*Jacq*CAD
M A S T E R ®

Technical Manual

Contents

INTRODUCTION

General Information

JacqCAD MASTER® is a computer program for creating textile designs on Macintosh computers. It contains extensive features designed to assist in designing, editing, creating loom control files, and punching of textile designs.

Industry standard TIFF and PICT files are supported, providing compatibility with many other Macintosh applications, including programs for painting, scanning, processing, editing, publishing, and analyzing images. Sub-areas of PICT files may be selected and scaled to any desired number of Ends and Picks. Designs of up to 16,000 Ends by 32,000 Picks are supported.

Textile designs are displayed in the correct as woven aspect ratio (Warp/Weft ratios of .05:1 to 20.00:1). Up to 20 image windows may be opened simultaneously to support cut/paste of design elements between designs or between design and scratch pad windows.

File Formats

JacqCAD MASTER® produces "loom control" files compatible with:
- Stäubli™ punch machines; auxiliary programs are supplied to control the punchs via serial lines.
- Stäubli™ CX860, CX960, and CX1060 Jacquard heads; a program is provided to write Stäubli format 3.5" floppy discs for their JC 3, JC 4 and JC 5 controllers.
- Bonas™ (.EP) files for Bonas electronic heads (standard DOS files, transferred to the Bonas system either via network or 3.5" floppy).
- Weavette™ '.PUN' files for punching cards via a Weavette™ system.
- Actrom-5 punch machine and TIS files (DOS).
- Grosse .WEA files.
- Muller .UPT and the newer .UNI files for Muller Needle and Airjet Looms.
- Special formats are added as needed.

Image Formats

JacqCAD MASTER® supports multiple image formats: standard images from PICT or TIFF files, and Expanded Images which contain a textile compatible structure. Standard images, which include those produced by scanning or painting programs, are organized simply by row and column. Expanded Images are structured by Pick and Shuttles and contain information about regulators and shuttle box assignments. Up to 32 'logical shuttles' can be assigned per Pick, each logical shuttle may either be 'always activated', as for Damask fabric or ground picks, or 'conditionally activated' under control of the design colors, as for Brocade fabric.

Image Editing

Editing color (256 simultaneous colors from a palette of 16 million) and grayscale (256 level) standard or Expanded images, including the ability to draw lines, rectangles, ovals , text, to fill or outline arbitrary shapes, or to paint with a brush or airbrush is supported. *JacqCAD* MASTER® allows the user to cut and paste image selections of arbitrary shape, with optional End or Pick Mirroring, within or between windows.

Expansion

JacqCAD MASTER® provides for very flexible 'expansion' from standard to Expanded format. Pick and/or End mirroring may be specified as part of the expansion, along with banding and scaling. Design colors may be duplicated into the resulting pick(s) and shuttle(s) or may be changed to other colors on a shuttle by shuttle basis. Regulators are assigned by the user to logical shuttles and can later be changed on a shuttle by shuttle basis. Expansion by color strip has been added for compatibility with design files from other systems and simplified expansion allows a quick expansion from 1 to 6 ends or picks per line.

Tools & Functions

Tools are provided to create and save weaves in Weave Library files, apply weave assignments to design colors, overlay these weaves on the design, and to cut weaves into the design itself. Weave dimensions may be as large as the entire design. Up to 256 colors are allowed with separate weave assignments to each color; each weave assignment includes independent alignment (starting End and Pick) and weave advance mode (by Pick, by Card, by Shuttle Group, or by Color Use). Weave overlaying is efficient – under 6 seconds for a 256 color 1152x1000 design on a Power PC 8500. The Weave Overlay may be updated easily before cutting into the final expanded file.

JacqCAD MASTER® provides powerful facilities for defining complex shapes and for using these shapes for cut/paste, outlining, filling, or limiting the range of many other operations.

A powerful Find and Replace function is provided in which the user defines a target pattern, for instance a float, and a replacement pattern. Find Next, Replace, Replace All, and Count are supported. Replace All, for example, will find all matching patterns and replace each with the desired new pattern. Symbolic patterns are supported; these search for patterns of color usage rather than for specific color patterns. Find and Replace can also be used for inserting a third color between two colors, for contour binding, and for general clean up.

JacqCAD MASTER® is designed to minimize the amount of repetitive work a designer must do; it provides for the saving of complex settings to files and for their subsequent reuse, in part or in whole. For example Weave Assignments (color by color assignment of Weave, Starting Position, Cut Polarity, and Weave Advance Rule) can be saved to a Weave Assignment File for later reuse, either 'as is' or as a starting point for changes. Similar files are provided for End Expansion and Pick Expansion rules, Find/Replace patterns, etc. Most of these files can also be converted to text files for printing so the settings can be saved in human readable form with the rest of the job paperwork.

