

# DeBloomer documentation

DeBloomer is a plug-in for MaxIm DL and CCDSoft

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## ***Installation Notes***

There are two separate versions of the DeBloomer. One is for CCDSoft, and one is for MaxIm DL. If you are using both programs, and want to use the DeBloomer, then you will need to download and install both versions. To install, simply run the executable file for each version.

Installation must copy the actual plug-in files to the correct sub-folders for CCDSoft and MaxIm DL. In some cases, the installation program may not be able to find these folders. If that occurs, you can copy the plug-in files from the default installation folder to the correct folder manually.

By default, the plug-in files are copied to the following folders:

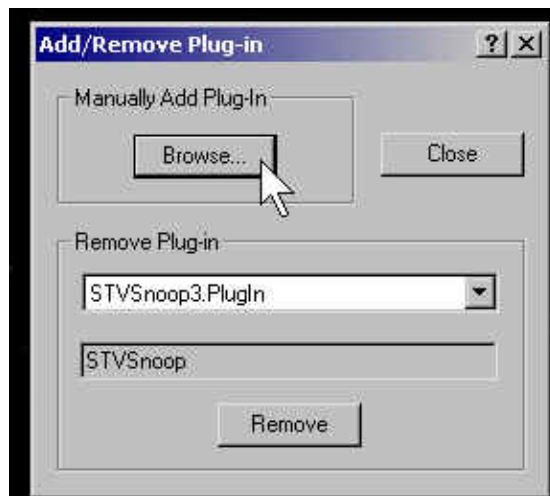
\Program Files\Software Bisque\CCDSOFT Version 5\Image Processing Plug Ins\DeBloomer\_CCDSoft.dll

\Program Files\Diffraction Limited\MaxIm DL V4\DeBloomer.dll

If you have installed CCDSoft or MaxIm DL to a different folder, manually copy the above files to the correct folder.

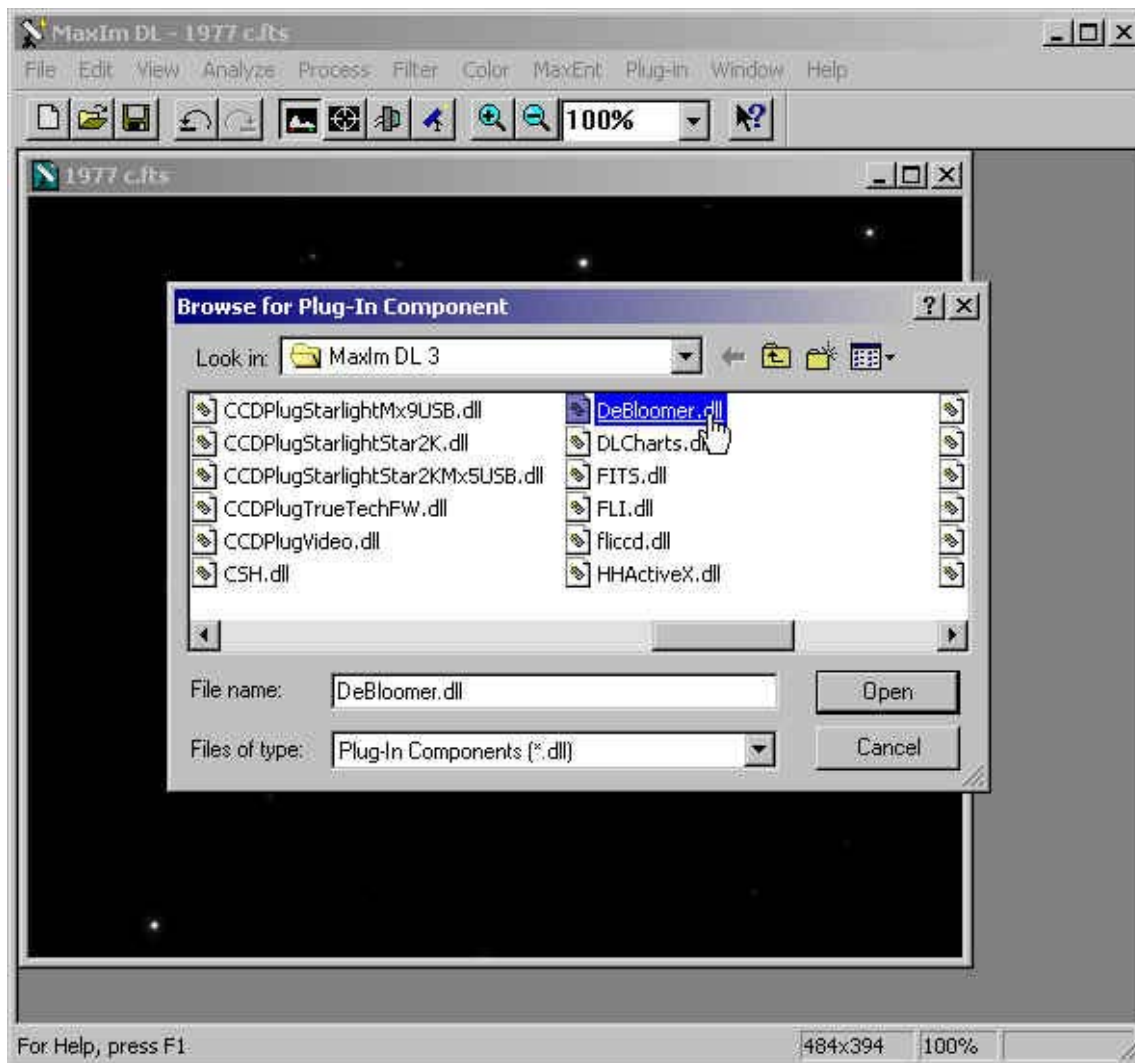
## ***Adding the DeBloomer Plug-In to MaxIm DL***

CCDSOFT will automatically recognize the plug-in. For MaxIm DL, click the Plug-in | Add/Remove Plug-in... menu item. This opens the Add/Remove Plug-in dialog, shown below. Click the Browse button.



