

Collecting a Ham's Tools of the Trade

Use your knowledge, test gear and calculator as ham "tools," but don't forget that a good set of hand tools is also necessary. If the contents of your toolbox look like leftovers from a scavenger hunt, consider purchasing these essentials!

By Jim Bartlett,* WB9VAV

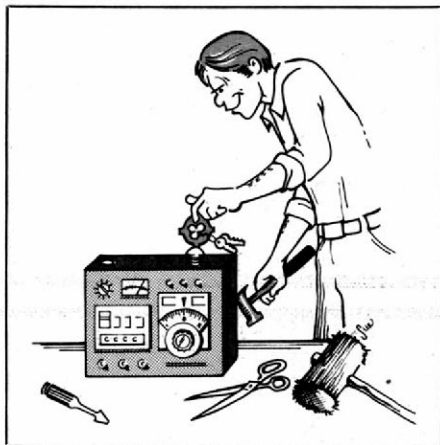
As I poked my head through the door of my friend's ham shack recently, John greeted me with the familiar "howzit-goin'?" I had begun to expect.

Sidestepping the rat's nest of wire on the floor, I entered the room as John fished his key ring from his pocket. He proceeded to tighten the last screws on his latest project with his "lucky charm" pocket screwdriver. "Whew, all done!" he beamed as I approached the workbench. Strewn across the bench top were John's "tools" for electronics: the kitchen scissors, an ice pick, and numerous other items, all looking only remotely like the tools I was accustomed to using. Not that John couldn't afford the *right* tools for the job, he probably never discovered the idea of using *real* tools instead of "make-dos." So this is for John, and those of you who, like John, are still "making do!"

When a new ham first joins the ranks after having spent time previously as an audio buff, SWL or certified tinkerer, he soon finds that, as a ham, he must do a considerable amount of "tinkering and fidgeting" with his equipment to become fully accepted and respected by his fellow radio operators. Along with this required activity comes the need for certain tools to make the task easier. Let's look at the more common tools first.

A soldering iron, a pair of needle-nosed pliers, diagonal cutters, and a screwdriver make up the most basic tool kit for the ham. Of course, you can purchase many other "more advanced" tools, but for now let's consider those to be accessory and luxury items; the ones listed above are *essential!*

If any of you have had the misfortune of having to replace broken tools, you will



John pulled out his "lucky charm," four-way pocket screwdriver and began tightening the last screws.

agree that the old proverb, "You only get what you pay for," is good advice! So remember, buy the best tools you can afford, and buy them *as you need them* instead of trying to cover every square inch of pegboard with goodies on your first trip to the store! Do some shopping. A number of excellent brands are available; some manufacturers offer lifetime guarantees on tools and replace them when they break.

Numero Uno

Probably the most used (and abused) tool in the ham's workshop is the soldering iron. This hot little number comes in configurations ranging from miniature pencil and cordless battery-operated types, to the larger "guns" and monster irons notorious for their secret use as cigarette lighters and for the large scorch marks they leave as signatures on workbenches. For all-around radio work, however, a 40-watt pencil type is probably the best choice. Though large enough to

handle joints of heavy gauge wire, it won't cause copper pads to separate from pc boards if you're careful. The soldering technique won't be discussed in this article, as that subject is well-treated in other ARRL publications. However, you should remember that a heat sink attached between a sensitive component and your 40-watt iron will protect the device from heat damage while soldering. Fig. 1 shows several types of soldering units and accessory items.

If you've ever fried your fingertips while juggling five wires, solder and iron, all at the same time, you know what it's like not to have needle-nosed pliers. Although probably dozens of different types of pliers are in use today, the most useful to the ham is the needle-nosed variety. Despite their nasty-looking appearance, they can really be quite friendly as long as you keep your flesh out of their jaws! (This is not always as easy as it sounds!)

When you shop for this tool, keep in mind the size of the parts you work with. Many times the impulse is to buy a large pair of pliers that fit your hand rather than a small pair that would be more suited to electronics. Going back to tool quality for a minute, when shopping for pliers, you should check the "bite" and alignment of the jaws for proper fit. A good pair of pliers will grip evenly from front to back and side to side. One way to examine a prospective purchase is to hold it up to the light and look for places where the light sneaks through. Let's face it, some tools are going to be better than others, and you might as well have the best you can find! (If light sneaks through, so could thin component leads.)

Needle-nosed pliers also come in two versions — with or without a wire cutter on the side. The prices are about the same, and since the wire cutters can come in handy and save you time, the pliers *with*

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Fig. 1 — In this photo (l-r) are a pencil-type iron with stand, a soldering gun, and a large iron with cradle. Near the bottom of the photo are a solder sucker, vacuum bulb, soldering tool and 60-40 solder.

