7-33 The emitter resistance of Fig. 7-27*b* increases by 10 percent. What happens to the emitter current, collector current, and collector voltage?

7-34 The collector resistance of Fig. 7-27*b* increases by 10 percent. What happens to the emitter current, collector current, and collector voltage?

7-35 The collector supply voltage of Fig. 7-27*b* increases by 10 percent. What happens to the emitter current, collector current, and collector voltage?

SEC. 7-9 TROUBLESHOOTING

7-36 A voltmeter reads 10 V at the collector of Fig. 7-27*a*. What are some of the troubles that can cause this high reading?

7-37 What if the ground on the emitter is open in Fig. 7-27*a*? What will a voltmeter read for the base voltage? For the collector voltage?

7-38 A dc voltmeter measures a very low voltage at the collector of Fig. 7-27*a*. What are some of the possible troubles?

7-39 A voltmeter reads 10 V at the collector of Fig. 7-27*b*. What are some of the troubles that can cause this high reading?

7-40 What if the emitter resistor is open in Fig. 7-27*b*? What will a voltmeter read for the base voltage? For the collector voltage?

7-41 A dc voltmeter measures 1.1 V at the collector of Fig. 7-27*b*. What are some of the possible troubles?

Critical Thinking

7-42 You have built the circuit of Fig. 7-27*a*, and it is working normally. Now your job is to destroy the transistor. In other words, you are trying to find the ways in which to ruin the transistor. What will you try?

7-43 A first-year electronics student invents a new circuit. It works quite well when the current gain is between 90 and 110. Outside this range, it fails. The student plans to mass-produce the circuit by hand selecting 2N3904s that have the right current gain, and asks for your advice. What are some of the things you would say?

7-44 A student swears that a base-biased circuit with a load line that is not straight can be built and is willing to bet you $50 that it can be done. Should you take the bet? Explain your answer.

7-45 A student wants to measure the collector-emitter voltage in Fig. 7-27*b* and so connects a voltmeter between the collector and emitter. What does the voltmeter read? (*Note:* There are many right answers.)

7-46 What is the collector current of Q_2 in Fig. 7-28*a*?

7-47 In Fig. 7-28*a*, the first transistor has a current gain of 100, and the second transistor has a current gain of 50. What is the base current in the first transistor?

7-48 What is the current through the LED of Fig. 7-28*b* if $V_{BB} = 0$? If $V_{BB} = 10$ V?

7-49 The zener diode of Fig. 7-28*b* is replaced by a 1N4736. What is the LED current when $V_{BB} = 0$?

7-50 What is the maximum possible value of current through the 2 kΩ of Fig. 7-29*a*?

7-51 Figure 7-29*b* applies to the 4N33 of Fig. 7-29*a*. If the voltage across the 2 kΩ is 2 V, what is the value of V_{BB}?

7-52 The LED is open in Fig. 7-29*a*, and $V_{BB} = 3$ V. A voltmeter is connected between the collector of the 2N3904 and ground. What does the voltmeter read?

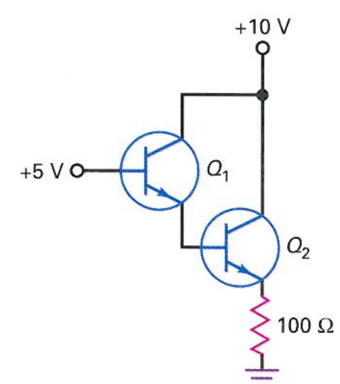
7-53 A DMM has an input resistance of 10 MΩ. The DMM is connected between the collector of Fig. 7-25*a* and ground. If the 3.3 kΩ collector resistor is open, what does the DMM read?

7-54 Redesign a transistor switch similar to Fig. 7-27*a* for hard saturation and to meet these specifications:

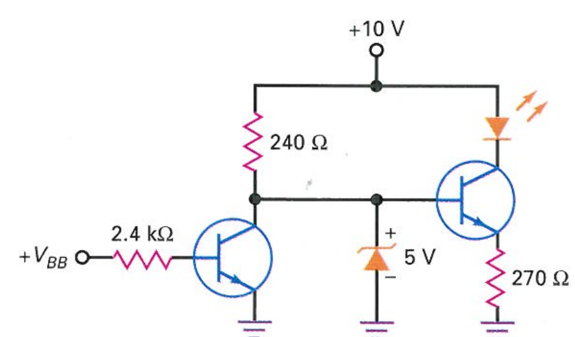
$$V_{CC} = 15\text{ V} \qquad V_{BB} = 0\text{ V and }15\text{ V} \qquad I_{C(sat)} = 5\text{ mA}$$

7-55 Using Fig. 7-27*b*, change the value of the collector resistor (3.6 kΩ) so $V_{CE} = 6.6$ V.