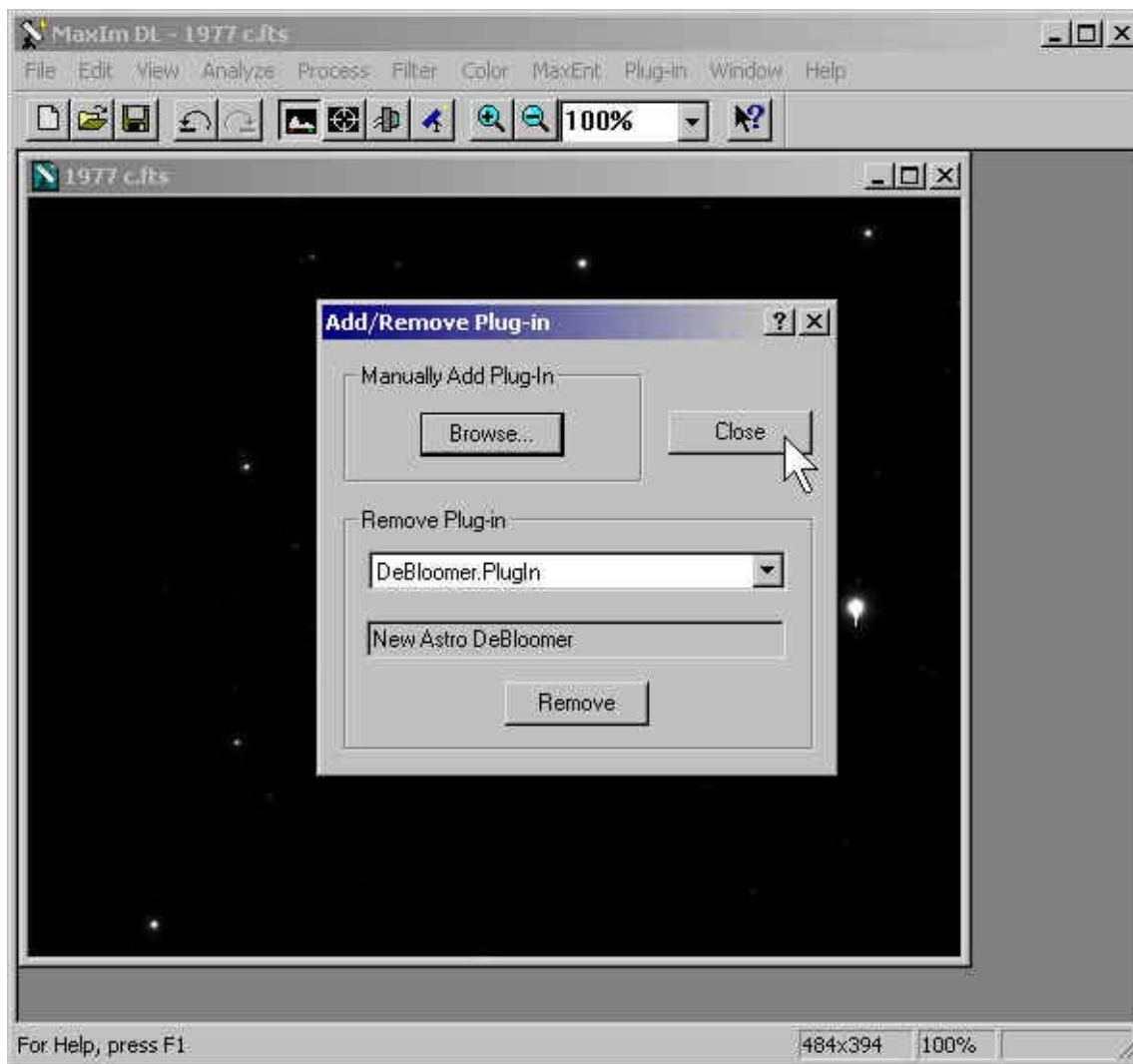
***Click the Browse button to locate debloomer.dll.***

This displays a list of all of the files in the MaxIm DL program folder. Locate debloomer.Plugin, and click on it to select it. Click the Open button, and then locate DeBloomer.dll.



**Locating debloomer.dll.**

This takes you back to the Add/Remove Plug-in dialog. DeBloomer.Plugin is listed now. Click the Close button.



***The DeBloomer Plug-in is now available.***

You only have to add the plug-in one time.

## Using DeBloomer

To begin, open an image that has some blooming in MaxIm DL or CCDSoft. You must have the latest version of these programs installed to use DeBloomer. Once the image is open, you will have access to the DeBloomer menu item in each program.

- To access DeBloomer in MaxIm DL, use the Plug-in | Newastro DeBloomer menu item.
- To access DeBloomer in CCDSoft, use the Image | Plug Ins | Newastro DeBloomer menu item.

The default settings of DeBloomer will work for most but not all images, so you may need to tweak the settings for your images. For your first deblooming session, start with the default values, observe the results you get, and then adjust the values. Here are some tips for common adjustments you can make to improve your results

