$2.50 US

RAMSEY

# Kit Building And Soldering Guide

**A comprehensive guide for "First Time" kit builders, students, and experimenters. Learn the basics to enter the exciting world of Electronics Kit Building!**

## Provides complete information on...

- ✔ *Required Tools*
- ✔ *How to Solder*
- ✔ *PC Board Soldering*
- ✔ *Desoldering*
- ✔ *Identifying Parts and Components*
- ✔ *Resistor Color Code*
- ✔ *Construction Techniques*

## TOOLS USED IN PC-BOARD KIT-BUILDING

You can “get by” in PC-board kit assembly with a soldering iron, solder, and a small pair of diagonal cutters (OR wire nippers), but you'll find yourself wishing for needle-nose pliers with every other move you make! Also important is a sponge, or steel wool or damp rag for keeping the tip of the soldering iron clean and shiny. You may also find a wire nipping tool easier to use for PC work than diagonal cutters.

There are a variety of “convenience tools” for electronics building such as soldering aids, “third hands” or mini-vises, tweezers *(for inserting small parts in tight spots)*, or magnifiers, and YOU will have to decide from experience which ones are useful to you

Choosing a soldering iron is like choosing a tennis racquet, fishing rod or other very personal tool. If you are new to soldering, try to get some guidance from someone with experience. You want the level of heat and the style of tip that helps you to accomplish the one goal of all soldering, a perfect connection! If you can't get any personal help in choosing a soldering iron, start with our WLC-100 Soldering Station, or visit your local Radio Shack. DO NOT try to use a soldering GUN on a PC-board kit project!

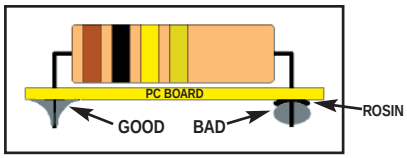
Screwdrivers, pliers, nut-drivers, wire-strippers and other common tools become needed only at the stage of working with enclosures or making connections to Mini-Kit PC-boards. If your kit requires adjustment of a coil, a non-metallic “alignment tool” will be needed and is explained in your kit manual.

## KIT PC-BOARD SOLDERING

Unprofessional soldering practices are the nightmare of ANY electronics manufacturer or service shop. GOOD soldering is essential to the performance of your project. A “cold” solder connection is caused by too little heat OR by heating only the component wire and not the wire and PC copper foil together. The tell-tale sign of too little heat is a dull, rough-looking connection. If you heat only the wire, the solder forms a cute ball around the wire, and rosin may completely insulate your ball from the copper.

***SOLDER BRIDGES***

You probably know that a solder bridge is a perfect and unintended connection of two PC-board points that should NOT be connected. They happen most easily when soldering IC's and other devices with pins close together. The only technique for avoiding solder bridges is for you to be in complete control of the tip of your soldering pencil. The best single tools for avoiding bridges are a proper point on the soldering iron, bright light, perhaps with some magnification of your work, and thin diameter solder. Study your connection before you zap it with heat and solder. Choose the best “approach angle” for the iron's tip to heat the connection. Plan ahead to make the solder do what YOU want it to do, and you just won't build any solder bridges!




***TEN COMMANDMENTS OF GOOD PC-BOARD SOLDERING***

1. *If the soldering iron tip is covered with burned rosin, it cannot heat your connection very well.*
2. *If you heat only the wire and not the wire and PC trace together, a cold, bad connection is likely.*
3. *If your soldering tip is big enough to bridge two adjoining connections, it probably will!*
4. *Dirty, grubby solder will contribute to dirty, grubby connections.*
5. *Any use of acid core (plumbers!) solder in electronics work will destroy everything...DON'T USE IT!*
6. *A connection in a large area of PC-board copper requires more heat than one pin of an IC.*
7. *If your connection looks dull or brittle, it's no good.*
8. *If your connection looks like a ball instead of a shiny cone, it's no good.*
9. *Thin diameters of shiny, fresh rosin core solder are easier to use for PC-board work than thicker “hardware store” solder.*
10. *Pre-tin any stranded hookup wires leading in and out of your PC-board kit project. It will prevent problems later!*

***THE PAINFUL BUT USEFUL ART OF “DE-SOLDERING”***

The art of PC-board “de-soldering” is harder than good, basic soldering, but it is a skill necessary for service technicians - or experimenters who like to salvage parts from scrapped PC boards - and for folks who make mistakes in building kits!

