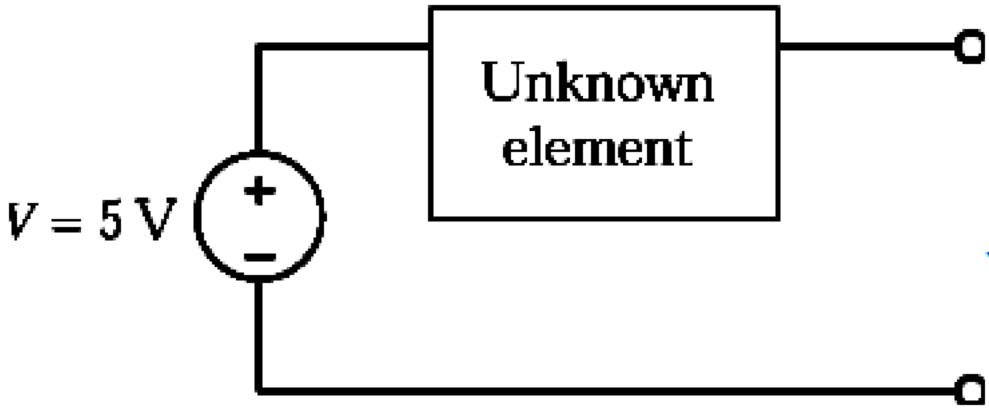
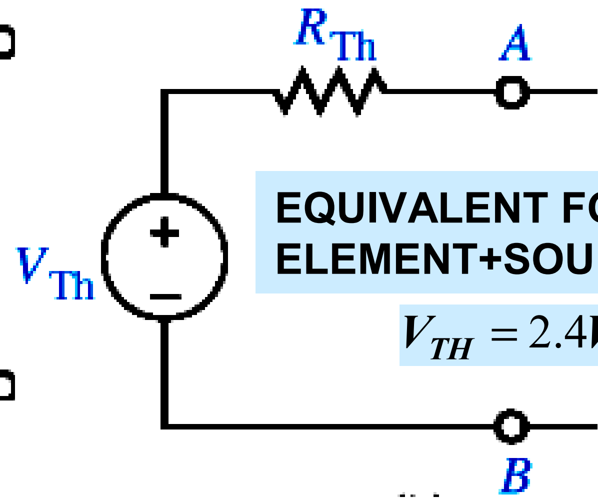
LEARNING BY APPLICATION

FIND THE THEVENIN EQUIVALENT FOR THE UNKNOWN ELEMENT USING A RESISTOR AND A VOLTMETER

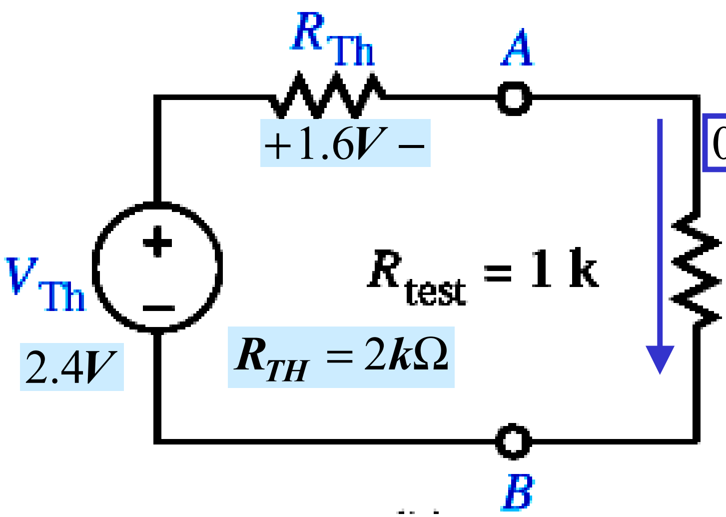




EQUIVALENT FOR ELEMENT+SOURCE

$V_{TH} = 2.4V$

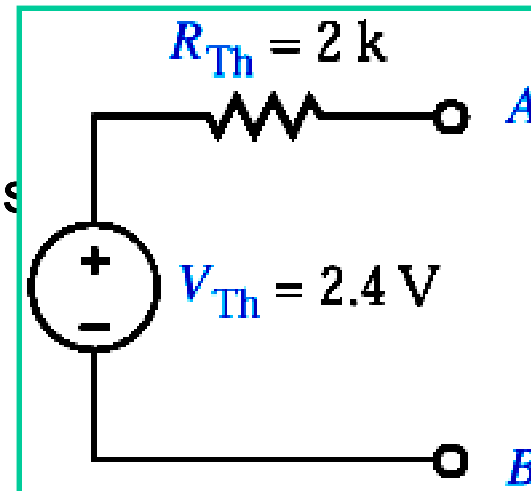
+
$2.4V$
–
(measured in open circuit)