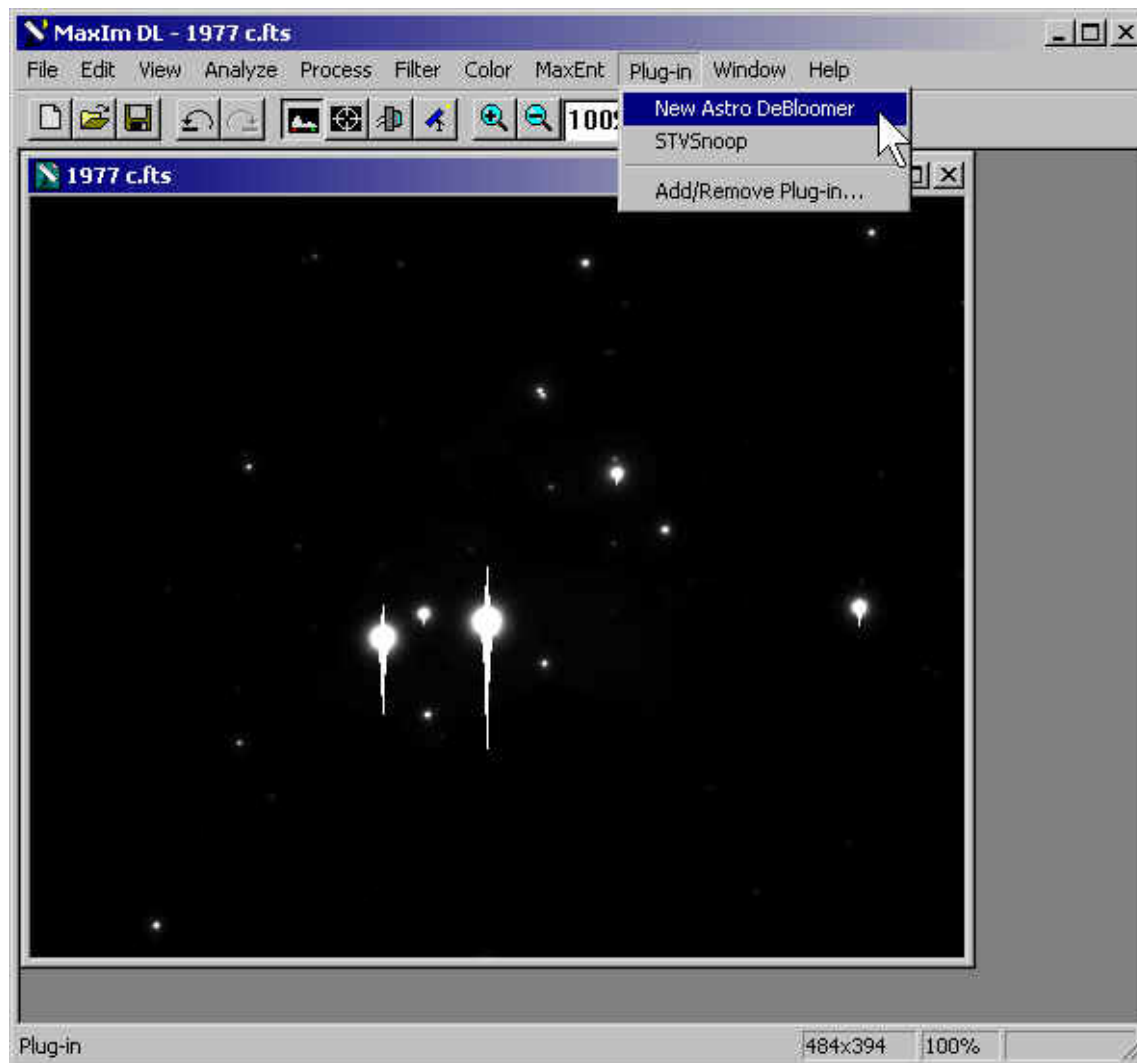
### Quick start tips

- **Always apply deblooming to single images, not to combined images. Combined images blur the line between what is a star and what is a bloom because the blooming values are smeared out by the combine. This makes it much more difficult to identify and remove blooms.**
- If you have very small blooms present, you can use a smaller Scan Length (on the More Options dialog). Default is 9, and small blooms may require a scan length of 3-5.
- If you get short blooming tails above and below bright stars, increase the Star Limit. The default star limit is 3200 above the average background; try raising the star limit by 1000-5000.
- If deblooming removes too much of the star, decrease the Star Limit. The default star limit is 3200 above the average background; try lowering the star limit by 500-1500.
- Stars with heavy blooming are more damaged, and therefore more challenging to repair. If you have very wide blooms in an image (or very small stars because of a very fast focal ratio and good seeing), careful use of the rotation tool will give you the best results. To use the rotation tool, check "Fix stars by rotation" and **uncheck** "Rotate without showing stars first" on the More Options dialog. See the end of this document for tips on using star rotation tools. If you want to keep repairs simple, shorten exposure times to limit the width of blooms near the bright stars.
- If the filled area doesn't match your image very well, you need to adjust the Noise factor to get the noise in the fill area to match the noise level in your image. Lower the number to get a smoother result; raise the number to increase the noise level.

### MaxIm DL Operation

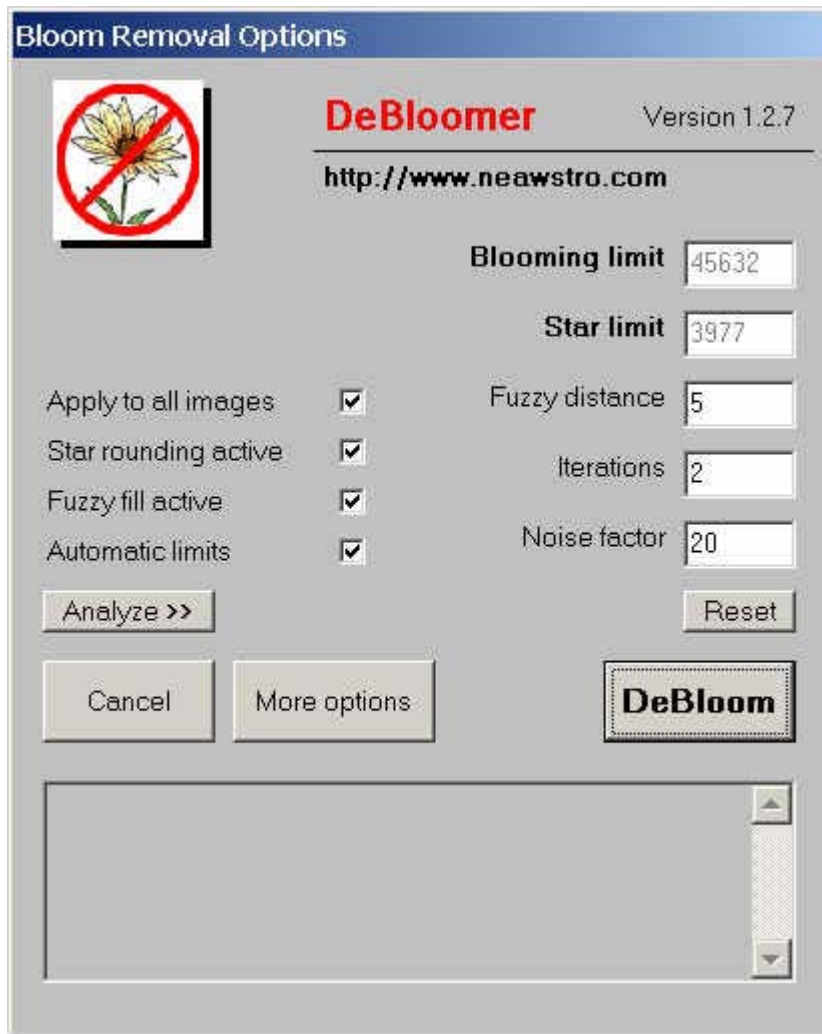
To use the plug-in, click the Plug-in | New Astro DeBloomer menu item as shown below.

