BY HOWARD JOHNSON, PHD

Scrape it

To probe a microstrip trace with no accessible test points or vias, you have to remove some of the solder mask. I know of only six ways to do it: scraping, milling, grinding, microblasting, chemical stripping, and UV (ultraviolet) illumination.

The UV-laser idea (US Patent No. 7081209) gives me the willies. It reminds me of a warning label I once saw on a powerful carbon-dioxide laser: "Do not look into this orifice with your remaining good eye." My lab is dangerous enough without adding invisible death rays.

Chemical stripping sounds like an appealing idea, unless you've ever tried to remove the old finish from an antique chair. It seems that, unless you know precisely what finish is on the surface, the strippers never react properly. Most likely, the technique will just make a big gooey ball on your PCB (printed-circuit board). Especially when you consider the huge variety of new coatings manufacturers are trying to mitigate tin-whisker problems, chemical stripping is not a good idea.

Eliminating those techniques leaves the mechanical approaches. Microblasting with a tiny sandblasting tool does quickly remove material, but it builds an incredible static charge across your board. Yikes! We are trying to measure signals on the board, not blow it to kingdom come. You can control the static buildup with a special ionized-air environment, but you can't deploy that sort of technology in an ordinary lab setting.

Grinding and milling are powerful techniques that both involve rotating machinery. Their biggest problem is that they are too powerful. You will spend a lot of effort throttling back their strength so you don't cut completely through the trace.

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Now you're down to my favorite tool, the lowly scraper. I like a scraper with a rounded blade. The curvature contacts your board over only a limited area. Given the right curvature, you can scrape a path just wide enough to reveal a trace under test without exposing other nearby features. Right before I set down my probe, I dress the exposed trace with a tiny piece of No. 600 sandpaper that I've heat-glued to the cut end of a Q-tip. This approach thins the copper oxide for better conduction.

So, where do you get a round-bladed scraper? If you wear nice slacks to work every day and you think digital engineers should always have clean, manicured fingernails, then you probably won't like this idea: Make it yourself. All you need are a hobby knife and a whetstone. I use a stone with a rough side and a smooth side. All hardware stores have them. Just ask for something that will sharpen a small pocketknife.

Some people recommend using a canine-tooth scraper (tartar scraper). It can work, but you'll have to grind it down to the width of your trace and then keep it sharp. Either way, you'll end up using a whetstone.

I start with a hobby knife that has a straight, sharp edge about 0.15 in. long. Holding the knife blade against the rough side of the whetstone, I make about 20 small circles. Then I turn the knife over and do the same on the other side. Try to hold the knife at a constant angle from the stone, about 20 to 30° from the horizontal. Whatever angle you choose will be the angle at which the stone grinds. Repeat the process on the smooth side of the stone, holding a 5° higher angle. The higher angle concentrates the final polishing on the sharp edge of the blade. Clean the stone with a paper towel.

With these basic instructions, you can make a sharp, straight blade. To form the curve, twist the blade back and forth as you circulate. You'll grind the ends of the sharp edge more than the middle, curving the blade.

When you're done, your knife will make clean scrapes the width of just one trace. EDN

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