

Kodak Polychrome Graphics

Color Fidelity Module

(CFM) for Macintosh OS X Systems

User Guide

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1. Color Fidelity Module (CFM) Overview

The **Kodak Polychrome Graphics Color Fidelity Module (CFM)** provides a means of mapping colors to create the best fit between two color spaces. The **CFM** is the software engine that converts color data from one color space to another. Color spaces must be coordinated from input to final output in such a way that non-reproducible colors in a larger or differently shaped color space are replaced by reproducible ones in the smaller space. Colors can also shift within a gamut, depending on color rendering changes. Color space adjustment, or gamut mapping, is therefore essential in color management.

For example, a color scanner is capable of capturing a much larger RGB gamut than can be reproduced by CMYK on a printing press. In other words, the scanner is able to scan many more colors than the press is capable of printing.

Sometimes devices have very similar gamuts, but they are not perfectly coordinated. For example, the display gamma color space of a Macintosh differs from the display gamma color space of a PC, so colors on a Macintosh monitor would not match those on a PC monitor.

Another example would be using a Matchprint system as a source device and a printing press as the destination device. Both devices have CMYK gamuts, but they are not in perfect sync. In the case of a CMYK to CMYK transformation, most color engines lose vital black channel information. But the **Kodak Polychrome Graphics CFM** maintains all of the black channel information or data, giving you a more accurate transformation between the profiles.

1.1. How the CFM Works

The Kodak Polychrome Graphics CFM consists of the engine itself and a Preferences window. The CFM is the color engine that calculates all of the color matching. The Preferences window allows you to tailor CFM operations to specific situations. This user's guide describes in detail how to customize your Kodak Polychrome Graphics CFM using the Preferences window. The CFM receives source and destination ICC profiles and image data as input from an application (e.g., Photoshop) and performs a color space transformation. You can choose the CFM from the ColorSync Utility, application plug-ins, or the CFM can be specified in a profile itself.

Device Links

The Kodak Polychrome Graphics CFM's color space transformation creates a file called a Device Link. A Device Link is an ICC-compliant Look-Up Table (LUT) that serves as a profile for two (or more) device profiles. The initial build between two device profiles may take some time, but once completed, the CFM can reference the Device Link immediately from the cache for all subsequent color transformations that include the same profiles and settings.

Cache

After a Device Link is built, it is saved to a folder or directory, called a cache. The cache, by default located in the Preferences folder of the user, serves as controlled storage space for Device Links. It gives the CFM easy future access to already-built Device Links, letting you quickly re-use a Device Link when you use the same source-destination profile combination.

Important! To use an existing Device Link in the cache, all conditions must remain unchanged. For example, the source and destination profiles and any black generation adjustments must not have changed since building the Device Link, or the Kodak Polychrome Graphics CFM will build a new Device Link.

2. CFM Preferences

The Preferences window lets you tailor CFM operations. To open the panel, select it from the **Applications** folder on your Macintosh OS X system.

The Preferences window consists of four tabs: **Cache**, **Run Options**, **Black Generation**, and **License**. Click on a tab to reveal that particular window. Each tab has a Hints area. Moving the pointer over specific areas or buttons displays information describing their functionality.