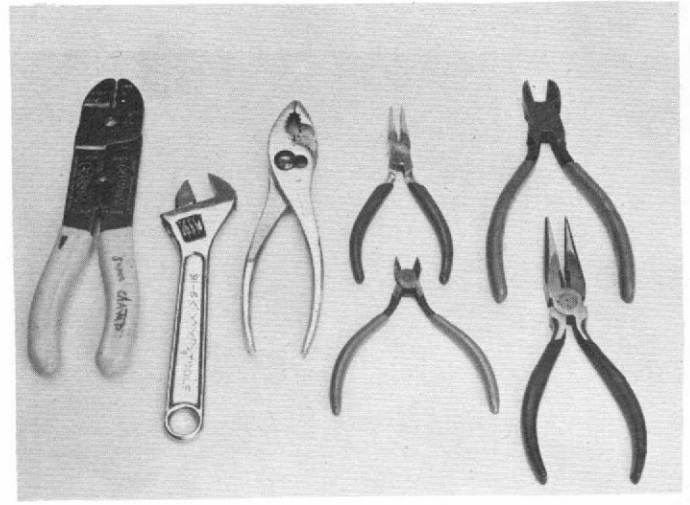


Fig. 2 — Shown here are (l-r) wire strippers, adjustable wrench, adjustable pliers, small set of diagonal cutters (dikes) and needle-nosed pliers, larger set of diagonal cutters and needle-nosed pliers.

the side cutters are probably the better buy. See Fig. 2.

Cutters and Strippers

Another tool you can “quality check” with the light-bulb technique is a pair of diagonal cutters, sometimes known as “die cuts” or just “dikes.” These jewels are indispensable when you are nipping off protruding wires and leads from a soldered pc board. They can also function as miniature bolt cutters if you don’t mind their getting dull. Again, try to resist the urge to buy the largest pair. Settle instead for the more dainty variety if you plan to do a lot of circuit-board work. With one exception, your diagonal cutters can also double as wire strippers. In fact, with practice, you may find that they can be used as skillfully as bona fide strippers. The exception is Teflon-covered wire. When stripping wire coated with Teflon, you must use regular strippers or a knife because of the toughness of this insulation.

Screwdrivers

If you’re like most hams I know, you’ve probably dreamed of owning all the necessary sizes of screwdrivers in both regular-blade and Phillips-style tips. With these, you could rule supreme — and no screw, large or small, would escape your grasp! Fortunately, several types of interchangeable-shaft screwdriver kits offer a reasonable economic alternative. You just pick the right blade for the job, and pop it into a common handle, thus giving the effect of having separate tools. This system of sharing a common part not only makes the kit less expensive than individual tools, but also makes it more compact and easier to fit in the tool box. For those screwdrivers you use most frequently, you may want to purchase separate tools of good quality to eliminate

having to change screwdriver shafts in the middle of a delicate operation. (You wouldn’t want to lose your patient!) Fig. 3 shows several options you can take in purchasing your screwdrivers.

Expanding Your Capabilities

These tools are essential for the beginning ham’s toolbox. However, many other tools can make the difference between simply repairing or converting ham gear, and actually *building!* Ironically, these are the more destructive tools: those which cut, punch, rip, bore holes in, or otherwise make mincemeat of those shiny new chassis boxes.

For many years the electric hand drill was considered an expensive luxury by a number of hams. Today the prices are quite attractive. This is especially true when the prospective builder visualizes the hundreds of pin-sized holes that must be drilled in an individual pc board. It wasn’t like that in the days of point-to-point wiring. Today, without an electric drill the builder is destined to a world of broken bits and frustration. This is not to say that a hand-crank drill isn’t a wise investment; in fact, many times it can be a lifesaver! But in the long run, a 1/4- or 3/8-inch electric drill is hard to beat.

Good drill bits are just as important as the drill itself. In fact, it is usually helpful to know what type of bits are going to be used *before* buying the drill. Why? Because drills vary, and one thing that doesn’t stay constant is the drill-bit holder, or *chuck*. For the average guy who’s only using 1/8-inch bits and larger, this shouldn’t present a problem. But for the ham who builds lots of circuit-board projects, a chuck that doesn’t squeeze down narrow enough to clamp a no. 60 drill bit firmly just won’t do the job. (I didn’t find out that my drill wouldn’t hold a no. 60 bit until a year after I had pur-

chased it!) If you want to be sure that your new drill will accommodate small-size drill bits, take along your smallest bit when you go shopping. You may find that very few 3/8-inch drills will handle a no. 60 bit. But if you can find one that *will* take a no. 60, get the 3/8- rather than a 1/4-inch drill. That way you can also get some good-sized (half-inch or larger) bits with reduced shanks into the chuck.

