

THE RUSS FORMULA FOR SUCCESSFUL PHOTO ENGRAVING

- 1) Choose your lens. The best will be 1.5" focal length but most will have 2" and that still gives good results. A good quality 2" meniscus lens performs better than a plano convex.
- 2) Choose your material. A near white surface with little texture is ideal, such as card, MDF, spruce faced plywood or even natural coloured hide. These organic materials will produce stunning results because they are capable of holding a nice crisp dark scorch dot which is the key requirement for the eye and brain to mix the varying dot densities with the light background that produces the illusion of a grey scale picture. The following principles also apply to mineral materials and plastics but the major difference is that there is usually a dark background and the dots that you produce will be WHITE. Hence you will have to make your picture into a NEGATIVE before you laser it
- 3) Find the perfect focal distance to your work. You can use my dot assessment program (DotSize.bmp) to do this. Set the power to about 15% and the speed to about 50mm/s and using my focus step gauge run some tests at various 0.5mm intervals to find the crispest, smallest dots. (see the video) You will need a magnifier to do this assessment. The ideal pocket tool is this linen gauge
<http://www.ebay.co.uk/itm/50mm-Plastic-folding-linen-tester-/252928793813?hash=item3ae3bb1cd5:g:xp0AAOSwIMFZEc1A>
- 4) Choose the best focus distance and look carefully at the dots to assess their diameter. The pattern of the dots will help with that assessment (see the video)
- 5) Your dotting capability will determine what resolution your picture can be. Although a 2" lens has a theoretical spot size of 0.1mm, you will be lucky to get better than 0.2mm. So let's use this typical value in all the following calculations.
- 6) Picture resolutions are normally expressed in "ppi" which is short for Pixels Per Inch. We (and RDWorks) are working in metric units. There are 25.4mm in an inch so
Calculation 1
 $25.4/\text{dot size} = 25.4/0.2 = 127\text{ppi}$. This is the best resolution you can use. If you decide to ignore this and use say 300 dpi then your dots will overlap and cover the white background that is so vital to the grey scale illusion. Trust me to start with then do your own experiments.
- 7) Import your picture into RDWorks. Use the Bitmap Handle to view the native resolution. Set the size of the picture to suit your requirement. and now use the Bitmap Handle again. You will find the resolution has changed but don't worry. Set the brightness and contrast to midpoints with their zero buttons. Do NOT invert yet if you are working with mineral or plastic. Tick the Set Resolution box and set the resolution to 127ppi. Tick the Dither box and choose Dot Graphic. Now press the Apply to View button.
- 8) Now is the point where experienced guessing helps. You can adjust the brightness and contrast to make what looks like a perfectly good picture into something that looks too dramatic but enhances certain features like eye, if this is a portrait. A tip is to zoom in on a light area and see how many pixels you can see. Move the brightness up by no more than 5% and then press the Apply to View button. Repeat this 5% process with both brightness and contrast until your picture jumps out the screen. Too much brightness will lose detail and too little contrast will do likewise. Now finally zoom in and check those light areas again and most of the dots will have gone.

This is one of the most difficult steps and you will only get better at assessing how much to distort the picture with practice.

9) When you are happy, press the Apply to View again and then the Apply to Source, followed by the OK button. Click on your source picture and it will dither. You cannot now go back and adjust the picture brightness and contrast you will have to delete it and start again to change it. If you are happy with the final look and you need to invert the picture to a negative, re-apply the Bitmap Handle and tick the invert box then press Apply to View again and then the Apply to Source, followed by the OK button.

10) We now have to set the engraving parameters.

Calculation 2

we have established the dot size to be 0.2mm so $1\text{mm}/0.2\text{mm}=5\text{pixels per mm}$

This is the secret part that I have spent so long trying to establish. How long does it take the machine to form a full power dot? This number we are going to use may vary slightly between machines but from all my observations it is between 3 and 4 ms. So lets use 3ms in the following calculation If we use a smaller number we will not be getting a uniform burn . There are single dots and groups of dots. We are trying to make a single dot reach its full potential so that it matches the burn of a multiple pixel group Now that we have set the resolution, this is all dependant on speed

Calculation 3

$3\text{ms} \times 5\text{pixels per mm} = 15\text{ms per mm}.$

$1000\text{ms}(\text{ie } 1 \text{ second}) / 15\text{ms} = 67\text{mm/sec}.$

This vital step sets the speed to make sure we do not go faster than 3ms per pixel . If you decide to ignore this and run faster, you will dilute the blackness of single dots and that in turn will distort the grey scale illusion you are trying to create. Again, trust me to start with then go forth and experiment for yourself.

11) Now that we know the running speed, we need to set the power. Make sure all the engraving option boxes are unticked. We do NOT want to do greyscale engraving we just want DOTS. Set the max and min powers equal at say, 15% for now.

That's the hard bit done.

12)Now back to the machine and my little dot test pattern. Set the speed to 67mm/s with 15% power and using your material, run the test several times, reducing the power by 1% each time. Examine the dots and dashes. Because the dashes are multiple dots they will always be black. Try to find the LOWEST power value where the dot colour matches the dash colour. Now revisit your program and set this as your power parameter.

That's it !! However, I would advise two more things. First go to Config System settings and set the head at one of the bottom corners. That way the engraving will start at the bottom and fumes will not pass over your stunning engraving. Secondly, turn your air assist down to the merest whisper and make sure you have a good CROSSFLOW of extraction air to keep the fumes dragging away from your work.