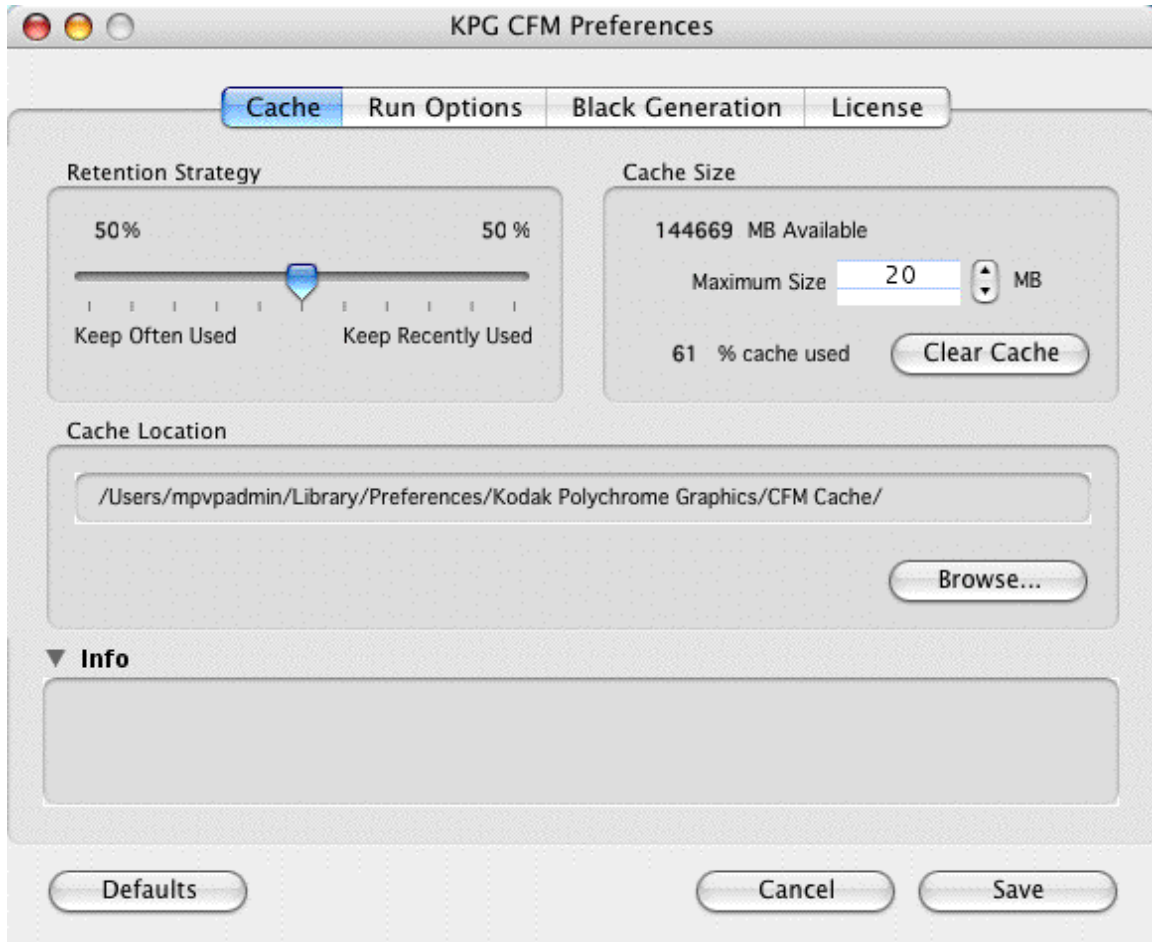


Figure 1. CFM Preferences window

2.1. Cache Tab

The first tab is the Cache tab, as shown in Figure 2. The cache is a folder that serves as controlled storage for Device Links. The cache gives the CFM quick access to previously built Device Links, avoiding the need to build new ones. In this Cache tab you can set the strategy for purging cached Device Link files, determine the cache location and maximum cache size, and clear the cache.

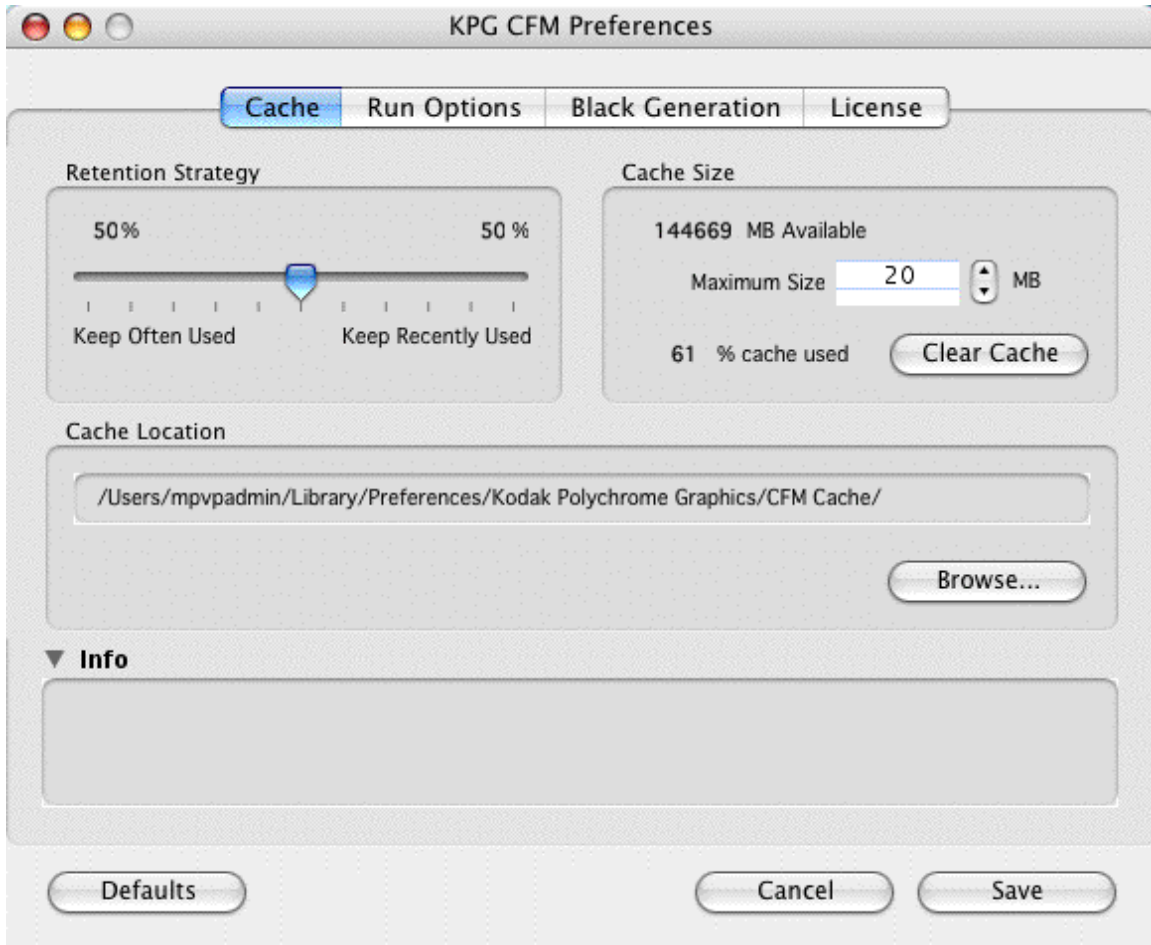


Figure 2. Preferences Window Cache Tab

Retention Strategy

If you change the maximum cache size to a setting smaller than the current cache size, some of the cache files will be purged. Also, changing cache location causes a purge; in both cases, you will be asked if this is OK.

You can set the strategy for purging by weighting the files, so the cache purges a certain percentage of "Often Used" and a certain percentage of "Recently Used" Device Links. In other words, the cache purges itself of those Device Links that don't get used as often and those that haven't been used in the longest time and does so according to the percentage weighting assigned to each category. It will purge until the required amount of cache space becomes available.



Figure 3. Setting Retention Strategy

Cache Size

This area shows how much space is available for the cache and the percent of the cache used. You can set the maximum cache size (maximum size depends on remaining drive space; 20 MB is the default). Click Clear Cache to delete all cached Device Links and to remove usage history (the information on Device Links tracked by the Preferences window, e.g., which Device Link has been used most recently, which used most often, etc.).

