FRAMEGRABBER™
Real Time Video Image Digitizer

Operators Manual

Disclaimer

The information contained in this document has been verified and is accurate at the time of publication; however, Progressive Peripherals & Software, Inc. does not assume any responsibility for use of the software, documentation or the hardware device.

Progressive Peripherals & Software, Inc. makes no warranties, either expressed or implied, concerning the performance, merchantability, or fitness for any particular purpose, of this product. In no event will Progressive Peripherals & Software, Inc. be liable for direct, indirect, incidental or consequential damages resulting from the use of, misuse of, or defects in this product.

Caution: This is a delicate, static electricity sensitive, device. Handle with extreme care. Disconnect from the computer and the A.C. outlet when not in use.

Warranty

Progressive Peripherals & Software, Inc., warrants the Frame-Grabber real-time color digitizer against defects in original materials and workmanship for a period of 90 days from the date of purchase. Please return the enclosed warranty card as soon as possible. Warranty cards must be received within one month (30 days) in order to validate any warranty-related repairs. For warranty repair service, call or write Progressive Peripherals & Software, Inc., to obtain a Return Merchandise Authorization (RMA) number. Send your FrameGrabber to Progressive Peripherals & Software, Inc., **in its original packaging** and write the RMA number clearly on the outside of the package. Products returned without an RMA number will be refused at our dock!

Please note: Your FrameGrabber has been exhaustively factory tested and aligned by our assembly production engineering staff. Included in this package:
(1) FrameGrabber real-time color digitizer.
(1) Operators Manual
(1) FrameGrabber 3.5" floppy program disk.
(1) Power supply.
(1) RGB Cable.
(1) RGB Adapter (optional, for use with 1084 monitors).
The user will need to provide (1) standard centronics printer cable.

Credits

The FrameGrabber real-time color digitizer was designed by Avalon Engineering. The FrameGrabber software was written by Justin V. McCormick, author of PIXmate.

TABLE OF CONTENTS

Model FG-1
Serial 06·922·89

I. Overview

Congratulations, you have purchased the Progressive Peripherals & Software **FrameGrabber**. This hardware/software real-time, color image capture system is intended for use with all Amiga computers. With its ease of use and state-of-the-art design, FrameGrabber will allow you to explore the vast array of digitized image applications.

The FrameGrabber hardware will connect to the Amiga through the parallel port using a standard centronics printer cable. FrameGrabber is a true stand-alone unit with its own power supply and internal dynamic RAM. The input to the FrameGrabber is a NTSC color or black and white signal from any video source.

FrameGrabber is capable of capturing (digitizing) an image in real-time. This makes it possible to "grab" images from live video or even from a VCR without pausing the image. The image is captured in one field (1/60 second) for 320x200 and 640x200 modes and in one frame (1/30 second) for 320x400 and 640x400 modes. The FrameGrabber software supports several color modes including 16 level grey scale (B&W), 32 color, 64 color EXTRA-HALFBRITE (EHB) and 4096 color HAM mode. The Captured image has the same aspect ratio as the original.

After the image is captured, it is then uploaded to the Amiga via the parallel port. This occurs in less than three (3) seconds for the 320x200 color mode. Longer upload times can be expected for the higher resolutions.

The FrameGrabber software includes image processing and animation capabilities as well as standard image capture facilities. Control commands are sent to the FrameGrabber via the parallel port. In addition to software control, there are three (3) external control knobs to adjust the incoming video signal. Each knob is labeled according to its function: intensity, hue and color saturation. Manual adjustments are made possible, prior to digitizing, via these knobs. Switching the display between the Amiga graphics screen and the live video signal, permits adjustments in focus, intensity, etc. prior to digitizing. The signal viewed is a B&W or 4096 color-- image depending on the mode selected.

The FrameGrabber Hardware Supports Color or B&W input signals at the resolution provided by the source camera.

The FrameGrabber Software supports the following real-time modes:

- 320x200x16 B&W
- 384x240x16 B&W (overscan)
- 320x400x16 B&W
- 640x200x16 B&W
- 640x400x16 B&W
- 320x200x(2,4,8,16,32,64,HAM) color
- 384x240x(2,4,8,16,32,64,HAM) color (overscan)
- 320x400x(2,4,8,16,32,64,HAM) color
- 640x400x(2,4,8,16) color

Hardware Power Requirements:

5 volts at 1 amp
Positive 12 volts at 200 milliamps
Hardware Size: 9.5"x 6.25"x 1.5"

II. Setup

Connecting the FrameGrabber hardware to the Amiga is easy and should only take a few minutes.

1. Remove all power from the Amiga and its peripherals.

2. Disconnect the Amiga RGB cable from the monitor. Connect this cable to the FrameGrabber at the connector labeled "Amiga". *Note:* If you are using a 1084 monitor, you will need to use the supplied adaptor.

3. Connect the supplied cable from the FrameGrabber output labeled "Monitor" to the Amiga monitor.

4. Connect the parallel port of the FrameGrabber to the parallel port of the Amiga using a standard centronics printer cable (not supplied).

5. Plug the 5 pin din connector from the FrameGrabber power supply into the FrameGrabber connector marked "Power".

6. Plug the power supply cord into a standard A.C. outlet. The LED indicator on the front should be lit. Now turn on the Amiga power. Your Amiga should boot up normally. *Note:* if power is not supplied to the FrameGrabber the Amiga monitor will appear dark.

Rear Panel

Parallel Port   Power   Amiga   Monitor
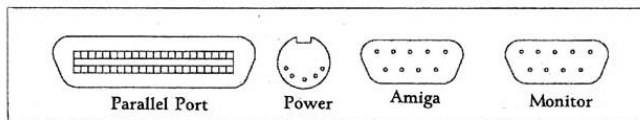
III. Front Panel Operation

1. Connect the video source to the "video input". With the FrameGrabber software running (see the section V on running the FrameGrabber Software), press the TAB key until the video signal appears on the monitor.

2. Adjust the intensity, hue and color saturation via the three knobs on the front of the FrameGrabber. These adjustments are similar to the controls on a color TV set.

Front Panel

FrameGrabber

NTSC   Intensity Hue Saturation

Video Input   Video Controls   Power LED
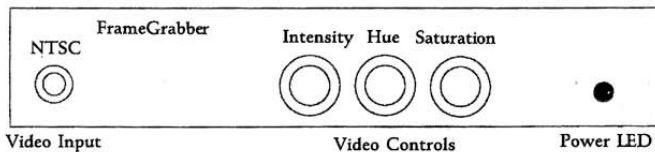
INTENSITY: Brightness of the video signal.

