FRAME GRABBER™

Real Time Video Image Digitizer
Enhancement Software

2.0

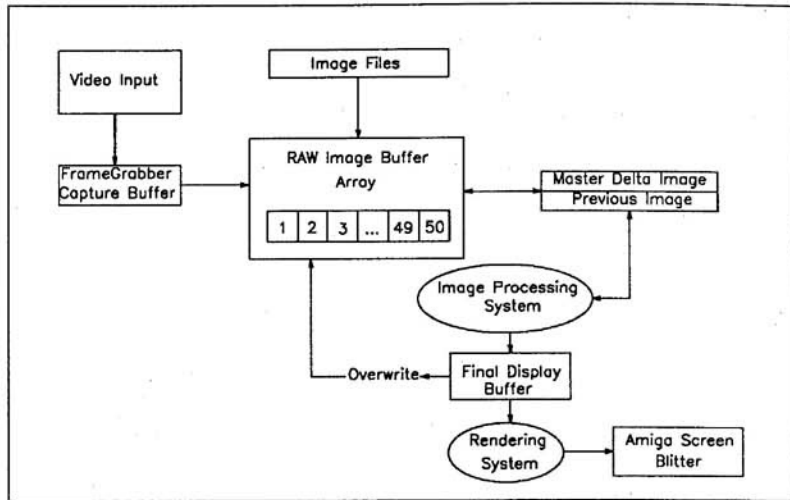# User Manual

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FrameGrabber 2.0 Data Path

Table of Contents

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The FrameGrabber 2.0 User Manual was written by Justin V. McCormick and Roy E. Brothwell.

Introduction

Congratulations on your purchase of **FG 2.0** enhancement software for the FrameGrabber real time color digitizer. **FG 2.0** gives added power to your FrameGrabber by allowing more control over the image data processing. Added features include updated "Anim" file support, histogram functions, pseudo coloring, image enlargement / reduction / stretching, mirrored images, image printing, "IFF24" file support, and much more. **FG 2.0** was written by Justin V. McCormick, the author of PIXmate image processing software, also published by Progressive Peripherals & Software.

FG 2.0 makes your FrameGrabber real time video digitizer a complete image acquisition system for your Amiga computer. Now you can capture, process, save, and print images using only one program.

Getting Started

Package Contents

FG 2.0 Software Disk
RGB color filter wheel
Warranty/Registration Card
This Manual

Please fill out the Warranty/Registration card and send it in immediately to be eligible for future updates/upgrades to your software.

System Requirements

1.   Amiga Computer with 1 Megabyte of memory
           (2 Megabytes recommended)
2.   RGB monitor with composite sync
           (Such as Commodore 1080, 2002, 1084S, 1084SD, etc.)
3.   Video Source (such as VCR or Video Camera)
4.   Centronics Printer Cable
5.   FrameGrabber Real Time Video Digitizer

Hard Disk Installation

FG 2.0 may be copied to any hard disk. No special drawers or assignments are required.

Loading the Software

FG 2.0 may be loaded from either CLI or Workbench.

Workbench:

Insert the "FG_2.0" disk into any floppy drive. Double-click on the "FG_2.0" disk icon. Next, double-click on the "FG_2.0" program icon.

CLI:

Insert the "FG_2.0" disk into any floppy drive. In any active CLI, type the following command (no "quotes"), followed by pressing [RETURN].

<div align="center">

"FG_2.0:FG_2.0"

</div>

The software does not accept any additional arguments during CLI loading. All startup options are set in the icon tooltypes and the default settings file, if any.

Software Reference

File Operations

A specialized window will appear whenever you select an operation that requires a filename. Some examples of File Operations are **Load File** and **Save File**. The PathMaster File Selector window will appear in these circumstances. PathMaster will prompt you for a file directory and name to use for the current operation. PathMaster has many advanced features, and is described in detail in Appendix A of this manual.

Rectangular Clip Operations

Rectangular operations are easy to recognize. The pointer will change to a larger set of crosshairs, and a pair of lines the full width and height of the screen will track your pointer as you move the mouse. Some examples of rectangular operations in **FG 2.0** are:

Save Rectangular Brush	(Project Menu)
Set Area to Print	(Project Menu)
Display Position and Size	(Image Menu)
Source Position and Zoom	(Image Menu)
Set Area for Sample Zone	(Color Menu)

Clip Constraint Keys

Clip Constraints can be used with all rectangular operations. They help you precisely position or size rectangles by limiting the way the pointer can move (constraining). Once you have started a rectangular operation as described in the previous section, you can then press the keys listed here to modify the default motion constraints:

[ESC]	Abort clip
[SPACE]	Abort clip (same as ESC)
[C]	Center at last clip
[E]	End the clip (same as right mouse button)
[F]	Full screen area (also ends the clip)
[G]	Gridsnap onto an 8x8 grid
[SHIFT] + [G]	Gridsnap with right edge rounded down to byte boundary
[S]	Scale y to match x
[X]	Allow X axis left/right movement
[Y]	Allow Y axis up/down movement
[Z]	Zero all constraint settings to default

Once enabled, constraints can be turned off by pressing the appropriate key again. The [Z] key (for zero) clears all the constraints. You can also press [RIGHT AMIGA] + [.] (period key), to turn on/off the Coordinate window at any time.

Menus/Sub-Menus

Once the program is loaded, pressing the right mouse button (menu button) will display several menu headings at the top of the screen. Each menu function will be described on each menu, from left-to-right, top-to-bottom.

Some menu items have sub-menus. These are identified with three dots "..." after the menu item. To select a sub-menu, the mouse pointer must be directly over the item so that it is highlighted.

Many of the menu items will cause specialized windows to appear when selected. These windows are used to group related controls into a single control system that you can move or dismiss at any time.

Some of these windows are quite complicated. This section of the manual will describe the general function of each of these windows. Detailed functions and usage of each window are described in the Appendix B of this manual.

Project Menu

Load File

Attempts to load a file using the current file type as indicated by the **File Type** menu selection described below. PathMaster will appear and prompt you for a filename. The selected file will then be loaded and displayed automatically.

Note: Iif the file type being loaded is different than the **File Type** setting, or if loading the image would force the current screen format to be changed, a requester window will appear. The requester allows you to abort or continue the loading process.

Save File

Saves the current image data as a file, using the current file type indicated by the **File Type** menu item described below. PathMaster will appear and prompt you for the directory and filename to use for the new file.

Delete File

Removes a file. **Note:** Once deleted, **FG 2.0** cannot restore the deleted file! A requester window will appear allowing you to confirm or cancel the deletion.

File Type...

The software supports nine different file formats to provide file compatibility with a variety of other software packages. The file formats supported include IFF, Brush, Palette, LUT, DV21, IFF24, RAW, RGB, and IMG8. For most applications you will want to use the IFF or IFF24 file types. An explanation of each file format is listed in Appendix E of this manual.

Brush Type...

A brush is a portion of an image that may be used within a "paint" program as a drawing tool. The software allows brushes to be defined using two methods. After selecting the brush type, and setting the **File Type** to **Brush**, select **Save File** in the Project Menu. You will then define the brush area to be saved using the following methods.

> **Rectangle** - The brush is defined with a **Rectangular Clip Operation** as described at the beginning of this section.
>
> **Freehand** - The brush is defined as any shape you draw. First move the crosshairs to a point on the edge of the brush area to be defined, and single click the left mouse button. Using the mouse, move the crosshairs around the border of the brush area to be defined. When the area has been almost completely enclosed, click on the left mouse button to complete the brush definition. You can now enclose another area by repeating this process if you wish. To finish the brush drawing mode, press the right mouse button (or press [E] on the keyboard). This will start the save operation.

After defining the brush area to be saved, PathMaster will appear to complete the file operation.

Print...

The software allow you to send the image to a printer. You can customize the printout by changing the printer settings with the Workbench Preferences tool.

Note: The FrameGrabber hardware uses the parallel port of the Amiga for communication with the Amiga. Attempting to print with the printer preferences set to "parallel" and with the FrameGrabber hardware still connected, could cause either the FrameGrabber hardware or the Amiga to "hang". Recovery is possible only by resetting the computer.

If your printer uses the Serial port of the Amiga for data communication, there will be no conflict with the FrameGrabber hardware. However, if your printer makes use of the Parallel port of the Amiga, the FrameGrabber must first be disconnected.

Many users have successfully used a RS-232 Parallel Switch Box to switch the communication path of the Amiga between the FrameGrabber and the printer, eliminating the need to disconnect and reconnect either the Frame-Grabber or printer. The success of this arrangement is dependent on several factors beyond the manufacturer's control. Switching between two electronically active devices could possibly damage one or both of the devices. Should you choose to install a switch box into your system, you do so at **YOUR OWN RISK!**

The Print commands are as follows:

> **Begin** - Starts the printing process by sending the selected image data to the printer port indicated by the Preferences printer settings.

> **Set Area** - Allows you to select any rectangular area of the screen to be sent to the printer. The area is defined using the **Rectangular Clip Operation** as described at the beginning of this section. Once you have defined the area to be printed, the **Begin** command can then be used to start the printing process.

Prefs...

> **No Workbench** - If possible, the Workbench will be closed in an attempt to free additional memory. All windows on the Workbench screen must be closed for this option to work, otherwise, the screen titlebar will inform you that the attempt failed. Selecting this option a second time will reopen the Workbench screen. Note: You may have to **Quit** the software in order to reopen the Workbench screen if you are severely low on RAM.

> **Create Icons** - When selected, a customized icon will be attached to each file created by the software.

> **Use Joystick** - When selected, allows remote control of the software through a joystick or equivalent hardware attached to the second mouse port. You can switch between live **Preview** mode and the Amiga screen by pulling the joystick down. Pressing the fire button grabs the image. When using color filters in RGB mode, you can choose whether to grab Red, Green, or Blue by moving the joystick in the left, up, or right directions while pressing the fire button:

Grab Grab Green

Grab Red Grab Blue

Preview
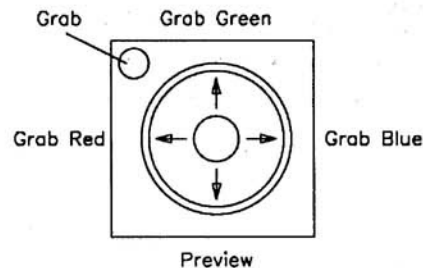
Note: Non-joystick devices connected to Mouse Port #2, such as software protection keys (dongles), "autofire" devices, etc., may cause the software to behave in an unpredictable fashion. You should disable the **Use Joystick** function if this causes difficulties.

Settings...

FG 2.0 lets you to Load or Save your current **FG 2.0** settings as a file. These files contain your current format, level settings, palette locks, window positions, clip sizes and positions, file type and directories for loading and

saving files, and more - virtually anything that you can manually change in **FG 2.0** is saved in these configuration files. The files are small enough that you can fit over 800 of them on a blank 880K disk.

These settings files are stored in the "default settings directory". The default settings directory can be changed by modifying the "FG_2.0" icon. This can be done using Info from the Workbench. See Appendix D for more information about settings files.

FG 2.0 settings files always have a filename suffix of ".fgset". If you forget to add the ".fgset" suffix when saving a settings file, the software will add it for you automatically. This means that if you saved your settings under the name "Hires", the software would create a new settings file called "Hires.fgset".

> **Load** - Uses PathMaster to select a settings file to load. PathMaster will search the default settings directory for any file with the ".fgset" suffix.

> **Save** - Uses PathMaster to save the current **FG 2.0** settings to disk using the filename you choose. The default settings directory and filename can be changed by modifying the "FG_2.0" icon. This can be done using Info from the Workbench.

Clear All

Erases the current image on the screen as well as the image buffer. Any image that has not been saved will be lost. **NOTE:** This option does NOT clear the raw data from the **FrameGrabber** internal memory.

Clear Screen

Erases the current image on the screen. Any image still in the image buffer remains untouched and can be seen using the **Show** option in the Image Menu.
Quit

Exits the program immediately. **Note:** No warning is given, and no chance is given to remain in the program after selecting Quit. We realize that you

know what you are doing, but BE CAREFUL!

Grab Menu

Preview

Switches the displayed image from the Amiga output to the live video image. The [SPACE BAR] may be used as a toggle switch between the two displays.

Grab Image

Digitizes or captures an image and transfers it to the computer. The keyboard equivalent of this command is the [C] key ("c" for "capture").

Grab Red
Grab Green
Grab Blue

These three commands may be used only when in "RGB" mode. When used with the supplied color filter wheel, these commands will capture red, green, and blue images respectively. These images are combined in memory to produce a color image. After all three images have been captured, the image may be processed and displayed by issuing the **Show** command from the Image Menu. This allows you to use a Black and White video camera with the FrameGrabber to produce a color image.

Mono/RGB

Switches the special monochrome FrameGrabber hardware to process the live video image in color or B&W. This is useful when using a color camera to grab grayscale images. The monochrome mode will cause any image displayed on the Amiga monitor to appear in shades of gray, with up to 16 possible shades displayable.

Automatic...

AutoGrab - Causes the **FG 2.0** to capture, process and display images as rapidly as possible. These captured images are not saved to disk or RAM, though the software will not stop you from doing so at any point. To turn off AutoGrab while the "ZZ" busy pointer is visible, press the [SPACE] key. The software will abort the current process as soon as possible and turn off AutoGrab.

AutoAnim - Toggles the AutoAnim mode on or off. The AutoAnim function is described in detail under the **Control** command in the **Anim** Menu.

Image Menu

Show

Processes and displays the image currently held in memory. When you make adjustments or changes to the current image, you then select **Show** to tell the software to process and render the image using the new settings.