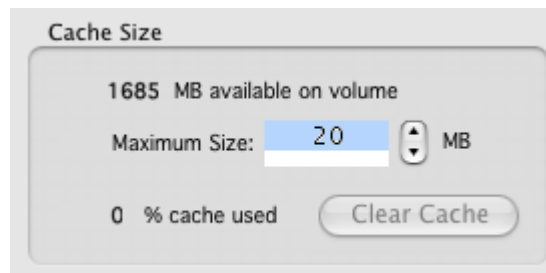


Figure 4. Maximum Cache Size

Cache Location

This area shows where the cache folder resides. See Figure 5. The default location is in the Preferences folder of the user. If you want to change its location, click Browse to display a directory dialog box. Locate and choose the desired cache folder, or create a new one.

If you change location, you will be asked if you want to purge the cache. If you choose to purge, the CFM will have to build new cache files, resulting in slower initial processing.

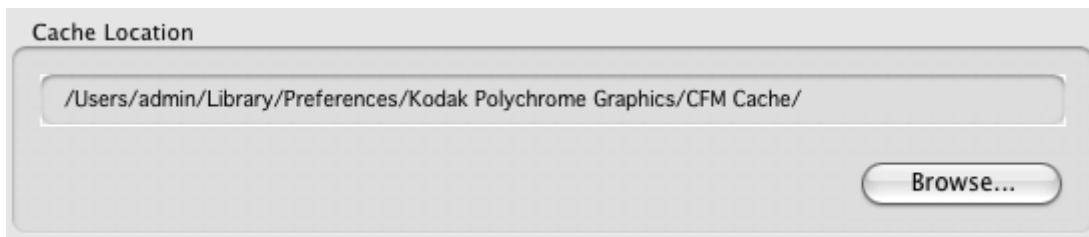


Figure 5. Cache Location

2.2. Run Options Tab

The second tab in the CFM Preferences Window is the Run Options tab. You can determine what sort of information to log, when to launch the Preferences Window, and whether to display a progress bar. You can also read log contents.

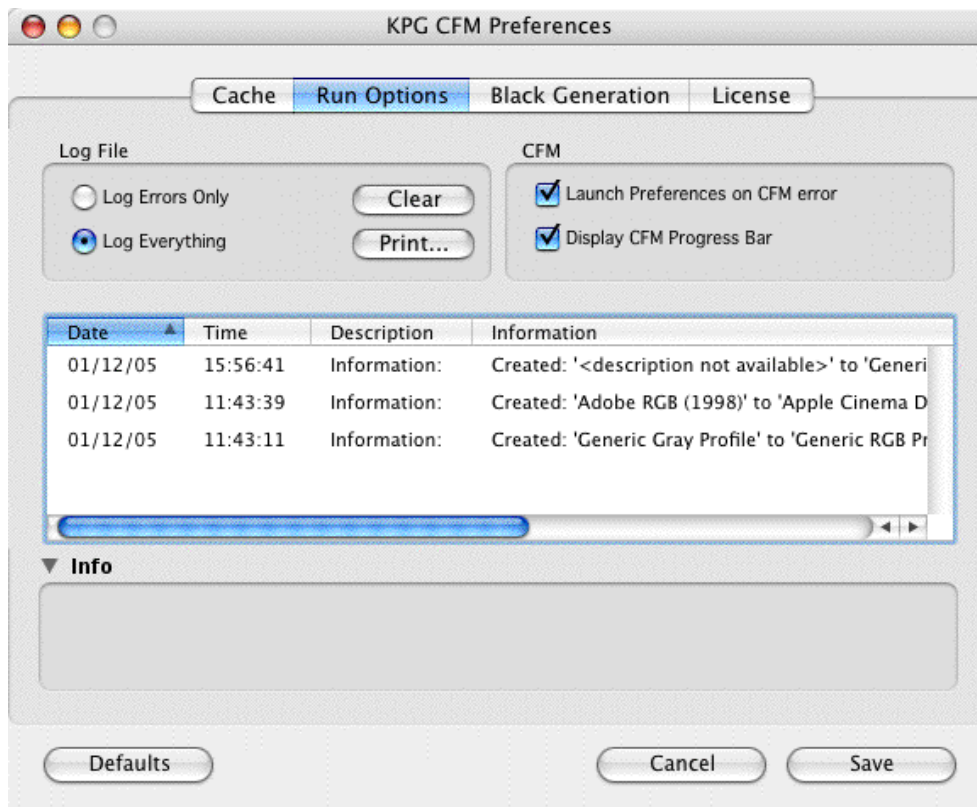


Figure 6. Run Options Tab

Log File

You can choose to log only errors or to log all CFM activity. Click Clear Log to remove all current log entries. The log file is limited to 2,000 entries, after which the oldest entry is removed.

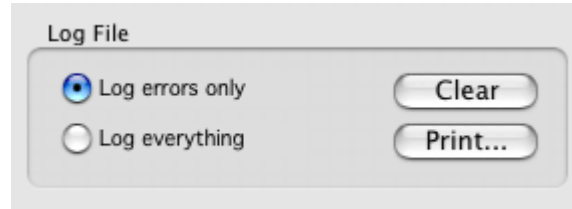


Figure 7. Log File

Launch Preferences on CFM error/Display CFM Progress Bar

Check the top box if you want the CFM to automatically launch the Preferences window if an error occurs. When an error occurs, the Run Options tab containing log information in the Log Contents Area displays. Check the second box if you want the CFM progress bar displayed as the CFM performs its color transformation.



Figure 8. Launch Preferences on CFM error/Display CFM Progress Bar

Log Contents Area

This area displays the contents of the log, including errors, warnings, and information messages, and the time and date they occurred. (If you choose Log errors only in the Log File, only errors will appear.)

Date	Time	Description	Information
01/12/05	15:56:41	Information:	Created: '<description not available>' to 'Generi
01/12/05	11:43:39	Information:	Created: 'Adobe RGB (1998)' to 'Apple Cinema D
01/12/05	11:43:11	Information:	Created: 'Generic Gray Profile' to 'Generic RGB Pr

Figure 9. Log Contents

2.3. Black Generation Tab

What is Black Channel?

