# QuadToneProfiler-Pro Instructions

## Introduction

QuadToneProfiler-Pro is the culmination of over ten years of work and 15 years of experience making custom profiles for QuadToneRIP.

I came to use QuadToneRIP as an extension of my work as a darkroom assistant then tasked with scanning printing 8x10-inch negatives to match the original silver-chloride contact prints. I spent a lot of time learning to master high-end flatbed and drum scanning techniques, all the elements of Photoshop for controlling subtle details and tones in the scans. I probably spent an equal amount of time learning to control the ink and paper to approximate what was otherwise easily achievable in the darkroom.

Like many, my journey learning QuadToneRIP started with the custom ink descriptor files, manual ink limits, calculating partitioning points by hand, and the traditional QTR linearization workflow. I made so many profiles and repeated so much work that I knew there must be an easier way. That became more evident when I started working with a PiezoTone dual-quad printer and then with customized Piezography ink sets later. What began as developing simple personalized tools to make calibrating a little easier turned into teaching myself software development and aspects of color science that allowed me to build specialized tools that are now used in darkrooms and digital labs worldwide.

First and foremost, I am a photographer, and I love fine prints—whether they are 19th-century albumen prints, platinum/palladium prints from digital negatives, or good inkjet prints. The goal is to make the best print possible for whatever a picture might require. Learning software development, the math involved in the calibration process, and now the business of selling profiling software is based around that overall focus on making better prints, and by extension, allowing more people to make better prints with less effort. There is no reason you should have to learn software development too when you should just be making pictures.

## Overview

This manual starts with setting up your system to work efficiently from the beginning. In the several years of teaching people how to use QuadToneRIP, I've found that the details of navigating the file system on the Mac and the folders for the profiles, curves, and measurements can get in the way of actually printing. I first start with how to install QuadToneRIP, find and set up the correct folders for your printers, and explain the parts of QuadToneRIP we will use for printing.

Then we go through all the tools included in the software and some ways to use them. This software does a lot, and you might not need all the tools when you first start, but they are there for you to use as your skills and needs progress.

The quick-start section is meant for people with the standard K3-style ink sets but wants to go beyond the built-in curves. This is where you'll make your own custom .qtp profile with components built around your specific paper to preview the blend of your toner settings—whether that is a dead neutral or a custom split-tone print.

The custom curve creation section is for people wanting to perfectly dial in their standard K3-style printer, ink, and paper combinations or go all in to make custom ink sets with up to 8 gray inks and color toning inks.

# Installing and Setting up QuadToneRIP

If not already done, install the latest version of QuadToneRIP, DataTool, and Print Tool from:

www.QuadToneRIP.com/downloads

## Setting up QuadToneRIP

After installing QuadToneRIP from the main installer package, you might ask, now what? Where did it go?

The great thing about using QTR on the Mac is that once you set up your printer and install the curves, QTR is just part of the printing system on the Mac. You can print with it anywhere you can press command+p to print. Ok, but WHERE is QuadToneRIP? Unfortunately, this is where people get tripped up right from the start.

QuadToneRIP needs to have components installed in two different places on your computer. The actual QuadToneRIP folder with all the stuff you would usually expect to work with will be installed in the usual Applications folder and is easily accessed. The QTR folders and files used for the actual printing are buried in the Library folder, deep within the file system. The good news is that you'll use very little of any of the stuff in the QuadToneRIP folder and will really only need to find or make shortcuts to two folders.

The next several steps detail precisely how it should be done. Just note, I **highly** recommend setting the Finder to show everything in List view (command+2). I also recommend double-clicking (or press command+o) to open each folder in its own

window and **not** use the little disclosure arrow to drill down into each folder. Using the disclosure arrow will open long lists of files that will make it harder to navigate to where you need to go.

# The QuadToneRIP folder

As I said, you will need very little of what is in the QuadToneRIP folder. The one you will go to the most is the Profiles folder with all the QTR-supported printers. Each of these folders will have an Installxxxx.command file (generally known as the installer command) and several text files. The text files are generally referred to as "profiles" (or less confusingly, "ink descriptor files"), and they will have either a .qidf or .txt extension. The text files contain the recipes for the printer/ink/paper combination that the QTR curve creation program needs to make the .quad files used for printing. Don't worry. If you are using my software, you will NOT need to use these text files or know what any of their settings mean. Just ignore them. Better yet, I recommend duplicating the folder for your printer, and deleting all the text files in it.

## Folder for your printer? Which one is that?

When you open the Applications/QuadToneRIP/Profiles folder, you will see an extensive list of printer models. You will need to find the folder that has the same name as your printer model. There are some folders that apply to multiple printer models in the same family, like the 4900, 7900, and 9900 or the P6000 and P8000. In these cases, it is best to create a new folder for your printer model and add "-QTP" or some way to indicate the installed ink set. Ex: my K5+CMY printer is called 3880-K5CMY, or my 9880 with PiezoPro inks is called 9880-PZP. You would then change the name of the install command to reflect that printer model name. Follow the detailed steps below and refer to the illustrations if needed.

# Installing QuadToneRIP and the Quad Printer Step-by-Step

- Create a new QuadToneRIP profiles folder for the QuadToneProfiler curves
- Open the QuadToneRIP application folder
- Open the Profiles folder and find the folder for your printer model and duplicate it.
- Change the name to (printer model)-QTP (ex: if you have the P800, find the P800-UC folder and duplicate and then rename it P800-QTP) and then add it as a shortcut to your Finder sidebar (drag the folder to the sidebar)
- Open the duplicated and renamed folder and delete all .txt quad ink descriptor files, so only the install.command file is in the folder.
- Change name of the install.command file to install(name of renamed folder).command (ex: P800-QTP.command)

- Double click the install command to run the program that will create a new Quad printer with the name of folder or name of install command (ex: QuadP800-QTP).
- Running the install command will always open a new macOS Terminal window and display some output that should look like the screenshot below.
- Navigate to the Quad printers folder by clicking he **Go** menu the Finder menu bar and choose **Go to folder** (or simply activate the Finder and press shift+command+G) and copy and paste **MacintoshHD/Library/Printers/qtr/Quadtone/**. Locate the newly-created Quadxxxx folder and add it as a shortcut to the Finder sidebar. This folder is where you will be save the .quad files that you will use when printing.

# The install.command file

Theoretically, the install.command file can be anywhere on your computer, but in practice and for ease of use, I recommend people put it with all the other QuadToneRIP related files in the QuadToneRIP/Profiles/YourPrinter folder.

When you first run the install command, it looks into the MacintoshHD/Library/Printers/qtr/Quadtone/ folder to see if there is already a folder called Quadxxxx (or whatever the install.command file is named). If the folder doesn't exist, it will create the new folder, attempt to create the new virtual Quadxxxx printer, install any .quad files, compile any .txt quad ink descriptor files in the Profiles folder, and then add it to the list of connected printers in the macOS printing system.

If the Quadxxxx folder already exists, it looks at the list of available printers to see if there is already a virtual printer named the same as the Quadxxxx folder. If there is, it will install or update any .quad media settings files within the Quad printer folder, making them available to print later.

While not used when working with the QuadToneProfiler software, another essential aspect of the install command needs to be understood. The install command is also responsible for compiling any ink descriptor text files within the same folder into a new .quad file into the Quad printer folder. It will also COPY any existing .quad file in the same folder as the install command to the Quad printer folder. Compiling and copying the quad files is something that always trips people up, and is why I recommend duplicating the folder and deleting all the .txt files first. It is also why I recommend adding any .quad files saved from QuadToneProfiler directly to the Quadxxxx folder for your printer and only running the install command to make them available to print with (rather than allowing the install command to copy them from the Profiles folder to the Quad folder).

## Deleting unused quad files

The install command will also update the printing system so that any deleted quad files will be removed from the list of available media settings to choose from the curve

menu options in the QuadToneRIP print dialog screen. If you want to delete any used .quad files, simply go to the quad folder for that printer and put them in the trash, and re-run the install command to update the printing system. This is also why I recommend putting the .quad files only in the Quad folder. If the .quad file is in the Profiles folder and the Quad folder, it will need to be deleted from both folders.

# Measurement File Organization

One of the hardest things for people to handle when working with QuadToneRIP is keeping the curves and measurement files organized. It is fairly easy to manage when you have one printer and a few papers, but can get a little chaotic when multiple printers, ink sets, and more than a small handful of papers are being calibrated.

I think I have come up with a straight forward file structure for the measurement files and curves that should help set things up correctly from the start.

