

EET-200L Week #3 Introduction to Diodes in D.C. Circuits

This experiment will give you some experience dealing with semiconductor diodes and their operation in D.C. circuits.

Components required:

- PAD-234 Analog Digital Trainer Kit
- 220 ohm resistor
- 3 silicon diodes (suggested 1N400X)
- 1, 2 & 3 cell battery holders
- 3 AA size batteries

A copy of this lab and a spreadsheet containing all of these tables are available for download at cset.stcc.edu/forums under the EET-200 Lab Forums, Week #3. You are encouraged to use Electronics Workbench (EWB) on the computers in the 20/M118 lab (or some other simulator program) to verify your results from this lab. In future labs, this will be required. You should use this opportunity to familiarize yourself with the program.

- 1.) Use the procedure outlined at http://www.allaboutcircuits.com/vol_3/chpt_3/2.html to test each of your diodes using your Digital Multimeter (DMM). This link is also available on the forums for EET-200 Lab, Week #3. Make sure you have 3 functioning diodes before proceeding to the rest of this lab exercise.

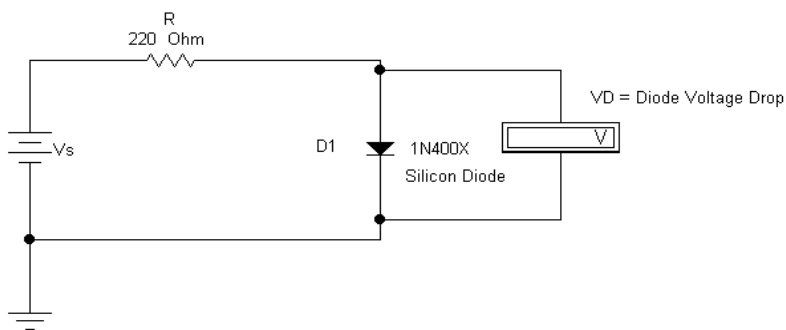
Diode Check with DMM						
	Diode D1		Diode D2		Diode D3	
	A-K	K-A	A-K	K-A	A-K	K-A
Resistance Reading:						
Diode Good? (Y/N)						

NOTE:

A=Anode=Positive Meter Lead
K=Cathode=Negative Meter Lead

The DMM can be a handy tool to perform quick Go/No-Go tests on components. While this type of test isn't perfect, it commonly will reveal components which have failed catastrophically. Most diodes upon failure will usually exhibit a low resistance condition in both directions (short circuit) or a high resistance condition in both directions (near open circuit). The DMM can quickly reveal these types of failure modes.

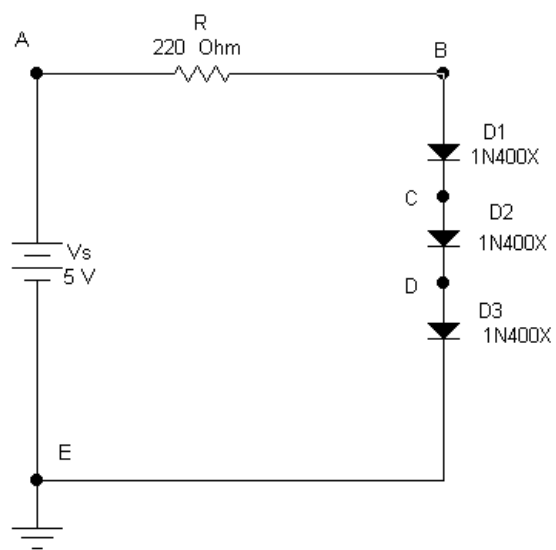
2.) Construct the circuit shown and complete the tables.



