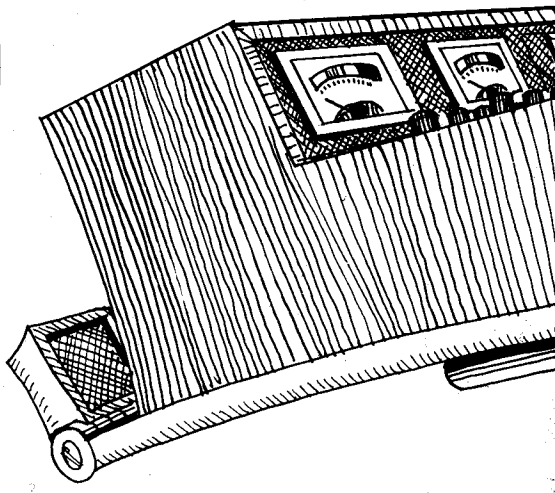
INSIDE A SOUNDMAN'S TOOLKIT

by Brian Roth & Jim Ford



It is amazing how many bands are out on the road with nothing more in their toolbox than a pair of rusty pliers, a hammer (with a broken handle) and a six-pack of empties. This state of affairs can go on for a long time with no ill results until some horrible fate befalls the equipment Saturday night at a gig in East Mobeetie. Then, the advantages of a properly stocked toolbox become painfully obvious.

The purpose of this literary ramble is to discuss the selection, care and feeding of a useful set of tools. While intended to assist those poor souls out on the road—whose very livelihood depends on typically intermittent electronic equipment—much of what is to be discussed will apply to the recordists at home or in the studio.

To begin, the first thing required for a properly stocked toolbox is, a toolbox. A shoebox or pillow case doesn't cut it. Preferably, the toolbox should be made of fairly heavy gauge steel with an appropriate paint job so the bottom doesn't rust out. However, a strong wooden model will suffice. Probably the best arrangement is the style with a tray that sits in the top part of the toolbox. Little dividers in the tray are convenient as long as enough room is left for the tools to fit. There are many different models to choose from, so select one that is large enough to anticipate present and future needs, yet is not so big that a forklift is necessary to move it.

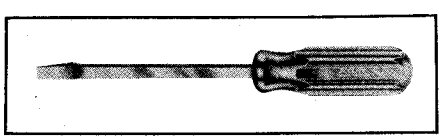
Now, there's nothing sadder than an empty toolbox, so it's easy to go tool crazy and fill the box with useless trinkets. Don't. Instead, think of the basics.

Screwdrivers

Screwdrivers are very necessary items. A good variety will include slot heads with ⅛-inch, 3/16-inch and ¼-inch size blades as well as Phillips head in the #0, #1 and #2 sizes. Additionally, a small 3/32-inch blade screwdriver for set screws is required. Four- to eight-inch lengths are optimum.

Screwdrivers should have comfortable, plastic insulated handles. Check the handle before you buy to be sure that some sadist in the factory didn't sharpen the ridges in the handle so that it will double as a steak knife.

The metal shaft should be of high quality steel or steel alloy, chrome plated if possible to inhibit rust.



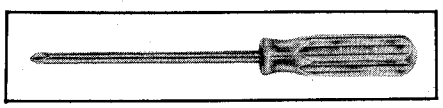
The Xcelite S5166 slot head screwdriver.

The shaft must be securely fastened to the handle so that the shaft won't rotate in the handle (it's interesting how some screwdriver makers haven't yet overcome that problem).

The "4 for 99¢" cheapies are usually a bad bargain because they won't hold up. Sears Craftsman screwdrivers are a good buy (watch for tool sales), as are Xcelite and Vaco.

Once you have your screwdrivers, try not to use the slot head types as a pry bar or the Phillips head types as a punch. This only serves to wreck the tips and make them useless for turning screws.