I like to group everything around the printer/ink set, then paper, then step in the calibration process.

For the custom curve creation and custom .qtp file creation this app is build around, I recommend a file structure like this

- Printer/Ink set
    - Paper
        - .qtp files for this printer/ink set/paper
        - Ink Separation Image Measurements
            - Separate Measurement files to partition the grayscale and each color ink groups
        - Partitioned Quads and Measurements for Grayscale and Color Tint Linearization
            - Save the partitioned curves to install and the measurements after printing.
        - Corrected and Blended Quads and Measurements
            - New: Save .qtpc single profile component files here for blending into new .quad files.
            - Optional:
                - Save the gray linearization and corrected color curves and then blend with the linearized gray inks.
                - Save the measurements from the blended .quad files.
        - Final Linearized Quads and Measurements

- Save the linearized quad files and measurement from them to be used to create the components for the .qtp file

# Printing with QuadToneRIP

QuadToneRIP will be available system-wide after installing your printer and any media settings, so you can print from whatever application that supports printing.

Getting to the QuadToneRIP print dialog options can be tricky the first time you do it because of the default state of the macOS print dialog window. If a small window like this appears, press the “Details” or “More options” button to expand the window to show the QTR options.

Press the button that says “Layout” to open the pop-up menu to reveal the other available settings in the print dialog window. Choose QuadToneRIP from the list to get to the mQTR-specific settings. There are three printing modes to choose from: 8-bit, 16-bit, and Calibration. I always use 16-bit printing because QTR allows for printing 16-bit images and will interpolate the 8-bit ink levels in the .quad file to 16-bits if the image is also 16-bits. Calibration mode requires specific 8-bit RGB images used to print each ink in the printer as a separate channel without any blending from the other inks. Calibration mode will be covered in the Custom Curve Creation section.

Normal 8 or 16-bit printing modes will allow you to choose media settings for Curve 1, and optionally for Curve 2, and Curve 3 for split toning. These settings in the print dialog window are where the name “QTR Curves” comes from when referring to the .quad media settings files (not to be confused with correction curves for inkjet negatives). Just remember Curves == .quad files == printer media settings.

## QuadToneRIP Media Settings

The media settings you choose for normal color printing with the Epson driver (and the fine-tuned with ICC profiles) are essentially what you are creating when making a linearized QuadToneRIP .quad file. The printer manufacturers create internal driver-specific settings containing the ink levels for the black and color inks for a few papers. These internal media settings tell the printer how to translate the RGB values in the file to the percentage of CMYK ink dots on the paper. QuadToneRIP bypasses the standard Epson driver and is why we need to make our own grayscale media settings. The nice thing is that my tools allow you to do what Epson does to create their media settings but is dedicated to printing grayscale images and allows for unlimited customization of the ink sets and not being locked into the predefined Epson inks and settings. It also means that we can tailor the media settings for YOUR printer, paper, and sensibilities and not rely on ICC profiles and color inks to control the overall density and gray

balance or color toning in the print for our selected paper. It might require a few additional steps at the beginning, but the results in the final prints are well worth it.

# QuadToneProfiler-Pro Custom Curve Overview

The traditional way of printing with QuadToneRIP is to have a set of linearized K3, Warm, Cool, Sepia, and Selenium-tones .quad files that you would blend in the QuadToneRIP print dialog. You would need to wait until after printing it to see what color the blended curves produced. I built QuadToneProfiler-Pro around the idea of seeing the tone and color of what your print will look like BEFORE you print it. Of course, this is easy to do with a colorized black and white image saved and printed as RGB and through the standard Epson driver and ICC profiles. But that doesn't allow for customizing your printer and means you're locked into Epson's color blending and gray curve reproduction.

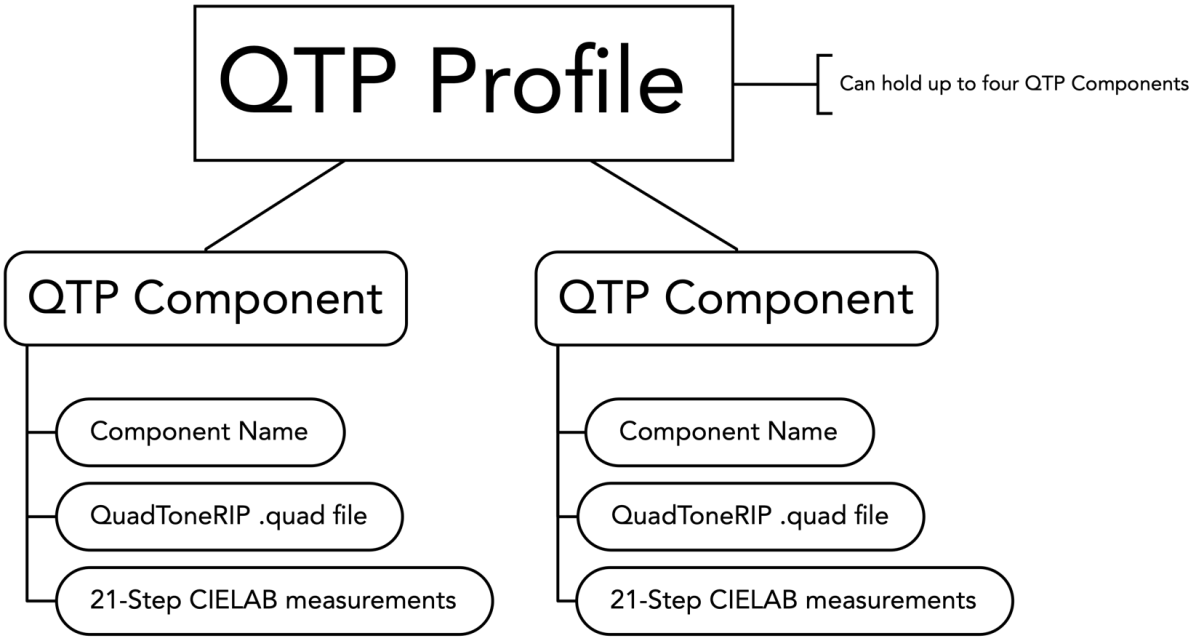
I built the custom toner and curve blending tools around a special QTP-specific file that contains the .quad curve ink levels and the CIELAB measurements for up to four separate toner components. This approach allows for incredible flexibility and predictable color when blending the different components and types of ink sets. It is capable of working with a standard K3 + CLcMLmY, PiezoPro, Paul Roark's Pure Carbon + Blue toner, or custom-dilution ink sets like my K6 Carbon + CM or K5 WN + LcLmY.

The general idea of the profile creation process is to make the black and gray inks into a base grayscale component. Then you make blends of the gray curves with each different color in the ink set to create the low-gamut color components. For example, when using a standard K3 ink set, you will make a linearized K, LK, LLK curve and then blend it with the C/Lc, M/Lm, and Y curves to create four composite components. You then save these combined components into a new file format specific to QuadToneProfiler-Pro called a .qtp profile.

The QTP profile can then be loaded into the custom curve blending screen to preview the color of the blended components before saving it as a new .quad file for printing through the standard QTR interface. What differs from the traditional QTR printing workflow is that since you have already previewed the color of the blend of components, you don't need to go through the split-tone curve blending settings in the QTR print dialog window.

## The .QTP Profile

The new .qtp file is a container for up to four custom QuadToneProfiler Components. The QTP Components contain the name for the component, the QTR quad curve values, the 21-Step CIELAB values from the quad curve. You can also save individual components as .qtpc files from the Linearization and Quad Blending tools.




The .qtpc file is a simple wrapper around the .quad ink values and LAB measurements to enable you to load a single file in the Quad Curve Blending and Profile Manager modules.

As of now, the .qtp and .qtpc files only support standard 21-step LAB measurements, but will be updated in the future to hold up to 256-step LAB values for even more accurate blending and color previews.

# QuadToneProfiler-Pro Quick Start

The fastest way to get started (if not using a custom or dedicated black and white ink set) is to use the pre-built curves for the standard K3-style printers. These are based around quad curves and measurements from a neutral paper base and will give you a good starting point to experiment with QuadToneRIP without diving headfirst into the custom curve creation components. (If you DO want to dive right in, feel free to skip to Part 2, where I throw you into the deep end.)

## Starter Curve Setup Screen

The starter curve setup screen has matte and glossy curves and toner settings for most standard K3-style printers. Choose the printer model, black ink setting, and toner setting and save the starter curves to your Quad printer folder and run the curve install command for that printer.