Special Features

JacqCAD MASTER® provides facilities for retrieving images from Loom Control Files (black / white 'cut' or 'miss'), essentially a 'card picture' which is useful as a final check. It also allows the creation of a 'Yarn Map Image' which displays for each Warp/Weft crossing the color of the yarn which is 'on top'; user specified yarn colors, including Warp sequences (alternating, banded, etc.), are fully supported as is selection of the fabric face to be viewed. Please note that this Yarn Map is a fabric engineering tool intended for use by the designer in checking box sequences, warp effects, and so on. Although it is not intended to be 'Fabric Simulation', it can provide helpful information as to the relationship between weaves being used in the design.

Technical Support

JacqCAD MASTER® 'Help Balloons' feature has been updated to Help Windows which include a list of all the keyboard commands, a description of Tool Box items and Result Window description, JacqCAD Co has a qualified technical support staff to assist customers with any questions they may have concerning *JacqCAD* MASTER®.

System Requirements

JacqCAD MASTER® requires any color Macintosh computer (II, Quadra, or PowerPC) with a minimum of 24 megabytes of memory; 40 megabytes of RAM is recommended for optimal operation. A large hard disc is needed for storage of files and applications. Some form of backup storage device is also recommended. All standard display sizes are supported; these range from small 13" (640x480) to large 24" (1600x1280) displays. Multiple monitors can be used to display a single window across 2 or more monitors or to view a single repeat on one monitor and a repeated view on the 2nd monitor.

About This Manual

The major sections of this manual are :

Overview - The remainder of this introduction is an overview of *JacqCAD* MASTER®'s features. This section is recommended reading for all new users.

Menus - Eight chapters with item by item explanations of Menu features.

Toolbox and Results Window - Item by item explanations of the Tools, and a summary of various information provided in the results window and its use.

Keyboard Functions - A complete listing of the key commands relative to Menus and Tools as well as key dependant functions.

Note: Some features that are of limited interest to typical JacqCAD MASTER® users are shown in smaller italicized type to indicate that they may safely be skipped over.

Overview

In the discussion which follows, the form Menu:Item, e.g. Edit:Paste, is used to identify menu choices by the menu in which they are found and the particular item chosen. Tools are identified by their name, e.g. Wand Tool. Some choices require that the Option, Command, Shift, and/or Control keys be held down simultaneously with the Menu or Tool choice or use; this is indicated by one or more of the following :

Name	Abbreviation	Keyboard Equivalent
option	(*opt)*	OPTION
command	(*cmd)*	⌘
shift		SHIFT
control	(*cntrl)*	CONTROL
space		SPACEBAR

JacqCAD MASTER® can be thought of as providing 6 processing phases:

1) Image Creation or Import

Sketching in a design,scanning artwork, or importing files from other applications.

2) Image Editing

Modifying an image using painting and cut/paste tools.

3) Expansion

Expansion of an image into a format structured by Picks and Logical Shuttles (cards), optional-lywith a variable number of cards per Pick, that displays 1 pixel for every thread in the basic design repeat.

4) Weave Overlaying

Overlaying weaves on the design followed by permanently cutting them into the design.

5) Box (shuttle)Assignment

Assigning physical shuttles (boxes) or box sequences to the Logical Shuttles created during expansion.

6) Application of Castout

Mapping of Design Ends into Machine Hooks (including Box Motion and Regulator hooks) and conversion into one of the various loom control file formats.

The sequence of these 6 phases is not rigid; for example: Image Editing is often used both before and after Expansion, Weave Overlaying is often done before Expansion (using suitably compressed weaves) as a guide in editing as well as after expansion, and Expansion is sometimes done several times. The only fixed aspects are the obvious ones, i.e. that the image must be created or imported before anything further can be done, that Expansion must precede Box Assignment, and that Expansion, Weave Overlaying, and Box Assignment must be completed before the Castout is applied.

1) Image Creation or Import

New or blank windows for sketching in new designs are created by **File:New** (default size set in Options:Preferences) or

⌘ N

Existing images are opened with **File:Open** which supports PICT files (the Macintosh standard format) as well as TIFF files (IBM standard).

⌘ O

All or any portion of an existing PICT file can be selected and scaled to any desired size using **File:Scaled Open**; this is especially important in converting artwork created by other programs to correctly dimensioned textile designs.

Other supported formats can be accessed through **File:Open As...**, including **RLS** files (Weavette standard image format), **P-Job** files, **TIFF**, **JH PIC** files, **E.A.T.** unix, **Grosse**, **Hell Scanner**, **Sophis**, and **NG. PAT** files.

JacqCAD MASTER® normally saves all images in PICT format, but special formats can be created using **File:Save As**; these include RLS, palette, and PIC files.

File:Save is used to update or save the file to match the current (edited) screen image.