Solder is efficient and stubborn, especially once it has adhered correctly to a PC-board connection. Those days of clipping away an old part from big solder lugs, and easily soldering the new part are gone except for keeping vintage equipment in good repair.

“Desoldering” is the skilled and swift removal of all solder from a PC connection. You re-melt the solder and “suck” it away as cleanly as possible. Most beginners will have reasonable success with any spring-powered vacuum device similar to Radio Shack catalog no. 64-2098. Remember...

- Follow kit-building instructions very carefully, so that you will not need to do needless "desoldering" to get it working!
- If possible, ask an expert to SHOW you how to “de-solder”.
- Use a bright light and magnifier to SEE what you are doing.
- Your goal is to get the connections clean enough so that you can easily re-solder the new part.

## SORTING PARTS AND GETTING READY!

Prepare a clear, uncluttered workspace. In addition to room needed for tools and handling the circuit board, allow space for some kind of "parts organizer" that will not be bumped or dropped. This organizer can be a small tray or box. (An egg crate works great!)

Refer to the Parts List published in the kit manual. Organize the kit parts according to basic types. Check carefully to make sure a small part did not slip away when opening the kit's packaging.

Please make sure that you have sufficient lighting for clear parts identification and accurate circuit soldering. This might seem like gratuitous advice that you did not ask for, but experience has shown that brown, orange, red and silver resistor colors and tiny numbers on capacitors and transistors all start to look the same in dim light after a hard day's work! Some PC-boards are very tiny with tight parts layouts.

Take a little time to read through the instruction manual for your kit before you start assembly.

## IDENTIFYING KIT PARTS

### *RESISTORS*

The universal color coding of resistors does not change, fortunately, but resistor body colors and the style of wire leads can vary. Also, resistors may be packed loose or supplied on tape strips. Install any resistor as shown on the PC board parts layout diagram. Keep all leads as short as possible. ***SEE THE RESISTOR COLOR CODE TABLE ON THE BACK PAGE!***

### *CERAMIC DISC CAPACITORS*

It is helpful practice to become as familiar as possible with the various marking codes for ceramic capacitors. The first fact to keep in mind is that there are several accepted methods for marking the value of these capacitors! While resistor color codes have withstood changing times over many decades, the protocols for marking evermore-tiny capacitors have many variations!

While capacitors also can be color-coded, Ramsey Kits use disc capacitors marked by a number-letter code. The first two digits establish the first two numbers of the value. The third digit is the multiplier. The letter designates the manufacturing 'tolerance"or accuracy for the value printed.

Values under 100 picofarads, used widely in our FM and VHF kits, are printed clearly with no need to interpret them further. Small capacitors stamped 4.7, 10, 15, 33, 68 and so forth are 4.7, 10, 15, 33, 68 picofarads respectively! A 100 picofarad capacitor, also commonly used in our kits, can be marked either 100 or 101! If it's marked 100, believe it. If it is marked 101, the value is 10 (first 2 digits) X 10 (3rd digit multiplier) = 100 picofarads! If it is marked 101J, we know that it is made to 5% accuracy, while H signifies 3% and K is 10%.

Rule of thumb: If the 3rd digit is a 0, you may assume the value is in picofarads, and you can take the three numbers together as the picofarad value for that capacitor. So, just as in the above example, both "470" and "471" are 470 pf.

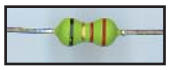
There is a growing trend to mark capacitors very clearly in nanofarads. Be sure not to confuse 10nf or 100nf with 10 or 100 picofarads!

There's more! Some manufacturers don't care about codes and print the value and tolerance VERY plainly. E.g.,. "820+20%" means 820 pf. at 20% tolerance. Yet another style of capacitor for values such as .1 uf is manufactured as a neat, rectangular block, with the value and other identifying data stamped on the top. For example, the information of interest to you in the marking ".1J63" on such a capacitor is the ".1" for .1 uf. ***SEE THE CAPACITOR TABLES ON THE BACK PAGE!***

### *ELECTROLYTIC CAPACITORS*

Virtually every kit uses one or more electrolytic capacitors. These are polarized capacitors, which means that they have positive (+) and negative (-) leads and MUST be installed correctly on the PC board. Your kit instruction manual is very clear about correct polarity of these capacitors, and the positive (+) side is generally etched on the PC-board itself. Ordinarily, only the negative side is marked on the capacitor.

