18. (a) In frame S, our coordinates are such that $x_1 = +1200$ m for the big flash, and $x_2 = 1200 - 720 = 480\,\text{m}$ for the small flash (which occurred later). Thus, $\Delta x = x_2 - x_1 = -720\,\text{m}$. If we set $\Delta x' = 0$ in Eq. 38-24, we find

$$0 = \gamma\,(\Delta x - v\Delta t) = \gamma\left(-720\,\text{m} - v(5.00 \times 10^{-6}\,\text{s})\right)$$

which yields $v = -1.44 \times 10^8$ m/s. Therefore, frame S' must be moving in the $-x$ direction with a speed of $0.480c$.

(b) Eq. 38-27 leads to

$$\Delta t' = \gamma\left(\Delta t - \frac{v\Delta x}{c^2}\right) = \gamma\left(5.00 \times 10^{-6}\,\text{s} - \frac{(-1.44 \times 10^8\,\text{m/s})(-720\,\text{m})}{(2.998 \times 10^8\,\text{m/s})^2}\right)$$

which turns out to be positive (regardless of the specific value of γ). Thus, the order of the flashes is the same in the S' frame as it is in the S frame (where Δt is also positive). Thus, the big flash occurs first, and the small flash occurs later.

(c) Finishing the computation begun in part (b), we obtain

$$\Delta t' = \frac{5.00 \times 10^{-6}\,\text{s} - \frac{(-1.44\times10^8\,\text{m/s})(-720\,\text{m})}{(2.998\times10^8\,\text{m/s})^2}}{\sqrt{1 - 0.480^2}} = 4.39 \times 10^{-6}\ \text{s}\ .$$