Circuit Notes: Scientific/Metric Notation
The Power of 10

Metric notation has been used as short hand when working with very large or small numbers. It uses a prefix to identify a specific amount of measurement. Scientists and engineers alike use these terms to address numeric complexity.

The method was originally created by the ancient Greek Archimedes while he attempted to calculate the number of sand grains in the universe for King Gelon. Centuries later French philosopher, mathematician, and scientist René Descartes developed the superscript method of scientific notation still used today. The method consists of a digit term and an exponential term. The digit term determines the significant figures and the exponential term places the decimal point.

There are slight differences between metric, scientific and engineering notation. Metric notation uses a prefix for exponents corresponding to the traditional name or number of commas. Scientific notation uses the power of 10 to show the magnitude of a number. Engineering notation follows these conventions, but the exponent must always be a multiple of three (engineering notation excludes metric and scientific notations' centi (10^{-2}), hecto (10^{2}), deci (10^{-1}), and deca (10^{1}), which are less than three).

How it Works

Take, for example, the number 4.27×10^{5}. 4.27 is the digit term and 10^{5} is the exponential term. A positive exponent moves the decimal to the right, where a negative exponent moves the decimal to the left. In this case, the full number would be 427,000. Another example is 8.93×10^{-7}. Since the exponential term is a negative, the actual number would be 0.000000893.

Many of these terms are what we use for sizes of units like resistors and capacitors. 32MHz, 25kΩ, and 35µF would be 32,000,000 hertz, 25,000 ohms and 0.0000035 farads.

You can also convert prefixes by multiplying or dividing by the difference between the two values. For example, converting 1MHz to kHz. 1MHz is one million hertz and 1kHz is one thousand hertz, so 1MHz is one thousand times bigger than 1kHz. Therefore, 1MHz is 1000kHz. A more simple method is to move the decimal point to the left or right depending upon whether you multiply or divide.

The table below contains metric values and their prefixes in scientific notation.
Entries in bold express engineering notation:

Metric Prefix	Symbol	Multiplier (Traditional Notation)	Exponential	Description
Yotta	**Y**	**1,000,000,000,000,000,000,000,000**	**10^{24}**	**Septillion**
Zetta	**Z**	**1,000,000,000,000,000,000,000**	**10^{21}**	**Sextillion**
Exa	**E**	**1,000,000,000,000,000,000**	**10^{18}**	**Quintillion**
Peta	**P**	**1,000,000,000,000,000**	**10^{15}**	**Quadrillion**
Tera	**T**	**1,000,000,000,000**	**10^{12}**	**Trillion**
Giga	**G**	**1,000,000,000**	**10^{9}**	**Billion**
Mega	**M**	**1,000,000**	**10^{6}**	**Million**
kilo	**k**	**1,000**	**10^{3}**	**Thousand**
hecto	h	100	10^{2}	Hundred
deca	da	10	10^{1}	Ten
base	b	1	10^{0}	One
deci	d	1/10	10^{-1}	Tenth
centi	c	1/100	10^{-2}	Hundredth
milli	**m**	**1/1,000**	**10^{-3}**	**Thousandth**
micro	**μ**	**1/1,000,000**	**10^{-6}**	**Millionth**
nano	**n**	**1/1,000,000,000**	**10^{-9}**	**Billionth**
pico	**p**	**1/1,000,000,000,000**	**10^{-12}**	**Trillionth**
femto	**f**	**1/1,000,000,000,000,000**	**10^{-15}**	**Quadrillionth**
atto	**a**	**1/1,000,000,000,000,000,000**	**10^{-18}**	**Quintillionth**
zepto	**z**	**1/1,000,000,000,000,000,000,000**	**10^{-21}**	**Sextillionth**
yocto	**y**	**1/1,000,000,000,000,000,000,000,000**	**10^{-24}**	**Septillionth**