

## STUDY-GUIDE NO. 1

## EASY STEPS TO GOOD SOLDERING

Soldering tools, techniques, chassis and circuit board wiring and soldering

By William M. Palmer

### Step No. 1—Soldering Tools

Soldering is used more often, in more crafts and hobbies than any other method of fastening. You'll find that it is simple with the proper equipment, a little know how, and some practical experience.

Naturally, the first step you must consider is a soldering tool. Today there are a number of quality soldering irons and guns on the market at reasonable prices. When shopping for this tool . . . look for quality features such as replaceable tips of plated solid copper, stainless steel barrels, heat resistant handles, etc. A quality soldering gun should feature a fingertip dual heat trigger, a spotlight to light the way into dark areas—speaker enclosures, chassis work, etc. Later on you may want to own both a soldering iron and gun for your student or hobby projects, and for general household soldering work.

If you are a beginner and wish to invest only a small amount of money in soldering tools, you may want to buy a low wattage pencil kit (illustrated in this article) which contains everything needed for low cost home soldering work.

On the other hand, a soldering gun kit of 100/140 watts (illustrated in this article) is an excellent investment, if your initial budget permits. Both types of soldering tools are available at Radio Shack stores.

You also need a pair of diagonal cutters (called dikes) and a pair of needle-nose pliers. The "dikes" are used for cutting the leads of resistors, capacitors, etc., and in cutting hook up wire to proper length. The needle-nose pliers are used for

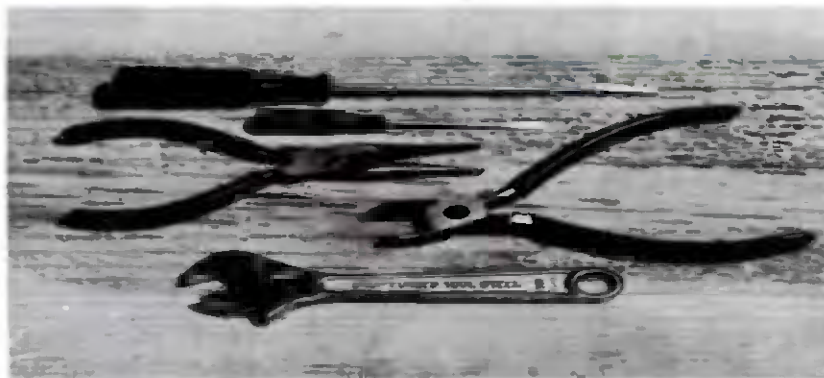


Photo upper right. Pictured are needle-nosed pliers, diagonal cutters or "dikes," small adjustable wrench, and screwdrivers. Photo lower right. Kit for homecrafters which includes dual-heat 100/140 watt gun and accessories — ideal for electronic work, and many household repair jobs.



Weller model W-100 (left) 100 watts, 8 1/4" long, with 750 degree (F) 1/4" screwdriver tip. Model W-60 (right) 60 watts, 7 1/4" long with 750 degree (F) 1/8" screwdriver tip.



Soldering pencil kit, 25 watts, which includes 60/40 rosin core solder, three pre-tinned, plated, solid copper tips and a soldering tool aid. Ideal for the hobbyist or student.

bending and positioning the leads and wires prior to soldering.

You should have at least two sizes of screwdrivers — one with a 3/16" blade for regular assembly work, and one with a 1/8" blade for the knobs and smaller work.

To complete your initial tool set, you will find a 6-inch adjustable wrench (drop-forged) handy to have around. This versatile tool can be used for tightening volume control nuts, panel and chassis hardware, bending brackets to proper shape, as well as household uses.

One final item is suggested — a small fishing tackle box, either metal or fibreglass, low cost. The purpose being to keep your small tools together "where you can find them." Also the small compartments in the tray make ideal places for spare parts, nuts, screws, lockwashers, solder, etc.

This completes the basic tool requirements for most electronic work.

#### Step No. 2—Clean the Work

Before soldering, be sure that work is free of grease, wax, or dirt. If not, clean with alcohol. Wire leads, or brackets can be rubbed lightly with fine sandpaper to leave "bright" look for best soldering results.

#### Step No. 3—Use the Proper Solder

Use a good grade of rosin core solder. Never use acid core solder in electronic work. There are three grades of solder most commonly used. For most work "60-40" is recommended because it flows freely at low temperatures.