Format

Selecting this item causes the Format Control Window to appear. This window combines the most frequently used **FG 2.0** software options. You can change screen resolution, color modes, image reductions, dither settings, and several other options from this window.

The Format Control may be called from the keyboard simply by pressing the [F] key. Many of the functions of the Format Control Window are self-explanatory. Simply click on the control boxes to select a desired option. Any control changes you make will take effect when you close the Format window. A complete explanation of each function of the window is given in Appendix B.1 of this manual.

Delta

Brings up the Delta Control window. Delta means difference, and here the word "delta" means the differences between images. **FG 2.0** is capable of

displaying the differences between captured images. This is a powerful technique for locating defects, detecting motion, and eliminating unchanging background image clutter.

A complete explanation of the function and usage of the Delta image system can be found in Appendix B.2 of this manual.

Display...
Source...

FG 2.0 is capable of enlarging and reducing the size of the displayed image to any arbitrary scale. Enlargement and reductions are a function of both the **Display** menu item and the **Source** menu item. These two functions work together to set the exact area, size, and position for the final display.

For example, if you leave the Source Size at its default (full screen), and reduce the Display Size to 1/4 screen, the resulting image will be a reduction of the original to 1/4 screen.

On the other hand, if the Display Size is at full screen, and the Source Size is reduced to 1/4 screen, the resulting image will be a 4x enlargement of the source area to fill the screen. Any combination of source and display areas may be used to produce changes in horizontal and vertical aspect ratio (stretching).

The **Display...** and **Source...** menus have identical sub-menu items to set the placement and size of the two areas:

Position - The current display or source position over the image will be outlined. Move the crosshairs over the position outline, then click and release the left mouse button. Using the mouse, drag the area outline to the desired screen position and click the left mouse button to set the new position. Note that if the size of the set area is full screen, no position movement is possible.

Size - The current display or source area size will be outlined. Move the crosshairs to the upper left corner of the area to be defined, and single click the left mouse button. Next move the crosshairs to the lower right corner of the area to be defined and single click the left mouse button to set the new size and position.

You can use any of the clip constraint features described in the **Rectangular Clip Operation** section to help you set the Position and Size accurately.

Scan Type...

When rendering an image to the screen, the **Scan Type** setting determines which method the software uses to render each line of pixels.

> **Visible** - The software will visually highlight each scan line being drawn, making it easier to see how many scan lines are left to be rendered.

> **Hidden** - The software will render each scan line with as little visual interference as possible.

Titlebar

Selecting this option either hides or shows the screen titlebar, depending on whether the titlebar is currently visible or not. You may want to turn the titlebar off to see the top of the image that is hidden by the titlebar, or if you find the software progress indicators annoying.

Pointer

Makes the mouse pointer invisible or visible again. This can be useful when you are making slides or videotaping directly from the Amiga screen and do not want the pointer visible in your final picture.

Jump Center

This option controls the automatic View centering. Normally, the software will automatically center overscanned displays so that a borderless image is shown on a standard monitor. You can manually adjust this centering by using the four cursor arrow keys to move the View in any direction.

This feature also allows you to examine the far right and bottom edges of an overscanned image. When you press the Menu button, the View jumps back to your original Preferences View position during the menu selection process. You can jump between the offset View and the default position by

selecting **Jump Center** again.

Note that the software periodically checks which Amiga screen is currently the top screen. If another screen is placed on top of the **FG 2.0** screen, the View will jump back to normal until the **FG 2.0** screen is the frontmost screen again. Also, this is an interim overscan support technique that may be changed when version 1.4 of the Amiga Operating System is released. If it interferes with other programs you should turn the centering feature off.

Overwrite

The software uses two image buffers to store and process images captured by the FrameGrabber hardware. When you **Show** an image, the software analyzes the raw data in the first buffer, then the raw data is transformed mathematically into the second buffer. The final image you see on the screen is created from this processed display buffer.

You can adjust levels, change options, and then **Show** an image again, without having to load or capture the image again. Since the original image data in the raw buffer is not modified, the software is always working from the same starting image.

However, for certain special effects you may *want* the first buffer to be an exact copy of the second buffer. **Overwrite** copies the current contents of the display buffer back into the raw buffer. Thus, any changes you make to the image now will be "on top of" any changes you have already made to the image.

For example, you might want to reduce an image to 1/16th of its original size. You could do this in a single step, by selecting the **Display... Size** option and creating a rectangle 1/16th the area of the screen. Or, you could do it in two steps, using the **Overwrite** feature.

First, shrink the image to 1/4th size, using either the **Display...Size** option or the 1/4th size Display option in the **Format** window. After using **Show** to display and reduce the image to 1/4th size, select **Overwrite** to copy this reduced image back to the raw data buffer. Now simply use **Show** again. Since you still have the size reduction set to 1/4th screen, the reduced image will reduced by the same factor again, resulting in a 1/16th sized image.

Of course, you would use the simpler, one-step operation in this situation. Normally, **Overwrite** is used for combining operations to create special effects.

Color Menu
Palette

Displays the Palette control window. This window lets you change the color palette of the current image. See Appendix B.3 for more information on the Palette control.

Palette Lock

Brings up the Palette Lock window. This window lets you select which color registers the software palette making process will use for the final Amiga display. See Appendix B.4 for more information on using the Palette Lock.

Color Bias

The Color Bias Window will appear. This window allows you to instantly alter brightness, contrast, and saturation in an image, as well as change red, green, and blue levels.

Like the Palette control, the Color Bias uses slide controls to manipulate the colors used by the image. However, while the Palette gives you control over individual color values, the Color Bias controls effect all the colors in the palette simultaneously. Adjustments are shown in terms of percentages to the right of the slide controls. See Appendix B.5 for more information on the Color Bias window.

Histogram

After analyzing the image, the Histogram window will appear. This window displays the intensity levels or RGB intensities used by the current image. The Histogram control window is also used to manually adjust image contrast, and provides a set of image processing tools that can be applied to any image. The Histogram window is described in detail in Appendix B.6.

Levels

Displays the Level control window. This window is similar to the Color Bias window, but the functions work on different information. The Color Bias controls only makes changes based on the current Amiga color palette. The Level controls allow subtle color and intensity changes to the original captured image data. This technique has a greater range of effect, as well as finer control than possible by simply changing the palette. However, it takes additional time to display the changes, since you must use **Show** to see any changes made to the levels.

Depending on your current **Format** color settings, the Level controls are modified to reflect whether **Mono** or **RGB** mode is in effect.

When used in **Mono** or **Pseudo** color modes, the Level controls allow adjustment of:

> CON - CONtrast level of the image
> BRT - BRighTness or intensity level of the image

When used in **RGB** color mode, six additional controls are available:

> DLT - DeLTa, palette color delta level
> HUE - Adjusts color hue
> SAT - Adjusts color saturation
> RED - Adjusts red levels
> GRN - Adjusts green levels
> BLU - Adjusts blue levels

The level settings are shown in terms of percentage increase or decrease. Additional controls for automatic gain control (AGC) and automatic white balance (AWB) appear at the bottom of the window. The Level Control window is explained in detail in appendix B.7 of this manual.

Pseudo Color

Displays the Pseudo Color Control window, allowing special color assignments for grayscale images. This menu item is not available unless Pseudo Color mode has been activated in the Format Control window. Once Pseudo

Color is activated, this window is used to assign any of the 32 available Amiga display colors to any of 256 intensities.

Note: Although the Amiga cannot display 256 intensities, **FG 2.0** can process the data stored in external files.

Pseudo Color is used to highlight a particular gray shade or group of shades in an image using any of 4096 colors in the Amiga palette. This option may also be used to create B&W clip art for desktop publishing programs. The window gives you complete control as to the colorization of the grayscale image. Remember that even though only 2 to 32 colors are displayed, the data for a full 256 grayscale image can still be processed.

Full details on the operation of the Pseudo Color Control is given in Appendix B.8 of this manual.

Sample Zone...

The Sample Zone determines the area of the image to be sampled by the histogram. This same area is used by the Automatic Contrast system to optimize each image (See **Contrast...Auto**).

> **Set Area** - The Sample Zone is defined as a rectangle by moving the crosshairs to the upper left corner of the area to be defined, and single clicking the left mouse button. Next move the crosshairs to the lower right corner of the area to be defined and single click.

> **Full/Set** - Toggles the Sample Zone between the set area as defined above, and the full screen area.

Contrast...

Live contrast changes are made by manipulating the two controls on the front of the **Frame**Grabber hardware before capturing an image. However, special contrast control is provided by the software:

> **OFF** - Turns off the Automatic Contrast system. The displayed image will be as close to the raw image data as possible using the given Format options.

> **Auto** - Each time an image is captured, the current **Sample Zone** area will be analyzed by the software. Based on this sample area, the Automatic Contrast system will adjust the raw image histogram to create the "best" display image, given the other settings in effect. This setting is the default mode for capturing images.

> **Lock** - Uses the current histogram contrast settings for all new images captured. This may be useful for capturing images to be compared, or when creating animations. **Lock** will prevent any changes by the Automatic Contrast system, insuring that your images have the same contrast settings. This mode should also be used when you want to display image differences using the **Delta** comparison techniques.

Anim Menu

Control

The Animation Control window lets you examine and set several variables controlling the creation of animations. The Animation Control window is explained in detail in Appendix B.9 of this manual.

Begin Anim

Begins the animation process by opening a file on disk or in RAM. PathMaster will request the directory and file name for the animation file to be created. The software then waits for you to capture and add the frames using the **Add Frame** command. If **AutoAnim** 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 **Grab** or **Show** a new image before selecting this item, otherwise the same image will be saved to the animation file twice. This allows you to capture and modify images before they are added to the animation.

This menu item is only available once an animation has been started with **Begin Anim** as described above.

End Anim

Ends the animation in progress and closes the animation file on disk. Your new animation may now be loaded into memory and played using **Playback** or any standard ANIM software.

Playback

Plays a standard animation file. Uses PathMaster to request the file name of the animation file to be loaded into memory and played. See Appendix C for details on additional Playback controls and features.

Info Menu

Memory

Displays the total amount of CHIP RAM, FAST RAM and the total amount of memory available. Also displays the largest single contiguous chunk of each type of RAM.

Status

Displays the current status of several important system control variables for quick reference:

File Type:	Current File Type selected in the Project Menu
AutoGrab:	On / Off status of the AutoGrab option
AutoAnim:	On / Off status of the AutoAnim option
Palette:	Free/Locked status of the Palette Lock
OverSample:	On / Off status, number of buffers used
Contrast:	Automatic Contrast system Off /Auto/Locked status
HistoArea:	Upper left to lower right pixel coordinates of the current Sample Zone
Display:	Upper left to lower right pixel coordinates of the current Display Area
Source:	Upper left to lower right pixel coordinates of the current Source Area
X/Y Zoom:	Aspect ratio of the Display size to the Source size, indicating the current enlargement or reduction factor

Display

Displays the current Display settings including screen resolution, dither technique, number of display colors possible in the current color mode, and the size of current image in memory.

Image

Displays information about the current image data. This differs from the **Display** data. Remember that an image in memory may contain as many as 16.7 million colors, but the displayed image may only contain 4096 colors (due to Amiga video output limitations).

Information includes number of actual colors used in the image, total size of the raw image in memory, and number of buffers in use.

Coords

Toggles the mouse pointer coordinate display window at the top of the screen.

Credits

Displays author, publisher and copyright message. The titlebar contains the current version and release date of the software.

Hints and Tips

Using the Supplied Color Wheel

Although the FrameGrabber was designed to be used with a color camera to capture in real time, it is possible to use FrameGrabber with a black and white video camera to capture static color images. Three separate 4 bit images are captured, each through one of three filters (Red, Green, and Blue). These three 4 bit images are combined in memory to create one 12 bit, 4096 color image.

Note: There is no benefit from using a B&W camera over a color camera to produce color images. There are reasons for using FrameGrabber with a B&W camera and color filter wheel over using other "slow scan" type digitizers. On screen preview is available, and the three separate images are captured much more quickly and easily.

The **Grab Red, Grab Green,** and **Grab Blue** functions are used to capture the three images, each grabbed through the appropriate filter color. The images are combined using the **Show** function.

The color wheel includes colors best used with fluorescent lighting. Incandescent (tungsten) lights contain a greater amount of yellow light and will introduce a "yellowish" tint to your pictures.

If you choose, and your camera style allows, the color filter wheel may be attached to a mounting bracket (not supplied), so that each filter color can be rotated into place. The filter wheel position with no filter (clear) is used during image preview.

The gelatin color filters tend to attract dust and lint, so you may want to gently brush the filters clean before each use.

Getting Best Color Results

Problem: In RGB mode, the palette is too drab or dull, lack of vivid colors, excessive color fringing in HAM mode.

Solution: Select **Levels** under the Color Menu (or press [I]) and the Levels window will appear. The third slide control from the top is labeled **DLT,** short for DeLTa, short for Color Delta. This slide control lets you choose what kind of palette the software creates for your picture. This diagram gives you a quick idea of how the control effects your palette:

$$-100\% \leftarrow \text{—Smoother} \leftarrow \text{——} 0\% \text{————} \rightarrow \text{Wilder} \text{——} \rightarrow 100\%$$
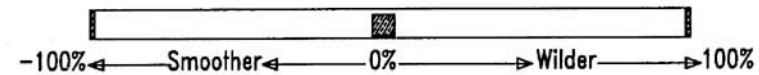
The 0% DLT level is the default, since it works well for most color scenes when shown in 32 colors. Vivid, colorful scenes may look better with a higher DLT, since this will cause the software to create a more diverse, colorful palette. However, if the DLT level is set too high, "color banding" can appear when displaying shades of the same color. A lower DLT level will create more shades, which can improve the appearance of a smoothly shaded areas, but at the expense of other large color changes in the image.