⌘ S

File:Close to update and put away the image.

⌘ W

File:Revert to Saved to bring back the previously saved version.

⌘ R

File:Save Snapshot saves the current image to serially numbered PICT files (used to save intermediate editing stages).

Multiple windows can be present to permit workspaces or copying from one image to another. Each image can contain up to 256 colors and each image window can make use of its own unique set of colors.

Image windows are limited to a maximum of 16,200 Ends in width by 32,000 Picks.

2) Image Editing

Images are viewed in the correct 'as woven' aspect ratio (i.e. using rectangular pixels); this ratio is set to the default value (set to default aspect ratio set in **Options:Preferences**) when a blank window is created (**File:New),** or when a PICT file is opened, and can be changed in **Options:Change Aspect Ratio…**. The requested aspect ratio can be seen by **File:Get Info**.

The image view can be 'zoomed up' using the **Magnifying Glass Tool** and 'zoomed down' using *opt*-**Magnifying Glass Tool.**

Click = Zoom up

option Click = Zoom down
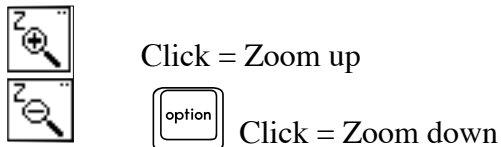
The zoom function can also be called while another tool is selected by using ***cmd-space-click*** to zoom up and ***opt-cmd-space-click*** to zoom out.

⌘ **SPACEBAR** Click **= Zoom up**

option ⌘ **SPACEBAR** Click = Zoom down

Double-clicking on the **Magnifying Glass Tool** in the **Tools Window** will restore 1:1 zoom (minimum).

Scrolling can be done using the **Hand Tool** , using the scroll bars on the right and bottom margins of the image window, or by holding down the **Space Bar** (which temporarily turns whatever tool is in use into the **Hand Tool**). The only exception to this is when the **Text Tool** is in use.

Clicking on the '**Zoom Box'** (upper right hand of image window) will scale the image such that the entire image will be visible and at the correct aspect ratio; clicking in the image will then restore the previous zoom settings and scroll the image so that the area clicked upon is centered in the screen. This is the preferred means of navigating in large images and is much faster than zooming down, scrolling, and then zooming back up. Up to 16 bookmarks can be set to remember a specific window, location, zoom level and grid status with keyboard short cuts for four; these allow instantaneous jumps between different view.

The painting tools include the **Pencil, Paint Brush, Paint Bucket, Eraser, Line, Airbrush,** and **Text Tools.** The most recent change can always be reversed using **Edit:Undo**. Holding down the **Shift Key** constrains most tools to horizontal or vertical paths. Colors can be picked up using the **Dropper Tool** in the Image Window, or by *opt*-**any painting Tool** which will pick up the color the tool is currently over. The color of the **Eraser Tool** can be set using *opt*-**Dropper Tool** or *opt*-**Eraser Tool.**

The attributes of the **Paint Brush, Line,** and **Airbrush Tools** can be set by double clicking on the appropriate tool in the **Tool Window**.

Various selection tools are provided including the **Rectangle, Oval, Polygon, Lasso, and Wand Tools** (selects contiguous areas of color). Subsequent selections can be **added**, **subtracted**, or **intersected** (overlapped) with the existing selection by modifying the selection tools with combinations of the **opt-**(Option)**, cmd-**(Command)**, shift-,** and **cntrl-**(Control) keys. More information on the various key commands can be found in the **Key Commands** section of this manual. The outline of the selected area is displayed as a moving dashed line (or Marque) around its perimeter.

Selections can be created in a variety of ways, e.g.

1. **Edit:Select All** or double clicking on the Rectangular Selection Tool will select the entire imag
2. The **Rectangle and Oval Selection Tools** will create selections of the corresponding shape whose size is adjusted via the mouse or stylus pen; if the Shift Key is held down during sizing the corresponding shapes will be a proportional square or circle. This type of selection is called a "constrained" selection. The dimensions of the selection are displayed in the Results window during sizing.
3. The **Polygon Selection Tool** allows the creation of any arbitrary polygon selection, i.e. any number of connected straight lines, simply by clicking on the corners.
4. The **Lasso Selection Tool** allows the selection of any arbitrary shape, e.g. for tracing the outline of a design element.
5. Two **Wand Selection Tools** are provided. The 'Normal' Wand selects an area of contiguous color starting under the Wand and flowing outward until a different color is seen; in other words it selects the area that would be painted if the Paint Bucket were used at the same location. If the Shift Key is held, all colors in the currently defined Color Group (see below) are treated as identical colors; this permits the selection of complex objects composed of any number of colors as long as they are bounded by colors not in the Color Group. If the Cmd Key is held, the selection is done over the entire image rather than flowing outward from under the Wand; this allows selections of all areas of a certain color, or color group if Shift is also held, in the entire image.