#### Step No. 4—Use the Right Soldering Tool

For electronic work and crafts and hobbies a pencil type soldering iron (25 to 80 watts) is recommended. A dual heat gun (100-140 watts) with finger-tip control is also recommended. A gun is more convenient — it heats and cools quickly, and does not require a stand.

#### Step No. 5—Be Sure Tip Is Tinned

A properly tinned soldering iron or gun tip should be "silver bright." Although some models are "tinned" when you buy it, it is necessary to re-tin the tip occasionally. Oxides which may have formed on the tip may easily be removed with fine sandpaper. Then heat the tip working in new solder as working temperature is attained. Excess solder should be wiped off with a cloth.

#### Step No. 6—Suggestions

If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire and an old radio receiver chassis will give you confidence as well as experience before starting on a new kit or project.



Note: A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not stick to the joint. In this case, a joint should be re-heated until the solder flows smoothly over the entire junction. It may be necessary to add a little more solder to get a smooth "bright" appearance.

**Step No. 7—Chassis Wiring and Soldering**

(a) As a general rule, when preparing hookup wire for connection, 1/4" of the insulation should be removed from each end, unless the kit instructions state otherwise.

(b) In order to avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, hold the lead with pliers while it is being stripped.

(c) The leads on resistors, capacitors, and similar components are usually longer than needed to complete the connection. Trim the lead for proper length before making the connection for soldering. As a rule, a lead should be just long enough to complete the connection.

(d) Crimp or bend the lead around the terminal with needle-nose pliers to form a tight connection. Do not rely on solder for physical strength. Follow your kit or project instructions concerning special connections.

(e) If possible, place your work so that gravity will assist in keeping the solder where it belongs.

(f) Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

(g) Then place the solder against the heated terminal and it will immediately flow over the joint. Use only enough solder to set the junction. In most cases it is not necessary to fill the entire hole in the terminal with solder.

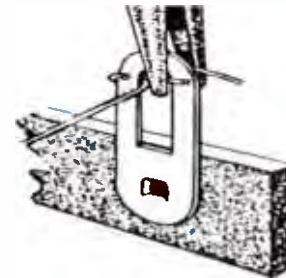
(h) Remove the solder and then the iron from the completed junction. Be careful not to move the leads until the solder has solidified.

**Step No. 8—Circuit Board Wiring and Soldering**

(a) Before attempting any work on circuit boards, read the following instructions carefully, and study the illustrations.

(b) Proper mounting of components on the board is a requisite for good performance. In general, all components on the board should be mounted tightly to the board. Follow the instructions in your kit or project in special cases. All leads should be kept as short as possible to minimize the effects of stray capacity in the wiring. Note proper and improper methods of mounting shown in the illustrations. Be careful not to damage resistors or capacitors when bending the leads for fitting to the circuit board.

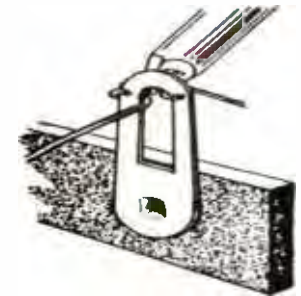
(c) Tubular capacitors and resistors will fit properly if the leads are bent as shown. Disc capacitors will generally fit in place with no lead preparation. However, leads should be straight. The components with lugs seldom require preparation unless they are bent. They can be straightened with pliers.



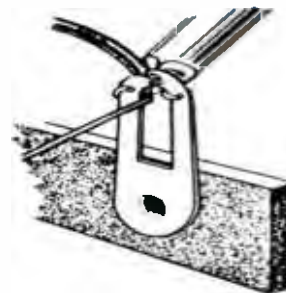
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CRIMP WIRES

2



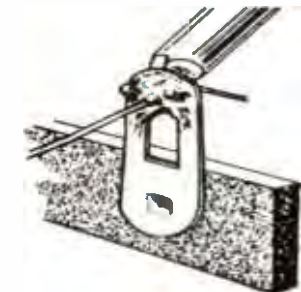
HEAT CONNECTION



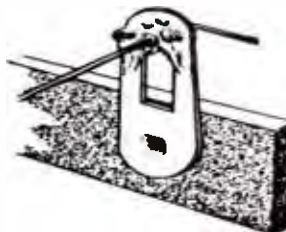
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APPLY SOLDER