Before describing how to use the **Black Generation** tab in the CFM Preferences window, let's first take a look at the black channel and its importance, then at the separation techniques **Undercolor Removal** (UCR) and **Gray Component Replacement** (GCR).

When creating a set of color separations, one of the most important variables is the density of the black channel. The three ink primaries (cyan, magenta, yellow) are combined in the printing process to create black. However, this combination does not produce true black, but rather a muddy brown. To compensate for the inability of CMY to produce black, a black (K) channel is added. Total ink limit means the total percentage of all four inks (CMYK); theoretically, an area covered with CMYK inks would have a total ink limit of 400% (100% of each color). In reality, the percentage is usually less. Depending on print conditions (press speed, paper, inks, etc.) the total ink limit is reduced to avoid problems on press.

For example, SWOP standards call for a total ink limit of 300%. To reduce total ink coverage without losing color saturation, cyan, magenta, and yellow inks are removed (in roughly equal proportions) and replaced with black ink. This is called black generation, and can be done in two ways: Undercolor Removal (UCR) or Gray Component Replacement (GCR). Remember, these methods are used when you convert an image from a three-color space to CMYK (or if you choose not to retain integrity if converting CMYK to CMYK). You can choose the type of black generation based on your paper stock and on print shop requirements.

What is GCR?

This technique replaces the neutral CMY part of a color with an appropriate amount of black (K). Any color is made up of two parts – a neutral (gray) component and a color (chromatic) component. The neutral component can be printed with a balanced combination of CMY and K inks, with the black ink replacing the neutral component partially or totally. GCR is expressed as a percentage of the neutrals replaced by black.

What is UCR?

This technique is similar to GCR, except it is only active in the neutrals and near neutrals. Overall ink coverage is reduced on the sheet, allowing it to hold onto ink without smearing. Images have more detail and better color saturation, particularly in the shadows.

Black Channel Terminology

Total Ink Limit: Maximum percentage of total ink coverage. In theory, all four inks (CMYK) at 100% each makes the top limit 400%. The value you select in this field depends on the capabilities of your output device. The default is 310%.

Black Generation: When GCR is selected, method of removing cyan, magenta, and yellow and adding black. There are different degrees of black generation: Light, Medium, Heavy, Maximum, and Custom (in which you manually adjust the black generation curve). The default is Medium.

Black Ink Limit: Maximum percentage of total black ink coverage. The default is 100%.

Black Ink Onset: When UCR is selected, this is the point where the black ink starts. For example, black could start with a 1% dot in the midtone area, increasing to a 50% dot in the shadows. Because black ink isn't necessarily needed in the highlight or quartertone areas, you can decide the best starting point for the onset of black. The default is 50%.

Black Generation Tab

You can determine how to handle black generation in several ways using this tab. The Black Generation dialog boxes for **GCR** and **UCR** let you "tell" the CFM exactly how to replace CMY with black. If you are transforming a CMYK source and CMYK destination profile, you can choose to retain the **integrity** of the black channel or to use black generation adjustments made here.

