Electrical Fundamentals and Basic Components
Chapters T2, T3, G4

Some Basic Math, Electrical Fundamentals, AC Power, The Basics… of Basic Components, A Little More Component Detail, Reactance and Impedance

Some Basic Math

HINT: For many of the following questions, use Table 2.1 (reproduced below from page T2-2 in your Tech Manual, the "International System of Units (SI) – Metric Units") and Table 7.1 two pages down to help you work out the answer.
The following is taken from the ARRL website:
https://www.arrl.org/files/file/Get%20Licensed/Metric.pdf

Table 2-1
International System of Units (SI) — Metric Units

Prefix	Symbol	Multiplication Factor
tera	T	10^{12} = 1,000,000,000,000
giga	G	10^{9} = 1,000,000,000
mega	M	10^{6} = 1,000,000
kilo	k	10^{3} = 1,000
hecto	h	10^{2} = 100
deca	da	10^{1} = 10
(unit)		10^{0} = 1
deci	d	10^{-1} = 0.1
centi	c	10^{-2} = 0.01
milli	m	10^{-3} = 0.001
micro	µ	10^{-6} = 0.000001
nano	n	10^{-9} = 0.000000001
pico	p	10^{-12} = 0.000000000001

Table 2.1 above summarizes the most-used **metric prefixes**. These same prefixes can be applied to any basic unit in the metric system. Even if you come across some terms you are not unfamiliar with, you will be able to recognize the prefixes.

We can write these prefixes as powers of 10, as shown in Table 2.1. The power of 10 (called the *exponent*) shows how many times you must multiply (or divide) the basic unit by 10. For example, we can see from the table that **kilo** means 103. Let's use the meter as an example. If you multiply a meter by 10 three times, you will have a *kilometer*. (1 meter × 103 = 1 m × 10 × 10 × 10 = 1000 meters, or 1 kilometer.) If you multiply 1 meter by 10 six times, you have a **mega**meter. (1 meter × 106 = 1 m × 10 × 10 × 10 × 10 × 10 × 10 = 1,000,000 meters or 1 megameter.)

Notice that the exponent for some of the prefixes is a negative number. This indicates that you must *divide* the basic unit by 10 that number of times. If you divide a meter by 10, you will have a **deci**meter. (1 meter × 10–1 = 1 m ÷ 10 = 0.1 meter, or 1 decimeter.) When we write 10–6, it means you must divide by 10 six times. (1 meter × 10–6 = 1 m ÷ 10 ÷ 10 ÷ 10 ÷ 10 ÷ 10 ÷ 10 = 0.000001 meter, or 1 **micro**meter.)

We can easily write very large or very small numbers with this system. We can use the metric prefixes with the basic units, or we can use powers of 10. Many of the quantities used in basic electronics are either very large or very small numbers, so we use these prefixes quite a bit. You should be sure you are familiar at least with the following prefixes and their associated powers of 10: **giga** (109), **mega** (106), **kilo** (103), **centi** (10–2), **milli** (10–3), **micro** (10–6) and **pico** (10–12).

Let's try an example. For this example, we'll use a term that you will run into quite often in your study of electronics: **hertz (abbreviated Hz)**. Hertz is a unit that refers to the frequency of a radio or television wave. We have a receiver dial calibrated in kilohertz (kHz), and it shows a signal at a frequency of 28450 kHz. Where would a dial calibrated in hertz show the signal? From Table 2.1 we see that kilo means times 1000. The basic unit of frequency is the hertz. That means that our signal is at 28450 kHz × 1,000 = 28,450,000 hertz. There are 1000 hertz in a kilohertz, so 28,450,000 divided by 1000 gives us 28,450 kHz.

How about another one? If we have a current of 3000 milliamperes, how many amperes is this? From Table 2.1 we see that milli means multiply by 0.001 or divide by 1000. Dividing 3000 milliamperes by 1000 gives us 3 amperes. The metric prefixes make it easy to use numbers that are a convenient size simply by changing the units. It is certainly easier to work with a measurement given as 3 amperes than as 3000 milliamperes!

Notice that it doesn't matter what the units are or what they represent. Meters, hertz, amperes, volts, farads or watts make no difference in how we use the prefixes. Each prefix represents a certain multiplication factor, and that value never changes.

With a little practice you should begin to understand how to change prefixes in the metric system. First write the number and find the proper power of ten (from memory or Table 2.1), and then move the decimal point to change to the basic unit. Then divide by the multiplication factor for the new prefix you want to use. With a little more practice you'll be changing prefixes with ease.

10^{18} 10^{15} 10^{12} 10^{9} 10^{6} 10^{3} 10^{2} 10^{1} 10^{0} 10^{-1} 10^{-2} 10^{-3} 10^{-6} 10^{-9} 10^{-12} 10^{-15} 10^{-18}

E • • P • • T • • G • • M • • k h da U d c m • • µ • • n • • p • • f • • a

Figure 7.1 - The above chart shows the symbols for all metric prefixes, with the power of ten that each represents. Write the abbreviations in decreasing order from left to right. The dots between certain prefixes indicate there are two decimal places between those prefixes. (Shaded areas are rarely used)

You must be sure to count a decimal place for each of these dots when converting from one prefix to another.

