Laboratory Maintenance & Configuration Tips
by Dennis L Feucht

Whether your electronics laboratory is a part of a large company lab or is your own private in-house lab, it has to be maintained, and configured, for effective work. Over time, various approaches to lab problems find creative solutions. Some are even effective. This article describes some I have found.

Tool Trays

Lab benches acquire dust. In air-conditioned rooms this is not so much a problem, but all labs eventually need cleaning. This task is complicated by the fact that the typical electronics bench is cluttered with tools and equipment. The tools can be handled modularly by keeping them on the bench in a flat tray, as shown below.

This is an aluminum tray found in the kitchenware sections of variety stores. I tend to stack tools separated functionally, and soon learn their locations, returning them to the same place in the tray each time they are set down. It requires a little discipline to handle tools in this structured manner, but it saves time in the long run in that tools are always in their proper place on the bench and in the tray. The soldering iron as a tool is an exception in that it has its own holder.

Bench cleaning is quicker and simpler when the tray is removed from it and set elsewhere. Of course, the tray itself occasionally needs to be cleaned, but that task has been separated from the bench-cleaning task. Software engineers are not the only ones benefiting from modularity. In a dusty environment (like mine has been), the tray can be covered when not in use by a cloth or plastic sheet, as shown below. Then only the sheet needs periodic dusting.

Soldering Tip Cleaner

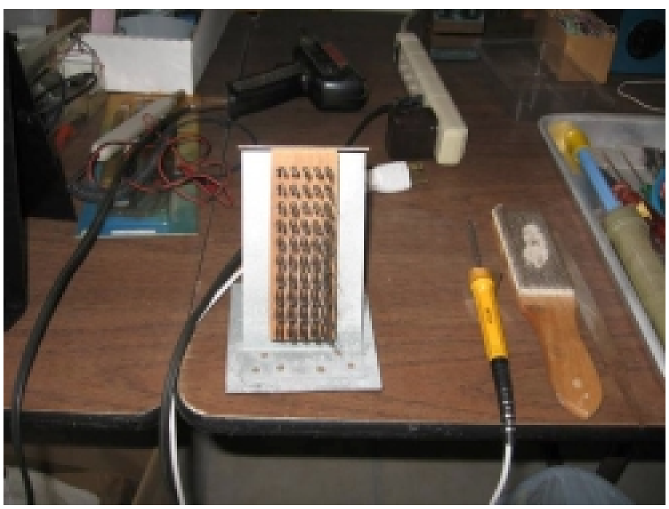
Soldering-iron tips are often cleaned using a wet sponge. I have never liked this scheme because not only does the sponge dry out (and a water bottle must be kept nearby) but a well-wetted sponge also cools the tip excessively and is a poor remover of solder, which forms balls when cooled. And the solder that is removed from the tip: where does it end up? New sponges are needed because of the accumulated solder embedded in the old one. This is eventually disgusting.

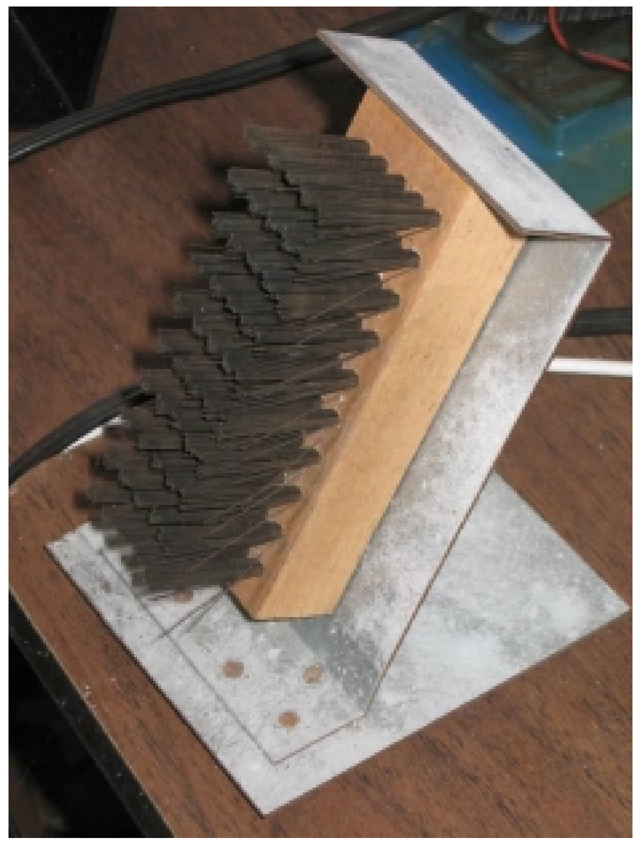
What grew up at Tektronix was a different scheme using company-made tip cleaners. An old one is shown below.

