May 2010

Scanning with Epson Perfection Scanners

Dear Nikonian,

This guide was created to offer detailed information on the diverse aspects of scanning. In the content on the next page, if you click on the respective section, this will directly go to the corresponding section.

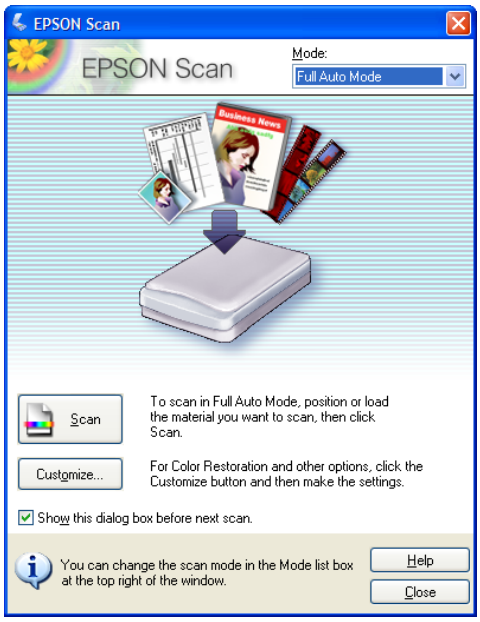
For further information, latest software and manuals please visit our web site.
www.epson.co.uk/Home-and-Home-Office/Scanners/Photo-scanners (UK web site for reference purpose)

Content

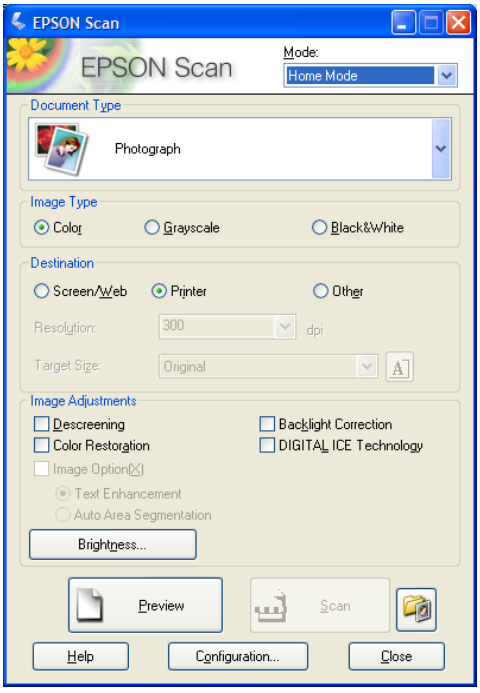
1. Scanning with Epson Perfection Scanners using Epson Scan

a. Epson Scan Overview

Epson Scan is Epson's TWAIN interface software, which is supplied with all current scanner models. It offers many features and a level of control that would normally be associated with a paid premium software product. Epson Scan can be used in one of four modes, offering a level of scan control suitable to your needs. The four different scan modes are outlined below.

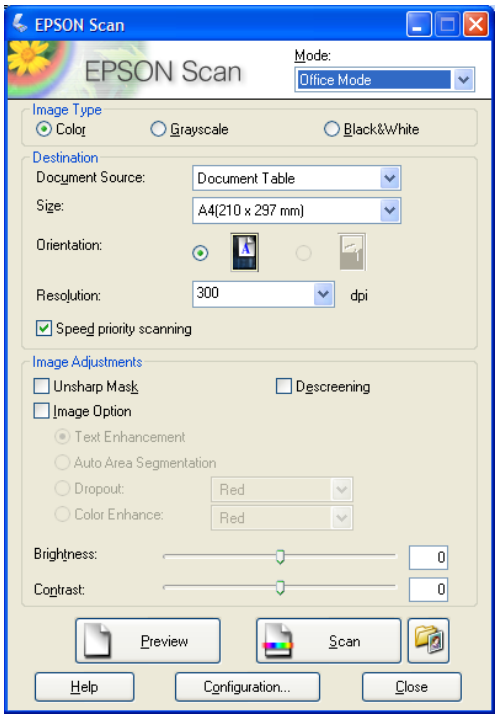


Full Auto Mode lets you scan quickly and easily, without selecting
any settings or previewing your image. Full Auto Mode is best when you need to scan your originals at 100% size and you do not need to preview the images before scanning. You can restore faded colors or remove dust marks in Full Auto Mode. This is the default mode in Epson Scan.

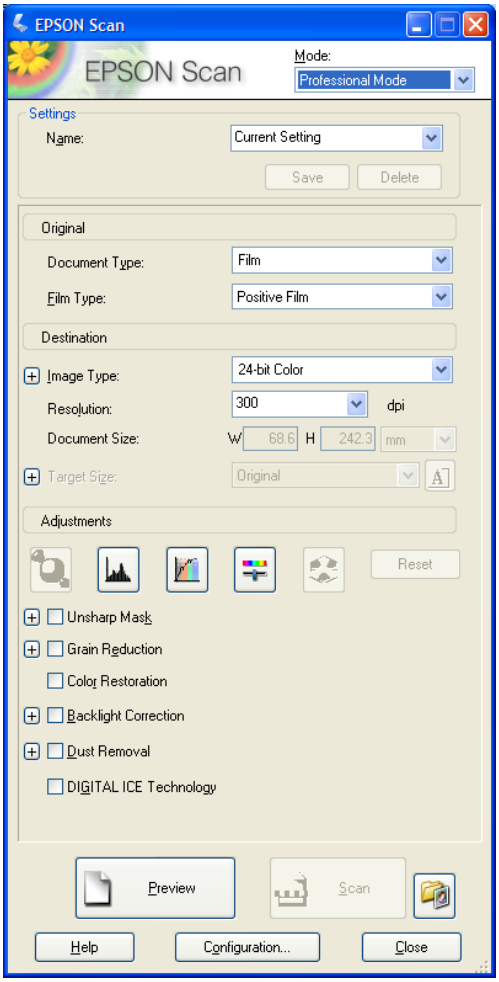


Home Mode lets you customize some scanning settings and check their effects with a preview image.