The most troublesome pictures contain both vivid colors and many shades of color. Try using a higher DLT level in combination with the Dither controls. The higher DLT level will give you more vivid colors, and the Dither control will help fill the "in between" shades.

Experimentation and experience are your best guidelines for setting the DLT level, since each image is unique. The following table gives recommended DLT levels for the various Amiga color modes:

| DISPLAY COLORS	SUGGESTED DLT LEVEL
HAM	4% to 6%
EHB	0% to 2%
32	0% to 2%
16	4% to 6%
8	6% to 12%
4	25% to 50%
2	50% to 100%

Getting Best Image Contrast

Problem: Lack of contrast and/or washed out colors in important areas of the image.

Solution: The software provides several tools for selectively improving image contrast. The Automatic Contrast system should be enabled (see **Contrast...Auto** under the Color menu) to allow the software to process the image.

There are two primary techniques used to improve image contrast:

> 1) Reduce the size of the **Sample Zone** area to cover only the portion of the image you want to enhance. The software will automatically adjust the exposure based on the new area. You could also use the **AutoZone** option on the Format Control window to automatically reduce the Sample Zone to the middle of the screen.

> 2) Stretch the original histogram of the image to cover more intensities, resulting in more contrast. This can be accomplished by selecting the **Weighted** option in the Format Control window, by increasing the **CON** level in the Level Control window, or by manually adjusting the **Min** and **Max** range lines in the Histogram window.

Appendix A - The PathMaster File Selector
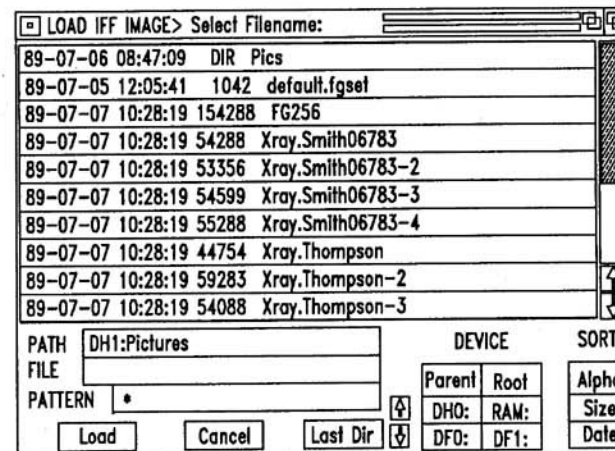
FG 2.0 uses the PathMaster File Selector to select directories and file names. When **FG 2.0** requires a filename to complete an operation, such as loading, saving, or deleting a file, the PathMaster window will pop up.

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

Warning: 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 five seconds after the light has gone out before removing a disk; this will allow AmigaDOS time to validate the disk. 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 needs to be reset. The safest way to reset the computer is to press the [CTRL] + [LEFT AMIGA] + [RIGHT AMIGA] combination of keys to force a warm boot.

Description of the File Selector Window

The PathMaster titlebar serves three purposes:

      1) The titlebar is a reminder of the current file action to perform.
      2) It reports the current status of PathMaster.
      3) It can be used like a regular drag bar for positioning the
         PathMaster window on the screen.

The text on the left of the TitleBar, left of the ">" symbol, is a reminder of current operation. For example, if you had selected **Load** from the Project Menu, the PathMaster Title Bar prompt would read:

      Load IFF Image> Select Filename:

To the right of the prompt area, the current PathMaster status is shown. Common status messages are "Reading...", which means that PathMaster is still reading the filenames from the directory, or "Select Filename:", which informs you PathMaster has read all the entries available from the current directory.

The titlebar 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 sub-directories from the File Display Area by clicking inside the rectangle that surrounds the desired entry. There is room for ten files in the display area at any one time. For each entry, the following information fields are supplied:

      DATESTAMP TIMESTAMP FILESIZE NAME

First, the date of creation (YY-MM-DD). 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". The last field is the file or directory name itself. Clicking once with the Left Mouse Button on a file entry will copy that file name into the File String Gadget. Double clicking on a file entry will select that filename as your choice, complete the operation, and return you to the application. If you click on a directory entry (i.e., entries labeled "DIR"), PathMaster will append that directory name to the current path name, and then display any entries available from that sub-directory.

Scroll and Slide Gadgets:

If there are more entries in a directory than can be displayed at once, the Scroll Gadgets to the right of the File Display Area can be used to move the list up and down. 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 PathMaster, if you try to move the Slide Gadget while entries are still being read from the directory, it may resist your attempt 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". Click anywhere inside the rectangle to the right of the label to activate the 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 typed 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 path name to the directory PathMaster is displaying in the File Display Area. Typing in a different path name and pressing [RETURN] will cause PathMaster to display entries in the new

directory. Path names 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 PathMaster is invoked by **FG 2.0**. Pressing [RETURN] will select the filename in the string gadget as your final choice, complete the operation, and return you to **FG 2.0**.

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 long, the screen will flash to warn that no more characters may be entered. As a convenience, if you enter a filename such as "DF1:testfile", PathMaster will divide the name into a path name and filename automatically. Thus, the new path name 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 "*" wild card character, which matches all filenames. The string area may contain a pattern other than the "*" character, depending on the type of file operation to be performed. You can type a new filter pattern into the string area and PathMaster will instantly update the File Display Area, showing you only filenames that match the new pattern.

Note: If you type in a new pattern and none of the available filenames match the new pattern, the titlebar will alert you with the status message "Nothing matched PATTERN!".

Action Gadgets:

The three Action Gadgets below the String Gadgets allow you to select a filename and return to **FG 2.0**, cancel the selection operations or undo the last path change made.

The **Select** gadget is used to confirm that the filename visible in the File String Gadget is the filename you want **FG 2.0** to use. This gadget may, depending on the operation selected, contain the word, "Delete", or "Save".

The **Cancel!** gadget allows you to exit PathMaster and abort the current file operation.

The **Last Dir** gadget toggles between the last path name used in PathMaster and the current path name. This can be a convenient way to switch between two commonly used directories; by selecting the first path name, then selecting the second path name, 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 PathMaster to read the new directory.

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

The **Root** gadget moves you to the topmost directory of the current directory system, in this case, DF0:.

Below the parent and root gadgets are the four **logical device** gadgets. PathMaster 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 to scroll through the list of available device names. No matter how many devices you have, PathMaster 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, PathMaster uses the full device name when changing path names.

Sort Gadgets:

The three Sort Gadgets allow you to sort the entries in the File Display Area by different fields:

The Alpha Gadget alphabetizes the entries, ignoring case differences.

The Size Gadget sorts the entries by file size, smallest file first.

The Date Gadget sorts the entries by time of creation, oldest first.

Note: Directories, although effected by the sort changes, will always be displayed at the top of the list.

These sort selections remain in effect until you re-select the current sort option highlighted, or select a different sorting method.

Appendix B - Windows

B.1 The Format Control Window

The Format Control Window combines the most often changed **FG 2.0** software options into a single window. The window contains controls for selecting screen resolutions, changing the color modes, setting automatic image reductions, setting and adjusting dither effects, and a column of eight special options switches.

To open the window, select the Format option under the **Image** menu, or press the [F] key on the keyboard. The Format Control window will appear, with the current settings highlighted. To close the window, click on the **CLOSEWINDOW** gadget box in the upper left of the window, or press either of the keyboard equivalents, [ESC] and [RETURN]. The window will disappear, and any changes you made to the format controls will be in effect next time you grab or show an image.

The controls are grouped by function under the following headings:

Screen - Determines the Amiga screen resolution to be used. To change screen resolutions, simply click on the box containing the new resolution. The FrameGrabber hardware supports the following screen resolutions:

320x200 (LORES+NOLACE)
384x240 (LORES+NOLACE+OVERSCAN)
320x400 (LORES+LACE)
384x480 (LORES+LACE+OVERSCAN)

Note: Though **FG 2.0** will load and display images up to the limits of the Amiga screen resolution (approximately 768x600), the FrameGrabber hardware digitizes with a maximum resolution of 640x400.

Overscan Screen Support:

Normally, the software uses your View Offset from the Workbench Preferences to center images on your monitor. This View Offset can be adjusted by running the Preferences program found on your Workbench disk and following the instructions for using Preferences. However, you can also manually move the View while in **FG 2.0** at any time without changing Preferences.

To shift the View, hold down either shift key, then press one of the four cursor arrow keys to move the View in a particular direction. The entire image will shift in the direction specified until you release the cursor key. This feature allows you to work on the far right and bottom edges of an overscanned image. When you press the Menu button (the right mouse button), the View will automatically jump back to your normal Preferences View settings. You can switch between the your current offset View and the Preferences position by selecting "Jump Center" (keyboard [J]) from the Image menu.

In order to reduce conflicts with other Amiga screens, **FG 2.0** periodically checks to see if the **FG 2.0** screen is the topmost screen. If another screen is placed on top of the **FG 2.0** screen, the View will be shifted back to normal until the **FG 2.0** screen is returned to the top of all other screens.

This is an interim overscan support technique that may change when version 1.4 of the Amiga Operating System is available. If **FG 2.0** interferes with other programs you can turn the centering feature off by selecting "Jump Center" (keyboard [J]) once.

Colors - Selects the color mode and sets the number of colors or grayscales to be used when displaying the captured images. The current settings will be highlighted. Clicking on the boxes will select how many colors or grayscales to use when producing the Amiga display.

Note: Not all combinations of color modes are possible. The current Amiga hardware can display 16 shades of gray or 4096 colors from a palette of 4096 colors. **FG 2.0** has the ability to load and analyze images using 21-bit data (2.09 million colors), or 24-bit data (16.7 million colors) and create images using the color settings selected.

There are three different color modes possible: Pseudo, Mono, and RGB. The current color mode determines whether the software is to produce color or grayscaled images, and how to display gray level information.

Pseudo - Pseudo Color is a special mode that allows you to assign any of up to 32 colors to any of the 16 gray levels in the captured image. The process is similar to "colorizing" a black and white picture. The Pseudo Color system provides finer control over the color assignments than possible using the Palette Window.

This mode is commonly used to automatically highlight a single level or range of gray levels. Pseudo Color may be also be used for special effects, highlighting details, or graphic intensity analysis of images.

When the **Pseudo** label is highlighted in the Format Control, the "Pseudo Color" option under the **Color** menu may be used to set the individual color assignments. Pseudo Color mode must be selected in order to access the Pseudo Color Window.

Mono - Monochrome mode is the normal grayscale mode used when capturing black and white images. The number of grayscales available range from two to sixteen.

RGB - The Red, Green, Blue, color mode allows three separate captured images to be combined to create a 12 bit, 4096 color image. The three images must be captured using Grab Red, Grab Green, Grab Blue menu items from the **Grab** menu. In this mode, 24-bit, 16.7 million color image files may be loaded and processed.

The number of colors available in the **RGB** mode ranges from 2 to 32 colors, plus two special modes: EHB (Extra Half Bright) which produces 64 colors, and HAM (Hold and Modify) which can produce 4096 colors.

Size - Determines which of three preset sizes the captured image will be displayed. The three graphic representations indicate Full Screen, Quarter Screen, or Sixteenth Screen sizes.

Display - Determines which of three preset display patterns captured images will be rendered on the screen. The Size and Display controls are closely linked; clicking on one may automatically force the other into a compatible setting. The Display options let you create montages of your images without having to manually reposition the output. Each time a new image is captured, the picture will be re-sized according to the current Size setting, and then rendered in a section of the screen. Successive images captured will fill in the screen in a left-to-right, top-to-bottom order. The three graphic representations, from left to right, indicate:

> **One Image Per Screen** - which is compatible with all three preset sizes. The image, whatever size has been selected, will be rendered starting from the upper left hand corner of the screen.

> **Four Images Per Screen** - Compatible with Quarter and Sixteenth screen sizes only. If current screen size is Full Screen, the preset size will be automatically changed to Quarter Screen size. Sixteenth screen size images will be displayed at the upper left hand corner of each quarter screen display area.

> **Sixteen Images Per Screen** - Compatible only with the Sixteenth Screen size image. If the current screen size is other than Sixteenth Screen size, the preset size will be automatically changed to Sixteenth Screen size.

Note: The screen display position of the next image is displayed to the left, in the title bar. For example, if "sixteen images per screen" is selected, and the next position to be filled is number "4", the titlebar will display "*x*/4" (*x* being the input number). Pressing the left [<-] or right [->] cursor keys while no other requester windows are active, will decrement/increment the display position number.

Dither - Determines which of three Dither Modes will be used to display the captured image. The three Dither Modes are represented graphically. They are from left to right:

> **No Dither** - Turns dithering off. The image will be displayed without any attempt to smooth differences between shading. This is the fastest display mode, but also produces the poorest results, especially in 16 and 32 color modes.

> **Normal Dither** - This is a modified Floyd-Steinburg error distribution dithering technique that produces shades of color by mixing other colors together. It adds a mild "salt-and-pepper" appearance to images, which can be adjusted by setting the **Level** control below the Dither options. When in HAM mode, a random error distribution technique is used instead of Floyd-Steinburg, for better results.

> **Patterned Dither** - This is a variable Ordered dither using a sixteen intensity matrix. It produces images that look a bit like printed linen or a newspaper wire photo. As with the Normal Dither, you can adjust the amount of patterning by changing the **Level** setting.

