6.13 *SilverFastSRD* (Dust- and Scratch Removal)

Eliminating dust and scratches by standard means of retouching is an extremely time consuming “pleasure”. There have been quite a few approaches in software to solve this problem, but none has reached a professional level so far. Those software packages that have tried showed poor quality and did not solve the challenge of «How can Software differentiate between the true details and unwanted artifacts?»

How does *SilverFast* Recognise Dust and Scratches and How will they be Eliminated?

With *SilverFast SRD* (Version 6.x and above), even inexperienced „retouchers“ can obtain convincing results with just a few clicks of the mouse and a small number of masks. “SRD“ stands for „Smart Removal of Defects“. More than 95% of burdening retouchings can be saved by means of *SilverFast's integrated SRD™* (Smart Removal of Defects).

SilverFast SRD uses a multi-stage process based on masking and layer technology over which the user has complete control. (*SilverFast SE* can only use one layer with reduced controls).

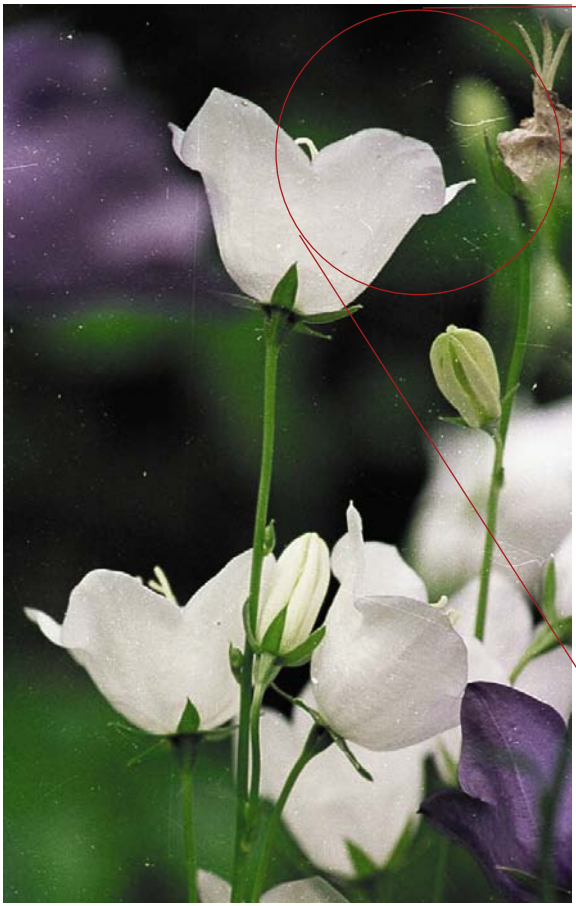
The starting point for this process is an intelligent automatic mechanism which achieves very good results for an average intensity of application and in most cases produces a successful outcome. It makes sense to start with fine, smaller defects and move up layer by layer and mask by mask to more pronounced scratches and artifacts.

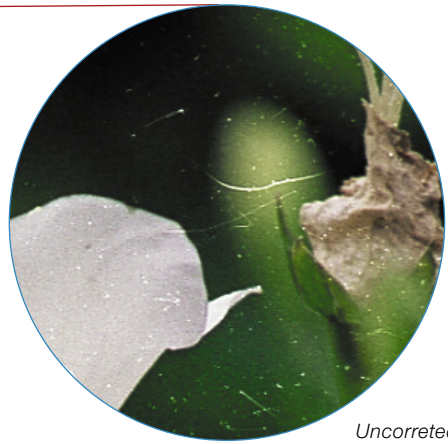
This elegant method enables to keep the image detail and leave a minimum (if at all) for removal with a clone tool.

Description of the special functions of iSRD can be found on page 389.

For optimum recognition of artifacts *SilverFast* uses two different methods: regular dust and scratch removal and the removal of linear artifacts. These work with parameters with similar names, yet have different effects on different artifacts.

Another advantage of *SilverFast SRD*: all processing uses the full dynamic range (bit depth) of the scanner involved! The better the scanner, the better will be the result of any processing.





Uncorreted silde

With SilverFast SRD corretced slide

Effect from SilverFast SRD
Left: uncorreted silde

Expert Mode

Allows usage of slider "Environment size" and opens menu "Longish scratch removal"

Administration of Layers

Add new layer

Delete active layer

Move layer in front of previous

Move layer behind following

Reset parameters

Creating Masks

Changing mask tools: Click button and hold mouse depressed, when pop-up comes up change to tool desired .

Brush

Polygon

Lasso

View of Artifacts

Realtime correction on / off

Original, without correction

Artifacts removed

Artifacts highlighted (red)

Help

Opens help, instructions and description of functionality

iSRD®
LaserSoft Imaging

Description of the special functions of iSRD can be found on page 389.

Activation of SilverFast Dust and Scratch Removal

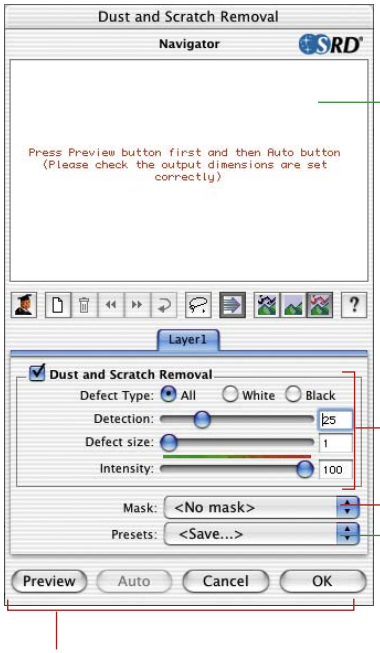
Depending on SilverFast version and scanner model different functionalities of dust and scratch removal are available. The corresponding buttons can be found in the vertical tools bar, left hand of the big preview window.

*SRD/iSRD is **deactivated**.*

*iSRD is active and running in **automatic mode**.*

*SRD/iSRD is active and running in **manual mode**. Clicking the bottom button opens the dialogue.*

SRD/iSRD is deactivated and ICE is active.



