

# Barlow Lens

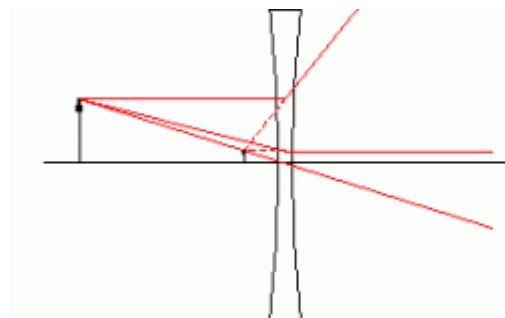


Are you ready to learn more about the barlow lens? Designed and created in the early 1800s by English engineer, Peter Barlow, this optical system acts in line with other optics to increase the focal ratio (length needed to achieve focus) of a telescope – thus acting as a magnifying eyepiece. How does it work? Let's take a look...

## The Barlow Lens – A Diverging Optics System

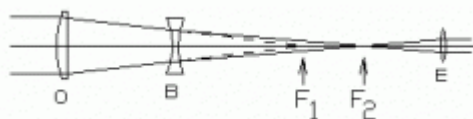
Any lens which is thinner in its centre than at its edges is called a concave lens and will act as a diverging lens when operating in [air](#).

When the [barlow lens](#) was first created, it was a two lens system enclosed in a clear, colorless liquid forming an achromatic arrangement much like a miniature telescope within a telescope.



The point where [light](#) rays entered the lens parallel to its axis are brought to a focus in front of the lens. This is called the principal focus point. At the same distance behind the lens there is also an identical point. This is called the secondary focus. When the rays of light diverge after passing through the lens, the image formed by the intersection and create a virtual image.

The virtual image is then picked up by the next series of lens – convex elements in the [eyepiece](#) – and refocused again.



How does it magnify? The magnification factor of a Barlow lens is the function of its position in respect to the eyepiece and the primary light gathering source – the

objective. For any given eyepiece and objective, the separation between the Barlow lens and the eyepiece, as well as the separation between the Barlow lens and objective separation are tied together.

The focal plane of the eyepiece becomes the same as that created by objective and Barlow combination. As distance between the eyepiece and the Barlow increases, the separation of the Barlow and objective decreases. Magnification is increased by increasing the distance of separation from the eyepiece.

Each barlow length is its own focal length and will double the magnification power. When the length of the lens tube increases by another “Barlow length” the magnification increases. For example, two “Barlow lengths” create 3X magnification.

## Why Use A Barlow Lens?



We know a good barlow lens can double – or triple – or amplify any eyepiece’s magnification. That makes owning a barlow lens an inexpensive addition to your telescope accessories. However, there’s more reasons to own a barlow lens than just magnification!

By using a barlow lens, you can expand eye relief – the distance your eye must be away from the eyepiece lens to be in focus. Short focal length eyepieces (high magnification with numbers like 5mm, 7mm and 10mm) have highly curved surfaces which often cause optical [aberrations](#).

What it amounts to is poor image quality at the edges of the field of view occur as the lens size increases – and that’s why most high power eyepieces are tiny “peep holes”. Imagine getting the lens size and eye relief of a 20mm eyepiece, but at 10mm magnifying power! A good barlow lens can also naturally deepen the contrast of larger deep [sky](#) objects by negating the [background](#) sky glow.

For “fast” telescopes (those with low F-ratios) and binoviewers, adding a barlow lens is necessary to increase magnifying power. But, remember... All telescopes have practical limits to magnification!

When using a barlow lens, remember your focuser size and eyepiece size. The correct barlow lens is the one that matches your equipment – either 1.25” or 2” diameter.

If you have a 2” focuser and use an adapter for 1.25” eyepieces, a barlow lens the same size as the adapter will also work. Another consideration is that some focusers have a shorter focus travel length – the distance you must move it in or out to achieve focus.

Some telescope models may even have a physical obstruction – such as clearance between the eyepiece and mount, so you may need to consider a “Shorty” Barlow.

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