21.55. **Model:** In a rod in which a longitudinal standing wave can be created, the standing wave is equivalent to a sound standing wave in an open-open tube. Both ends of the rod are antinodes, and the rod is vibrating in the fundamental mode.

Visualize: Please refer to Figure P21.55.

Solve: Since the rod is in the fundamental mode, $\lambda_1 = 2L = 2(2.0 \text{ m}) = 4.0$ m. Using the speed of sound in aluminum, the frequency is

$$f_1 = \frac{v_{Al}}{\lambda_1} = \frac{6420 \text{ m / s}}{4.0 \text{ m}} = 1605 \text{ Hz}$$