Navigator Window

***Areas with red frame**: available image area*

***Areas with yellow frame**: selection visible in preview window can be moved with mouse.*

Control Menu for Dust- and Scratch-Removal

***Defect Type**: All, white (bright) or black (dark) artifacts*

***Detection**: Recognition Sensitivity*

***Defect Size**: Artifact size*

***Intensity**: Differentiation of image detail and artifact*

Mask

Loading and Saving* of Masks*

Presets*

Loading and Saving of presets

Control Buttons

***Preview:** High resolution preview to monitor elimination of artifacts*

***Auto**: Activates intial slider setting*

***Cancel**: Leaves the D&S dialogue, without applying parameters*

***OK**: Applies current parameters and closes control window.*

** DIGITAL ICE technologies hardware based dust and scratch removal is not user-controlled and can only be switched on or off. Does not work with black & white nor Kodachromes.*

digital ICE technologies

Workflow of *SilverFastSRD*

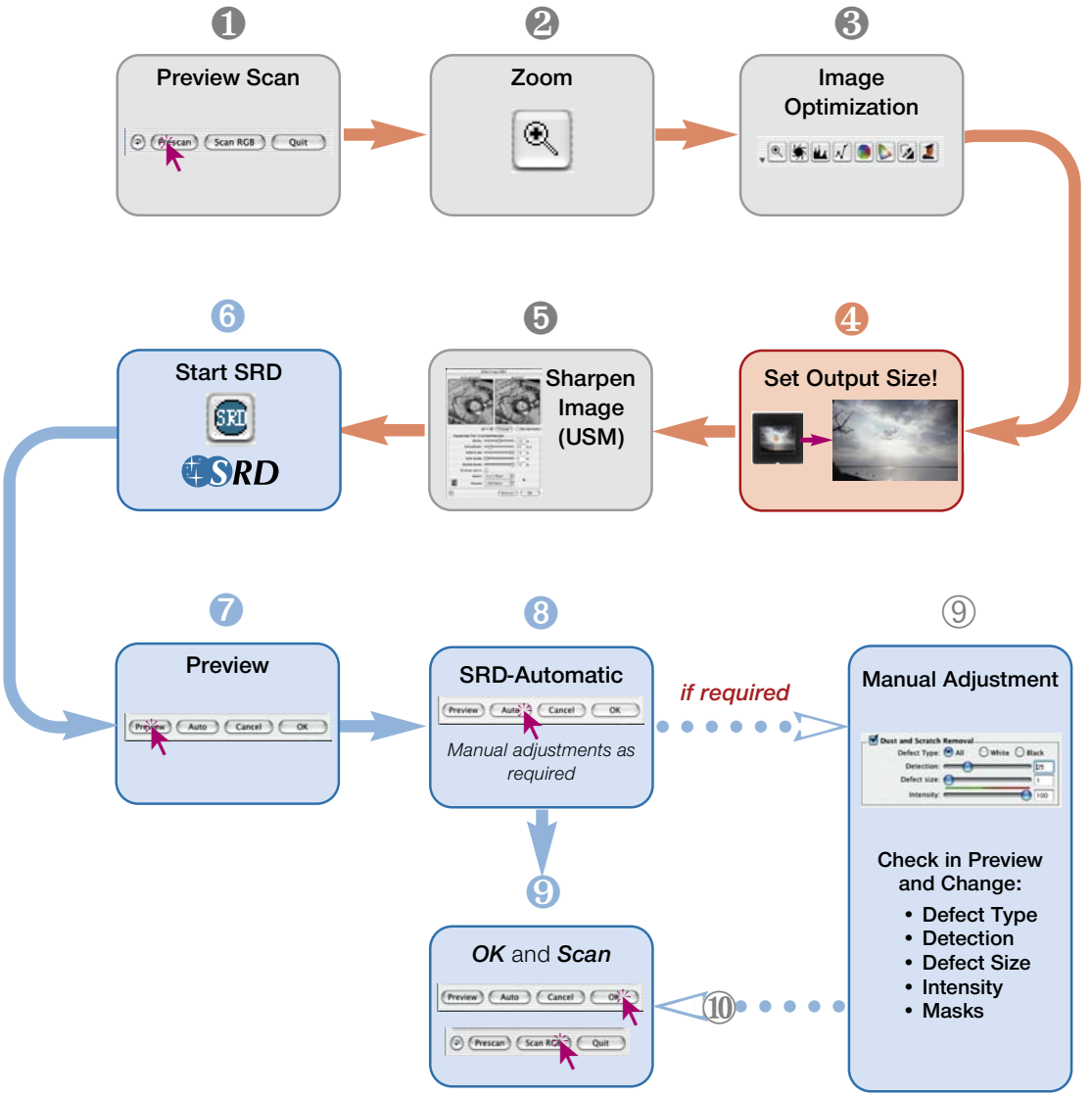


Image Optimization Workflow with *SilverFastSRD*

Briefly we will illustrate how an image will be optimized and *SilverFastSRD* (dust and scratch removal) be applied, on the following pages.

1. Preview scan

Start SilverFast and initiate a preview scan. Within the selected image position your scan frame.

2. Zoom

In order to see more image details (if required) start a zoom (click zoom tool).

3. Image Optimization

Start with *auto-adjust*, with different adjustments (if needed) such as *midtone* (top slider), *contrast* (bottom slider) or *global* or *selective colour correction*, all tools for image enhancement can be applied.

If you are not familiar with the best possible workflow the *ScanPilot* can help you effectively.

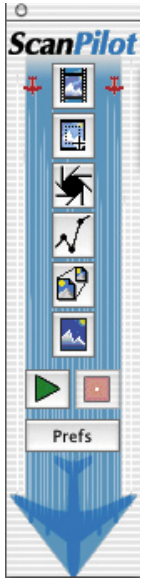
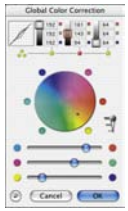
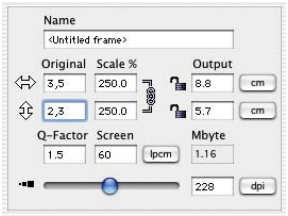


Image Optimization
Gradation, global- and selective colour correction in SilverFast Ai

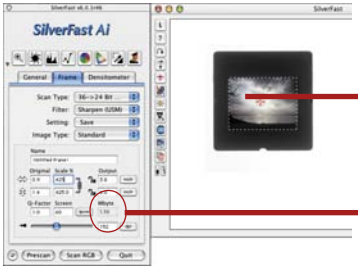


4. Output Resolution

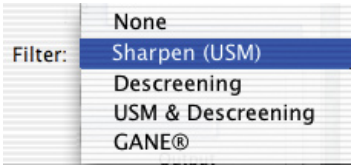


You have to set the required output parameters for your image: Scaling (or width and height) and output resolution.

It should be noted, that file size increases (MB!) with increased resolution, as well as recognition of image artifacts such as dust and scratches. Small resolutions will show less scratches than higher resolutions.



5. Sharpen Image (USM)



USM Dialogue
in SilverFast Ai

From version 6 *SilverFast...* will have a sharpen dialogue with »before« and »after« preview combined with automatic presets.