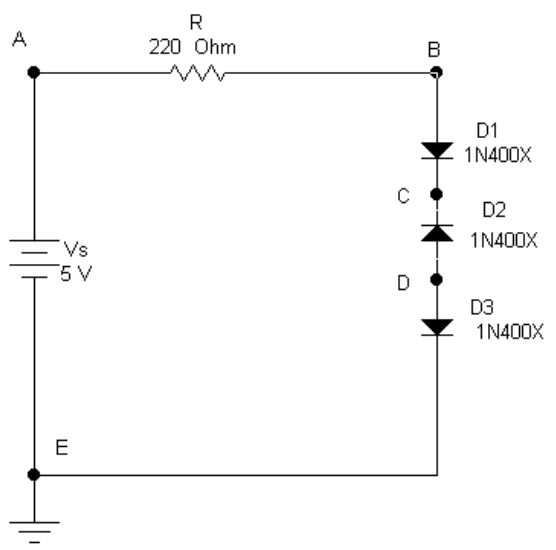
Forward Bias Measurements				
Nominal	Measured		Calculated	
Vs	Vs	Vd	$I_d = (V_s - V_d)/R$	$R_d = V_d/I_d$
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
12				
15				

Reverse Bias Measurements				
Nominal	Measured		Calculated	
Vs	Vs	Vd	$I_D = (V_s - V_d)/R$	$R_d = V_d/I_d$
0				
-3				
-5				
-8				
-10				
-12				
-15				

Steps 3 & 4: Construct each of the circuits shown below and complete the indicated tables. You will notice that these circuits are the same, except that D2 is reversed in Circuit #4. What effect does this have on the circuit?



Circuit #3

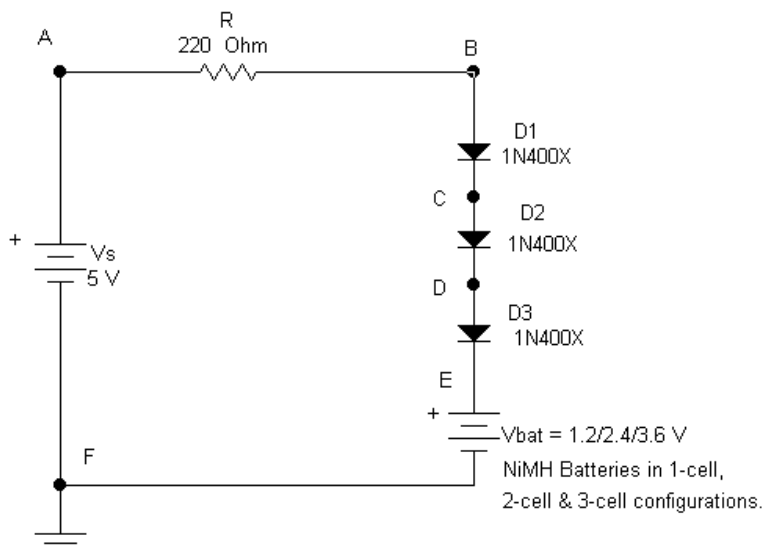


Circuit #4

	Circuit #3	Circuit #4
$V_A=$		
$V_B=$		
$V_C=$		
$V_D=$		
$V_E=$		
$V_{AB}=$		
$V_{BC}=$		
$V_{CD}=$		
$V_{DE}=$		
$V_{BE}=$		
$V_{CE}=$		
$V_{BD}=$		
$I(\text{mA})=$		

5.) Construct the circuit shown below and complete the table. Notice that this is the same circuit as Circuit #3 with the addition of a voltage source in series with the diode. You will use AA cells in 1, 2 & 3 cell configurations to add the D.C. bias to this circuit. You will use NiMH rechargeable batteries which have a nominal voltage of about 1.2V per cell. You should measure each cell before you use them to make sure they are properly charged. If you find a cell which measures below 1.2V, give it to your instructor so that it can be recharged. DO NOT THROW IT AWAY!!!

Make special note of when the diodes are forward biased and when they are reverse biased.



	Vbat = 1.2V	Vbat=2.4V	Vbat=3.6V
VA=			
VB=			
VC=			
VD=			
VE=			
VF=			
VAB=			
VBE=			
I(mA)=			

6.) What do you think would happen if you reverse the polarity of the batteries used in step #5? If you're unsure, try connecting them and see. Would you ever expect the diodes to become reverse biased in this situation?