The 'Proximity' Wand works the same as the 'Normal' Wand with the exception that it selects regions of similar colors. Double-clicking the 'Proximity' Wand tool allows one to adjust the range of colors considered to be similar.

Modifying Selections

Selections can be modified and used in a variety of ways...

1. Moved by dragging or using the **Arrow Keys**.

$$\boxed{\leftarrow} \quad \boxed{\downarrow} \quad \boxed{\rightarrow} \quad \boxed{\uparrow}$$

2. Saved to files using **File:Save As... Outline**.
3. Modified by using the **opt-, shift-,** and **cntrl-** keys in conjunction with the **Arrow Keys** to grow or shrink the selection in any direction; Reversed (turned inside-out) by **Special:Reverse Outline**.
4. For painting operations such as outlining (**Edit:Draw Boundary**), filling (**Edit:Fill**), in versio (**Edit:Invert**), or for rotation and/or scaling (**Edit:Flip, Rotate, Scale: Scale Selection...; Rotate and Scale...; Rotate CCW; Rotate CW; Flip Vertical; Flip Horizontal**).

5. For cutting or copying and pasting operations using **Edit:Cut, :Copy, and :Paste**. Pasting can include **Transparency Blend**, **End Mirroring**, and **Pick Mirroring** using **Options:Show Paste Control**.

6. **Special:Sel Out Mem** selects one of 4 outline memories. **Special:Use Out Mem** allows the current outline to be stored in the selected Outline Memory (Copy). Stored outlines can be Reversed, Pasted back into any image, or Swapped with, Added to, Subtracted from, or Intersected with the existing outline. The Outline Memories permit the creation of very complex selections.

7. **Repeat pasting** is supported, by default the repeated pastes step over by the width of the selection (**Tab Key)** or down by the height of the selection (**Return Key)**, but any combination of horizontal and vertical step sizes may be set (**double-click** on **Hand Tool** in **Tools Window**) for more complex repeat patterns. **Shift Key** reverses the direction of the Tab and Return keys (to left & up respectively); **Enter Key** acts as the return on a typewriter, i.e. moves down one line and across to the left margin (defined as the last position to which the paste was moved by dragging, arrow keys, or an Enter).

8. The most recent change in the current selection can be undone via **Special:Undo Selection Change**; selections that have disappeared due to the use of, e.g., the Pencil Tool can be restored via **Special:Restore Outline**.

*Note: Most editing operations can be reversed using **Edit:Undo**, though only the most recent change is 'undo-able'. Frequent use of **File:Save**, **File:Save As, or File:Save Snapshot** will provide greater protection against errors.*

Color Groups

Up to 16 separate **Color Groups** can be defined and changed via the **Special:Color Group** submenu. A Color Group is defined by creating a selection and then selecting New in the Color Group submenu; all colors found in the selected area will be placed in the group. Similarly, other selections of colors can be Added to or Subtracted from the Color Group. The color group can be Reversed; this will exclude all colors that were in the group and include all colors that were not. The Color Group can be viewed and changed using Edit.

The Color Group is used with:

1. **Image:Change Colors…** as an efficient way to change all the colors in the group to a single color; this is very useful for 'posterizing' scanned artwork.

2. the Wand Selection Tool by holding down the Shift key when using the Wand; all colors in the group will be treated as a single color by the Wand.

3) Expansion

Expansion, called using **Weave:Expansion…**, serves two basic purposes :

1. To enlarge a compressed image (e.g. '2 for 1') into a full sized image where every yarn (warp and weft) intersection is represented by a pixel, and

2. To organize the image into Picks (each representing an advance of the fabric) which in turn contain one or more Logical Shuttles (cards) representing weft threads. Each line in the image will represent a single card and will contain information about its Pick, Logical Shuttle, Physical Shuttle, and Regulators (Warp and Fabric).

Up to 32 Logical Shuttles are supported; these are assigned to real shuttles (physical shuttles or boxes) during the subsequent Assign Boxes phase. Though most looms only support 8 boxes, the larger number of Logical Shuttles makes possible "double picking" (using a yarn twice within a single pick) and other special techniques.

Expansion is done in one or more ***Pick Ranges***; completely different sets of expansion rules may be used in each Pick Range to allow great flexibility.

Within each Pick Range, Expanded Picks (the *destination* image) are created from a selected range of Picks (lines) in the image being expanded (the *source* image). Picks in the source can be scanned in normal or reverse order (creating a Pick Mirror), and can be used one by one or with skipping (e.g. every other one, every third one, etc.). Each source pick used can be used to create a single destination Pick or can be *replicated* to produce up to 10 destination Picks. Skipping combined with Replication allows special expansions such as "2 for 3", i.e. 3 destination Picks from every 2 source Picks.