With »before« and »after« preview the final scan sharpness can be monitored and nicely adjusted in real-time.

The strength of the applied sharpness, as well as the quality of the scanner used, will have significant influence on the appearance of dust and scratches.

A high quality scanner, with good optical resolution, hence very good sharpness will clearly bring out every image detail and dust and scratches. Any additional sharpening might bring out exaggeration of the sharpness effect.

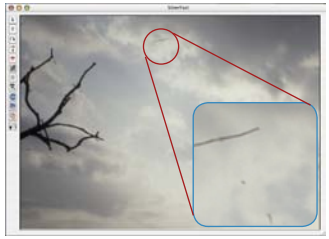
6. Activating *SilverFast SRD*

Click onto the *SRD* icon to open the *SilverFast SRD* dialogue. In case you have a scanner with hardware supported descratch function such as *DIGITAL ICE technologies*, you can switch between e.g. *DIGITAL ICE technologies* and *SilverFast SRD*. All other scanners will only have *SilverFast SRD*. The upper of the two buttons is intended to switch *SilverFast SRD off*.

SRD Dialogue in SilverFast Ai

When opening *SilverFast SRD* the first time you will see an empty Navigator window. Please follow the instruction inside the Navigator window:

a) Clicking on "**Preview**" initiates a preview scan, whose resolution is related to the output resolution that has been set.



b) Clicking on "**Auto**" analyses the image with *SRD* automatic. Artifacts will be recognized and highlighted with red.

After you have deactivated *SilverFast SRD* and then reactivate the function, the previous preview scan will come up again, with all previous settings inside the control window.
In case the previous preview is not the one you want, since you would like to work with another image which is already in the normal SilverFast preview window, you have to:

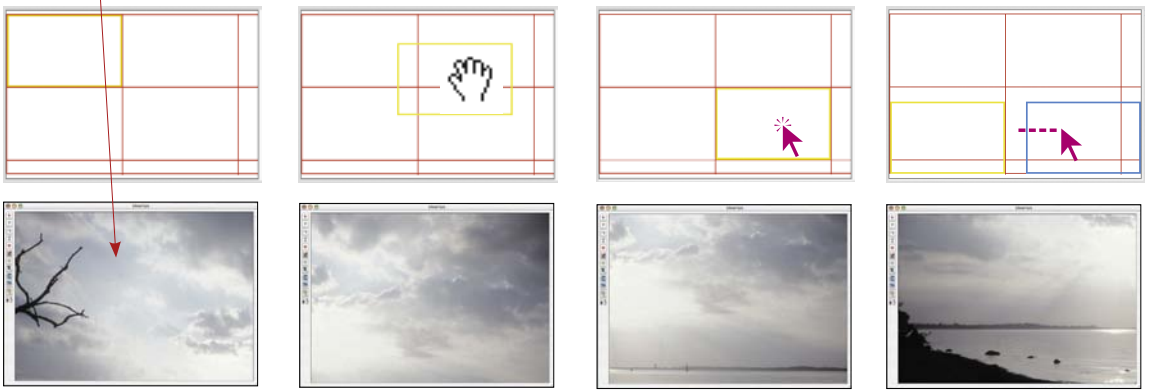
a) Click onto the *SRD* "**Preview**", and initiate a new preview scan and **b**) click on "**Auto**", to start an new *SRD* automatic.

a) and b)

7. Navigator • Working with the *SRD* preview dialogues

Most of the image artifacts have already been identified by the *SRD* automatic mechanism (step no. 6) but no differentiation has been made at this stage between subject details and actual artifacts, a process to be undertaken manually at a later stage.

In order to effectively monitor and check the results the whole image is divided into tiles in the Navigator window.
The **"Navigator" window** displays the position of each tile with regard to the image. The size and number of tiles depend on the image size and output resolution set.



Using the "Navigator"

The **yellow-framed** tile represents the image in the high resolution preview window. The yellow-framed tile can be freely moved to any position inside the Navigator window, while the high res window will be updated accordingly.

By clicking into a **red-framed** tile the image selection related will be displayed inside the high res window. The selected tile will then become yellow-framed.

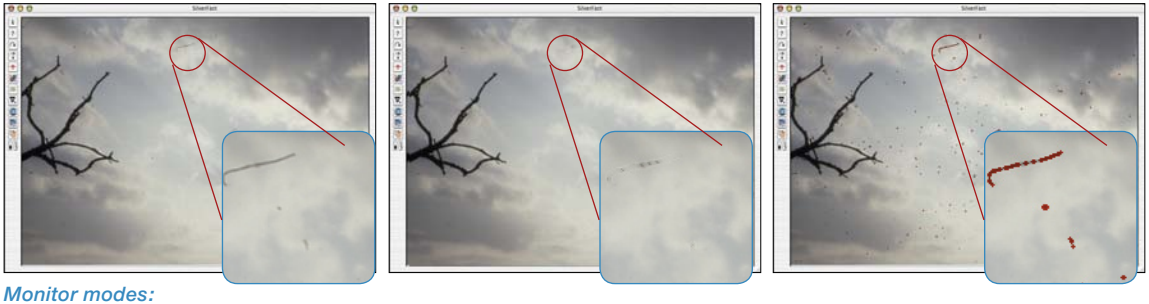
There are three **"Monitor modes"** available, which can be activated by clicking the appropriate button:

a) Original image, without correction,

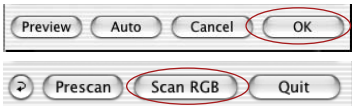
b) Corrected image, artifacts eliminated,

c) Original image with artifacts highlighted in red.

In modes b) and c) you can temporarily switch into mode a (original view) by clicking into the high res preview window. Keeping the mouse depressed will show mode a (original). Releasing the mouse the display will show b or c.



Monitor modes:
a) Original view *b) Corrected view* *c) Artifacts highlighted*



In case the result is satisfactory, the *SRD* dialogue can be closed with “OK” and the scan can be started from the *SilverFast* main dialogue. If it is not, further use needs to be made of the manual mask and layer technology.

Activate / Deactivate Real-Time Correction

Clicking onto the blue / red arrow will activate or deactivate the *SilverFast SRD* real-time correction.

If the arrow is blue any change will only be processed and displayed in the large preview after mouse has been released. This can take a moment depending on the processing power of your computer. The real-time correction bypasses this problem.

If the arrow has turned red, a small rectangular frame will appear on your image representing the area of real-time correction. This real-time frame can be freely moved around in the preview window. Any changes of *SRD* parameters will be displayed in close to real-time inside the real-time frame.

