Laser-printed decals for ceramic use
Arbuckle, Univ of FL Ceramics

Commercial ceramic decals are made from China paint silk-screened onto decal paper, and fired to low temperatures of 022-016. This allows for printing of multiple colors, but require familiarity with silk-screening and specific materials to do this.

Laser decals use a special decal paper that is heat-set in a laser printer, and takes advantage of the iron used as a toner component for most laser printers. These will be monochrome, iron-colored images. Although industry is developing color digital printing processes, it's very expensive at this time.

Denise Pelletier has done workshops on these processes, and generously offers the information below.

Regular water-slide decal paper requires the use of a cover-coat, as mentioned below. Newer decal paper made for laser-printing requires no cover-coat and is very easy to use.

Laser decal paper is available from various sources. At school we get ours from:

Bel Inc
6080 NW 84 Avenue
Miami Florida 33166
Phone 593 0911 Fax 305 593 1011
http://www.beldecal.com/
http://www.beldecal.com/laser_paper.html

Top: unfired decal applied to cone 10 celadon
Middle: fired to cone 02
Bottom: fired to cone 2

Bel makes this paper for non-fired use, and does not mention firing on their web page last I looked. Paper comes in clear or with a ground that fires translucent white. The last order came with a cover sheet that had to be removed before printing.

Reports are coming in that laser print cartridge manufacturers have changed formulation to be more environmentally friendly. This has lowered the amount of iron, and there are reports that the newer laser toner does not make a fireable decal. If that is the case w/the toner you try, then you'll need to get special toner cartridges for your printer made for printing checks. I understand the check numbers are read magnetically, so the toner does still contain the high iron needed for a decal you fire. One company that produces this toner is

Ganson Engineering Inc
gei@ganson.com
928 854 5000

If you're making images in Photoshop, it's suggested that you use 300 dpi, black and white or grayscale for your image.

Denise Pelletier
deepelletier@hotmail.com

How and why do laser printer decals work?

Black laser printer toner is composed of tiny iron filings, other pigments, and tiny beads of plastic. When a laser printer prints an image, it establishes a static field on the piece of paper, the toner sticks to the field, then the whole thing goes through a heat element which melts the plastic bits, fixing the toner to the paper (in this case, decal paper). When a decal from a printer containing enough iron oxide is applied to a

ceramic surface and fired, the iron oxide survives the firing. The resulting image on the ceramic surface is permanent and sepia colored- ranging from tones of brown, to reddish purple or ochre. The exact color depends on the composition of the glaze underneath the decal, and the firing temperature of the decal.

Not all laser printer cartridges contain iron or enough iron to work as a ceramic decal. All Apple black laser printers work, and so do Hewlett Packard black laser printers. Other brands of laser printers may work, but there is no guarantee unless you test them first. Bubble jet, inkjet, and all color printers do NOT work because they don't contain any or enough iron or other metallic oxides.

How to make the decal

1. Create an image or text directly on the computer, and format it like you normally would print it - positive and right reading (so that the text reads correctly).
OR
Found images and text (from books, magazines, newspapers, or drawn) may be scanned into
the computer. The image can be changed or altered in any way you like in Photoshop or another such program. Any image should work, text and line art reproduce beautifully (even old lithographic images).

Arrange smaller images, text, whatever on the page with a small bit of space between images, 1/4" is good. Lots of images can go on the same page that way so you don't waste decal paper, just like silkscreened decals. Fit them on the page in any orientation, but be sure to leave about 1/2" border at the edge of the page all around.

TIPS: Photographic work can sometimes be tricky. You may want to convert photographs to halftones so that there aren't any vast expanses of dark black. For any images with large expanses of black, especially from photographic images, it is a good idea to adjust the brightness/contrast about 25%-30% brighter/lighter.

Note: artist Jacquie Rice suggests that the very first step is to be working with images in Photoshop at 300dpi, grayscale or bitmap. She finds that grayscale is best.

More TIPS: Large images on ceramic tile or other relatively flat surfaces like plates, can be produced from smaller images using a tiling program (such as Adobe
Illustrator) to grid the
image for each tile.

ALSO: Remember that any image you print on decal paper is a decal! That means you must take into consideration the fact that a big decal won't slide onto a complex or curvy surface without wrinkling. So, relatively flat ceramic surfaces work best with larger images, unless you slice, dice cut, and collage them. Experiment!

