HaSoTec Color Frame Grabber
FG-30 PCMCIA
FG-31 ISA
FG-32 PCI
FG-33 CardBus
FG-34 PCI
FG-35 Low Profil PCI

MS-Windows XP/2000/NT
MS-Windows Me/9x/3.x

FG3xCLIP.EXE

Version 4.87

Hot- key- list

F5 - start live video display, again F5 will freeze the display
F6 - capture single frame
F7 - dialog to select video input
F4 - dialog to select image format
F3 - save images
F2 - load images
F8 - video parameter dialog

Crtl-F5 - contrast, saturation and brightness control
Crtl-F4 - hardware settings
Crtl F8 - extended video parameters

Alt F7 - grey-level look-up-table
Alt F8 - gain control
Ctrl C - copy image or selected area of an image to the clipboard
Ctrl V - paste image

Contents

1.   System requirements

The 32-bit version of FG3xCLIP runs under Microsoft Windows XP/2000/NT and, if a WDM-driver is installed, under Windows Me/98. Installation Software V.4.xx installs a similar 16-bit version of FG3xCLIP under Windows Me/9x/3.x for FG-31, FG-32, FG-33, FG-34 and FG-35. The 16-bit version for FG-30 and FG-30-II has only a subset of the functions described here. FG30CLIP for OS/2 and its subset of functions is described in Chapter 9.

This program can run under Microsoft Windows on all industry-standard compatible PCs equipped with a VGA board and at least 2 Mbytes of main memory.
We recommend that you use a SVGA board in a 16 bit-per-pixel mode, such as 32K or 64K colors. If a pixel depth of 4 bit (16 colors) or 8-bit (256 colors) is used, additional computing time is required to realize an optimal color presentation. These problems are described later in Section 2.3.4.
The program FG3xCLIP functions with all color depths of SVGA drivers. All color images are handled internally with a color depth of 24 bits. Thus, the quality of image files can be chosen independently of the presentation quality, which depends on display driver features.

Online presentation of video sources at high frame rates requires additional system features. To achieve high frame rates the program FG3xCLIP can use Direct X to access the video memory of the graphic boards. For older Windows versions it makes a noticeable difference if you use a graphics board that is supported directly by the device driver FG3xDRV.EXE. The current driver version produces high frame rates on graphics boards based on Direct X (always present under Windows XP/2000/Me and 98) or for Windows 3.x and 95 for Tseng Labs graphic controllers. Tseng Labs supported resolutions are 256 and 32,768 colors with resolutions from 640x480 to 1280x1024.

## 2.	Functions
## 2.1.	File
### 2.1.1.	Load...

Image files in various formats can be loaded from this dialog box. The presentation takes place immediately after loading is completed. Path names, files and drives can be selected with a double click on a list box item. File names can be selected using wildcards. More then one wildcard can be combined using a ";" separator. Unformatted image data with 8-bit-pixel resolution can be loaded in *.PIX format. For this format a single mouse click on a file

activates an editor field to specify the number of pixels per line.
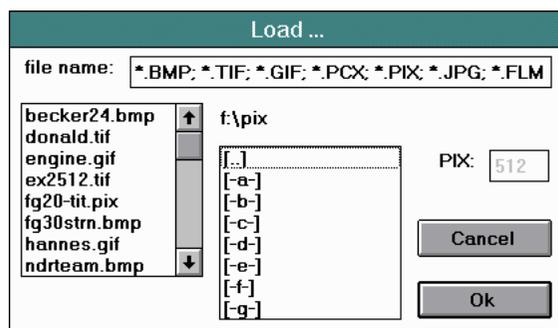
### 2.1.2.	Save...