There are options for creating custom split tones with the custom toner settings and by adjusting the C, M, and Y component sliders based on the color you want to achieve. The blended curves will be very good and linear for getting started, but for

best results, you should consider a final linearization due to differences in your printer and paper from what I used to build the initial starter curves.

# Custom .qtp file from pre-made components

If you are using one of the standard K3 printers and what to create a new custom .qtp profile for your specific ink set and paper, you can do so quickly in two rounds of printing. The first round is to linearize the separates components, and the second is to print and measure the linearized curves to load into the custom profile manager.

You will first need to install the four quad curve components into QTR to linearize for your paper.

- Copy the four quad curves for those components to the QuadPrinter folder and run the QTR install command for that printer.

Print a linearization target for each quad curve component and then thoroughly dry and measure the target.

## Linearize each component

Open the measurement file and associated quad curve in the linearization screen, do any necessary measurement data smoothing and save the linearized quad file back to the Quad folder for your printer. *

- Run the install command again to enable printing with the linearized quad files and print a final 21-step target with each linearized quad curve.
- Measure the final 21-step target from each of the linearized components.

* Please refer to the section on linearization for more details about all the linearization options and workflows.

# Using the Custom Profile Manager

## Creating a Custom .QTP Profile

- Press Command+5 or go to the QuadToneProfiler-Pro menu and select Window -> Custom Profile Manager
- Click the tab on the right to select the Profile Manager
- Click the Add Component button to bring up a new window that will allow you to select the name and the linearized quad file and measurement file for that component.
    - Name the profile components with short names like Black, Cyan, Cool Warm or Neutral

    - You can abbreviate the inks with C, M, Y, but the components will be listed in alphabetical order in the Custom Curve Blending window, so don't use K to abbreviate Black in these component names.
- Press the finish editing button to return to the previous screen, press Add Component, and go through the same process to create the next component. Repeat for each of the components you have for your ink set. If you need to edit the component from the Profile Manager screen, you can double click the name in the list to open the Component Editor screen to change the name, measurement file, or quad file.
- When you finish adding or editing all the components, press the button to save the new custom .qtp file. There are no special file name requirements for the .qtp file, so I generally name the profile like this
    - Printer Name and Inkset
    - Paper Manufacturer
    - Paper Name

## Blending Custom .QTP Profiles

Click the tab on the left to switch to the Custom Component Blending screen

- Drag your .qtp file from the finder or press the Open QTP Profile Button to load your custom profile.
- The sliders will activate with the number of components in the profile, and the names will appear above the sliders.
  -The blended output color ramp and graph of the LAB a* and b* channels will appear and update when you adjust the component blending sliders

The sliders are grouped as Highlight, Mid-tone, and Shadow tonal groups and control the shape of the blended components with a smoothed-step interpolation. The ink-level balancing formula will increase or decrease the value of each component in proportion to the total values from the sliders from each tonal group.

You can turn off the component by dragging the slider to 0, and it will not update or increase when changing any other slider. That also means the top-most slider won't move until you increase one of the sliders from one of the other components in that tonal group

You can also preview the color of the blend on an actual image by pressing the Preview Image button and then open an image into the new window.

The Dmax can be mapped to the LAB L* value in the blended measurements but might appear blocked up and low contrast when using matte papers. You can turn off the preview Dmax check box, which will scale the LAB L* values from 99 to 1 to give a better idea of the color in the actual print.

When you are happy with the color of the blend, save the new .quad file that you will use to print in the QTR print dialog. Since you built the toner or split-tone blend

into the single quad file, there is no need to use the curve blending tools in the QTR interface; simply choose the blended quad as Curve 1 menu in the print dialog window. Additionally, since the saved quad file is a blend of previously linearized quad files, there is no need to do another round of linearization.

## Blending other custom curve settings

You can now use the same .qtp file to save other toning blends that you can save as .quad files

## Going one step further with new .qtp profiles from blended components

Once you make a neutral, warm, selenium, and cool set of quads, you have the option to make a new .qtp file with those curves and measurements as new components. You will need to print and measure a 21-step target from each quad curve, create a new .qtp file in the Profile Manager tab, and add new components with the quad and their measurements and the new .qtp file.

# Custom Curve Creation with QTP-Pro

## Partitioning

One of the more powerful features of QuadToneProfiler-Pro is the custom curve creation program that will generate new .quad files for any combination of gray or color inks through a process known as “partitioning.” The QTR curve creation program uses settings manually calculated and entered into the ink descriptor text file to determine the partitions.

I created a new partitioning algorithm for QuadToneProfiler-Pro that is much different from the traditional QTR curve creation program. The Custom Curve Creation system revolves around measurements of each step from the whole ink separation image, rather than only using the individual ink limit and manually calculated cross-over point for each channel. Having measurements from each step allows the profiling application to re-interpolate the full scale of the inks at any ink limit and automatically calculate the cross-over points to partition the inks. The initial quad curve is automatically created and updated in real-time when editing the overall ink limits and each channel’s starting and ending overlap settings. An approximate correction curve is automatically calculated from the rescaled measurements from the densest ink and applied to the initial curve to adjust for the non-linear density increase in the printer’s native output. You can then manually edit the base quad curve with a boost or gamma adjustment for all channels and manually edit each curve on an ink-by-ink basis.

# Overview of the Custom QTP Profiling Workflow

- Create, print, and measure the Ink Separation Image
- Create the custom base gray and toning curves from the separation image measurement files
- Linearize the base gray and color toner curves
- Blend gray and toner curves into .qtp profile components
- Linearize and measure blended toner components (suggested, but optional)
- Create the .qtp file from components
- Use the .qtp file to preview the color blend and make the quad curves for printing.

## Creating the Ink Separation Image

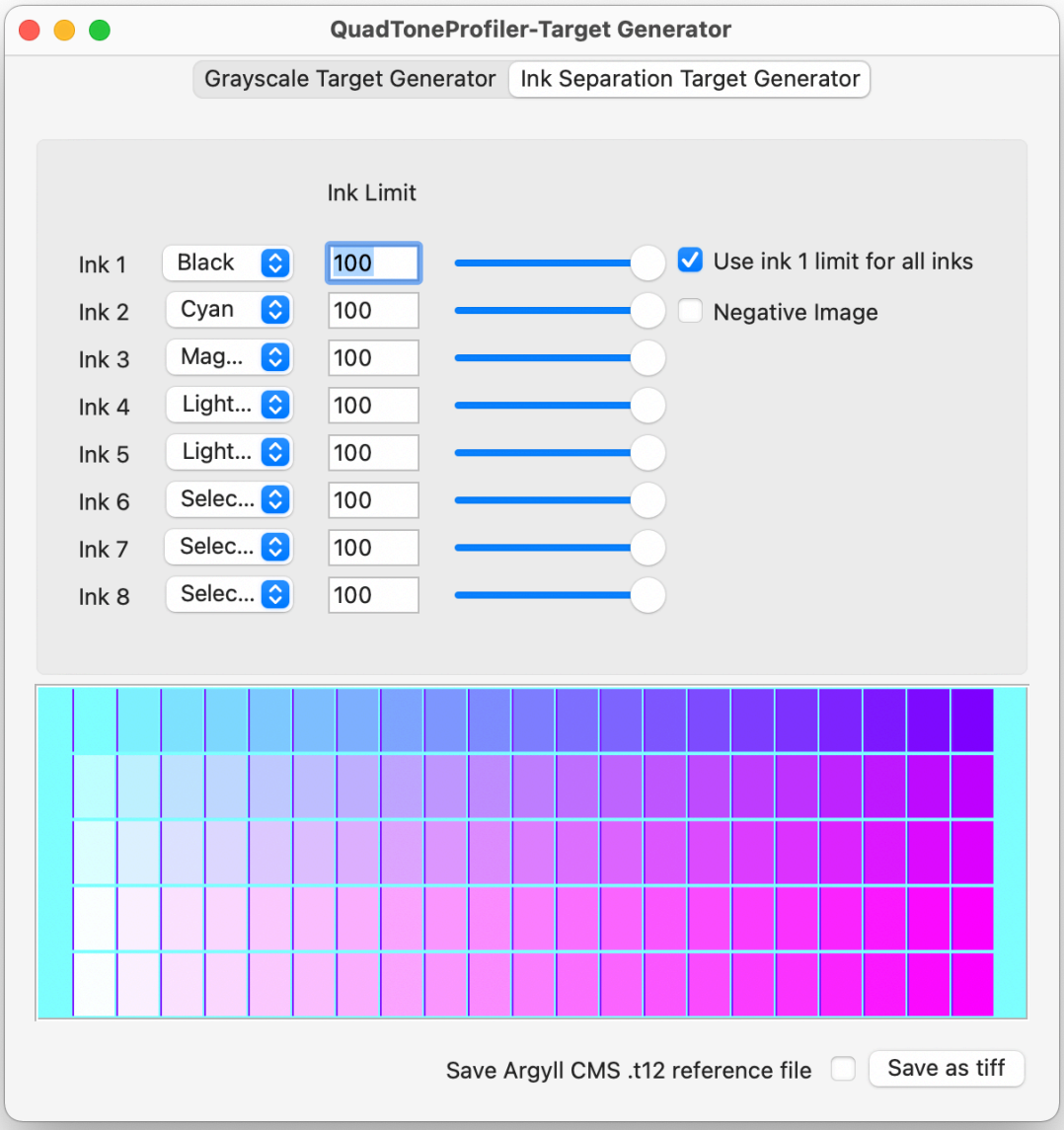
The first step in creating curves for custom ink sets is to generate a new ink separation image for your ink set.