Home Mode is best when you want to preview images of your originals before scanning them. You can resize the image as you scan, adjust the scan area, and adjust many image settings, including color restoration, dust removal, and backlight correction



Office Mode lets you quickly select settings for scanning text documents and check their effects with a preview image



Professional Mode gives you total control of your scanning settings and lets you check their effects with a preview image. Professional Mode is best when you want to preview your image and make extensive, detailed corrections to it before scanning. You can sharpen, color correct, and enhance your image with a full array of advanced image adjustment tools, including histogram, tone correction and colour palette.

b. Image Adjustment – Auto correction

Epson Scan offers a number of image correction options, helping produce high quality results. One of these is referred to as Epson Easy Photo Fix.

Epson Easy Photo Fix is the easy way to improve your photos – the software automatically picks up on any defects and corrects them to ensure your photos are the best quality they can be. It's very simple to use and is ideal for beginners or professionals. Epson's Easy Photo Fix technology has just what you need to scan automatically or easily fix problem photos, slides, or negatives – with just one click.

i. So how does it work?

With Epson's fully automatic scanning you simply place a picture on the scan bed. Epson Scan automatically previews the images and recognizes the document source and type. This mode then automatically crops, optimizes and scans the image. Home and Professional modes are also available for added image scanning control.

There are three improvements that Easy Photo Fix can make to your scanned photos - colour restoration, dust removal and backlight correction.

Epson Easy Photo Fix is perfect for photo, negative, and transparency restoration. Designed specifically for high quality photo and film scanning, the colour restoration software employs sophisticated technology to restore image colour that has been affected by fading through sunlight or other conditions. Epson Easy Photo Fix can also remove dust by detecting dust particles and adjust the image if there is too much backlight. It then automatically corrects the shadows to near-perfect quality.

ii. Colour Restoration

The colour restoration function of Epson Easy Photo Fix technology allows you to optimize your scanned images by restoring faded colours with just one click. It automatically adjusts the image by rebalancing the colour channels, effectively removing the colour casts caused by dark storage, light exposure and age. Even when stored in an album a photo can turn magenta or orange, while a photo hanging on the wall can turn yellow or green. The good news is that Epson Easy Photo Fix can restore old, faded, color-shifted photographs to near original colours.

Original Image

Colour restoration applied

iii. Dust removal

Removing dust from slides and negatives is easy with Epson Easy Photo Fix. Old slides, negatives and photos can carry dust and be discoloured. With this software, you can create photographs that are as good as new by removing dust particles. The software detects the dust particles on your negatives and photos and adjusts the colours of the photo removing the shadows that the dust has created.

Original Image

Dust removal applied

iv. Backlight correction

Backlight correction is the third function of Epson's Easy Photo Fix. Sometimes when you take a photo, you find there is too much background light in the picture, making the subject unclear and very dark. With Easy photo Fix you can automatically detect too much light and correct any shadows that may be in the photo to improve the quality. The photo is then much clearer and more like the original you wanted to take.

Original Image

Backlight correction applied

c. How to use Epson Scan in Professional mode

The following 10 steps will guide you through the professional mode. The screen shot of the Professional Mode will advise where each step is located.

Step ❶: Place your original(s) on the document table, using the correct film holder as and when necessary.

Step ❷: Start Epson Scan.

Step ❸: Select Professional Mode in the Mode list. The mode list is located in the upper right hand corner of the Epson scan window.

Step ❹: Click the arrow to open the Document Type list and select Reflective (for scanning documents or photos) or Film (for scanning film or slides).
If you selected Film (for scanning film or slides) as the Document Type, click the arrow in the Film Type list and select Positive Film, Color Negative Film, or B&W Negative Film

Step ❺: Click the arrow to open the Image Type list and select the detailed image type you are scanning.

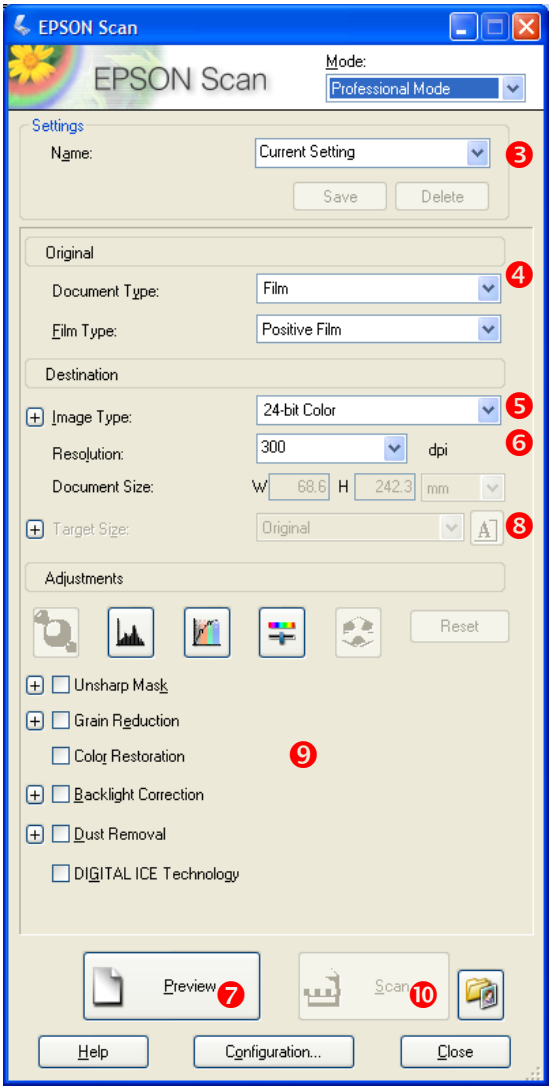
Step ❻: Click the arrow to open the Resolution list and select an appropriate resolution for your original(s). See product user manual for instructions.