HUE: Color bias of the video signal. Counterclockwise for Green, clockwise for Red.

SATURATION: Fully counterclockwise is Black & White and fully clockwise is 100% color saturation.

When in the B&W mode or the color wheel mode, the image displayed will be Black & White. The hue and saturation controls will have no effect on the displayed image.

Caution: The picture will wash out if the brightness is turned to maximum. A poor quality image will result. The wide range in brightness control is provided to compensate for the various video signal strength levels inherent in different equipment. For best results, the brightness must be adjusted such that the picture is below the wash out point. The saturation control should be set low enough that color bleeding does not occur.

IV. Usage: Getting the most out of the FrameGrabber.

A. Camera Input.

For the best results, use a video camera of equal or greater resolution than the format of image storage you plan to use with FrameGrabber. Remember that the higher quality the camera, the better the final image. For instance, if you plan to grab mostly high resolution B&W (640x400x16), you should use a camera with a resolution of 640 or greater such as the Panasonic WV-1410 B&W video camera. If you plan to capture medium-res (320x400) or Overscan (384x240) color images use a quality camera such as the Panasonic WV-3260/8AF color video camera.

B. Lighting.

Lighting conditions are very important for optimum camera usage. Use indirect sunlight or photography lighting equipment for best results.

C. VCR Input.

For optimum VCR performance a good quality VCR with a first generation tape should be used. As with the camera, the higher quality video recorders render better results.

D. Amiga System Memory Requirements.

The FrameGrabber Software requires at least 512K memory. For optimum performance a memory expansion card is recommended. The following modes will not work without a memory expansion card.

> B&W: 640x400x16
> Color: Any resolution greater than 320x200xHAM
> (384x240 is only available in 2 color mode)

E. Workbench Release.

Use workbench version 1.2 or later.

V. SOFTWARE

Load the FrameGrabber software from Workbench by clicking on the icon, or from CLI by typing "FG".

The FrameGrabber software will check to be sure that the FrameGrabber hardware is properly connected. If it is not, a warning requester will be displayed. You may run the software without the hardware being connected; however, only the image processing functions of the software may be used.

A. Menu Descriptions
The File Selector

FrameGrabber software uses the Path-Master File Selector. You use the File Selector to select a pathname and filename for the file you wish to load, save or delete. The File Selector dynamically time-slices its operations, so you are never forced to wait for a directory to be read. **Further instructions on using Path-Master can be found in Appendix H.**

1. Project Menu
LOAD IFF
SAVE IFF

You may load and save images in standard IFF format. The images saved in this format may be used by other software packages.

LOAD FROM...
SAVE AS...

You may load and save images in three formats.

IMG8 File: A compressed format where 12 bits per pixel are preserved, for future manipulation.

IP File: Images are compatible with Digi-View software.

RAW File: All the information (12 bits per pixel) used in Frame-Grabber are preserved. These files are very large, allowing only 2-3 per disk! **See Appendix F for information on all file formats.**

LOAD PALETTE
SAVE PALETTE

You may load and save palettes in standard IFF format. This may be useful in capturing images for a specific purpose where color compatibility is imperative.

SAVE BRUSH

Allows you to save a portion of the image in IFF format. Select the menu item and then point to the upper left of the image you want to save. Hold the left mouse button down and move the pointer to the lower right of the desired image. Release the mouse button and save the image to disk. You can abort the selection by pressing the space bar before releasing the mouse button, or by cancelling the file request.

DELETE FILE

Removes a file from the disk. **NOTE:** Once deleted, FrameGrabber cannot restore the deleted file!

CLEAR SCREEN

Erases the current image on the screen. Any image still in the image buffer remains untouched and can be seen using SHOW IMAGE.

CLEAR ALL

Erases the current image on the screen as well as the image buffer that is used for multiple exposure.

QUIT

Quits the program immediately.

2. Grab Menu

GRAB IMAGE

The command to digitize (capture) an image and upload it to the computer. Use this command for all modes other than "Color Wheel Mode". The keyboard equivalent of this command is "c" for "Capture".

GRAB RED
GRAB GREEN
GRAB BLUE
SHOW IMAGE

(Color Wheel Mode) These commands are for use with a color wheel and a B&W camera. The user must put the corresponding color filter in front of the lens prior to grabbing that color. After all three colors are grabbed, select "SHOW IMAGE" to see the image. The iris must be in the manual mode when using an auto-iris camera. Keyboard equivalents to these commands are "r", "g", "b", and "s" respectively.

3. Control Menu

LIVE/AMIGA

Switches the displayed image from the Amiga output to the live video image. The TAB key may be used as a toggle to switch between the two displays.

FORMAT CONTROL (window)

A window will pop up with all the available picture formats. Make your selection, then click on USE.

Screen: Displays the desired resolution for use.
Color: Selects number of colors used in palette.
Exposure (single/multiple): Selects desired exposure type.

Single exposure mode

Captures one image and displays it. Any old image is overwritten.

Multiple exposure mode

Averages the digitized image with the existing image. Multiple exposing a still image should reduce the noise in the image. Multiple exposing two different images will cause both to appear in the display. You can multiple expose as many times as you wish. This feature cannot be used with the Dither mode.

Time Lapse

For a full description and proper use see Appendix B.

Dither

Attempts to color correct the image. If two-color mode has been selected, a B&W half-toned image will be produced. Note that dither mode cannot be used if the B&W mode is selected. You cannot use the Multi-Exposure mode while using Dither.

Size (Full/Half)

Full size image fills the whole screen. The **half size** image reduces the entire image to one quarter screen size.

PALETTE (window)

This pop-up window shows all the colors used in the image. Allows the user to control each color. These additional features are also included:

Undo   Returns the image to the state prior to the most recent change.

Reset   Resets palette to initial status.

Find   Flashes selected color on the image.

Copy   Copies one color register to another.

Exchange   Swaps any two color registers.

Spread   The user selects two palette colors. The software calculates the in between colors and places them in the registers between the two selected colors.

Click on the RGB gadget to toggle between RGB and HSV modes.

PALETTE LOCK...(off/on)

With lock off, a new color palette is calculated each time an image is digitized. With lock on, a new palette is not calculated, but the image is matched as closely as possible with the current palette.