What is an ink separation image? It is a unique 21-step target with specific RGB values that determine *which ink* and how much of that ink to print each color patch in the image. You will notice that each line is a different color, but they all have 21-steps, with a small separator between each path. The R and B values control which ink to print, and the G value controls how much of that ink is printed for each pixel.

There has always been a set of standard ink separation images included in QuadToneRIP, but there was never a way to print each row at different ink limits or in different orders without manually editing the standard images or printing each ink row individually with different calibration mode ink limit values. To solve this, I made a simple target generation program to create these 21-step targets for the standard NPS inks in any order and with different total ink loads for each channel.

Note: The settings for different ink loads in the separation image are not used in this workflow and are there for other uses not related to my profiling software.

## Target Generator Ink Instructions




- Open the Target Generator app and choose the ink separation image tab.
- List the ink channels and cartridge positions in order from most dense to least dense. In this workflow, you must use an ink limit of 100% for all inks. (You can use the button next to the top ink slider to control the limits for all the channels.)
- List any color toning inks below the gray inks and the denser toner ink (of the same color) first if the toner color has multiple dilutions (ex: C, LC, or M, LM).

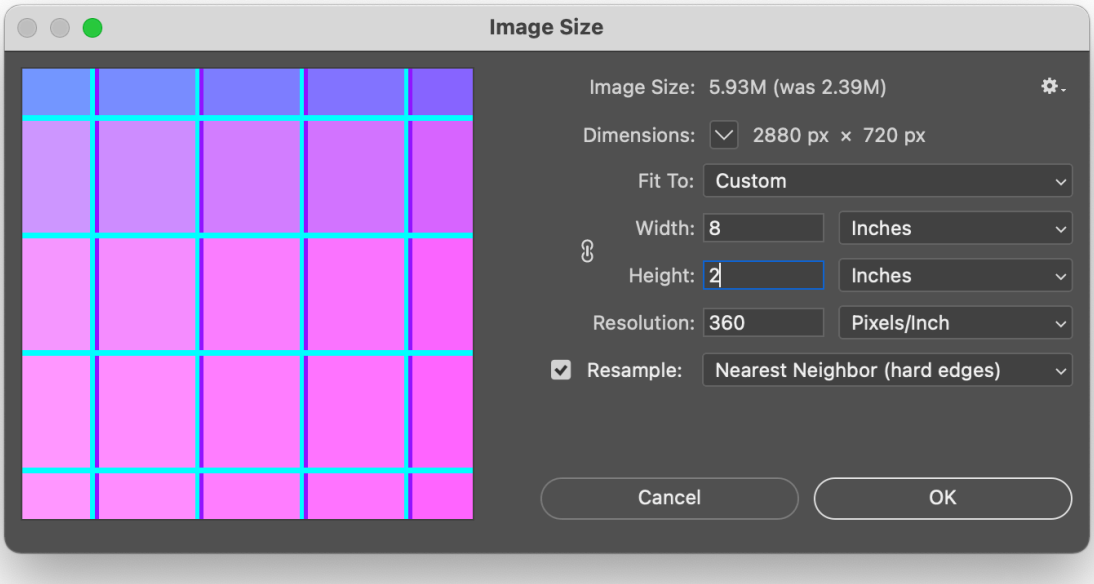
- Save the target as a tiff
- Note for Argyll CMS measurements: You will need to save the gray ink separation image separately from the color ink separation images so that you can also generate the .ti2 reference files that are used with the Argyll chartread program.

## Editing the Ink Separation Image

At the moment, there is a problem with the way macOS saves the image from the TargetGenerator app in that the print size and resolution are not included in the tiff metadata. To fix this, open the image in Photoshop and change the image size and resave the file.

Note: Before opening the file, make sure your Photoshop Color Settings (in the Edit -> Color Settings menu) is set to ask or ignore and not convert images with missing ICC profiles or untagged color spaces.

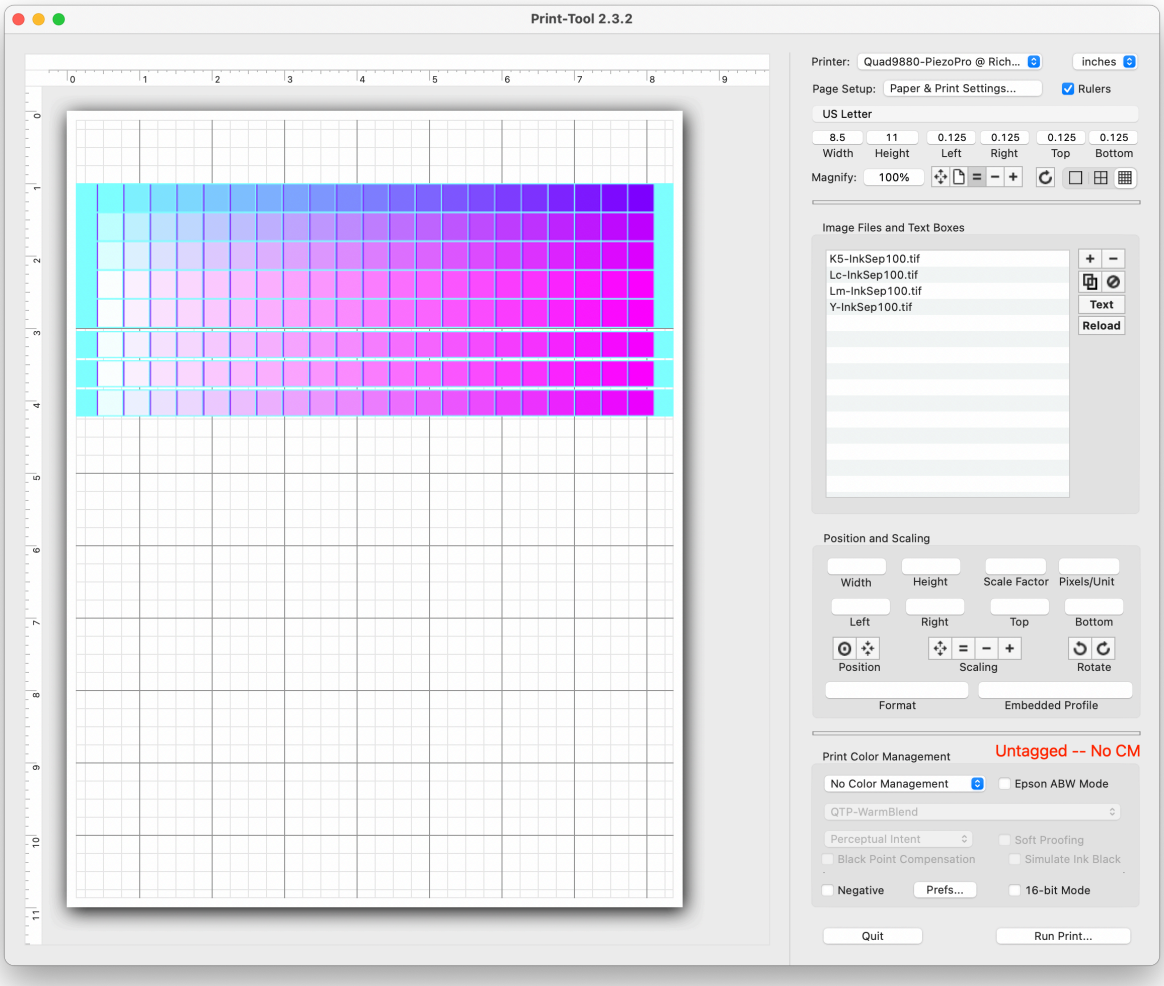
Open the saved tiff in Photoshop and make sure there is no assigning ICC profile or that Photoshop is not converting the image to the working color space when you open it. Converting to or assigning the working colorspace will change the particular RGB values in the separation images, and QTR will not print the ink ramps as individual channels. It will most likely cause a big mess of ink for you to clean up.