Step ❼: Click Preview to preview your image(s). The Preview window appears and displays your image(s). See Previewing and Adjusting the Scan Area in the product user manual for further instructions

Step ❽: Click the arrow to open the Target Size list to select the size you want of the scanned image(s), if necessary. You can scan your images at their original size, or you can reduce or enlarge their size by selecting Target Size.

Step ❾: Modify the image quality, if necessary. See Adjusting the Color and Other Image Settings for instructions.

Step ❿: Click Scan



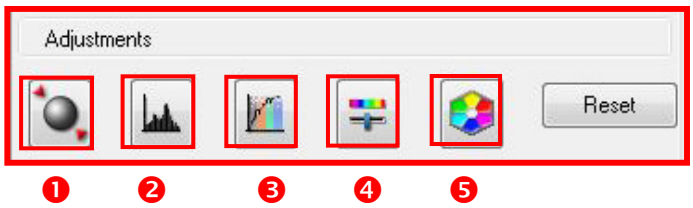
v. Professional Mode Control

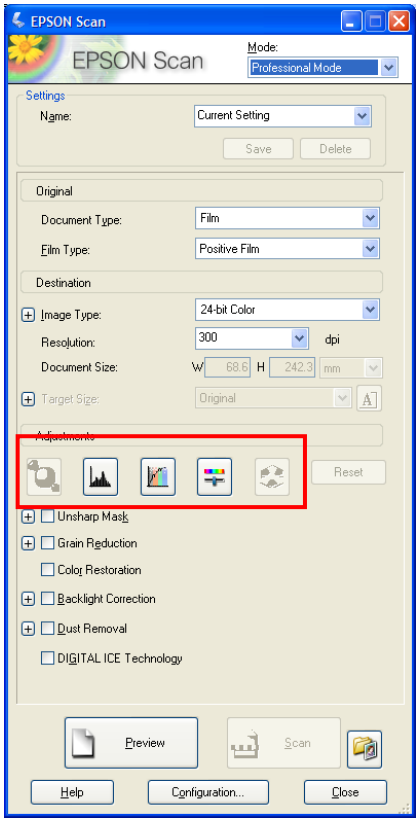
Professional mode offers the maximum level of control when scanning film/ reflective documents. The table below shows the differ options with a brief description of what each one does.

Setting	Description
Unsharp Mask	Turn on to make the edges of image areas clearer for an overall sharper image. Turn off to leave softer edges. This setting is available only when the Image Type is set to Color or Greyscale.
Descreening (Document/Photo only)	Removes the rippled pattern that can appear in subtly-shaded image areas, such as in skin tones. Also improves results when scanning magazine or newspaper images which include screening in their original print processes. This setting is available only when the Image Type is set to Color or Greyscale. The results of descreening do not appear in the preview, only in your scanned image.
Brightness	Adjusts the overall image lightness and darkness. This setting is available in the following conditions: - when the Image Type is set to Color - when the Image Type is set to Grayscale - when the Image Type is set to Black&White, and Image Option and Auto Area Segmentation are selected
Contrast	Adjusts the difference between the light and dark areas of the overall image. This setting is available in the following conditions: - when the Image Type is set to Color - when the Image Type is set to Grayscale - when the Image Type is set to Black&White, and Image Option and Auto Area Segmentation are selected
Threshold	Adjusts the level at which the black areas in text and line art are delineated, improving text recognition in OCR programs. This setting is available in the following conditions: - when the Image Type is set to Black&White, and Image Option is not selected - when the Image Type is set to Black&White, and Image Option and Color Enhance are selected

d. Additional Adjustment Controls

When working with Epson Scan in Professional mode a number of additional controls are available, these are covered in more detail below.





The adjustment controls are as follows:

❶: Auto Exposure

❷: Histogram

❸: Tone Correction

❹: Brightness, Contrast, Saturation, Colour balance

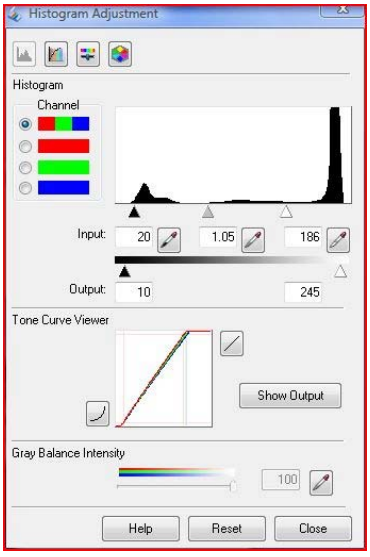
❺: Color Palette

i. Auto Exposure

Auto exposure will apply automatic changes to the scanned image to ensure the best possible output. This means it will balance the brightness, contrast and colour.

ii. Histogram

The Histogram provides a graphical interface for adjusting highlight, shadow, and gamma levels individually. The example below shows an image which has had the highlights increased.



