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BENCH BRIEFS

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HOW TO REMOVE ICs

by Dick Gasperini, Editor

Removing integrated circuits from printed circuit boards is a problem that sometimes is bewildering to repair personnel when initially encountering ICs. Here are several methods that may provide an interesting solution to your IC removal job.

I find that soldering techniques are a very personal subject. A method one person likes well may be hated by a co-worker. Therefore these are presented to acquaint you with the various methods that I have found helpful. Some work well in most situations, while others work best in unique circumstances.

CLIP OUT

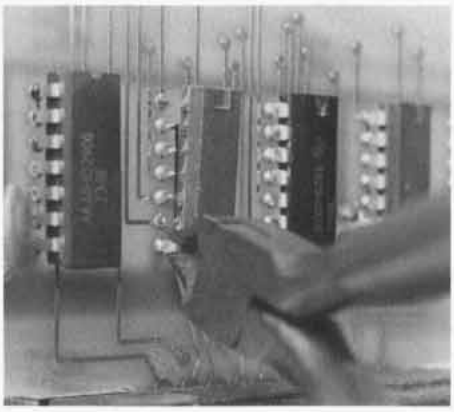

FIGURE 1

One of the easiest methods to master is the "clip out" — where each pin is cut off the IC as close as possible to the body of the IC. See Figure 1. The IC body is then removed, leaving all the pins still soldered in the board. The pins can then be removed one at a time by heating with a solder iron and pulling out with needle nose pliers. See Figure 2.

FIGURE 2

Then each hole must be cleared of solder. The most effective way I have found is by using a hand operated vacuum device such as the Soldapullt shown in Figure 3.

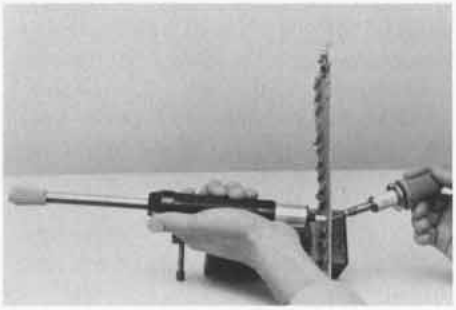

FIGURE 3

This is a spring-loaded plunger that can be cocked and released, pulling the solder into the Soldapullt. Periodically solder is removed from this desolder device.

Some service personnel regard the clip out method as crude, but it is very effective. While other methods may be faster, the clip out method is easy to learn and there is minimal chance of overheating and damaging the p.c. board. Many people prefer this for multilayer boards or other delicate boards.

VACUUM DEVICE

A faster method is to unsolder each lead of the IC by heating it on one side and using a vacuum device on the other. See Figure 4. Shown here is a smaller vacuum device called Soldavac. Each pin of the IC is unsoldered in this manner, taking care not to overheat the board. Too much heat will cause spots on the p.c. board, referred to as "measling".

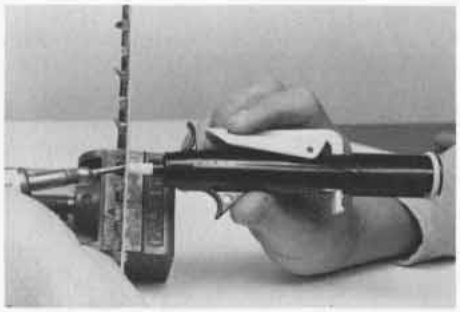

FIGURE 4

Many p.c. boards have traces on both sides and have eyelets or plated-through-holes connecting the two sides. It is important that each IC lead be dislodged from the plated-through-hole; this is easily accomplished by wiggling each lead gently with a long nose pliers. A distinctive click will be heard as the lead is pulled free. See Figure 5. After all leads are free, the IC should easily come out of the board with an IC puller. See Figure 6.

IN THIS ISSUE

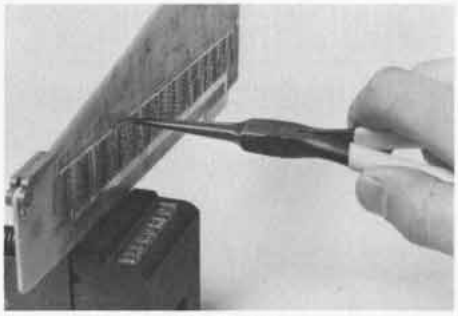

FIGURE 5

Use of excessive force would damage the p.c. board if traces are lifted or plated-through-holes are cracked. Either of these would cause long-term problems with reliability and serviceability. Philosophically speaking, it is important to leave the electronic gear in no worse condition after the repair than before the failure occurred. Therefore mastering an effective IC removal procedure is essential.

