

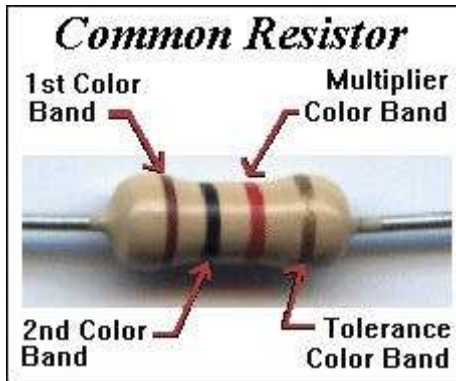
# How to read Resistor Color Codes

## First the code

	<b>Black</b>	<b>Brown</b>	<b>Red</b>	<b>Orange</b>	<b>Yellow</b>	<b>Green</b>	<b>Blue</b>	<b>Violet</b>	<b>Gray</b>	<b>White</b>
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>Multiplier</b>	<b>1</b>	<b>10</b>	<b>100</b>	<b>1,000</b>	<b>10,000</b>	<b>100,000</b>	<b>1,000,000</b>	<b>10,000,000</b>	<b>100,000,000</b>	<b>...</b>

## How to read the code

Resistors are color coded for easy reading. Imagine how many blind technicians there would be otherwise.



To determine the value of a given resistor look for the gold or silver tolerance band and rotate the resistor as in the photo on the left. (Tolerance band to the right-- refer to the [tolerance chart](#) below for exact values.). Look at the 1st color band and determine its color. This maybe difficult on small or oddly colored resistors. Now look at the chart and match the "1st & 2nd color band" color to the "Digit it represents". Write this number down.

Now look at the 2nd color band and match that color to the same chart. Write this number next to the 1st Digit.

The last color band is the number you will multiply the result by. Match the 3rd color band with the chart under multiplier. This is the number you will multiply the other 2 numbers by. Write it next to the other 2 numbers with a multiplication sign before it. Example : 2 2 x 1,000.

To pull it all together now, simply multiply the first 2 numbers (1st number in the tens column and 2nd in the ones column) by the Multiplier.

Read the number as the '% Failure rate per 1000 hour' This is rated assuming full wattage being applied to the resistors. (To get better failure rates, resistors are typically specified to have twice the needed wattage dissipation that the circuit produces) 1% resistors have three bands to read digits to the left of the multiplier. They have a different temperature coefficient in order to provide the 1% tolerance.

### Tolerance Explained

Resistors are never the exact value that the color codes indicate. Therefore manufacturers place a tolerance color band on the resistor to tell you just how accurate this resistor is made. It is simply a measurement of the imperfections.

<b>Tolerance Rating</b>	<b>Red = 2%</b>	<b>Gold = 5%</b>	<b>Silver = 10%</b>	<b>No band = 20%</b>
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As the chart indicates, Red means the resistor is within 2%; Gold means the resistor is within 5% of being dead-on accurate. Silver being within 10% and no color band being within 20%. To determine the exact range that the resistor may be, take the value of the resistor and multiply it by 5,10, Or 20%. That is the number that the resistor may go either way.

### A couple of examples:

Example: A 1,000 Ohm resistor with a gold band maybe any value between 950 to 1050 Ohms.

Example: A 22,000 Ohm resistor with a silver band maybe any value between 19,800 and 24,200 Ohms.

## Resistor FAQ's

Just a few common questions to help you out.

### 1) Which side of the resistor do I read from?

The Gold or Silver band is always set to the right, then you read from left to right. Sometimes there will be no tolerance band -- Simply find the side that has a band closest to a lead and make that the first band.

### 2) Sometimes the colors are hard to make out. How do I make certain what the value of the resistor really is?

Occasionally the colors are jumbled or burnt off. The only way to read it then is with a multi-meter across the leads

### 3) How do I remember this sequence of colors?

Remember the color codes with this sentence: **B**ig **B**rown **R**abbits **O**ften **Y**ield **G**reat **B**ig **V**ocal **G**roans **W**hen **G**ingerly **S**lapped.

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*Last modified February 08, 2004 by Paul B. Peters, [Show contact information](#)  
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