



DIY Projector Screen Book

**Basic Projector Screens
Version 1.0**

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DIY Projector Screen Book

You bought that front projector with the dream of a theater with a 100" screen or more. Quality projectors can now be had for under \$1000. So you have stretched your budget to get the projector but then you realize that showing it on a bed sheet doesn't look very good. You also realize that you are going to have to spend \$600 or more for the cheapest 100" screen with decent quality. Good news!! It's not that hard to build your own. Great news!! Many can be built for \$100 or less.

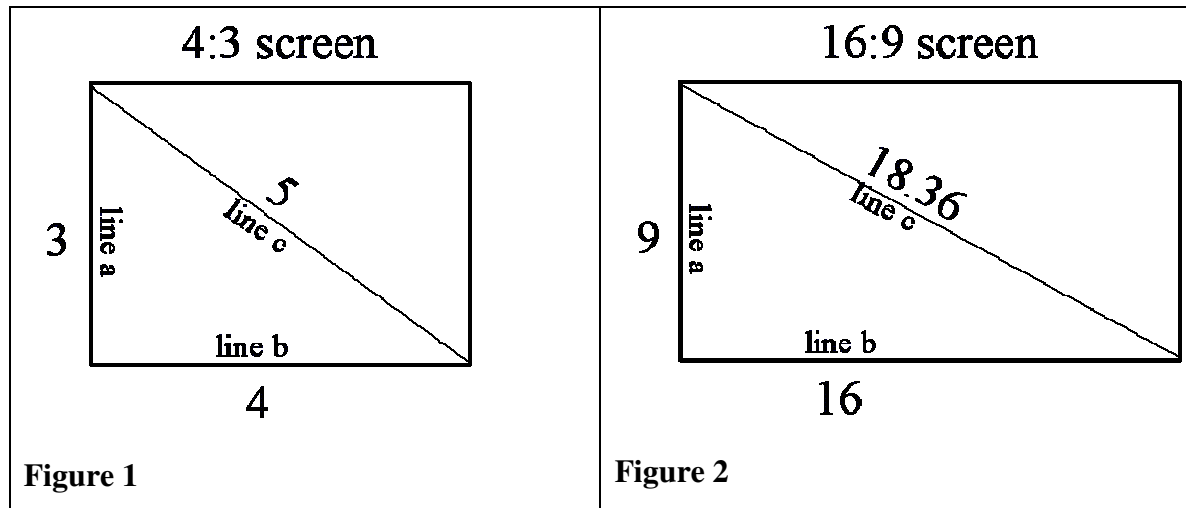
The following chapters will teach all you need to know about screens, discuss what type of screen you need, and give you lists of materials and paints that you can use to make your own screen.

Chapter 1 - Introduction to Screens

Screen Sizes & Shapes

Diagonal Measurements

Projector screens like TV screens and Computer screens are measured diagonally. In other words they are measured from one corner to the opposite corner. In figure 1 below we see a screen that is 4 inches wide (line b) by 3 inches tall (line a). This would be a 5 inch diagonal screen (line c). Figure 2 is a 18.36 inch diagonal screen.



ADVANCED TOPIC – Calculating diagonal measurements

The Pythagorean theorem in trigonometry states that in a right-angled triangle the length of the hypotenuse (the side opposite the right angle), c , is equal to the sum of the squares of the other two sides, b and a , that is, $a^2 + b^2 = c^2$.

Since lines a , b , and c in a screen always form a right triangle, the length of the diagonal line c can be calculated using the formula $a^2 + b^2 = c^2$ and some algebra to solve for c .

$$a^2 + b^2 = c^2 \rightarrow 3^2 + 4^2 = c^2 \rightarrow 9 + 16 = c^2 \rightarrow 25 = c^2 \rightarrow 5 = c$$

Try the screen calculator at ProjectorScreenBook.com. It's easier!!

Aspect ratios

Screens generally only come as rectangles but they come in different widths and heights. The relationship between the width and the height is represented by the **aspect ratio**. Since a square has the same width and height, it has an aspect ratio of 1:1 (pronounced 1 to 1) meaning that for every 1 inch wide it is also 1 inch tall. If a screen had an aspect ratio of 2:1, it would be 2 inches wide for every 1 inch tall.

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Terminology

When discussing screens there are a number of factors to consider that will affect how it performs. Terms such as Gain, viewing angle and contrast are used all the time often without people really knowing what they mean. Let's explain some of the most common terms now.

Ambient Light

Ambient light is the surrounding light or the light coming from surrounding sources including windows and installed lighting. Knowing how much ambient light will be in the viewing area is an important factor in picking the right screen.

Lumen

Lumen is a unit of measurement for light output. A projector that puts out 2000 lumens is

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Chapter 2 – Screen Decisions

Before building a screen, you need to make decisions about the color, size, aspect ratio, and mounting type of the screen you will build. Here is some advice to help you make these decisions.

White vs. Gray Screen

Typically when people think of a projector screen, they think of a white screen. However white is not the only color choice and often not the best choice. Gray screens have been extremely popular in the digital projector age. Back in 2001, when gray screens were first introduced, digital projectors were pretty low contrast and the black levels were not so great. The gray screen helps boost contrast by absorbing more ambient light than a white screen and increases black levels due to its darker color.

Certainly the contrast of digital projectors has improved greatly in the last few years but gray screens are still often the best choice. If you are going to be watching your projector with ambient light then you will want a gray screen. Sometimes one person likes to read while the other watches TV, or how about having people over to watch sporting events, or maybe you just don't have or don't want a darkened theater room. Maybe you are building a screen for a conference display or for a board room. These are all great examples of when to use a grey screen.

