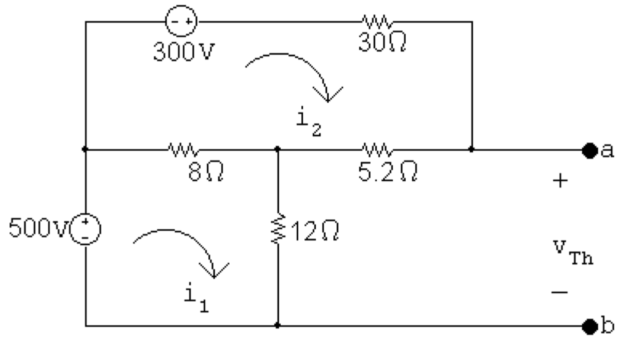
P 4.61 After making a source transformation the circuit becomes



The mesh current equations are:

$$-500 + 8(i_1 - i_2) + 12i_1 = 0$$

$$-300 + 30i_2 + 5.2i_2 + 8(i_2 - i_1) = 0$$

Put the equations in standard form:

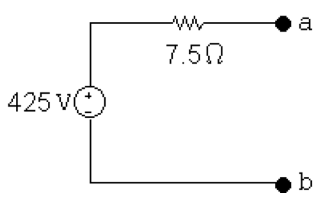
$$i_1(8 + 12) + i_2(-8) = 500$$

$$i_1(-8) + i_2(30 + 5.2 + 8) = 300$$

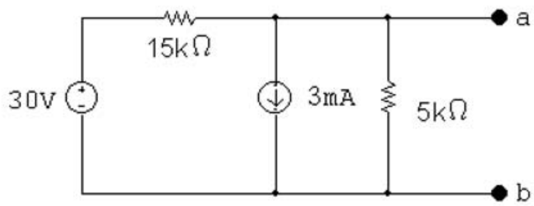
Solving, $i_1 = 30$ A; $i_2 = 12.5$ A

$V_{\rm Th} = 5.2i_2 + 12i_1 = 425$ V

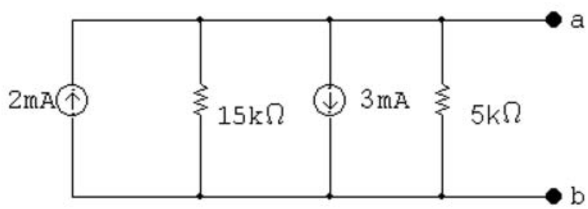
$R_{\rm Th} = (8\|12 + 5.2)\|30 = 7.5\,\Omega$



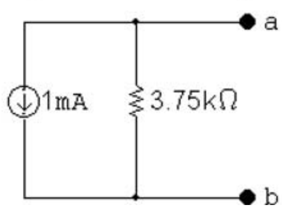
P 4.62 First we make the observation that the 10 mA current source and the 10 kΩ resistor will have no influence on the behavior of the circuit with respect to the terminals a,b. This follows because they are in parallel with an ideal voltage source. Hence our circuit can be simplified to



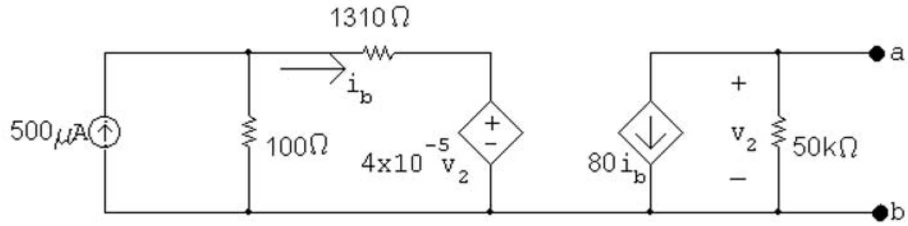
or



Therefore the Norton equivalent is determined by adding the current sources and combining the resistors in parallel:



P 4.65



OPEN CIRCUIT

Use Ohm's law to solve for v_2 on the right hand side of the circuit:

$v_2 = -80i_\text{b}(50{,}000) = -40 \times 10^5 i_\text{b}$

Use this value of v_2 to express the value of the dependent voltage source in terms of i_b:

$4 \times 10^{-5} v_2 = 4 \times 10^{-5}(-40 \times 10^5 i_\text{b}) = -160 i_\text{b}$

Write the mesh current equation for the i_b mesh:

$1310 i_\text{b} - 160 i_\text{b} + 100(i_\text{b} - 500 \times 10^{-6}) = 0$

Solving,

$1250 i_\text{b} = 0.05 \quad \therefore \quad i_\text{b} = 0.05/1250 = 40\,\mu\,\text{A}$

Thus,

$V_\text{Th} = v_2 = -40 \times 10^5 i_\text{b} = -40 \times 10^5 (40 \times 10^{-6}) = -160\ \text{V}$

SHORT CIRCUIT

$$v_2 = 0; \qquad i_\text{sc} = -80 i_b$$

Calculate i_b using current division on the left hand side of the circuit:

$$i_b = \frac{100}{100 + 1310} 500 \times 10^{-6} = 35.461\,\mu\,\text{A}$$

Calculate the short circuit current from the right hand side of the circuit:

$$i_\text{sc} = -80(35.461 \times 10^{-6}) = -2.8369 \times 10^{-3}\,\text{mA}$$

Calculate R_Th from the short circuit current and open circuit voltage:

$$R_\text{Th} = \frac{-160}{-2.8369 \times 10^{-3}} = 56.4\ \text{k}\Omega$$