Each selected Pick is assembled from the source line using End Expansion Rules. These permit similar flexibility in selecting which Ends in the source line will be used, and in what order, to fill in the destination Pick. End Mirrors are readily implemented as are variable expansions (e.g. 3 for 1 along the borders but 2 for 1 within the center). Pick shifts are also support to permit pattern repeats with pick shift.

Each Pick created by the End Expansion Rules is then expanded into one or more Logical Shuttles (Lances) using Pick Expansion Rules. Each Logical Shuttle is assigned a default color, Warp and Fabric Regulator status, and an Activation status (Always Active, i.e. will occur in every Pick, or Conditionally Active, i.e. will occur only if activated by the placement of an activating color, see below).

A color mapping table is defined for every Logical shuttle which contains a unique color assignment for every color used in the design. This assignment can be 'none' or any color and can be 'passive' or 'activating'. For example, for design color 7 the assignment in Logical Shuttle 4 could be color 107 meaning that every occurrence in the Pick of color 7 would result in color 107 being placed in Logical Shuttle 4. For design color 8 the assignment could be color 208**+** indicating that this color (208) would be placed in the Logical Shuttle and would activate that Logical Shuttle if it was a Conditionally Active shuttle. Finally, design color 9 could be assigned to 'none'; where it occurred the Logical Shuttle would simply be filled with its Default Color.

Conditional activation is the key to designs which use supplemental weft ("Tissue"), since it permits shuttles to be triggered only as needed. Passive assignments are useful for creating 'shadow' colors used to control back-binder weaves which will be required if the shuttle is activated by some other assignment.

The End Expansion Rules and Pick Expansion Rules can be saved to files (**EExR** and **PExr** files respectively) for later reuse.

The result of Expansion is an Expanded Image which contains one line for every activated Logical Shuttle. Physical Shuttles are all unassigned. The position display in the Results Window will display the usual X,Y, and color values plus Pick, Logical Shuttle, and Physical Shuttle values along with indicators of the activation status (Always or Conditional) and Warp and Fabric regulator status.

4) Weave Overlaying : overlaying weaves onto the design

Weaves are created by sketching in their pattern using the painting tools, selecting one repeat of the weave, and calling **Weave:Convert Select to Wve…** to create a Weave (**Wve**) file.

Weaves are assigned to colors through **Weave:Assign Weaves**; up to 256 colors and 256 weaves are supported. Each color can be assigned a weave with individual weave starting position (End & Pick shifts), polarity (normal or reverse), cutting color, and weave advance mode (By Card, By Pick, By Color Use, or By Shuttle List). Weaves are loaded in from **Wve** (single weaves), **WLib** (weave library), or **WAsn** (weaves plus color assignments) files.

Weaves are displayed as an overlay on the underlying image. The display of this overlay can be turned on or off by **Weave: Weave Cuts: Weave Marks Off; Whole Wve Marks; Dot Wve Marks**. The appearance of the overlay can be changed through **Weave:Wve Display Prefs…** to mark weave cuts with either a change in the color of the entire pixel or a dot of contrasting color in the center of the cut pixel. The marking colors used are selected automatically but can be adjusted for optimum appearance. The corners of every pixel can also be marked through **Weave: Wel Grid: No Grid, Line Grid or Dot Grid,** as an aid to 'navigation'.

The weave overlay can be updated following changes in the image (due to editing) by **Weave:Update Wve Overlay**.

Weave:Assign Weaves also allows the user to save Weaves and Weave Assignments in Weave Assignment (**WAsn**) files for later retrieval. Related weaves can also be stored in Weave Library (**WLib**) files (up to 256 weaves) for convenient storage and retrieval of weave families.

Overlain weaves can then be cut into the image itself through **Weave:Cut Weave into Design…**. The weaves are usually cut into the image using color 255 (black) which is the color recognized as 'cut' when creating loom control files. ('Cut' is a hole in the cards or a warp lifted by the electronic head.)

5) Box (shuttle) Assignment

Physical shuttles (boxes) are assigned to the Logical Shuttles created during Expansion using **Weave:Assign Boxes…** and can be assigned either directly or through Box Sequences. For example, Logical Shuttle 3 can be assigned directly to Box 2, or it can be assigned to Box Sequence 2 which might be defined as Boxes 1,3,5 (i.e. 1,3,5,1,3,5,.....). Box Sequences can exceed lengths of 5,000 and can be saved in, and read from, text files.

These assignments can be made over the entire job, or over user specified card ranges when it is desired to change the box assignments in different parts of the job.

Box assignments, and regulator status, can also be changed on a card by card basis to meet special requirements.