Manual Correction

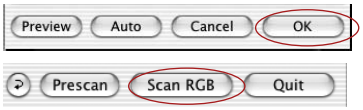
If the result of the *SRD* automatic is not sufficient and there are further corrections needed, a few points should be observed:

- Always start with bigger, clearly visible artifacts and step by step, while adding layers (if required), attack weaker less pronounced artifacts.

  For each layer only one set of parameters can be applied.

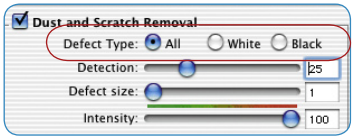
  Multi layers and masks are only available in *SilverFast Ai*. In *SilverFast SE* and *DCSE* only one set of parameters and only one mask can be applied.

- Initially use the first method of “Dust and Scratch Removal” and only when required with artifacts dominantly consisting of or resembling lines use the second method.

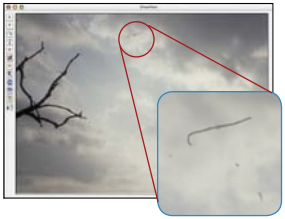


After all corrections have been completed click “OK“ acknowledge the parameters set and leave the dialogue. Now only the final scan has to be started from the *SilverFast* main dialogue.

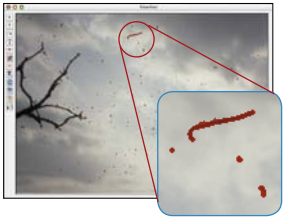
1. Changing Defect-Type



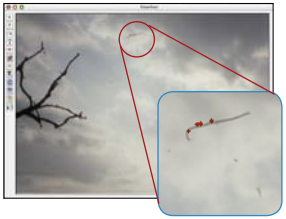
Before starting a manual correction, check whether a different "Defect Type" could produce better results.
Switch from the current Defect-Type, e.g. from "All" to "White" or "Black" and monitor the effects in the preview window.
Check the different monitor modes! Also check different tiles for more artifacts in other areas of the image!



uncorrected original



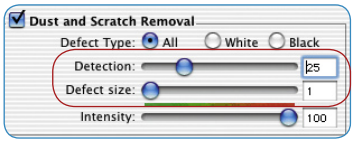
Defect-Type "All"



Defect-Type "White"

Defect-Type "Black"

2. Slider "Defect Recognition" and "Defect Size"

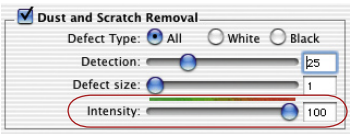


Both sliders have been preset by the *SRD* automatic.

"**Detection**" represents sensitivity of recognition. Optimum parameters will depend on the image character. With sharp or images that have been sharpened, detection will be mostly between 1 and 60. With unsharp or images that have been smoothened detection will most likely be between 60 and 100.

"**Defect Size**" equates to pixel size of the artefact. Values are small respectively and are mostly between 1 and 5.
Always monitor the effect of both sliders in the large preview window, if necessary check different tiles of the image.

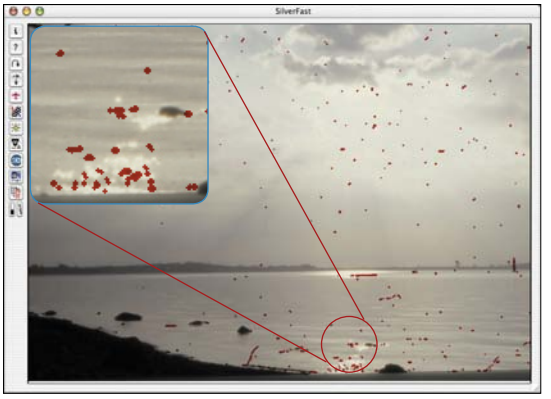
Recommended procedure: Start with defect size = 1 then adjust defect recognition. If the effect is still too small use defect size = 2 for further enhancement and approach the best possible result through small changes .
Important: At first leave the "Intensity" slider on its default value "100".

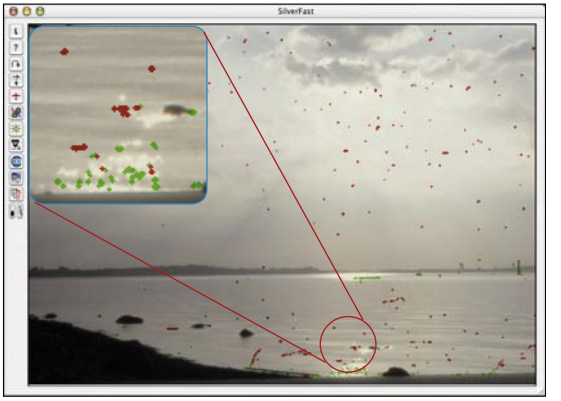


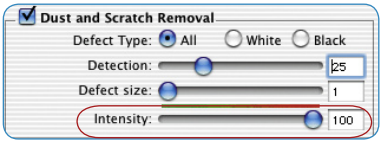
3. Slider “Intensity“

Only when the results of the previous two sliders do not yield the desired results, you can change “Intensity“ in small increments to values smaller than 100. This will predominately be the case with images with a lot of details.
This slider enables to reduce the amount of “erroneously“ recognised artifacts. This function controls the differentiation of which image details are recognised as true details and which are supposed to be recognised as artifacts.
Always monitor the effect of the slider in the large preview window, if appropriate also for different image tiles.

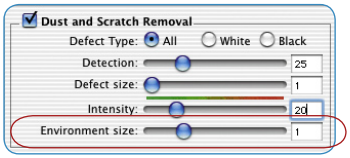
If the *Intensity* slider is at the very right, which is the “100” position, all recognised artifacts will be highlighted in red and will be eliminated in the final scan respectively.
The more a slider will be moved to the left, the more the amount of artifacts that will be highlighted in green colour. Green highlighted details will be preserved in the final scan.
The red-green colour bar above the slider indicates the relation of the function.