**NOTE:** When working in MaxIm DL, you can also select a drag rectangle around one or more blooms before invoking the DeBloomer. This allows you to customized deblooming on portions of the image. In many cases, however, DeBloomer will do a good job even if bloom sizes and star sizes vary.



***Starting the plug-in.***

The Options dialog of the DeBloomer plug-in appears as shown below in MaxIm DL. The plug-in has a large number of options available, but if you set the options as shown below you can try your first deblooming session right away. If your results aren't optimal, read the rest of this documentation to learn how you can tune DeBloomer to your images.



*The MaxIm DL options for the DeBloomer plug-in.*

## CCDSOft Operation

The Options dialog of the DeBloomer plug-in appears as shown below in CCDSOft. The options are slightly different than in MaxIm DL because of differences between the two programs. If you set the options as shown below you can try your first deblooming session right away. If your results aren't optimal, read the rest of this documentation to learn how you can tune DeBloomer to your images.



*The CCDSOft options for the DeBloomer plug-in.*

## Options and Settings

The DeBloomer Options dialog contains the following options:

**Blooming Limit** - All pixels brighter than this value are assumed to be bloomed pixels. If you set this number too low, blooming removal will be too aggressive. If you set it too high, you may not get any bloom removal at all.

**TIP** Click on the text "Blooming limit" and DeBloomer will calculate a suggested value for the Blooming Limit.

To find the Blooming Limit manually, open the MaxIm DL Information window and pass the cursor over some blooms to get an idea of how bright they are. Set the Blooming limit to about 5000 ADU (brightness levels) lower than the typical bloomed pixel level.

**Star Limit** - This determines what the program considers a star. All pixels brighter than this number and dimmer than the Blooming Limit are considered to be star pixels. This number should typically be about 1000-3500 ADU brighter than the background level.

If blooming is severe, a higher number will be better. If blooming is mild, use a number closer to the background

**TIP** Click on the text "Star limit" and DeBloomer will calculate a suggested value for the Star Limit.

If the Star Limit is too small, the program will fail to clean up blooms effectively. If the number is too large, stars will typically have square tops and/or bottoms. You can use rotation to clean up aggressive bloom removal, however, and the combination of a high star limit and use of rotation (see "More Options" dialog box description) can be very effective.

**Fuzzy distance** - Determines how far away from the bloom to apply smoothing. The larger this number, the more smoothly the edge of the bloom is blended into the background. Only applies if "Fuzzy fill active" checkbox is checked.

**Iterations** - The number of times the program should process the image. In most cases, a single iteration will do the trick. If you need more than one iteration, be sure to set the Auto Increment value on the "More Options" dialog. This tells DeBloomer how aggressive to get with each successive iteration.

**Noise factor** - Every image has some residual noise. This setting allows you to match the fill in the area where the blooms were to the image noise level. Larger numbers make for greater noise. Start with a value of 20, and raise or lower it to match the noise in your image. To evaluate the noise level accuracy, temporarily lower the white point and examine how well the background in the area where the bloom was removed matches the rest of the image.

**Apply to all open images** - When checked, applies the deblooming operation to each open image.

**Note:** In CCDSoft, this is replaced by the **Apply to Folder** option. Click the button with three dots on it to select the folder of images to DeBloom.

**Star rounding active** - When checked, boosts brightness at the top and bottom of large stars to help alleviate square tops and bottoms. If you do more than one iteration, this effect will only be applied on the last iteration.

**NOTE** This option provides mild star rounding. For more aggressive/advanced star rounding, try using star rotation instead.

**Fuzzy fill active** - When checked, the program will smooth out rough edges of the bloom by extending the fill area into the surrounding background. If this number is too large, you will lose stars that are very close to the bloom. If it is too small, blending will be minimal. The "Fuzzy distance" setting determines the extent of fuzzy fill.

**Automatic limits** - When checked, the program will calculate its best guess for the Blooming and Star Limits for each image processed. This is Ideal for processing multiple dissimilar images when "Apply to all open images" is checked. Automatic Limits is also a great way to get close on your first attempt. You can then tweak these two settings to get the best possible results.