Setting the Dither Level:

> Below the three Dither Mode selectors, a box labeled **Level** will appear when either Normal or Patterned dither is selected. You can adjust the level setting by clicking in the box and editing the number. Level settings can range from 0 to 255, with zero being no dither and 255 is maximum dither. The default values are 200 for Normal Dither, and 7 for Patterned Dither, but since every image is unique, you are encouraged to experiment with these values to get the best results.

Options - This is a column of eight option selections on the right of the Format Control window. Each selection works like a lighted push button switch; highlighted text when activated, and plain text when disabled. These options may be selected at any time, and can be used in any combination for special effects.

Border -

When highlighted, this option creates a simple white border surrounding each image frame when rendered. This feature helps separate images when using the smaller Screen Sizes and multiple Images Per Screen modes (See **Size** and **Display** in the previous sections).

DateStamp -

Adds the time and date to each captured frame. The time and date are the same as returned by the AmigaDOS DATE command, and may be changed using the DATE command or though Preferences. The information appears in the lower right-hand corner of each image frame in white letters, and the size of the text font is automatically reduced to fit inside small frames. This option can be used to authenticate images, provide timing marks, or for image database record management.

Mirror -

When enabled, the image will be displayed as a mirror image of the original, causing everything to be reversed from left to right. Only the display data is mirrored, leaving the raw image data unaffected. This allows you to mirror any rectangular section of an image when used in combination with the *CropDisp* option. The mirror feature is useful for producing images in silkscreening or printing applications, since the image is normally reversed again by the printing process.

OverSamp -

Short for OverSample, this option allows you to make up to 50 digitizations of static images, which will be combined into a final high-quality composite image. This technique can greatly reduce the amount of camera and digitization noise, resulting in exceptionally clean images.

When you click on the *OverSamp* box, a small window will appear prompting you for the number of buffers to allocate for oversampling. The default is 10 buffers, but you can change this to as few as 2 buffers or as many as 50 buffers by editing the number shown. Pressing [RETURN] or closing the window will accept the number of buffers shown and enable OverSample mode.

You may not have sufficient RAM available on your Amiga to allocate as many buffers as requested. When you close the Format Control window, the software will attempt to allocate as many buffers as you specified. If there is insufficient memory, an information window will appear explaining the situation. You can try again with a smaller screen size if you are unable to allocate enough buffers. Note that using 320x400 12-bit images with 50x oversampling, the software will require over 12 megabytes of RAM for oversample buffers!

Once OverSample mode is engaged, the software will digitize as many samples as specified when you give the **Grab** command. Each sample is put into a separate buffer. The screen titlebar will show a progress report of which sample is being digitized. When all the samples are in RAM, the software averages all the images together into the final raw image buffer. This final image is then manipulated and displayed according to your other software settings. By using 10x oversampling (10 buffers), you can dramatically reduce the "grainy" look of copy stand images. This mode could also be used for creating "strobe" effects or for motion analysis by digitizing moving objects.

MultiExp -

Short for Multiple Exposure, this mode allows you to create double-exposed images. Each image you **Grab** is averaged with the previous image and displayed. This feature can be used for special effects, for image comparison, or for 2x oversampling of static images. The *MultiExp* mode requires less RAM than using *OverSamp* with two buffers, but produces the same result.

Weighted -

This option effects the way the automatic contrast system responds to very bright or very dark images. The **Contrast...Auto** option under the Color menu must be selected for this feature to take effect.

Normally, the AutoContrast system looks for the darkest and brightest features in an image, then *stretches* the contrast between these two values to the full possible contrast range. This normally works very well, however, some images may be mostly dark with only a few spots of extreme brightness. This can confuse the simple

"Low/High" contrast system since the image is already using full contrast. When *Weighted* is engaged, the AutoContrast system "weighs" the number of dark and bright pixels. This weighted population count is used to decide what the predominate brightness of the entire image is. The contrast is then stretched to improve the majority of the image, though some of the bright, low population details will be shifted into pure white. This mode is especially useful when working with poor lighting conditions.
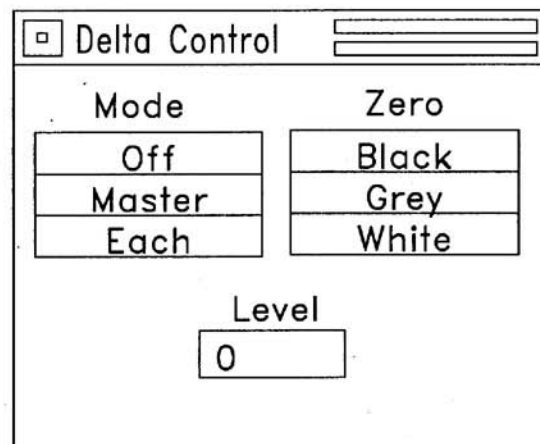
AutoZone -

This option effects the size of the **Sample Zone** Area used by the AutoContrast system. When engaged, *AutoZone* changes the sample zone to be 15% smaller than full frame size. This improves the quality of pictures by concentrating the image analysis on the image center where normally the most important details are found. This occurs at the expense of details near the borders however, since they are not included by the image analysis.

CropDisp -

Short for Crop Display, this feature locks the **Display Size** and **Source Size** settings together so that they are always the same size areas. Changing the size of one will cause the other to be sized to the same area, insuring that the Source image will remain the same scale as the final Display area.

This feature allows you to create borders of any size around your images without shrinking them. Areas in the border will not be effected by new images. Another use is to selectively process or overlay areas of an existing image. For instance, you could digitize a person full screen as your first image. Then, with *CropDisp* engaged, you could set the **Display Size** to frame the person's face. Now you could overlay a different face for this body by digitizing a different person, or use any of the **Histogram** image processing features to enhance this area.

B.2 The Delta Control Window

```
┌─────────────────────────────────────────┐
│ □  Delta Control      ═══════════        │
│                       ═══════════        │
│     Mode              Zero               │
│   ┌──────────┐      ┌──────────┐         │
│   │   Off    │      │  Black   │         │
│   ├──────────┤      ├──────────┤         │
│   │  Master  │      │   Grey   │         │
│   ├──────────┤      ├──────────┤         │
│   │   Each   │      │  White   │         │
│   └──────────┘      └──────────┘         │
│                                          │
│           Level                          │
│         ┌──────────┐                     │
│         │    0     │                     │
│         └──────────┘                     │
│                                          │
└─────────────────────────────────────────┘
```

Selecting Delta under the Image menu, or pressing [D] on the keyboard causes the Delta Control window to appear. There are three controls governing the various aspects of the delta comparison mode:

Mode - Turns the comparison system on/off and selects the delta type.

   Off - Defeats Delta Mode.

   Master - Compares each image captured with a single original image held in the delta buffer.

   Each - Compares each image captured with the previously captured image. After the comparison, the new image replaces the old in the delta buffer.

Zero - Determines how the differences will be displayed on the screen.

   Black - Any pixels that have not changed will be displayed as black. Any changes will be displayed as white.

   Gray - Any pixels that have not changed will be displayed as gray. Any pixels that are brighter than the master will be displayed as white. Any pixels that are darker than the master will be displayed
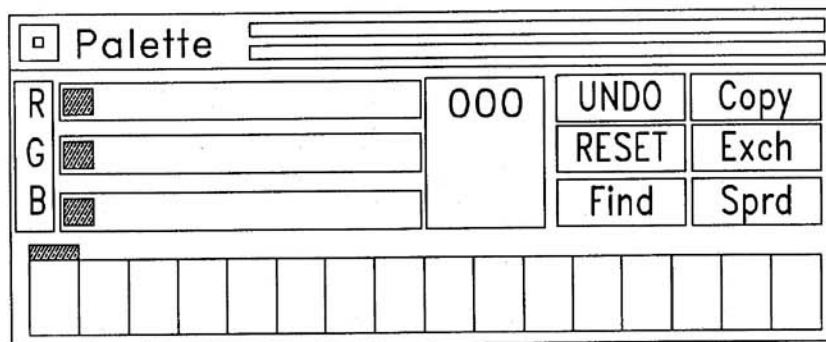
as black. This delta mode produces the most natural looking images.

White - Any pixels that have not changed will be displayed as white. Any changes will be displayed as black.

Level - Delta threshold control, sets the lower limit for visible differences.

You can enter a number from 0 to 255 in the Level box. Intensity differences below the threshold level will be ignored. A higher threshold, will display only major differences. This setting also allows you to eliminate noise or random specks that appear in the displayed image.

B.3 The Palette Window

```
┌─────────────────────────────────────────────┐
│ ┌─┐                                          │
│ │□│ Palette  ═══════════════════════════     │
│ └─┘                                          │
│  ┌──┬──────────────┐ ┌─────┐ ┌─────┬─────┐   │
│  │R │▓▓▓           │ │ 000 │ │UNDO │Copy │   │
│  ├──┼──────────────┤ │     │ ├─────┼─────┤   │
│  │G │▓▓▓           │ │     │ │RESET│Exch │   │
│  ├──┼──────────────┤ │     │ ├─────┼─────┤   │
│  │B │▓▓▓           │ └─────┘ │Find │Sprd │   │
│  └──┴──────────────┘         └─────┴─────┘   │
│  ┌──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┐ │
│  │▓▓│  │  │  │  │  │  │  │  │  │  │  │  │  │ │
│  └──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┘ │
└─────────────────────────────────────────────┘
```

This next section contains a great deal of information. To better understand the material, have FG 2.0 loaded and experiment with the Palette Window as you read through the text.

To display the current palette, you can either press the [P] key, or use the mouse to select Palette from the Color menu using these steps:

    A) Press and hold down the right mouse button
    B) Move the crosshairs to the Color menu header
    C) Move the crosshairs down until the word Palette is highlighted, then release the mouse button

When you activate the palette window, a rectangle will pop up with the

palette information. Along the top of the window is the *titlebar* with the word "Palette" displayed. Move the crosshairs on top of the drag bar, then press and hold the left mouse button. Now move the palette window around the screen and release the mouse button. As you can see, the palette can be moved so that you can see any part of the screen.

Along the bottom of the palette window is a strip of sixteen boxes representing *color registers*. These show the number of colors in the current palette, and can be selected by clicking on the color register to be changed. *Click* on one of the registers. Notice that a small white box appears above the register. This indicates which register is currently selected. Also notice that the color and the RGB value of the selected register appear inside the *current color box* located in the center of the window.

To the left of the current color box are the three control sliders. Normally, these sliders work in RGB mode to control the value or amount of each of the three colors: Red, Green, and Blue. RGB mode is indicated by the RGB box to the left of the sliders. *Click on, and move* any one of the three sliders to the right or left. Notice how the color in the current color box changes hue. The RGB value for that slider also changes. Experiment with these sliders until you are satisfied that you understand their operation.

The control sliders can also be used in HSV (Hue, Saturation, Value) mode. Move the crosshairs on top of the RGB box to the left of the control sliders, and click the left button. HSV is now displayed instead of RGB. Now the three control sliders will control Hue (color), Saturation (amount of color), and Value (illumination or brightness). Finding the exact color wanted is often easier in HSV mode than in RGB mode. Experiment with HSV and RGB mode until you understand the difference between them.

On the right side of the palette window are six buttons. The buttons perform the following operations:

UNDO

Clicking on the UNDO button will cancel the most recent change made to the palette. Clicking UNDO again will restore the last change.

RESET

Clicking on the RESET button will undo all changes made to the palette since it was activated. If the palette had been changed earlier, it will not effect those previous changes.

Find

The Find button will locate the selected color register and flash that color on the image. While the Find function is active, you may select other colors at any time by clicking on the image the color you want to Find. To end the Find function and return to the Palette window, press the right mouse button. Experiment with this feature until you are satisfied that you understand its operation.

Copy

The Copy button will duplicate the value or color of the selected register into another register. To use this function, first select a value to be copied by clicking on the color register box that holds that value to be copied (the source register). Next click on the Copy button, and click on the register to which the value is to be copied (the destination register). Notice that the source register still holds the copied value. Experiment with this feature until you are satisfied that you understand its operation.

Exch

The Exch button works much like the Copy button except that the source and destination color registers will Exchange their values. To use this function, select the source register box by clicking on it. Next click on the Exch button, and click on the destination register. The destination register now holds the value that was in the source register, and the source register now holds the value that was previously held by the destination register. Experiment with this feature until you are satisfied that you understand its operation.

Sprd

The Sprd button will Spread the value of the selected register into a range

of adjacent registers. The range selected can be from across three registers, to across the entire range of registers. The effected range is selected by first clicking on the register whose value is to be spread. Next click on the Sprd button, and click on the last register to be effected by the spread operation. The value to be spread will be mixed with the values already held by the effected registers, resulting in a composite of the spread value and the existing value. Experiment with this feature until you are satisfied that you understand its operation.