When you change **from a larger to a smaller prefix**, you are moving **to the right** on the chart. **The decimal point in the number you are changing also moves to the right.**

Likewise, when you change **from a smaller to a larger prefix**, you are moving **to the left, and the decimal point also moves to the left.**

There is another method you can use to convert between metric prefixes, but it involves a little trick. Learn to write the chart shown in **Figure 7.1 above** on a piece of paper when you are going to make a conversion. Always start with the large prefixes on the left and go toward the right with the smaller ones. Sometimes you can make an abbreviated list, using only the units from kilo to milli. If you need the units larger than kilo or smaller than milli, be sure to include the dots as shown in **Figure 7.1.** (They mark the extra decimal places between the larger and smaller prefixes, which go in steps of 1000 instead of every 10.) Once you learn to write the chart correctly, it will be very easy to change prefixes.
Let's work through an example to show how to use this chart. Change 3725 kilohertz to hertz. Since we are starting with kilohertz (kilo), begin at the k on the chart. Now count each symbol to the right, until you come to the basic unit (U). Did you count three places? Well that's how many places you must move the decimal point to change from kilohertz (kHz) to hertz (Hz). Which way do you move the decimal point? Notice that you counted to the right on the chart. Move the decimal point in the same direction. Now you can write the answer: 3725 kHz = 3,725,000 Hz!

Suppose a meter indicates a voltage of 3500 millivolts (abbreviated mV) across a circuit. How many volts (abbreviated V) is that?

First, write the list of metric prefixes. Since you won't need those smaller than milli or larger than kilo, you can write an abbreviated list. You don't have to write the powers of ten, if you remember what the prefixes represent. To change from milli to the unit, we count 3 decimal places toward the left. This tells us to move the decimal point in our number three places to the left. 3500 mV = 3.5 V
Let's try one more example for some extra practice changing metric prefixes by moving the decimal point in a number. What if someone told you to tune your radio receiver to 145,450,000 Hz? You probably won't find any radio receiver with a dial marking like this! To make the number more practical, we'll write the frequency with a prefix that's more likely to appear on a receiver dial. Our first step is to select a new prefix to express the number. We can write the number with one, two or three digits to the left of the decimal point. It looks like we'll need the entire prefix chart for this one, so write it down as described earlier. (You can look at the chart in **Figure 7.1**, but you should practice writing it for those times when you don't have the book — like your exam!)
The next job is to count how many places you can move the decimal point. The number you end up with should have one, two or three digits to the left of the decimal point. Remember that metric prefixes larger than kilo represent multiples of 1000, or 103. Did you count six places to move the decimal point in our example, 145,450,000 Hz? That would leave us with 145.45 × 106 Hz. Now go back to the chart and count six places to the left. (This is the same number of places and the same direction as we moved the decimal point.) The new spot on the chart indicates our new metric prefix, mega, abbreviated M. Replacing the power of ten with this prefix, we can write our frequency as 145.45 MHz.

BASIC MATH QUESTIONS:

(T5C14) What is the proper abbreviation for megahertz?

ANSWER:

(T5B12) Which of the following frequencies is equal to 28,400 kHz?

ANSWER:

(T5B13) If a frequency display shows a reading of 2425 MHz, what frequency is that in GHz?

ANSWER:

(T5B02) What is another way to specify a radio signal frequency of 1,500,000 hertz?

ANSWER:

(T5B07) If a frequency display calibrated in megahertz shows a reading of 3.525 MHz, what would it show if it were calibrated in kilohertz?

ANSWER:

T5B01) How many milliamperes is 1.5 amperes?

ANSWER:

(T5B03) How many volts are equal to one kilovolt?

ANSWER: ______________________________

(T5B04) How many volts are equal to one microvolt?

ANSWER: ______________________________

(T5B05) Which of the following is equivalent to 500 milliwatts?

ANSWER: ______________________________

(T5B06) If an ammeter calibrated in amperes is used to measure a 3000-milliampere current, what reading would it show?

ANSWER: ______________________________

(T5B08) How many microfarads are equal to 1,000,000 picofarads?

ANSWER: ______________________________

(T5D01) What formula is used to calculate current in a circuit?

ANSWER: ______________________________

(T5D02) What formula is used to calculate voltage in a circuit?

ANSWER: ______________________________

(T5D03) What formula is used to calculate resistance in a circuit?

ANSWER: ______________________________

(T5D04) What is the resistance of a circuit in which a current of 3 amperes flows through a resistor connected to 90 volts?

ANSWER: ________________________________

(T5D05) What is the resistance in a circuit for which the applied voltage is 12 volts and the current flow is 1.5 amperes?

ANSWER: ________________________________

(T5D06) What is the resistance of a circuit that draws 4 amperes from a 12-volt source?

ANSWER: ________________________________

(T5D07) What is the current in a circuit with an applied voltage of 120 volts and a resistance of 80 ohms?

ANSWER: ________________________________

(T5D08) What is the current through a 100-ohm resistor connected across 200 volts?

ANSWER: ________________________________

(T5D09) What is the current through a 24-ohm resistor connected across 240 volts?

ANSWER: ________________________________

(T5D10) What is the voltage across a 2-ohm resistor if a current of 0.5 amperes flows through it?

ANSWER: ________________________________

(T5D11) What is the voltage across a 10-ohm resistor if a current of 1 ampere flows through it?

