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Digital Playfield Touch-Up Without a Scanner

I first presented these tools in a seminar at the 2009 Pinball Expo in Chicago. The intended purpose of the tools is to help in the restoration of damaged or missing artwork on pinball machines, by printing reproductions on waterslide decal paper, but feel free to use them however you like. I used white waterslide decal paper from Papilio. With an inkjet printer you will need to seal the artwork before applying it. Krylon Crystal Clear seems to work just as well as the fixative Papilio sells. The decal mounting fluid they have is very helpful though, in getting the decal positioned properly before squeegeeing it into place.

The Photo Grid tool helps you get a good starting image for retoration using a digital camera. The Color Book and Color Strip tools help you find colors that your printer can produce that closely match the color of the existing artwork. All of the tools described here can be found at http://tools.reelpinball.com/.

Click on the pictures below to see larger images. Most can be clicked again to show them full size.

Photo Grid

Playfields and backglasses on older pinball machines were typically screen printed using spot colors. The art consisted primarily of solid colored areas separated by black lines, with little to no blending of the colors. One screen was used for each color on the playfield. This type of artwork can easily be recreated on a computer with vector drawing tools.

The first step in creating a clean printed graphic is getting a base image that can be cleaned up. A scanner is the ideal way to get a base image because it generates an image of accurate size and proportion when comared to the original. Unfortunately, most scanners that people have access to are designed to have an 8-1/2"x11" sheet of paper placed on them. HP did make a line of scanners with a window that could be placed on large flat objects. The use of

these scanners for pinball art reproduction has been documented in the [This Old Pinball](#) DVDs and elsewhere. Unfortunately HP discontinued this line a few years ago and they are hard to find.

Another issue with the HP scanner is that you must have a flat surface at least as large as the scanning window, with no playfield components in the way. If you are restoring playfield artwork you are going to want to strip as much as possible off of your playfield anyway. But while a good scan of your worn playfield can serve as a base image, a base image of a playfield that's in nice shape would be better. Finding someone with a nice playfield, who has access to a scanner, AND is willing to strip his playfield down to get you the images you need, is no small feat.

The Photo Grid tool allows anyone with a digital camera to get a properly sized and proportioned base image, and the process is flexible enough to get most images without removing components from the playfield. This makes it easier to find someone with a good playfield to get the images you need.

To use this process, go to the tools page on my website and click on Download Photo Grid.

http://tools.reelpinball.com/

Extract the file photgrid-8x11.png, load it into a graphics program, and print it out full size. Do not try printing this from your browser or Microsoft Photo Viewer, because they will not print the correct size. Windows Paint can handle this. Print it full size and don't let the program scale it to fit the page. After printing, make sure the centers of the crosshairs are exactly 1/2 inch apart, in both directions.

Cut a hole in the paper to make a frame big enough to surround the area you want to photograph. Be careful not to crease the paper while cutting, because you want it to lay flat on the playfield. You can cut the paper as necessary to fit around items on the playfield. The only important thing is that you need to have 4 crosshairs clearly visible that form a perfect rectangle. The circled crosshairs in this photo form a rectangle.
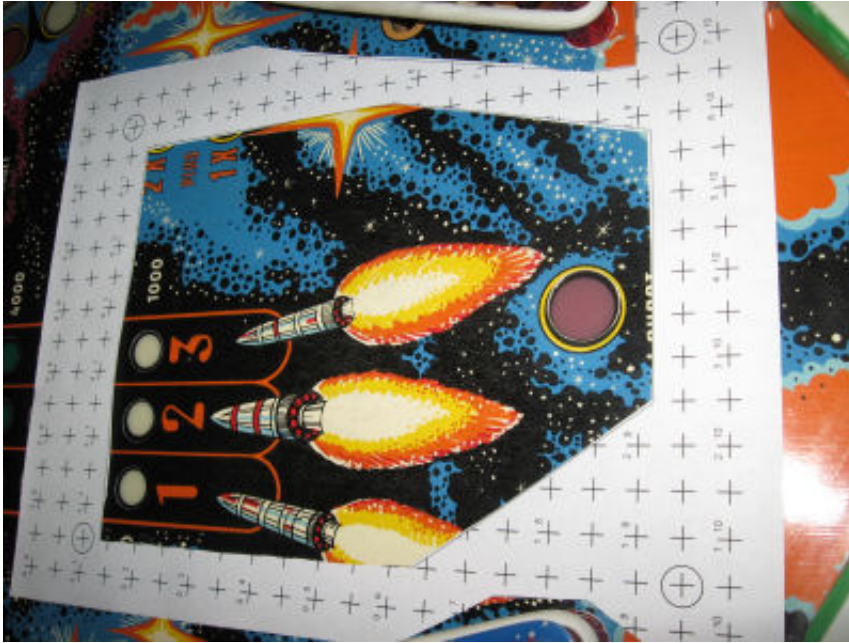
Take a close-up photo with your camera in macro mode, being sure to get the circled crosshairs in the picture. Don't worry about getting the picture perfectly square, and you can hold the camera at a bit of an angle to avoid glare from the flash.