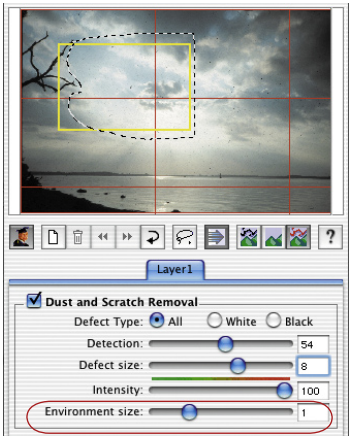


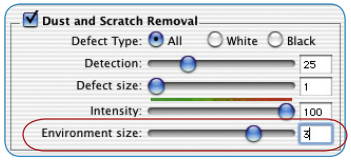


4. Slider “Environment Size”

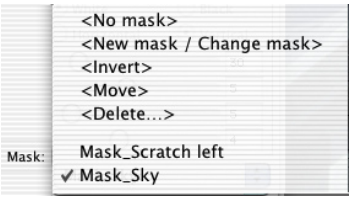


This slider is only available in full versions of *SilverFast* and become visible when activating the expert mode.
This slider is used to control the recognition of the defect border. Parameter values are small. Usually between 1 and 6.

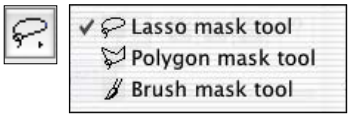




5. Using Masks

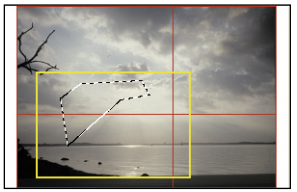


In general all parameters set in *SilverFast SRD* will be applied to the whole image.
However, mask technology should be used if an image has just a small number of very pronounced artifacts, there are defects only in certain parts of the image or the subject means that *SilverFast-SRD* is restricted to specific areas of the image.
A mask can be freely drawn with the mouse in the preview as well as in the Navigator window. Mask tools available are “Lasso”, “Polygon” and “Brush”:



Selection of mask tool: Clicking onto the mask tool and holding the mouse depressed will bring up a mask tool selection pop-up. With the mouse still depressed you can now move to the desired mask tool and release the mouse.

Drawing a mask: It is best to draw the mask in rough form in the navigator window and then add the finishing details in the large preview window.



With the **Lasso tool** you can freely encircle any area of the image inside the preview or navigator window you want to apply the dust and scratch removal to.

With the **Polygon tool** you can encircle any desired area with straight line segments by click-drag, click-drag, etc. until hitting the start point again.

With the **Brush tool** you can cover thin longish defects, by just drawing over it. Only these areas covered will be corrected by *SilverFast SRD*.

Drawing an inverted mask: Depressing the ”Alt“ key with any of the mask tools activated will invert the mask function. The mask will become kind of a negative mask. Now encircle the area with the mask tool you do not want get affected by the correction.

This function is similar to the invert mask function from the mask menu.

Adding and subtracting from an existing mask: After a mask has been drawn you can add or subtract from the existing mask.

Adding to mask: Press “Shift” and draw desired addition.

Subtracting from mask: Press “Alt” and draw desired subtraction.

Active Mask with marquee

Mask adapted with „Shift”- and „Alt“

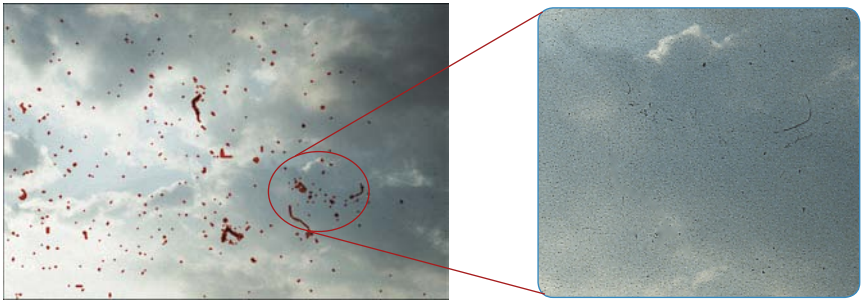
6. Working with multiple layers

When starting *SilverFast SRD* you will get the 1st layer automatically. On this layer you will perform the first corrections of coarser artifacts. If the settings only enable to get rid of some of the artifacts, the remaining artifacts should be treated on the next layer. Start with the larger distinct artifacts and proceed increasingly, layer bay layer to less distinct scratches and artifacts.

New layers can be added by clicking onto the “Add Layer” button. You can have a maximum of four layers.

Double arrow buttons allow to move layers between each other. Here you would change the order of stapling similar to the layer function in Photoshop. This is especially significant with overlapping mask areas.

Uncorrected original



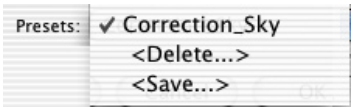
Layer 1

Correction of more subtle artifacts. On the right you can see that some of the artifacts are not recognized.

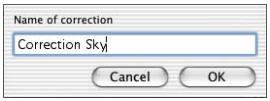
Layer2

Correction of more distinct artifacts with more aggressive setting. Remaining artifacts from layer 1 can now, one by one, with help of masking be eliminated without problems.

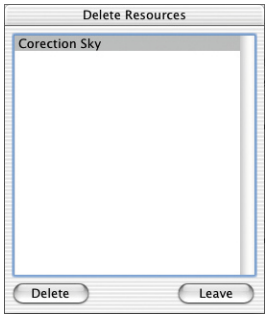
7. Save / Load Settings



Clicking onto the “Save” menu will save the current settings. In the “Save” dialogue you can input the desired name for your setting.

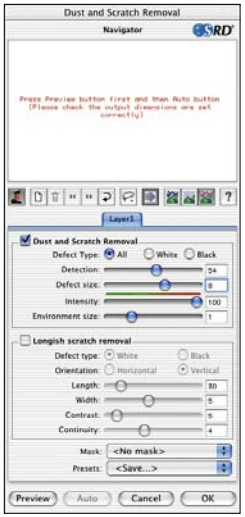


In order to delete previously saved settings highlight the settings you want to delete in the “Delete Resources” dialogue and click “Delete”.



Expert Mode

Activating the Expert Mode

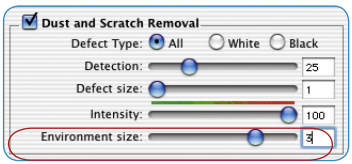


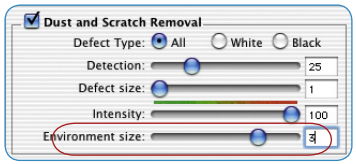
Clicking onto the Expert button will extend the *SRD* dialogue and show the second alternative method's settings to eliminate longish artifacts. In addition you will the slider "Extension".

Both alternative methods can be used either alone by themselves or in conjunction with each other. It is advised to allocate a separate layer for each of the different methods.