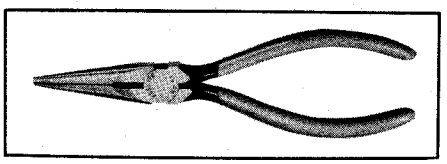
Some brands of equipment may use oddball type screws to discourage disassembly. However, Murphy's laws tell us that disassembly will be necessary sooner or later, so investigate the equipment to see if there are special screws in use. Some of these special types are the clutch head whose slot looks somewhat like the letter "S," the Scrulock with a square slot, the spline which resembles the hexagonal Allen head and the Pozidrive which looks like a Phillips head with four extra slots. All of these and others require the proper screwdriver, so be aware of the requirements of your equipment.



The Xcelite RP103 Phillips screwdriver.

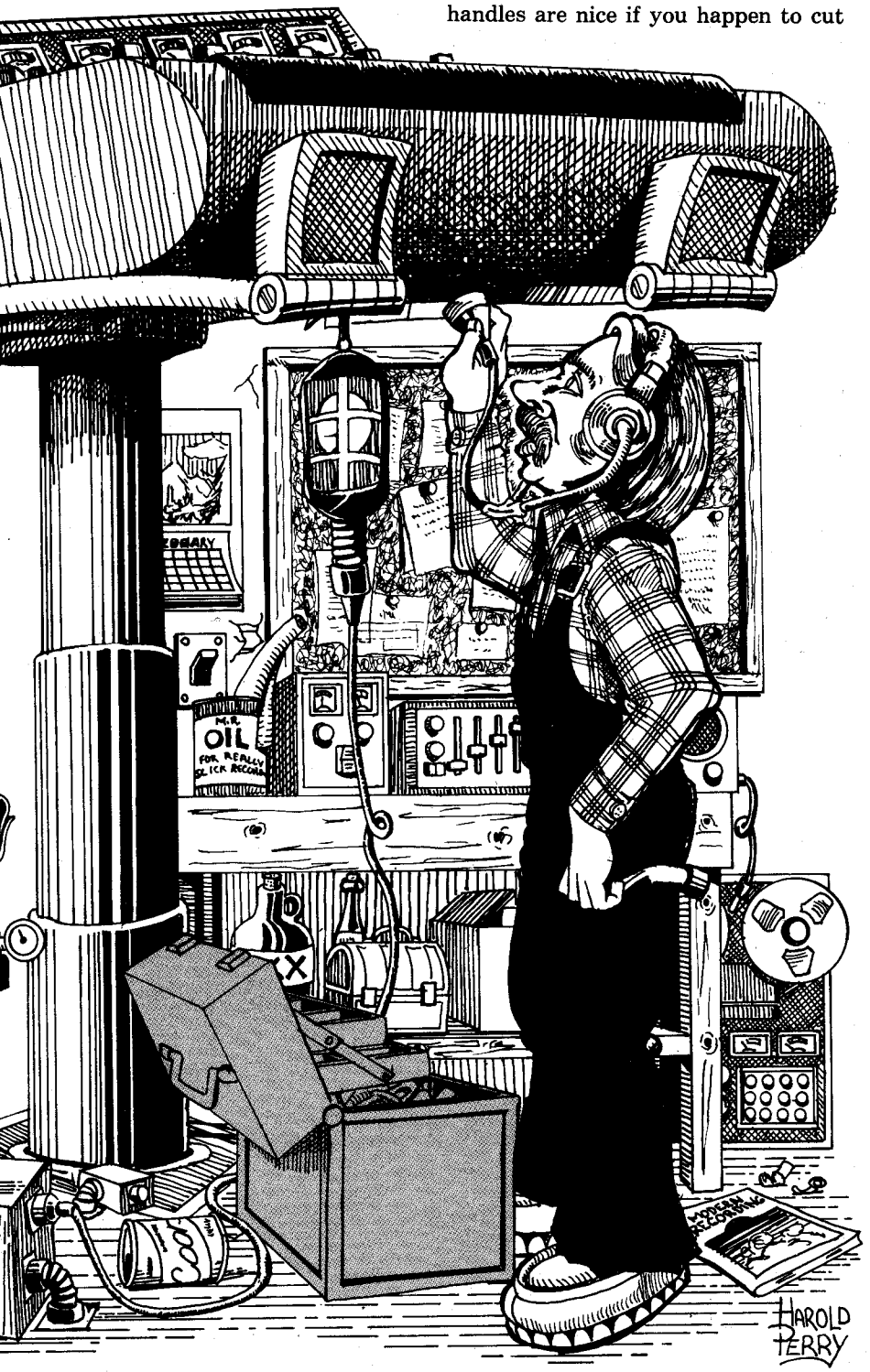
Pliers

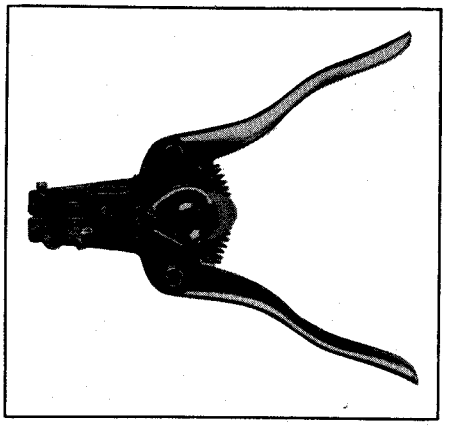
Next on the list should be an assortment of pliers. The ubiquitous slip joint pliers are obvious (the 5 to 6 inch length is about right), but also required are diagonal cutting pliers ("dikes") preferably in two sizes: 6-inch length for heavy cutting and a smaller 4-inch length for those more delicate jobs like trimming moustaches. Add similar sizes of round nose or chain nose (often called needle nose).



The Xcelite 51CG needle nose plier.