Once you start drilling holes you’ll find that drills leave burrs and sharp edges behind, and sometimes the hole you drill isn’t quite large enough to clear the part to be inserted. Here’s where a reamer and a couple of rat-tail files come in handy! A reamer is a conical tool with cutting edges down the side. It can be twisted into a hole by hand or inserted into the drill chuck and used as a large drill bit to remove burrs, enlarge holes, and smooth rough edges easily. Rat-tail files can help with very small and very large holes by rounding off sharp edges and filing notches or clearance grooves in chassis boxes when necessary. Fig. 4 shows a drill, drill bits, reamer and other metal-working tools.

With some oversized drill bits, an electric drill, and a reamer, you can cut holes up to about an inch with ease. And if your poor aluminum chassis box doesn’t die from these gaping wounds, you can finish it off by chopping out a two- or three-inch hole and inserting a panel meter. This can be easily accomplished using chassis punches, or a “nibbling tool.” See Fig. 5.

Chassis punches are really big artillery, and thus cost big dollars! But if you find yourself hacking out the same-size holes week after week, the investment might be worth it. Chassis punches can punch square or round holes anywhere from about 1/2 inch to over three inches in diameter. They consist of two pieces that fit one inside the other, and a bolt used to pull the two together. A small hole is

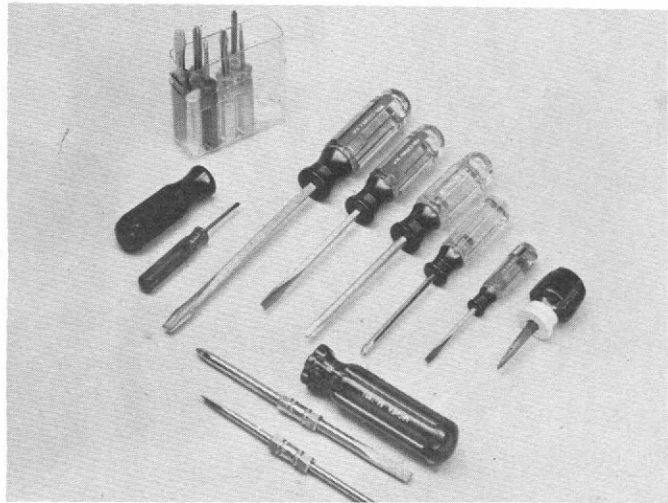


Fig. 3 — Several options are available to the ham who is purchasing screwdrivers. Shown here are two types of "kit-type" screwdrivers, and a standard set of individual tools.

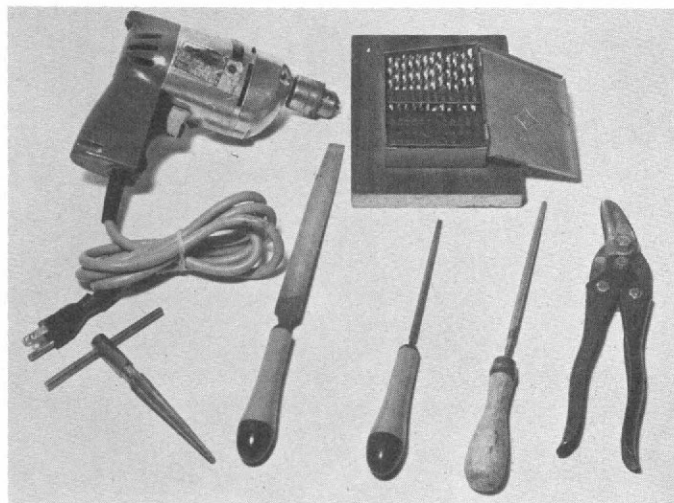


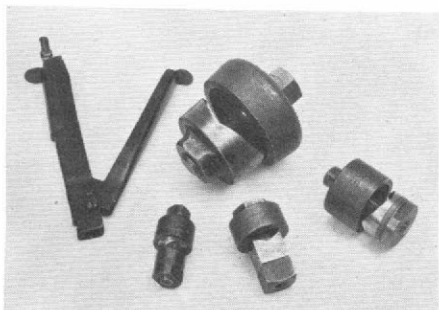
Fig. 4 — A 3/8-inch drill capable of clamping very small bits is a desirable tool if you plan to work on pc boards. Also shown below the drill and bits are (l-r) reamer, files and sheet-metal shears.

drilled in the chassis first. Then the bolt is pushed through one side of the punch, inserted in the hole, and the other punch half is attached. The two halves are then pulled together by turning the bolt until they cut through the metal between them.