The currently displayed image can be saved with this function. All possible file formats are shown in the dialog box. It is possible to set a default working directory. The configuration file FG3xCLIP.CFG must be

located in the same directory. On selection of this dialog, the image will be taken with its actual color depth. If you select a lower color
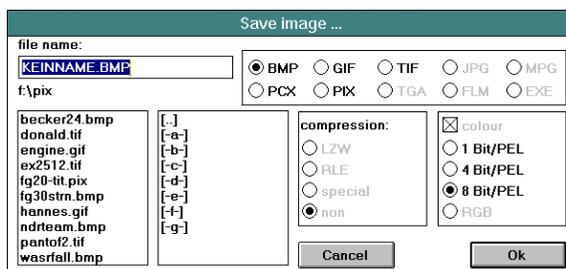
depth within this dialog, the image data will be reduced by simple reduction procedures. We recommend that you run the color reduction before saving the image with reduced colors - so that you can check it visually first. These functions are described in 2.3.4. If a graphic resolution with 256 colors or less is applied, the full color depth can be saved, if the memory-based image is activated by 2.3.4.6. In this case, the image is sometimes presented poorly and very slowly because MS-Windows does not provide functions for displaying device-independent image data. Nevertheless, image data will be saved with a full color depth of 16,7 million colors.

### 2.1.3.	Print...

The currently displayed image can be printed using this function. First, a dialog box for selecting the printing options appears. Select one of three options for placing the image onto the paper. The option **Automatic size** scales the image according to the horizontal paper size. The option **Fit to page** scales the image to horizontal and vertical paper sizes. The option **Scale** allows you to

scale the image by selected coefficients. It depends on the printer driver, which of these functions are supported. Banding makes printing slower but requires less memory, and old printer drivers can be used if **Use Print functions related to Windows 3.1** is enabled. Inappropriately selected print options can effect
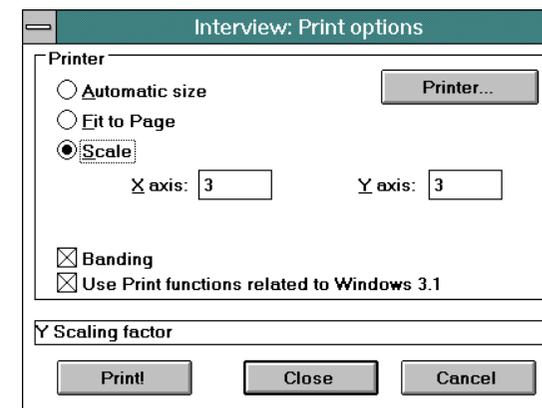
image quality. The option **Printer...** allows you to select existing printer drivers. In most cases you will find additional options related to a specific printer model in this subdialog. Selecting "cancel" closes the box, ignoring any changes you have made. "Close" saves all options you have selected during a FG3xCLIP session and closes the box without printing. "Print!" starts a print job of the currently displayed image using all selected options.

2.1.4. Save adjustments

All adjustments you have made in a FG3xCLIP session are stored in a configuration file, which are then used for the next FG3xCLIP session.

2.1.5. About FG-3x

This menu item shows a text box which contains information and a version number of this software. The first digit of the version number should be the same as the version number of this document.

2.2.   Edit

2.2.1.   Copy image with full pixel depth

Selected image data is copied to the clip board using the Device Independent Bitmap (DIB) format. Other MS-Windows applications can then use this image data if they support the CF_DIB clipboard format. It is possible to select any rectangular region of an image. Press the left mouse button at the top-left corner of the region you wish to select and then release it at the bottom-right corner.

2.2.2.   Copy image with screen pixel depth

This function works similar to Copy DIB except, that this time a Device Dependent Bitmap (DDB) is transferred to the clip board. This format is used by simple applications such as Paintbrush.

2.2.3.   Copy palette

Whenever images contain palette information, it is possible to

make their current colors available to other applications which support the CF_PALETTE format.

2.2.4. Paste image

This function retrieves Device Independent Bitmap data from the clipboard.

2.2.5. Vertical mirror

The current image is mirrored along its vertical axis.

2.2.6. Horizontal mirror
The current image is mirrored along its horizontal axis.

2.2.7. Invert
The inverse value for each pixel is replaced in the current image.

2.2.8. Redisplay
When screen settings change, such as pixel depth, a loss of image quality can occur. A redisplay will optimize the display for the new screen mode.

2.3. Options

2.3.1. Live video display

This function allows for a live video display. The supported resolutions can be selected using the image size dialog.

