Calculating Different Field of View Diameters

What do you need to know before you can calculate the diameters of different fields of view of your microscope?

1. You must know at least one field of view diameter for one of the objective lenses.
2. You must know the magnification of the objective lenses of your microscope.
3. You must figure out the conversion factors between the different objective lenses.

On the following page is a model you can use to help you figure conversion factors and calculate the diameters of the different field of views for your microscope.

How do you figure out a conversion factor?

Since the sizes of the diameters of the field of views between different objective lenses are proportional, you can figure out different diameters by using conversion factors that exist between any two objective lenses. You just have to figure them out!! For example, if the Scanning objective is 4X and the low power objective is 10X, the conversion factor between them is $10 \div 4 = 2.5$. This means that the diameter of the low power field of view is 2.5 times smaller than the diameter of the scanning field of view. Conversely, you could also say that the diameter of the scanning field of view is 2.5 times larger than the diameter of the low power field of view.

So, for each two objective lenses you are comparing divide the smaller objective magnification into the larger objective magnification to find your conversion factor. If you are moving from a known diameter of a lower power objective lens to an unknown diameter of a higher power objective lens, you will divide your conversion factor by the lower power diameter. This will give you the diameter of the field of view for the higher power. Conversely if you are moving from a known diameter of a higher power objective lens to an unknown diameter of a lower power objective lens you will multiply your conversion factor times the field of view diameter of the higher power. This will give you the diameter of the field of view for the lower power.
**Figure 3 continued**

**Calculating Different Field of View Diameters: A Model Chart**

<table>
<thead>
<tr>
<th>Objective lens &amp; its magnification</th>
<th>Conversion factor</th>
<th>Conversion factor</th>
<th>Conversion factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning Objective 4X</td>
<td>2.5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Low Power Objective 10X</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>High Power Objective 40X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil immersion Objective 100X</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Tip Reminders**

1. **When increasing magnification** (i.e. switching from a lower power to a higher power lens) **divide** the starting field of view diameter by the conversion factor between the two objective lenses. Results = a smaller field of view.

2. **When decreasing magnification** (i.e. switching from a higher power to a lower power lens) **multiply** the starting field of view diameter by the conversion factor between the two objectives. Results = a larger field of view.
**Figure 4: Metric System Conversion Tips: Moving the Decimal**

### Tips to metric conversion:

1. When converting from a larger unit of measure to a smaller unit of measure move the decimal to the right.

2. When converting from a smaller unit of measure to a larger unit of measure move the decimal to the left.

### How many decimal places do you move?

The number of decimal places moved is equal to the magnitude difference between the exponents of the two units of measure. Think of the magnitude of difference as represented by the following partial “exponent” scale:

```
-6  |  -5  |  -4  |  -3  |  -2  |  -1  |  0  |  1  |  2  |  3  |  4  |  5  |  6
µm  |  mm  | cm   | m    | km
```

**Example A: 9.25 km = ? mm**

- a. km to mm = Large to small so decimal moves to the right.
- b. The magnitude difference between km ($10^3$) and mm ($10^{-3}$) is 6.
  
  \[
  (3 \text{ minus } -3 = 6) \]
- c. So the decimal place moves to the right 6 places giving 9,250,000.00 mm.

**Example B: 8.543 nm = ? mm**

- a. nm to mm = Small to large so the decimal moves to the left.
- b. The magnitude difference between nm (-9) and mm (-3) is 6.
  
  \[
  (-9 \text{ minus } -3 = -6) \]
- c. So the decimal place moves to the left 6 places giving 0.000008543 mm.