ANSWER: ________________________________

(T5D12) What is the voltage across a 10-ohm resistor if a current of 2 amperes flows through it?

ANSWER: ______________________________

(T5C09) How much power is being used in a circuit when the applied voltage is 13.8 volts DC and the current is 10 amperes?

ANSWER: ______________________________

(T5C10) How much power is being used in a circuit when the applied voltage is 12 volts DC and the current is 2.5 amperes?

ANSWER: ______________________________

(T5C11) How many amperes are flowing in a circuit when the applied voltage is 12 volts DC and the load is 120 watts?

ANSWER: ______________________________

dB Calculations

WATTS TO dB

You have a 100W amplifier and want to change to a 350W amplifier. How many more dB will you get out of your loudspeaker?

Formula: dB = 10 x Log (watts1/watts2) or 10 x Log (350/100).

Note the larger number is divided by smaller will give you +dB. You DO expect higher SPL, don't you?

Enter 350 (watts1)
Hit the divide key
Enter 100 (watts2)
Hit the = key
Your answer should be 3
Hit the Log key
Your answer should be 0.54
Hit the multiply key
Enter 10
Hit the = key
Your answer should be 5.4 dB

This is the power difference in dB between these amplifiers. If you were going from a 350W to a 100W, the answer would be -5.4 dB as the smaller number would be divided by the larger. Try it.

You could go through correct mathematical conversions, but because we are being practical, the SPL from your loudspeaker will be 5.4 dB greater with the 350W amplifier than the 100W amplifier. Or, it will be -5.4 dB less using a 100W amplifier instead of a 350W amplifier.

VOLTAGE TO dB

The question is what is the difference in dB between 1.4 volts and 8 volts?

Formula: dB = 20 x Log (volts1/volts2) or 20 Log (1.4/8)

Enter 1.4 (volts1)
Hit the divide key
Enter 8 (volts2)
Hit the = key
Your answer should be 0.17
Hit the Log key
Your answer should be -0.75
Hit the multiply key

Enter 20
Your answer should be -15.13 dB

Find the dB difference between 71.30V and 70.16V.

Suppose you have one device that has a maximum 15.5 volt output and the device you wish to drive with it accepts a maximum input of only 7.75 volts.

What is the dB difference?

Formula: dB = 20 x Log (volts1/volts2) or 20 x Log (15.5/7.75)
Enter 15.5 (volts1)
Hit the divide key
Enter 7.75 (volts2)
Hit the = key
Your answer should be 2
Hit the Log key
Your answer should be 0.30
Hit the multiply key
Enter 20
Hit the = key
Your answer should be 6.02 dB

The output of the first device is 6 dB more than what the second device can accept.

You'll notice that in the first voltage to dB calculation you ended up with a minus dB number and in this one a plus or positive dB number.

+dB AND -dB

In the last example, if you used the formula 20 x Log (7.75/15.5), your answer would be -6.02 dB. It simply depends whether a larger number is divided by a smaller one (answer is always +dB) or a smaller one is divided by a larger one (answer is always -dB). The basic number will be the same no matter which way you divide. Try reversing the 7.75 and 15.5 in the last example.

You should get -6.02 as the answer.

Also, if you calculated the dB difference between the 71.30V and the 70.16V for the amplifier outputs, you would have gotten 0.139 dB or -0.139 dB, depending on which number you divided by which. This is why the difference was not significant: you can not hear a 0.139 dB difference.
The main reason for dividing a smaller by a larger number when calculating dB is to figure out the LOSS in dB.

How to Calculate dB Loss

Decibels (dB) determine the relationship in signal strength between two sources. When the power of the first signal outweighs that of the second, a loss occurs; this can be desirable, as with the use of carpets to quiet a library, or it can be detrimental, as when a bad cable weakens electrical signals from an antenna on their way to your TV. Use the formula for finding the decibels as a ratio of the power of the signals to calculate the exact value of the loss. A scientific calculator with a log function helps to solve the equation.

- Measure the full-strength signal with an appropriate meter; to measure radio signals, for example, a radio signal power meter indicates the strength of radio waves at a particular location in units of milliwatts, microwatts or similar units. Write down the results, labeling them “full strength.”
- Measure the attenuated signal with the same meter; this is the signal for which you expect a reduction in power. For example, an antenna picks up a radio signal; right at the antenna, the meter measures 20 miliwatts, but the long cable connected to the cable reduces the power to 5 miliwatts. In this instance, you measure the attenuated signal at the output end of the long cable. Write down the results, labeling them “attenuated.”

- Divide the first signal's power by the second signal's power to find the ratio of the two signals. For instance, if signal A has a power of 20 mW and signal B has a power of 5 mW: 20/5 = 4.

- Take the log of the the ratio of the signals by pressing the log button on the scientific calculator. For instance: log 4 = 0.602.

- Multiply this answer by 10 to find the decibels. For the example: 0.602 x 10 = 6 decibels (dB).

- Determine if the decibel reading reflects a loss or gain of power by looking at signal A and signal B. Record a loss if signal A had a greater value than signal B, and a gain if signal B had the greater number. For the example, since the first signal (signal A) measured more than signal B, the result indicated a loss of 6 decibels (dB).

