COLOR CODE SYSTEMS

The designation of numbers by specific colors is standard, but there are various systems of numbering employed by different users and manufacturers of electronic components.

RESISTORS

All color coded resistors used by Tektronix display the same marking system whether marked with stripes or dots.

CAPACITORS

There are three types of color coded capacitors used, employing two different numbering systems. Both the PTM (paper tubular molded) and ceramic type capacitors use basically the same system as that used on resistors, while the mica capacitors employ two variations of the six dot system.

COILS

Most adjustable and non-adjustable coils that are color coded, display a three dot system which indicates their value. A few non-adjustable coils however, are marked by a single dot placed on a stripe which is used for circuit identification purposes only.

NEON BULBS

Neon bulbs are marked with a two dot system which indicates their operating potential and polarity. Neon bulbs used as ignition bulbs have an additional identification marking on the terminal end.

WIRES

Wires are coded by their body color and stripes which spiral their entire length. There is no complete system of coding, but in most instances, wires carrying regulated voltages are stripe coded according to the voltages they carry.

STANDARD COLOR CODE

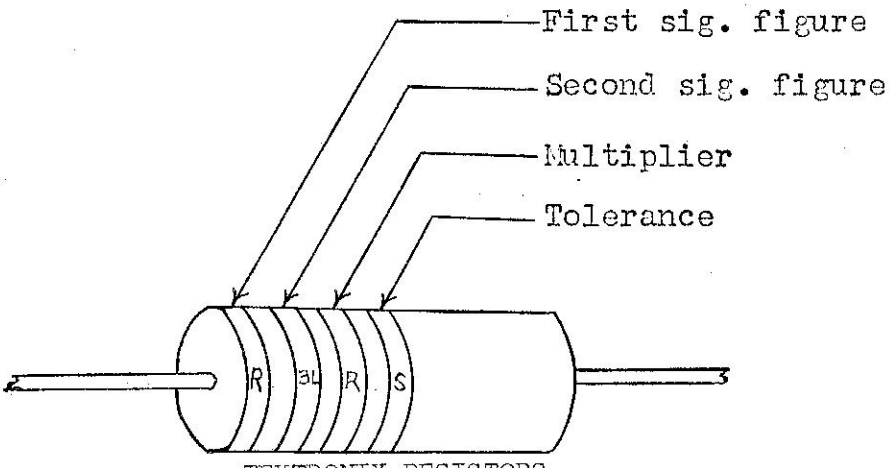
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White
0	Black

RESISTOR COLOR CODING SYSTEM

Resistors are measured in ohms, the units of resistance, and indicated by the Greek letter, Omega (Ω).

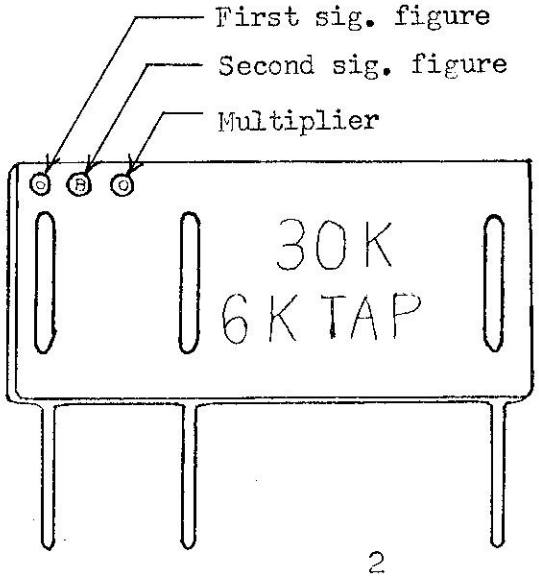
In order to simplify the writing of resistance values between 1,000 and 1,000,000 ohms, a division of 1000 is made. This is indicated by the letter "K", meaning kilo or one thousand, indicating the number will have to be multiplied by 1,000, i.e., move decimal three places to the right to get correct value. As an example, 2,600 Ω would be written and read 2.6 KΩ. For values greater than 1,000,000 ohms, a division of one million is made. This is indicated by "Meg.", meaning million, and indicating the number will have to be multiplied by 1,000,000, i.e., move decimal six places to the right to get correct value. As an example, 3,500,000 Ω would be written and read 3.5 MegΩ.

PURCHASED RESISTORS



TEKTRONIX RESISTORS

Previously Tektronix manufactured resistors were color coded as shown below with no indication of their value at the center tap. At present all production items are stamped as shown without the color code.