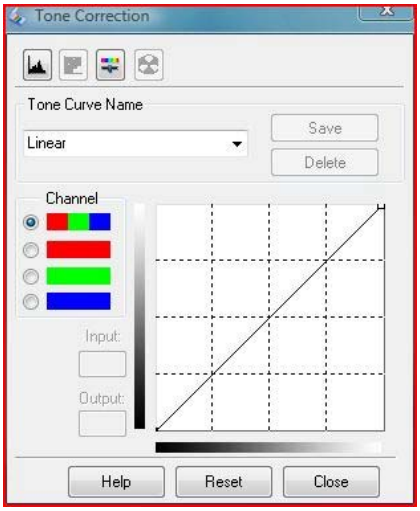
Before

After

iii. Tone Correction

Tone correction provides a graphical interface for adjusting tone levels individually. In the example below a high contrast tone curve has been applied to the image.

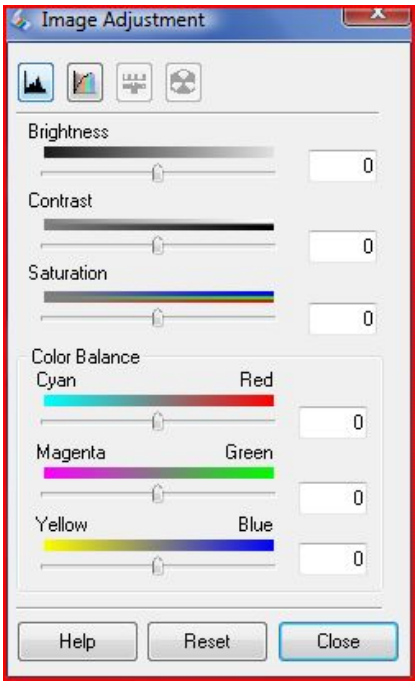
Before *After*



iv. Brightness, Contrast, Saturation and Color Balance

This set of controls offers a multitude of setting adjustments for example adjust the density of colors in the overall image, adjust the difference between the light and dark areas of the overall image and adjusts the overall image lightness and darkness. The example below shows an increase in color saturation.

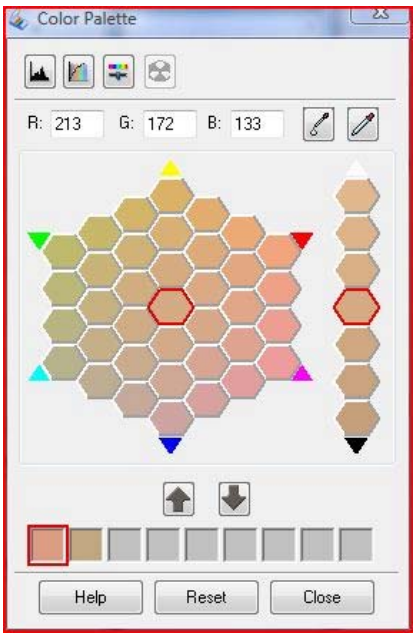
Before *After*



v.

vi. Color Palette

Color Palette provides a graphical interface for adjusting mid-tone levels, such as skin tones, without affecting the highlight and shadow areas of the image. The example below shows a slight warming color applied to the image.



Before

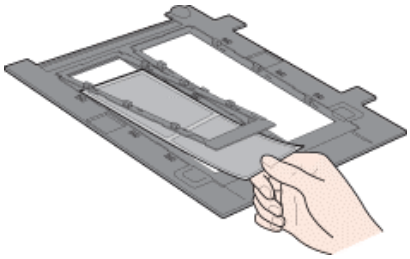
After

e. Scanning Medium Format Film

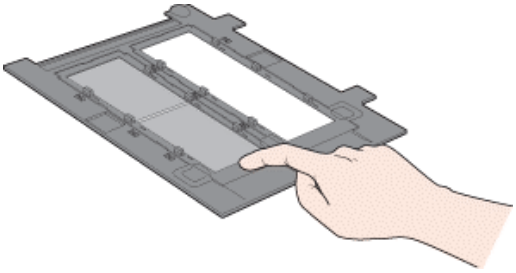
A number of Epson Scanners offer support for scanning medium format film. To ensure that this process is successful, the following steps should be observed.

i. Placing the Medium Format film

1. Open the cover on the medium format film holder.
2. Slide up to two medium format film images into the film holder with the shiny base side facing down. Your images and any wording on the film should appear backwards on the side that faces up, as shown by the illustration on the film holder. Make sure the entire image frame is positioned in the film holder opening.

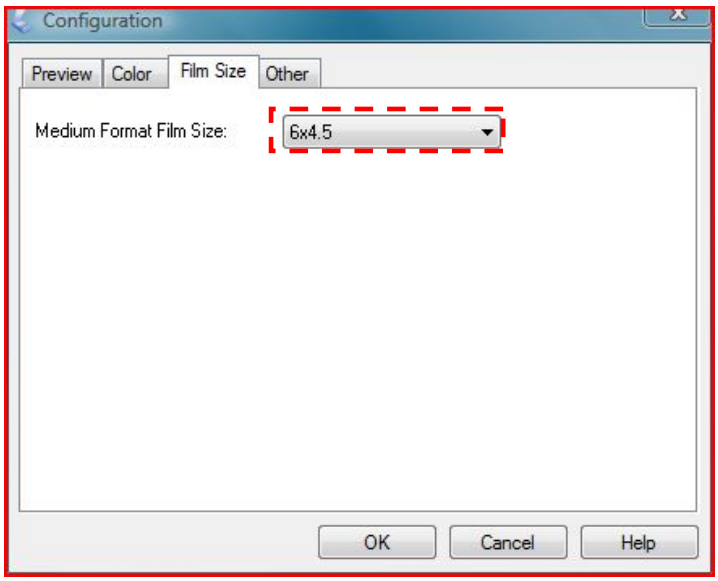


3. Close the cover over the film and press it down until it clicks. Then press down on all the edges of the cover to secure it.