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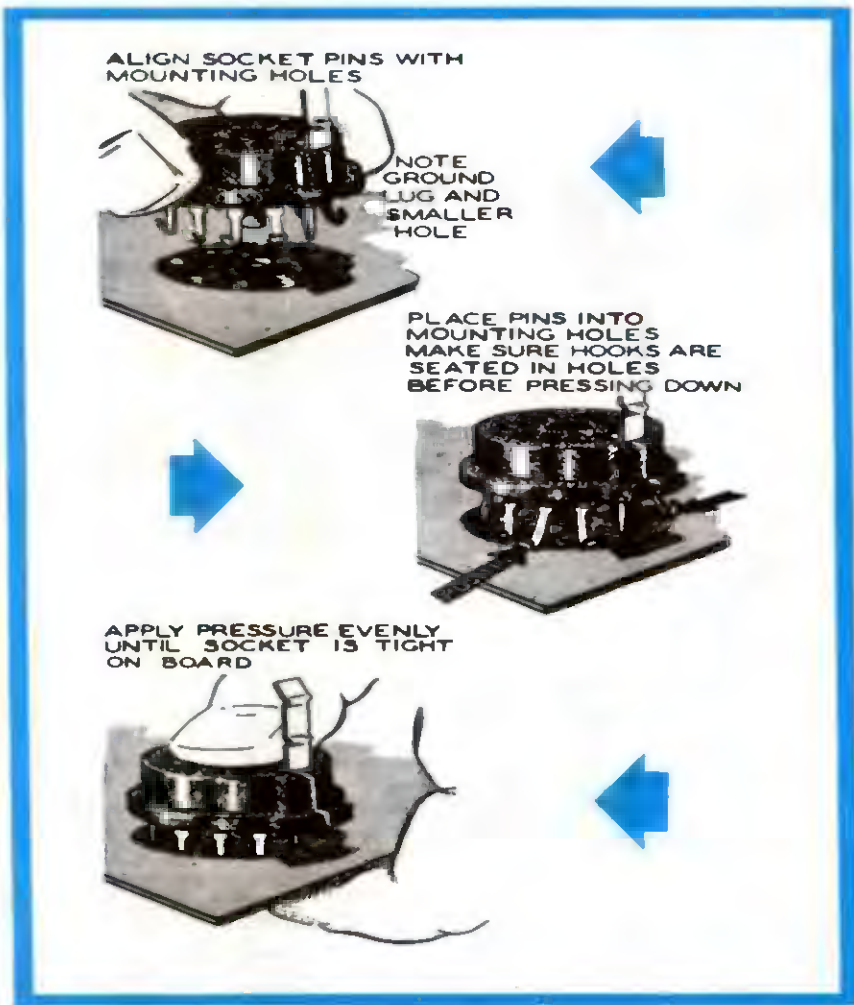


ALLOW SOLDER TO FLOW



5

PROPER SOLDER CONNECTION



(d) Parts should be inserted and the leads bent outward slightly to lock them in place, as shown in illustration.

(e) Components are sometimes soldered in groups. Follow the instructions of your kit or project in this case. When they have been soldered, diagonal cutters may be used to cut off the excess leads close to the board.

(f) The actual technique of soldering leads to a circuit board is quite simple. Position the tip of the soldering iron so that it firmly contacts both the circuit board foil and the wire or lug to be soldered, as shown in illustration. The iron should be held so that solder is not likely to flow to adjacent foil conductors or connections. The solder should immediately be placed between the iron and the joint to be soldered. Remove the length of solder as soon as its end begins to melt and flow onto the lead and foil. Hold the tip of the iron in place only until the solder begins to flow outward over the foil; then remove the iron quickly.

(g) Avoid overheating the connection. A soldering pencil or small iron (approximately 30 watts) is ideal for use in circuit board work. If a soldering iron or gun with high wattage is used, be careful not to damage the circuit board from overheating.

(h) The use of excessive amounts of solder will increase the possibility of bridging between foil conductors or plugging holes which are to be left open for wires which may be added later. If solder is accidentally bridged across insulating areas between conductors, it can be cleaned off by heating the connection carefully and quickly wiping or brushing the solder away with a soft cloth or clean brush. Holes which become plugged can be cleared by heating the area immediately over the hole while gently pushing the lead of a resistor through the hole from the opposite side, and withdrawing the lead before the solder rehardens. Do not force the lead through; too much pressure before the solder has time to soften may separate the foil from the board. A break in the foil can be repaired with a small piece of bare wire soldered across the break.

*Informational Data and Drawings Courtesy Heath Company; Photos of Soldering Irons and Guns Courtesy Weller Electric Company*