The problems with camera pictures are that they will have some distortion due to the angle of the camera, and the actual size of the image varies depending on how close your camera is from the surface. The Photo Grid helps correct for both of these, but you'll need a better graphics editor than Paint at this point. I use Paint Shop Pro 9, but other programs should have similar tools.

Paint Shop Pro has a Perspective Correction Tool that displays a rectangular box over your image, with corners you can drag.
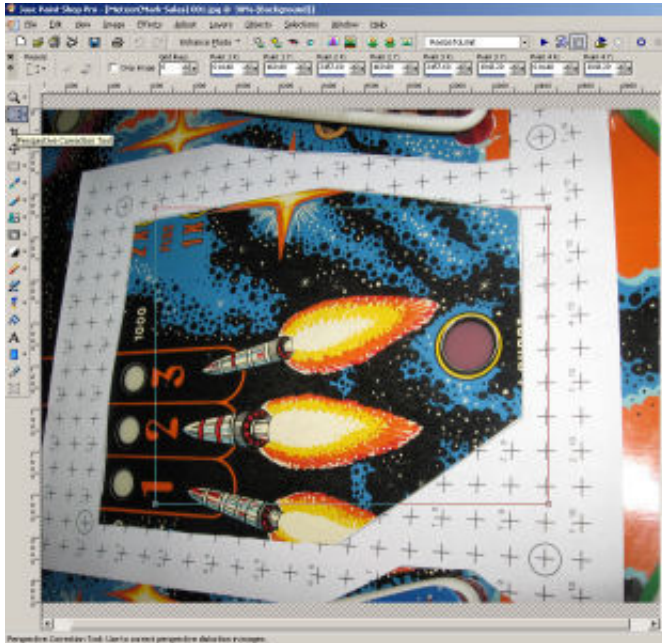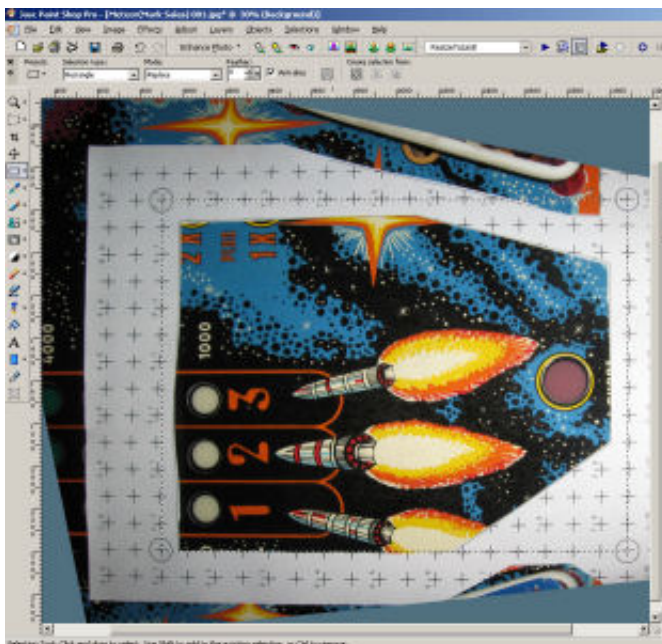
Drag the corners of the box so they are on the circled crosshairs.
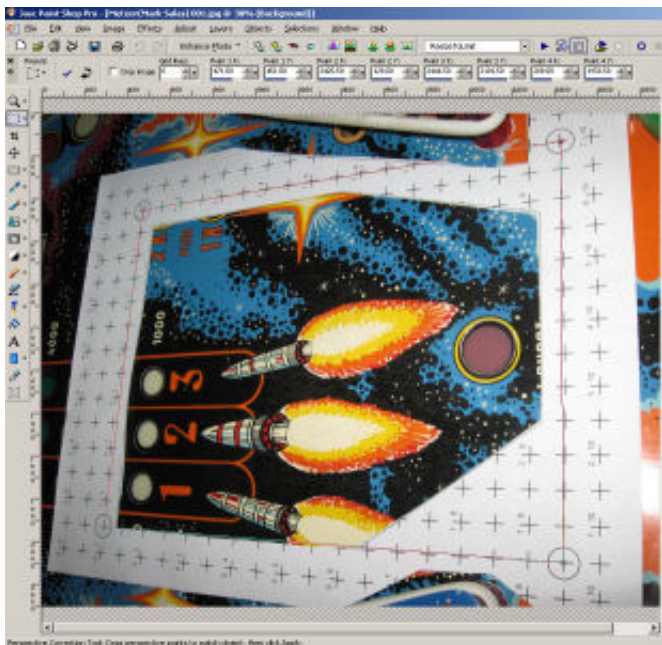