Figure 7-28

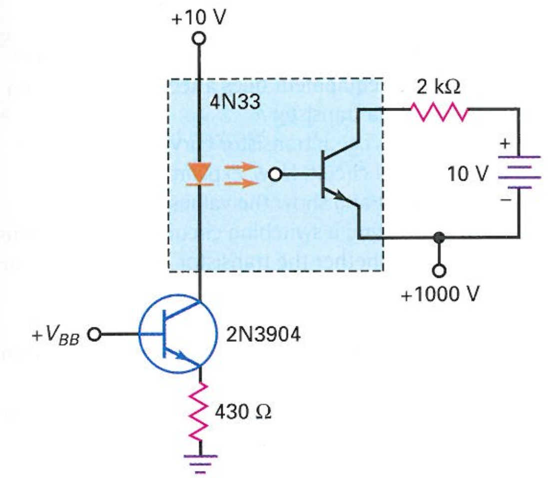


(*a*)

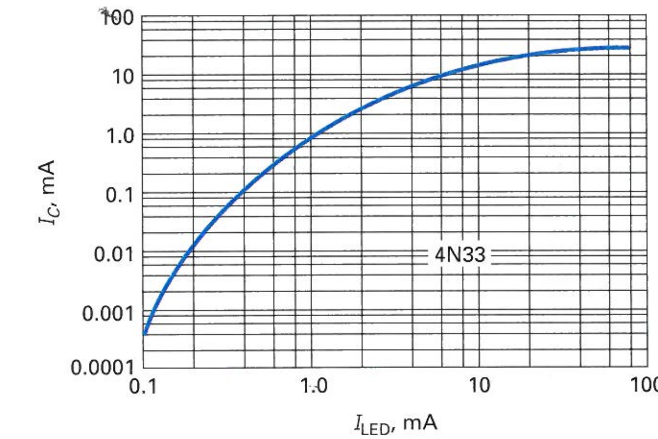


(*b*)

Figure 7-29



(*a*)



(*b*)

Up-Down Analysis

Use Fig. 7-30 for the remaining problems. Assume increases of approximately 10 percent in the independent variable, and use the second approximation of the transistor. A response should be an N (no change) if the change in a dependent variable is so small that you would have difficulty measuring it. For instance, you probably would find it difficult to measure a change of less than 1 percent. To a troubleshooter, a change like this is usually considered to be no change at all.

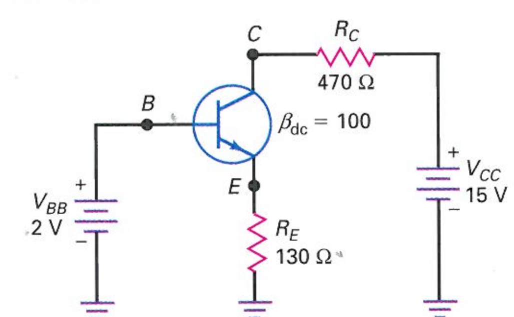
7-56 Try to predict the response of each dependent variable in the row labeled V_{BB}. Then answer the following question as simply and directly as possible. What effect does an increase in the base-supply voltage have on the dependent variables of the circuit?

7-57 Predict the response of each dependent variable in the row labeled V_{CC}. Then summarize your findings in one or two sentences.

7-58 Predict the response of each dependent variable in the row labeled R_E. List the dependent variables that decrease. Explain why these variables decrease, using Ohm's law or similar basic ideas.

7-59 Predict the response of each dependent variable in the row labeled R_C. List the dependent variables that show no change. Explain why these variables show no change.

Figure 7-30 Up-down analysis.



(*a*)

INDEPENDENT VARIABLES / DEPENDENT VARIABLES

10% increase	V_B	V_E	V_C	I_E	I_C	I_B
V_{BB}						
V_{CC}						
R_E						
R_C						

(*b*)