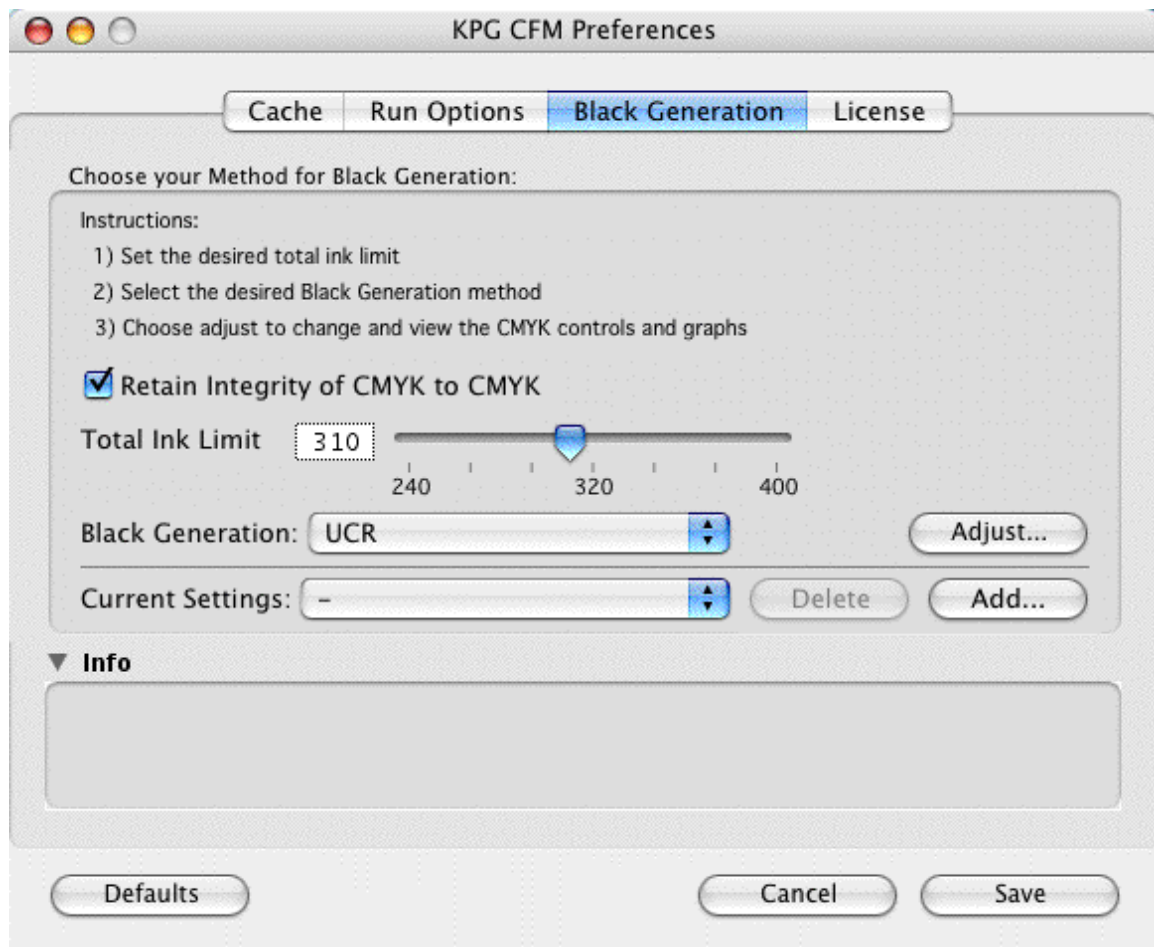


Figure 10. Black Generation Tab

Retain Integrity if CMYK to CMYK

Checking this option means that any Black Generation adjustments you make in the Preferences window will be ignored during a CMYK to CMYK transformation. Instead, the image will have a similar, proportionate amount of black as that present in the original image. If the box is not checked, any Black Generation adjustments made to UCR or GCR will be applied during CMYK to CMYK transformation.

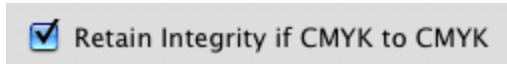


Figure 11. Preferences Black Generation Tab

Black Generation Adjustments

As Figure 12 indicates, you have two choices for Black Generation: **GCR**, and **UCR**.

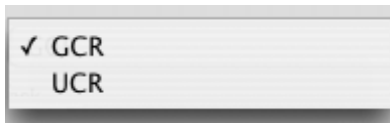


Figure 12. Black Generation Selections

2.4. Making GCR Adjustments

1. Set the **Total Ink Limit**. (See Figure 10.) Enter a number and press **Tab** or use the slider. The default is 310%. In other words, the total of all four inks (CMYK) is 310%.
2. Select **GCR** from the Black Generation drop-down list box as shown below.



Figure 13. Selecting GCR

3. Click **Adjust....** The GCR adjustment dialog box displays. See Figure 14.

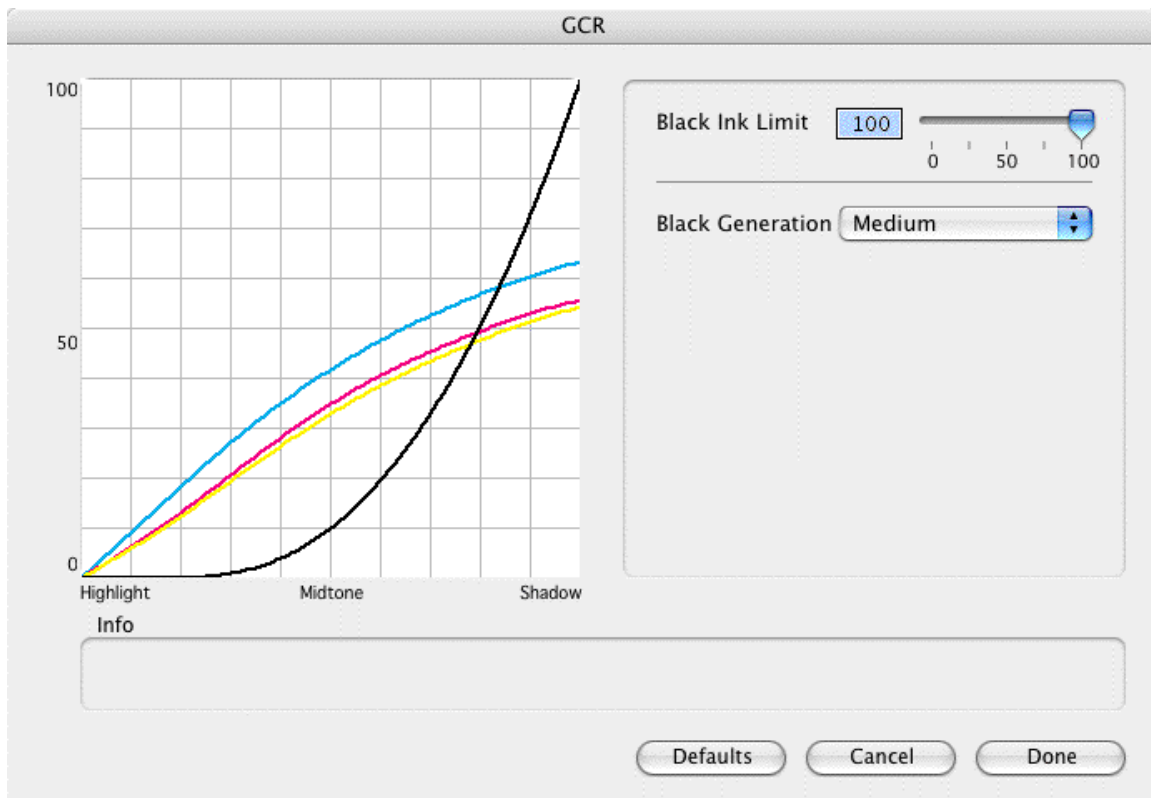


Figure 14. GCR Adjustment Dialog Box

4. Set the **Black Ink Limit**: Enter a number and press **Tab** or use the slider. The default is 100%.
5. Select the degree of **Black Generation** (None, Light, Medium, Heavy, Maximum or Custom) from the drop-down list box.

Notes:

- The CMYK graph changes depending on your Black Generation selection. Figures 15a and 15b show the difference between Light and Heavy black

generation (“Light” is on the left, “Heavy” on the right). In this example, both graphs have a Total Ink Limit of 310% and a Black Ink Limit of 100%. Notice that the black ink begins in the Midtone area with Light generation, while it starts almost immediately in the Highlights with Heavy generation.