If buying a separate punch for each size of hole sounds like an expensive proposition, you're absolutely right! But there's still another way to knock out those mammoth holes in a professional manner: the nibbling tool. This gadget is probably one of the handiest items to have around, if building is your bag. It can be used to chop holes of any size or shape in aluminum, copper or thin-steel sheet metal — even pc-board material. To use a nibbler, you must first drill a small starter hole. Then the tool is inserted through the hole and small bits of metal or material can be cut out piece by piece by squeezing the nibbler's handle.

In addition to the tools already mentioned, there are others which can save you time and money if properly used. Some are items that you most likely have around the house, and others are simply

Fig. 5 — With a nibbler and an assortment of chassis punches, you could cut holes of any size or shape in aluminum stock. Shown here are a hand nibbler and several sizes of chassis punches. Note the different shapes of holes these punches can cut out.



accessories and "niceties." The household items include a hacksaw, hammer, ruler, scribe or pencil, and pocket knife. The accessory items fall into several groups, the first being those used with the soldering iron.

Many good joints can be made using just a soldering iron and a roll of 60/40 solder, but there will be times when you'll want to reverse the process. Several items can make desoldering a more pleasant operation. See Fig. 1. A cheap method of removing molten solder is to apply Solder Wick or a similar substance to the joint while heating with your iron. The wick is made of braided wire, similar to the braided shield around coax, except that it is flat. It "attracts" or actually absorbs solder when placed on top of a heated solder joint. When all of the wick becomes completely saturated with solder, it is discarded, and a new supply purchased. (Sometimes the old wick can be used for common bus strips in breadboard projects.)

When larger quantities of solder must be removed from a joint or from a pc-board foil, a solder vacuum bulb, or solder sucker is probably more expedient. These devices quickly apply a strong vacuum to a hot solder joint, and pull the molten metal from the connection.

Tuning tools are indispensable if you plan to do any tuning of i-f cans, slug-tuned coils, and the like. Fortunately, they are also quite inexpensive and can be purchased in kits or individually. Most tuning rods have stepped ends which will fit several sizes of slugs, and some wands will even count the number of turns as the rod is twisted.

One last invaluable accessory tool is the Vise-Grip pliers. These pliers allow you to clamp any part, small or large, tightly and quickly for drilling, painting, grinding, soldering, or what have you.

To review the tools discussed so far in this article, see the list in Table 1. Of course, many other tools can be useful to the ham, but those described here should prove to be more than adequate for most jobs the newcomer encounters in his "fidgeting."

Recommended reading for the beginner are the "Construction Practices" chapter in *The Radio Amateur's Handbook*, and the chapter on "Workshop and Test Bench" in *Understanding Amateur Radio*. These describe in detail such things as care of tools, chassis working, circuit-board etching, and soldering. QST

Table 1

Recommended Tools

- Soldering iron — 40-watt pencil type.
 - Solder — use 60/40 rosin-core solder only.
 - Needle-nosed pliers.
 - Diagonal-cutting pliers.
 - Screwdriver set (interchangeable blades).
 - Screwdriver — regular blade tip, 3/16 inch.
 - Screwdriver — Phillips tip.
 - Electric drill — 3/8- or 1/4-inch chuck.
 - Drill bits — from no. 60 to 3/8 inch, various sizes.
 - Hand reamer with T handle.
 - Rat-tail files, small and medium (triangular and flat files useful also).
 - Chassis punches — buy only as needed!
 - Nibbling tool.
 - Hacksaw — with metal working blade.
 - Hammer — Ball-peen, one-pound head.
 - Ruler — metal edge is best.
 - Scribe or pencil.
 - Pocket knife (Boy Scout or similar).
 - Solder Wick or similar material.
 - Vacuum bulb or solder sucker.
 - Tuning tools — buy as needed, or in kit.
 - Vise-Grip pliers.
 - *Nut drivers.
 - *Adjustable wrench.
 - *Center punch.
 - *Combination pliers.
 - *Stripper-crimper pliers.
 - *Channel Loks pliers.
 - **Emery cloth, electrical tape, cement.
- Items with * are not mentioned in article text, but are additional tools that may be of use to the ham. Items with ** are shop materials.