When you click apply, everything in the box will be stretched/compressed so it becomes a rectangle again. This gives you a nicely proportioned picture, fixing the distortion you get from the angle of the camera.
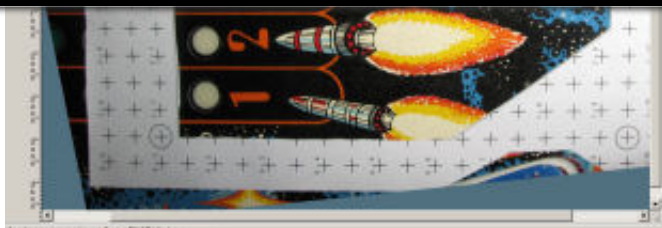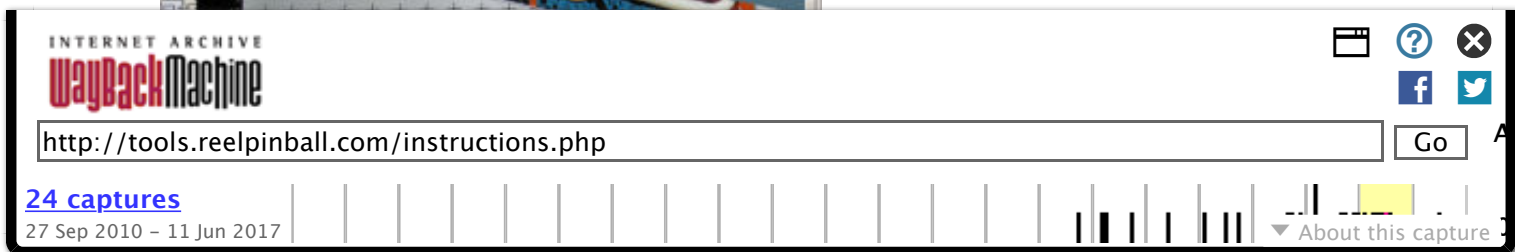
You then use the selection tool to select the rectangle formed by the circled crosshairs


