



Concept:

The **reflection at a fixed end is inverted** because the incoming pulse exerts a force on the rigid boundary that is opposite in direction to the reaction force the boundary exerts on the spring. The **reflection at a free end is not inverted**. If the mass density of the spring is μ_1 and that of the boundary is μ_2 , then a fixed end reflection is modeled by $\mu_2 \gg \mu_1$ and vice-versa for a free end reflection. In the demonstration, a fixed end is accomplished by attaching the spring to the rod clamp while a free end is approximated by attaching the spring to a light string.

Procedure:

Fixed End Reflection

1. Clamp the spring end as close to the slotted end clamp as possible (see top left picture).
2. Give the spring a sharp pulse by snapping your wrist and forearm up and down with spring in hand.
3. Dampen spring by bringing handheld end to the ground.

Free End Reflection

4. Loosen screw in slotted end clamp and let out about 50 cm (2 ft) of string.
5. Tighten clamp and repeat steps 1-3.

Notes and Extras:

- Video Link: <http://blip.tv/file/1439394>
- The details of the reflection process can also be understood as a [superposition of a real and an imaginary pulse](#).

Equipment:

- Large Support Stand
- Long Spring with String
- Large Rod Clamp
- Slotted End Clamp