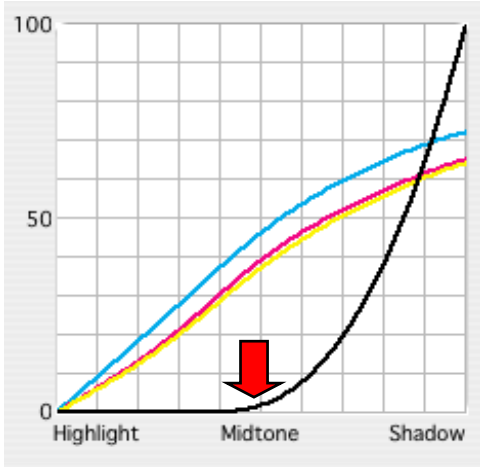


Fig 15a. Black begins in Midtones

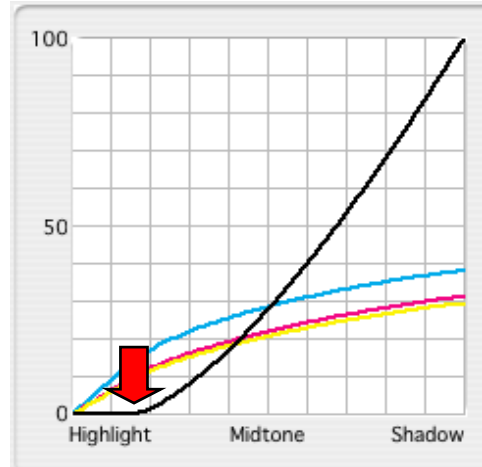


Fig 15b. Black begins in Highlights

Important! Curves displayed on the graph are to help you visualize the results of your settings; actual results will vary.

Custom Black Generation

Select **Custom**, and note how the dialog box changes. See Figure 16. The slide bar and Custom Black field along the right side allow you to change the Black Ink Limit incrementally. The CMY curves are adjusted automatically, relative to the new black curve and total ink densities.