B.4 The Palette Lock Window
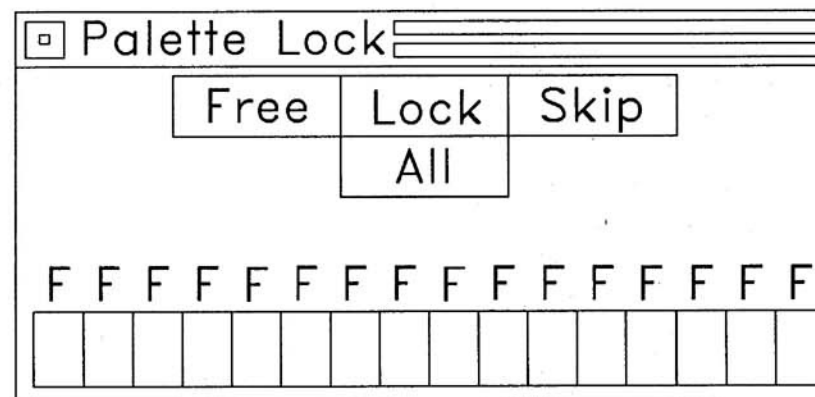
The Palette Lock Window allows manipulation of the lock status of individual, or multiple color registers. At the top of the window are three mode selectors. These modes are as follows:

> **Free** - Free registers can be altered by the software to create the best possible palette for each image captured.
>
> **Lock** - Locked registers can be used by the software, but the color value of the register may not be altered. This mode may be used to create a series of palette compatible images.
>
> **Skip** - Color registers that are skipped are simply not used by the software when creating the color palette for a captured image. Usually only one or two registers would be skipped to provide image compatibility for use with some software packages. The

color values of skipped registers will not be changed, and the image will be matched to the remaining palette colors.

Clicking on the box marked **All**, located immediately below the mode selectors, will change all the registers to the currently selected lock mode.

The current lock status of each register is indicated by the letters **F, L,** and **S** above each register, representing **Free, Lock,** and **Skip** modes respectively.

To change the lock status of an individual register, first select the desired lock mode, then click on the register to be changed. Any register may be changed to any of the three lock modes.

B.5 The Color Bias Window
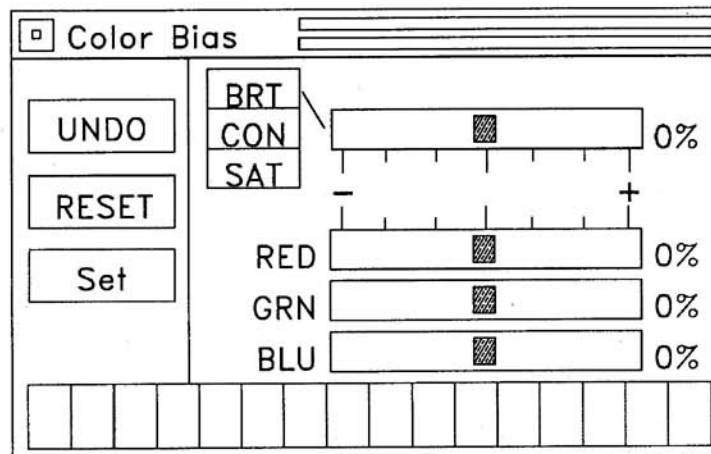
The Color Bias Window consists of four horizontal slider controls, three action gadgets at the left, and a color palette at the bottom of the window.

The horizontal slider located in the upper portion of the Color Bias window is used to control three different values; Brightness, Contrast, and Saturation. The value to be adjusted by the slider is determined by the three selector gadgets to the left of the slider labeled **BRT** for Brightness, **CON** for Contrast, and **SAT** for Saturation. After selecting the function of the slider, the value is adjusted by click-holding on a slide gadget with the Left

Mouse Button, and sliding the gadget horizontally. Alternately, you can click inside the slider box to the right or left of the slide gadget and move the gadget one position at a time.

The slider gadget is set to the center of the control by default. This represents a 0% adjustment. Moving the gadget to the right cause a positive adjustment as indicated by the plus sign (+) to the right and below the slider control. Moving the slider gadget to the left causes a negative adjustment as indicated by the minus sign (-) to the left and below the slider control. Index marks are located between the minus and plus signs to aid in coarse adjustments. The amount of adjustment is also displayed at the right side of the slider control.

BRT - The Brightness control effects the luminance of an image. When moved to the right of the center position, all the colors in the ColorMap are made proportionally brighter. When moved to the left of the default position, the image becomes darker. You have a wide range of brightness control; at the lowest setting the image will be completely black, at the highest setting the image and screen will be completely white.

CON - The Contrast slide control allows you to adjust the contrast of the image. When moved to the right of the center position, contrast is increased by making the brighter colors brighter, and the darker colors darker. Moving the gadget to the left of the center position makes brighter colors darker, and darker colors brighter. The Contrast control has a wide dynamic range; at the highest setting an image will be almost black and white, at the lowest, the image resembles a black and white negative. The software determines what is considered "dark" and "light" by sampling a large number of pixels on the screen and calculating their average intensity. Colors brighter than average are considered bright, colors below the average intensity are dark colors. The median color itself is always left unchanged.

SAT - The Saturation slide control effects the purity and brilliance of the colors in the ColorMap. Moving the Saturation control to the right of the center position adds saturation, resulting in richer, more emphasized colors. Setting the control to the left of the center position reduces saturation, making the colors appear more pastel or "washed out". Totally removing saturation from the ColorMap leaves a gray-scaled, black and white image.

RED
GRN
BLU

The Red, Green, and Blue adjustments each have their own control slider labeled **RED**, **GRN**, and **BLU** respectively. They are located just below the Brightness, Contrast, Saturation combination slider. By default the slide controls are set to the center position. Moving a control to the right of center adds more of that color to the image. Moving a control to the left of the center position lessens the contribution of that color. For instance, moving the Red slide gadget toward the right of the slider box will add more red to the image. Moving the Red control toward the left will remove red from the image, ultimately leaving only the green and blue components.

Note: Slide gadgets have mutually exclusive effects. For example, if you adjust the contrast control, then attempt to alter any other control, the contrast control will be reset. This is done to prevent an "infinite response" problem from developing while adjusting a slide control, and to allow you to undo intermediate steps. Clicking on the **Set** gadget causes the Color Bias window to analyze the image based upon the current control settings, and centers the slide controls for additional adjustments. For example, after adjusting the brightness of an image with the Intensity control, you would click on **Set** when you were done. The new median intensity would then be computed, based upon the brighter image and center the controls. You could then adjust the contrast to bring more definition to the image, click on Set and so on indefinitely.

The Color Bias controls have unpredictable effects when used with HAM images.

UNDO - The UNDO gadget permits you to quickly center the controls.

B.6 The Histogram Window
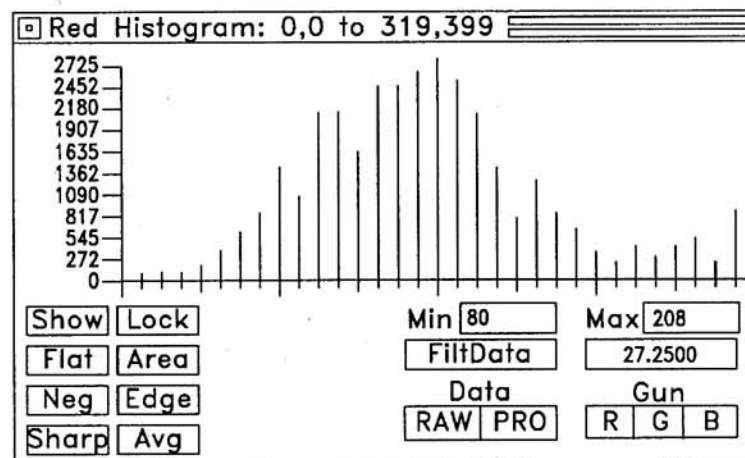
The Histogram displays a graphic representation of what gray level intensities are found in the current image, and how these intensities are distributed throughout the image.

The Histogram window contains a histogram display, a scale factor, minimum and maximum range indicators, Raw and Processed data selections, Red, Green, and Blue Gun selections for RGB images, and a set of useful image processing functions.

The histogram is essentially a bar graph representing the number of pixels in the image that correspond to each of the 256 gray levels possible in a 24-bit image. The gray levels are displayed in the histogram as vertical bars aligned from left to right and arranged from darkest to lightest.

The histogram display is a combination of two histograms: the raw original image sample and the processed result of the histogram settings. These two histograms are overlayed using different colors on the same graph for easy comparison. The Data selector lets you choose which of the graphs appears on top.

Histogram Data

The area of the current image sampled by the histogram is displayed in the

Histogram window titlebar. Notice the default coordinates are displayed as "0,0-319,199", indicating an area starting in the upper left corner down to the lower right corner of a 320x200 screen. These coordinates can be altered by using the **Sample Zone** area functions from the Color Menu. The selected area is analyzed, and the levels of only the selected area is displayed by the histogram. Using this method, you can select the area of the image that is most important, and use the features of the histogram window to produce the best possible grayscale for viewing the this area.

Min and Max

The **Min** and **Max** indicators represent values between 0 and 255 that correspond to the 256 possible gray levels. The numeric values displayed in each of these boxes are graphically shown in the histogram by two vertical dotted lines that are called *range lines*. These Min and Max values define a range of contrast to be used by the **Show** command when producing the final display. Setting a range and expanding it will cause the gray values to be spread across the entire range of 256 gray levels. The resulting image will effectively have fewer actual gray levels, but will display more contrast between each of the remaining gray levels.

The values contained in the Min and Max boxes can be altered using two methods:

A) You can simply click into either box and edit the number inside the box. Notice that when the numeric values in either of these boxes are changed, the new range represented by the range lines reflects the change.

B) The range can be changed by dragging the range lines directly with the mouse. Move the mouse pointer over the histogram display area. The left mouse button is used to drag the **Min** range, and the right mouse button moves the **Max** range line. Release the mouse button when the range line has reached the desired setting. The histogram data will be automatically processed to fill the new range. This procedure can be repeated to place either of the range lines in exactly the position required.

While dragging the range lines with the mouse, you can press the following keys to modify or constrain the range line motion:

1) Pressing either [SHIFT] key causes the range lines to move together as you drag either one. The two lines will maintain an equal distance from the weighted sample median of the current histogram. See also **Weighted**.

2) Pressing the [CTRL] key locks the distance between the two range lines. The two lines will maintain their current distance apart as you drag either one.

FitData

Below the Min and Max range boxes are two controls that allow you to magnify or scale the histogram display. The numeric labels for the vertical axis of the histogram represent the total pixel count for each of the gray levels in the Sample Zone area. The scale of these numeric values is displayed by the *scale factor box*.

Clicking on the **FitData** box causes the histogram data between the Min and Max range lines to be automatically scaled to full height display. The scale factor can be manually changed by clicking into the scale factor box and editing the number inside. After you press [RETURN], the histogram will be displayed using the new scale factor.

Data

Below the FitData gadget are the two histogram Data selection gadgets, **RAW** for raw data and **PRO** for processed data. You can think of these two sets of data as representing "before" and "after" processing by the software. Since the histogram display shows two sets of data, one overlayed on the other, the Data selector gives you access to either set. By clicking on the Data box, you exchange the two data sets. Notice that you can alter the Min and Max range values independently for each data set. This lets you stretch or compress a range of intensities from the RAW data to the PROcessed data according to the relative positions of these four range limits.

Gun

When in RGB mode (i.e., **RGB** mode is highlighted in the Format Control window - See Format Control), the **Gun** selector boxes appear to the right

of the Data selectors. The Gun selector determines which of the three guns (red, green, or blue) is currently displayed by the histogram. By clicking on the **R**, **G**, or **B** boxes below the Gun label, the histogram display and Min and Max ranges will switch to the highlighted gun selection. The Histogram window titlebar will confirm which histogram is being displayed.

RGB mode gives you a total of six histograms to display and modify: the three raw data graphs for red, green, and blue, and the three processed histograms, which show how the histogram will look after processing. Clicking on the **Data** gadget, as explained above, will switch between the raw and processed histogram displays.

Show

Processes and displays the image using the current settings.

Flat

Attempts to improve the histogram profile using a histogram equalization technique. This typically results in better contrast in the dark and bright areas of an image, but at the expense of mid range gray shades.

Neg

Creates a photographic negative image of the original image. The process can be repeated to restore the original image. This works with RGB color as well as monochrome images.

Sharp

Applies an edge enhancement technique to the raw image, improving the visibility of small details. This results in a displayed image with more prominent edges than the original.

Lock

When highlighted, prevents the Automatic Contrast system from changing your manual histogram settings. See also **Contrast...Lock** under the Color menu.

Area

Allows the user to redefine the **Sample Zone** area of the image to be analyzed by the histogram. Once the area has been defined and analyzed, the histogram will reappear displaying the data for the new sample area.

Edge

Applies an edge detection process on the raw image data. This results in what might be described as a line drawing of the original image. **Suggestion:** Use the **Contrast...Auto** option from the Color Menu and turn on the **Weighted** histogram option in the Format Control Window for stronger edge results.
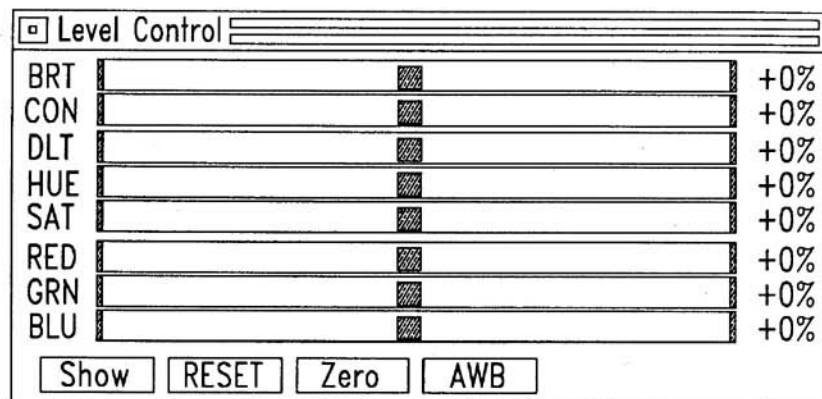
Avg

Averages the pixels together throughout the image. This might be considered as the opposite of **Sharp**, in that instead of sharpening the edges and details the image, it softens and blurs them.