6) Application of Castout

Weave:Make Castout File…

Provides powerful rule based tools for creating the files used to map from Design Ends, Shuttles, and Regulators into Machine Hooks. Placement of design repeats across the loom's width including End Mirroring is fully supported.

The rule based approach greatly simplifies the task of defining a Castout; in most cases just one or two rules will suffice to define the entire Castout. Creation of castouts need only be done once as the Hook files can be saved for later use.

Weave:Punch As…

This function is used to apply a Castout file to an Expanded Design to produce 'ready to weave' files for transfer to the loom or punch. Advanced box motion (on previous card) is supported for those looms which require it.

Miscellaneous:

A generalized and very powerful **Find and Replace** feature is provided. This allows the definition of matching and replacement patterns using **Special:Find…**. Patterns can be defined either by manual entry of color numbers, or by selecting a rectangular area prior to calling Find. Pattern sizes are allowed up to a maximum 3072 cells (e.g. 1x3072, 2x1536, 16x192, 56x54, etc.). Each color in the pattern to be matched (found) can be set to 'don't care', a color to be matched, or a color to be not matched; each color in the replacement pattern can be set to 'don't change', a color to be used as the replacement, or a value to add to the color found at the location. Patterns can also be defined in terms of 'symbolic' colors, e.g. 4 pixels of color A followed by 3 pixels of color B; this provides a very powerful tool for finding and altering 'shapes' independent of the specific colors used.

Special:Count All
Used to count and report the number of matches found.
Special:Find Next
Locates and selects the position of the next match found.
Special:Replace
Finds the first match and replaces it with the replacement pattern
Special:Replace All
Finds and replaces all matching patterns.
Special:Preset Finds
Provides a number of built-in Find & Replace patterns useful for finding and fixing floats, for smoothing jagged corners, or for finding weaves

All the above will work within the selection area if a selection is in effect, otherwise they work within the entire image. Searching is done from Left to Right and from Top to Bottom.

Find and Replace is especially useful for finding and fixing problems that occur along weave boundaries. Use of 'don't care' colors in the match pattern permits searches for any shape target.

Measurements

Histograms displaying which colors are used, and how often, can be displayed using **Measure:Show Histogram**; these can be for the entire image or for any selected area. **Measure:Color Use Summary** will produce a list of colors used and on which Picks the first and last occurrences of each color were seen and how many Picks contained each color; in Expanded Images the same information is also summarized by Logical Shuttle and by Box which provides a quick and convenient way of measuring yarn usage for pricing. **Measure:Float Lengths** provides a listing of floats by length useful in controlling floats. **Measure:Warp Balance** measures the relative activity (face changing) of all warps to help identify warps which may become too tight or too slack. **Measure:Two in Shed** and **:Two in Warp** locate yarns which follow excessively similar paths, even in multi-layer constructions. The **Ruler, Pointer,** and **Angle Tools** can be used to measure distances, locations, and angles for display in the **Results Window**. Any of these measurements can be printed or exported to a text file using **Measure:Show Results**.

Color manipulations

Each PICT file supplies its own color table. A file's color table can be replaced with standard palettes by **Options:Grayscale, :System Palette, or :256 Color Spectrum**. A palette from another file can be used by first opening that file, then opening the desired file using **File:Open** and checking the **Keep LUT** (Look Up Table) box. Using **File:Open As:Palette** will open a saved palette and apply it to the current image. Palettes from any file containing a CLUT' (Color Look Up Table) resource can also be obtained by using **File:Open As:Other Palette. Options:Map to New Palette** is used to change to a new palette while preserving the image's appearance.

Options:Change Colors…

This function allows the user to change the colors within the image, e.g. to merge several colors into one. The Color Group can be used to quickly change an entire group of colors to a single color in Change Colors…, simply define the Color Group, enter Change Colors…, click twice on the desired final color, and then click on Color Group ==>; all colors in the Color Group will be mapped to the desired color. This is very useful for 'posterizing' scanned images.

Options:Re-order Colors…

This is used to sort the palette by use, hue, brightness, value, or into arbitrary sequences.

Any color can be changed by double-clicking on it on the **Color Micro-Palette** or *ctrl*-**Dropper Tool** in the image window; this will bring up the standard color picker dialog which provides complete flexibility in changing the color.

Selected colors can all be changed to a single color with **Image:Apply LUT** or converted to black on a white background using **Image:Binary:Make Binary.**

Grey scale images, and colored images that have been sorted by brightness, can be manipulated by various procedures in the **Image** menu; these include filtering (smoothing, sharpening), edge tracing, noise reduction, and convolution with any desired kernel for special effects. Colored images can also be reduced to grey scale equivalents using **Image:Convert to Grayscale**. Binary images can be further manipulated via the **:Binary** sub-menu.

