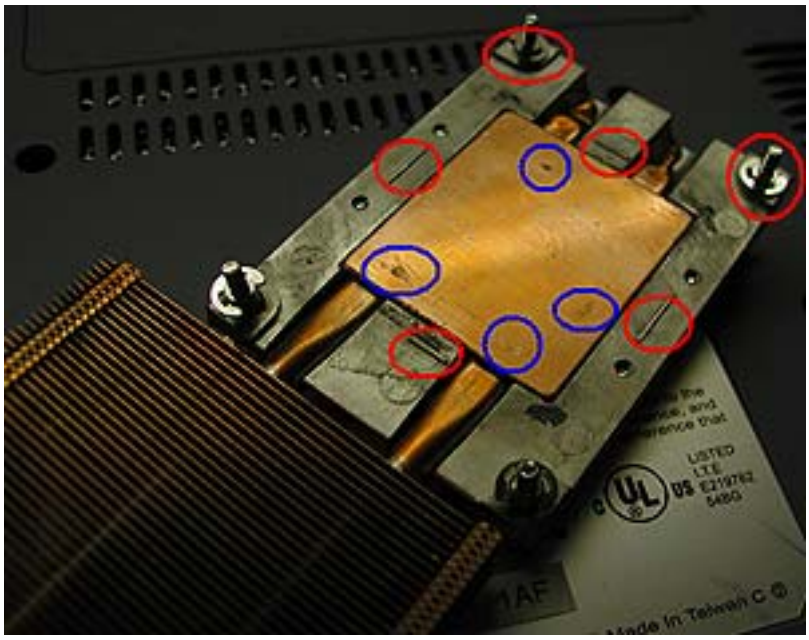
Desknote O/C Project Part I: Lapping

I have an ECS I-Buddie 4 Desknote and have been overclocking it, but I can't get the FSB quite as high as I would like. My heatsink had quite a few scratches on it and I felt it was not as efficient as it could be. I also felt my temperatures were too high even for a laptop; I was afraid to leave any paper near the exhaust on my laptop for fear it would catch fire. These are the main reasons why I chose to lap my heatsink, however, I also did it because my P4 1.8A cannot run stable at 2.4Ghz which is a 133Mhz FSB. It will run for a while but always crashes. I'm hoping lapping will solve some of my problems.

The general purpose behind lapping your heatsink is to create a flatter surface. Compared to a flat heatsink with a mirror finish, heatsinks with scratches and chips, or ones with an uneven surface, will not make good contact with the CPU. Better contact with the CPU will decrease temperatures, because air is a very poor conductor, whereas copper is very good. So we want as much copper as possible from your heatsink in contact with the CPU. Thermal paste will be used to fill the gaps, but copper still transfers heat much better than the thermal paste. Thus, we use very little thermal paste, and only to fill the small air pockets between the CPU and the heatsink.



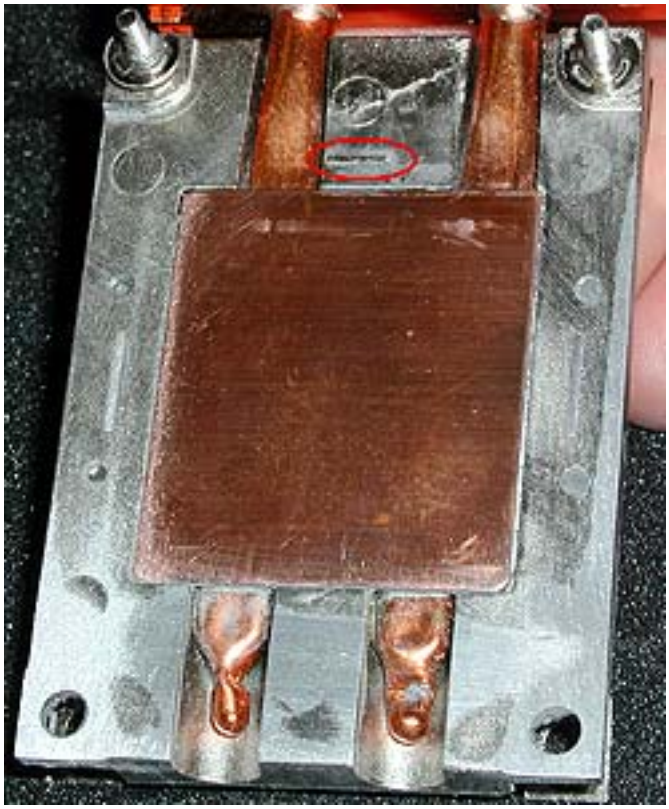
Above shows the condition of the heatsink prior to lapping. I have circled the most noticeable scratches in blue. In red I have circled the raised surfaces that have to be removed before I can actually lap the heatsink's copper core.

