17. (a) We take the flashbulbs to be at rest in frame S, and let frame S' be the rest frame of the second observer. Clocks in neither frame measure the proper time interval between the flashes, so the full Lorentz transformation (Eq. 38-20) must be used. Let t_s be the time and x_s be the coordinate of the small flash, as measured in frame S. Then, the time of the small flash, as measured in frame S', is

$$t'_s = \gamma\left(t_s - \frac{\beta x_s}{c}\right)$$

where $\beta = v/c = 0.250$ and $\gamma = 1/\sqrt{1-\beta^2} = 1/\sqrt{1-(0.250)^2} = 1.0328$. Similarly, let t_b be the time and x_b be the coordinate of the big flash, as measured in frame S. Then, the time of the big flash, as measured in frame S', is

$$t'_b = \gamma\left(t_b - \frac{\beta x_b}{c}\right) .$$

Subtracting the second Lorentz transformation equation from the first and recognizing that $t_s = t_b$ (since the flashes are simultaneous in S), we find

$$\Delta t' = -\frac{\gamma\beta(x_s - x_b)}{c} = -\frac{(1.0328)(0.250)(30 \times 10^3\,\text{m})}{3.00 \times 10^8\,\text{m/s}} = -2.58 \times 10^{-5}\ \text{s}$$

where $\Delta t' = t'_s - t'_b$.

(b) Since $\Delta t'$ is negative, t'_b is greater than t'_s. The small flash occurs first in S'.