SKIP COLOR...(None/ 0/ 0 & 1)

With Skip Color 0 on, the first color in the palette is not used in image calculation. The first color is the border color. If the captured image is to be used in another program, it may be necessary to set color 0 to a specific color. This feature allows you to change color 0 without effecting the actual image palette. Skip Color 0 & 1 is the same as Skip Color 0, except that color 1 (normally the foreground or text color) is also skipped.

COLOR BIAS (window)

This pop-up window has slide controls to allow adjustments to the entire palette. The following parameters can be adjusted by sliding the controls while holding down the left mouse button:

- contrast, saturation, brightness
- red
- green
- blue

These controls work best with non-HAM pictures.

TOGGLE TITLE

Suppresses the title bar or returns it.

TOGGLE CURSOR

Suppresses the pointer or returns it.

CENTER SCREEN

Used only for the overscan mode. This command will re-center overscan images. The overscan image will be non-centered when accessing any item on the menu.

REDUCE IMAGE

Takes the current image and reduces it to one quarter screen size. This feature works only on images that have been captured, or on RAW, IP, or FG data loaded into the computer. It does not function on IFF files loaded into the computer.

CENTER AT...(Upper Left / Middle)

For use only with a halfsize image. Places the image either in the center of the screen or at the upper left-hand corner of the screen.

4. Anim Menu

NOTE: See Appendix A and B for detailed information.

BEGIN ANIM

Begins the animation process by opening a file on disk and saving the current image as the first frame of that file. FrameGrabber then waits for you to capture and add the next frame. If the TIME LAPSE option is active, image capture and save will be automatic.

ADD FRAME

Adds the current image to the last frame of the current animation file. You must first capture the new image before selecting this item, otherwise the same image will be saved to the animation file twice. This allows you to select which captured image is to be committed to the animation.

END ANIM

Ends the animation process and closes the animation file on disk. Your new animation may now be loaded into memory and played.

PLAY ANIM

Loads animation file from disk to be displayed on screen.

TIME LAPSE (window)

Set-up window for time lapse animation. Includes automatic capture (enable/disable), maximum number of frames, palette lock, interval time, and alarm tone on/off.

5. Info Menu

MEMORY (requester)

Displays current memory usage and availability.

IMAGE (requester)

Displays image resolution, possible colors, and size of bit map.

COORDS (window)

Opens a small window at the top of the screen to display the x,y pixel location of the pointer.

CREDITS (requester)

Displays name of author, publisher and a copyright message.

Appendix A: Making Animations with FrameGrabber

A.1 Introduction to Animation

With FrameGrabber, you can easily make your own animated movies! Animations are created by capturing several images, one after another. The software saves these images as a collection of frames in an animation file. After you have recorded as many frames as you want, you can play back the file. The frames can be shown at high-speed during playback, giving the illusion of motion. This is the basis of animation; the same technique is used in motion pictures and animated cartoons.

A.2 Starting an Animation

Prepare a freshly formatted blank diskette in advance to save the animation file on, since these files can be quite large. Alternately, if you have lots of available RAM, you can save the animation file in your RAM disk for greatest speed during recording.

To start an animation, select your image format and capture the first image, Frame 1. Now, select "Begin ANIM" from the Anim Menu. The File Selector will appear, and you choose a directory and file in which to store the animation file. If all goes well, the first frame will be stored in the animation file, and you will be ready to start adding additional frames. If a file problem occurs, the software will inform you of the problem and the animation will be aborted.

A.3 Adding Frames to an Animation in Progress

Now that you have saved Frame 1 of your animation, you're ready to add the next frame. Adjust the camera and subject for the next frame and capture the image. Select "Add Frame" from the Anim Menu. Each frame is sucessfully added when the frame counter in the Title Bar advances. This capture/add frame process can be repeated as many times as you desire, or until you run out of storage room.

A.4 Finishing Your Animation

When your animation is complete, select "End ANIM" from the Anim Menu. The animation file is now ready to be played back.

A.5 Playing an Animation File

Select "Play ANIM" from the Anim Menu. The File Selector will appear, select the file you want to play. After the animation file has loaded, the frames will be played back in the sequence in which they were recorded. When the last frame is reached, the playback will start over.

You can control playback speed by pressing the number keys 1-0. The "1" key plays the animation as fast as possible, up to 30 frames per second. Pressing the "0" key plays the animation in slow motion, about one frame per second. The keys "2" through "9" select speeds between these two frame rates. In addition, you can press the plus or minus keys to fine tune your frame speed even further.

To "single-step" through the frames, press the SPACE BAR. To resume automatic playback, press any one of the number keys, 1 through 0.

A.6 Technical Notes on Animation Files

For fastest playback speed, you should use the lowest resolution and the least number of colors that are acceptable for your application. For instance, 320x200, black and white images will take less room and playback faster than 320x400, 4096 color images. Another trick is to use the HalfSize mode when capturing images. This will greatly reduce the size of your animation files, allowing for longer animations, and will result in faster loading and playback.

The FrameGrabber software stores animation files using the standardized IFF ANIM file format. The first frame is stored as an IFF ILBM file, so you can use "Load IFF" to look at the first frame without loading the entire file. Subsequent frames are stored by saving just the areas of the image that have changed since the last frame, using a compression algorithm known as vertical skip encoding. For those of you who are familiar with the IFF ANIM format, the software uses IFF ANIM opcode 5 style compression. This variety of the ANIM standard has the advantage of superior image compression, and is one of the most popular animation file formats. Thus, you can interchange animation files produced by FrameGrabber with a wide selection of compatible software packages.

Since only the differences between frames are stored in an ANIM file, the amount of change in the scene between captured frames has a direct relationship to the size of the resulting file, and affects the speed of playback. If there is a radical change in lighting or scenery between frames, more data must be saved to record the differences, and it will take longer to reconstruct the next frame from the previous frame during playback.

Appendix B: Time Lapse Animation

B.1 Introduction to Time Lapse Animations

FrameGrabber has a powerful alternative to manually creating animations frame by frame: automatic capture. Once you start the process, the software does the rest, giving you totally automatic, unattended operation. You set the amount of time that passes between capturing each frame, and set a limit on how many frames you want to capture.

B.2 Preparing for Automatic Capture

To prepare for automatic capture, select "Time Lapse" from the Anim Menu. The controls on this window determine whether automatic capture or manual capture is used after an animation has begun, and lets you adjust the automatic capture settings.