Try the pliers out before purchase and select ones that operate smoothly without being so loose that they flop around in the breeze. Insulated handles are nice if you happen to cut into "live" wiring (not recommended), so look for pliers with plastic coated handles that don't slip off. Good brands include Sears Craftsman (no, we're not on their payroll!), Utica, Klein and Diamond.

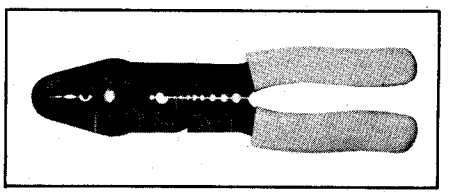




Wire strippers by GC Electronics

Even the best pliers will rust, so keep a thin film of light oil on them to avoid watching your investment turn brown. Special platings help prevent rusting.

In a similar category with pliers are wire strippers. No one has made a universal set of wire strippers that satisfy everyone. However, it appears that the type with a little wheel to set the strippers for different gauges of wire is widely favored. GC Electronics is one of the several manufacturers of this type.

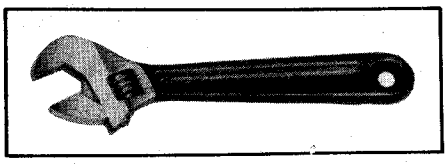


Wire strippers by Vaco.

Wrenches

A "crescent" or similar adjustable wrench may seem the way to go, but there is nothing like having the right size wrench to start with. A set of open-end wrenches from ¼-inch to ⅝-inch should cover most needs except for replacing blown head gaskets and similar automotive malfunctions. Choose stoutly made wrenches with chrome plated finishes.

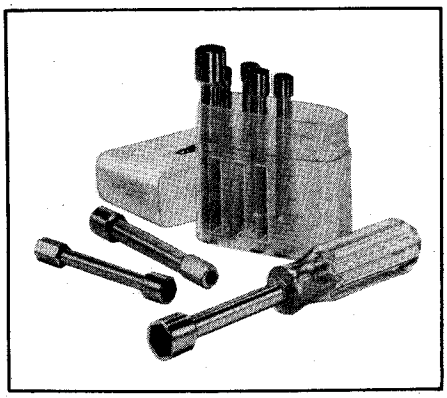
In tight places, nut drivers are often more convenient than wrenches. Buy nut drivers with hollow shafts so that they can slip over the ends of bolts.



Xcelite 46CG adjustable wrench.