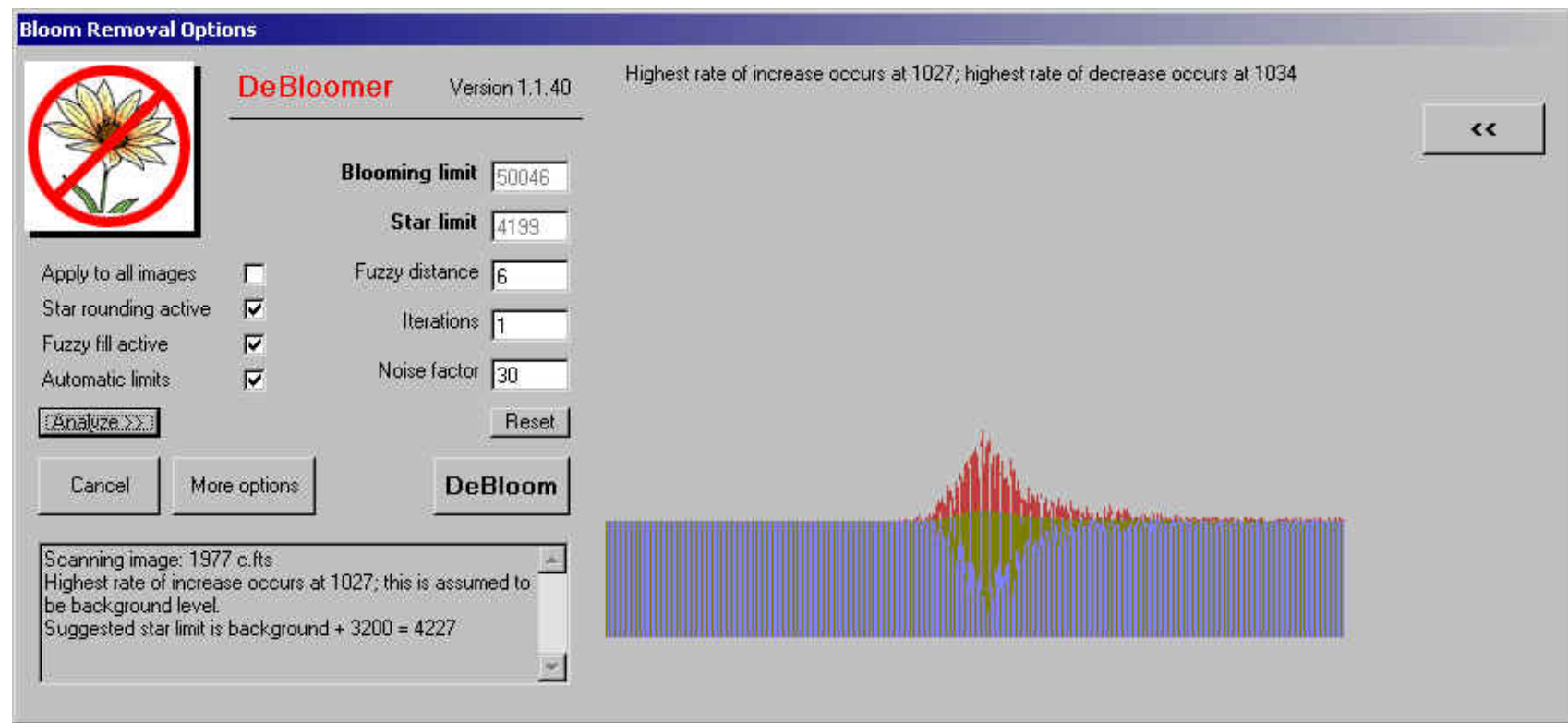


There are two small buttons on the Options dialog:

**Graph/Analyze** - The program will examine the dim portions of the data and show how it calculates the average background level. A graph (see sample below) is displayed that shows two parameters: the histogram of the image (blue) and the rate of change in the histogram (red). (The data plots appear green where they overlap each other.) Click the "<<" button at top right to close the analysis section. Typically, an image's background level is located at about the point where the histogram's higher rate of increase occurs.

A text report of the analysis appears at the bottom left of the DeBloomer Options dialog. You can select this text and copy it to the clipboard for later evaluation.

**Reset** - Resets default values for all options here and on the "More Options" dialog.



*An analysis shows the histogram for the dim portions of the image.*

There are also three large buttons:

**Cancel** - Cancels deblooming. This button remains active during most portions of the deblooming operation, so you can cancel while deblooming is occurring. It is not active during evaluation of rotation.

**More Options** - Displays additional options described below.

**DeBloom** - Starts the deblooming process.

The “More Options” button displays the “Additional Options” dialog shown below. This dialog is the same in both CCDSoft and MaxIm DL. See below for detailed descriptions of the settings. In most cases, you can get good results without making many changes to the More Options settings. The most important settings are the ones related to the rotation features of the DeBloomer.

***The Additional Options dialog.***

The additional options include:

**Scan Length** - This value tells the software how small of a star to check for blooming. The idea value will vary with the quality of the seeing. Nights of good seeing will produce compact stars that are more likely to bloom. Nights of poor seeing will spread out the light and only larger stars will bloom. You can adapt to imaging conditions using the Scan Length. Values of 5 to 10 can prove useful. If small stars with short blooms remain after deblooming, you need a lower value here.

**Scan booster** - This value increases or decreases the Scan Length when scanning for stars. A large value will help root out larger blooms, but may compromise stars by lopping off tops and/or bottoms a bit. This number rarely needs changing.

**Auto increment** - Determines how aggressively the program should hunt down and destroy blooming during multiple iterations. This parameter increases the Star Limit in each iteration. Values over 100 increase the star limit more aggressively; values under 100 have less impact.

**Star limit adjust** - When you ask DeBloomer to automatically set or suggest the value for Star limit, it finds the average background value and adds this number to it. The Star Limit Adjust value allows you to customize the automatic setting for your typical images.

**Left Adjustment** - When filling in bloomed pixels, DeBloomer uses the value of pixels adjacent to the bloom to calculate the fill values. The Left Adjustment value, if it is not zero, tells DeBloomer to adjust the starting value for the left edge of the fill by the amount specified. For example, if the left edge is slightly brighter due to flaring of the bloom, you can enter a negative number for Left Adjustment to compensate. This will prevent a slightly bright fill for the bloom on the left side.

**Right Adjustment** - Same as above, but for the right side of the bloom.

**NOTE** Left and Right adjustment values are never saved to the registry. These values are typically suited only to one image (or even one bloom) at a time, and would be annoying if you forget to change them back.

**Create bloom map** - When checked, causes a map of blooms and stars to be created instead of removing blooms. DeBloomer will scan the image looking for blooms and stars as it usually does, but it will not fix the blooms.

If you are having trouble with settings or in getting bloom removal done right, you can use a map to help figure out what's going wrong. Are the stars that the program is identifying too large? Raise the star limit. Is blooming overly aggressive because stars are too small? Lower the star limit. Is there a complete failure to find any blooms? The Blooming limit is probably too high.

**Fix by rotation** - This is a very powerful feature unique to DeBloomer. When checked, the DeBloomer will make a copy of a star, rotate it 90 degrees, and then use that to fix up the top and bottom edges of the star.

Typically, blooms run right through a star, obliterating the top and bottom of the star image. When "Fix by rotation" is on, the left and right edges of bloomed stars are copied and rotated fix up star images. Replacement stars are displayed for evaluation using a dialog described below.

See also "Rotate without showing stars first" below; it controls whether you get a chance to evaluate star rotation.

You can set a larger or smaller "Min. star size" (see below) to determine the smallest star presented for evaluation. During evaluation, you can also adjust the x, y coordinate of the rotation and the size of the rotated image.

**Rotate without showing stars first** - Performs star rotation to fix up bloom damage (see above) without showing you the rotated star first. This turns on automatic rotation.

**NOTE** Blooming makes it difficult to automatically find star centers. For most images, leave this setting unchecked so you can evaluate each rotation visually and confirm or adjust it. Use this setting with caution!