First, use the three slider controls on the left of the window to set the amount of time you want to elapse between frames. The default is one frame every five seconds. You can increase the delay to a maximum of 99 hours, 59 minutes, and 59 seconds; at this setting, only one frame will be added every four days! Or you can reduce the interval all the way down to zero seconds; at this setting, the software will capture and add frames as quickly as possible.

Next, select how many frames you want to capture. Click inside the box labeled "Max Frames". Use the DELETE and BACKSPACE keys to clear out the old number and type in a new number of frames. The default number is 30. If you set "Max Frames" to zero, the number of frames will be essentially unlimited; the software will capture frames until you manually end the animation, or run out of storage room. Enable the automatic capture mode by clicking the "ON" gadget under the "Automatic Capture" label. Normally, this is set to "OFF". Position "OFF" will allow you to manually create animations.

The next pair of ON/OFF gadgets, "Alarm Tone", determines whether the computer gives you audio alert sounds or not. With alarm "ON", the computer will beep one minute before the next frame is added. This serves as a warning to you that the subject of the next frame should be made camera-ready! Additionally, if the alarm tone is enabled, the computer will beep when the entire animation has been completed. When using the alarm, make sure your speaker is connected to your computer and the volume is set high enough to hear!

The last pair of OFF/ON controls, under the heading "Palette Lock", determines whether the software uses the current palette for the entire animation, or creates a new palette for each frame. If the Palette Lock is "ON" it will take less time for the software to process each color image; however, if the colors change drastically between frames, the color accuracy may suffer. With the Palette Lock "OFF", the software will give you better color accuracy, but it takes more time. Remember, if you use the Palette Lock feature, you should capture your subject once to set the palette before turning on the Palette Lock.

After you have everything set the way you want, click on the CLOSEWINDOW gadget or press the RETURN key to exit the Time Lapse Control window.

B.3 Starting the Time Lapse Animation

Once you have set the time lapse controls and have turned Automatic Capture "ON", you are ready to start the animation. Capture your first frame and begin the animation by selecting "Begin ANIM", as described in section A.2, "Starting an Animation". The first frame will be recorded, and the title bar of the FrameGrabber screen will display a countdown timer showing how long until the next frame will be added. When the timer hits zero, the next frame will be automatically captured and added to the animation file, and the countdown for the next frame will begin. This process will repeat automatically until the desired number of frames have been recorded. You can select "End ANIM" at any time to finish the animation immediately.

Appendix C: Manual Color Adjustments

Normally, the FrameGrabber software automatically chooses the best palette for color images; however, there may be times when you would like to gain additional control over this process. The FrameGrabber software allows you to fine-tune the palette picking algorithm to suit your taste.

The palette-picking parameters are displayed in the title bar of the screen. To show the current parameters, make sure the title bar is visible (press the "t" key if necessary) and press the "1" (one) key (not the one on the numeric keypad!) The title bar will display a message something like this:

AutoCon:(2) RGB(1.0, 1.0, 1.0)

The first part means that AutoContrast mode is ON, and that the color contrast threshold is set to 2. The three numbers after RGB are the current color difference ratios for red, green and blue, respectively. The default treats red, green and blue differences equally.

To change the color threshold, press the the back quote key, to the left of the "1" key. The title bar message will read "AutoContrast OFF". AutoContrast must be OFF to adjust the color contrast threshold. To lower the threshold, press the "2" key. To increase it, press the "@" key (SHIFT-2). Pressing the back quote key again would turn AutoContrast "ON" again, which overrides the manual setting.

To decrease the R, G, or B ratios, press the "3", "4", or "5" keys. Likewise, to increase R, G, or B, press the shifted equivalents of these keys. To reset all three ratios to their defaults, press the "6" key.

The color contrast threshold value determines how "wild" the palette will be. A low color threshold, 0 or 1, will result in a palette full of very similar shades of color. A larger threshold, 6 or 7, will produce a palette full of very different, extremely vivid colors. Values like 3 or 4 are best when digitizing scenes with many different colors, specially in the 32 color and 16 color modes.

The RGB ratios determine the relative importance of red, green, and blue color differences when choosing the best match for a given color. For instance, you might have an image that contains lots of skin tones, but on a bright blue background. You could increase the red difference ratio (the first of the three RGB numbers) from its default setting of "1.0" to "1.4". This would increase the importance of exactly matching shades of red (the same shades that occur in skin tones) while decreasing the relative importance of matching green and blue color components. This can be tricky, since skin tones actually contain a fair amount of green. In effect, if you set one of the ratios smaller than the other two, you can give FrameGrabber a case of artificial color-blindness, which may or may not be what you desire.

To summarize, there are many ways of controlling the color environment that FrameGrabber uses. The Palette Window lets you adjust individual colors, and the Color Bias Window lets you adjust all the colors simultaneously. The color contrast threshold and RGB ratios allow you to manually fine-tune the palette selection process. And of course, there are (3) external controls on the FrameGrabber, plus any color camera controls!

Appendix D: Block Diagram
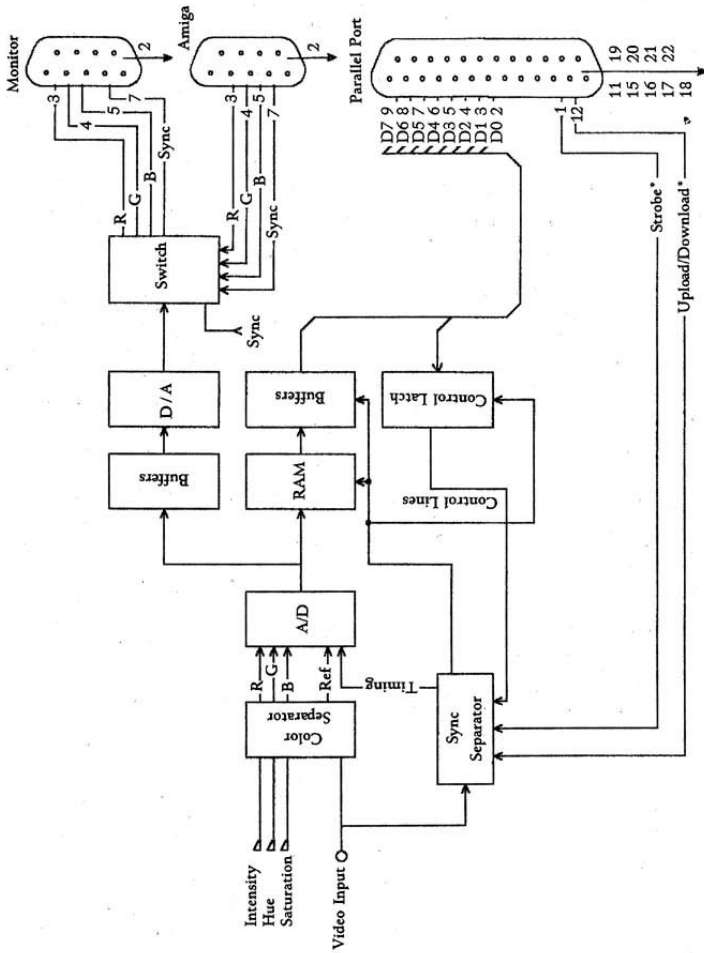
Appendix E: Port Control Definition