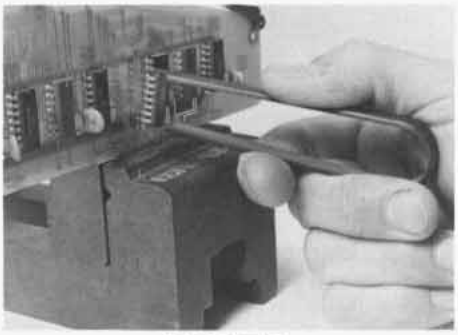

FIGURE 6

Any lead that cannot be wiggled is still soldered to the plated-through-hole and it must be unsoldered. An easy way to do this is to solder that lead and then again apply the desoldering vacuum tool. Attempting to pull solder out of a half-unsoldered hole is difficult.

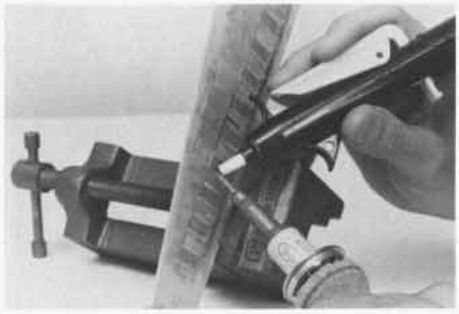

FIGURE 7

Another method of unsoldering is to heat and pull solder from the same side of the board, as in Figure 7. The procedure is to heat the pin, remove the solder iron, and very quickly move the vacuum device perpendicular to the board while pressing the trigger. While this method is satisfactory, generally more heat must be applied than with the technique in Figure 4.

The solder iron I use for these situations in an Ungar #776 body with a 42 watt element and chisel-shaped point. I prefer a chisel-shaped tip because I can heat two pins at once on an IC. The vacuum devices can also accommodate two at a time. If operated at full line voltage, a 42 watt element would get too hot for most p.c. boards. My work-bench has a variable voltage transformer with which I control the tip temperature.

Running this element at about 80 volts seems to work well for p.c. boards, and yet I still have enough power (at full line voltage or above) for fast warm-up and for ground planes on p.c. boards or wires on a terminal tiepoint. A simple heat control can be constructed with a diode and a switch where the diode is placed in series with the iron for low heat or by-passed for high heat (see the Nov-Dec 1973 *BENCH BRIEFS*).

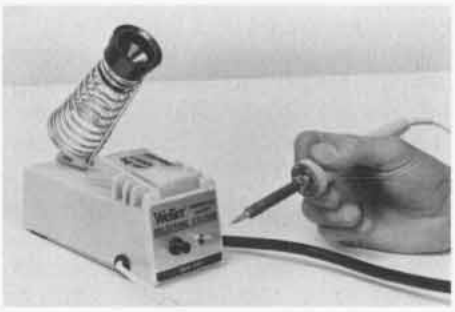

FIGURE 8

More sophisticated solder irons have built-in temperature control. Some have a temperature sensor in the holder so the temperature gets monitored when the solder iron is at rest. Others have continuous temperature monitoring, such as the one shown in Figure 8.

COMBINATION IRON

Another iron that I like is Uniline Mark VII, shown in Figure 9. This is a solder iron with a hollow tip and a squeeze bulb. To use it, squeeze the bulb, apply the iron to the IC lead, and watch for evidence of melting solder on the component side of the board. When the bulb is released, the solder is sucked into the iron. After each joint the solder is ejected from the iron by squeezing the bulb. All the other leads are similarly done. The IC leads are then wiggled free of the plated-through-hole and the IC is removed.

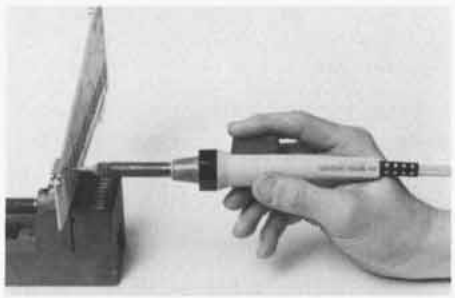

FIGURE 9

This iron gives me the fastest results of any method I've tried, although some people prefer other techniques. This iron also has a 3-wire cord so the tip is connected to ground (earth). You may be shocked (no pun intended) to measure the AC voltage on your solder iron tip. A small amount of leakage can result in sufficient potential to destroy sensitive devices such as MOSFETS.