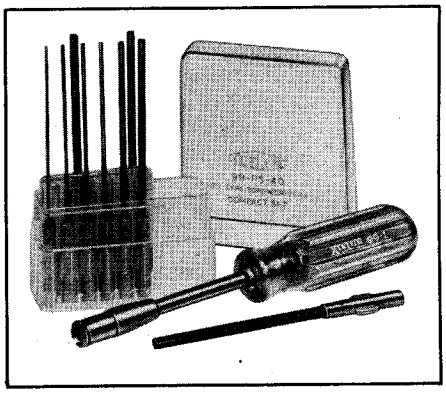
Xcelite makes a small set that has a plastic case to keep track of inventory. Sears Craftsman also has a full-size set with a plastic carrying case.

Included in the wrench category are the so called "Allen" wrenches or hex keys. This type of tool was invented by



Xcelite HSC-1 nut drivers.

a paranoid that didn't want anyone stealing the hardware. Seriously, there is nothing like an Allen wrench set when you need one. The best sets (and they don't cost that much more than the cheapies) are made to close tolerances and then hardened by heat treatment. This type generally has a black finish. For convenience, the hex keys should be in a pouch that provides a separate place for each one; this makes it much easier to keep track of how many of them were left sitting in the shag carpeting. Unfortunately, while Sears (who else?) makes a nice set, they are supplied in a single pocket pouch which is most inconvenient.



Xcelite 99PS40 Allen wrenches.

Several manufacturers make fold-out hex keys that are fastened together like a pocket knife. You won't have to worry about losing them, but often the handle and other wrenches get in the way when working in close quarters.

Xcelite makes a set with the hex keys installed into screwdriver handles. These are nice, but they are also expensive.

Soldering Equipment

For some reason, when thinking of doing some soldering, many people grab for the biggest soldering gun they can find. The high degree of heat provided by guns is often unnecessary, and consequently everything in the vicinity (wire insulation, connector parts, etc.) is reduced to a charred puddle.

One of the most important rules of soldering is to use only enough heat to make a good connection. This leaves out the favorite soldering guns except for the heaviest jobs. A good iron in the 35- to 45-watt category is required for most applications. A fairly small, screwdriver shaped tip on the iron is probably best.

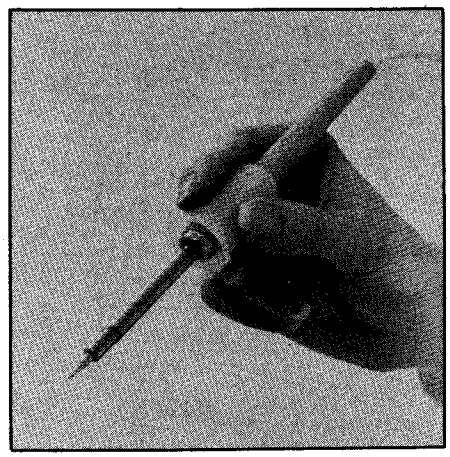
Ungar makes a wide variety of irons, but their Imperial models are probably the most popular. Weller makes a series of moderate cost irons (W-60 models) that feature temperature controlled heating elements. This last type of iron is a good idea since the heat is regulated for optimal soldering results.

A proper soldering iron stand is a must unless you happen to like the smell of burning substances that come in contact with the iron. A moist sponge is definitely required so that all of the gunk caused by oxidation can be cleaned off. While soldering, wipe the tip on the sponge before each connection, thus ensuring as clean a tip as possible. This not only makes for pretty work, but also helps heat transfer to the work.

It cannot be emphasized enough that *only rosin core* solder can be used for electronic applications. Time and time again careless people have ruined electrical equipment by using acid core solder. While the connection will work for awhile, soon the acid eats everything up and you are left with a noisy, intermittent connection. Use only rosin core solder!

The solder metal itself is an alloy, most universally tin and lead. The majority of solder uses a ratio of 60% tin and 40% lead. Another alloy, 63% tin/37% lead is also becoming popular due to its slightly lower melting point and the fact that it is eutectic, which means that as it heats or cools it goes directly from solid to liquid (or vice versa) without going through a "plastic" stage. 63/37 solder makes it easier to create nice, shiny connections.