4. Place the film holder on the document table so that it is aligned with the upper right

5. Make sure you removed the document mat.
6. Close the scanner cover
7. Open Epson Scan.
8. Select professional mode.
9. Click the arrow to open the Document Type list and select Film (with Film holder) followed by the relevant film type (color negative, color positive, etc)
10. Click on the configuration button located at the bottom of the Epson scan window and select the film size tab from the new window that appears.
11. Select the relevant medium format size from the drop down box and click ok.



12. Make any other settings needed for scanning and click preview or scan to continue.

f. Scanning to PDF

Using Epson Scan, you can create a PDF file with the following features.

1. Scanning multiple document pages into a single PDF file: You can scan multiple document pages and save them in a single PDF file.
2. Creating a searchable PDF file: You can create a PDF file with search functionality, so that you can look for words in the file. (This feature may not be available in some countries.)
3. Specifying the number of pages in a single PDF file: You can specify the maximum number of pages that can be included in one PDF file. For example, if you are scanning a 20-page document, and specify the page number to be included in one PDF as 4, 5 PDF files are automatically created.

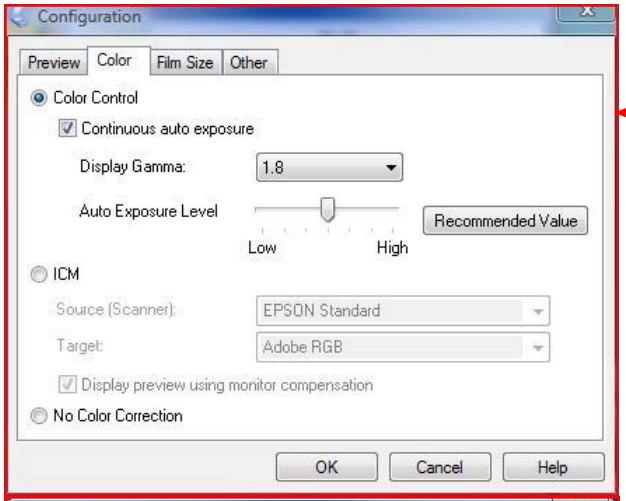
g. Color Management – Epson Scan

Epson Scan (in professional mode) offers the user colour control when scanning, this include support for ICC profile. To use these functions navigate to the following location.

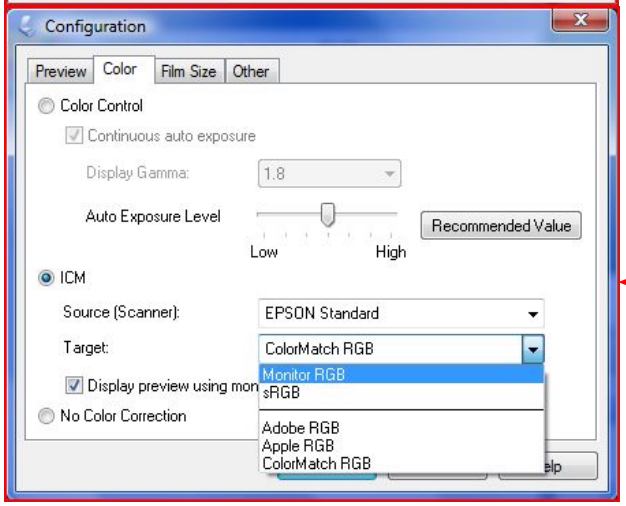
1 Open Epson Scan and select professional mode, from the drop down menu box located in the top right hand corner of the Epson scan window.

2 Click on the configuration button found at the bottom of the Epson scan window

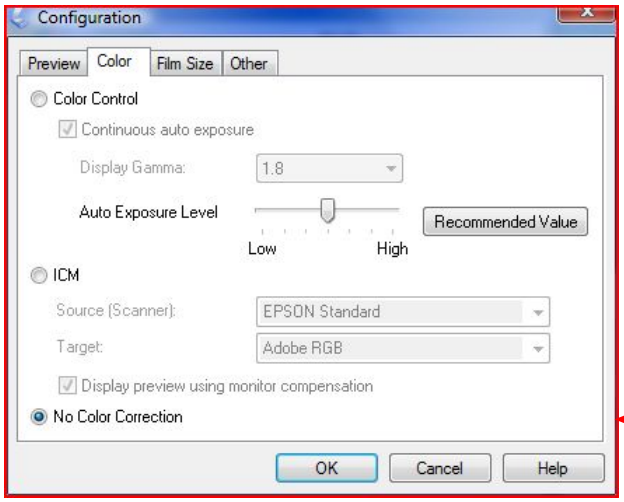
3 A new window will appear, click on the Color tab From here you may select a number of different color controls, these include selecting gamma, changing ICM profile and turning off color control.