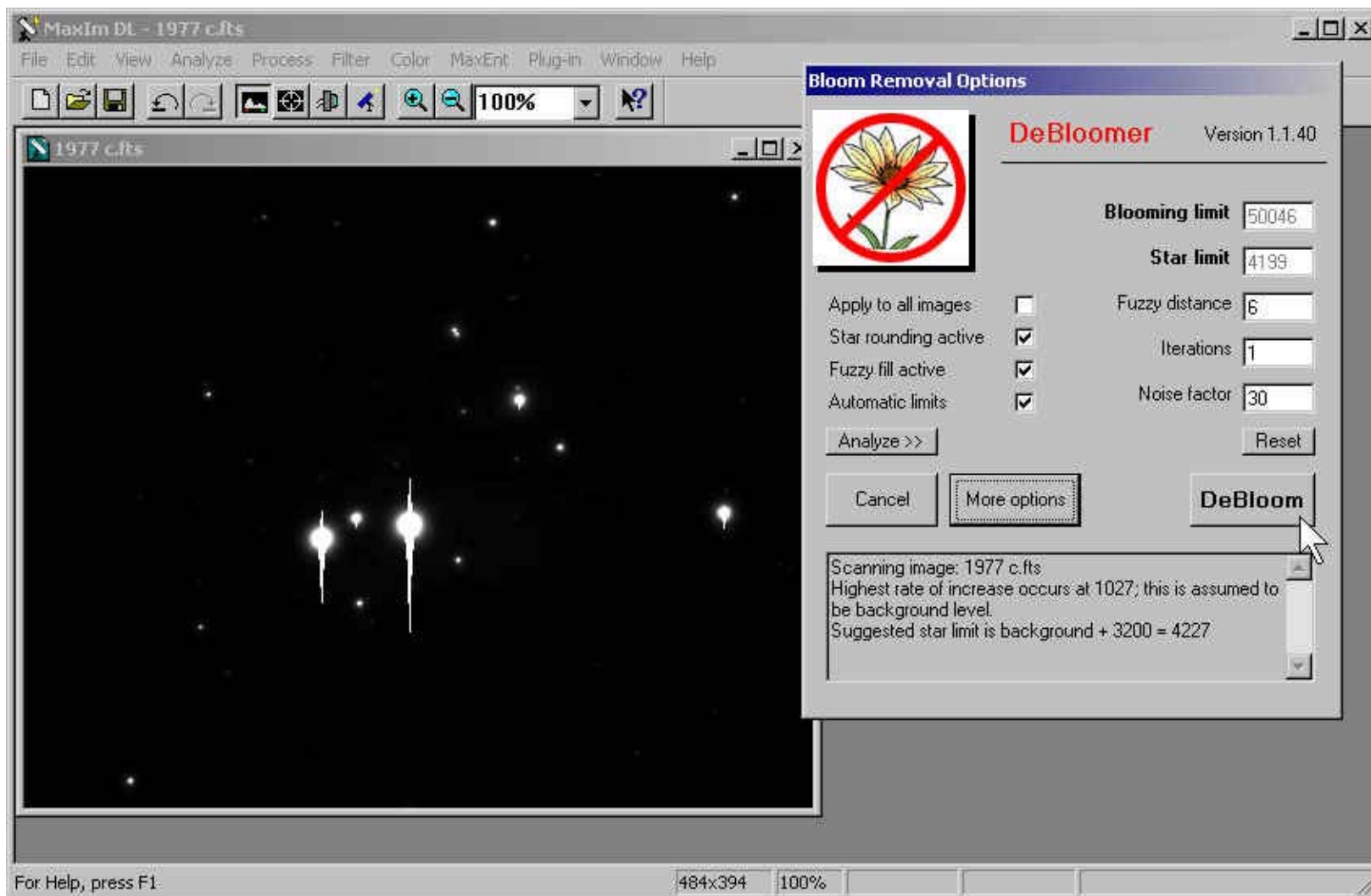
**Min. star size** - During rotation, this is the smallest star that will be shown for evaluation. A value of 3-4 will show lots of stars; a value of 8 will show only the largest stars. The best numbers for your images will depend on exposure length, seeing conditions, etc.

**Star factor** - Determines how far out from the center of the star the DeBloomer will make changes when "Fix by rotation" is checked. A value of 15 or 16 is typically a good match for most images, but smaller or larger values may be required for some stars. You can set this value interactively while visually evaluating rotation results as described below.

There is also a registry-only value:

**Blooming Slope** - This number should not need to be changed; it is pre-set in the registry to 1000. The program uses this number to determine how much brighter than an adjoining pixel a potential bloom pixel must be in order for it to be a legitimate bloom pixel. If you are experiencing problems with the software accurately finding bloomed pixels, you can edit this value in the registry to see if it will help. Try increasing it to make the program more discriminating about what is, or is not, a bloomed pixel.

To start a deblooming session, click the DeBloom button as show below.

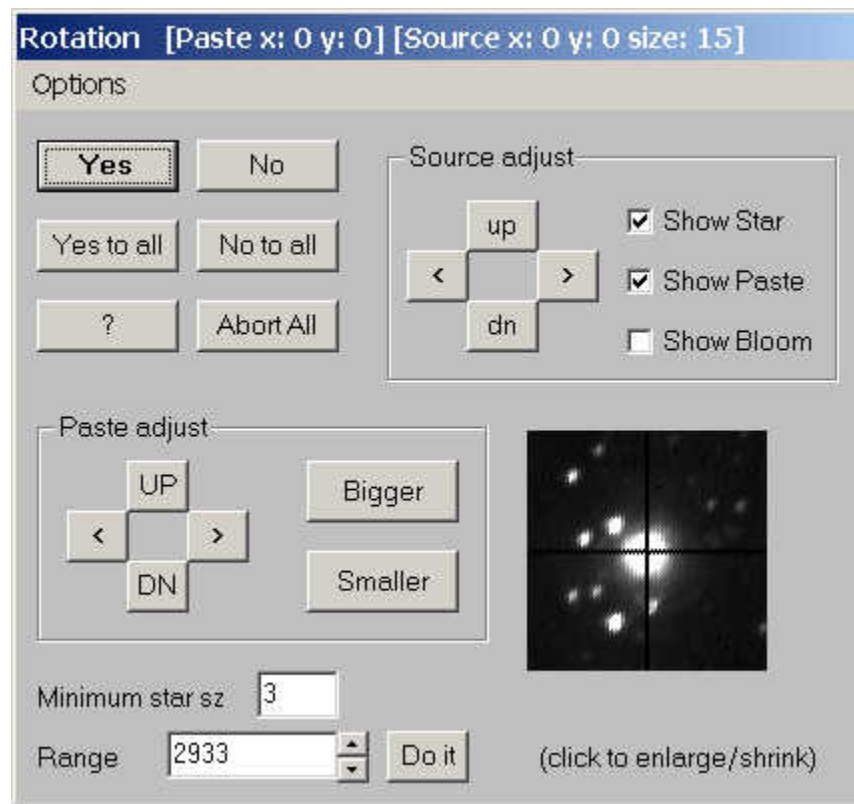


**Start a deblooming session by clicking the DeBloom button.**

During deblooming, you will see status information in the small box at the bottom of the DeBloomer Options dialog.

