CHAPTER 2

Math Refresher

Metric Prefixes

Metric prefixes you'll need to know ...

1 Giga (G) = 1 billion = 1,000,000,000
1 Mega (M) = 1 million = 1,000,000
1 kilo (k) = 1 thousand = 1,000
1 centi (c) = 1 one-hundredth = 0.01
1 milli (m) = 1 one-thousandth = 0.001
1 micro (u) = 1 one-millionth = 0.000001
1 pico (p) = 1 one-trillionth = 0.000000000001

... and a few you might want to know ...

1 Tera (T) = 1trillion = 1,000,000,000,000
1 hecto (h) = hundred = 100
1 deci (d) = 1 tenth = 0.1
1 nano (n) = 1 one-billionth = 0.000000001

Metric Prefixes

The prefix enables us to reduce the amount of zeros that are used in writing out large numbers.

For example…

Instead of saying that the frequency of a signal is 1,000,000 Hz
(Hz = Hertz, or cycles per second)

We say it is 1 Megahertz (MHz) or 1,000 kilohertz (kHz)

The prefix enables us to write the number in a shorter form

This becomes especially useful when we need to measure or record very large or very small values

Metric Prefixes

Mega = one million = 1,000,000

Let’s go back and look at large frequencies again

1,000 Hz = 1 kHz
"One thousand Hertz equals one kilohertz"

1,000,000 Hz = 1 Mhz
"One million Hertz equal one megahertz"

How many kilohertz are in one megahertz?

1000 kHz = 1 MHz
"One thousand kilohertz equals one megahertz"

If a radio is tuned to 7125 kHz, how do we express it in megahertz?

1000 kHz = 1 MHz || 7125 kHz = 7.125 MHz

Metric Prefixes

Mega = one million = 1,000,000

Another frequency problem: your dial reads 3525 kHz. What is the same frequency expressed in Hertz?

1 kHz = 1000 Hz || 3525 kHz = 3,525,000 Hz

(Notice that since we have to add three zeros to go from 1 kHz to 1000 Hz, we must also do the same to go from 3525 kHz to 3,525,000 Hz.)

Your displays shows a frequency of 3.525 MHz. What is that same frequency in kilohertz?

1 MHz = 1000 kHz || 3.525 MHz = 3525 kHz

(See how the 1 became 1000? To go from megahertz to kilohertz, you multiply by 1000. Try multiplying 3.525 MHz by 1000 to get your frequency in kilohertz.)

Metric Prefixes

Giga = one billion = 1,000,000,000

Remember, kilo equals one thousand, and mega equals one million

One billion Hertz is one gigahertz (GHz).

You are transmitting on 1.265 GHz, what is your frequency in megahertz?

1 GHz = 1000 MHz || 1.265 GHz = 1265 MHz

These prefixes make it easier to express the large and small numbers commonly used in radio and electronics

Metric Prefixes

Milli = one one-thousandth = 0.001

If you were to take an ammeter (a meter that measures current) marked in amperes and measure a 3,000 milliampere current, what would your ammeter read?

1,000 mA = 1 A || 3,000 mA = 3 A

Metric Prefixes

Now lets say, on a different circuit, you were using a voltmeter marked in volts (V), and you were measuring a voltage of 3,500 millivolts (mV). How many volts would your meter read?

1,000 mV = 1 V || 3,500 mV = 3.5 V

How about one of those new pocket sized, micro handheld radio you're itching to buy once you get your license? One manufacturer says that their radio puts out 500 milliwatts (mW) , while the other manufacturer's radio will put out 250 milliwatts (mW). How many watts (W) do these radios really put out?

1000 mW = 1 W || 500 mW = 0.5 W

1000 mW = 1 W || 250 mW = 0.25 W

Metric Prefixes

Micro = on one-millionth = 0.0000000001

Capacitors usually have very small values. A one-farad capacitor is seldom used in commercial electronics.

Usually, capacitors have values in the range of thousandths of a farad to trillionths of a farad

Micro and pico are the opposite end of the scale compared with kilo, mega, and giga… they indicate very small values

If a capacitor has a value of 500,000 microfarads, how many farads would that be?

Since it takes one million microfarads to equal one farad...

1,000,000 uF = 1 F || 500,000 uF = 0.5 F

Metric Prefixes

Pico = one one-trillionth = 0.000000000001

What if a capacitor has a value of 1,000,000 picofarads? One picofarad is one trillionth of a farad. One picofarad is also one millionth of a microfarad. So it takes one million picofarads (pF) to equal one microfarad (uF):

1,000,000 pF = 1 uF

It takes one trillion (i.e. one million-million) picofarads (pF) to equal one farad (F):

1,000,000,000,000 pF = 1 F