Images are uploaded through the parallel port. The red, green, and blue A/D's data buses must be buffered to a common data bus. The common bus is buffered and cabled to the parallel port of the Amiga. The buffer to the cable must be turned off when not in use.

Commands are downloaded from the Amiga to an eight (8) bit latch. Each bit of the latch controls some feature of the Frame-Grabber. These bits are:

D0 - Color Select
D1 - Color Select (00-Off, 01-Red, 02-Green, 03-Blue)
D2 - Switch (0 = Amiga , 1 = Frame Grabber)
D3 - Overscan (0 = normal , 1 = overscan)
D4 - Color Kill (0 = color , 1 = B&W)
D5 - 320 / 640 (0 = 320 , 1 = 640)
D6 - Digitize (0 to 1 transition = digitize)
D7 - Reset (0 = reset , 1 = operate)

The port powers up with all bits in the low state.

Two separate bits are used to control data flow between the Amiga and the FrameGrabber. They are:

- Upload / Download
- Strobe

The Upload / Download line ("paper out" of the parallel port) is used to control the data flow direction of the parallel port. If the line is low, data will be transferred from the FrameGrabber to the computer. Reading the port automatically causes the strobe to generate a pulse. This pulse readies the FrameGrabber for the next data transfer. A control command can be sent to the Frame-Grabber when the Upload / Download line is high. The strobe to latch the command is automatically sent.

Appendix F: FrameGrabber File Formats

F.1 Saving your captured images

Generally, you will want to save your captured images with the "Save IFF" option. Most Amiga programs that work with picture files, such as paint programs and slide show utilities, use the IFF file format.

F.2 Why you need file formats other than IFF

When you save an image in IFF format, not all of the information captured by FrameGrabber is preserved. For instance, if you save a 32 color image in IFF format, you cannot go back and change the image to 4096 colors, since the additional color information has been discarded. Thus, the software allows you to save an image in any one of three alternate formats. These alternate file formats preserve all of the information captured by FrameGrabber. You can then load the image at a later time and convert it to another format, using an exact copy of the original data from FrameGrabber. There is a drawback to saving images this way; the file size will be larger than if you saved the image in IFF format, since more data is kept. You will not be able to store as many images on a disk. Also, most other Amiga programs can only read files in IFF format.

F.3 The three alternatives to IFF

To save an image in one of the alternate formats, you select the format you want from the "Save As..." section of the Project Menu. Later, you can use the "Load From..." options to retrieve the image data in the same format in which it was saved.

Three formats are available next to the "Load From..." and "Save As..." headings. These three choices are "IMG8 File", "IP File" and "RAW Data". Each format has its own distinct advantages.

The first type, "IMG8 File", stores the captured image data in a compressed form. We recommend you use this format, since it produces the smallest files and allows more saved images on a disk. Another benefit is that the file contains the screen size you used to capture the image, so that the software can automatically set your screen to the proper size when you load the file later.

The second type, "IP File", stores the image data in a format that is compatible with Digi-View. If you happen to own Digi-View or have software that works with files in this format, you can easily swap files with FrameGrabber.

The third format, "RAW Data", is the simplest format, but it produces the largest files. A 640x400, 16 color image file will be 768,000 bytes long -- almost a full disk! If you have a lot of RAM, you can load and save files to RAM: using "RAW Data" format very quickly. If you are considering writing your own software to process images, you may find that the "RAW Data" format is the easiest to decode.

F.4 Implementing the alternate file formats

Unless you are writing custom software to read or write image files, you may not need to understand the details of how the data is stored. For those of you who are interested, the exact format for each type of file is described in the following sections.

F.5 IMG8 Data Format

The IMG8 image format consists of a file header, an information block, and a data block of run-length encoded image data. The header and information block are organized as follows:
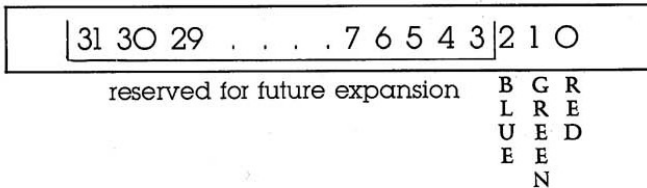
Bytes 1-4 --- Contains the file header string "IMG8" that uniquely identifies the file as being an IMG8-type file.

Bytes 5-6 --- Contains an unsigned 16-bit value that specifies the width of the screen (DisplayX) in pixels.

Bytes 7-8 --- Contains an unsigned 16-bit value that specifies the height of the screen (DisplayY) in pixels.

Bytes 9-12 --- Contains an unsigned 32-bit flag field that describes color information concerning the RGB image data (ColorInfoBits). The interpretation of the 32-bit ColorInfoBits field is as follows:

Diagram 1

```
┌─────────────────────────────────────────────────┐
│  31 30 29  . . . . . 7 6 5 4 3 │2 1 0            │
└─────────────────────────────────────────────────┘
        reserved for future expansion      B  G  R
                                           L  R  E
                                           U  E  D
                                           E  E
                                              N
```

Thus, if bit 0 is set, the data block contains information for the red gun. If bit 1 is set, the file contains data for the green gun. If bit 2 is set, the file contains data for the blue gun. If bits 0, 1, and 2 are all set, the data block contains data for red, followed by green, followed by blue. If none of the bits are set, the data block contains data for a gray-scaled black and white image. Typically, this field will equal 3 for RGB images, and 0 for black and white images. Currently, bits 3 through 31 are unused, and are reserved. This may be used for flagging cyan, magenta and yellow, or YIQ color information in future software.