## Rotation Features

The Rotation Adjustments dialog allows you to interactively make adjustments to the rotation to optimize results. With the Rotation dialog, you can get a very high percentage of round stars with a single pass of deblooming. The figure below shows the Rotation dialog.



**The Rotation dialog.**

The Rotation dialog contains the following settings and tools.

**Paste/Source offsets** - These appear in the caption bar of the dialog. They show the current up/down and left/right offsets for the paste and source, and the size of the paste object (star factor).

**Yes** - Applies the current rotation adjustments to the displayed star.

**No** - No rotation adjustment is applied to the displayed star.

**Yes to all** - Applies rotation adjustments to all stars automatically. If "Remember adjust" is checked, the current x, y, and Star factor settings are used. If it is unchecked, x=0, y=0, and star factor remains unchanged for all subsequent stars.

**No to all** - No rotation is applied to this and all subsequent stars.

**Minimum star size** - Same as "Min. star size" on "More options" dialog. It allows you to change the minimum star size if you decide that too many or too few stars are appearing for evaluation.

? - Click for an explanation of why manual evaluation is used in addition to automatic:

#### Why use manual centering for rotation?

Bloomed pixels obliterate a major portion of a star. This makes it very, very difficult to locate the star center accurately. The software does do its best to find the star center, but manual centering is still available as an option for those cases where the blooming makes it impossible to locate the star center automatically. The worse the blooming, the harder it is to find star centers accurately.

**Source Adjust area:** Controls how the star data is picked up from the image.

**Up, Left, Right, Down buttons** - Adjust the center of the source star image in the indicated directions. X and Y values that result are displayed in the caption bar of the Rotation window. Use these arrows if the pick up star image is not centered. You will need to uncheck Show Star and Show Bloom to check centering. The image at right shows a star pick up image that is not centered (it is too low; you would click the up button to fix it).



**Show Star** - When checked, includes the original star image in the view at bottom right.

**Show Paste** - When checked, includes the pasted, rotated image in the view at bottom right.

**Show Bloom** - When checked, includes the bloomed pixels in the view at bottom right.

**View Window** – Displays the star, bloom, and paste images as determined by the check boxes. Click the view window to toggle it between small and large versions.

**Paste Adjust area:** Controls how the rotated star image is pasted over the data.

**Up, Left, Right, Down buttons** - Adjust the position of the pasted star image in the indicated directions. X and Y values that result are displayed in the caption bar of the Rotation Adjustments window.

**Bigger** - Expands the size of the rotated star image. If too large, excess background will be copied. If too small, the rotated image will be smaller than the star size. The initial value is controlled by the "Star factor" setting on the "More options" dialog. The current value of Star factor is displayed in the caption bar of the Rotation window.

**Smaller** - Shrinks the size of the rotated star image. See "Bigger" for more details.

**Minimum star size** - Smaller number result in more stars being presented for manual review. Larger numbers result in fewer stars for manual review. Adjust so that only stars that actually require manual adjustments are shown.

**Range** - Same as the Range in programs such as CCDOPS. Larger numbers move the white point further out; smaller numbers move it in and increase contrast. For best results, adjust the Range so that you can see the boundary of the star clearly. Click the Do It! Button to change the Range.

The **Options menu** contains the following settings:

**Remember adjustments** - When checked, the X, Y, and Star factor values from the current star are carried forward to the next star.

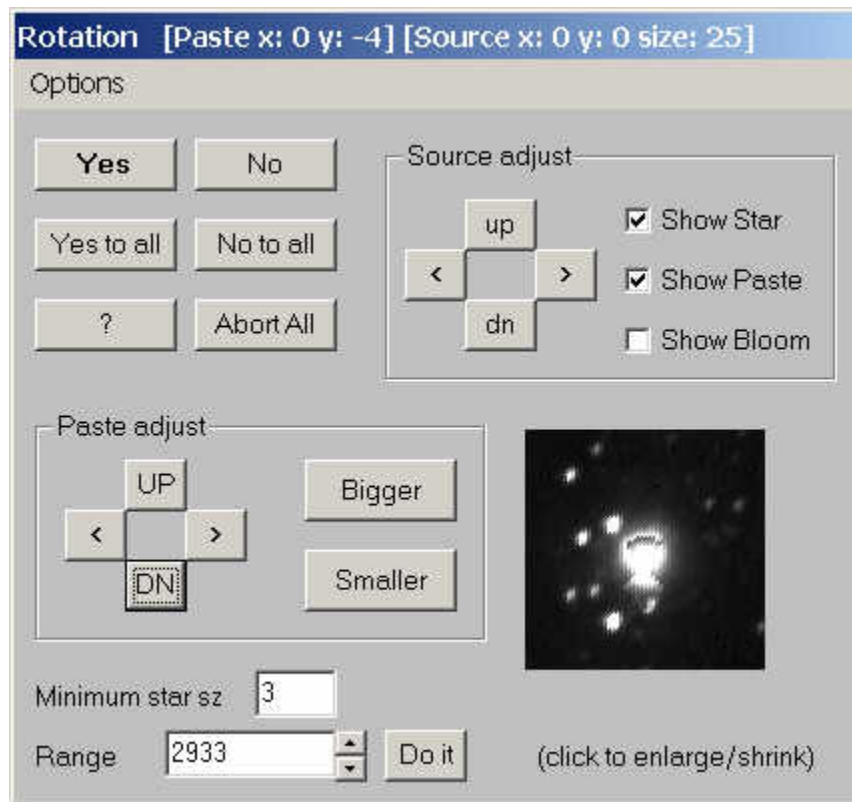
**Show blooms at full intensity red** – When checked, and when the Show Bloom checkbox is checked, blooms will be shown as a fully saturated red color. Otherwise, blooms are shown in a hatched pattern that allows the underlying star image to be seen more clearly.