- Open the Image Size panel by selecting the Image -> Image Size menu item (or press command+option+i).

- Change the height, width, and resolution with the resampling algorithm set to **Nearest Neighbor** to ensure the resampling algorithm does not alter the particular RGB values in the separation image.
- I generally recommend the height of each patch be slightly taller than it is wide by unchecking the constrain proportions option and adding 0.5-1 inch to the height of the target.
    - I recommend the following sizes:
    - Width: 8.125-8.25 inches
    - Height: 1.5-5.5 inches, depending on the number of channels in the separation image
    - Resolution: 180 or 360 pixels per inch
- Save the file with no color management or embedded ICC profile and open it in PrintTool.

## Printing the Ink Separation Image



1. Load the ink separation image into Print Tool and arrange it so that there is enough border to prevent printer marks and give enough room for handling.
2. Make sure No Color Management is selected in the Print Tool color management section (found in the bottom right area of the Print Tool interface).
3. Press Print or the Paper and Print Settings button, and click the Layout button to access the menu for the QuadToneRIP printer dialog settings.
4. Go to the Mode menu and select Calibration. Then set the ink limit slider to 100, which will disable the curves 1, 2, 3 menus.
5. Set the printer to unidirectional and the highest resolution available.
6. Optional: Save the settings as a preset called Ink Separation or Calibration Mode and make sure to select "Only this printer."
7. If you selected Printer and Paper Settings to set up the QTR driver options, press Print or command+p and ensure your saved preset or Last Used Settings is selected. If not, press the Layout menu to access the QTR dialog options to make sure you're printing in Calibration mode with the ink limit set to 100

## Measuring the Ink Separation Image

### i1 Profiler

The easiest method of measuring the separation image is as a generic target in single scan mode with i1 Profiler.

- Open i1 Profiler and check the advanced button to enable the additional options on the left side of the window. Find the RGB printer section and select Measure Chart.
- Define the size of the target for one row for each ink you are using in the gray base curve (don't duplicate channels, dilutions, or include the color inks in this step). Set the target to have 21 columns.
- Calibrate the i1 Pro device and set it to single scan mode (M0).
- Measure each row from the darkest ink to the lightest, from the white patch to the 100% patch for each row.
- Name the file for your printer, ink set, and paper, and then add "-InkSep-100".
- Choose "CGATS custom..." in the file type menu at the bottom of the window and press save.
- A new window will open with the save options. Check the boxes for LAB values, a period as a decimal separator, and a scale of 0-100. I recommend saving the name and location info, but it isn't necessary.

**SpyderPrint and Manual Densitometers**

The measurement format for the SpyderPrint or manually entered values requires you to measure by column (the opposite of i1 Profiler)

**SpyderPrint Setup**

- Open SpyderPrint, and with the device on the white calibration tile, press command + k to calibrate.
- Press command + m to open the measurement window.
- Press the export button and name the file.
- Check the CIELab and save row numbers options

**Manual Densitometer Setup**

- Use a plain text editor like Text Edit, BBEdit, Sublime Text, or a similar application.
- Open a new file and type **Density** on the first line, followed by a single line return.
- Note: If using a manual densitometer, type the density value for each patch on a new line, with no additional spaces, notes or comments, or extra line returns between each line.
- When readings are less than 1.0, use a 0 before the decimal place. (Example: 0.07)

**Measuring**

- Starting with the white patch in the darkest ink row, measure the corresponding density patches for each ink. Ex: Measure the paper white patch for each row of gray inks.
  - Then move back to the 5% patch of the darkest ink, measure, and then each of the next lighter inks
  - Repeat for each 5% patch in each row until you measure the Dmax patch for each ink and then press “Done.”
- Close and reopen the measurement window, press the export button again to go to the default save location, and move the file to your measurement files folder for that paper and ink set.

**Argyll CSM for i1Studio/ColorMunki or older i1 Pro devices with Apple Silicon (M1) Computers**

Argyll CMS is a powerful but complex ICC profile creation command-line application. Using Argyll will enable you to use ColorMunki or i1Studio devices in ways that their limited dedicated software won’t allow. Argyll CMS can also let you use older devices that require software that doesn’t run on later versions of macOS. The command-line interface can be intimidating, but I made a simple copy and paste command that you

can use that makes it as easy as possible. See the instructions here for how to run the chartread command for any step that requires measurements from Argyll CMS

**Note:** Be sure the save the Argyll CMS .ti2 reference file when creating the ink separation file.

# Creating the Base Curves

Open the Custom Curve Creation screen in QuadToneProfiler-Pro (command+shift+n).

## Custom Curve Creation Interface

### Ink selection and ink controls

The top half of the screen has controls for each ink channel, and the inks are in order from darkest to lightest. There are drop-down menus to choose the cartridge position for each shade, followed by sliders for the Ink Limit, and controlling the start and stop points for additional overlap each channel has with the neighboring shades.

### Measurement Graphs and Visual Color Displays

The L*a*b* L* values are graphed in the lower left of the screen. Paper white will always be at the top left of the graph, and all the inks will start at the same point and diverge to their respective Dmaxes (there is a problem with the format of your measurement data file if they do not start at the same point on the left. Double check your measurements before proceeding). The software will recalculate the L*a*b* L* values, and the graph will update when the ink limit sliders change.

You can press the show inks button, and a floating window will open with a 21-step 5% scale for each ink. You can click on any of the patches to temporarily display a color readout of the L*a*b* value. The sample and readout will update when the limit slider changes for that ink as well.

### Quad Curve Graph

The graph on the lower right shows what the partitioned quad curve will look like as ink percentage values for each channel.

The horizontal axis represents the image tone from white on the left to black on the right. The vertical axis shows the percentage of ink the printer will use for the corresponding image tone.

# The Base Gray Curve

## Printer Model Settings

Select the printer model you are using from the drop-down menu to load the available inks in the ink selection drop-down menu associated with each channel. (There will only be one available ink channel until you load the measurements from the separation image.)

Many printer models share the same number of channels and ink channel names, so they have been grouped in the drop-down menu. For example, the x800-x880 option covers all 8-ink printers from the 2880 and 3800 to the 9880. Most common printer models are supported, but if you don't see your printer model or the cartridges that match names in the drop-down menus, please submit a support request for that printer.

## Loading the measurements

Open the measurement file from the ink separation image for the gray inks. You can drag it from the Finder into the Curve Creation screen or press the Open Measurement File button.

If there are no errors in reading the measurement file, the program will automatically calculate the number of inks used and then enable the ink selection menus and the ink limit and overlap sliders. The program calculates the number of inks used in the profile because it expects groups of 21-step measurements. So it just divides the total number of measurements by 21 and then enables the drop-down menus and sliders for that number of ink channels.

The program will also graph the LAB L* densities for each channel in the chart on the left and an initial quad curve in the chart on the right.

Use the drop-down menus to define the ink channels from top to bottom in sequence from darkest to lightest. Use the same order listed in the Target Generator software or the order in which you measured them.

Note: The color for each ink in the graphs might not correspond to the actual position used until you select the correct order of inks in the drop-down menus for each channel.

## Ink limits

The term ink limit refers to setting the maximum number of dots a channel will use. While you might set the ink limit slider to a specific value, it will might never actually output that much ink due to the overlap from the other inks in the printer.

The reason to use an ink separation image with the maximum ink output and print it with the calibration mode limit set to 100 is that QuadToneProfiler-Pro can then use the original measurements in the 21-steps to rescale full tonal scale and LAB values for

whatever limit you set with the sliders. This approach allows the program to automatically calculate the crossover points for all channels and partition the initial ink curves in real-time.

### Setting the Ink Limits

Set the limit for darkest ink first. It doesn't have the be the absolute darkest value, but where the line on the graph starts to flatten out, or the point where there isn't an obvious visual difference between one patch and the next. The partitioning and initial correction curve will be better, and the Dmax can be boosted in a later step. Be sure to note what ink limit is needed to achieve the desired density.