and select Crop to Selection from the Image menu. You'll still have some of the frame in the picture at this point, but that's okay. The intent of the crop is not to remove unwanted areas, it is to get an image of a known size. Since you know how far apart the circled crosshairs (which are now at the corners of your image) are, you can resize the image to the proper dimensions. Select Resize from the Image menu. Uncheck the Lock Aspect Ratio box so you can set both dimensions exactly. In the Print Size box, enter the width and height in inches, and go ahead and set the Resolution to 300 pixels per inch.
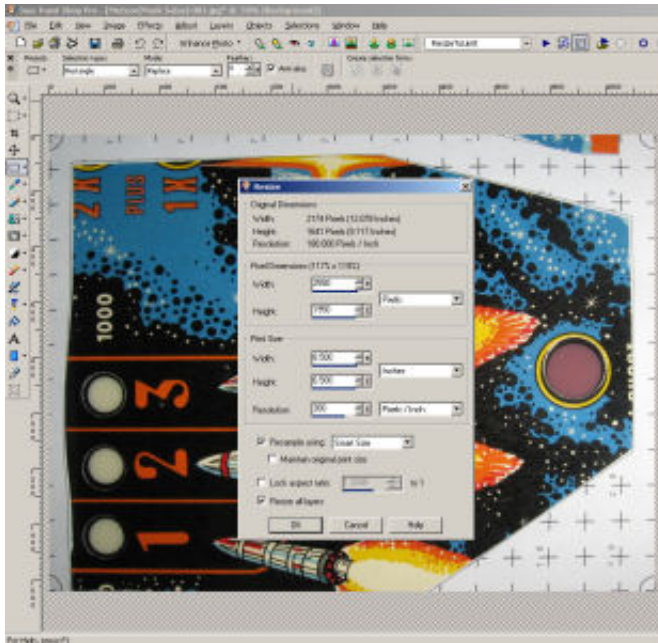
If you print this image now and cut it out, you should find that it overlays the original image pretty accurately. You can crop the image further now if you want to reduce the file size. Anything you crop out will remain the correct size.

At this point you'll want to add some vector layers and redraw the artwork in solid colors. You basically just trace over the original artwork using vector tools, then hide the original raster layer and print the redrawn graphics.
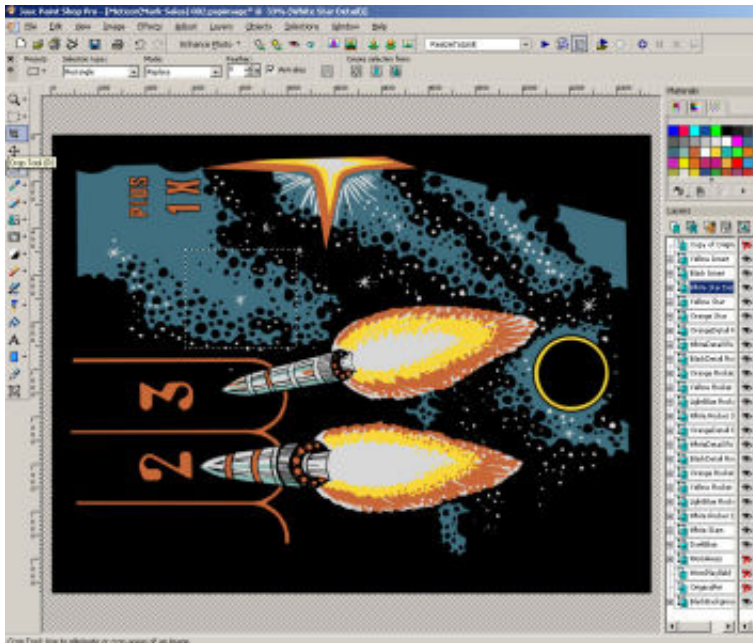

The process is not perfect. You may have noticed that the lines of the perspective correction box and selection box do not line up perfectly on the

other crosshairs. This is due to distortion caused by the curcular lens. This inaccurracy may or may not be an issue. You may be able to correct for this as well using the Barrel, Fisheye, and Pincushion Distortion Correction tools. I haven't tried these, and feel the results have been acceptable without them.