1. Slider "Environment Size"

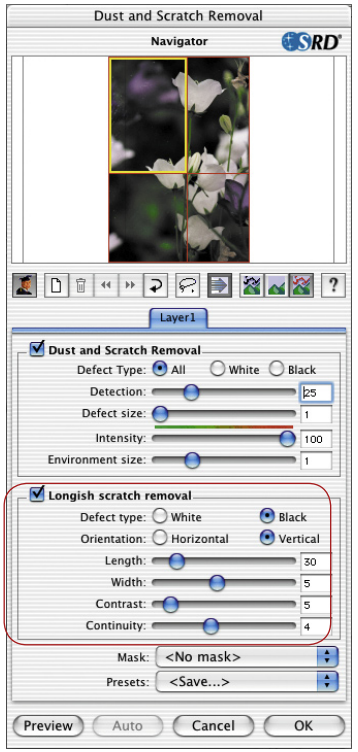
This slider is only available in *SilverFast* full versions and can only be seen after activating the expert dialogue.
With this slider you can precisely control the defect border. Parameter values are small and are usually between 1 and 5.





2. Longish Scratches

The following controls and options are in the menu “**Longish Scratches**”. This menu is only available in *SilverFast* full versions and will only be visible after clicking onto the Expert button.

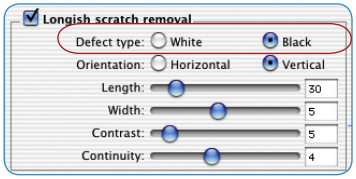


This alternative method can be applied to e.g. 35 mm film where the surface has been scratched while reversing the film by small dust or sand particles. Mostly these scratches proceed across several images, sometime even across the whole film. They are frequently always parallel to the edge of the film.

In order to eliminate longish scratches, the following controls are available: **Defect Type, Orientation, Length, Width, Contrast** and **Continuity**.

Usually using the first three controls (Defect Type, Orientation, Length) are sufficient to get adequate results. Other controls such as Width, Contrast and Continuity can remain at their default settings.

The order and position of the controls is related to the work flow.

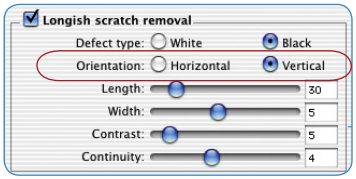


3. Selection ”Defect Type”

First you would select the colour of the defect type: white or black. Longish scratches most likely can be related to one or the other of the two defect types. depending on the original you will see a white or a black line.

This selection will be offered to the user since longish scratches can have different origins. It could for instance be a “real” scratch or sometimes also a faulty or dirty CCD cell in the scanner.

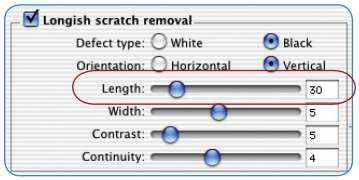
In case you have to consider both defect types, you can use another layer to treat the second type.



4. Selection “Orientation”

Depending on the orientation of the scratches on the scan original, you can switch between horizontal or vertical orientation.

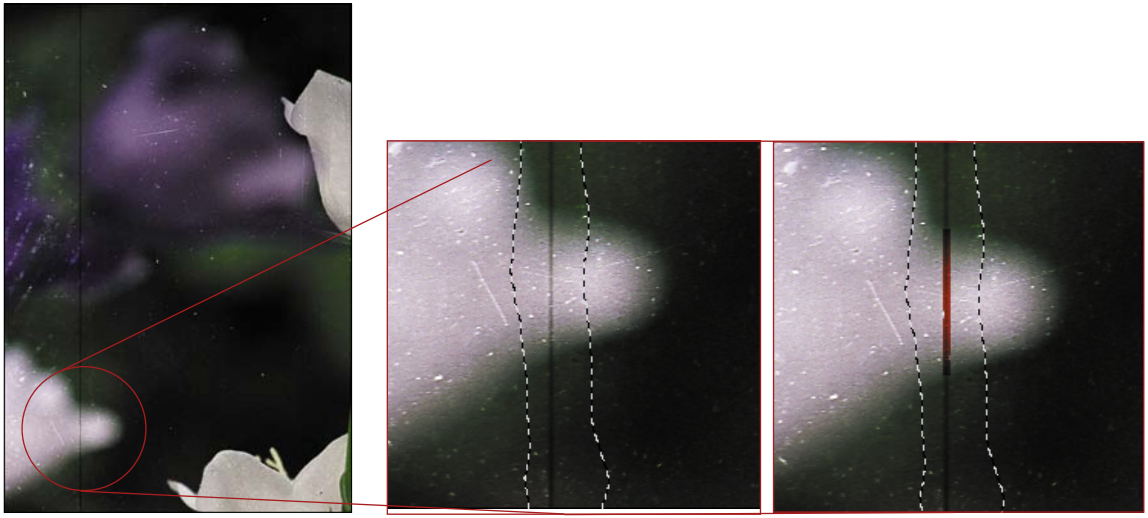
In case scratches are vertical and horizontal, you can create a second layer and get rid of both of them.



5. Slider “Length”

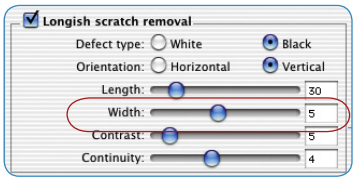
This slider determines the maximum length of a scratch. This parameter is the most important and has strongest effect on the recognition of artifacts with reference to other parameters. The default value is 30. Value range is between 5 and 200.

Smaller value recognize longer structures, larger values recognize smaller structures.



Original *Lenght = 100* *Length = 10*

In case parameter settings of this slider lead to results which could be further improved, use the other sliders.



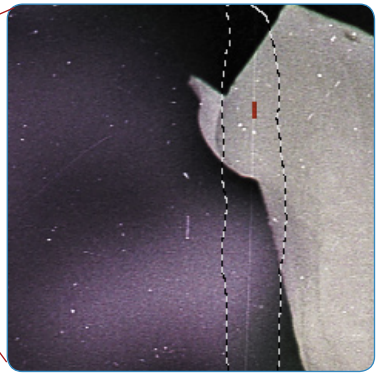
6. Slider “Width”

This slider determines the maximum width of a scratch.

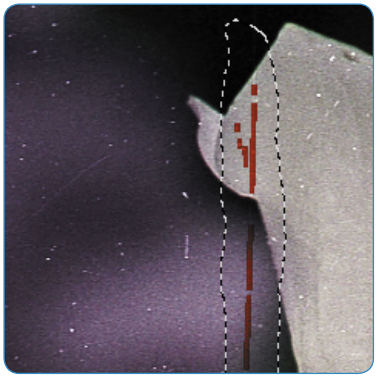
In most cases the range for optimum recognition is between 1 and 5. Larger values will have wider and longish artifacts recognized.