$0.8mA$

$V_{AB} = 0.8\,V$

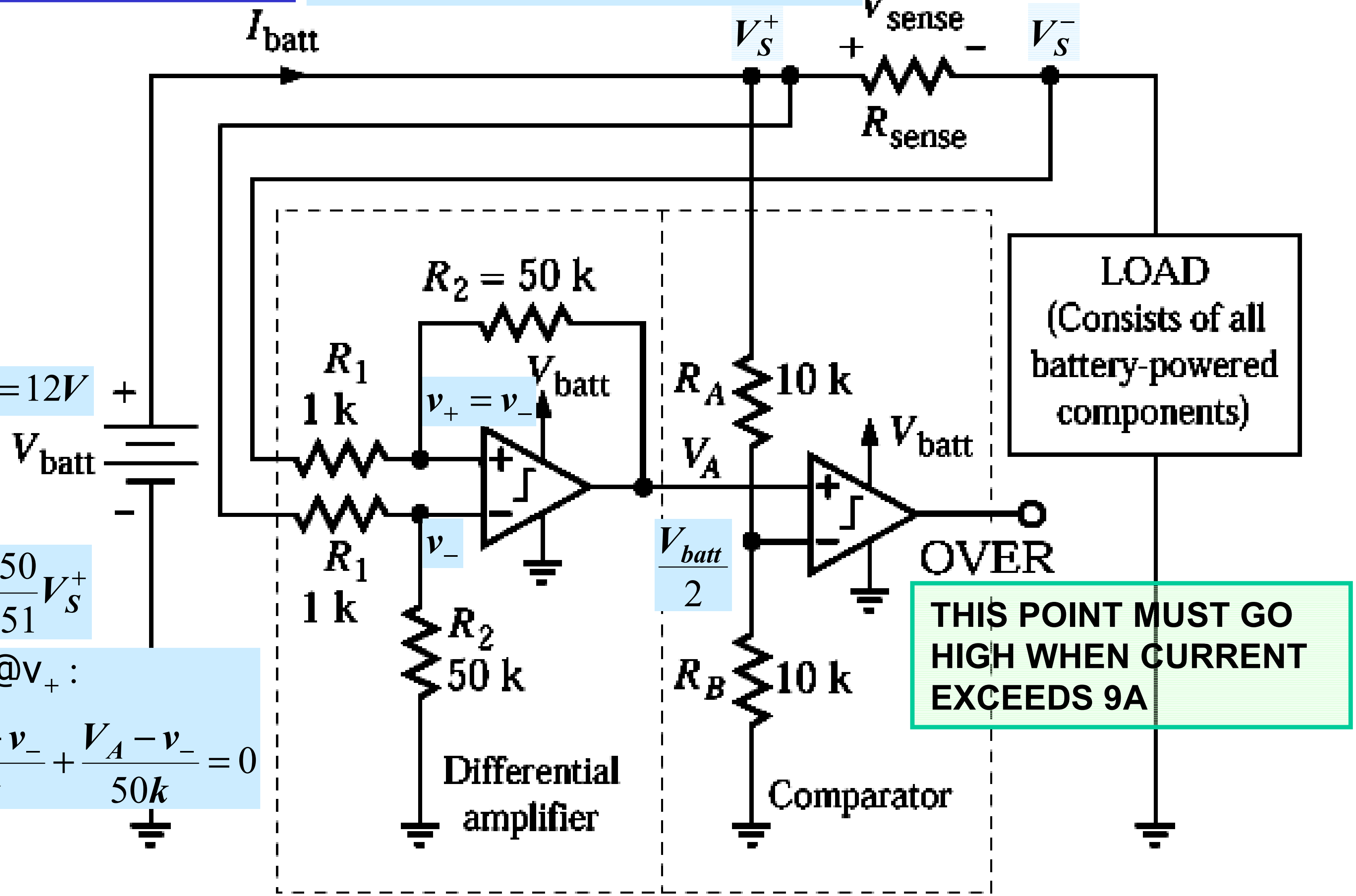
MEASURED ACROSS TEST RESISTOR



GEAUX

LEARNING BY DESIGN

CURRENT OVERLOAD SENSOR



$V_{batt} = 12V$

$v_+ = v_-$

v_-

$\frac{V_{batt}}{2}$

$$v_- = \frac{50}{51} V_S^+$$

KCL@v_+ :

$$\frac{V_S^- - v_-}{1k} + \frac{V_A - v_-}{50k} = 0$$

THIS POINT MUST GO HIGH WHEN CURRENT EXCEEDS 9A

$$V_A = 50(V_S^+ - V_S^-) = 50V_{sense}$$

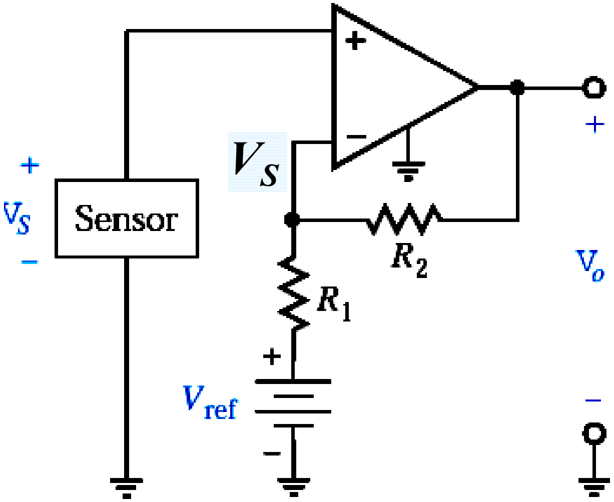
$$50 \times R_{sense} \times 9(A) = 6V \Rightarrow R_{sense} = 0.0133\Omega$$