As you solder, be sure to heat the connections being attached; do not just put solder on the iron and wipe it onto the connection. Apply the solder to the heated connection. Use only the least amount of solder possible. Do not allow big blobs of excess solder to form on the connection. Also, while the solder cools, do not be tempted to wiggle the joint to see if the solder has solidified; this will lead to cold solder connections which are dull and crusty looking and unreliable.

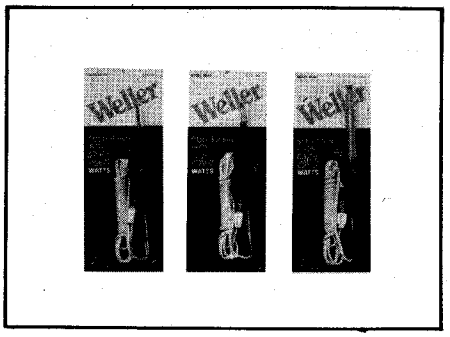


One of Ungar's many soldering irons.

Sometimes, a soldering gun is required, so be aware of how to properly maintain the gun. Many times people using a soldering gun think that their unit is defective and no longer even able to melt butter. This can usually be traced to improper tip care. Use the sponge to wipe off the crud that forms on the tip. Also, periodically loosen the two nuts that secure the tip to the gun and move the tip around a bit. This helps loosen oxide deposits that build up at this point. Retighten the nuts and the gun should again work fine.

It is a very good idea to carry spare tips for your gun or iron. In fact, it is good planning to have two irons in case one of them croaks, which, at the worst possible moment, they have been known to do.

Sometimes it is necessary to remove solder from a connection. There are little solder sucker squeeze bulbs for this



The Weller Model SP-40 soldering iron.

purpose, but they only work moderately well. The spring loader solder suckers made by Edsol are better, but the user should be careful with these since they can spew little solder flakes all over the place if not kept scrupulously clean. Also, the Edsol models rely on oil to keep a vacuum seal in the suction mechanism. If kept clean and oiled the plunger units work nicely.

Another type of solder remover is the solder wick. This is nothing more than a length of copper braid on a plastic spool. The braid is set on the connection to be cleaned, the iron placed on the braid, and presto—the solder is wicked off. It is considered to be a pretty effective method for most applications, and a roll of solder wick is not terribly expensive.

Volt-Ohm Meters

No toolkit is complete without a volt-ohm meter (VOM). It is invaluable for checking the AC power voltage to see if the local electrician wired 240 to the 120 volt outlet. Also a VOM is useful for checking out guitar cords and the like.

There is no need to buy an expensive unit. The digital readout models are nice, but the mechanical meter VOMs are much less costly.

The input characteristics of a VOM are given in terms of ohms per volt for the voltage scales. The least expensive VOMs have a 1000 ohms per volt input. Better models have input impedances up to 100,000 ohms per volt. The higher the rating, the less the meter will load a circuit. For general purpose, an input of 10,000 ohms per volt or more is fine.

The ohms or resistance measurement scale, which is used for checking continuity of cords, is a battery operated function. The batteries have a long life, but it is good to have a spare set. Be sure the meter has at least three different ohms ranges to handle all resistance measurements. It is particularly important that the low ohms range be such that very low resistances (10 ohms and less) are easily readable. On some meters, these lowest values are crowded together on the scale making reading of the values almost impossible.

A number of manufacturers make VOMs—Eico, Simpson and Radio Shack are some of the more widely known.

Be careful when using a VOM. Make sure that it is switched to the proper scale for the desired measurement; checking a 120 volt power line on the ohms range generally will charcoal broil the internal workings. Also, most mechanical meters really dislike being dropped.

When checking power voltages, be sure to keep your fingers out of danger or else you will be in for a real shock.

Miscellanea

The preceeding tools are the basic requirements. Some other items to be considered follow here.

A variable speed reversible electric drill can be used to puncture things, and with the addition of a screwdriver bit it becomes very handy as an electric screwdriver. Since the back covers on most speaker enclosures are secured with a jillion screws (give or take a few wazillion or so), it is a lot easier on the wrists to use a drill. A reversible function is necessary for backing the screws out, so definitely buy one with this feature.