With very wide scratches (high resolution and wide artifact) it is sometimes necessary to enhance the image manually.

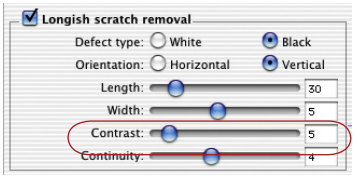
Original



Width = 1

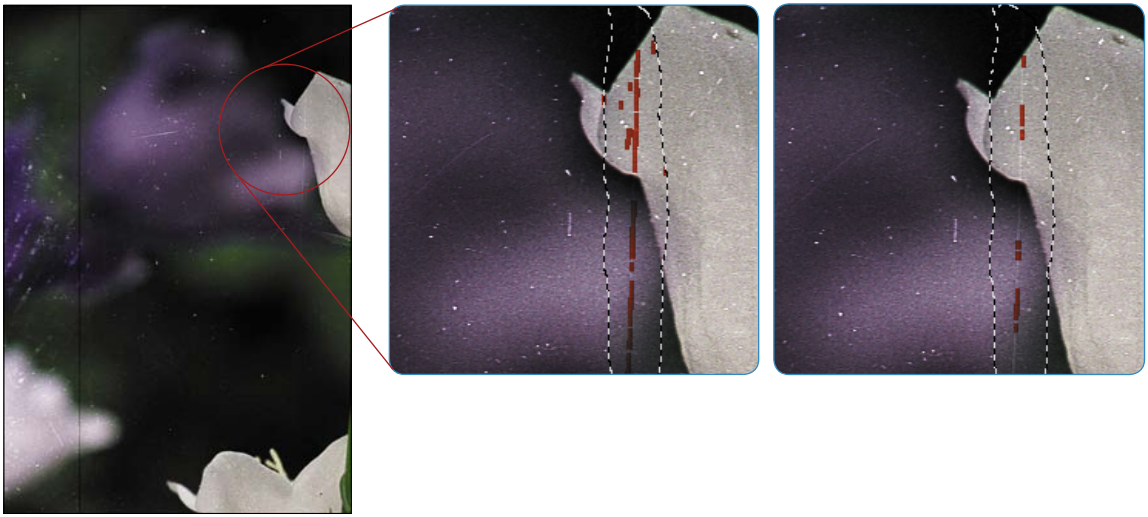


Width = 3



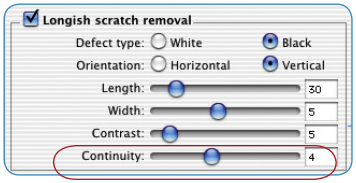
7. Slider “Contrast”

This slider relates to the local contrast of the scratch against its background. A very bright scratch on a dark background can be recognized with a high contrast value. In order to recognize a scratch that is barely visible against its background, the contrast value must be set to a low value. Smaller contrast values (1 to 5) in combination with small “Length” values (5 to 20) can lead to faulty recognition. This might recognize small image details. For this reason the contrast value should be greater than 5 if possible.



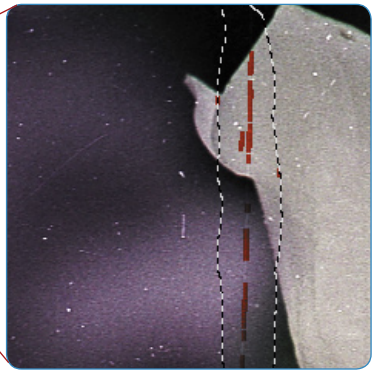
Original *Contrast = 2* *Contrast = 6*

8. Slider “Continuity”

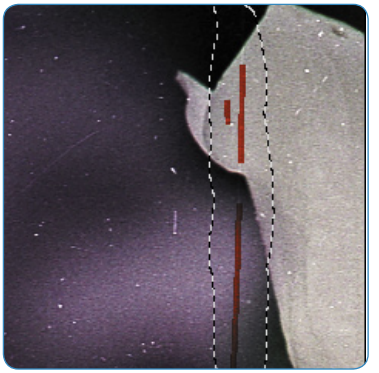


With noisy images or when the scratch is inside a part of the image with lots of details, the value of the Continuity slider should be readjusted (between 0 and 10). A greater value will enable a better recognition of scratches in a “difficult” environment (noisy or very detailed images).

Original



Continuity = 1



Continuity = 9

Remark: In some cases the longish scratches are slightly bent. Since this method is designed for horizontal or vertical scratches, it is required to watch the parameter settings more closely.
For instance: A horizontal scratch which is 120 long and 1 pixel of width and with a slight bent extends to 4 lines of the image, cannot be recognized with values of 120 and 1 for length and width. In stead a value of roughly 30 (120 divided by 4) would be needed.

*SilverFastiSRD**

Dust and Scratch Removal with Infrared Technology*

The latest development* in dust and scratch removal using *SilverFastSRD* is the addition of hardware* linked technologies which use infrared light.

This solves the problem faced by any software which has to both recognise and remove dust, scratches etc., differentiating between dust to be removed and image information to be retained.

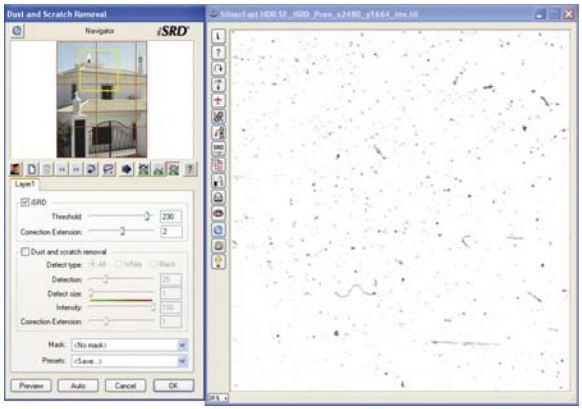
How does *iSRD* work?

Thanks to the long wavelength of infrared light, it can penetrate the colour emulsions of film negatives and slides virtually unhindered. There are only problems if it encounters scratches, dust particles, lint etc. which also cast shadows in infrared light.

iSRD exploits this characteristic by scanning the image in two passes. The first pass is the infrared scan and the second pass the normal RGB scan.

Once the software has completed both scans, an additional image channel created automatically from the infrared image is used for the dust and scratch removal calculation.

On completion of the calculation, the results can be displayed in the large preview window. The default display is the RGB scan but by pressing Ctrl + Shift and holding down the mouse button in the large preview scan, the infrared channel is displayed.