DESIGN REQUIREMENT

$$I_{batt} \geq 9A \Rightarrow V_A \geq 6V$$

GEAUX

LEARNING BY DESIGN



DESIGN REQUIREMENT

INPUT	OUTOUT
$0.5 \le V_S \le 1.0V$	$0 \le V_O \le 5V$

DETERMINE V_{ref}, R_1, R_2

KCL @ v-

$$\frac{V_O - V_S}{R_2} + \frac{V_{ref} - V_S}{R_1} = 0$$

$$V_O = \left[1 + \frac{R_2}{R_1}\right]V_S - \frac{R_2}{R_1}V_{ref}$$

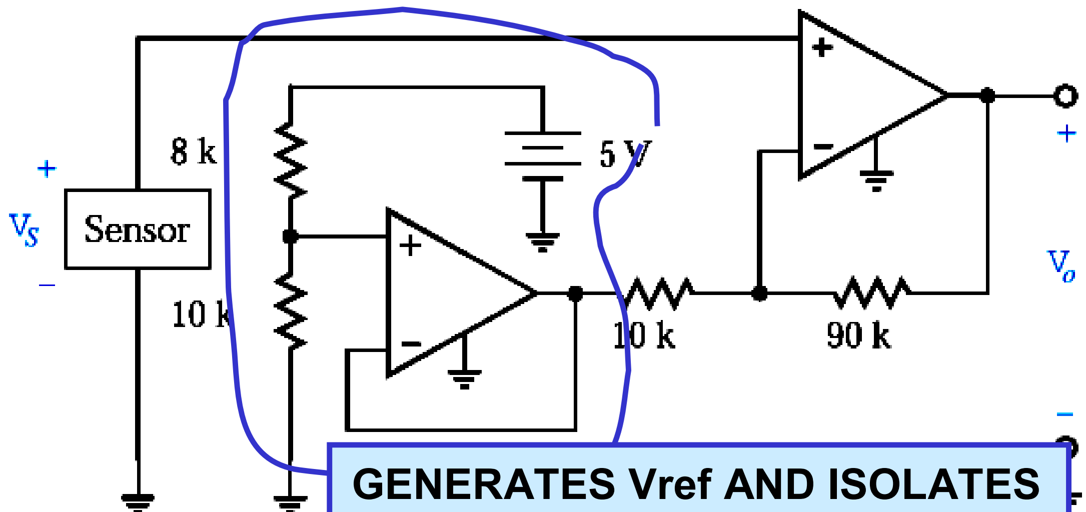
DESIGN EQUATIONS

$$0 = \left[1 + \frac{R_2}{R_1}\right](0.5) - \frac{R_2}{R_1}V_{ref}$$

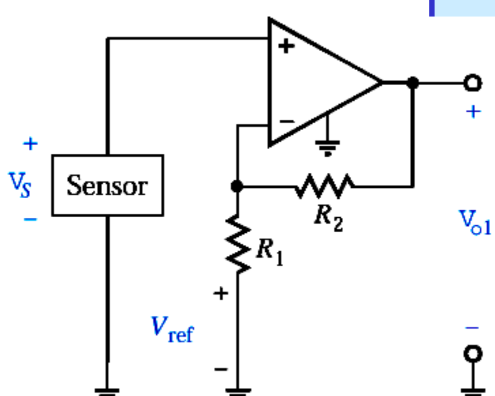
$$5 = \left[1 + \frac{R_2}{R_1}\right](1.0) - \frac{R_2}{R_1}V_{ref}$$

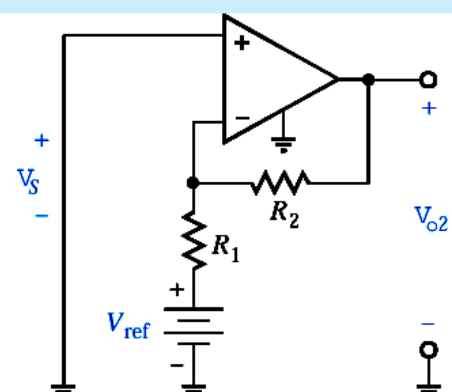
$$\Rightarrow \quad \frac{R_1}{R_1} = 9 \qquad V_{ref} = \frac{5}{9}V$$

CHOOSE $R_1 = 10k\Omega$



GENERATES Vref AND ISOLATES VOLTAGE DIVIDER





Analyzing circuit using superposition