Then set the ink limit for the lightest ink. The value will depend on the number of inks used and the overall dilution of that ink, but a good starting point is a LAB L* value between 80-75 or where there is an ink limit setting between 50-70.

You can then set the ink limit for each of the other inks so that there is roughly even space between each of the ending points on the LAB L* graph and consistent distribution of ink in the initial quad graph.

## Setting the overlaps

You can change the starting and ending overlap points on an ink-by-ink basis to fine-tune the amount of coverage by adjacent ink channels for smoother prints with less perceptible ink dots.

The total ink loads will be rebalanced, and the shape of the curves will change based on the amount of overlap from each channel. There is a point where too much overlap starts to cause problems with the ink balancing formula, and the shape of the curve changes drastically. The goal is to find the right balance of overlap and smoothness of the partitioned ink channels. Don't worry about slight bumps in the downward slope when adjusting the ending overlap; that can be corrected in the next step.

Once you are satisfied with the ink limits, overlaps, and general shape of the ink channels, press the Edit Custom Curve button to open the Curve Editor Panel.

## Editing the base gray curve

The custom curve editor panel allows you to choose individual channels and manually adjust the partitioned curve to smooth out any bumps and create smoother leading or trailing edges of the ink ramps.

### Gamma and Boost

You can change the whole scale by changing the gamma and boost sliders. The gamma slider will affect all the inks by "moving" them to the right or left, and has the effect of lightening or darkening the print without changing the overall ink level for each channel. The partitioning system always adds a little too much ink in the

highlights and mid-tones, so I recommend starting by changing the gamma slider so that the inks move to the right slightly. The actual number is dependent on the total number of inks used, and custom ink sets with more gray inks tend to need a slightly higher gamma setting. A good starting point is 1.15-1.3.

The boost slider will increase the ink load at the right end of the scale (where the shadows values in the print will be). You can boost the shade one ink channel by itself or all the inks together by checking the boost all inks option.

Change the boost amount to get the shade one channel back to the ink limit value to produce the desired Dmax. I recommend changing the Boost after any edits to the individual channels. *Just make sure the value of the label below the slider does not go past 100. (There is a known issue where the slider doesn't stop when the ink limit goes above 100 but will be solved in a future update.)*

## Editing individual ink channels

Choose an ink name from the drop-down menu to load that channel with editable curve points. The editor will take a percentage of all 256 values to create a subset set of editable points and recalculate a Bézier curve from them.

Click on one of the points to select it. While you can use the mouse to drag the point to change the shape of the curve, do not use that method to reshape the ink curves at this stage. I recommend clicking the lower-left corner of the graph in the editor screen to select the first point and then use the tab key to cycle forward through the points (or shift + tab to cycle backward). Use the arrow keys to move the points by 1 pixel in any four directions (or shift+arrow keys to move the point by 10 pixels to make faster changes).

It is generally better to only change the selected point up or down to prevent any distortion in the recalculated and smoothed ink curves. The goal is to only slightly adjust the general shape of the up or down slopes and correct for distortions in the curve from the initial overlap and ink balancing controls. Do not change the ink loads at the top of the curves too drastically.

When you are happy with the shape of the curve preview in the editor, press the Accept button, and the software will create a bézier curve for the final ink channel using the x and y values for each point, and take you back to the Curve Editor Screen to select the next ink. Pressing the option key when you move your mouse over the Accept button title will change to Reset and return to the curve editor screen without applying any changes to the ink channel.

I recommend starting with the inks from light to dark, and to NOT manually edit the shade one channel. The shade one channel has too many values at the extreme right edge of the scale and might not be as smooth as if you left it alone and only used the boost slider to change the ink level. Use the illustration below as a guide for the before and after of the edited channels.

Press the Finish Editing button when you are satisfied with the shape and smoothness, and it will take you back to the Custom Curve Creation screen and show

the edited quad curves in the graph on the lower right. **IMPORTANT** Changing any slider in the main curve creation window will recalculate the initial partitioned curves, and you will lose any changes you applied in the quad editor screen.

Press the Save Quad File button to open a standard save dialog window and name and save the base gray curve (see Quad File Naming below). If you are using color toning inks, stay in the custom curve creation screen to open the measurement files for each color group from the ink separation print.

If you are only making a single grayscale curve, you can now close the custom curve creation window, install the base gray curve, and proceed to the linearization step.

**Quad File Naming**

***Note:** There is a QTR-specific file naming requirements for the .quad files. There is a 37-character limit in the file name, and it can not start with a number, and it can not have spaces or other special characters. Use underscores or dashes between components in the file name. A common pattern is to use the name of the paper, the ink set, and the color components. An example for HAHN PhotoRag with the base gray inks for a K6 carbon ink set might be HPR-C6 or HPR-K6-Carbon. The color toning components for that paper would be HPR-CLc for a 2 part cyan curve or HPR-Blue if using a single blue toner. The save step will automatically add .quad extension so you don't need to type it manually.

***Warning:** Changing any setting at this point will reset and override any changes to the edited quad curves.

# Creating the Toning Curve Components

## Loading the toning measurements

Load the measurements for the ink separation image the same way you did the gray ink measurements. You will notice the density graph on the left will only show the color inks, and the lab L* values will be much lighter than the gray inks. It will also do an initial partition of the quad curve and graph that on the right.

## Setting the toning curve limits

Set the ink limits for the color inks works the same as the gray inks. The color inks will need to start darker than you will eventually print with to allow for a high enough ink load to change the color when they are later blended with the base gray curve. I generally recommend an ink limit of between 50-70, depending on the color used. (Ex: Cyan will usually appear darker than magenta).

If you are using a CMY style ink set, try to set the limits for the M and C inks so that the L* values are relatively similar. It is better to start with the magenta inks because they will not reach as high of a density as the Cyan inks, and it is easier to lower the Cyan limits to match the L* value in the Magenta inks.

An automatic correction curve based on the L* values will be applied to the initial curves and will need to be fine-tuned later in the color tint linearization step. You can now edit the base toning curve similar to the gray curves to smooth out any bumps or inconsistencies from the automatic correction or the starting and ending overlap settings. Finish editing and then save the base color toning curve to the Quad printer folder.

Repeat the process for all the color components you will use in the ink set, and then install the .quad files and print the linearization targets.

## Installing the base curves

Open the Profiles folder for your printer and double click or press command+o on the install command. A new Terminal window will appear, and the installation program will go through all the steps to update or install the .quad files in the Quad folder. You should see a list of .quad files installed successfully and any errors or problems with any .quad files that didn't install. Please note any errors in the output for troubleshooting or to include in any support requests.

# Linearization

Linearization is the process of using measurements from a print and corresponding quad curve to match some desired output. It essentially defines what the output should be—either a straight line from the paper white to the Dmax or some custom set of values you choose—and creates a look-up table to determine what set of ink values will produce that final output in the print.

## QuadToneProfiler Linearization Interface

The linearization window is divided into two main sections.

The left side has a table for the measurements in a list from light to dark. You will see 21-step placeholder values when the screen first launches, and the list will update with the values from the opened measurement file. The chart on the left side of the screen will display graphs for the measured, smoothed, and output values. The buttons below the chart open additional panels to preview the original and corrected color patches, preview the original and corrected output with an actual image, and adjust a custom output curve.

The right side of the screen has a graph of the output quad ink levels, a field to add notes to the final quad file, and different export options in addition to the standard .quad file used with QTR.

## Basic Linearization Workflow

- Print and measure a step wedge image with the initial quad curve
  - Open the measurement file and corresponding .quad used for the print
  - Apply any smoothing or error correction to the original measurement data
  - Apply any custom output curve if needed
  - Save and install the new corrected quad curve
  - Make a new test print to check results

# Linearizing the base gray curve

## Printing the linearization target

The initial quad curve created in the custom curve creation screen had an initial correction applied when you created it, but you need to create a final linearized curve based on measurements from a printed step target.

### Target Sizes

The grayscale linearization can accommodate target sizes from 11 to 256 patches from a wide range of measurement devices and file formats. I generally recommend a 128-step target if using an i1 pro device in strip mode, but linearization will work fine with a 21-step target if using a flatbed scanner or manual measurement device to read the target.

- Open PrintTool and open the image.
- Make sure there is no color management, and then select Run Print.
- Open the QuadToneRIP print dialog options (remember to press the Layout button to open the menu to access the QuadToneRIP settings).
- Set the mode to 16-bit to enable the Curves 1, 2, and 3 menus
- Select the menu for Curve 1 and choose the newly created base gray curve.
- Set the printer settings to highest resolution (2880x2880) Unidirectional and Installed Black.
- Leave the advanced options unchecked.