With the F5 function key you can cancel the online presentation. During presentation of the video source, a large amount of data is handled. The performance of the PC is very important if high frame

rates are to be achieved. Modern PCs can display 8 to 30 frames/s using 32,768 colors or 12 to 30 frames/s using 256 colors.
Higher clock speeds will not necessarily result in higher frame rates, because the throughput is affected by the complete data path from the Frame Grabber to the graphics board memory.

2.3.2. Contrast dialog

This dialog shows a live video preview and allows you to adjust contrast, brightness and saturation with the help of horizontal scroll bars. If gain control is switched to manual mode, the

position of the gain slider has an influence on the image. Gain adjustment has an effect similar to contrast adjustment, but a gain change appears in the analog video signal before it is digitized. This has a great advantage for further processing because it keeps all 256 grey levels.
Offset adjustments are not required for FG-3x Frame Grabbers, because brightness control in conjunction with the automatic black porch processing feature of these Frame Grabbers results

in the same effect.

2.3.3. Image Size

This dialog allows you to select between four fixed-color resolutions and three resolutions applied to grey-level images. Due to the square-pixel operation of the Frame Grabber, 60 Hz US standard requires different resolutions in order to assure a 4:3 row-to-line ratio as required by TV standards. If you check the 60 Hz box, the radio button labels change automatically. To capture grey-level images in 50 Hz (60 Hz US) standard resolutions of 768x576 (640x480)pixels, 384x288 (320x240)pixels and 192x144 (160x120) are possible.

The highest color resolution is 768x576 (640x480) pixels. This resolution makes sense if high-quality video sources are used. An alternative resolution of 592x442 is also available, which requires less memory and disk capacity. Uncompressed image data requires 766,5 KByte in this mode. This resolution is an image fragment of 768x576 (640x480), so it has the same quality requirements. If a color camera with fewer than 700 pixels per line is used, these resolutions will not achieve their potential sharpness. Because of the video standard definition, a 2:1 interlaced mode is used for all TV signals to combine the fields to get a TV frame. These fields are captured in the FG-3x's internal buffer in real time. Video standards have frame rates of either 20 milliseconds (PAL, SECAM) or 16,7 milliseconds (NTSC).

High-speed moving objects can cause an offset every second row. This effect appears on a TV screen as well, but the eye does not detect it, because it is visible only for 1/25 or 1/30 of a second. Frozen images exhibit this effect, however. Some cameras can minimize this effect by means of stroboscopic CCD sensors. Today, even low-priced cameras offer activation times of 1/500 or 1/1000 as standard. (If one activation time can be applied for both

fields, then this effect disappears entirely, but only few cameras offer this feature.)

The default position of the 592x442 section of an image is the top-left corner of the entire image. One can change the values of "distance to left border" and "distance to top border" to move the 592x442 section within the 768x576 (640x480) image .

One can also select a further image size of 384x288 (320x240)
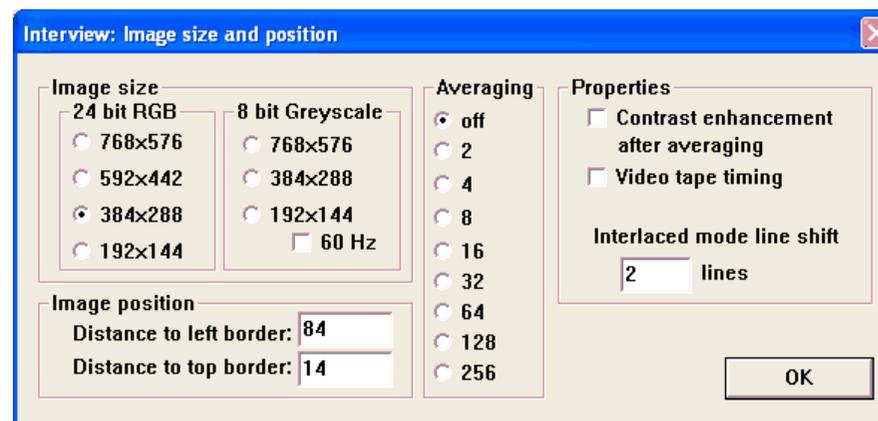
pixels. In this case, every second horizontal and vertical pixel is written into the FG-3x's frame buffer. The memory and disk capacity required decreases to 324 KByte. This resolution has several additional advantages. Since the image data is now taken from a single field, high speed movements can be grabbed without any influence on the interlaced nature of the video standard.