Color Controls including continuous auto exposure and gamma settings



ICM controls, allows selection of a color profile from a dropdown list. For instructions on installing ICC profiles see the user guide for your scanner product



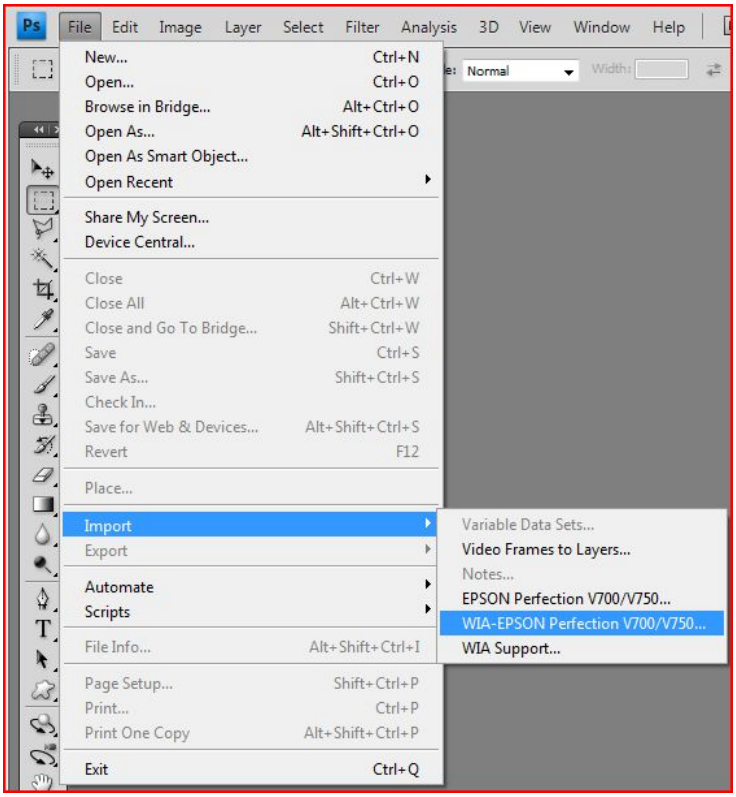
No Color correction, you may turn this off by clicking on this option.

h. Scanning directly into Photoshop (CS or Elements)

Importing images can be performed via many different versions of Photoshop, inclusive of Elements. To do so, follow the steps below. Screenshots taken from Photoshop CS4

1. Open Photoshop CS or Elements.

2 Click on file>import you can then chose Epson Scan as the software import option.



3 A new window will appear which will be representative of the Epson Scan mode you normally use. At this stage you must make your scan settings followed by clicking on either the preview or the Scan button.

4 If you selected the preview option, use either the Auto Marquee or draw your own selection, followed by clicking on Scan.

Note: When using Photoshop CS4 on vista/xp on a 64bit system, problems can occur. For a full explanation of the issue and the solution please visit the link here

2. Core Scanner Technologies

Epson Scanners contain a multitude of different technologies aimed at bringing the best scanning experience possible to the end use. This section outlines some of the key features, helping to explain why Epson scanners are market leaders.

a. ReadyScan LED Technology

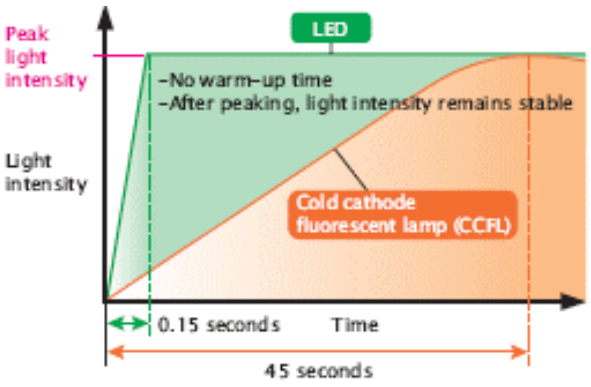
ReadyScan is an LED (Light Emitting Diode) Technology, which replaces the traditional light source found in some Scanning products. It offers a number of distinct advantages.

i. Environmental advantages

- Mercury free - green design
- Less power consumption to achieve energy efficiency
- Light source can be turned off during stand-by
- Safer to scan materials sensitive to heat as less heat dissipated over same duration of time
- Less material used in construction, no power inverter required

ii. Instant warm-up time

- Time required for “warm-up“ is less than 1 sec
- Same for both cold and warm environments



Power consumption is one area in which this technology excels. This is illustrated in the table below which shows the power reduction bought about by using LED technology. Additionally an LED light source can be turned off during stand-by unlike CCFL (Cold Cathode Fluorescent Lamps) which need to remain illuminated to avoid additional warm-up time.

	Operating	Stand-by/ Ready mode
ReadyScan Scanner	16.5W	5.0W
CCFL Scanner	27.0W (39% more power used)	18.0W (73% more power used)

iii. Lower operating Temperature

Thanks to using an LED light source, the working temperature from the scanner lamp is lower than that found from a CCFL lamp. This can be very important when working with temperature sensitive materials.