Bytes 13-16 --- Contains an unsigned 32-bit value that specifies the length of the block of compressed image data that immediately follows. This is used as a checksum to insure that the file has not been truncated, and to simplify unpacking the data block.

Bytes 17-nnn --- The compressed image data. When unpacked, image data is a series of 8-bit values, one byte per pixel, allowing 256 levels of intensity to be represented. RGB data, (or other combinations thereof), is stored as one contiguous block of compressed data, with red data preceding green data, followed by blue data, as specified by the ColorInfoBits.

The data is compressed using a run-length encoding technique, with a signed 8-bit count byte followed by data bytes, using the following set of rules:

```
if 1 <= count byte <= 127:
    Copy next count bytes of data directly.
if -127 <= count byte <= 1:
    Repeat the next byte -(count) times.
If count byte = 0: No operation.
```

To determine how many bytes each field will occupy after unpacking, multiply DisplayX by DisplayY. Thus, if DisplayX = 640 and DisplayY = 400, each field will be 256,000 bytes long when decompressed. So, to decode a data block that contains red-green-blue data (i.e., ColorInfoBits = 3), you would unpack 256,000 bytes of red, then start unpacking 256,000 bytes of green, and finally unpack 256,000 bytes of blue data.

F.6 IP Data Format

The IP format consists of a series of 8-bit values, one byte per pixel, representing 256 levels of intensity. For RGB data, the red, green, and blue fields are stored contiguously. A 12 byte information block is attached to the end of the file, and is used by Digi-View software to store control settings. By default, this block contains all 8's, i.e., hex 0x080808080808080808080808. *Note:* No information is contained concerning the width or height of the display, thus, this must be inferred from the length of the data file. Some ambiguity can arise since a 320x400 file is the same length as a 640x200 file.

F.7 RAW Data Format

The RAW data format consists of a series of 4-bit values, one byte per pixel, representing 16 levels of intensity. Thus, a black and white gray scaled 320x200 image would be stored as 64,000 bytes of 4-bit data. RGB data is stored contiguously, with the first third of the file representing the red data, the second third representing the green data, and the last third representing the blue data. Thus, a 320x200 color image would be stored as 192,000 bytes of 4-bit image data, with the first 64,000 bytes containing red data, followed by 64,000 bytes of green data, followed by 64,000 bytes of blue data. As noted for the IP data format, no information is stored concerning the width or height of the display.

Appendix G: Writing Your Own Application Program

A file called "fgtutorial.c" is included on the FrameGrabber disk as an example program for those who wish to write their own application software. Do not attempt this unless you are familar with "C" and Amiga graphics programming. While fgtutorial.c will compile and run, it is a much simplified program than the one supplied with FrameGrabber and is intended only as a tutorial program.

The following ideas are given to aid in writing your own application program. Refer to the PORT CONTROL DEFINITION as needed. First, the FrameGrabber must be set to a particular mode such as LORES or HIRES, COLOR or B&W and, OVERSCAN or NONOVERSCAN. A digitize command must be sent to the FrameGrabber. The digitized image must be uploaded to the Amiga. The Amiga must take the 12 bits of color information and calculate the palette and draw the image to the screen. You may also want to view the live image before you digitize the image. You may also want to have menu control to do something to the image after it is drawn to the screen.

Here are some ideas on how to upload the image. Initialize three character arrays of 64K each to hold the red, green, and blue images. Determine what image format you want and send the following commands to the parallel port. Note in the example code that there are delays between sending each of the commands, they are necessary. See the example code for proper port initialization.

(M= mode control, X= don't care).

d7	d6	d5	d4	d3	d2	d1	d0	
O	O	M	M	M	O	X	X	reset
O	O	M	M	M	1	X	X	view live
1	1	M	M	M	O	X	X	digitize
O	O	M	M	M	O	X	X	reset
1	O	M	M	M	O	O	1	upload red
O	O	M	M	M	O	X	X	reset
1	O	M	M	M	O	1	O	upload green
O	O	M	M	M	O	X	X	reset
1	O	M	M	M	O	1	1	upload blue
O	O	M	M	M	O	X	X	reset

The red, green, and blue colors are packed separately. Each read of the 8 bit port reads two pixels. The image is sequenced from top left to bottom right with the odd field read first then the even field. Each read to the port automatically generates an acknowledge strobe which readies the FrameGrabber for the next read. If the programmer wants a non-interlaced picture it is necessary only to read in 32K bytes instead of the 64K bytes required for the interlaced image. To draw the image the programmer will have to combine the red, green, and blue pixels.

There is no best method to calculate the color palette. Each method can produce good or bad images depending on the effect the user wants. For a 32 color image, the programmer must reduce the 12 bit image (4 red, 4 green, 4 blue) to a 5 bit image. One way to do this is to generate a histogram of the image and take the 32 most used colors and then map the colors in the image to the best fit of the calculated palette. A little fancier version would force the palette not to have two adjacent colors. This produces good results. A faster version would use the two most significant bits of two of the colors and the most significant bit of one color. This method does not produce very good results.
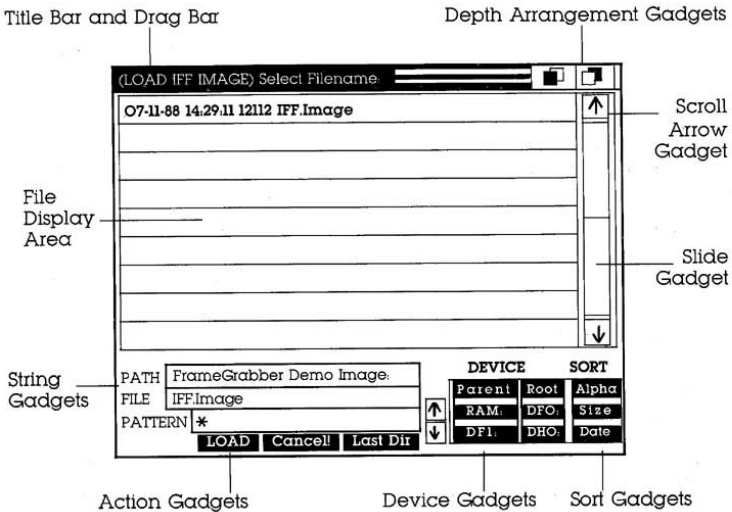
After the image is calculated, the appropriate screen and window must be opened and then the image is projected into the window a pixel at a time. The example is written in "C"; a faster version would have to be written in assembly language.