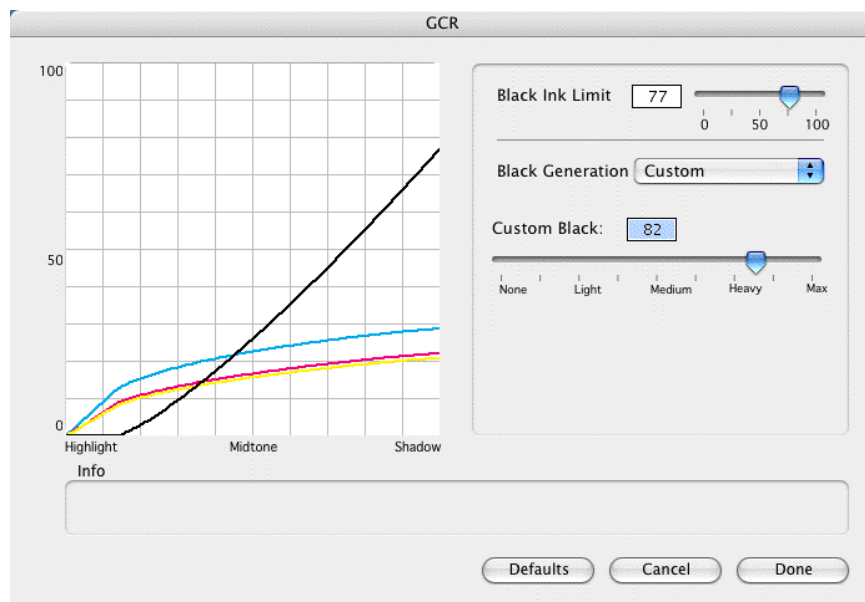


Figure 16. Custom Black Generation Dialog Box

2.5. Making UCR Adjustments

1. Set the **Total Ink Limit**. (See Figure 10.)
2. Select **UCR** from the Black Generation drop-down list box.

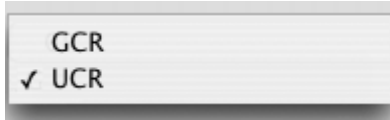


Figure 17. UCR Selected

3. Click **Adjust**. The UCR adjustment dialog box is displayed. See Figure 18.

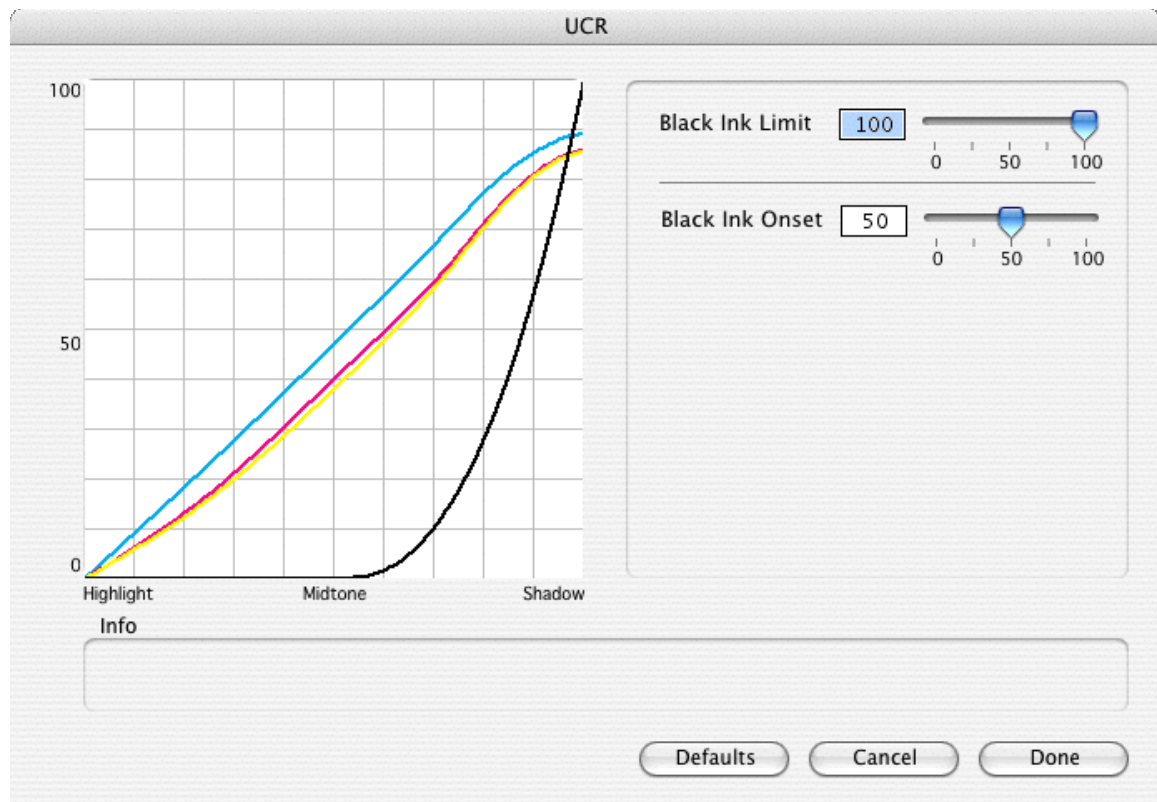


Figure 18. UCR Adjust Dialog Box

4. Set the **Black Ink Limit**. Enter a number and press **Tab** or use the slider.

5. Set the **Black Ink Onset**. Enter a number and press **Tab** or use the slider. The default is 50%. Figure 19 shows a black ink onset of 10%. In other words, the black ink will be laid down starting at the 10% dot, or the Highlight area.

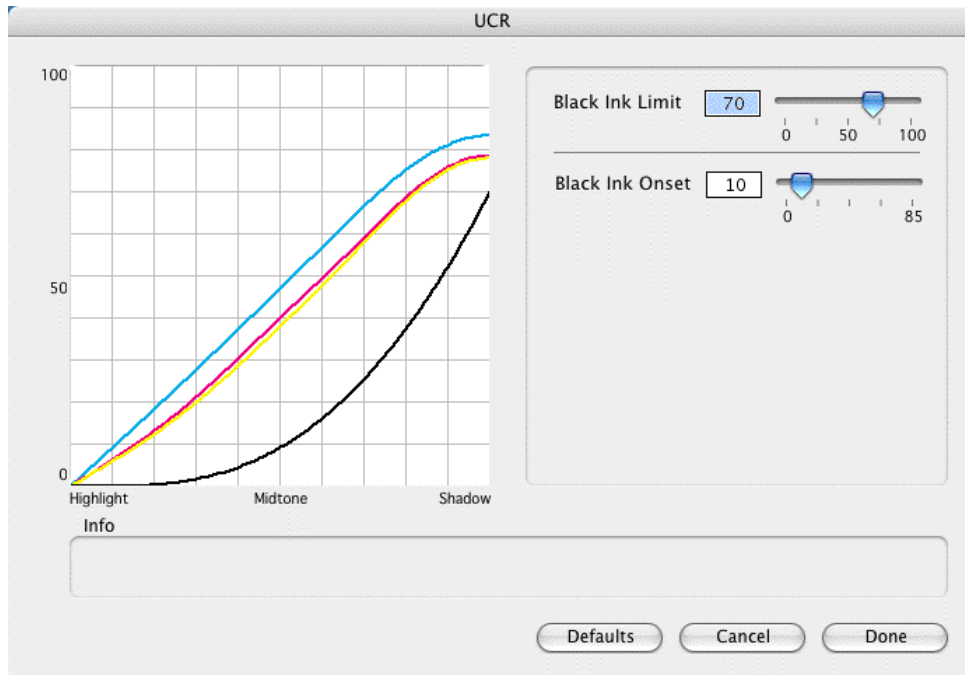


Figure 19. Setting Ink Limits and Black Ink Onset

Note: The black curve changes depending on your Black Ink Onset selection. Figures 20a and 20b show the difference between a 25% onset and a 50% onset (25% is on the left, 50% on the right). In this example, both graphs have a Total Ink Limit of 310 and Black Ink Limit of 50. Notice that the black curve begins in the quartertones with a 25% onset, while a 50% onset starts the black in the Midtone area and has a steeper incline into the Shadows.

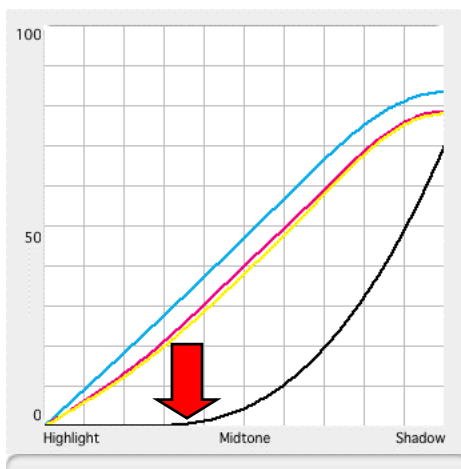


Fig 20a. Black begins at 25% dot

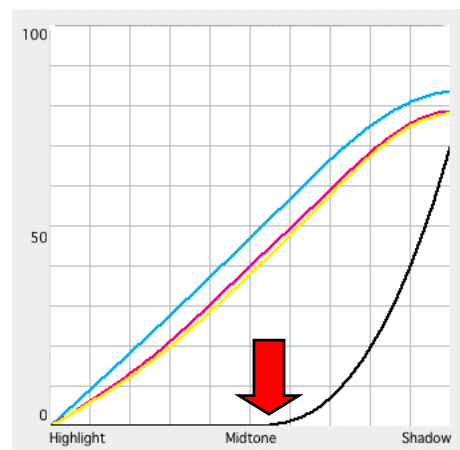


Fig 20b. Black begins at 50% dot

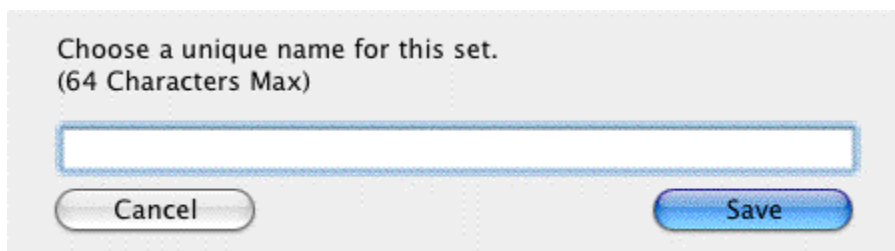
Important! Curves displayed on the graph are to help you visualize the results of your settings; actual results will vary.