How to Convert the dB Loss to a Percent

Decibels, or dB, are the most popular unit for measuring sound intensity. In addition to this, another practical use of decibels is to measure power loss in a range of circuits. The ratios obtained when this measurement takes place can also be expressed as a percent value in order to make it easier to read and use in calculations. Finally, a clearer indication of the scale of power change can also be given if a conversion from dB loss to percent is used.

- Determine the physical quantity type that is to be measured. For example, if field amplitudes are measured, such as voltage or sound level, the level of decibels is equal to "log base 20 of A/Aref", where A and Aref are used to denote amplitude and amplitude reference level, respectively. On the other hand, if power levels are measured, the level of decibels can be defined using the formula "LdB = log base 10 of P / Pref". P represents the power ratio, while Pref is the reference level used.
- Use one of the formulas above in order to obtain the "P / Pref" or "A / Aref" ratio. For example, if sound measurement is used, A / Aref = 10 ^ (LdB / 20) is obtained.
- Multiply the value of the ratio above with 100 in order to obtain the final result in percent. For example, a loss of 3 db of sound is equivalent to a decrease of 10 ^ (-3 / 20) * 100 = 70.8%. -3 is used since this is a loss, so the variation is negative.

For Voltage

$$\text{Field quantity } L \text{ in dB} = 20 \cdot \log\left(\frac{a_2}{a_1}\right)$$

For Power

$$\text{Energy quantity } L \text{ in dB} = 10 \cdot \log\left(\frac{b_2}{b_1}\right)$$

(a_1 and b_1 is the reference)

Electrical Fundamentals

(T3B02) What property of a radio wave is used to describe its polarization?

ANSWER:

(T5A01) Electrical current is measured in which of the following units?

ANSWER:

(T5A02) Electrical power is measured in which of the following units?

ANSWER:

(T5A03) What is the name for the flow of electrons in an electric circuit?

ANSWER:

(T5A04) What is the name for a current that flows only in one direction?

ANSWER:

(T5A05) What is the electrical term for an electromotive force (EMF) that causes electron flow?

ANSWER:

(T5A07) Which of the following is a good electrical conductor?

ANSWER:

(T5A08) Which of the following is a good electrical insulator?

ANSWER:

(T5A09) What is the name for a current that reverses direction on a regular basis?

ANSWER:

(T5A10) Which term describes the rate at which electrical energy is used?

ANSWER:

(T5A11) What is the unit of electromotive force?

ANSWER:

(T5A12) What describes the number of times per second that an alternating current makes a complete cycle?

ANSWER:

(T5A13) In which type of circuit is current the same through all components?

ANSWER:

(T5A14) In which type of circuit is voltage the same across all components?

ANSWER:

(T5D13) What happens to current at the junction of two components in series?

ANSWER:

(T5D14) What happens to current at the junction of two components in parallel?

ANSWER: ___

(T5D15) What is the voltage across each of two components in series with a voltage source?

ANSWER: ___

(T5D16) What is the voltage across each of two components in parallel with a voltage source?

ANSWER: ___

(T5C08) What is the formula used to calculate electrical power in a DC circuit?

ANSWER: ___

(T7D01) Which instrument would you use to measure electric potential or electromotive force?

ANSWER: ___

(T7D02) What is the correct way to connect a voltmeter to a circuit?

ANSWER: ___

(T7D03) How is a simple ammeter connected to a circuit?

ANSWER: ___

(T7D04) Which instrument is used to measure electric current?

ANSWER: ___

(T7D05) What instrument is used to measure resistance?

ANSWER:

(T7D06) Which of the following might damage a multimeter?

ANSWER:

(T7D07) Which of the following measurements are commonly made using a multimeter?

ANSWER:

(T7D10) What is probably happening when an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows increasing resistance with time?

ANSWER:

(T7D11) Which of the following precautions should be taken when measuring circuit resistance with an ohmmeter?

ANSWER:

(T5B10) What is the approximate amount of change, measured in decibels (dB), of a power decrease from 12 watts to 3 watts?

ANSWER:

G5B01 -- What dB change represents a factor of two increase or decrease in power?

ANSWER:

G5B03 -- How many watts of electrical power are used if 400 VDC is supplied to an 800 ohm load?

ANSWER: ____________________

G5B04 -- How many watts of electrical power are used by a 12-VDC light bulb that draws 0.2 amperes?

ANSWER: ____________________

G5B10 -- What percentage of power loss would result from a transmission line loss of 1 dB?

ANSWER: ____________________

T5B09 -- What is the approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts?

ANSWER: ____________________

(T5B11) -- What is the amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts?

ANSWER: ____________________

AC Power

G5B06 -- What is the output PEP from a transmitter if an oscilloscope measures 200 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

ANSWER: ________________________________

G5B07 -- Which value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

ANSWER: ________________________________

G5B09 -- What is the RMS voltage of a sine wave with a value of 17 volts peak?

ANSWER: ________________________________

G5B11 -- What is the ratio of peak envelope power to average power for an unmodulated carrier?

ANSWER: ________________________________

G5B13 -- What is the output PEP of an unmodulated carrier if an average reading wattmeter connected to the transmitter output indicates 1060 watts?

ANSWER: ________________________________

G5B08 -- What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120.0 volts?

