614-0665 (50-115) Laser Tank

You will need: 1 -AAA Battery

Introduction: Water is one of the odder compounds, and light is a very strange phenomenon. By way of explanation, the chemical and physical properties of water are so unique that no other substance mimics them. Light is the visible manifestation of electromagnetic radiation. It took mankind centuries to realize that light actually moved throughout the universe, instead of being a static, assumed property. Even today, the basic understanding of the nature of light is incomplete. We know that light is made up of photons; that is, discrete packets of energy emitted by excited atoms. However, just what are photons anyway? Why do they behave as both particles and waves? truth be told, we really don't know. In any case, such discussions are beyond the scope of this guide.

Water is a clear liquid, but has a certain property: it slows light down. A ray of light entering into a body of water is reduced to around 75% of the speed that same ray could achieve in a vacuum. This extremely abrupt shift in speed causes a ray of light to bend, which is known as refraction.

Refraction is an interesting property. It can only occur at the boundary of two media with dissimilar indices of refraction. That is, light could refract inside a glass block, but wouldn't do so spontaneously in the open air. Likewise, a ray of light shone through two acrylic blocks placed edge to edge would not experience any deflection at the juncture of the blocks, because the index of refraction is the same for both. With our laser tank, a light ray enters the water in the tank, slows down, and becomes refracted. Here's how it works:

Operation: To use your laser tank, you will first need to set it up. To do so:

Remove the two short thumbscrews from the base.
Slide these screws through the two holes in the bracket on the bottom of the tank. Thread the screws back into the base, making sure the tank is held down snugly.
Place the tank on a table. Using the bubble level, level the unit. The two longer screws can be threaded in and out of the base to act as leveling feet.
When the tank is set up and leveled, it is time to add fluids.

Different fluids have different optical properties, but three in particular are especially good. You will need a transparent liquid with a high index of refraction, such as water, mineral oil, or corn syrup. Each of these fluids is easy to obtain and slows down light enough for noticeable refraction. Water is obviously the easiest to obtain, but it is interesting to see how light behaves in the other two compared against water.

Add your fluid to the tank until the tank is half full. A dark line is printed across the tank at the halfway mark to help.

After you have filled the tank, you will need to unscrew the back to the laser, add the AAA battery and attach the laser as follow:

You will notice a steel arm that emerges from the back of the tank and is free to spin, making an arc around the perimeter of the tank.

The laser included with your unit has magnets embedded in its base. Use these to stick the laser to the iron arm. Be sure the laser is pointed towards the center of the tank.

Activate the laser.

You will notice a degree scale printed on the tank. This allows you to know what angle the laser beam hits the surface of the fluid, and to note the final angle of the laser beam after it has been refracted.

By knowing these two angles, you can know the total angle of refraction caused by whichever fluid you are using.

Note: if the laser beam enters the tank from beneath at a steep enough angle, the laser beam will reflect off of the air/fluid interface instead. This phenomenon is known as total internal reflection. This property is what keeps light signals inside fiber optic cables.

Warranty and Parts:

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.