I actually had some difficulty obtaining the high grit sand paper needed for this project, since I'm on holiday in the UK at the moment and don't know the stores around here at all. I got some help from a member of the MHW forums who goes by Iffy and whom apparently lived in the UK for some time but now is a resident of Canada, like myself. He told me to check out Halfords and they stock a pack which was pretty much what I needed. The pack shown below was about $7.00 US and contained a few sheets of several grit ranging from 40 to 1200.


PROJECT
PACK

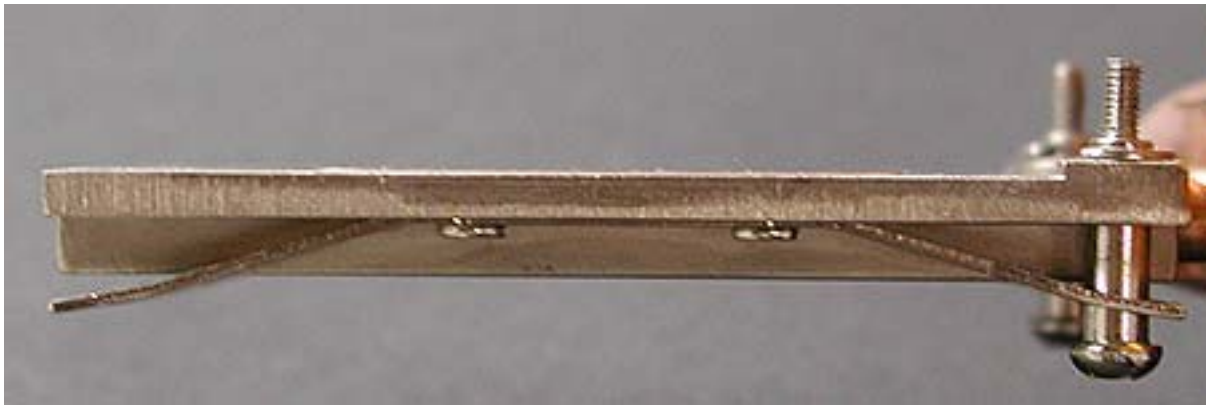
Once I had the sandpaper, the first thing I had to do was remove the raised areas that were in the way of my lapping. In order to do this, I had to remove the screws on the part of the heatsink I was sanding. Removing the screws involved taking off the standoffs, which took a bit of force and then simply sliding them out. I would have preferred to use a file to remove the raised areas, but I'm not at home at the moment, so I don't have access to my tools. Instead, I used the coarsest of the wet/dry paper I had which was 130 grit. This seemed adequate as I wasn't concerned about the finish of the metal which wouldn't be touching the core. Even though the edges around the copper didn't need to be totally flat, I placed the sand paper over a glass mirror for a flat surface. This is shown below.

The next picture shows most of the raised surfaces removed except for one which is circled once again in red. I hadn't realized it was there until I took the picture, so back to sanding...



