36.28. Visualize: At $t = t' = t'' = 0$ s, the origins of the S, S′, and S″ reference frames coincide.

Solve: We have $\gamma = \left[1-(v/c)^2\right]^{-\frac{1}{2}} = \left[1-(0.80)^2\right]^{-\frac{1}{2}} = 1.667$. Using the Lorentz transformations,

$$x' = \gamma(x - vt) = 1.667\left[1200\text{ m} - (0.80)(3\times10^8\text{ m/s})(2.0\times10^{-6}\text{ s})\right] = 1200\text{ m}$$

$$t' = \gamma\left(t - \frac{vx}{c^2}\right) = 1.667\left[2.0\times10^{-6}\text{ s} - \frac{(0.80)(3\times10^8\text{ m/s})(1200\text{ m})}{(3\times10^8\text{ m/s})^2}\right] = -2.0\ \mu\text{s}$$

Using $v = -0.80c$, the above equations yield $x'' = 2800$ m and $t'' = 8.67\ \mu$s.