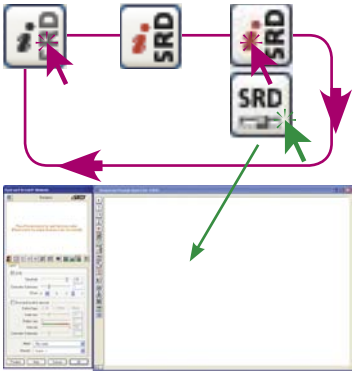
** Warning!*
SilverFastiSRD is only available for certain scanners.
In SilverFastSE versions, iSRD only works in automatic mode. Please see our website for the current situation and compatible scanners.

Which Films can *iSRD* be Used With?

iSRD can be used with conventional colour negatives (developed using the C41 process), colour slides (developed using the E6 process) and paper proofs. Due to the silver content in conventional black and white negatives and slides, these **CANNOT** be retouched using *iSRD*. However, special black and white negatives which have been developed using the C41 process behave like colour negatives and are *iSRD* compatible.

Activating *iSRD*

Since *iSRD* is an additional function within *SRD*, it is activated and deactivated in the same way, by clicking the relevant button on the vertical button bar to the left of the large *SilverFast Ai* preview window.



SRD/iSRD is **deactivated**.

SRD/iSRD is active and running in **automatic mode**.

SRD/iSRD is active and running in **manual mode**. Clicking the bottom button opens the dialogue.

iSRD Automatic Mode

In automatic mode, *iSRD* works completely autonomously and the *iSRD* automatic mechanism covers the entire content of the active scan frame. The user does not need to enter any settings but the effect of *iSRD* cannot be seen in advance in the large *SilverFast Ai* preview window. This is only possible in manual mode.

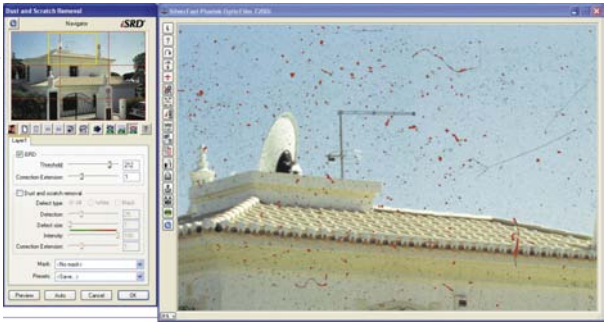
iSRD Manual Mode

In order to start *SRD/iSRD*, the final scan frame output resolution must always be set in advance!

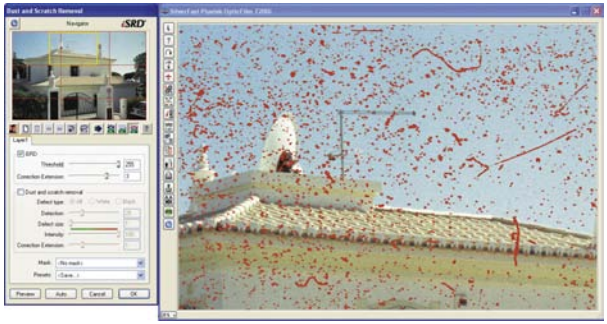
If manual mode is activated, it is possible to decide whether to work with *iSRD* or just with the normal *SRD* by checking the relevant box in the dialogue. The subsequent steps are the same as those described in the section on *SRD*: “Prescan“ button, “Auto“ button, select the area to be analysed in the navigation window and decide on the display mode. The correction process can then start.

The *iSRD* function has two sliders – Threshold value and Expansion correction.

Threshold value: This slider is used to set the level of recognition. The higher the value, the more sensitive the software reaction and the higher the number of probable defects recognised.



Expansion correction*: This slider is only available



** Warning!*
The “Expansion correction“ slider is only available in full versions of SilverFast Ai in expert mode.

Using *SRD* and *iSRD* Simultaneously (Layer Technology)*

iSRD and *SRD* can of course be used simultaneously. The built-in layer function can be used to maximise the positive effects of both technologies and rule out undesirable side-effects.

The *SRD/iSRD* default setting only shows the first layer „1“. For this first layer, the default setting is for *iSRD* to be activated. It can be deactivated and replaced by *SRD* at any time.

If a further layer is created (by clicking on the relevant toolbar button), the initial default setting for this layer is *SRD*. Here again, it is possible to switch to *iSRD* at any time.

With regard to the use of masks, the same applies to *SRD* as applies to *iSRD*! Mask technology can be used for any layer (see the previous section on *SRD*).

Examples:

- ***iSRD* in Several Layers*:**

  Since masks always work within their specific layer, it would be possible, for example, to create two layers which both use *iSRD* but work with different levels of correction on specific parts of the image.

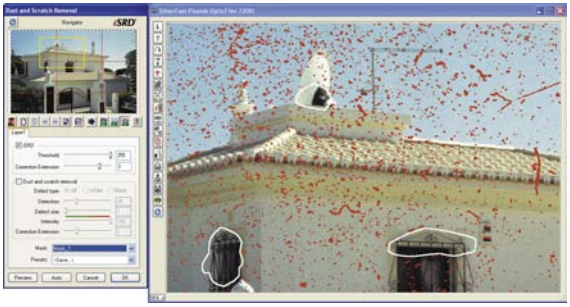
- **Combining *iSRD* and *SRD**:**

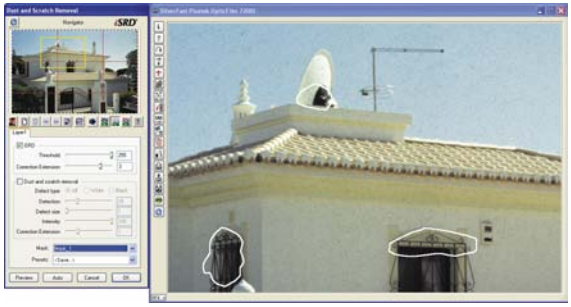
  The first layer uses *iSRD* in the entire image (for basic correction). A second layer uses *SRD* (possibly in combination with a mask) to remove residual artifacts which *iSRD* was not able to remove completely.

** Warning!*
Multiple layers and masks are only possible in the full versions, not the SE versions.

Use of Freehand Masks in *iSRD*

Freehand masks in all shapes and sizes can of course also be used in *iSRD* which then only works within the mask areas drawn. Please read the previous section on *SRD* for details of how to use the masks.





Infrared Channel Display

Once the software has completed the infrared and RGB scans, an additional image channel created automatically from the infrared image is used for the dust and scratch removal calculation.

On completion of the calculation, the results can be displayed in the large preview window. The default display is the RGB scan but by pressing Ctrl + Shift and holding down the mouse button in the large preview scan, the infrared channel is displayed.