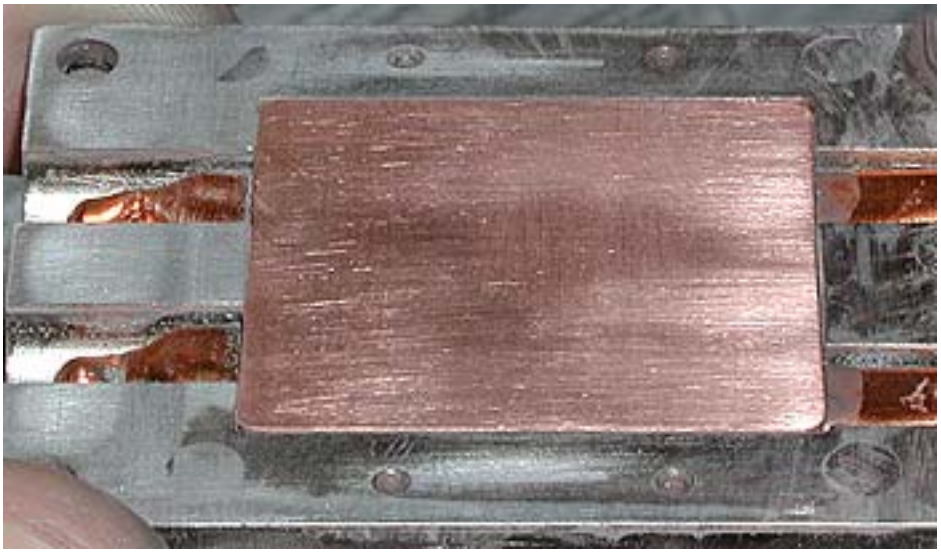
After a bit more sanding, I finally got rid of all the raised areas. I actually did the last one by folding the

sandpaper around a ruler and sliding it back and forth. A file would have done a much better job. This next picture is a side view of the heatsink now flat enough for me to start lapping. If you look closely you can see the copper core raised slightly above the aluminum.

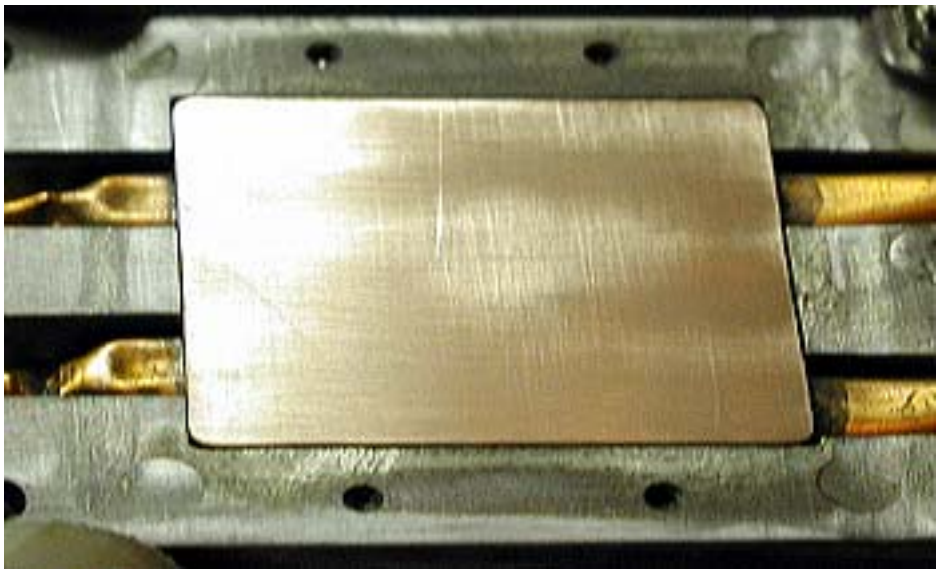


Throughout the lapping, I kept a pitcher of water nearby so I could sprinkle water over the wet/dry sandpaper to keep it moist. Keeping it moist allowed for easier sanding, since water allows the metal particles to move around the heatsink instead of clogging up the sandpaper. The water also reduced the amount of metal particles flying around in the air for you to breathe in, which is good ;) I used up/down and left/right movements. I wanted to try the figure eight technique, but the radiator attached to the side of my particular heatsink was in the way.

