Title: Hexadecimal and Octal Number Systems

Conclusion

① C, since Base 8 is smaller than Base 10, an equivalent in Base 8 would have to be greater than its counterpart in Base 10, ruling out B. A is additionally not a valid octal number

② The shopper does not understand Hexadecimal.

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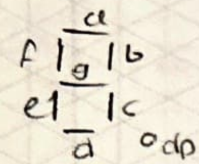
Seven Segment Display Notes

Segment Identification

A Seven-Segment Display (SSD) is simply a figure 8 grouping of LEDs and some include a decimal point (DP).

Each segment is labeled (a) through (g)

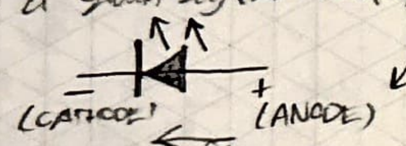


SSDs can come in two configurations
- Common Cathode (all LED cathodes are connected)
- Common Anode (all LED anodes are connected)

SSDs have limited display capabilities, only a select few alpha characters are possible to be displayed

Basic LED Operations

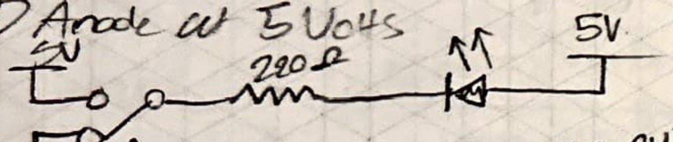
Understanding how a seven segment display works requires knowing how an LED is powered



must be higher voltage than cathode

the amount of current flowing through will determine the brightness

LED Anode at 5 Volts



down - LED on (cathode at ~0V)
up - LED on (cathode at ~5V)

Larger resistors will limit more current, meaning a dimmer LED.
Smaller resistors will limit less current, meaning a brighter LED.

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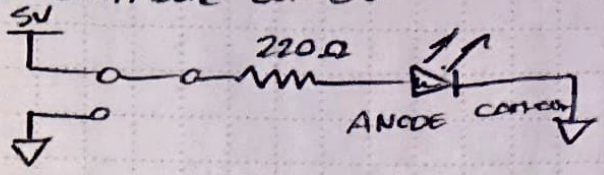
An anode SSD will activate segments if connected to ground

LED Cathode at 0V



On - Anode at 5V, Cathode at ~0V

Off - Anode at 0V, Cathode at 0V

A cathode SSD will activate segments if connected to Vcc

Resistor Values for SSD

the resistor value determines the amount of current that travels through the SSD LEDs

the amount of current determines the brightness of an LED

- Too little current, you can't see the LED
- Too much current, the LED might be damaged

to know the correct value, read the data sheet for the SSD.

Circuit Theory Review

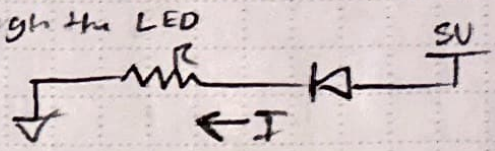
The voltage across the LED when on is 1.5V

Use Kirchhoff's Voltage Law to calculate a 3.5V across the resistor

$$5V - 1.5V = 3.5V$$

Use Ohm's Law to calculate the value of the resistor using the current through the LED

$$R = \frac{3.5V}{I}$$



$$= \frac{3.5V}{15mA} = 233.33\Omega = 220\Omega \text{ (standard value)}$$

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