It consists of an aluminum frame holding two brushes that are readily available at variety stores. The locations of the brushes can be adjusted with screws holding the brushes from the back of the frame so that their separation is optimal. A soldering tip is passed down between the brushes to clean it. The removed solder ends up either stuck to the brushes (which are easier to clean than sponges) or it falls to the base of the frame. These tip cleaners were used with Antex 18 W irons, with chisel tips, to develop most of the oscilloscopes you might have used in the past.

Some people use round solder tips. I don’t know why. The chisel tips allow soldered wire to be pried free from the solder junction while the solder is molten. The round tips are not nearly as effective in this use because they lack edges for prying.

Outside Tek, access to these tip cleaners is difficult. I eventually had to resort to making my own. One is shown below. It is based on an even simpler scheme, that of merely wiping the tip on the edge of the brush tines. This cleaner has the advantage of simplicity at the expense of solder control. The dual Tek brushes kept the solder from splattering. Mine do not, though it still ends up on or around the brush holder and can be occasionally cleaned fairly easily. I also went to a metal brush because the plastic (Nylon) brushes in the Tek cleaners had a tendency to burn and be worn back or frayed by burning over time. Metal brush tines do not burn.





Another approach is to clean the tip with a metal-tined brush or card file. The problem with these is that you have to use two hands, one to hold the iron and the other the brush. With the brush tip cleaners, the hand holding the iron does the cleaning as the brushes are supported on the bench by their holder.

Overhanging Equipment Benches

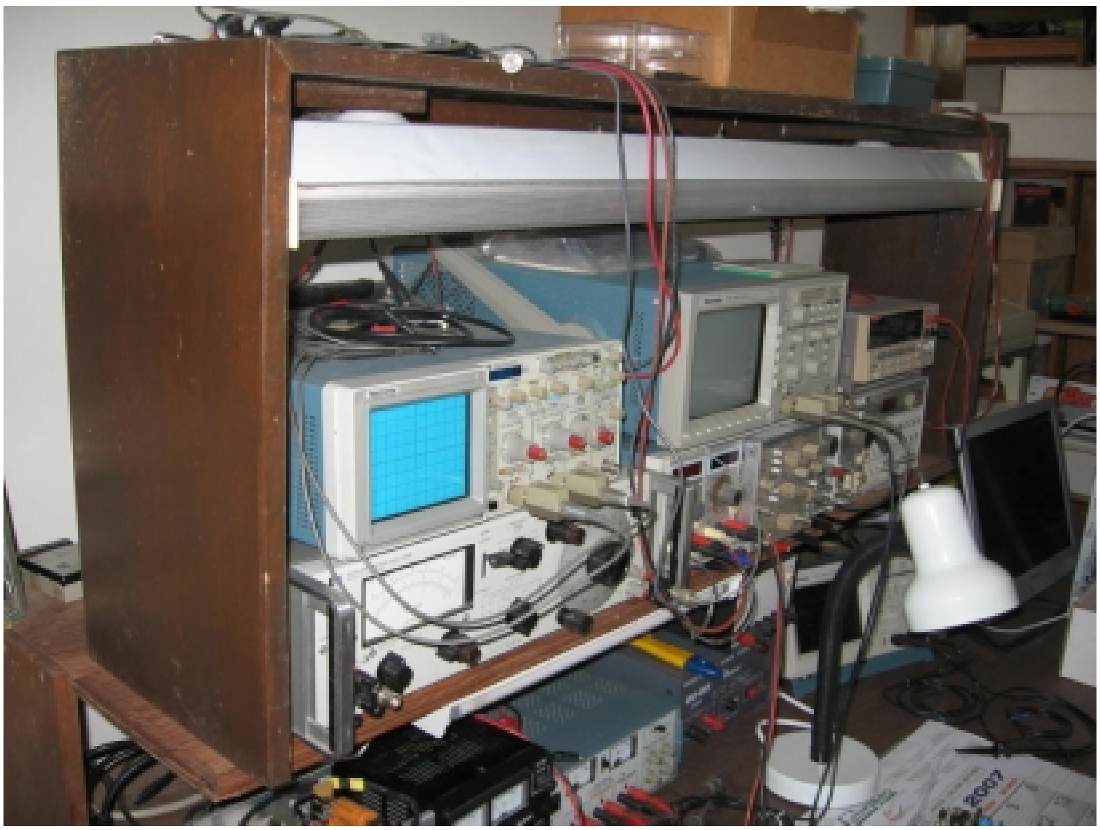
The second clutter factor besides tools is equipment. Some of it, like hand-held DMMs, are easily moved. The larger equipment is best removed from the bench to leave room for work-pieces. Where then should it be placed? I solved this problem by designing some customized wooden (finished plywood) equipment benches, as shown below.