Naturally, you'll also need drill bits to go with the drill. The Morse cutting tools company has some nice, high-speed twist drill bit sets for a reasonable price. These should be available at a local industrial supply company.

Obviously, a flashlight is a very good thing to have in the toolkit. It beats burning your fingers on a match when trying to check out some dark corner on the stage.

A package of clip leads with small alligator clips on each end is an inexpensive addition. Have plenty on hand since these for some reason have a tendency to be pilfered.

It is reasonable to expect cords and connectors to fail, so always have spare parts to anticipate this. A roll or two of insulated hook up wire is also worth having. *Plastic* electrician's tape should be on the tool list too; forget about using that cloth "friction" tape.

"Get a bigger hammer" is the oldest phrase in electronic servicing. The standard carpenter's hammer with a wooden handle can be found from a number of different sources.

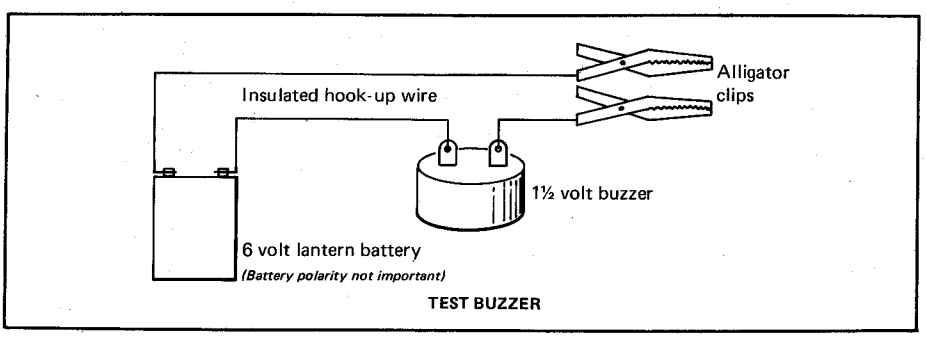
If you have the bucks, consider purchasing a hacksaw and a couple of different files. These will be required if you have to change a volume pot on a guitar or other piece of equipment since most replacement controls have a mile long shaft that must be chopped back to size. You don't really want input volume control #5 sticking up four inches from the top of the mixer.

Two other types of pliers that may be useful are a set of vice-grips and a pair of ignition pliers. The vice-grips look somewhat like regular pliers, but they will clamp down and lock onto whatever is placed in their jaws. An adjustment is provided to establish how tight the jaws clamp when the vice-grips are locked. These are useful for a multitude of purposes when it is important to hold the work in one place. There have even been cases when vice-grips were used to hold the stage together!

The ignition pliers are a miniature version of the so called "Channelock" style of pliers. Their small size makes it easy to get them into tight places where ordinary pliers won't fit.

Cleaning & Lubing

Many times it is desirable to have a small variety of various cleaning and lubricating chemicals. An aerosol can of Freon solvent will clean just about



anything without leaving residue. A silicone-based cleaner is required for noisy volume controls, although the noise can also be caused by other malfunctions.

For lubricating, a can of WD-40 is most convenient, as is a small can of general purpose household oil.

If a tape recorder or tape echo device is in use, cotton swabs and isopropyl alcohol are absolutely necessary to maintain these units in top operating condition.

Fuses & Shorts

What would happen if the bass guitar amp decided to eat a fuse? Would you reach for a discarded chewing gum wrapper and create a Wrigley's 50 amp fuse with it? If you would, may your days be filled with smoldering power transformers.

The intelligent person would be prepared for blown fuse by having made a master list of all fuse sizes of the equipment in use and stocking one box of each size fuse in his tool box.

Please note that if the first replacement fuse blows, DON'T try a larger fuse. The equipment is trying to tell you that it has developed an internal tumor when it repeatedly pops fuses. Stop while you're ahead.

Two other handy items to have are a battery operated continuity buzzer and an audio signal tone generator.