**Show cross-hairs** - When checked, cross hairs are added to the evaluation image. The cross hairs mark the center of the rotated star image.

## Using Rotation Features

The first task is to make sure that the star has been properly picked up from the image for rotation. Use the Source Adjust area to make any corrections in the pick-up star. To do this, uncheck Show Star and Show Bloom, and make sure that Show Paste is checked. Now use the up/down and left/right buttons in the Source Adjust area to center the pick-up star image.

The next task is to make sure that the rotated image is correctly centered on the original image. Use the Paste Adjust area to make any corrections. Make sure that the Show Star and Show Paste checkboxes are checked, and that Show Bloom is not checked.



**Use the UP button in the Paste Adjust area to line up the pasted image with the star.**

Once the pasted image is correctly centered, use the Bigger and Smaller buttons to match the outer edges of the pasted star to the underlying star.

That's all there is to it! The Rotation tool takes a while to learn, but it's a powerful weapon in your efforts to get the cleanest possible results.



## ***Scripting with the DeBloomer***

You can create an instance of the DeBloomer plug-in for use in scripting.

To create an object in Visual Basic:

```
Set debloomer = CreateObject("DeBloomer.Plugin")
```

For most applications, automated bloom and star limits are best. The following sample code sets the settings and calls the call:

```
' You must declare the document variable as an Object type
Dim myDoc as Object
Set myDoc = CreateObject("MaxIm.Document")
myDoc.OpenFile "C:\somefolder\myimage.fit"
fixAllBlooms(myDoc)
' The document is left in a changed state, but is not saved.

' A subroutine that sets properties and calls DeBloomer.
Public Sub fixAllBlooms(inDoc As Object)
    Dim fltr as Object

    Set fltr = CreateObject("DeBloomer.Plugin")
    ' Save changed settings to registry so they will be loaded
    '   the next time DeBloomer is run manually?
    If savingSettings Then
        fltr.saveSettings = True
    End If

    ' Set up options; note data types!
    '   numbers are Doubles; checkboxes are Integers.
    fltr.bloomLimit = CDBl(frmBloomRemoval.txtBloomLimit)
    fltr.starLimit = CDBl(frmBloomRemoval.txtStarLimit)
    fltr.fuzzyDistance = CDBl(frmBloomRemoval.txtFillDistance)
    fltr.iterations = CDBl(frmBloomRemoval.txtBloomIterations)
    fltr.noiseFactor = CDBl(frmBloomRemoval.txtNoiseFactor)
    fltr.starRounding = CInt(frmBloomRemoval.chkFixTopBottom.Value)
    fltr.fuzzyActive = CInt(frmBloomRemoval.chkFuzzy.Value)
    fltr.autoLimits = CInt(frmBloomRemoval.chkAuto.Value)
    fltr.starSize = CDBl(frmBloomRemoval.txtStarSize)
    fltr.AutoIncrement = CDBl(frmBloomRemoval.txtBloomIncrement)
    fltr.starAdjustment = CDBl(frmBloomRemoval.txtStarAdjust)
    fltr.leftAdjustment = CDBl(frmBloomRemoval.txtLeftAdjust)
```

```

    fltr.rightAdjustment = CDBl(frmBloomRemoval.txtRightAdjust)
    fltr.fixByRotation = CInt(frmBloomRemoval.chkRotate.Value)
    fltr.displayRotatedStars = CInt(frmBloomRemoval.chkNoStars.Value)
    fltr.minStarSize = CDBl(frmBloomRemoval.txtMinStarSize)
    fltr.starFactor = CDBl(frmBloomRemoval.txtStarFactor)

    ' Perform deblooming.
    fltr.deBloom inDoc

    ' Clean up object we created.
    Set fltr = Nothing
End Sub

```

## DeBloomer Properties:

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### **debloomer.saveSettings** As Boolean

When set to True, the settings you set in script are saved to the Windows registry, and will be the settings used for all subsequent deblooming operations, manual or scripted. When set to false, settings are only valid for the current call to the DeBloomer.

---

### **debloomer.bloomLimit** As Double

Same as the Blooming limit in the plug-in.

---

### **debloomer.starLimit** As Double

Same as the Star limit in the plug-in.

---

### **debloomer.fuzzyDistance** As Double

Same as Fuzzy distance in the plug-in.

---

### **debloomer.iterations** As Double

Same as Iterations in the plug-in. Number of passes to make with each image.

---

### **debloomer.noiseFactor** As Double

Same as the Noise factor in the plug-in.

---

### **debloomer.applyAll** As Integer

Same as the "Apply to all open images" checkbox in the plug-in.

---

### **debloomer.starRounding** As Integer

Same as the "Star rounding active" checkbox in the plug-in.

---

**debloomer.fuzzyActive** As Integer

Same as the "Fuzzy fill active" checkbox in the plug-in.

---

**debloomer.autoLimits** As Integer

Same as the "Automatic limits" checkbox in the plug-in.

---

**debloomer.fixByRotation** As Integer

Same as the "Fix by rotation" checkbox in the plug-in.

---

**debloomer.starFactor** As Integer

Same as "Star factor" in the plug-in.

---

**debloomer.starAdjustment** As Double

Same as "Star limit adjust" in the plug-in.

---

**debloomer.leftAdjustment** As Double

Same as "Left Adjustment" in the plug-in.

---

**debloomer.rightAdjustment** As Double

Same as "Right adjustment" in the plug-in.

---

**debloomer.displayRotatedStars** as Integer

Same as "Rotate without showing stars first" checkbox.

---

**debloomer.minStarSize** as Double

Same as "Min. star size" in the plug-in.

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## **DeBloomer Methods:**

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**debloomer.deBloom(inDoc As Object)**

Takes a Maxim.Document object as its argument. Specifies the document that is to be debloomed. Returns nothing. Note that you must declare the object as object, not as a MaxIm DL Document!