DETERMINING VALUE

To find the value of a resistor, write the numbers corresponding to the first two stripes beginning with the color nearest the end. The third stripe indicates the number of times the first two figures are multiplied by ten. See multiplier stripe paragraph.

MULTIPLIER STRIPE

The multiplier stripe indicates the number of zeros following the first two significant figures. If this stripe is gold, it indicates a multiplier of 0.1, i.e., move the decimal one place to the left of the second significant figure. If the stripe is silver, it indicates a multiplier of 0.01, i.e., move the decimal two places to the left.

TOLERANCE STRIPE

The tolerance stripe indicates the degree of precision to be expected. The absence of this stripe indicates a tolerance of ±20%, silver±10%, and gold-±5%. Resistors of greater precision than this have their values and tolerances stamped on their bodies.

SIZE

The physical size of a resistor is no indication of its resistance value.

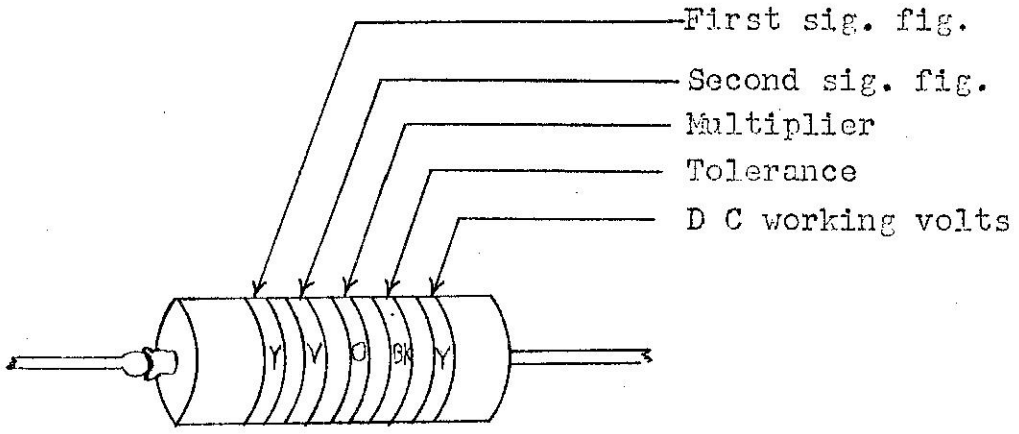
CAPACITOR COLOR CODING SYSTEMS

Capacitors are measured in units of capacitance called farads, but since a one farad capacitor is so large as to be extremely impractical, the units are broken down into millionths of a farad and millionths of a millionth of a farad.

A millionth is indicated by the term micro and millionth of a millionth by micromicro. These are abbreviated by the Greek letter Mu (μ) for micro and μμ for micromicro. The term micromicrofarad is further broken down to picofarad, an expression widely used by the British. The abbreviation for picofarad, is pf, pronounced "puff". This term is used by Tektronix to indicate small value capacitors. All color coded capacitors should be read in μμfs or "puffs"*.

* Some disc capacitors (discaps) values are denoted by K, indicating that a multiplication of 1,000 has to be made. This means they would be read in thousands of μμf, e.g., 5 K would be read 5000 μμf. Others are stamped with only a number, and are read in μf. In most cases, remember that any number greater than one is read in μμf and any decimal fraction, or number less than one, is read in μf. Other capacitors such as trimmers and electrolytics have their values stamped on them. Read them in μμf unless stamped otherwise.

PTM CAPACITORS



47,000 pf or 0.047 μf ±20%, 400 volts d. c.

When reading PTM capacitors, begin from the end which is nearest the stripes. The soldered end cannot be relied upon as a reading guide.

MULTIPLIER

The multiplier is read the same as resistors.

TOLERANCES

Tolerances are read as follows:

Green	±5 %
White or Silver	±10 %
Black	±20 %
Orange	±30 %
Yellow	±40 %

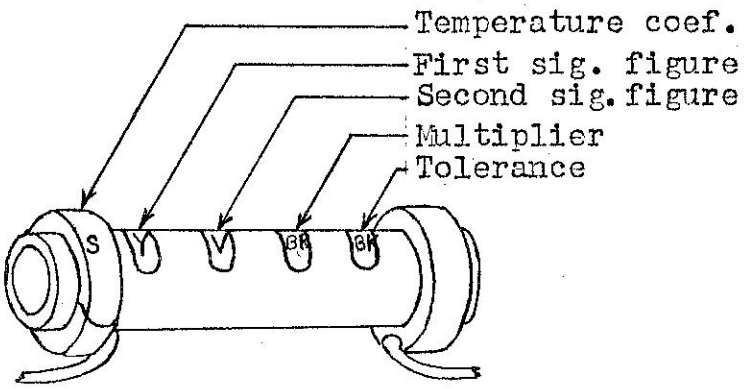
A white tolerance stripe indicates 10%, RMA coding; silver stripe indicates 10%, JAN coding*.