- Then run the print.
- **note** there is a bug in QuadToneRIP v2.8.0 that will duplicate the print job and have a filter failed error. The print will print fine; just delete the duplicated job in the printer queue.

# Measuring the target

There are too many devices and software to detail in these instructions, but the general rule is to measure from light to dark and save the lab values as a plain .txt file.

Please see the measurement workflows on my site for detailed instructions and videos for the most popular devices.

# Loading the Measurement Data

Press the button to load the measurement data from the target you printed a measured. The software will automatically detect the data format, and if there are multiple samples per patch, average them into a single set of values and show a graph of the measured values in the measurements chart and list on the left side of the Linearization screen.

## Measurement Data Graph

There are four sets of data graphed when loading the measurement data.

- The black dots are the original interpolated measurement data.
  - The software interpolates the original measurements into 256 steps, but there are only 129 steps graphed in the chart. These dots will not change when adjusting the smoothing sliders. However, they will change if you edit the values in the table on the left
- The red line represents the 256-smoothed values and will change when adjusting the two smoothing sliders or when updating any of the values in the original measurement data list. These are the values used in the linearization calculations
- The straight black line is the linear L*a*b* values from Dmin (top left of the graph) to Dmax (bottom right). The black line is a reference for the linear output, but those values **are not used** in the actual correction calculations.
- The Green line shows the target L*a*b* L* values and **are the actual values used** in the linearization calculations. You can adjust the output values to be something other than perfectly linear output with the manual curve control panel.

# Smoothing the Measurement Data

Proper smoothing of the measurement data is one of the more critical adjustments you will need to make. Thankfully, it is all visual and you don't need to do any calculations on your part. There are two sliders that control the number of points used in the smoothing algorithm. The main smoothing value adjusts for any large bumps in the measurement data but can distort it at the extreme highlight and shadow ends of the tonal scale. Use the second smoothing slider to adjust the values from the main smoothing slider back to the general trend in the original measurement data while also smoothing out any remaining bumps in the curve. The goal is to use enough smoothing to remove any bumps or flat spots that will result in banding in the final print and remain true to the general trend of the original data.

## Main Smoothing Window Size:

The number of points to use will depend on the size of the measurement target. 21-step targets will require less smoothing than 128 or 256 step targets. A larger value will result in a larger moving-average window and a smoother curve. Very high values will distort the shadow values because the window will include and average values from the 3/4 tones. A good starting point is a setting of 11-35. (Note: the window size will always be rounded up to an odd number to ensure that there is an equal number of input points around the point being smoothed.

## Fine Smoothing Percentage:

A value of 0 will turn off the smoothing, and start to apply the smoothing as soon as you begin to adjust it to the right. A higher value will result in a smoother curve but will distort the highlight and shadow values if it is set too high.

For those interested, here is what is happening in the smoothing steps: The main smoothing slider is a simple moving average. It creates a window of the specified number of points, averages them into a new value, then moves down one step and repeats until it creates a new set of 256 smoothed values. Those values are input into the second smoothing calculation, where the fine smoothing slider value determines the percentage of points to use in a smooth-step interpolation to recreate the final 256 smoothed values. Those final values are graphed as the red line and used in the actual linearization calculations.

# Manual Curve Control

The manual curve control allows you to adjust the output densities to something other than a perfectly linear L*a*b* L*. The purpose of this control is to adjust for how matte papers with a relatively low Dmax will appear too light or have shadow values that appear much lighter than the image on the display. It adjusts the output values in the .quad curves so that the final print appears more perceptually correct and removes the need to use a 2nd adjustment curve to the digital image prior to printing.

I would not recommend starting to adjust these until you see what a linear L*a*b* L* print looks like.

# Saving the linearized .quad curves

When you are happy with the smoothing and manual output curve (if used) and have added any notes, you will need to save the linearized .quad file to the Quadxxxx folder for your printer.

## Naming the Linearized Curve

I always suggest using the same name as the non-linearized curve and adding -LIN before the .quad extension. If I use the manual output curve controls, I add -LIN-MC or -LIN-CS (for “manual curve” or “compressed shadows”).

You can also output a .qtpc file that contains the corrected quad values and the corrected output LAB values. You can open the .qtpc files in the Quad Curve Blending tool to preview the approximate blended color.

You will also need to rerun the install command for the printer (found in Applications/QuadToneRIP/Profiles/YourPrinter) so that it is available in the QTR print dialog options.

# Confirming Linearization

To ensure the new linearized curve is printing correctly and make the .qtp file, you need to make a test print of your standard test image and include a bullseye gradient that will show any obvious reversals or problems with the linearization. Include a simple 21-step grayscale target with your test print to measure, confirm linearity, and add the measurements to the .qtp file.

The other important factor to check is the smoothness of the mid-tones. The grayscale torture test image in the resources folder includes two bullseye gradients as well as linear gradients broken up into 11, 21, 51, 101, and 256 steps. Use this image along with your standard test image to make sure there is no posterization or banding in the final linearized curves.

Open the PrintTool and arrange your test image, the torture test, and a 21-step target so that they print together and that there is enough space around the 21-step target for easily reading the patch values. Also, be sure to check that color management is still turned off in the main Print Tool window.

Open the QTR print dialog windows by choosing the Print and Paper Settings, going straight to the Print button, and choosing the new linearized gray curve in the Curve 1 drop-down menu.

# Linearizing the Color Toning Curves

## Spot Color Tone Value Correction

The color toner curves are linearized using a different formula called a spot color tone value correction. This method comes from the world of offset printing and is what Calvin Grier uses for linearizing color emulsions for color carbon transfer printing. The SCTV formula works in the XZY color space to linearize both the visual luminance and saturation of a color ramp rather than the luminance alone (which is what the grayscale linearization does). You will need all three LAB values for the software to convert from LAB to XYZ color spaces, so it requires measurements from a colorimeter, spectrophotometer, or calibrated flatbed scanner for this step—a manual densitometer is not sufficient. The SCTV correction goes a long way to archiving a predictable color when blending two different ink colors.

## Print the toner color ink ramps

Use a single 21-step grayscale target to use with the toner color curves. Print this the same way as the grayscale linearization target. Position the image in the PrintTool preview window, ensure no color management is applied, and press command+p or the Run Print button.

Open the QuadToneRIP print dialog options and select the initial toner curve from Curve 1 drop-down menu.

## Loading the measurements and quad curve

Loading the measurement and quad curve data is similar to the grayscale linearization in that you can use the individual buttons to open the files with a standard Open dialog window or drag and drop the files from the Finder into the SCTV correction window.

- While not applicable to the QuadToneProfiler custom curve creation workflow, loading a .quad file is optional if you use the app to create .acv or .cube correction curve files to load into Photoshop.

### Smoothing

The color tint linearization is less critical, and any slight measurement errors will not show as color banding, so there is only a simple built-in smoothing function and no editable smoothing controls. The graphs only show the corrected quad curves and the original and corrected color patch samples.

## Saving the corrected output

These corrected quad files need to be blended with the linearized base gray curves before installing and printing the final linearization targets. Using the .qtpc file will allow you to see the preview of the density and color when the corrected single color toner curve is blended with the linearized base gray curve.

Select the QuadToneProfiler Single Component (.qtpc) file with the same name as the opened quad file and add -SCTV to the end. The .qtpc file contains the corrected quad values and the corrected output LAB values so that they can be loaded into the blending tool in the next step.

You can still save a standard .quad file that can be used in multi-color gravure or single-color inkjet printing when not going through the blending step with the gray base curve.

#### Non-QTR workflows

There are also options to save the correction curve to adjust the image directly in Photoshop for workflows or using printer drivers other than QuadToneRIP.

LUT corrections will require converting the image to RGB and then loading the .cube file as an adjustment layer. Photoshop curves files can be used in grayscale or RGB color spaces. Just be sure to use the same color space and media settings for all printing steps.

# Blending the Base Gray and Toner Curves

## Quad Blending Tool

The Quad Blending Tool is just as it sounds. It blends the values from two different .quad files to create a new output quad file. It works similarly to the split-tone options in the QTR print dialog but uses five control points instead of three.

The new version of the blending tool is also able to open the new .qtpc component files that contain the quad values and measurements. Using .qtpc files allows you to preview the color of the blend and do a basic linearization to correct for any density differences in the two files, which isn't possible when only using the .quad files alone.

## Loading the base gray and color curves

First, open either the .qtpc file for the ink and measurement values from linearized base gray curve or the single .quad curve file for the linearized base gray curve.