2. Once your image is completed in the computer, load the water slide decal paper into the laser printer so that the printing goes on the SHINY side of the paper. Make sure you cut the paper to a size that the printer is capable of- many printers prefer an 8 1/2" x 11" piece of decal paper to be trimmed slightly-say, an 1/8" less on length and width. Test first and trim if needed. Same goes for 11" x 14" printers.

3. Print your image on the decal paper! Print extras if a particular image is important, because sometimes a decal might tear or run when you apply it, so it's best to have extras.

Almost any glazed object works, also fired burnished terra sigillata and most vitreous slips. (Porous surfaces do not work. Terra-sigged pieces should be fired to at least c/04). Every glaze is different, so students should come with an attitude of testing and experimentation. Computer decals work over varying firing ranges, so the first try is always an experiment to find what temperature will work best with my given glaze. It's a good idea to have some small glazed test pieces or tiles if you want to experiment. You might also try decals on found glazed objects.

Transferring the decal to the ceramic surface

Apply the decals in the same way that you would apply a commercial or silkscreen decal. However, you should keep in mind that computer decals sometimes give you problems if the cover coat isn't right. If the cover coat is too thin, the image will tear or break apart-if it's too thick you may have trouble adhering it to your piece or incomplete adhesion (resulting in burning off part of your image) -

1. Clean the surface of your piece (where the decal will go) with alcohol and a clean cloth.

2. Cut out your image as close to the edges as possible. Try to make curved rather than angled comers and edges. Sharp edges can cause the decal to lift up.

3. Fill a shallow bottomed pan or tray with warm water. Soak the decal for 30-60 seconds, or until the cover coat and image begin to separate from the paper. (Sometimes the paper will curl and flatten out again)

4. With a wet sponge moisten the ceramic surface where the decal will go. This helps you position your decal without wrinkling or tearing it.

5. GENTLY slide the decal into position on your piece, carefully smoothing it from the center outward, with a small sponge, soft rubber rib, or rubber brayer. This forces all the water and air bubbles out from beneath the decal. Check to make sure there are no air bubbles or edges that won't stick. If the decal is not in complete contact with the surface, it will disappear in the firing. If you need to reposition the decal, flood it with a little water first.

6. Let the decal dry overnight.

Firing the decal

The firing temperature for computer decals is quite variable, and depends on the glaze that the decal is on. Since every glaze is different, you must experiment to know what the optimum firing temperature will be for any given glaze. Success can be had from c/018 (maybe lower) all the way to c/9. Basically you should try to fire at the temperature where the glaze is just beginning to flux. This melts the iron into the glaze, preserving the image. If you fire too hot, the glaze will suck up all of the iron or distort your image. If you fire too low, the image will smudge or wipe off. These are some general firing ranges:

On china paint: 4020 - c/018
On low-fire glaze: c/06 - c/010
On cone 6 glaze: c/04 - c/1
On cone 10 glaze: c/04 -c/6
On terra sigillata: fire at least to c/04, preferably a bit higher on burnished sigillata only

Make sure your decals are stacked in the kiln with at least 2" of clearance between shelves. Fire slowly especially in the beginning to allow cover coat to bum off without lifting the decal or causing incomplete bumoff of cover coat. The lid or door of your kiln should be cracked until the cover coat is completely burned off. I like to leave the kiln cracked right through red heat

EXPERIMENT! You will need to find the temperature that is right for your glaze. If your image burns out at a low temperature, your toner may not have any or enough iron. Even if you've found a temperature that works for a particular glaze, try firing hotter or cooler-sometimes a long firing range will work and give you different colors or shades of iron.

ALSO: use what you know about glazes to help you... Clear glazes with lots of gerstley borate or nepheline syenite tend to "eat" or distort the image. Try firing the decal lower or bag that glaze! And

remember, if what you need is a consistent undistorted image, it is easier to succeed with glazes c/6 or above.

BIBLIOGRAPHY for Computer Decals

Johnson, Garth, MFA Thesis, Technical Statement, NYSCC, Alfred University, 2000
Ross, Katherine, "Ceramic Decals from the Computer" (handout) School of the Art Institute of Chicago
Scott, Paul, Ceramics and Print

Note: additional resources are online from the Print and Clay web site:
http://www.printandclay.net/