D-C WORKING VOLTAGE

The d-c working voltage is read in hundreds of volts.

* See Type, Mica Capacitors, Page 6

CERAMIC CAPACITORS



GP2, 470 pf ± 20 %

TEMPERATURE COEFFICIENT

Ceramic capacitors are marked with a temperature coefficient stripe which indicates the amount of change in capacitance per one million units for each degree centigrade change in temperature using 25°C as a reference temperature.

TEMPERATURE COEFFICIENT CODING

In the following chart, N indicates negative, P, positive and GP, general purpose.

Black	NPO
Brown	N 033
Red	N 075
Green	N 330
White	GP1
Silver	GP2

MULTIPLIER

The multiplier stripe is read the same as the PTM capacitors, with the exception that grey indicates .01, or move the decimal two places to the left; white indicates .1 or move the decimal one place to the left.

TOLERANCE CODING

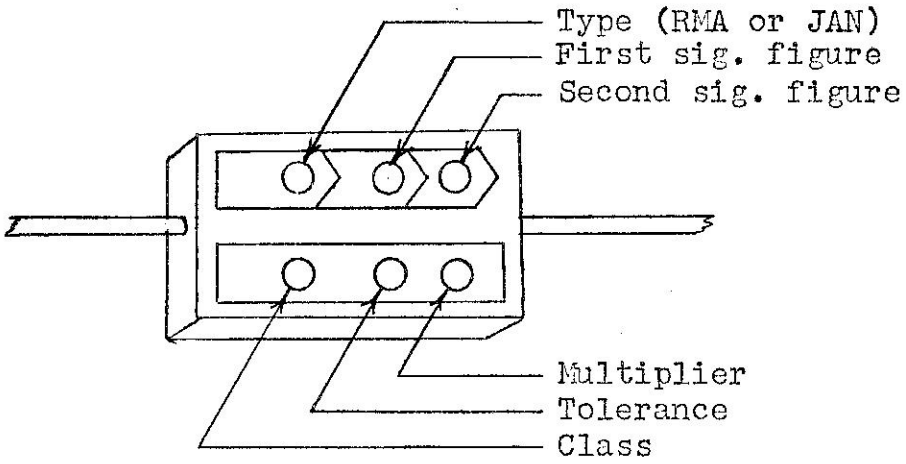
If capacitance read is greater than 10 pf, the tolerance is read in a percentage of the capacitance, as follows:

Brown	± 1 %
Red	± 2 %
Orange	± 2.5 % (RMA)
Green	± 5 %
White	±10 %
Black	±20 %

If capacitance is less than 10 pf, the tolerance is read in parts of the capacitance, as follows:

Brown	± .1 pf
Grey	± .25 pf
Green	± .5 pf
White	±1.0 pf
Black	±2.0 pf (JAN)

* MICA CAPACITORS



With the arrow pointing to the right, read from left to right across the top, then continue right to left across the bottom.

TYPE

If this dot is white, it indicates RMA (Radio Manufacturers Association) color coding, and if it is black it indicates JAN (joint Army-Navy) color coding.

SIGNIFICANT FIGURES, MULTIPLIER

The significant figures and multiplier are read the same as PTM capacitors.

*To date all mica capacitors purchased by Tektronix are rated at 500 working volts d-c. Other voltage ratings are available and can be identified according to capacitance value. The specific manufacturers catalogue must be referred to for this information.

TOLERANCE

The tolerance is read as follows:

RMA		JAN	
Red	2%	Red	2%
Orange	3%	Gold	5%
Green	5%	Silver	10%
Silver	10%	Black	20%
Black	20%		