ANSWER: ________________________________

G5B12 -- What would be the RMS voltage across a 50-ohm dummy load dissipating 1200 watts?

ANSWER:

G5B14 -- What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50 ohm resistive load connected to the transmitter output?

The Basics... of Basic Components

(T5C01) What is the ability to store energy in an electric field called?

ANSWER:

(T5C02) What is the basic unit of capacitance?

ANSWER:

(T5C03) What is the ability to store energy in a magnetic field called?

ANSWER:

(T5C04) What is the basic unit of inductance?

ANSWER:

(T6A01) What electrical component opposes the flow of current in a DC circuit?

ANSWER: ______________________________

(T6A04) What electrical component stores energy in an electric field?

ANSWER: ______________________________

(T6A05) What type of electrical component consists of two or more conductive surfaces separated by an insulator?

ANSWER: ______________________________

(T6A06) What type of electrical component stores energy in a magnetic field?

ANSWER: ______________________________

(T6A07) What electrical component usually is constructed as a coil of wire?

ANSWER: ______________________________

(T6A08) What electrical component is used to connect or disconnect electrical circuits?

ANSWER: ______________________________

(T6A09) What electrical component is used to protect other circuit components from current overloads?

ANSWER: ______________________________

(T6B01) What class of electronic components uses a voltage or current signal to control current flow?

ANSWER: ______________________________

(T6B02) What electronic component allows current to flow in only one direction?

ANSWER: ______________________________

(T6B03) Which of these components can be used as an electronic switch or amplifier?

ANSWER: ______________________________

(T6B04) Which of the following components can consist of three layers of semiconductor material?

ANSWER: ______________________________

(T6B05) Which of the following electronic components can amplify signals?

ANSWER: ______________________________

(T6B06) How is the cathode lead of a semiconductor diode often marked on the package?

ANSWER: ______________________________

(T6B07) What does the abbreviation "LED" stand for?

ANSWER: ______________________________

(T6B08) What does the abbreviation "FET" stand for?

ANSWER: ______________________________

(T6B09) What are the names of the two electrodes of a diode?

ANSWER: ______________________________

(T6B10) Which of the following could be the primary gain-producing component in an RF power amplifier?

ANSWER: ______________________________

(T6B11) What is the term that describes a device's ability to amplify a signal?

ANSWER: ______________________________

(T6C01) What is the name of an electrical wiring diagram that uses standard component symbols?

ANSWER: ______________________________

(T6C12) What do the symbols on an electrical schematic represent?

ANSWER: ______________________________

(T6C13) Which of the following is accurately represented in electrical schematics?

ANSWER: ______________________________

(T6D01) Which of the following devices or circuits changes an alternating current into a varying direct current signal?

ANSWER: ______________________________

(T6D02) What is a relay?

ANSWER: ______________________________

(T6D04) Which of the following displays an electrical quantity as a numeric value?

ANSWER: ______________________________

(T6D05) What type of circuit controls the amount of voltage from a power supply?

ANSWER: ____

(T6D06) What component is commonly used to change 120V AC house current to a lower AC voltage for other uses?

ANSWER: ____

(T6D07) Which of the following is commonly used as a visual indicator?

ANSWER: ____

(T6D08) Which of the following is combined with an inductor to make a tuned circuit?

ANSWER: ____

(T6D09) What is the name of the device that combines several semiconductors and other components into one package?

ANSWER: ____

A Little More Component Detail

G5B02 -- How does the total current relate to the individual currents in each branch of a purely resistive parallel circuit?

ANSWER:

G5C01 -- What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

ANSWER:

G5B05 -- How many watts are dissipated when a current of 7.0 milliamperes flows through a 1250 ohm resistance?

ANSWER:

G5C02 -- What happens if a signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

ANSWER:

G5C16 -- Why is the conductor of the primary winding of many voltage step-up transformers larger in diameter than the conductor of the secondary winding?

ANSWER:

G5C03 -- Which of the following components increases the total resistance of a resistor?

ANSWER:

G5C04 -- What is the total resistance of three 100 ohm resistors in parallel?

ANSWER: ____

G5C05 -- If three equal value resistors in series produce 450 ohms, what is the value of each resistor?

ANSWER: ____

G5C06 -- What is the RMS voltage across a 500-turn secondary winding in a transformer if the 2250-turn primary is connected to 120 VAC?

ANSWER: ____

G5C08 -- What is the equivalent capacitance of two 5.0 nanofarad capacitors and one 750 picofarad capacitor connected in parallel?

ANSWER: ____

G5C09 -- What is the capacitance of three 100 microfarad capacitors connected in series?

ANSWER: ____

G5C10 -- What is the inductance of three 10 millihenry inductors connected in parallel?

ANSWER: ____

G5C11 -- What is the inductance of a 20 millihenry inductor connected in series with a 50 millihenry inductor?

ANSWER: ____

G5C12 -- What is the capacitance of a 20 microfarad capacitor connected in series with a 50 microfarad capacitor?

ANSWER:

G5C17 -- What is the value in nanofarads (nF) of a 22,000 picofarad (pF) capacitor?

ANSWER:

G5C18 – What is the value in microfarads of a 4700 nanofarad (nF) capacitor?

ANSWER:

G5C13 -- Which of the following components should be added to a capacitor to increase the capacitance?