Other concerns include running out of memory if you have a 512K Amiga. Also, using the method shown in the example code the stack needs to be set higher; 50K will do.

Appendix H: The PATH-MASTER FILE SELECTOR

Using the FrameGrabber File Selector.

Figure 4 Path-Master File Selector

Title Bar and Drag Bar · Depth Arrangement Gadgets

File Display Area · Scroll Arrow Gadget · Slide Gadget

String Gadgets · Action Gadgets · Device Gadgets · Sort Gadgets

(LOAD IFF IMAGE) Select Filename:

O7-11-88 14:29:11 12112 IFF.Image

PATH FrameGrabber Demo Image:
FILE IFF.Image
PATTERN *

DEVICE
Parent | Root
RAM: | DFO:
DF1: | DHO:

SORT
Alpha
Size
Date

LOAD | Cancel! | Last Dir

FrameGrabber uses the Path-Master File Selector to choose a pathname and filename for the file you wish to load, save, or delete. When FrameGrabber requires a filename to complete an operation, such as loading, saving, or deleting a file, the File Selector window will pop up. (see Figure 4).

The File Selector reads your current directory (or directory where FrameGrabber is located if you are using the WorkBench) the first time it is used. The File Selector keeps track of its current information between uses, so it never has to re-read a directory unless the directory has changed. Also, if you are finished using the File Selector before it has a chance to read all the entries in the currently selected directory, the File Selector will pick up where it left off reading next time you use the File Selector.

NOTE: You should never remove a disk from a drive when the drive-activity light is on! Removing a disk while it is spinning can scramble any information on the disk and possibly cause damage to your drive. It is a good idea to wait about five seconds after the light has extinguished before removing a disk, to let AmigaDOS validate the disk if it needs to. If the drive-activity light does not go out after a reasonable period of time, and the keyboard and mouse are unresponsive ("locked up"), it is possible the Amiga operating system has crashed or "hung". The safest way to reset the computer and drives is to press the CTRL/Left-Amiga/Right-Amiga combination of keys to force a warm boot.

Descriptions of the File Selector Window
Title Bar and Depth Arrangement Gadgets:

The Title Bar serves three purposes: it prompts you for action, reports the current status of the File Selector, and can be used as a drag bar for positioning the File Selector on the WorkBench screen. The text on the left of the Title Bar, inside the " < > " symbols, is a reminder and prompt to complete the currently selected FrameGrabber operation. For example, if you had selected "Delete File" from the FrameGrabber Project Menu, the File Selector Title Bar prompt would read " < DELETE FILE > ."

To the right of the prompt area, the current status of the File Selector is shown. Common status messages are "Reading...", which means that the File Selector is still reading filenames from the directory, or "Select Filename:", which informs you the File Selector has read all entries available from the current directory. The status area is also used for displaying any problems or errors encountered while reading a directory or changing paths. For instance, if you select a pathname for a directory that does not exist, the status area will read "Path not Found!." If you remove the disk or change paths to a disk drive with no disk present, the status area will read "No disk in drive!" or "Volume not available!."

File Display Area:

The File Display Area gives you information on files and sub-directories the current directory contains. You can select filenames or display subdirectories from the File Display Area by clicking inside the rectangle that surrounds the desired entry. There is room for ten files in the directory at any one time. For each entry, the following information fields are supplied. First, the date of creation (MM-DD-YY). Second, the time of creation (HH-MM-SS).

Third, the size of the file entry in bytes, or if the entry is a directory, the word "DIR". Directory entries are easy to recognize, since they are a different color than file entries. The last field is the file or directory name itself. Clicking once with the Left Mouse Button on a file entry will copy that filename into the File String Gadget. Clicking twice in quick succession on a file entry (double-clicking) will select that filename as your final choice and return you to FrameGrabber. If you click on a directory entry (i.e., entries labeled "DIR"), the File Selector will append that directory name to the current pathname, and then display any entries available from that subdirectory.

Scroll and Slide Gadgets:

If there are more entries in a directory than can display at once, the Scroll Gadgets to the right of the File Display Area can be used to move up and down the list. Clicking once on the up or down arrow gadgets with the Left Mouse Button scrolls the list up or down one entry. Holding the mouse button down for a moment on an arrow starts the auto-repeat feature, scrolling through the list. Due to the dynamic nature of the File Selector, if you try to move the knob while entries are still being read from the directory, the slide gadget may resist your attempts to position it. Using the arrow gadgets instead will result in less conflict during directory reads.

String Gadgets:

Below the File Display Area are the three string gadgets, labeled **"PATH"**, **"FILE"** and **"PATTERN"**. You click using the Left Mouse Button anywhere inside the rectangle to the right of the label to activate a string gadget. A cursor will appear inside the rectangle to indicate that the gadget is ready for you to type in information from the keyboard. When you press RETURN, the information you type is processed. The string gadgets use standard Intuition rules and shortcuts for line editing inside the gadget. **NOTE:** You must press RETURN to actually finish a string entry. If you click the mouse elsewhere before pressing RETURN, the original string will be restored unchanged. The cursor will disappear when you press RETURN, signaling that the entry is finished.

The Path String Gadget shows the pathname to the directory the File Selector is displaying in the File Display Area. Typing in a different pathname and pressing RETURN will cause the File Selector to display entries in the new directory. Pathnames may not total more than 300 characters in length.

The File String Gadget shows you the currently selected filename and allows you to type a filename into the space provided. This gadget is automatically activated and ready for typing when the File Selector is invoked by FrameGrabber. Pressing RETURN will select the filename in the File String gadget as your final choice and return you to FrameGrabber. **NOTE:** Legal filenames must be at least one character, and no more than 30 characters in length. If you attempt to enter a filename more than 30 characters in length, the screen will flash to warn no more characters may be entered. As a convenience, if you enter a filename such as "DF1:testfile", the File Selector will divide the name into a pathname and filename automatically. Thus, the new pathname would be "DF1:" and the new filename would be "testfile".

The Pattern String Gadget shows the current pattern that filenames in the File Display Area are filtered through before display. Directory names are always visible regardless of the pattern selected. Normally, the string area will contain the "*" wildcard character, which matches all filenames. You can type a new filter pattern into the string area and the File Selector will instantly update the File Display Area, showing you only filenames that match the new pattern. If you specify a pattern and none of the available filenames match the new pattern, the Title Bar will alert you with the status message "Pattern not found!".