Repeat display functions

    Options: Set Repeat View lets the designer move an image's repeat seams into the center of the image - useful when editing a design into repeatable form.

    Options:Make Repeats Window… creates a new window which will contain several repeats of the original window. Plain, End Shift, and Pick Drop repeat patterns are supported with End Shifts or Pick Drops of 1/2, 1/3, 1/4, or 1/5 the corresponding image dimension; up to 5x5 repeats can be displayed and each repeat can be mirrored independently in the Ends or Picks directions. After changes have been made in the base window, **Update RepeatsWindow** will update the repeats window, or **Live Update** can be set so that all changes in the base window are automatically applied to the repeats window. The repeats window can itself be used as a design image.

CHAPTER 2: THE FILE MENU

New... ⌘ N

Creates a new image window using Color 0 as background color. The size and aspect ratio (Pick/End) of the new window are set in the New Window dialog; these can be set as large as 16,000 x 30,000 and the aspect ratio can range from 0.05 to 20.0. The default settings for New Window size and ratio can also be set in the Preferences settings in the Options menu. If an image selection is present the default size for the New Window is set to the selection size.

Open... ⌘ O
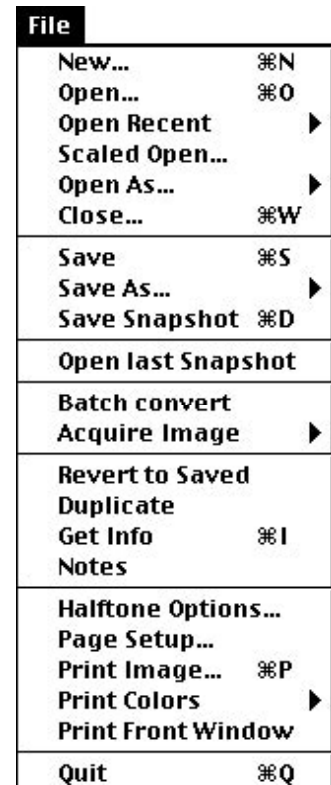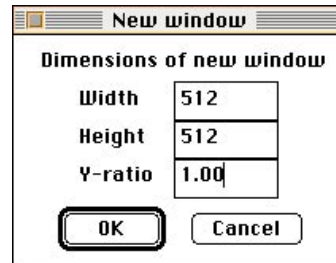
JacqCAD MASTER® currently supports three image file formats (TIFF, PICT, and Expanded). PICT format is the standard format.

 1. 8-bit TIFF files, of type "TIFF", created by many other Mac programs. TIFF files that were created on other systems, such as an IBM-PC, can be opened using the "Open As...TIFF" command.

 2. PICT files, of type "PICT", created by most Macintosh programs. Checking "Keep LUT" (Look Up Table) in the Open dialog box will force the newly opened image into the current color palette, instead of the one contained in the PICT file. This can be used to reduce colors by forcing a picture into a custom palette.

When a PICT file is opened the user is asked for the aspect ratio (Y-ratio). If the PICT file has never been processed by *JacqCAD* MASTER®, then the default Y-ratio value set in the preferences dialog will be offered as the default value; if the PICT file has been created by *JaqCAD* MATER®, then the Y-ratio in use when it was last written will be offered as the default.

 3. Expanded Image files are created and used only by *JacqCAD* MASTER®; these are very similar to PICT files but contain additional information about Pick numbers, Logical & Physical Shuttles, and Regulators.
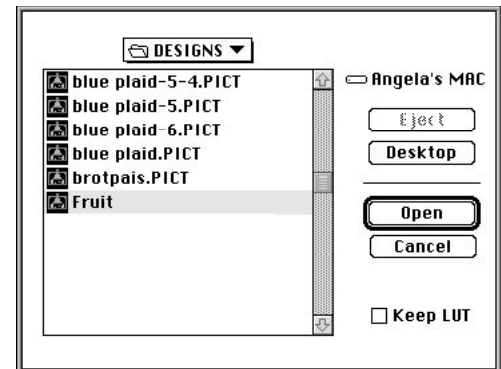
Check **Keep LUT**   (Look Up Table) if the image being opened is to be displayed using the current color palette, rather than the one saved with the image. This feature can be used to combine PICT files with different palettes into a montage.

Note: when a PICT file is drawn on the screen, and the image and screen LUTs are different, the pixel values are remapped to make the colors consistent. This may cause some colors that were separate in the PICT file to merge into a single color, for example two close shades of orange when the screen LUT only contains a single shade. This effect can be used to 'posterize' an image by using a palette that contains fewer shades than the original image.

Open Recent

The use of Open Recent will provide a list of .PCT, .TIF and .EXP files that have been recently edited by the user.

Scaled Open...