ANSWER:

G5C14 -- Which of the following components should be added to an inductor to increase the inductance?

ANSWER:

G5C15 -- What is the total resistance of a 10 ohm, a 20 ohm, and a 50 ohm resistor connected in parallel?

ANSWER:

G6A14 -- Which of the following is an advantage of ceramic capacitors as compared to other types of capacitors?

ANSWER:

G6A04 -- Which of the following is an advantage of an electrolytic capacitor?

ANSWER:

G6A06 -- Which of the following is a reason not to use wire-wound resistors in an RF circuit?

ANSWER:

G6B01-- What determines the performance of a ferrite core at different frequencies?

ANSWER:

G6A08 -- What is an advantage of using a ferrite core toroidal inductor?

ANSWER:

G6A11 -- What happens when an inductor is operated above its self-resonant frequency?

ANSWER:

G6A13 -- Why is the polarity of applied voltages important for polarized capacitors?

ANSWER:

(T6A02) What type of component is often used as an adjustable volume control?

ANSWER:

(T6A03) What electrical parameter is controlled by a potentiometer?

ANSWER:

G7A12 -- Which symbol in Figure G7-1 represents a solid core transformer?

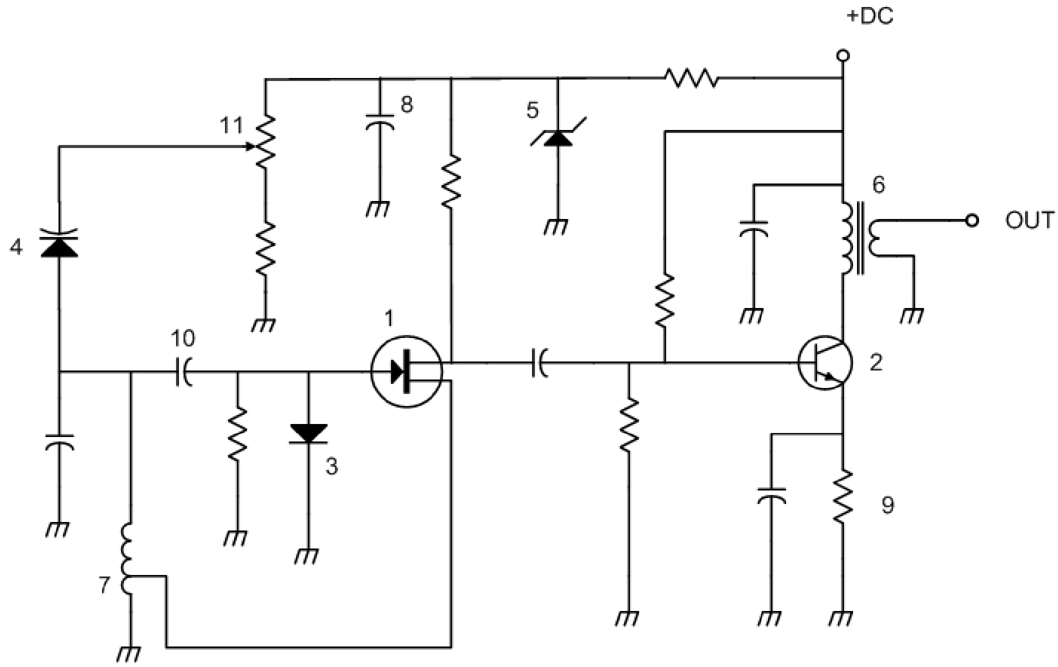

Figure G7-1

ANSWER:

(T6C02) What is component 1 in figure T1?

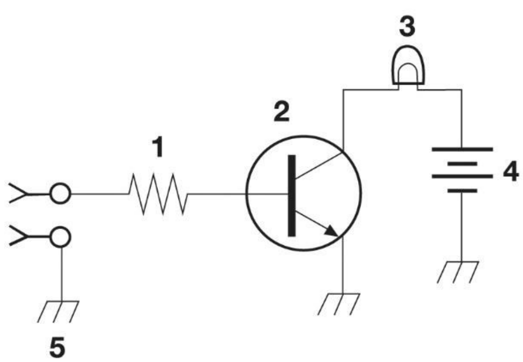

Figure T-1

ANSWER:

(T6C03) What is component 2 in figure T1?

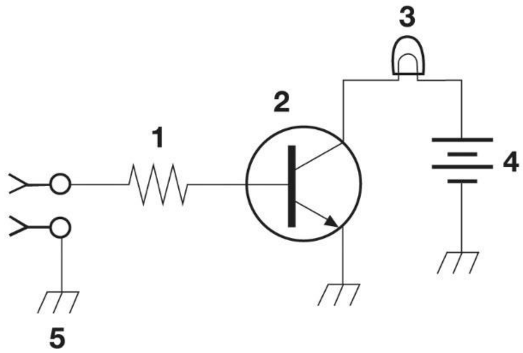

Figure T-1

ANSWER: ____________________

(T6D10) What is the function of component 2 in Figure T1?