The color decoder of the FG-3x board works at 4:2:2 broadcast standard. This means that every other pixel in a line has individual luminance information of the same color value as its neighbor. With a 2:1 data reduction, an image with 4:4:4 standard is created. Now every pixel contains individual luminance and color information. Thus 384x288 (320x240) pixel resolution results in a 2:1 scaled image containing much more

information than a fragment from an interlaced image.
You can adjust the image position with the edit fields **distance to left border** and **distance to top border**. These values show the number of unused TV lines and pixels from their sync signals. Changes are required only for non-standard video sources. If values are chosen that are too large, this may lead to incomplete digitizing processes which result in incorrect images. In this case, you can simply go back to smaller values to get the correct frames for the next grabbed frames.

Image averaging is a useful way of dealing with noisy images that do not move. Due to the stochastic nature of noise, the average value of a pixel comes closer to its real value when more frames are included in an average calculation. Averaging values of 2,4,8,16...256 can be selected. Single frames – or the last frame of a live video display – are taken from multiple frames as an average on a pixel by pixel basis. The number of frames taken is equal to the selected averaging value. An averaging value of 1 turns averaging off. Every change in image size automatically turns averaging off until the user reselects a new averaging value.

When FG3x Frame Grabbers capture interlaced images, they take two additional TV lines for each field. This allows you to put all even lines in the right place with a simple procedure after the odd field. This procedure skips a predefined number of lines shown by the interlaced value. Values of 1...4 make sense. There is no need to change the default value for standard camera or TV signals.

2.3.4.   Video Input dialog

The Frame Grabber has 9 video inputs for connecting up to 6 video sources. Use this dialog box to select one of these sources. For each video input, there exists a separate data set which includes all parameters. So it is possible to configure the video sources individually after an input has been selected.

In case of S-Video sources (separate chrominance and luminance signals) the FG-3x must be equipped with an S-Video cable in order to take advantage of this standard. To connect S-Video sources, a mini-DIN (Hosiden) connector is provided as is used in most S-VHS sources.

Each S-Video input requires two composite channels which cannot be used simultaneously. So a maximum of 3 S-Video sources is possible.

This dialog allows you to specify which sources operate as video tape. If you are running video tapes, the appropriate check box has to be activated to achieve optimal results. Cameras and television studios supply exact crystal-controlled video signals. Due to the mechanical parts of a videotape recorder, signals from tape are less stable and require special videotape settings. Incorrect settings result in line-shifts reminiscent of poor TV reception.
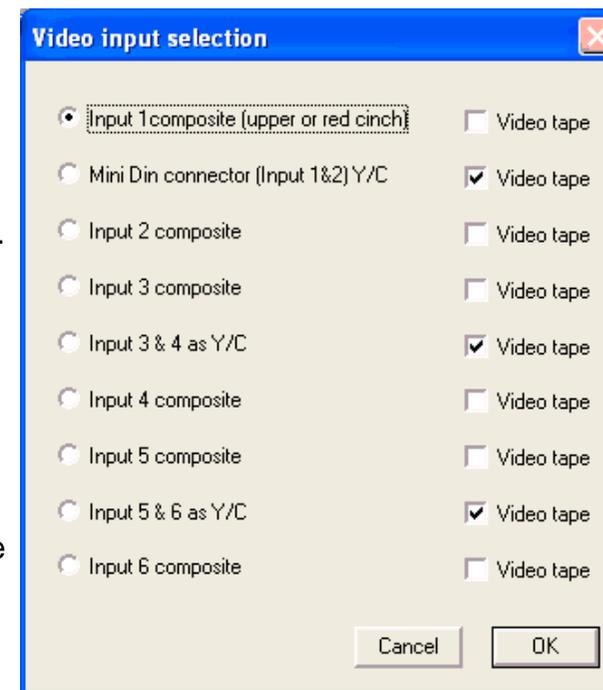
2.3.5. Grey scale LUT dialog

The grey scale look-up-table dialog allows you to assign each level of grey a new value. When this dialog is opened the first time, a diagonal line shows that each index is set to its value 1:1. These original values bypass the look-up-table. To return to these values, simply press the "Linearize" button. Two scroll bars act like gain and offset for the LUT. The line in the blue field can be edited with mouse clicks. The line can be changed by moving the mouse slowly while keeping the left mouse key pressed. The blue field represents 256 columns for the grey-level index from left to right. In each column only one value is possible, so you can set only one point. The point will jump to the place pointed to by the mouse. If you wish to start the next FG3xCLIP session with the same values, press the save-button and the 256 values will be replaced in the configuration file,.

