

READINGS: Electronics Workbook 1 (ew1.pdf): Pages 77 - END.

Armstrong (armstrong.pdf): Chapters 10 - 11.

Assignment is due at the beginning of the next class, a one question quiz on this homework occurs after the lecture.

4.A1) From your Armstrong readings recall the passage: "Sarnoff was furious. He issued an edict that anyone who allowed Armstrong to (???) again would promptly be fired."

What did Armstrong do?

4.A2) The signature by the Notary on Armstrong's crucial document appeared to be forged.

What was the explanation?

Transistor Circuits and Gain

4.1. We will use a **2N5551** NPN Silicon Bipolar Junction Transistor in this course. The published h_{FE} for this transistor is in the range of **60-250**. A transistor's h_{FE} is the I_C/I_B current amplification which is also written as H_{FE} or called **Beta**. The value of h_{FE} varies somewhat with the circuit's collector current and can vary quite a bit from transistor to transistor even with the same type number as will be seen in our lab experiments.

*We will approximate V_{BE} (the voltage measured from base to emitter) as **0.6 volts** 4 3.*

*We will approximate the **2N5551's** h_{FE} as **200**.*

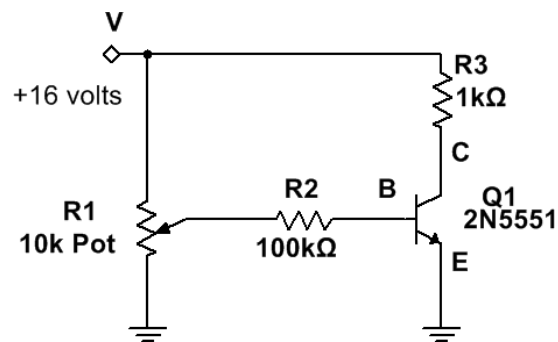


Figure 4.1 Transistor Circuit

SHOW ALL WORK CLEARLY

4.B1 What would the collector current I_C have to be if the base current I_B is **0.02 mA** ?

4.B2 What would the collector current I_C have to be if the voltage from the potentiometer slider to ground is approximately **5.0 volts** ?

4.B3 If the base current is **0.2mA** and $h_{FE} = 200$ the collector current will be much less than **40 mA**. Calculate the circuit's saturation current.

NOTE : There is a point at which an increase in base current no longer produces an increase in collector current, because the available voltage in the circuit limits the current. This condition, called "saturation" limits the actual collector current and thus the gain of the circuit. In Figure 4.1 we would calculate the saturation current as the supply voltage divided by the resistance in the collector-emitter circuit as if the collector-emitter junction were short-circuited.