Histogram Window Keyboard Equivalents:

[A] - Area, set new Sample Zone
[D] - Data, toggles selection between **RAW** and **PRO**
[F] - FitData, re-scales histogram display to fit
[L] - Lock, toggles the histogram range lock status
[SHIFT] - Center range lines around average intensity
[CTRL] - Lock range line distance apart while dragging
[ESC] or [RETURN] - Closes the window

B.7 Level Control Window

```
┌─────────────────────────────────────────────┐
│ ▣ Level Control ════════════════════════════ │
│ BRT ▐███████████░░▒░███████████▌ +0%          │
│ CON ▐███████████░░▒░███████████▌ +0%          │
│ DLT ▐███████████░░▒░███████████▌ +0%          │
│ HUE ▐███████████░░▒░███████████▌ +0%          │
│ SAT ▐███████████░░▒░███████████▌ +0%          │
│ RED ▐███████████░░▒░███████████▌ +0%          │
│ GRN ▐███████████░░▒░███████████▌ +0%          │
│ BLU ▐███████████░░▒░███████████▌ +0%          │
│  [ Show ]  [ RESET ]  [ Zero ]  [ AWB ]       │
└─────────────────────────────────────────────┘
```

The first two Level controls apply to both monochrome (grayscale) and RGB color images:

BRT - Increases or decreases the brightness of the image. The effect ranges from positive 100 percent (+100%) which produces an all white image, to negative 100 percent (-100%) which is all black.

CON - Increases or decreases the contrast level of the image. This ranges from +100%, which produces a strictly black and white image, to -100%, which produces an all gray image.

The next six controls are only available when processing **RGB** color images:

DLT - Increases or decreases the amount of difference (delta) between colors in the palette created for the image. The control ranges from +100%, where each color is as different as possible from every other color in the palette, to -100% which produces a palette containing only the most used colors in the current Sample Zone. See Hints and Tips for more information on setting the DLT control.

HUE - Shifts the color hue of the image. Positive HUE settings shift colors into the yellow-green-cyan range. Negative values shift colors into the orange-magenta-cyan range. Thus, you have 360 degrees of color shift possible, using settings from -100% to +100%.

SAT - Adds or subtracts saturation to the image. The +100% setting gives maximum saturation, using only pure colors. At the opposite end of the range, -100% removes all color saturation from the image, leaving only shades of gray.

Note: If you set **HUE** or **SAT** levels to other than 0%, the image processing time will be considerably longer. The screen titlebar will show a progress report when performing these operations:

Biasing HSV: 0% done...

RED - Boosts or cuts the red component of an RGB image.

GRN - Boosts or cuts the green component of an RGB image.

BLU - Boosts or cuts the blue component of an RGB image.

The bottom of the Level window has a row of special command boxes. These are standard gadget boxes that may be selected by clicking on them. The commands are as follows:

Show - Processes and displays the image using the current Level settings. Any other software options in effect will be incorporated in the new display.

RESET - Returns all Level controls to their original position (i.e., the position last used).

Zero - Sets all Level controls to their default center position, at 0% (zero percent). When all levels are set to zero, the Level control system does not modify the raw image data.
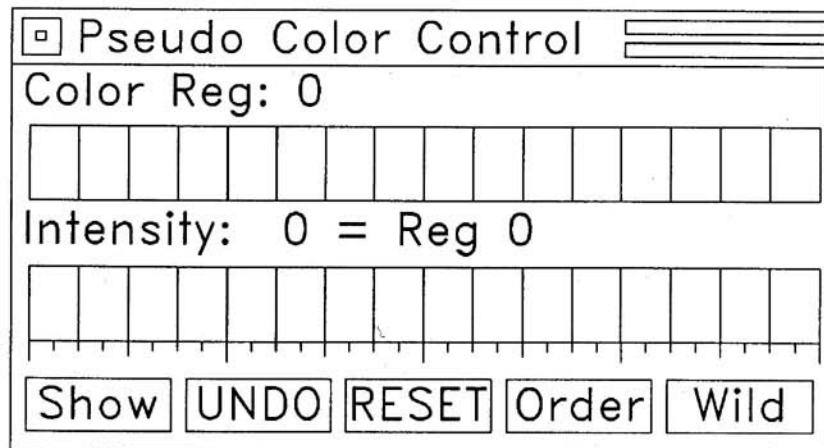
AWB - Short for Automatic White Balance, clicking on this box has two possible effects, depending on whether you are in B&W grayscale or RGB color mode. In B&W mode, the AWB feature sets the **BRT** (brightness) level to offset any under or overexposure condition that may exist in the image. In RGB color mode, AWB adjusts the **RED**, **GRN**, and **BLU** levels to offset any color imbalance, attempting to produce a combination that produces "white". This is similar to the automatic tint control found on many televisions.

Level Control Window Keyboard Equivalents:

[A] - AWB
[R] - RESET
[S] - Show
[Z] - Zero

[ESC] or [RETURN] - Closes the window.

B.8 Pseudo Color Control Window

```
┌─────────────────────────────────────────────────┐
│ ┌─┐                               ═══════════════ │
│ │□│ Pseudo  Color  Control  ═══════════════       │
│ └─┘                                               │
│ Color  Reg:  0                                    │
│ ┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐ │
│ │   │   │   │   │   │   │   │   │   │   │   │   │ │
│ └───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘ │
│ Intensity:   0  =  Reg  0                         │
│ ┌─────────────────────────────────────────────┐  │
│ │                                             │  │
│ └─────────────────────────────────────────────┘  │
│ ┌──────┐┌──────┐┌───────┐┌───────┐┌──────┐       │
│ │ Show ││ UNDO ││ RESET ││ Order ││ Wild │       │
│ └──────┘└──────┘└───────┘└───────┘└──────┘       │
└─────────────────────────────────────────────────┘
```

Pseudo coloring is a powerful technique for highlighting or enhancing image details. The idea behind pseudo coloring is to assign arbitrary colors from a palette to certain levels of gray in an image. You can have several different levels of gray correspond to the same color, but for each gray level you can have at most one color.

Note: When in Pseudo Color mode, the FrameGrabber captures images in sixteen grayscales. These sixteen grayscales represent only sixteen out of 256 possible grayscales. Pseudo Coloring can be used on saved images containing more than sixteen gray scales. For example, images captured using **FrameGrabber 256** may be converted to sixteen grayscales for display on an Amiga not equipped with the FrameGrabber 256 hardware.

The Pseudo Color Control window contains two color bars. The top color

bar is the current Amiga palette, from which you select the color you wish to assign or map to various levels of gray. The lower color bar shows the current pseudo color assignments, and lets you map colors from the Amiga palette to individual gray levels (intensities) on the bottom bar.

Color Reg: *rr* - Where *rr* indicates the number of the currently selected color register.

Intensity: *xx* = Reg *rr* - Where *xx* indicates which of the 256 possible intensities is currently under the crosshairs, and *rr* indicates the color register currently assigned to that intensity. By clicking on the intensity bar with the left mouse button, the currently selected color register will be assigned to the gray level under the crosshairs. You can also *drag* the crosshairs across the color bar while holding down the left mouse button. This allows you to assign a single color to an entire range of intensities.

Note that the **Intensity** information display changes as you move the crosshairs over the image. You can click on any section of the displayed image to create a direct pseudo color assignment. The intensity of the pixel under your crosshairs will be read, and the current color register selected from the top color bar will be assigned to this intensity.

Below the two color bars is a row of command gadgets that help control the pseudo color environment:

Show - Processes and displays the image using the new color assignments.

UNDO - Cancels the last intensity assignment made to the lower color bar.

RESET - Cancels all changes made to any intensity assignments since last use.

Order - Sorts the current Amiga palette by intensity, then assigns each palette color to the intensity it most closely matches. This option is useful as a first step in using a new palette with the Pseudo Color system.

Wild - Creates a new color palette at random, but insuring that each color is unique and visibly different than any other color. You can then use the **Order** option to sort the new palette into intensities.

Suggestion: Use the Amiga 32 color mode in combination with Pseudo Color mode (See Format Control for details). This mode will give you access to the normal 16 gray shades available on the Amiga, plus 16 extra color registers that you can use for custom color assignments.

Suggestion: When "colorizing" a captured image, select the desired color on the Pseudo Color requester window, then click on the grayscale to be colored <u>on the currently displayed image</u>. The selected grayscale will be assigned with the new color as indicated on the Pseudo Color requester window. Remember that only sixteen of the 256 grayscales are used when capturing an image. When all desired colors have been assigned, click on the "Show" gadget to re-display the image using the newly assigned palette.

Pseudo Color Control Window Keyboard Equivalents:

[S] - Show
[U] - UNDO
[R] - RESET
[W] - Wild
[<-] and [->] - Left and right cursor keys shift the Amiga palette colors either direction. Colors shifted off one end of the palette reappear at the opposite end.
[ESC] or [RETURN] - Closes the control window

B.9 Animation Control Window

```
┌─────────────────────────────┐
│ ▣ Animation Control ▭▭▭▭    │
├─────────────────────────────┤
│   Interval      Frames      │
│  00:00:05     ┌────────┐     │
│   H  M  S     │   10   │     │
│               └────────┘     │
│  ┌┐ ┌┐ ┌┐      Timing        │
│  ││ ││ ││     ┌────────┐     │
│  ││ ││ ││     │    0   │     │
│  ││ ││ ││     └────────┘     │
│  ││ ││ ││     ┌────────┐     │
│  ││ ││ ││     │AutoAnim│     │
│  ││ ││ ││     ├────────┤     │
│  ││ ││ ││     │ Alarm  │     │
│  └┘ └┘ └┘     ├────────┤     │
│               │PalLock │     │
│               ├────────┤     │
│               │Looping │     │
│               └────────┘     │
└─────────────────────────────┘
```
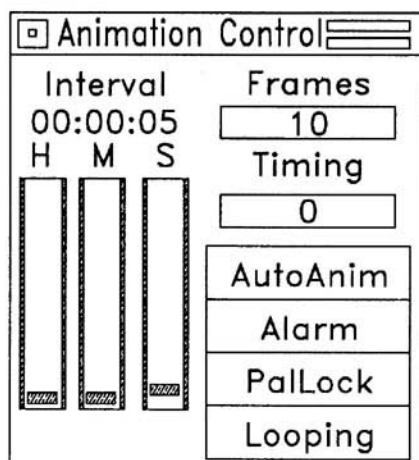
Interval - Controls the amount of time between the last saved frame and the next automatic capture. Three vertical slider bars are used to set the Hours, Minutes, and Seconds between captures. Intervals may range from 00:00:00 to 99:59:59. This control is only used when **AutoAnim** is active.

Remember that FrameGrabber requires time to send the captured image into the computer, analyze the picture and save it to RAM or disk. The interval timer is started at the end of this process. Setting the interval to 00:00:00 will cause the **FG 2.0** to capture and save frames as rapidly as the computer is capable.

Frames - Total number of frames to be automatically included in an animation, from 0 to 9999. When **AutoAnim** is active, this value determines how many frames to capture and save before finishing the animation file. You can specify 0 (zero) frames for unlimited automatic capture. You will then be responsible for manually ending the animation (See **End Anim**).

Timing - The Timing control allows you to set the specific time that a frame is to be displayed during playback. The value inside the Timing box specifies the number of 1/60th seconds the frame will be displayed. A time delay of 60 would cause a frame to be shown for one second before displaying the next frame. Allowable Timing values range from 0 to 9,999,999 1/60ths of a second.

Individual frame timing allows you to quickly produce animations that would normally take many more frames to create. For instance, you may want the first frame of an animation to be displayed for five seconds, to act as a title screen. Other frames may be displayed for a longer or shorter period of time as desired. Note that only newer animation players use individual frame timing.

AutoAnim - When highlighted, this option will cause the software to automatically capture and save frames to the current animation file, based on the other settings within this window.

Selecting **AutoAnim** does not start the animation when it is selected. The animation process is started only when **Begin Anim** is selected as described below.

Alarm - When highlighted, this option will provide audible alerts prior to digitizing new frames in **AutoAnim** mode. Selecting **Alarm** will cause a loud "beep" tone to sound one minute prior to digitizing the next frame, giving you time to turn on lights and cameras during lengthy time lapse animations. In addition, during the last seconds before digitizing, a short audible cue will be sounded, marking off the final 5 seconds before capture. Finally, an alarm is sounded when the animation is completed.

PalLock - When highlighted, this option will "lock" the current Amiga palette, preventing the software from creating a new one. The current colors will be used for the entire animation. This option may be used to save processing time, which increases the frequency of frame captures. Also, some animation players cannot play animations that contain dynamic color changes. However, if the colors within the scene vary greatly, a fixed palette may result in inaccurate color reproduction in the animation. Turning off the **PalLock** option will improve the color quality by allowing the software to optimize the palette for every frame. For more specialized situations, the **Palette Lock** control allows you to lock or free any individual color register in the palette.

Looping - This option determines the type of animation file created by the software. When **Looping** is highlighted, an additional three frames will be automatically added to the end of your animations. These extra frames are copies of the first frames added to the animation. Later, this allows the frames to be played back as if they were endlessly repeating. Also, some animation players require that animation files be of the "looping" variety in order to function. However, **Looping** mode takes additional memory away from your computer, since it must "remember" the first few frames during the entire animation. You can turn off **Looping** if you have insufficient RAM or wish to create "single-play" non-looping animations.

Appendix C - Playback

Selecting **Playback** from the Anim menu will allow you to display the animations created by **FG 2.0** or other animation software. The PathMaster file selector will prompt you for the animation file to be played. If the file is the correct format, the animation will be loaded into memory and decoded. Playback will begin automatically when all the frames have been loaded from the file.

