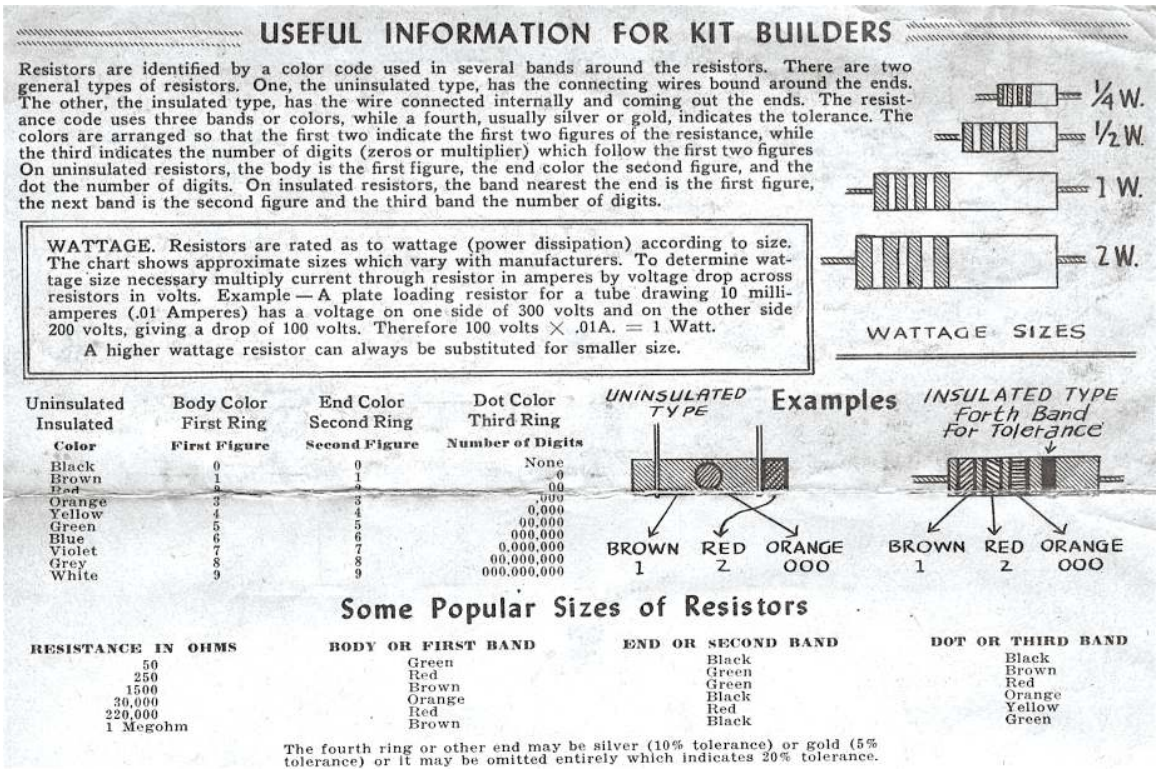
Old Condenser (Capacitor) and Resistor Codes, *circa* 1945

By Bart Lee, K6VK, CHRS Fellow in History

Heathkit ® issued the graphics that follow, in the 1950s. For radio restorers, reading the value on an old, 1920s, 1930s resistor can be a challenge because the protocol is so unfamiliar. It's all the worse on old dotted condensers because the colors can't be trusted after 70 years.



USEFUL INFORMATION FOR KIT BUILDERS

Resistors are identified by a color code used in several bands around the resistors. There are two general types of resistors. One, the uninsulated type, has the connecting wires bound around the ends. The other, the insulated type, has the wire connected internally and coming out the ends. The resistance code uses three bands or colors, while a fourth, usually silver or gold, indicates the tolerance. The colors are arranged so that the first two indicate the first two figures of the resistance, while the third indicates the number of digits (zeros or multiplier) which follow the first two figures On uninsulated resistors, the body is the first figure, the end color the second figure, and the dot the number of digits. On insulated resistors, the band nearest the end is the first figure, the next band is the second figure and the third band the number of digits.

WATTAGE. Resistors are rated as to wattage (power dissipation) according to size. The chart shows approximate sizes which vary with manufacturers. To determine wattage size necessary multiply current through resistor in amperes by voltage drop across resistors in volts. Example — A plate loading resistor for a tube drawing 10 milliamperes (.01 Amperes) has a voltage on one side of 300 volts and on the other side 200 volts, giving a drop of 100 volts. Therefore 100 volts × .01A. = 1 Watt.

A higher wattage resistor can always be substituted for smaller size.

Uninsulated Insulated Color	Body Color First Ring First Figure	End Color Second Ring Second Figure	Dot Color Third Ring Number of Digits
Black	0	0	None
Brown	1	1	0
Red	2	2	00
Orange	3	3	,000
Yellow	4	4	0,000
Green	5	5	00,000
Blue	6	6	000,000
Violet	7	7	0,000,000
Grey	8	8	00,000,000
White	9	9	000,000,000

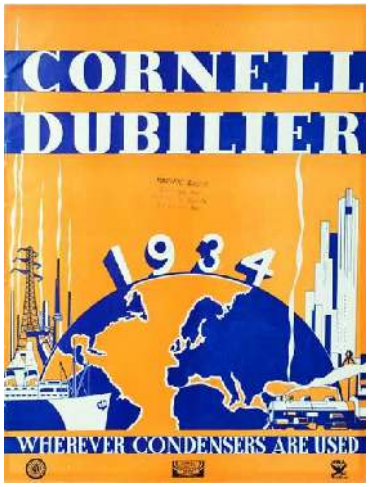
Some Popular Sizes of Resistors

RESISTANCE IN OHMS	BODY OR FIRST BAND	END OR SECOND BAND	DOT OR THIRD BAND
50	Green	Black	Black
250	Red	Green	Brown
1500	Brown	Green	Red
30,000	Orange	Black	Orange
220,000	Red	Red	Yellow
1 Megohm	Brown	Black	Green

The fourth ring or other end may be silver (10% tolerance) or gold (5% tolerance) or it may be omitted entirely which indicates 20% tolerance.