The continuity tester (see figure) is a very simple device that is useful for checking microphone or speaker leads for open circuits or shorts. In operation, one of the test leads is touched to one end of the cable and the other test lead is attached to the other end. If the buzzer sounds, the electrical path through the cable is continuous. If, on a two-conductor cord like a speaker or mic cord, the buzzer sounds when the leads are attached to each separate conductor, the cord or connector has a short.

Note that the diagram shows a 6-volt battery with a 1½-volt buzzer. This is to ensure that there will be sufficient voltage to trigger the buzzer if a long cord is being tested. The buzzer can withstand the over voltage for short periods.

The continuity buzzer does the same job as the ohms (resistance) scale on a VOM, but in many instances it is easier to listen for the buzz rather than squinting at the meter scale.

The tone generator need not be elaborate or expensive. The Shure A15TG is a small, battery-operated model that plugs directly into a low-impedance microphone line. Having this generator makes trouble shooting much easier than having someone shouting "Test-Test" into one of the stage microphones.

TOOL CHECK LIST
(Refer to Text for Details)

The Basics:

- ☐ 1/8" diameter blade screwdriver
- ☐ 3/16" diameter blade screwdriver
- ☐ 1/4" diameter blade screwdriver
- ☐ 3/32" diameter set-screwdriver
- ☐ #0 Phillips screwdriver
- ☐ #1 Phillips screwdriver
- ☐ #2 Phillips screwdriver
- ☐ 6" length slip joint pliers
- ☐ 6" diagonal cutting pliers
- ☐ 4" diagonal cutter pliers
- ☐ 6" round nose (needle nose) pliers
- ☐ 4" round nose (needle nose) pliers
- ☐ Wire strippers
- ☐ Open-end wrench set, 1/4" to 5/8" size
- ☐ Nut drive set
- ☐ Allen wrench set
- ☐ Soldering iron with proper stand and sponge
- ☐ Pound of solder, rosin core, 60% tin/40% lead or 63% tin/37% lead
- ☐ Solder wick
- ☐ Spare soldering iron tips
- ☐ Volt-ohm meter
- ☐ Flashlight
- ☐ Spare connectors and wire
- ☐ Roll of electrical tape
- ☐ Hammer
- ☐ Aerosol volume pot cleaner
- ☐ Lubricating oil and/or WD-40
- ☐ Spare fuses

Optional:

- ☐ Special tip screwdriver (as required)
- ☐ Adjustable wrench
- ☐ Spare soldering iron
- ☐ Soldering gun
- ☐ Reversible variable speed electric drill
- ☐ Set of drill bits, 1/16" to 1/4" (minimum)
- ☐ Screwdriver bits for drill
- ☐ Package of clip leads
- ☐ Hacksaw
- ☐ Files
- ☐ Vice-Grips
- ☐ Ignition pliers
- ☐ Freon aerosol solvent
- ☐ Cotton swabs
- ☐ Isopropyl alcohol
- ☐ Battery and buzzer continuity tester
- ☐ Small Audio Tone Generator (battery operated)

Safety

The most basic rule of safety is: Use your head! Tools should be used for their proper function. For example, a pair of pliers being used as a hammer can chip and send pieces of metal flying into your eyes.

Power tools require some care in use. An electric drill can easily become entangled in long hair and inflict pain and injury. If drilling in metal, protective eye goggles are required.

Keep all power cords in good shape. Repair all damage to these or else electrical shocks and fire can result.

If a power tool uses a third prong on its plug for grounding, do not break it off or defeat it. It exists to protect the user from shock if by some chance the tool malfunctions.

When working inside of an amplifier or other electrically operated gear, ALWAYS DISCONNECT THE POWER FIRST! This will protect both the serviceman and the equipment from damage.

Use common sense when working with tools, and you'll live a long life (unless being on the road gets you first!).

Summary

Hopefully, this article has given you some ideas on how to stock a tooolbox. There are probably some items that have been left out, but the listing covers the majority of tools required for most applications.

If you have an experience to share concerning tools, or have an additional suggestion, the Editors of *Modern Recording* would be glad to hear from you.

In closing, the next time you're out in East Mobeetie and something blows up, have a good tool assortment and the show *will* go on.