You can see from the bubble in the picture that I am keeping the paper wet. There is a mirror underneath to keep the sandpaper as flat as possible, but any flat glass surface can be used.

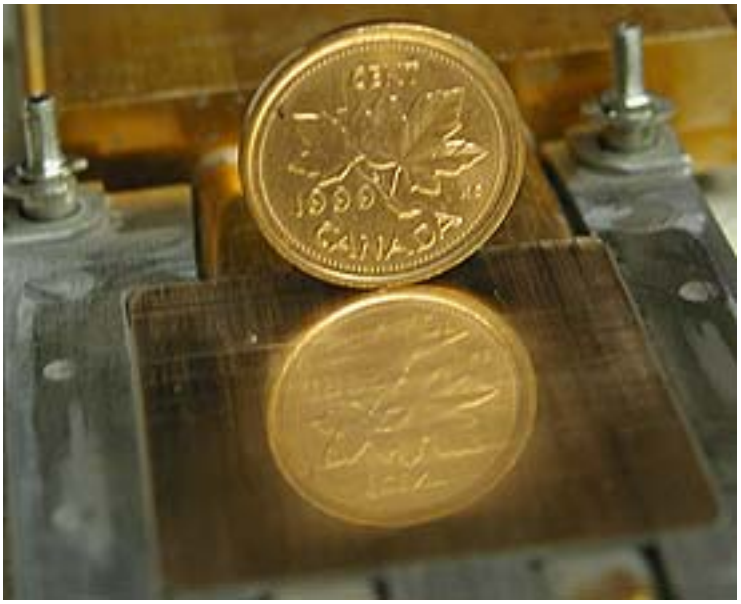


This is after using the 600 grit paper. You can see the large scratches from the first picture are gone, and the discolored copper layer that was exposed to the air has also been removed.



The above picture is after using the 800 grit paper and looks much smoother. At this point, I have been sanding for quite a while and decided to take a break. I also soon learned to wash off the heatsink after each sanding: leftovers from the last grit usually ended up scratching up my nice finish. It became especially noticeable on the 1000 grit and 1200 grit sanding. Each time you get a scratch on it, you have to start over again so make sure to really wash it off between grits. When using the higher grits, I found it helpful to add a lubricant to the surface. The lubricant seemed to prevent the grit from sticking, which eliminated the problems of old grit scratching. I used my fiancée's hair smoothing cream (After-Party by Bedhead- ask your wife).

After about 2 hours of work, most of which was spent sanding, and some spent taking pictures and fooling around, I arrived at my finished product. The surface was quite flat, with no more deep scratches on it, and was very reflective. The curving of the heatsink's edges, which usually occurs during lapping didn't really affect the copper core; it was the aluminum that ended up curved. All in all I think I did a pretty good job for my first time lapping, but see for yourself...



You can see a few insignificant scratches on the copper, which I noticed after taking the picture, so of course I went back to sanding ;) If I do this again in the future I will try to get a grit higher than 1200, since I couldn't remove all the scratches. No matter how much I sanded, I ended up with the same results. So I finally settled

and put on the paste and spread it around.

My fiancée was kind enough to take the pictures as I was working and put up with me taking over her entire room and keeping her up late.

I used a tube of thermal paste that a friend got for free with a heatsink or some such. I used it instead of my normal white paste: I was hoping that it would not dry out as fast as the silicon base paste, but only time will tell. If you're still with me by now, you are probably wondering how my temps changed. Well I'm getting to that...

When all was said and done, I lowered my load temps from 57C to 53C, a decrease of 4C! My idle temps showed a similar improvement. This also decreased my case temperatures by 3C - 4C, though it showed some variance. As for overclocking, I was able to notice a very slight increase in its overclock ability, but the 133Mhz FSB I was looking for was still not stable (the mouse locked up when windows started), so the project continues. Next I will be taking the Integrated Heat Spreader (IHS) off my P4 1.8A to see if I can reach that elusive 2.4Ghz! I should be done that article sometime this week so check back soon.

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