Color Book

If you are planning to print the artwork on waterslide decals or some other media, my tools page also has some tools to help with color matching. There are over 16 million colors you can choose from in your graphics program. Trying to choose one of these that will match the playfield is difficult to say the least, especially since the colors that print will look different than the colors you see on the screen. The best chance of matching the colors is to have a set of color samples from you printer that you can compare what you are trying to match.

Downloading Color Book will give you sixteen images that have a total of 4096 color samples. If you print these images on your printer using the media and settings you plan to use to print your final images, you'll have an accurate set of color samples that give a good idea of what your printer can do. You can fit 2 of these images on an 8-1/2x11 sheet of paper, so you will need 8 sheets to print all of the images. They look something like this:
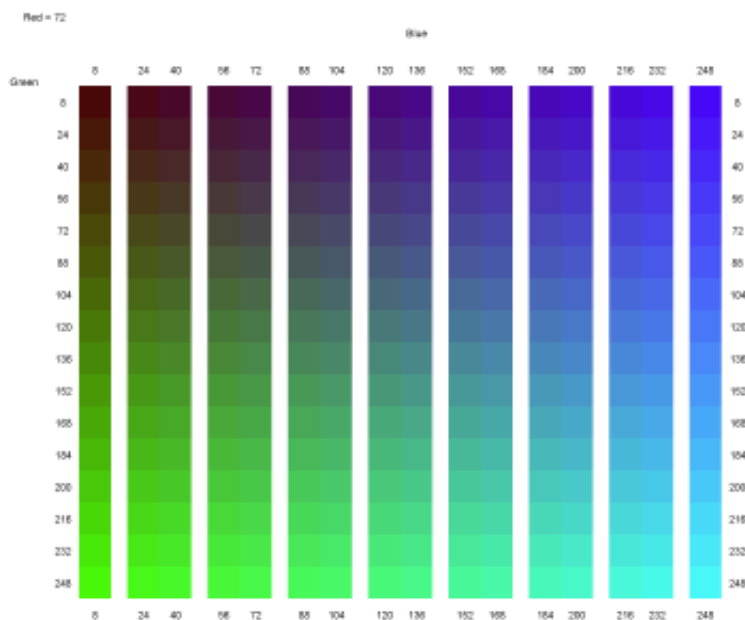
Each image has 256 colors, created by combining 16 different levels of green and blue (16x16=256). All colors on each sheet have a constant red value, with the red value increasing from page to page with the same 16 values used for blue and green. If you cut out the white areas between the colors with an x-acto

knife, you can slide these pages over the playfield to compare to the existing colors and find a value that is close.

The sheets show you the values of red, green, and blue to enter to reproduce that color. Cutting the slits out of the pages is very tedious, but if you take care of them you'll only need to do it once.

Color Strips

The Color Book pages will give you a pretty good color match, but there are actually over 16 million color combinations you can enter in your graphics program. (256 different levels for each of red, green, and blue). The 4096 colors on the Color Book pages are only a small fraction of this. If you want to refine the color selection further, you can enter the values for the closest match found on the pages into the Color Strip form on my tools page. This will give you a strip of 27 shades that are close to the color you entered, varying the red, green, and blue values slightly in both directions.

You can print several of these on a page in landscape mode, and they can be easily cut out with scissors or a paper cutter because the colors are all around the outer edge of the image. Several of the shades may look the same because your printer may not be able to vary the color that precisely.

Here's a printed decal laid across (but not yet applied) my worn Meteor playfield to show how the final product looks.

You need to make sure you use the same media, ink, and printer settings when printing your Color Book pages and Color Strips as you will use when printing your final artwork. Don't print with OEM ink and then refill your cartridges with cheap-off brand ink. You may want to do some research on the ink for your printer, and maybe buy a new printer that uses better ink that may keep its color better over time.

I'm interested in hearing any comments or suggestions on how to make improvements to the tools or process.

Please email me with any questions, comments, or suggestions for improvement.

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