### *INDUCTORS*



Coils or inductors supplied with Ramsey kits can come to you in ANY of these styles:

- unshielded, slug-tuned
- shielded, slug-tuned
- enameled wire and easy do-it-yourself winding directions
- Color-coded coil similar in appearance to a resistor

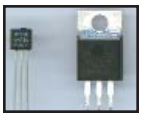
Your kit manual provides clear information for correctly identifying any coils used.

### *DIODES*

If a kit uses one diode, or a number of the same kind of diode, you are in luck. Just be sure to understand the difference between the cathode (banded) end and the anode before installing. If the kit uses several different diodes, it is necessary to identify each of them correctly. Believe it or not, there ARE printed markings on even tiny diodes. You'll need a magnifying glass even if you claim perfect 20-20 eyes! If you are unsure about correct diode identification, please ask for help.

An LED (light-emitting diode) is indeed a diode, not a lamp. If your kit uses LED's, the instruction manual shows you clearly how to install them correctly. A numeric display such as used in frequency counters or tone decoders is a series of LED's.

### *TRANSISTORS*



The most common single transistor for most Ramsey kits is the versatile NPN 2N3904. We use a variety of other types as well. Please pay close attention to how the "flat" or other special characteristic of any transistor is oriented on your kit manual's PC-board drawing.

### *INTEGRATED CIRCUITS ("IC's")*

Many Ramsey kits employ at least one IC. And, for most kits, we encourage careful, direct soldering of the IC to the PC board. Our years of factory service experience shows us that IC sockets themselves can cause needless problems. If you prefer to use sockets, buy them and do so. Be very careful in setting IC's into sockets. It is VERY important to orient the end with the notch, ball or band in the direction shown on the PC-board drawing!

### *NON-CRITICAL PART VALUES*

The majority of components in our circuits have a specific value for a specific purpose. For example, a certain resistor is needed to provide correct bias to a transistor. And, of course, the frequency of tuned circuits is directly determined by the capacitor and inductor. However, some parts values are not critical at all, and your kit manual may specify, for example, that an electrolytic capacitor may be in a range of 2 to 5 uf or 4.7 to 10 uf. Or we can state a range of values for resistors or potentiometers or that "any" NPN transistor will work in a given circuit position.

### CAPACITOR & RESISTOR TABLES

**CAPACITORS**

| | |
|---|---|
| 101 = 100 pf | |
| 221 = 220 pf | 102 = .001 uf = 1 nf |
| 331 = 330 pf | 103 = .01 uf = 10 nf |
| 471 = 470 pf | 104 = .1 uf = 100 nf |

**RESISTORS**

| | |
|---|---|
| 0-Black | 6-Blue |
| 1-Brown | 7-Violet |
| 2-Red | 8-Gray |
| 3-Orange | 9-White |
| 4-Yellow | Silver=10% Tolerance |
| 5-Green | Gold-5% Tolerance |

1st Band=Value Number
2nd Band=Value Number
3rd Band=Number of Zeros
4th Band=Tolerance

### COMPONENTS ON SOLDER-SIDE OF PC BOARD

99.9% of all parts in all kits are mounted on the component side (top side) of the drilled PC board. Occasionally, the assembly will call for a small capacitor or resistor to be soldered across two points on the bottom side of the board. When this is required, be sure to cut away excess wire to avoid shorting other PC-board connections.

### DC OPERATING VOLTAGES, ON-OFF SWITCHES, ETC.

Most Ramsey Kits are designed to be battery-powered, and most major kits designed for our standard case and knob sets have internal 9-volt batteries and on-off switches. The Mini-Kits generally operate over a wide range of voltages, from 3 to 18 volts, with 6, 9 or 12 volts being standard. Your kit manual specifies the ideal operating voltage for that kit. It is up to you to supply a switch, wires, battery holders, etc., for the small kits. Hint: it's good practice to use red hookup wire for the DC positive (+) and black for the negative (-).

### THE FINISHING TOUCHES!

Although you will be anxious to "turn on" your project, take one last look at the wiring and soldering connections. A few minutes spent now can save you hours of troubleshooting time later! Look for solder bridges, cold solder joints, missed connections, reversed polarity on components, and stranded wire shorts. Touch up ANY solder connections that seem less than perfect. ***ONCE YOU APPLY POWER...IT MAY BE TOO LATE!***

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**RAMSEY ELECTRONICS, INC.**

793 Canning Parkway • Victor, NY 14564 • 716-924-4560

www.ramseyelectronics.com