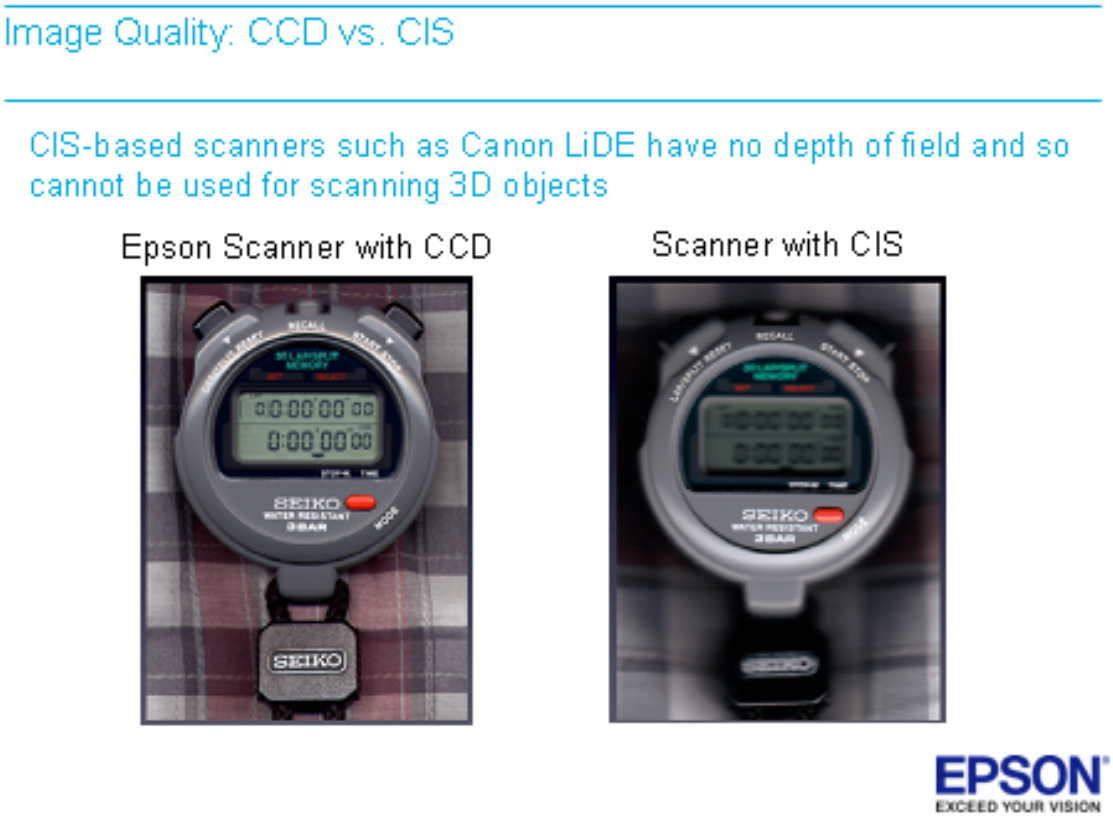
Condition	CCFL Scanner		LED Scanner	
	Document surface	Room ambient	Document surface	Room ambient
Reflective scanning	43.3°C	25.0°C	36.2°C	24.8°C
Film scanning	41.9°C	25.2°C	33.4°C	23.7°C

2. Matrix CCD Technology

The current core technology for image capturing sensor used in Epson Perfection scanners is the MatrixCCD image sensor. MatrixCCD is a trademark of Seiko Epson Corporation. Jointly developed with Sony, Epson was the first company in the world to use the technology in a scanner, the Epson Perfection 1200, which was introduced in 1999.

i. Pros of Matrix CCD with improved Micro Lens are:

- Allows a high resolution to be achieved without increasing the physical size of the scanner
- Better image quality achieved with the combination of the overall optical system and excellent image processing
- Together with the micro lens, the high sensitivity of the pixels is not compromised
- With the bigger sized micro lens, it allows more light to reach the CCD sensor leading to an improvement in image noise as well
- MatrixCCD also has deep depth of field over its other counterparts such as the CIS (e.g. Canon's LiDE technology). CIS systems are not adept at capturing images on film, in thick media such as magazines or 3D object (see image comparison below). A warped document will result in a loss in sharpness when scanning in CIS. Due to this fact, CCD are commonly found in high-end models of scanners and can be used in different applications.



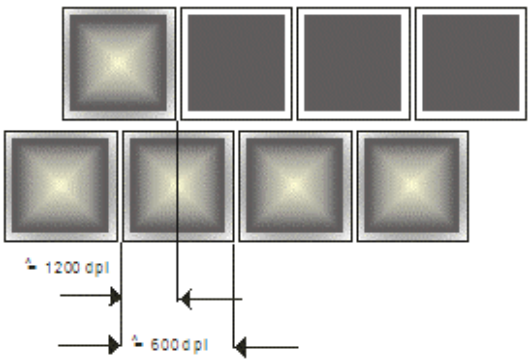
- Higher color gamut provided by the color filters for red, green, blue on the rows of CCD elements.
- Fast due to small chip size

ii. How it works

The electric sensitivity (the ability to turn light into a voltage) of each CCD element is higher at the center than at the edges of each element, meaning overall scan quality can suffer as a result. Epson Matrix CCD technology stacks multiple rows of light-sensitive elements so that the available light is captured more efficiently thanks to overlapping elements, this way a high resolution can be achieved while improving sensitivity of the entire system.

Traditional CCD

Epson Matrix CCD



3. Digital ICE Technologies

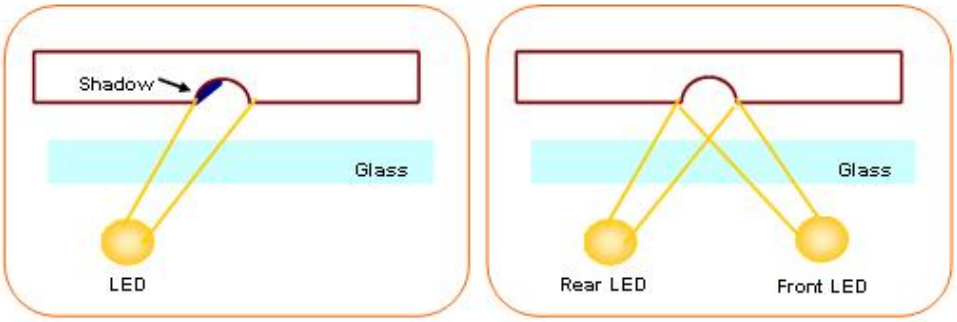
The term "Digital ICE" initially applied specifically to a proprietary technology developed by Kodak's Austin Development Center (formerly Applied Science Fiction (ASF)) that automatically removes surface defects, such as dust and scratches, from scanned images. A select team of former ASF founders and employees then later formed Image Trends Inc. This was initially a film scanning technology but was later brought into photo scanners through Image Trend Inc.).

