and heat sink.

Often, simple approaches like this will solve the problem, but not always. Probably the best method to use when trying to solve more complex hardware problems is to open the case and disconnect everything but the video card (if there is one that is not built into the motherboard). That means unplugging the hard drive, the floppy, the CD-ROM, and removing any other cards plugged into the bus. Then reboot, to see if everything is working. If it is, add back one item at a time, rebooting each time, until the problem reoccurs. When the problem resurfaces, it is very likely the last component that you plugged back in that is the cause. Replace it, and you should be home free. Maybe.

But what if unplugging all the power sucking components does not solve the problem? That leaves only two components – the motherboard itself and the power supply. I have heard from a number of techs that repair computers for a living that the single most common component that brings computers into the shop is the power supply. A bad one may work intermittently, confounding any efforts to isolate the problem. So, if you can, borrow a known good power supply and plug it in (you don't need to install it in the case for this test – just unplug the old one and plug in the good one). The chances are that you will isolate the problem. If not, well then, think about a new motherboard. Happy Computing!