Saving a Black Generation Set

If you have Black Generation settings that you need to use at a later date or over time, use the **Add...** button on the Black Generation tab to save your black generation settings.



1. Once you have found your desired Black Generation settings, click **Add...** A dialog box displays asking you to name the set.



2. Type a name in the field (64 characters maximum). Click **Save**.
3. The Black Generation workspace displays again with the name you typed displayed in the **Current Settings** list box.

Loading a Black Generation Set

When you have need of a previously saved set, click the **Current Settings** list box on the Black Generation tab. Locate your saved set in the list and select it. Your previously saved settings are loaded.

Important! If you click the **Defaults** button, regardless of which tab you have selected, CFM will remove ALL of your saved settings and they are not recoverable.

Deleting a Black Generation Set

When you have need to delete a saved set:

1. Click the **Current Settings** list box on the Black Generation tab.
2. Locate your saved set in the list and select it. Your previously saved settings are loaded, and the **Delete** button becomes active.
3. Click on the **Delete** button.
4. A dialog box displays asking you to confirm that you want to delete the saved set.
5. Click on **OK** to delete the saved set.

2.6. License Tab

For some product releases the License tab is used to activate the CFM when a license key is not automatically entered during installation.

If a license key is required to activate the CFM, complete the following steps:

1. Click the **Add...** button.

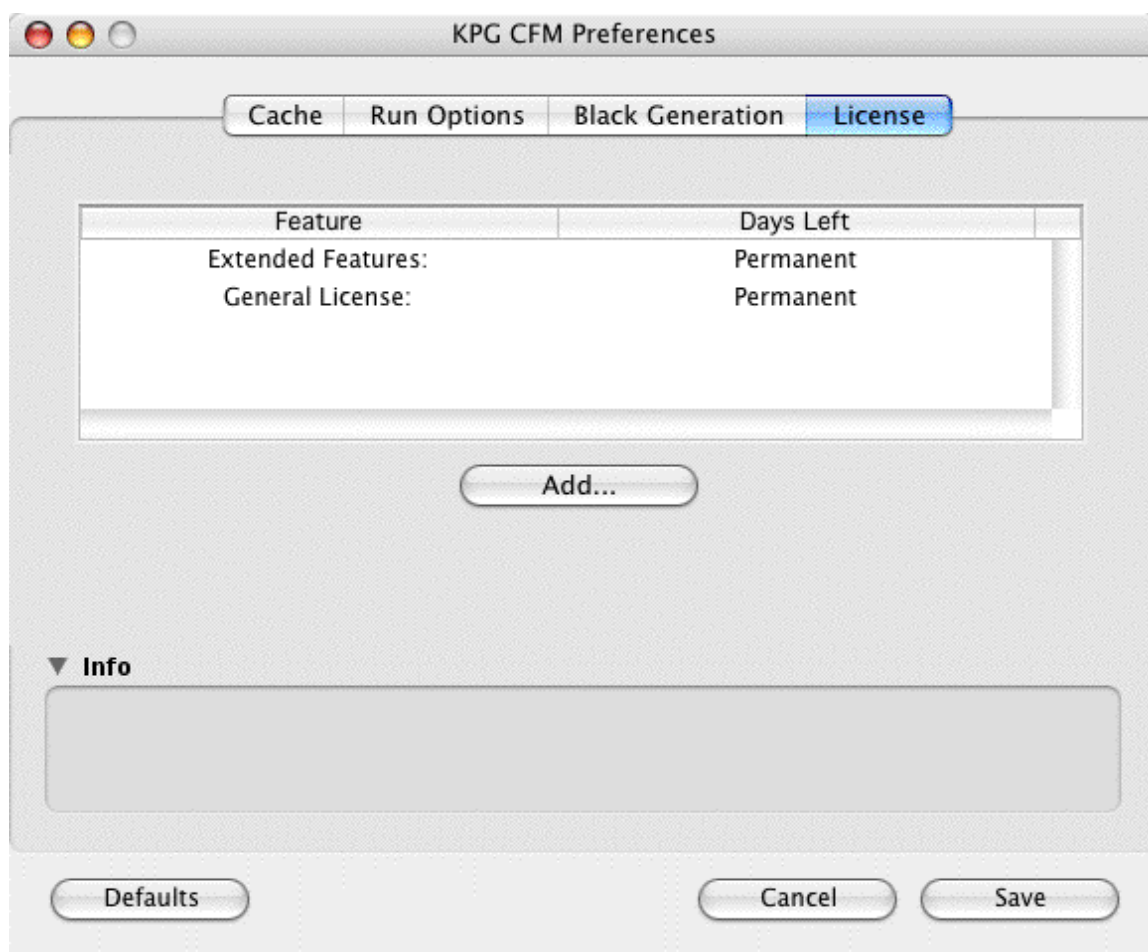


Figure 21. License Tab

2. The license key entry field displays. Enter your license key and click **OK**.

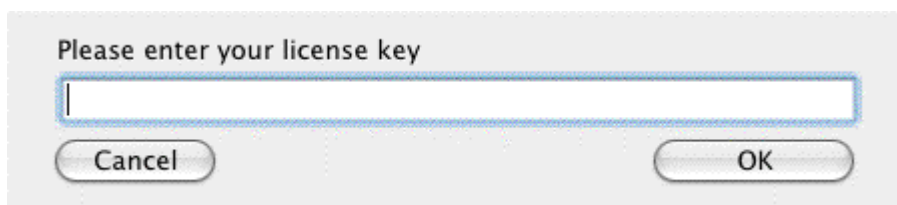


Figure 22. License Key Entry Field