Action Gadgets:

The three Action Gadgets below the String Gadgets allow you to select a filename and return to FrameGrabber, cancel file selection operations, or undo the last path change made.

The "Select" is used to confirm that the filename visible in the File String Gadget is the filename you want FrameGrabber to use.

The "Cancel!" allows you to exit the File Selector and abort the current FrameGrabber operation.

The "Last Dir" toggles between the last pathname used in the File Selector and the current pathname. This can be a convenient way to switch between two commonly used directories; by selecting the first pathname, then selecting the second pathname, you can use the "Last Dir" gadget to jump from one to the other.

Device Gadgets:

The six Device Gadgets allow you to quickly switch to different directories and logical devices in the AmigaDOS filing system. Clicking on these gadgets will immediately cause a path change and force the File Selector to read the new directory.

The "Parent" Gadget moves you one directory closer to the top (root) of a directory structure, i.e., the pathname is shortened by one directory name. For example, if your current pathname was "FrameGrabber:Pictures/Hires", clicking on the parent gadget would change your pathname to "DF0:Pictures". Clicking on the gadget again would change the pathname to "DF0:". Further clicks would simply re-read drive DF0:, since you are at the root directory now.

The "Root" Gadget moves you directly to the topmost directory of a directory structure, in this case, "DF0:". Below the parent and root gadgets are the four logical device gadgets. The File Selector automatically labels these four gadgets with the first four logical devices found in the AmigaDOS filing system. All Amigas currently have the "RAM:" and "DF0:" logical devices available to them. If you do not have an external disk drive or hard disk, the bottom two device gadgets will be disabled, since they are unused. Otherwise these gadgets will be labeled with the other available logical device names present on your Amiga. If you have more than four logical devices, (e.g., several disk drives, hard disk partitions, recoverable ram disks, etc.) the two small arrow gadgets to the left of the four device gadgets allow you scroll through the list of available device names. No matter how many devices you have, the File Selector will allow you to select the device you want.

NOTE: AmigaDOS allows device names to be more than three characters. If a device name on the system is more than three characters long, only the first four characters of the name will be displayed on the device gadget label; however, the File Selector uses the full device name when changing pathnames.

Sort Gadgets:

The three Sort Gadgets allow you to organize the information in the File Display Area several ways.

The "Alpha" Gadget alphabetizes the directory list, ignoring case differences. **The "Size" Gadget** sorts the entries by file size, shortest file first. **The "Date" Gadget** sorts the entries by time of creation, oldest entry first. A handy way of separating the directory names from the filenames in a directory is to first sort them using "Alpha", then using "Size." All the directory names will be at the top of the list, sorted alphabetically. These sort selections remain in effect until you reselect the gadget or choose a different sorting method.

Appendix I: Troubleshooting

Should you ever have problems with your FrameGrabber system, please check all connections and components before calling our Technical Services Department. Below are some specific symptoms and remedies.

Symptom: No picture on monitor.

Remedy: Check all connections, be sure that power is applied to FrameGrabber hardware. If you choose to leave it connected when not in use, power must be applied to the FrameGrabber hardware for it to pass the RGB signal to the monitor.

Symptom: No video signal. (video not displayed when TAB is pressed)

Remedy: Check all video source and power connections. If using a video camera, be sure the camera is active (not on standby).

Symptom: Video signal appears broken or separated.

Remedy: Check and adjust the intensity and saturation controls on the front panel of the FrameGrabber.

Symptom: B&W video signal displayed when using color camera.

Remedy: Check FORMAT setting to be sure color is selected. If B&W is selected a B&W video image will be displayed on the monitor. Also check and adjust color saturation on the front panel of the FrameGrabber.

Symptom: Picture displays, distorts, then disappears. Sometimes reappears.

Remedy: Check all connections. Verify video connections. This is a common symptom of an unstable video signal, usually the result of using a VHS tape that is a copy. The FrameGrabber needs a fairly stable signal to lock onto. Often, copy protected tapes will cause this to happen.

Symptom: Picture has evenly spaced vertical rows of dots.

Remedy: The video source is unstable. Usually the result of using VHS tape that is a copy, not an original. Copy protection on the tape may also cause this to occur.

If you have a problem with your FrameGrabber hardware or software that is not discussed above, contact our Technical Services Department at:

Progressive Peripherals & Software Inc.
Technical Services Department
464 Kalamath Street
Denver, Colorado USA 80204
Phone: (303) 825-4144 FAX: (303) 893-6938 BBS: (303) 629-6746

Appendix J: FRAMEGRABBER Keyboard Quick Reference

Project Menu
L-Amiga-L -Load IFF
L-Amiga-S -Save IFF
L-Amiga-B -Save Brush
L-Amiga-D -Delete File
L-Amiga-X -Clear Screen
L-Amiga-N -Clear All (New)
L-Amiga-Q -Quit

Grab Menu
c- Grab Color or B&W
r- Grab Red -ColorWheel Mode Only
b- Grab Blue -ColorWheel Mode Only
g- Grab Green -ColorWheel Mode Only
s- Show Image

Control Menu
TAB- Live/Amiga video toggle
f- Format Control Window
p- Palette Window
k- Color Bias Window
t- Toggle Title
y- Toggle Cursor
d- Center Screen (Overscan only)

ANIM Menu
L-Amiga-A -Begin ANIM
L-Amiga-F -Add Frame
L-Amiga-E -End ANIM
L-Amiga-P -Play ANIM
L-Amiga-T -Time Lapse
        Control Window

Info Menu
L-Amiga-M -Memory Information
L-Amiga-I -Image Information
L-Amiga-. -Coordinate Display Window
, -Same as period except x,y
coordinate origin is at (1, 1).
. -Set Coordinate Window to
(O, O) at current cursor
position.

Color Adjustments

' - Toggle AutoContrast ON/OFF
1 - Display current Color Adjustments
2 - Decrease color difference threshold
3 - Decrease red color differences
4 - Decrease green color differences
5 - Decrease blue color differences
@ - Increase color difference threshold
# - Increase red color differences
$ - Increase green color differences
% - Increase blue color differences
6 - Reset R, G, and B color differences

General

ESC - Close an open window or requester
RETURN - Close an open window or requester
SPACE - Use Workbench colors while down.