2.3.6. Reduction

High-color resolutions result in large image files. The full-color resolution of the HaSoTec FG3x Frame Grabber will take 3 bytes per pixel. It is often practical to save image
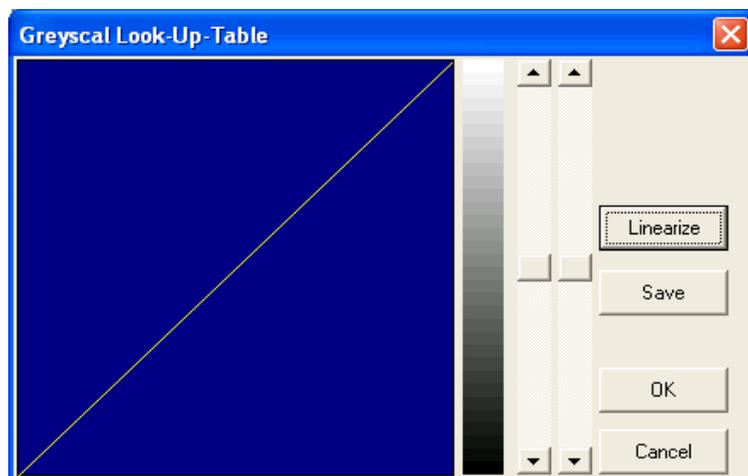
data with a reduced number of colors. The following menu items allow you to reduce the amount of color information displayed without losing the original image. The Function **display memory based image** allows you to return to the unreduced original image. When using a graphic resolution with 256 colors or less, the images displayed are already results of the predefined color reduction. The color reduction menu points represent a change of the color reduction method. Upon making a new selection, the image is then redisplayed, which makes comparisons simple. The last selection is marked by a "v" sign and shows which reduction method is applied for all following captures.

2.3.6.1. 256-color optimized palette

The original image is reduced to color-indexed data with a color palette calculated from the image contents. Twenty MS-Windows colors are combined with 236 calculated colors. While a FG3xCLIP window is active, it can use all 256 colors to display images. When a window from another program which sets his own color palette is active, the colors of the FG3xCLIP window are adapted as well as possible.

2.3.6.2. 256-color fixed palette

The original image is reduced to 3+3+2 bit color information. The reduction takes place with a 3-bit copy from the red and green color channels and a 2-bit copy from the blue color channel. All lower bits of the color channels are lost.

2.3.6.3. 256-color error diffusion

The original image is reduced to 3+3+2 bit color information. The reduction takes place in a method equivalent to Floyd-Steinberg

Error diffusion. The principle is to take the difference between the desired color and the available color for a given pixel into account in the color reduction of neighboring pixels. The color error of a pixel splits into 3 directions and will force neighboring pixels to keep this error as low as possible. This method is more complex then other methods of reduction and thus requires more processing time.

2.3.6.4. 16-color optimized palette

The original image is reduced to the 16 most important colors. This reduction makes no sense for screen display if the graphics board can display only 16 colors, since these colors are fixed. However, it is nonetheless often the best choice for saving images in 16 colors.

2.3.6.5. 16-color fixed palette

The original image is reduced to RGB data with 2+1+1 bit color information. The reduction takes place with a copy of the highest 2 bits of the red channel color information and the highest single bits of the green and blue channel color information. All lower bits of the color channels are ignored.

2.3.6.6. 16-color error diffusion

The original image is reduced to RGB data with 2+1+1 bit color information. The reduction takes place by a method equivalent to Floyd-Steinberg Error diffusion.