These benches are placed behind the folding tables, which are a low-cost, light-weight, and effective form of lab bench. Their height allows use of ordinary chairs instead of bench stools. I cannot imagine the advantage of being perched up on a stool to work on a bench when ordinary desk-height tables suffice for electronics work. The equipment benches are given added lateral strength and storage space by adding shelves across them. The shelves are handy for items that are not continually used but must be kept nearby, such as variacs or isolation transformers.

One caution in using these kinds of benches: because they cantilever out over the workbench, they must be weighted sufficiently at the rear to be stable. This is usually not a problem in that most equipment is large enough to extend back (with the heavy 60 Hz power-supply transformers in the rear) to balance them. Also, any heavy items stored on their shelves will similarly keep the bench from rotating forward, spilling equipment onto the workbench.

Bench or Desk Lighting

Along with customized equipment shelves, the desk lighting can also be removed from the desk. A simple U-shaped tubular-fluorescent lamp (TFL) stand made of finished wood provides lighting where it is needed. In the situation shown below, it is not optimal in that it illuminates the tops of equipment enclosures more than the bench. However, on a desk, it is near-optimal.



Project Tote Boxes

With several projects in the works, whether shelved or active, project management of not only events and tasks but hardware and documentation becomes a factor. Cardboard tote boxes, as shown on the next page, are useful for keeping all the hardware of a given project in one place. This concept can be extended by also keeping the documentation with the hardware so that the problem of undocumented hardware is minimized, as shown in the upper-left picture.

Various sizes of boxes can be used, though I standardized on three. The largest, the *project box*, tote tray is a TT1 from Tharco http://www.tharco.com in Denver, CO. It is shown in the upper left and right photos and has dimensions: 13.5 × 13.5 × 3.5 in. A decade ago when I invested in them, you could get 25 for about $21 US.






The lower-right picture is that of an alternative tote tray, though I much prefer the more durable TT1. A smaller box, shown in the middle and lower-left photos, is a self-locking bin box, Tharco # B6, with dimensions: 12 × 6 × 4.5 in. For 100 of these, I paid $45.30 in 1996. The bin boxes are useful for containing smaller projects and to hold large parts on stock shelves.