While playing an animation, there are several keyboard controls that allow you to stop, start, advance, and control the speed of playback:

[SPACE] - Stop/Start playback (Also Right Mouse Button)
[A] - Advance a single frame (Also Left Mouse Button)
[+] - Increase playback delay 1/60th of a second
[-] - Decrease playback delay 1/60th of a second
[ESC] - Ends playback mode

The ten Function keys control the frame rate:

[F1] - 60 fps
[F2] - 30 fps
[F3] - 20 fps
[F4] - 15 fps
[F5] - 12 fps
[F6] - 10 fps
[F7] - 6 fps
[F8] - 3 fps
[F9] - 2 fps
[F10] - 1 fps

The row of number keys below the ten Function keys act as speed division factors for the current frame rate:

[1] - 1/1, Full speed
[2] - 1/2, Half speed
[3] - 1/3rd speed
[4] - 1/4th speed
[5] - 1/5th speed
[6] - 1/6th speed

[7] - 1/7th speed
[8] - 1/8th speed
[9] - 1/9th speed
[0] - 1/10th speed

By combining the Function key frame rates with the number key delay factors, you can delay as long as 10 seconds between frames, as well as "in-between" frame rates not directly available.

Appendix D - FG 2.0 Settings File

FG 2.0 lets you conveniently Load or Save your current software settings in a file. These files contain your current screen format, level settings, palette locks, window positions, clip sizes and positions, file type, current directories for loading and saving image files, and much more. Virtually anything that you can manually change in the program is saved in these configuration files. Over 800 of these files will fit on a single 880K 3.5" disk.

FG 2.0 Setting files always have a filename suffix of ".fgset". If you forget to add the ".fgset" suffix when creating a settings file, the program will add it for you automatically. This means that if you Saved your settings under the name "Hires", the program would create a new settings file called "Hires.fgset".

Default Settings File

By default, the program looks for a file named "default.fgset" in your "S" directory (the full pathname is "S:default.fgset"). Optionally, the program will look in the directory of your choice as indicated in the program's icon TOOLTYPES Info.

For example, suppose you need the software to load and save settings from a directory named "ENV:" instead of "S:". Click once on the "FG_2.0" program icon so that it is highlighted, and select "Info" from the Workbench Menu. Click on the "ADD" gadget for the TOOLTYPES info. Now type exactly:

SETDIR=ENV:

Then press [RETURN]. Click on "Save" in the lower left of the Info window, and you are done! Next time you run the program using this icon, the program will look for "ENV:default.fgset", and will use "ENV:" as the default settings directory.

Note that if you use the software from the CLI, you must be in the same directory as the program in order for the program to find its icon info.

Function Key Settings Files

In addition to the default .fgset file, you can also have up to ten different
.fgset files assigned to your Function keys. Holding down the Control key
[CTRL] and pressing function key [F1] through [F10] loads the assigned
settings file and reconfigures the software automatically.

Assigning a .fgset file to a particular function key is done the same way you
set the default settings directory: using the icon TOOLTYPES. Simply
"ADD" new lines to the TOOLTYPES list like this:

    F1=joe
    F2=fred
    F3=sue
    ...
    F10=jane

The software will now load these .fgset files from your default SETDIR
when you press Ctrl-F1, Ctrl-F2, etc. If our SETDIR was "ENV:" as in the
previous example, the actual pathnames for the function keys FG 2.0 looks
for would be:

    ENV:joe.fgset
    ENV:fred.fgset
    ENV:sue.fgset
    ...
    ENV:jane.fgset

Whichever .fgset filename you assign to F1 will also be your "default.fgset",
replacing the built-in name that the program normally uses. This lets you
easily get back to your favorite settings by pressing "Ctrl-F1". This also
gives you total flexibility in naming the default .fgset directory and
filename.

Appendix E - Description of File Types

The software supports loading and saving for a variety of different image
file formats. Also, two special file formats are provided to save and restore
Amiga color palettes and Pseudo Color Look Up Tables (LUTs). The
current file type is set by selecting the desired type from the File Type... sub-
menu under the Project menu heading.

Each image file format has advantages and disadvantages. The IFF, Brush,
and Palette file types should be used to create files compatible with paint
programs, slide shows, and similar Amiga utilities. The LUT file type is a
new IFF format used by the FG 2.0 Pseudo Color system to save color
assignments. The remaining five file types are used to store and retrieve
your original image data without the loss of quality associated with standard
IFF format. After saving a captured image using one of these formats, you
can then load and process the images as if they had been freshly captured.

The file types available are:

IFF - Selects the standard full screen IFF ILBM file format, compatible with
most Amiga graphics programs. When creating new IFF files, an exact
copy of the currently displayed screen and palette will be saved. However,
IFF files cannot be loaded and processed as an original digitized image.
You must use the IFF24 or similar format to save the original image data.

Brush - Allows you to save a rectangular or freehand section of the Amiga
screen as a separate section, which can then be loaded by a paint program
and used as a brush or stamp. The current Brush Type... setting determines
whether to outline rectangular or freehand sections after the Save File
command is given.

Unlike other programs, you can make disjoined areas in a brush when
creating freehand brushes. For example, this feature could be used to save
the two ears or eyes of a person without creating two separate brushes. You
simply "lasso" each object, then press the right mouse button to finish the
brush drawing mode. PathMaster will then prompt you for a filename and
save the brush as a single object. Also see the section Rectangular Clip
Operations for more details on the brush creation process.

Palette - This file type is a subset of the standard IFF ILBM format, in that it only contains the Amiga color palette information. This feature allows you to save the current palette for future use, or to load just the color information from another IFF file in order to match palettes.

LUT - An abbreviation for **Look Up Table**, this file type is used to store and retrieve your custom pseudo color intensity assignments. Please see the **Pseudo Color Control** topic for more information.

DV21 - Short for **Digi_View 21**™-bit, this is a variant of the IFF format used by NewTek's™ software to store RGB image data. It is provided for backward compatibility, and saves only 21-bits of the full 24-bit image data so that the Digi-View software can read the files. When storing 8-bit B&W images, the Digi-View format expands the data to 21-bit RGB format, wasting almost three times the storage space actually required. Thus, we recommend using the IFF24 file type discussed below unless Digi_View file compatibility is required.

IFF24 - Short for **IFF 24**-bit, this is a new IFF format designed to store 8 grayscale and 24-bit RGB image data in a efficient and flexible format. It stores the full 8 or 24-bit image data captured by the FrameGrabber hardware, allowing you to later load IFF24 files and use the other software features as if they had just been captured. IFF24 uses the same compression system that standard IFF ILBM uses, so your files will not be as large as those created using **RAW** or **RGB** file types. However, the file size of a 320x400, 24-bit image can still be up to 378K. You may only be able to fit one or two full color image files on a standard 880K disk.

RAW - This file format is the simplest, and is best suited for applications where speed and ease of readability are more important than file size.

Like IFF24, this file type saves the original raw image data using full 8-bit resolution. The image data is simply saved as a stream of 8-bit values (bytes) into a file. The 8-bit values are taken by reading the pixels from left to right, top to bottom on the image. RGB color images are stored the same way, except the red, green, and blue data sections are written as three "blocks" in the file, one after the other. Since no information is saved concerning screen format or file size, you will need to record what screen format your RAW format files require for proper display.

RGB - This format is identical to **RAW**, except that RGB color images will be automatically saved as three separate files, instead of a single raw image file. The resulting three files will have filename suffixes of ".R", ".G", and ".B" automatically appended to them. This format is required by some software and is provided for compatibility.

IMG8 - Uses a proprietary image file format to store 8 and 24-bit image data. Provided for backward compatibility with FrameGrabber 1.0 software, this file format should not be used for new images and will not be supported in future versions. Use IFF24 instead.

Choosing File Types:

We recommend using the IFF24 format when storing raw images for greatest compatibility with future Amiga software. The DV21 format is for backward compatibility with existing Digi_View files, however, this format uses only 21 bits of data instead of the full 24 available. The IMG8 format is supported for backward compatibility with previous FrameGrabber software. The IFF24 file format should be used for all new applications.

Appendix G - Glossary of Terms

Alert

In the Amiga context, an Alert is a startling message generated by a program or by the operating system. Alerts are used in desperate situations to communicate information to the user; they are printed in ominous red letters on a black background, and have an unmistakable flashing red border. An common example of an Alert is the infamous Guru Meditation Alert, which provides information on the cause of a major software failure to the knowledgeable user. The software uses Alerts in emergency situations where there is insufficient CHIP RAM to use a regular window to display text. To exit an Alert, simply press the Left or Right Mouse Button, as prompted by the text at the bottom of the Alert.

AmigaDOS

The operating system used by the Amiga to store and retrieve information, and to run programs. AmigaDOS is itself a collection of programs that work together to control the Amiga. AmigaDOS also provides the foundation for the CLI environment (see CLI).

Backup

A computer slang term for making a copy of a file or disk. This copy (the backup) is usually put in a safe place, in case the original file or disk is destroyed. Also, if you make frequent changes to a particular file (perhaps an image file), you should make copies of the file between changes. Later, you can "back up" to the last version of the file, if for some reason you want the old file back.

Binary

A way of representing any number using only zeros and ones. Computers use binary numbers to store and process information in memory. The computer's memory works like a collection of on/off flags that represent "0" or "1". Each one of these on/off flags are called bits. Eight of these bits combine to make a byte, a standard measurement of memory size.

Bits

See Binary.

Bitmap

A bitmap is an organized way of storing image data in memory. Most modern computers, including the Amiga, use bitmapped graphics. A bitmap contains one or more bitplanes, and the number of bitplanes in a bitmap determine the number of colors available for that image.

Bitplane

A bitplane is a rectangular area of image data that is stored in binary format. Each pixel that is "on" in the image has a corresponding bit set to "1" in the bitplane, each blank space is represented by a "0" in the bitplane. Thus for two-color images, only one bitplane is needed to represent the on/off pixel values. For more colors, more bitplanes are necessary. The Amiga hardware currently supports up to six bitplanes of data.

Blitter

The Amiga has a high-performance graphics engine called the blitter that can be used to move image data (pixels) much faster than a microprocessor. Physically, the blitter is part of a large integrated circuit (a custom chip) inside your Amiga. The blitter, like other custom chips in the Amiga, can only access data in CHIP RAM.

Boot

The process of awakening a computer or loading a program for use, e.g., turning on the power, inserting disks, typing magic words, etc. The process of turning on the power to the Amiga is referred to as a Cold Boot. By pressing the [CTRL] + [Left Amiga] + [Right Amiga] key combination (on some Amiga 500s and 2000s the [Left Amiga] key has been changed to the [Commodore] key), the Amiga undergoes a complete reset process known as a Warm Boot. This can be used to reset the machine after a crash.

Buffer

A temporary storage area in memory that the computer can use as a scratch pad for calculations, or as a place to put information until it is used by the program.

Bug

As applied to software, a failure or defect that decreases the usefulness of a program. Hopefully, this program does not have any bugs, but nobody is perfect.

> **Quote:** A noted programmer once said...
> *"A program of any significance is never bug free"*.

Byte

See Binary.

Chip

A complex electronic component that combines the function of hundreds or thousands of individual devices into a single package, commonly called an integrated circuit (IC). The Amiga hardware has several custom chips that handle the display, sound, and other system needs.

CHIP RAM

The Amiga has two types of memory, called CHIP RAM and FAST RAM. The Amiga's custom chip set can use up to 512K of memory (1 megabyte with the Enhanced Chip Set or "ECS"). The remainder of the Amiga memory cannot be accessed directly by the custom chips, and is called FAST RAM.

CLI

Short for Command Line Interface, the CLI is the keyboard oriented way to control the Amiga. You type commands (a line of text on the screen), then press RETURN and the command is performed. The CLI environment is a flexible alternative to the mouse and icon system used by the Workbench.

Clicking

The act of positioning the mouse pointer directly over a gadget or icon, then pressing and releasing the Left Mouse Button. This technique is used to select icons, and to activate gadgets.

Color

In the context of this manual, the term refers to a mixture of red, green, and blue. Note that shades of gray are considered "colors" by this definition.

ColorMap

A ColorMap is an organized way of storing color values. The Amiga hardware currently supports 32 color registers, which are filled by the program from the current ColorMap. A ColorMap can be thought of as the current palette of colors available for use.

Crash

A computer slang term used to describe a major software or hardware failure. A crash is usually accompanied by a Guru Meditation Alert (see Alert), or in extreme cases, wild unpredictable phenomena. A software crash can be remedied by re-booting (see Boot) the computer. A related malady of the crash occurs when the computer enters a dead-end situation, often referred to as "hung", "locked", or "frozen" to describe its unresponsive state. A reset is needed to remedy this situation.

Directory

A place where files are stored, similar to a filing cabinet. Each directory has a name associated with it. From the Workbench environment, directories appear as small icons that look like drawers from a filing cabinet. A directory may contain other directories, often referred to as sub-directories.

Double-Click

The act of positioning the mouse pointer over a gadget or icon, then pressing and releasing the Left Mouse Button twice in quick succession.

Drag Bar

The top edge of most screens and windows have a combination title bar and drag bar. By positioning the mouse pointer over the drag bar, then pressing and holding the Left Mouse Button down, the drag bar is activated. You can then drag the screen or window to

a new position, releasing the mouse button when you are ready to drop the window or screen. See also Title Bar.

Dragging

The act of positioning the mouse pointer over an object (e.g., an icon or drag bar), then holding down the Left Mouse Button. While the button is depressed, the object can be moved around by sliding the mouse in the desired direction. Releasing the button drops the object at its current position.