FIGURE 10

Other manufacturers also make similar irons, such as the Weller DS40-3 shown in Figure 10. This particular model is available with either two- or three-wire cord.

LEAKAGE AND ISOLATION

When repairing a piece of electronic gear, the chassis is almost always connected to ground (earth), even with the power cord disconnected. There may be a signal generator giving a test signal, an oscilloscope making a measurement or a power supply providing a bias, and each instrument will be completing a path to ground.

If a leaky solder iron is used, strong currents may flow in adjacent circuits, causing extensive and mysterious failures.

The use of solder guns is generally not recommended because of the huge transients that may be induced in sensitive circuits.

And needless to say, anyone not disconnecting power before attempting a soldering operation is merely creating problems since the solder iron tip will be shorting the circuit to ground.

One way around all of this is to use an isolated solder iron such as the Wahl Cordless Solder Iron in Figure 11. This iron, which has a rechargeable nicad battery supplying the power, is equivalent to about a 35 watt element. A combination holder and charging unit is supplied so the iron is charged while not in immediate use. This iron works very well for field use because of its portability and small size. In addition, the built-in light is handy for improved visibility.

FIGURE 11

More elaborate desoldering fixtures are available that combine a temperature controlled heating element with an electric vacuum pump. While these may be the solution for a number of installations such as a manufacturing plant or a high-volume p.c. board repair area, their lack of portability may be a deterent for service personnel who must repair electronic gear on site. The initial investment is also rather substantial.

Some solder iron manufacturers offer attachments that heat all pins of an IC simultaneously. While some people are happy with the results, most people seem to have trouble and end up overheating (and damaging) the p.c. board.

DESOLDERING WICK

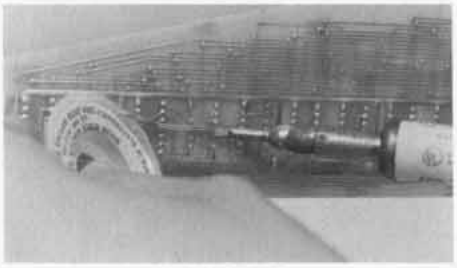

FIGURE 12

One other method that has some merit is desoldering wick, which is braided wire treated such that solder easily flows to it. Use is simple; merely place it between the solder iron and the point to be unsoldered. Solder flows onto the braid. See Figure 12.

Its use on printed circuit boards with plated-through-holes is nowhere near as effective as the vacuum devices. However, desoldering braid can be very useful in high density point-to-point wiring (such as an oscilloscope) where a vacuum device won't fit. It may be helpful to keep a small roll in your toolbox for use in the appropriate circumstances. Best results are obtained by dipping the wick in liquid flux immediately before use.

INSTALLATION AND CLEANING

After the defective IC is removed and the holes in the p.c. board are all clean, install the new IC and solder into place. (Double check the orientation of the IC before soldering. It is very embarassing to complete a soldering operation and then realize that the IC is in backwards.) See Figure 13. Be certain to get each pin

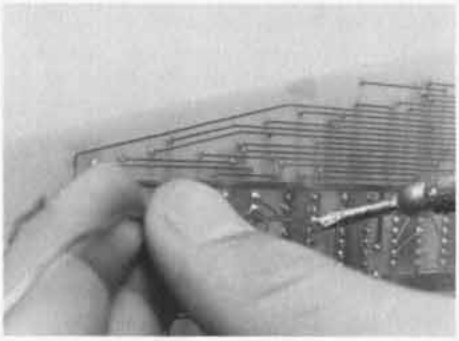

FIGURE 13

hot enough so solder flows up into the plated-through-hole. Some service people suggest soldering the lead from both sides of the board. Next, clean the board with a flux remover such as Freon TF Degreaser. A small brush with short bristles can be a helpful tool. See Figure 14.

FIGURE 14

A clean board is advantageous for several reasons, one of which is a reduced susceptibility to dust sticking and the resulting high humidity leakage path that would result. Another is esthetics. It just plain looks unprofessional to see flux remaining on a board. A neat looking repair job is a sign of a true professional.