2.3.6.7. display memory based image

The original image is restored from memory after imagines have been displayed in connection with the operations described under

2.3.6.1 to 2.3.6.6.
If screen modes with 256 or 16 colors are used, a captured color frame using color reduction is the best choice. The reason is that the program FG3xCLIP can handle color reduction better than MS-Windows.

2.3.7. Details

The following submenus contain dialogs for adjusting details in accordance with video standards and hardware configurations.

2.3.7.1. Video parameter configuration

All the functions described below have been preset in the factory before delivery; they should only be altered after careful consideration.

The **field frequency** allows you to select between 50 Hz and 60 Hz video standards. The position "automatic" lets FG-3x detect the vertical frequency. Automatic mode is generally appropriate for video signals of good quality in one of the 50 Hz or 60 Hz TV standards. The other two settings are required when signals are noisy or differ from a given TV standard. They will force the signal processing to use the respective frequency.

The group **Color adjustments** contains several components that influence the color channel. The **force color on** check box is used for noisy signals to let FG-3x always decode the color burst. By default, this check box is not marked. With black and white video sources this switch would force FG-3x to produce color from noise. Therefore this switch should be turned off in this case.

Chroma Prefilter influences both color and grey-level signals. In the case of composite video signals, this filter eliminates noise for color operation and can reduce color burst influences to grey-

level images. The Edit field allows you to adjust possible delays between the color burst and other parts of the video signal. The edit field **Color level** is one of the coefficients on the video chip for calculating color values.

The **phase** value can correct false color effects. This value has different effects in different video standards. In some cases its value can correct effects from long cables where reflections appear. In cases where a video source does not operate with a correct phase - input values from 0 ... 127 will cause a phase change between 0° and 179° and values from 128 ... 255 cause a phase change from -180° to -1.4°. The **color thresholds** for color decoding in both PAL- and SECAM-standards allow you to change the default values to influence automatic color switching. A lower value will detect color bursts easier in poor video signals.

The group **luminance correction** contains elements that have an influence on brightness-dependent parts of the video signal. Delays within a video signal can be corrected in 8 steps by the radio button **luminance delay**. For a digital aperture bandpass filter, the aperture can be selected in 4 steps by **filter aperture** and **filter threshold.** This filter also has an influence on grey-level images. To use the full scale of 256 grey levels this filter must be adjusted correctly. In a grey bar test image, a histogram would present a more-or-less horizontal line. For normal grey images you should not have missing codes. Such missing codes are visible as periodic gaps in a histogram. These are caused by incorrect settings and are typical scaling effects arising with digital filters.

For "exotic" TV standards such as PAL 60 Hz you can change the **mid frequency**.

There is no automatic switching to SECAM mode implemented in this program. You must switch manually to SECAM with **SECAM Mode**. The cross color effect typical of the SECAM TV standard can be reduced by activating the **cross color filter**.