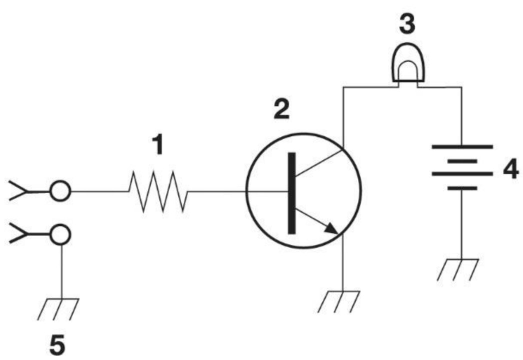

Figure T-1

ANSWER: ____________________

(T6C04) What is component 3 in figure T1?

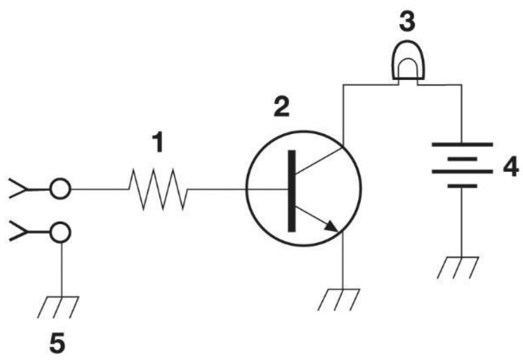

Figure T-1

ANSWER: ____

(T6C05) What is component 4 in figure T1?

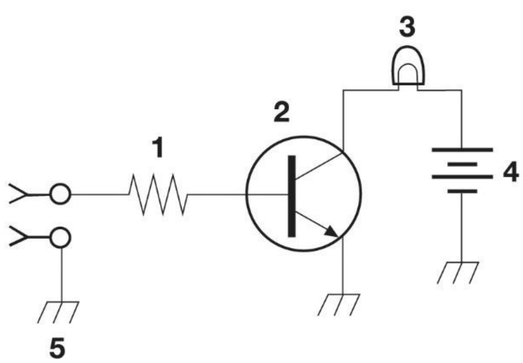

Figure T-1

ANSWER: ____

(T6C06) What is component 6 in figure T2?

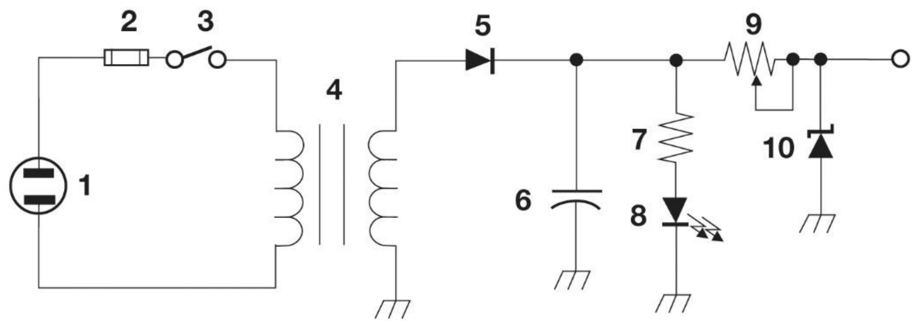

Figure T-2

ANSWER:

(T6C07) What is component 8 in figure T2?

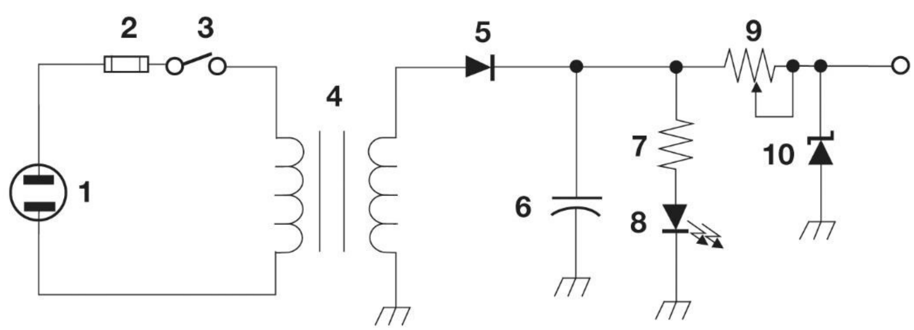

Figure T-2

ANSWER:

(T6C08) What is component 9 in figure T2?

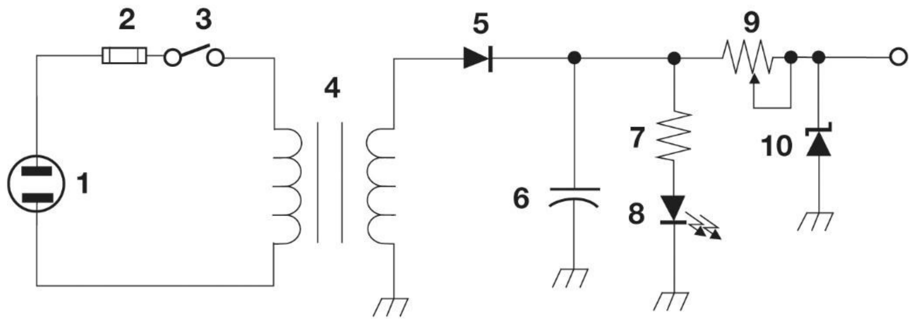

Figure T-2

ANSWER:

(T6C09) What is component 4 in figure T2?