Digital ICE Technology is built into the hardware of Epson scanners (such as the V750) and works with the Digital ICE software built into Epson Scan drivers. Digital ICE technologies in Epson scanners are available for both reflective (glossy photos) and films

i. Reflective

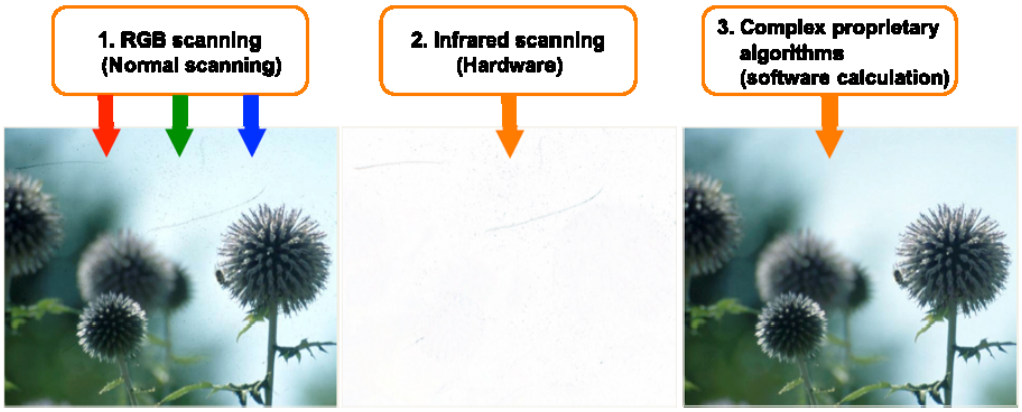
DIGITAL ICE for Photo Prints automatically removes surface defects, such as dust and scratches, from a scanned image. It uses differential shadowing technology and proprietary software algorithms to identify the precise locations of physical defects on a print being scanned. It quickly and automatically eliminates the unwanted defects, producing a scanned image file that improves upon the original print.

This is done by scanning a glossy photo with defects twice: 1st RGB scanning with rear lamp (one angle), 2nd RGB scanning with front lamp (another angle). Through these 2 images, information about the shadows created by these defects is stored in a separate data space. Digital ICE for Photo Prints will then use this information to remove defects from scanned image through complex algorithm calculation in software.



ii. Film

Digital ICE for Film uses a different method to remove defects from scanned image. During a typical scanning process, information is gathered using red, green and blue channels. However with Digital ICE for Film, an additional Infra-Red channel is used to collect defect information for correction. One of the properties of Infra-Red is its longer wavelength as compared to visible light, hence its ability to scan film media transparently. Images on film do not block Infra-Red while dust/defects do, thus creating an image with only the highly visible dust/defects visible. By superimposing the images scanned with Infra-Red and visible light, it detects the dust/defects on the document and automatically removes them using the interpolated and corrected image data near the dust/defects in the image.



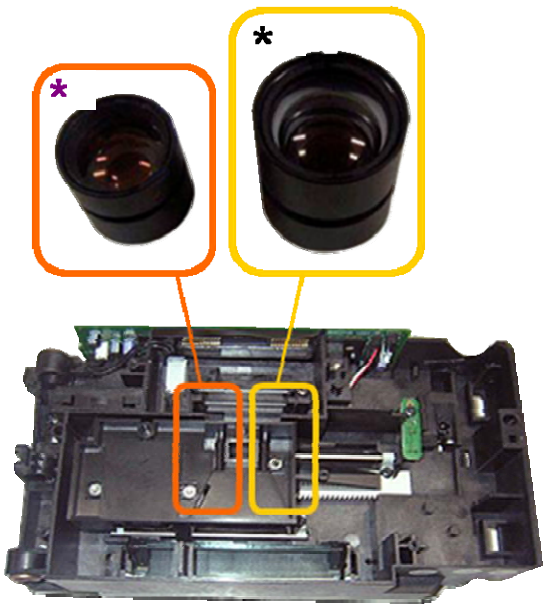
With hardware detection and software processing both involved, the end result will be a high quality image with reliable corrections.

4. Dual Lens System

The Dual Lens System is unique to Epson scanners, with the Epson V700 & V750 Pro being the first A4 consumer flatbed scanner in its range that are equipped with Dual Lens System. With this system, the scanner can achieve optimized scan quality by changing the lens according to the originals. Good image quality is achieved as Epson design different focus points for reflective and transmissive (film) media types. This translates to a dedicated lens (Duel lens system) for each the two different media types, ensuring maximum sharpness in the resulting scanned images.

i. Dual Lens System is featured with 2 different optical resolution lenses:

1. 6400 dpi Super Resolution Lens for film scanning with Film Holders, which exhibits the following:
   - Bigger Diameter leading to sharper image (Higher MTF)
   - Higher F number leading to wider depth of field which is necessary because the magnification of the super resolution lens is high. Additionally scanning with a super resolution lens mean increased sensitivity to distance for focusing, thus a wide depth of focus is needed for scanning with super resolution lens
   - Special lens material improves inflection rate
2. 4800 dpi High Resolution Lens for reflective scans and film scanning with Film Area Guide



ii. Why is Dual Lens System used instead of a single lens to achieve 6400dpi scanning?

If a single lens was used, it will lead to the need for a more expensive CCD. The cost will put the products beyond the consumer flatbed scanner price range.

The size of scanner would also need to be increased, making the unit larger than is practical for it to be considered a personal desktop scanner.