If FG-30-I, FG31 or FG32 are used with Y/C sources it is possible to switch between composite **CVBS** video signals and signals with a separate **S-Video** chrominance channel. The term S-Video includes SVHS, Hi8 or Y/C standards.
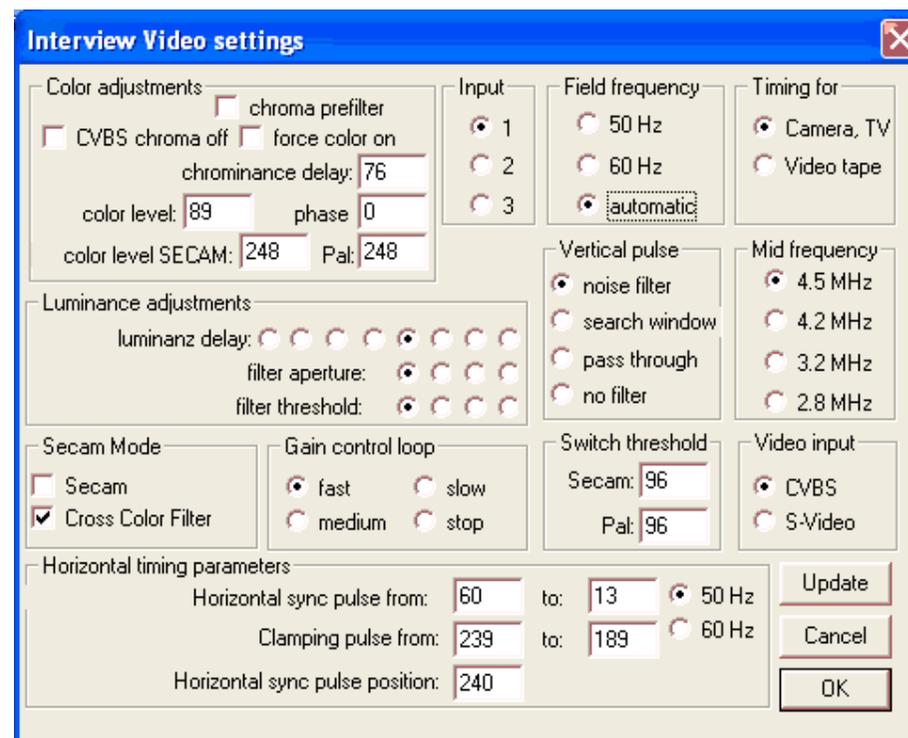
If the **force color** switch is turned off, the **switch level** for both the PAL/NTSC or SECAM standard decides if color information will be used. The values must be chosen in such a way that a color carrier can be detected even with noisy signals. These values should not be used as a way of turning off color. If you wish to turn off color, use the switch **CVBS chroma off**. You do not need to worry about most of the switch settings when digitizing 8-bit grey-level images, because the luminance channel is handled separately in this case.

Even if standard video sources claim to produce a 1 Volt video

signal on 75 ohm termination, real life is different.

Some video cameras do not use gain control at all and images with a changing illumination may produce video signals with dynamic changes that are too large to deal with within an 8-bit grey scale. **Gain control** can compensate for much of these problems. However, simple solutions for realizing gain control have many disadvantages. Because a video signal contains not just visual information, it cannot be amplified so easily. Professional video systems often use a black-level clamping gain control – the FG-3x uses this as well.

A video signal consists of black-level porches before and after each horizontal sync pulse. These shoulders provide good reference points for defining the black level for a video signal. The values **Clamping pulse from** and **Clamping pulse to** can define a window in time during which FG-3x samples the value for the video level "black". If correctly adjusted, even video sources with some timing differences can be adapted. Both values have individual variables for **50 Hz** and **60 Hz** standards. Before making changes, the required standard should be selected. To find the black level porches it is important to have exact values of the position for the horizontal sync pulse. The values **horizontal sync pulse from** and **horizontal sync pulse to** define a search window where the horizontal sync pulse appears. Again, these values point to individual variables for 50 Hz and 60 Hz signals. Incorrect values cause FG-3x to switch to a mode where gain control works differently. To test whether the settings are correct, turn off the camera's gain control and try to capture a completely black image (cover the lense with your hand). If FG-3x is in the correct mode, the captured image is black, otherwise grey levels with a value around 80 will appear.

Automatic **gain control** also has a time characteristic which is selectable in four steps: **fast, medium, slow** and **off**. Gain control is not limited to a CVBS signal. In the case of S-Video signals a

second loop controls the chrominance signal.

The value **horizontal sync pulse position** has no influence on the operation of FG-3x, but it may have an influence on additional hardware connected to feature connectors that are available on FG-32, FG-34 and FG-35.

The group **vertical sync** has an influence on how reliably even and odd frames are detected. Four selections are possible: for working with a **noise filter**, using a **search window**, running **auto deflection** mode or working **without** any **filter**s.

For use with standard video sources we recommend that the noise filter be selected.

2.3.7.2.   Extended video parameters

This dialog appears for FG-30-II, FG-33, FG-34 and FG-35 when modern operating systems are used.
It shows a complete list of video parameters. This dialog has three pages and about 300 control elements. It can be opened during a live video display. All changes appear in real time in the live video display.

2.3.7.3.   Gain and Sync adjustments

This dialog helps you to see effects of the sync and clamp positions in real time. These are described in chapter 2.3.7.1. You can change values by moving scroll bars and see effects with the help of a small preview contained in this dialog.