The good news is that mica condensers, as illustrated here, tend to hold up well over the decades. (We can thank 1909 amateur wireless telegraphy and telephone pioneer William Dubilier for them; the wiki says: "A graduate of Cooper Union, he was the first

to use sheets of naturally occurring mica as the dielectric in a capacitor.”)



Paper condensers, on the other hand, seem always to go bad. But some say that the capacitor leading into the audio output stage should always be replaced with a reliable new one, ideally ceramic.

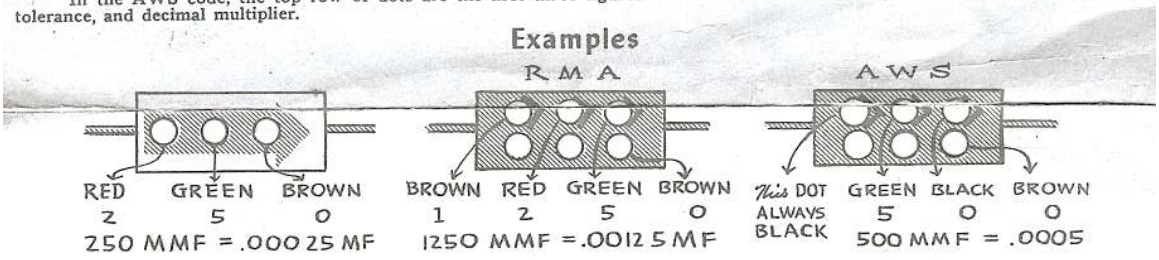
Condenser Code

Condensers use the same code as resistors and are read in micromicrofarads.

If there is one row of dots, they are read in direction of arrow or if manufacturer's name appears in the same direction as name. If two rows of dots appear, it can either be of two different codes: The RMA or the AWS (American War Standard). In the RMA, the top row of dots are the first three figures (carried to three figures), the bottom row are left to right the voltage rating, tolerance, and decimal multiplier.

In the AWS code, the top row of dots are the first three figures while the bottom row are, left to right, characteristic, tolerance, and decimal multiplier.

Examples



Some Commonly Used Sizes of Condensers

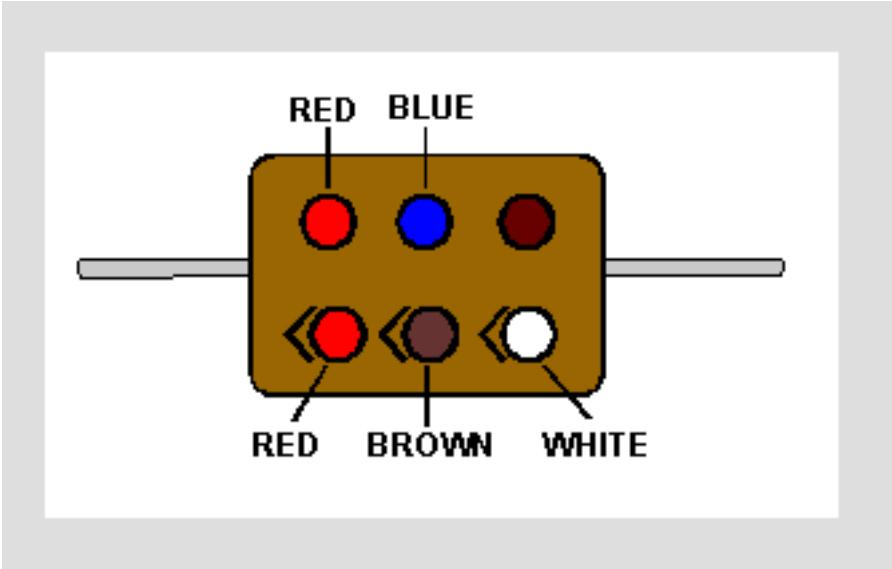
MMF.	MF.	FIRST DOT	SECOND DOT	THIRD DOT
10	.00001	Brown	Black	Black
50	.00005	Green	Black	Black
100	.0001	Brown	Black	Brown
250	.00025	Red	Green	Brown
500	.0005	Green	Black	Brown
1000	.001	Brown	Black	Red
3000	.003	Orange	Black	Red
10,000	.01	Brown	Black	Orange

The tolerance rating corresponds to the color code, i.e., red — 2%, green — 5%, etc.

The voltage rating corresponds to the code multiplied by 100. Example: Orange dot — 300 volt rating; Blue — 600 volt rating.

And it's always worth verifying a capacitor value as read against the radio's schematic diagram and / or parts list. The manufacturer's specs are likely to be the more accurate data; again, after 70 years.

See: www.tpub.com/neets/book2/3g.htm , a very helpful set of color graphics for capacitors showing how they are to be read.



(de K6VK, v 2)