EXTRA HALFBRITE

Abbreviated "EHB", this is an Amiga graphics mode that allows up to 64 colors to be displayed on the same screen.

FAST RAM

One of the two types of RAM available on the Amiga. Memory that cannot be accessed by the Amiga's custom chip set is considered FAST RAM. See CHIP RAM.

File

A file is a way to store computer information for later use. Each file is identified by a name that is associated with it, called a filename. Programs and data used by programs are stored in files. See also Directory and Path.

Format

In the context of AmigaDOS, the FORMAT command is used to initialize a disk or file system, completely clearing it of old data and "formatting" the disk to the new specifications. In the context of this software, Format also refers to the current width, height, and depth of the Amiga screen, as well as the process of changing these options.

Gadget

A type of software control, usually with a rectangular border. Gadgets often mimic familiar controls like push-buttons or volume controls, and usually contain printed or pictorial labels. Gadgets are activated by positioning the mouse pointer directly over the gadget, then pressing and releasing the Left Mouse Button. A

special class of Gadgets, called String Gadgets, allow you to enter text or numbers from the keyboard after being activated.

HAM

Short for Hold-And-Modify, HAM is a special graphics mode that allows all 4096 colors in the Amiga palette to be displayed on the same screen.

Hardware

The electronic and mechanical parts of a computer system. See Software.

HIRES

Short for HIgh-RESolution, HIRES is a graphics mode that doubles the number of pixels that will fit on a horizontal line of the screen.

Histogram

A bar-graph style chart, usually used to display relative values or numeric totals. The vertical height of the bars are directly proportional to the values being represented.

Icon

An icon is a small pictorial representation of an object, and are related to gadgets. The Workbench screen uses icons to represent disks, drawers, files, and programs. You can drag icons to new positions on the screen using the mouse, and you can activate an icon by double-clicking on it.

Image

In the context of this manual, the term applies any picture or part of a picture that the program can load and display. Art work created with a paint program or pictures digitized with a camera are two examples of images.

Interlace

A video technique used to double the number of lines on the screen, thus doubling the vertical resolution. Due to the nature of the interlace technique, a "flickering" effect may result since the screen is re-drawn only half as often using interlace.

Intuition

Intuition is the Amiga mouse and icon system designed to make control and display consistent between different programs. The Workbench screen, with its icons, menus, windows, and gadgets, is a good example of using Intuition. Intuition provides a variety of programming tools to help programmers keep their programs friendly and familiar to use. Intuition is also a program that is running on your Amiga; Intuition manages the mouse and display.

K

Abbreviation of "Kilo", meaning one thousand. When associated with computers, "K" refers to one "kilobyte" (1024 bytes). For instance 512K is actually 524,288 bytes.

LACE

See Interlace.

Load

The process of reading a program or file into memory, usually from a disk drive.

Menu

On the Amiga, a menu is a standard Intuition control system that offers the user a variety of labeled choices. Intuition menus are part of the screen, and communicate with the program they control using windows. Most menus are of the drop-down variety; they "drop down" from the top of the screen when you depress the Right Mouse Button and slide the mouse pointer over a menu header on the Screen Title Bar. The printed choices, called menu items, appear inside the rectangle that drops down from the menu header.

Monochrome

While using this software, monochrome refers to colors of the same shade. The Amiga hardware can produce 16 shades of red, green, or blue, which when combined, produce 16 shades of gray. A monochrome image is one that uses only shades of the same color, for instance, a black and white image.

Mouse Pointer

While using this software, the mouse pointer is a small, crosshair shaped cursor that can be moved about the screen using the mouse. The pointer shows the exact point the mouse is currently positioned at. The default Workbench mouse pointer is a small red arrow, but mouse pointers can come in almost any shape or color. One common variation is the "ZZ" busy cloud image that appears when the software or the Workbench is busy performing some operation.

Multitasking

A feature of the Amiga operating system that permits several programs to appear to run simultaneously.

Overscan

Technically, overscan refers to the parts of a television picture that fall off the edges of the screen. Often, people will incorrectly refer to any image that completely fills the screen (i.e., no visible border surrounding the image) as being overscanned.

Palette

As applied to the Amiga, the palette is the range of available colors that can be generated by the hardware. Current Amiga hardware produces a palette of 4096 different colors. The term palette is also commonly used to refer to the current ColorMap used by an image (see ColorMap).

Path

A path or pathname is a unique name specifying a particular file and directory in the Amiga filing system. Pathnames can be thought of as the full name of a file, similar to the full name of a person.

PathMaster

The trade name of the file requester used by this software to select filenames.

Pixel

Short for "picture element", a pixel is the smallest dot that can be displayed on the current display device in a given resolution. Examples of display devices that use pixels are monitors, televisions,

and dot-matrix printers. The standard Workbench screen is composed of an array of 640 by 200 pixels, giving a total of 128,000 pixels. Pixels may be any one of 4096 possible colors on the Amiga.

Pointer

See Mouse Pointer.

RAM

Abbreviation for Random Access Memory. This type of memory is generally non-volatile, i.e., when you turn the computer off, any information in RAM is permanently lost.

RAM Disk

An alternative to floppy disk drives or hard disk drives, the RAM disk is an imaginary disk drive simulated in the computer's memory. RAM disks are many times faster than their physical counterparts, but require more computer memory to use. Also, any information stored in the RAM disk will be lost when the power is turned off to the computer.

Raster

A video term used to describe the way information is organized in a video image. Raster images are composed of horizontal lines, called scan lines, that are drawn left-to-right, top-to-bottom on the screen. This drawing process is often referred to as raster scanning.

Register

Registers are special memory locations used by the computer to store information that is needed often or without delay. Special registers in the Amiga store the colors and type of display to use when generating images.

Render

The automatic drawing process by which the software produces images. See also Raster and Pixel.

Resolution

This relates to the number of dots-per-inch possible on the display (e.g., the number of pixels on the screen), and effects the sharpness of an image. Using high resolution (i.e., more pixels per inch) allows smaller details in an image than low resolution will, since the pixels themselves are smaller.

Run

A computer-related verb, running a program refers to the task a program performs after loading into memory. After the Amiga boots, several programs are running. "Run" is also an AmigaDOS command that allows you to have several active programs running in an apparently simultaneous fashion.

Save

The process of storing a program or file in the computer's memory to a more permanent storage place, such as a disk drive.

Scan Line

A single horizontal row of pixels on the screen. See Raster.

Screen

A screen is the basic Intuition display, that can contain graphics, text, windows, and gadgets. A screen usually has a title bar, which can display text generated by programs.

Software

The programs and files (information) that control the hardware. Without software, hardware is useless, since the software instructs the hardware how to behave and interact with the real world.

String

A string is a series of characters of indefinite length, usually a line of text or a name.

Title Bar

A title bar is a rectangular label area at the top of most screens and windows. A title bar is used to identify a particular screen or window, and can be used by the program as a display area to print

other information. Most title bars can also be used as drag bars to move a screen or window with the mouse.

Window

A window is a rectangular area of the screen that can be used to display graphics and text, and acts as a communications medium between a program and its user. Most windows contain Gadgets that control operations or allow the user to effect the action taken by a program.

Workbench

The Workbench is the Amiga's icon and mouse control system for operating the Amiga. The Workbench uses the basic Intuition tools (see Intuition) to interact with the user and the Amiga. See also CLI.

Appendix H - 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 [SPACE] 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: Picture displays, distorts, then disappears. Sometimes re-appears.

Remedy: Check all connections. Verify video connections. This is a common symptom of an unstable video signal, usually the result of using 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: Captured image "wraps" around screen.

Remedy: The video source is unstable. Usually the result of "pausing" a video tape. This may also occur when attempting to capture an image from a protected video tape, or a video source with a "weak" sync.

Symptom: Previously captured image is displayed instead of, or overlayed on top of current image.

Remedy: The video source is unstable. Usually the result of "paus-

ing" a video tape. This may also occur when attempting to capture an image from a protected video tape.

Note: When capturing images from VCR, it is recommended that you DO NOT attempt to capture a "paused" frame. Although the previewed video appears stable, the sync signal may not be of a quality to allow capture.

New "digital pause" VCR's **may or may not** allow capturing a "paused" frame. It has been our experience however, that this is NOT a dependable source. A stable sync signal must be provided by the circuitry of the VCR to allow capture. Finding a "digital pause" VCR that will consistently allow "paused" frame captures is a "hit and miss" operation at best.

Appendix I - Keyboard Quick Reference

Project Menu

Load File	[RIGHT-AMIGA] + [L]
Save File	[RIGHT-AMIGA] + [S]
Delete File	[RIGHT-AMIGA] + [D]
Clear All	[RIGHT-AMIGA] + [N]
Clear Screen	[RIGHT-AMIGA] + [X]
Quit	[RIGHT-AMIGA] + [Q]

Grab Menu

Preview		[SPACE BAR]
Grab Image		[C]
Grab Red		[R]
Grab Green		[G]
Grab Blue		[B]
Mono/RGB		[TAB]
Automatic ...		
	Autograb	[F6]
	Autoanim	[F7]

Image Menu

Show		[S]
Format		[F]
Delta		[D]
Sequencer		[Q]
Display ..		
	Position	[W]
	Size	[Z]
Source ...		
	Position	[SHIFT] + [W]
	Size	[SHIFT] + [Z]
Title Bar		[T]
Pointer		[Y]
Jump Center		[J]

Overwrite   [RIGHT-AMIGA] + [=]

Color Menu

Palette   [P]
Palette Lock   [L]
Color Bias   [K]
Histogram   [H]
Levels   [I]
Pseudo Color   [O]
Sample Zone ...
                Set Area   [A]
                Full/Set   [SHIFT] + [A]

Anim Menu

Control   [RIGHT-AMIGA] + [T]
Begin Anim   [RIGHT-AMIGA] + [A]
Add Frame   [RIGHT-AMIGA] + [F]
End Anim   [RIGHT-AMIGA] + [E]
Playback   [RIGHT-AMIGA] + [Z]

Info Menu

Memory   [RIGHT-AMIGA] + [M
Status   [RIGHT-AMIGA] + [Y]
Display   [RIGHT-AMIGA] + [U]
Image   [RIGHT-AMIGA] + [I]
Coords   [RIGHT-AMIGA] + [.]

Appendix J - Test Systems

This section describes special features of the FrameGrabber 256 software, that allow you to a) customize the software for special hardware, b) test the software/hardware display system, and c) test some conversion routines. These conversions are provided to let you experiment with alternate processing techniques.

J.1 Timing Controls

After you select **Grab Image** from Grab menu, the current video signal is digitized and sent to the Amiga through the Centronics cable. Due to speed limitations at which data can be transfered through this port, you may be have to slow down the transfer speed manually in some situations. Signs of excessive speed are images that have been split in half horizontally, or the FrameGrabber hardware seems to be capturing images unpredictably. In these situations you may need to reduce the port speed for reliable operation.

Changing the Timing

There are two timing delays that you may change using the keyboard. You use the Up and Down cursor keys while holding down the [CTRL] or [CTRL]+[SHIFT] to increase or decrease the two time delay values.

> **Comm Delay** - While the FrameGrabber is fast, it is not instantaneous. If too many commands are sent to the FrameGrabber in a short period of time, the hardware will not be able to keep up with the new commands. The **Comm Delay** value determines the number of 1/50ths of a second to pause between commands sent to the hardware. The default **Comm Delay** value is 5, which means 5/50ths or 1/10th of a second between commands. You may change this value from 0, which is no delay, to several seconds between commands. To do this, hold the [CTRL] key down while pressing the up and down cursor keys. The titlebar of the screen will show the new **Comm Delay** values.

> **Port Delay** - As noted above, the parallel port delay may need adjustment for best results. To do this, hold down both the [CTRL]

key and a [SHIFT] key while pressing the up and down cursor keys. The new **Port Delay** value will be shown to you in the screen's titlebar.

Note: Normally, the software will adjust the port delay for you automatically. A stock Amiga with the 68000 processor can download information from the parallel port as fast as it is able to read the data, that is to say, with zero port delays. If you have a 68020 card, such as the Amiga A2620, the software will reduce the speed to that of a 68000 equipped machine by adding a delay factor. Another factor affecting speed is the cable length between the Amiga and the FrameGrabber. When using a long cable, the data transfer speed may have to be reduced to get good results. Under some circumstances, you may be able to *increase* the speed at which you can capture and process images by lowering the default delay values. Experiment with different settings until you find a reliable value for your equipment.

After you have changed the **Comm** or **Port** delay values, you can save the settings by selecting **Settings...Save** from the Project menu (See Appendix D).

J.2 Test Pattern Generator

You can generate a grayscale or RGB color test screen by holding down both the [CTRL] and an [ALT] key while pressing [F1]. This will create a test pattern that fills the current screen and software image buffers. This feature allows you to experiment with the rendering abilities of the software, and lets you check that the computer and monitor are properly displaying the full range of information possible in each graphics mode.

J.3 Color Space Conversions

The RGB color system is only one of several known techniques for mapping colors into numbers. For those who want to experiment with alternate techniques in color processing and analysis, the software provides a pair of conversion routines to change RGB (Red, Green, Blue) images into HSI data (Hue, Saturation, Intensity). You can then convert the HSI data back into an RGB image for display.

To convert the current RGB color image in the raw image buffer to HSI, hold down the [CTRL] and either [ALT] key and press [F2]. To convert HSI data back to RGB space, hold down [CTRL] + [ALT] and press [F3]. The screen's titlebar will report the status of the conversion process.

Index

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