2.3.7.4.   Hardware configuration...

This dialog allows you to change the base address for FG-3x. If more than one board is installed, this dialog will switch between cards by selecting the base address of the chosen card. Starting with newer operating systems, two frame grabber cards can be preselected. If FG-32 with base address 300H is selected but not present, the first automatically detected plug & play card is used instead. The shown settings are used for FG-32, FG-33, FG-34 and FG-35, and there is no need to change this address unless more than one of these cards is installed.
If CardBus cards are installed and plugged in, the FG33:0000H text will change the 0000-text into the assigned base address. There are two such positions to show these values for the first two FG33 cards. Two more such positions labeled FG-34 show the first two FG-34 and FG-35 cards if they are present. All 8 positions mirror the device drivers device list. There are driver functions for making
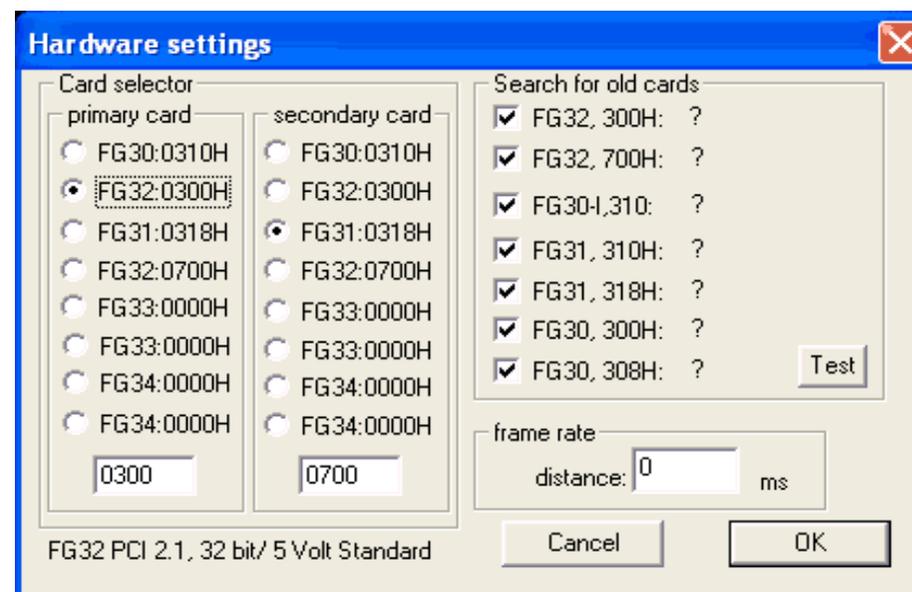
changes in this list – but it is not the aim of this program to do this. If external programs change this list you may see any other possible combination of cards, perhaps even 8 cards of the same type.

2.3.7.4.   Field selection for small images

The size dialog allows you to change the size of the captured image. If images of medium and small size are captured, image data is based on a single field. You can select the type of field to be used for small images. The position "next field" allows the program to take whatever field comes next in the video signal.

2.3.7.5. Dithering configuration

This dialog allows you to have some influence on error diffusion dithering. Separately for 4 and 8 bits per pixel, you can change the

error distribution. The color error of a pixel splits into 3 directions and will force neighboring pixels to keep this error as low as possible. The

Dithering from 24 to 8 or 4 bits per pixel

Reduction from 24 bit to 8 bit/Pixel

	Threshold (2**n)	Quantizing coeff.	horizontal	vertical	diagonal
Blue	6	63	7	6	3
Green	5	31	7	6	3
Red	5	31	7	6	3

error diffusion (n/16)

Reduction from 24 bit to 4 bit/Pixel

	Threshold (2**n)	Quantizing coeff.	horizontal	vertical	diagonal
Blue	8	129	7	6	3
Green	8	129	7	6	3
Red	7	85	7	6	3

error diffusion (n/16)

Defaults   OK

calculated error will be distributed in horizontal, vertical and diagonal directions in quantiy steps of 1/16

2.5. Snap

Use the accelerator key F6 to capture and display a single frame (all settings made in dialog boxes are applicable). In some FG3xCLIP versions there are two more menu items, "1" and "2", for switching rapidly between two preselected cards.