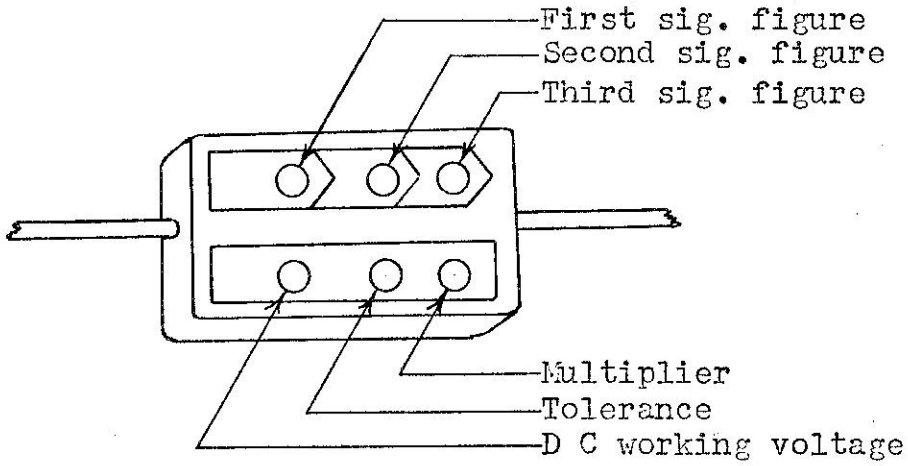
CLASS

The class dot represents the temperature coefficient and can be found by referring to the manufacturers catalogue.

RMA		JAN	
Black	A	Black	A
Brown	B	Brown	B
Red	C	Red	C
Orange	D	Orange	D
Yellow	E	Yellow	E
Grey	I	Green	F
White	J	Blue	G

RMA 6-DOT (OBSOLETE)

Although this system of coding is becoming obsolete, Tektronix will continue to purchase capacitors of this type; therefore making it necessary to be able to identify them.



The only difference is the addition of one more significant figure in the top row and the substitution of the d-c working voltage for the class.

* Also see TYPE

MULTIPLIER AND TOLERANCE

The multiplier and tolerance are read the same as the RMA or JAN types.

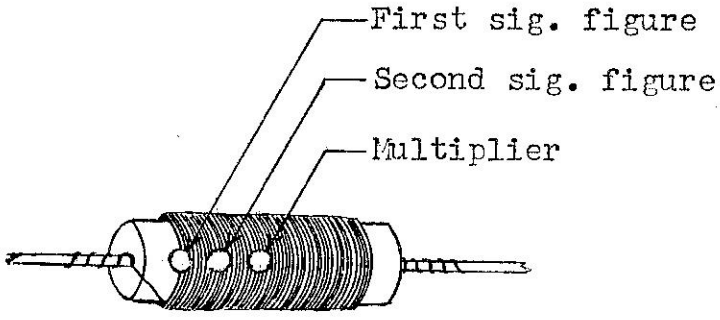
D-C WORKING VOLTAGE

The d-c working voltage is read the same as with PTM capacitors.

COIL COLOR CODING SYSTEM

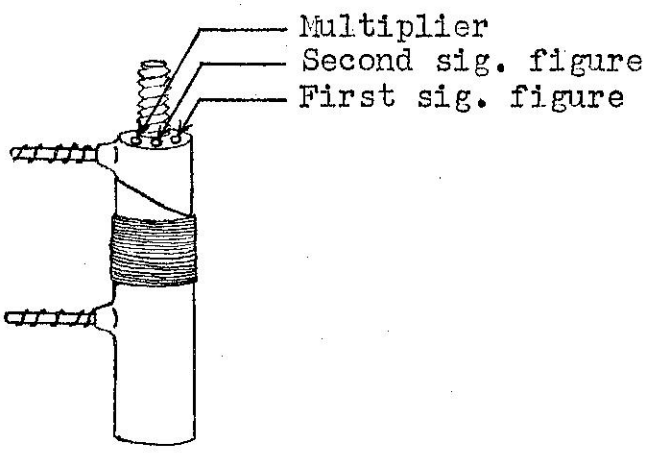
Coils (correctly called inductors) are measured in units of inductance called henries. Since most color coded coils used by Tektronix are very small, they are read in millimicro henries or one thousandth of one millionth of a henry. These coils are coded with the three dot system near one end and are read the same as resistors. There are no tolerance markings on these coils.

SOLID COIL FORMS



88,000 millimicro henries or 88 μh

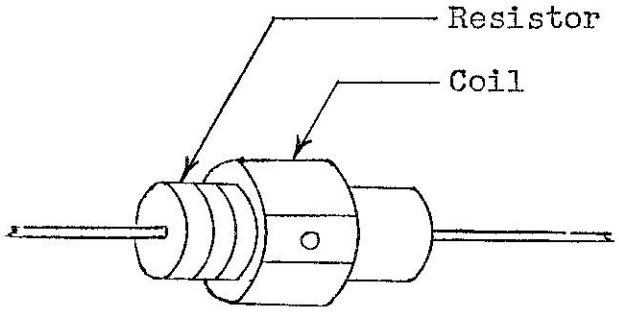
NYLON POST COIL FORMS



82 µh

When looking down on form, read in clockwise direction.

