# "THE ELECTROPAGE"

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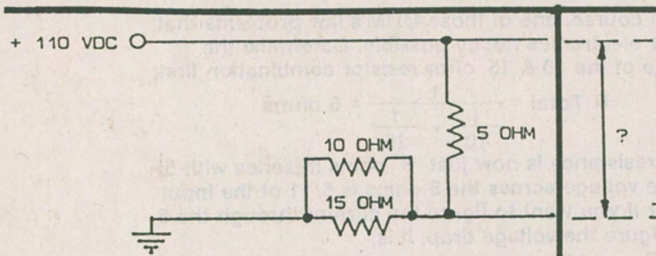
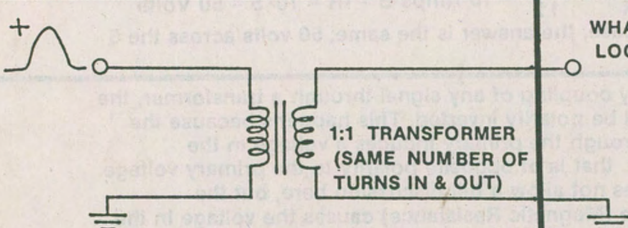
Here is a fun way to check your electronic knowledge, or perhaps brush up on some fundamentals — and at the same time you will get some experience at "folding papers". Study each circuit below, notice what the INPUT conditions are as stated.... Your job is to figure out what the OUTPUT VOLTAGE will be for each circuit shown, and then to actually draw a sketch of the output in the blank space to the right.



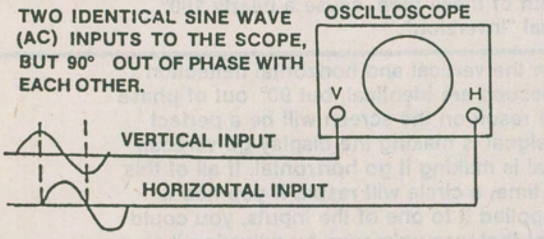

WHAT IS THE "ELECTROMOTIVE FORCE" (VOLTS) BETWEEN THESE TWO POINTS?

_ _ _ VOLTS



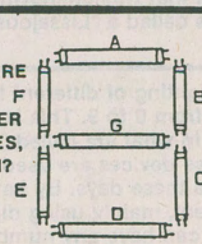

WHAT DOES THE PULSE LOOK LIKE HERE?

TWO IDENTICAL SINE WAVE (AC) INPUTS TO THE SCOPE, BUT 90° OUT OF PHASE WITH EACH OTHER.

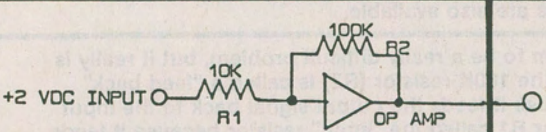



IF THE SCOPE HAS THE SAME VERTICAL/HORIZONTAL GAIN, DRAW PICTURE ON THE SCREEN:

7 FLUORESCENT LITE TUBES ARE ARRANGED IN THE FIGURE "8" CONFIGURATION. IF YOU WANTED TO MAKE THE NUMBER "2", BY LIGHTING THE TUBES, WHICH WOULD YOU TURN ON? CHECK THE BOXES AT RIGHT.




- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F
- [ ] G




WHAT IS THE DC VOLTAGE OUT OF THE OPERATIONAL AMPLIFIER?

TO SEE ANSWERS, FOLD OVER PAGE AT THIS DOTTED LINE

**When you have completed all your answers, (and it might be a good idea to check them twice) then and ONLY THEN, fold the page at the dotted line to see how you did.**

**Some of the answers will be in the form of a plain old DC voltage above or below ground, but on the other hand, some of the outputs will be of a more "dynamic" nature, such as you might see on a piece of test equipment called the Oscilloscope.**

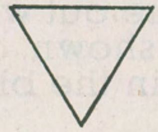
**Remember this is just a fun way to check your knowledge, and perhaps learn a little more about the wonderful world that we call electronics. So don't feel bad if you should happen to miss one or two of the answers, at least the first time through! When you completely turn this page, you will find an explanation in detail of each circuit.**

**HAVE FUN!**

**LOOK FOR THE ELECTROPAGE IN THE NEXT ELECTRONICS HANDBOOK.**

# THE ELECTROPAGE

**HERE ARE THE ANSWERS TO THE "ELECTROPAGE"!**



**Congratulations for completing the "ELECTROPAGE". The following explanations may help to clear up some of the answers. While space does not allow a complete coverage of all the details of each circuit or diagram, it is hoped that your appetite has been tempted, to study in more depth some of the principles that have been briefly described. It is the curiosity of how and why things work, that has caused the field of electronics to be where it is at today.**

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**50 VOLTS**

This is of course, one of those OHM's law problems that make our electronics hobby possible. Determine the resistance of the 10 & 15 ohm resistor combination first:

$$R\ Total = \frac{1}{\frac{1}{10} + \frac{1}{15}} = 6\ ohms$$

The total resistance is now just 6 ohms in series with 5 ohms. The voltage across the 5 ohms is 5/11 of the input voltage, or if you want to figure the current through the 5 ohms to figure the voltage drop, it is;

$$I = \frac{E}{R} = \frac{110}{11} = 10\ Amps\quad E = IR = 10 \times 5 = 50\ Volts$$

In either case, the answer is the same; 50 volts across the 5 ohms.

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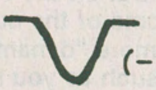
(-)

In ordinary coupling of any signal through a transformer, the output will be polarity inverted. This happens because the current through the primary induces a voltage in the secondary that is of opposite polarity to the primary voltage. Space does not allow a full discussion here, but the inductance (Magnetic Resistance) causes the voltage in the primary to lead the current by 90°. Then the inductance that occurs in the secondary of the transformer causes another 90° phase shift. Both of these then cause a nearly 180° phase shift, or signal "inversion".

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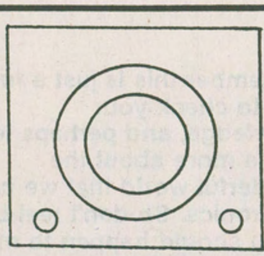

When the signals on the vertical and horizontal deflection plates of the oscilloscope are identical, but 90° out of phase with each other, the result on the screen will be a perfect circle. The vertical signal is making the display go vertical. The horizontal signal is making it go horizontal. If all of this occurs at the same time, a circle will result. If you had a *known* signal and applied it to one of the inputs, you could match another signal that was unknown, by adjusting it to make a circle. This is called a "Lissajous" figure, the simplest being a circle.

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A
B
D
E
G

As you can see, the lighting of different tubes will allow you to make any number from 0 to 9. This is the exactly the same principle that is used in what are called "seven segment display" devices. These devices are used on everything from watches to calculators these days. By having the appropriate signals to each segment, mainly using digital logic to turn them on and off, you can have any number you want. Of course two of them (or more) can be placed side by side. Letter displays are also available.

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**20 VOLTS**

This may seem to be a really difficult problem, but it really is very simple. The 100K resistor (R2) is called a "feed back" resistor, because it feeds the output signal back to the input partly. Resistor R1 called the "input" resistor because it feeds the input signal to the amplifier. The gain of any amplifier like this is related to the ratio of these two resistors. That ratio is always the feed back resistor divided by the input resistor, in this case 100÷10=10, then 10×2 Volts=20 Volts.