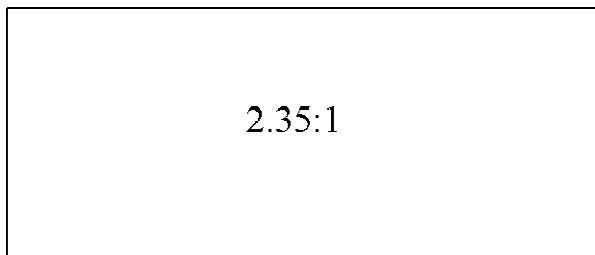
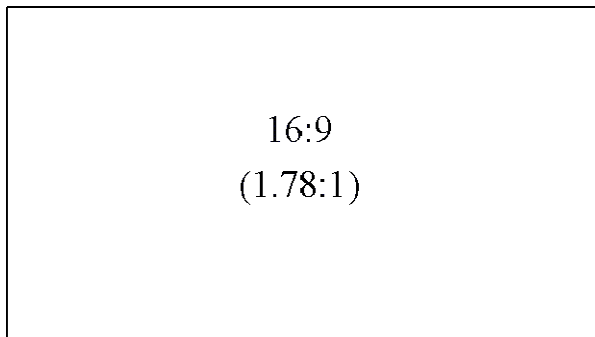
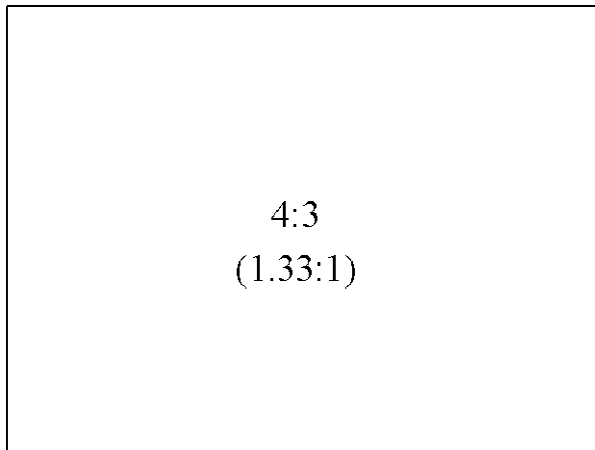
A gray screen will absorb more light than a white screen because it is darker. This will cause it to absorb the light in the room and the light from the projector. However, since the light from the projector is generally more powerful and more concentrated than the ambient light in the room, it will net a brighter screen in the presence of ambient light. Generally the darker the screen, the better it will perform in ambient light. There comes a point when the screen is too dark for the projector to light up effectively. All grays will become black and you lose detail in the picture. The less lumens a projector puts out, the sooner this will happen. It takes more lumens to light up a dark screen. It is also good to think about your bulb life. Expensive projector bulbs will last longer if run in low-power modes. So don't go darker than needed.

If you have a light-controlled theater room and a projector with high contrast then a white screen is probably a better choice. The nice thing about building your own screen is that you can experiment without breaking the bank.

Choosing an aspect ratio - 16:9, 4:3, or 2.35:1

In all practicality, you only have three choices for aspect ratio. 16:9, 4:3, or 2.35:1. They all have trade-offs and the choice is a matter of personal preference. Keep in mind that no matter what aspect ratio you choose for your screen, there will be material that will not fit perfectly on the screen. HDTV will be in 16:9 but standard TV will be in 4:3 and movies will be in any number of formats used over the years. Newer movies will generally be 2.35:1 while very old movies are 4:3. When the picture does not fit perfectly, the projector will scale it to fit by using black bars on the top, bottom, and sides. This is called letter-boxing (top and bottom) or pillar-boxing (sides). The use of black curtains or masks to hide the black bars is not uncommon.

The following images show each screen format. I made them all the same width because most rooms are limited more by width than height. *It is highly likely that no matter what aspect ratio you choose, the width will be the same.*



Chapter 3 – Screen Materials

Many materials have been tried for projector screens. Some of the qualities that make a good screen are color (white or gray) and texture (not too rough or uneven). It must be opaque enough that it does not let light pass through it and it must have enough gain without being shiny. A good material has a “matte” finish because if it is shiny, it will cause hot-spotting.

Panels

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Fabrics

Material	Color	Max 16:9 size	Cost	quality
Blackout Cloth (BOC)	<i>White</i>	220"	<i>\$</i>	<i>GOOD</i>
<p>One of the cheapest, easiest, and most popular materials for making a screen. This is a material used to line drapes so that light does not pass through them. BOC usually comes in white but can come in other colors. Make sure you get white. BOC has one side that is “rubbery”. Most people tend to use the rubbery side but try both sides and see what you like best.</p> <p>BOC can easily be found in 54” widths at most fabric stores for around \$4-\$6 per yard. So you can easily make a 110” 16:9 screen (4.5 ft X 8 ft) with 3 yards of cloth. Pretty cheap! The performance is very good too. If you want a larger screen, BOC can be ordered in 110” widths. You can buy material for a 220” 16:9 screen (9ft x 16 ft) for \$80. Since it is a cloth it can be stretched over a frame or hung from a rod or pipe. It can be used as a pull-down and is portable. It is a popular material for making big outdoor screens. Just unroll and hang it over a balcony. Many people have been very happy with BOC and it is an excellent way to get started in the world of DIY screens. The biggest drawback is that it only comes in white. If you need a gray screen, you will have to paint the BOC with one of the paints discussed later in the book.</p>				

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