SERVICE CLINIC

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Chip components

THE RAPID ADVANCEMENT OF ELECtronic technology has provided us with many interesting and useful consumer products, such as portable VCR's, personal computers, and so on. It was mainly the development of transistors and later, the integrated circuit, that rocketed us into this new era of miniaturization and made possible the development of those and other products.

As a result of the miniaturazition process, a new family of components was born. That new family, known as *chip components* (or surface-mounted devices), are small units encapsulated in IC-type packages. Because of their small size, chip components demand that you be especially careful when soldering—you need just the right solder, soldering iron, etc. We'll get to that in a moment. For now, let's see how to identify the component values.

Identifying chip components

Because of their small size, some practical means of identifying chip components had to be developed. But don't worry—it's not hard to learn: The system used for both resistors and capacitors is similar to the method you're already using to identify small capacitors.

Instead of using colored dots or bands, chip resistors are identified by numbers printed on the top of the device, as shown in Fig. 1-a. For example, a 1000-ohm resistor would be marked "102." The first two numbers (10) are the first two digits of the value. The third number is the power-of-ten multiplier. (It tells you how many zeros to add, as seen in Fig. 1-a.)

Ceramic capacitors are marked with a similar system, except that two rows of numbers are used, as shown in Fig. 1-b. For instance, a .047-μF capacitor would be marked "47" in the top row and "3-u" in the bottom one. The top two numbers represent the first and second digit in the part value. The number in the second row is the power-of-ten multiplier. All values are marked in picofarads. (To convert that value to microfarads, the decimal point is then moved six places to the left.) That is practically the same as the system used now for small mica and ceramic types. The letter following the number represents the class or tolerance of the capacitor.

Identifying chip transistors is quite different from identifying capacitors and resistors. Chip transistors have two letters printed lengthwise across the top. The first letter shows the "2S" (EIA) number and the second gives the transistor's gain rating. A transistor with a gain rating of "C" will have higher gain than one rated "A" or "B," and so on. While you can replace a transistor with one with higher gain, the opposite is not true. Table 1 is a partial identification chart for chip transistors.

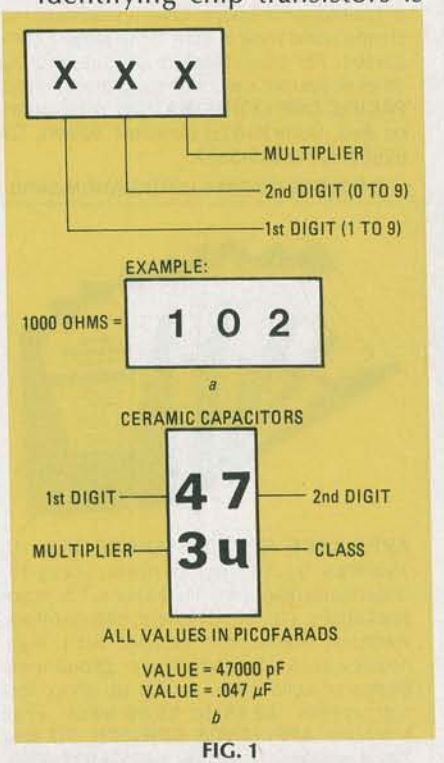

FIG. 1

TABLE 1

1st LETTER	2S NUMBER	2nd LETTER h_{FE} RANK (GAIN)
E	2SA1022	A to C
F	2SA1034	R to U
H	2SA1035	R to U
Ⓐ	2SB709	O to T
Ⓑ	2SB709A	O to T
Ⓒ	2SB710	P to S
D	2SB710A	P to S
A	2SB766	P to S
B	2SB766A	P to S
C	2SB767	P to S
V	2SC2295	A to C
U	2SC2404	B to E
S	2SC2405	R to U
T	2SC2406	R to U
R	2SC2480	T to S
Y	2SD601	O to T
Z	2SD601A	O to T
W	2SD602	P to S
X	2SD602A	P to S
Q	2SD813	P to R
P	2SD814	P to T
Ⓩ	2SD874	P to S
Ⓨ	2SD874A	P to S
Ⓧ	2SD875	P to S

Now let's see what precautions must be taken when using them.

Soldering chip components

Some manufacturers of chip components recommend a solder

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containing 63% tin to 37% lead, with a pure rosin-flux core. Others recommend a solder with 2–3% silver added to reduce "silver migration" in components having fired-on silver-platinum conductors (like some small ceramic capacitors, for example).

Silver migration during soldering results in weak joints and poor adhesion. The addition of silver to the solder raises its cost a bit, and also raises the melting temperature. (No, silver solder isn't something new, it has been around for some time now.)

As far as soldering irons are concerned, there are many that are compatible with high-tech soldering, and are available in a variety of styles and prices.

The power rating for the irons should range from 10 to 50 watts. Remember that as components decrease in size, they also increase in heat sensitivity. Therefore it is recommended that you do not use an over-rated iron. Note: Because of the electrostatic sensitivity of chip components, isolated or grounded-tip soldering irons should be used. Needless to say, surface-mounted parts will have to be replaced by exact duplicates because nothing else will fit in their places.

When it comes to desoldering, any one of three desoldering methods may be used; wicking, heat plus a suction device, or a desoldering iron (which are made by several of the major manufacturers). Each one will give good results if properly used—so, it's just a matter of personal preference. I happen to like the desoldering iron.

When desoldering always use the smallest size iron you can; a 30-watt iron will do a good job on the average small part. Just be sure that the solder is completely melted when either soldering or desoldering. That is especially necessary when replacing parts. Make sure that the joint is bright and shiny, not "frosty or fuzzy-looking." If you do see something like that, you know that you have a cold solder joint.

One of the longest jobs we had turned out to be a bad solder joint at the bottom of the base winding of a driver transformer for a horizontal output stage. (I did tell you that it was an intermittent, didn't I?) As if that wasn't enough, we had three of the same model set with the same problem! Fix one and you've fixed all three.

I wrote to the service manager of the firm that manufactured the set about it and he wrote back saying: "Yes, we've run into that problem, but only in about 20% of the sets!" That one nearly went by me, until I finally realized that 20% of the sets meant one in every five sets had a problem!

After that, when ever one of those sets came in, we went right to that joint and resoldered it. In fact, we caught some that didn't even have that problem, but definitely did have a bad solder joint.

In any repair, it's also a good idea to clean the board after any resoldering. That gets off any remaining flux; that stuff is sticky and can catch dust, which will almost certainly result in trouble in the future. **R-E**