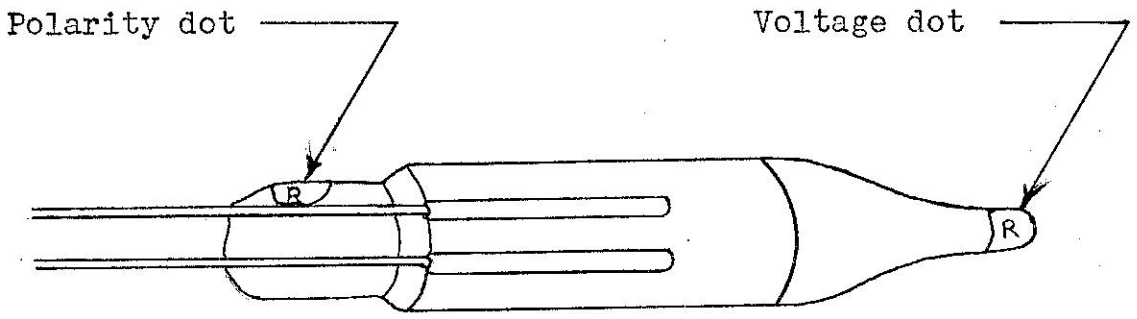
COILS WOUND ON MARKED RESISTORS



These coils are marked with a dot on a stripe or sometimes just a dot, but these markings are for part or circuit identification purposes only, and do not necessarily indicate their value.

NEON BULB COLOR CODING

Neon bulbs (NE-2) are aged in our Component Test Department with direct current (d-c). The bulb terminal that is connected to the positive side of the circuit is then marked with a spot of red paint. The bulb should be operated with this same polarity so the red coded terminal will connect to the positive side of the circuit.



65 volts

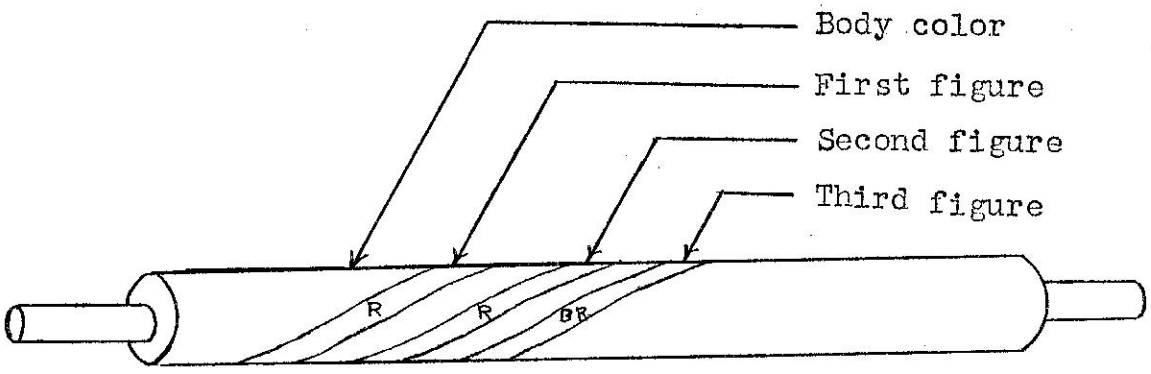
The voltage drop across each bulb is measured and the bulb is marked with colored paint on the tip to indicate this drop as follows:

50 volts	Brown dot on tip
55 volts	Black dot on tip
60 volts	White dot on tip
65 volts	Red dot on tip
70 volts	Yellow dot on tip
75 volts	Orange dot on tip

IGNITION BULBS

Ignition bulbs (65-75 volts) are coded with a green spot of paint on the terminal end in addition to the red polarity dot.

WIRE COLOR CODING



220 volts regulated

When reading wire coding begin from the wide stripe and read in the direction of decreasing stripe width until the first wide stripe is reached. The body color determines the prefix number, e. g., 9-221 indicates a white wire with two red stripes and a brown stripe.

Three stripe wires are used to carry regulated low voltages and are marked to the nearest 10 v. Two stripe wires are used to indicate voltage to the nearest volt along with the circuit number with which it is associated, e. g., filament wires. One stripe wires are used mainly as a means of circuit identification. Black bodied wires are used to carry negative voltages.