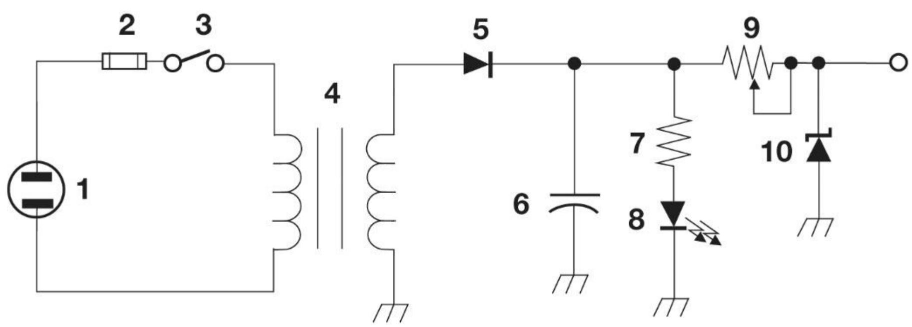

Figure T-2

ANSWER:

(T6D03) What type of switch is represented by component 3 in figure T2?

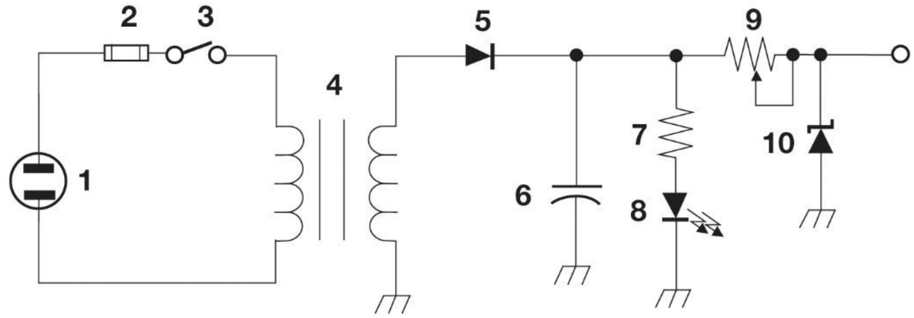

Figure T-2

ANSWER: ______________________________

(T6C10) What is component 3 in figure T3?

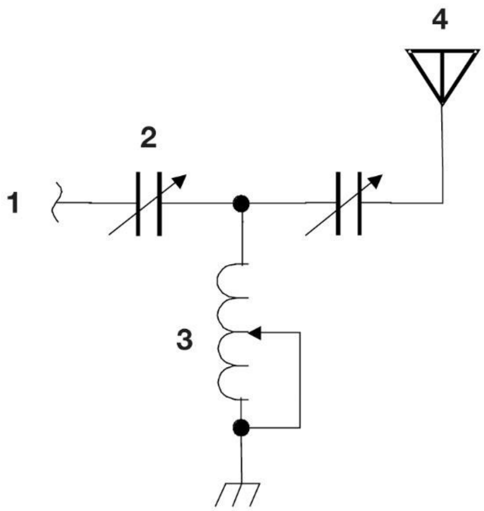

Figure T-3

ANSWER: ______________________________

(T6C11) What is component 4 in figure T3?

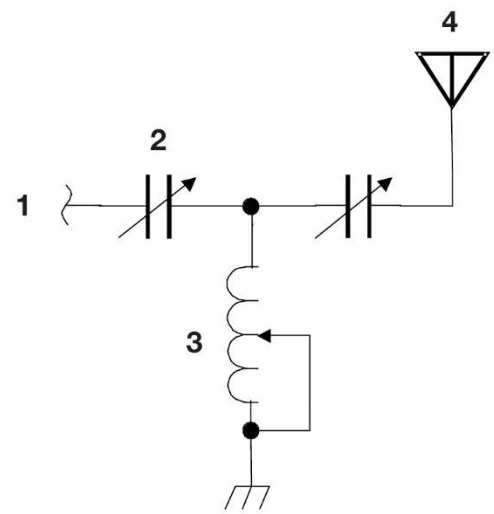

Figure T-3

ANSWER: ____

Reactance and Impedance

T5C12 -- What is impedance?

ANSWER:

T5C13 -- What is a unit of impedance?

ANSWER:

G5A01 -- What is impedance?

ANSWER:

G5A02 -- What is reactance?

ANSWER:

G5A03 -- Which of the following causes opposition to the flow of alternating current in an inductor?

ANSWER:

G5A04 -- Which of the following causes opposition to the flow of alternating current in a capacitor?

ANSWER:

G5A05 -- How does an inductor react to AC?

ANSWER:

G5A06 -- How does a capacitor react to AC?

ANSWER: ____________________

- -

G5A07 -- What happens when the impedance of an electrical load is equal to the output impedance of a power source, assuming both impedances are resistive?

ANSWER: ____________________

- -

G5A09 -- What unit is used to measure reactance?

ANSWER: ____________________

- -

G5A11 -- Which of the following describes one method of impedance matching between two AC circuits?

ANSWER: ____________________

- -

G5A08 -- What is one reason to use an impedance matching transformer?

ANSWER: ____________________

- -

G5A10 -- Which of the following devices can be used for impedance matching at radio frequencies?

ANSWER: ____________________

- -

G5C07 -- What is the turns ratio of a transformer used to match an audio amplifier having 600 ohm output impedance to a speaker having a 4 ohm impedance?

ANSWER: ____________________

- -