Then load the SCTV-corrected single ink toner as Curve 2—either as the .qtpc or single .quad file. You can not use two different file types, so if you loaded the .qtpc file for the gray curve, you need to use a .qtpc file for the toning curve and vice versa.

## Setting the blending values

Set the blending values so that there is a consistent increase in the low gamut color through the highlights and darker mid-tones. The saturation will naturally decrease in the shadow values, so giving a 50/50 blend in the shadows is less important. There are no rules for the settings but generally start with 50/50 for the whites and light tones and then gradually decrease the amount of color ink used for the mid-tone, shadows, and black sliders. (The 50/50 blend is why I always start with a higher ink limit for the color inks in the initial curve creation step).

Using the .qtpc component files from the gray curve linearization and color tint linearization steps will also enable an option to apply an automatic correction curve to adjust for any loss in density from blending the lower density color inks with the higher density gray inks. This takes the predicted blend of the two files and does an initial linearization so you can preview the color, saturation, tonality, and blended ink curves.

A final linearization before creating the final .qtp profile is generally encouraged, but you can save a .qtpc file from this preview to go directly into the custom profile manager step to create the .qtp profile.

Leave the slider settings unchanged so that the same amount of gray and color inks will be used for each of the low gamut components, and open and save the blend for the remaining color components for your ink set.

Save the blended .quad file to the QuadXXXX printer folder and run the install command to make the new .quad files available in the QTR print dialog options to print the final linearization targets.

# Linearize the blended curves

You will need to go through a final round of grayscale linearization for all the blended curves to ensure that the .qtp profiles maintain proper density when blending into the final toner curves. If you chose to use the .qtpc component files in the previous blending step, this linearization step is used to confirm linearity and use the measurements and quad values for the final .qtp file.

## Printing the target

You can use a step wedge target with any number of steps for this linearization step because this should just be a final fine-tuning before creating the file .qtp file.

## Linearizing with gray curve linearization

Use the same procedure for doing the initial gray-curve linearization for each component used in the final profile. If you are using the manual curve control, use the same manual curve settings for each component.

## Measure the Linearized Components

After final linearization, you will need to print and measure a simple 21-step grayscale target to use in the final .qtp file. Include a bullseye torture test, but since these are the color toner components, you do not need to include your standard test image with this step.

# Creating the .QTP File

## The Profile Manager

There are two tabs in the Custom Profiler Manager window. The default tab is where you open the .qtp file to preview the toning blend and make new toned quad curves used for printing. The tab on the right is for creating new .qtp profiles from single .qtpc component files (or separate quad curves and measurement files). Once you create your custom .qtp profiles for each paper you want to use, you will use the main custom profile blending screen.

## Creating a new profile from components

- Press Command+5 or go to the QuadToneProfiler-Pro menu and select Window -> Custom Profile Manager
- Click the tab on the right to select the Profile Manager
- Click the Add Component button to bring up a new window that will allow you to select the name and the linearized quad file and measurement file for that component.
    - Name the profile components with short names like Black, Cyan, Cool Warm or Neutral
    - You can abbreviate the inks with C, M, Y, but the components will be listed in alphabetical order in the Custom Curve Blending window, so don't use K to abbreviate Black in these component names.
- Press the finish editing button to return to the previous screen, press Add Component, and go through the same process to create the next component. Repeat for each of the components you have for your ink set. If you need to edit the component from the Profile Manager screen, you can

double click the name in the list to open the Component Editor screen to change the name, measurement file, or quad file.
- When you finish adding or editing all the components, press the button to save the new custom .qtp file. There are no special file name requirements for the .qtp file, so I generally name the profile like this
  - Printer Name and Inkset
  - Paper Manufacturer
  - Paper Name

## Blending Custom .QTP Profiles

Click the tab on the left to switch to the Custom Component Blending screen

- Drag your .qtp file from the finder or press the Open QTP Profile Button to load your custom profile.
- The sliders will activate with the number of components in the profile, and the names will appear above the sliders.
  -The blended output color ramp and graph of the LAB a* and b* channels will appear and update when you adjust the component blending sliders

The sliders are grouped as Highlight, Mid-tone, and Shadow tonal groups and control the shape of the blended components with a smoothed-step interpolation. The ink-level balancing formula will increase or decrease the value of each component in proportion to the total values from the sliders from each tonal group.

You can turn off the component by dragging the slider to 0, and it will not update or increase when changing any other slider. That also means the top-most slider won't move until you increase one of the sliders from one of the other components in that tonal group

You can also preview the color of the blend on an actual image by pressing the Preview Image button and then open an image into the new window.

The Dmax can be mapped to the LAB L* value in the blended measurements but might appear blocked up and low contrast when using matte papers. You can turn off the preview Dmax check box, which will scale the LAB L* values from 99 to 1 to give a better idea of the color in the actual print.

When you are happy with the color of the blend, save the new .quad file that you will use to print in the QTR print dialog. Since you built the toner or split-tone blend into the single quad file, there is no need to use the curve blending tools in the QTR interface; simply choose the blended quad as Curve 1 menu in the print dialog window. Additionally, since the saved quad file is a blend of previously linearized quad files, there is no need to do another round of linearization.

## Blending other custom curve settings

You can now use the same .qtp file to save other toning blends to can save as .quad files

## Going one step further with new .qtp profiles from blended components

Once you make a neutral, warm, selenium, and cool set of quads, you have the option to make a new .qtp file with those curves and measurements as new components. You will need to print and measure a 21-step target from each quad curve, create a new .qtp file in the Profile Manager tab, and add new components with the quad and their measurements and the new .qtp file.

# Additional Tools

## Quad Levels

The QuadLevels utility is an easy way to rescale a quad curve between the input points of 0-100 and to the output values set in the interface. This the equivalent to setting the lower output slider values in a Photoshop levels adjustment.

This is helpful for quickly limiting the amount of ink in a quad curve to match the lower density of alternative process prints, or to set the white and black points for when using Clay Harmon's photopolymer gravure method.

You also have the option of keeping a the first quad value at whatever the output point is, which would put that amount of ink on the whole area being printed outside of the actual image area. You can use the Zero first quad value button so that white areas remain white in the final print.

Output points can be displayed on a 0-100 pigment scale or a 255 to 0 luminance scale.

## Quad Editor

The Quad Editor tool is similar to the editors found in the custom curve creation and linearization screens.

The custom curve editor panel allows you to choose individual channels and manually adjust individual channels to smooth out any bumps and create smoother leading or trailing edges of the ink ramps.

## Gamma and Boost

You can change the whole scale by changing the gamma and boost sliders. The gamma slider will affect all the inks by "moving" them to the right or left, and has the effect of lightening or darkening the print without changing the overall ink level for each channel. This is similar to the midpoint gamma control found in a Photoshop levels adjustment.

The boost slider will increase the ink load at the right end of the scale (where the shadows values in the print will be). You can boost the shade one ink channel by itself or all the inks together by checking the boost all inks option.

Change the boost amount to get the shade one channel back to the ink limit value to produce the desired Dmax. I recommend changing the Boost after any edits to the individual channels. *Just make sure the value of the label below the slider does not go past 100. (There is a known issue where the slider doesn't stop when the ink limit goes above 100 but will be solved in a future update.)*

## Editing individual ink channels

Choose an ink name from the drop-down menu to load that channel with editable curve points. The editor will take a percentage of all 256 values to create a subset of editable points and recalculate a Bézier curve from them. You can

Click on one of the points to select it. While you can use the mouse to drag the point to change the shape of the curve, do not use that method to reshape the ink curves at this stage. I recommend clicking the lower-left corner of the graph in the editor screen to select the first point and then use the tab key to cycle forward through the points (or shift + tab to cycle backward). Use the arrow keys to move the points by 1 pixel in any four directions (or shift+arrow keys to move the point by 10 pixels to make faster changes).

It is generally better to only change the selected point up or down to prevent any distortion in the recalculated and smoothed ink curves. The goal is to only slightly adjust the general shape of the up or down slopes and correct for distortions in the curve from the initial overlap and ink balancing controls. Do not change the ink loads at the top of the curves too drastically.

When you are happy with the shape of the curve preview in the editor, press the Accept button, and the software will create a bézier curve for the final ink channel using the x and y values for each point, and take you back to the Curve Editor Screen to select the next ink. Pressing the option key when you move your mouse over the Accept button title will change to Reset and return to the curve editor screen without applying any changes to the ink channel.

# Quad Remapping