Power Cart

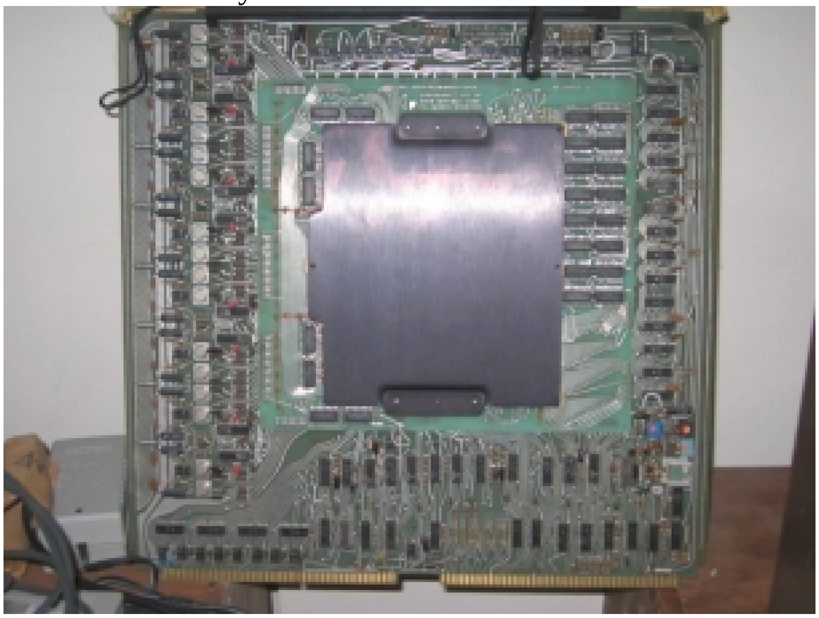
Another useful category of items are carts. They are often used for curve tracers or other pieces of equipment that can be rolled to near the workbench, then backed off when not needed. A variation on this theme for power electronics is to use a Rubbermaid-brand three-tier cart for holding the bulky and heavy 1 kW line conditioning unit, shown below. I placed it on the center shelf, leaving the bottom one for associated bulky items, such as the 1 kW load made from 10 100 W incandescent bulbs. The top shelf can then hold a dynamometer or other equipment.

Document Holder

Another de-cluttering factor for workbench space (which is always at a premium) is a way to hold circuit diagrams and other documentation that must be referred to while working on electronics. This is not so much a custom item, though the paper holder shown below was made near the lab when it was purchased. The only drawback of this particular holder design (should you decide to cut, heat, and bend some plastic sheeting) is that the lip coming up from the bottom to keep papers from slipping forward is too high and obscures text at the bottom of the pages. It ought to be about ¼ in. (7 mm) to be optimal.

Ambience

How much the *ambience* factors of the lab increase its functionality is hard to quantify, but they should not be entirely overlooked. A few inspiring items in the lab environment can function not unlike stained-glass windows in cathedrals. One such item in my lab is shown below.



Ah, some reader is bound to object; that Eclipse computer memory board is *digital!* Well, have you ever designed a core memory? The most interesting circuitry in it is very analog: the circuits that drive core planes and read the magnetization of the cores. I could have suggested the following item instead: the front panel of a Data General Eclipse, the computer written about by Tracy Kidder in his book *Soul of a New Machine* (Avon, 1981).

In this case, the association of the story Kidder tells of the engineering development is easily generalized by the analog thinker to apply to electronics development generally, including analog. Thus the digital computer front-panel indirectly provides a kind of emotional boost to the analogically-oriented designer. To an analog hammer, everything is an analog nail.

Ambience can be combined with functionality. The CRT lamp (shown over) is another historical part of Tektronix culture (except for the CFL mounted atop it). Tek built high-performance CRTs for oscilloscopes and storage-display terminals. Oscilloscope CRTs rejected in CRT manufacturing found a new use by the women (they were nearly all women back then) who worked in final assembly. These CRTs would show up at the Country Store, the company surplus outlet mainly visited by Tek employees in the early days but later to include people from Intel and other places. The eye of an ordinary person, who is not an engineer, will see practical household uses for components where an engineer sees only intended function. The hole in the glass near the faceplate (which contacts the surface of the table, thus hiding the graticule) for the high-voltage connection of the *post-deflection anode* (PDA) is drilled for the line cord exit. On the other end, the socket is drilled. Then the act of threading the line cord through the interior is finally accomplished, a lamp socket is attached, and the rest is downhill from there.

The historic value of an old piece of impressive-looking electronics reminds us of the larger context in which we do our bench work. We are creating a piece of history on those benches.

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