The Scaled Open command can be used only with PICT files; it allows you to select an 'Area of Interest' (AOI) within the PICT file image and to scale that AOI to any desired size. Please note that the coordinates are in 'Ends and Picks'; in other words the end in the lower left corner is End #1, Pick #1, while the end in the upper left corner (referred to as pixel 0,0 by most Macintosh applications) will be End #1, Pick X where X is the highest Pick number.


```
            Select & Scale from PICT input file
PICT file :: Flower #1.PICT
                                          = UPPER Left =
                          Width   Height    End      Pick
             PICT file     200     150       1       150
     Area Of Interest      180     130       11      140
       Scaled Image        240     100
    Pick/End Scaling     1.733         End Scaling  1.333
                                       Pick Scaling 0.769
  DISPLAY Pick/End ratio  1.733
  Blank Margins :                             ( Cancel )
                          0   Top
       Left     0              0   Right
                          0   Bottom
                                                ( Ok )
  Final Image size = 240 H 100                     ⌘P
```

For example, the PICT file contains an image that is 200 pixels wide and 150 pixels high. The area of interest is surrounded by a 10 pixel wide margin that needs to be ignored; i.e. the portion desired is only 180 pixels wide by 130 pixels high. The final image will be 240 Ends wide and 100 Picks high:

1. Set the Area Of Interest = 180 wide, 130 high, upper left at End 11, Pick 140
2. Set the Final Image = 240 wide, 100 high
3. Set the Display Pick/End ratio to whatever is appropriate fo the design.
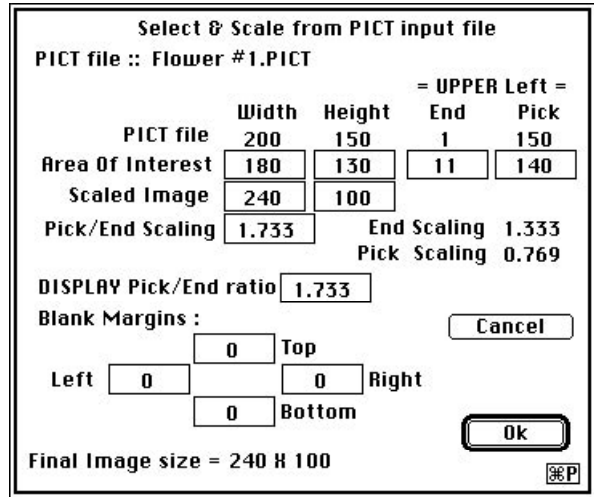
⌘P   Notice the Print icon in the lower right corner. This indicates the ability to print the window to keep a record of settings.

Blank Margins

The Scaled Open dialog box also allows the user to add margins of any size to the Top, Bottom, Right, or Left edges. The new margins will appear in the designated area of the new image in the current eraser color. Example: The PICT being opened is 580 wide and 790 high. To add 50 ends to the right side of the image, enter 50 into the Right Blank Margin entry box. This creates a new untitled image with a size of 630 x 790 with the original image located on the left side of the newly created image bed.

Open As...

The Open As command can be used to read image files created by non-Macintosh based systems, or for importing custom color palettes. It allows you to select one of the file types RLS, P-JOB, TIFF, JH PIC, EAT Unix, Grosse, Hell Scanner, Sophis, NG. PAT, Muller MD, Muller .FNT>PICT, Viable .FNT>PICT and Custom or Palette.

Palette

Opens and applies a color palette created with *JacqCAD* MASTER® to the currently active image.

Other palette

Select "Other Palette" to import 256 color palettes from other images that contain 'CLUT' (Color Lookup Table) file resources.

RLS

Select RLS to open an RLS file. If the RLS file was created by *JacqCAD* MASTER®, the original color table and aspect ratio (Y-ratio) will be recovered automatically. If the RLS file has been transferred from a Weavette® system, the aspect ratio will default to 1.00 and the standard Weavette® color palette will be used.

P-Job File

This selection imports the P-Job file created on the Viable Weavette®, which has been copied from a Viable formatted 8" diskette. Such files are copied to the Macintosh using the application Floppy 853 in conjunction with the SCSI 8" floppy disk drive. The file is imported as an Expanded Image, i.e. the textile structure (Picks, Cards, Shuttles, ect.) is preserved.

TIFF

Opens 8-bit grayscale or color TIFF files imported from another system, such as an IBM PC.

JH PIC

This selection imports a DOS Based PIC image file. The JH Pic format refers to some DOS based PC's currently being used in the knitting industry. These knitting sytems produce an isolated form of the PIC image format.

EAT Unix

Opens EAT image files with the original color table and aspect ratio. Such files are copied to the Macintosh using the application EAT DISK or through a network connection.

Grosse

Newer model Grosse systems will write a DOS 3.5" disk which can be read in the Macintosh super drive and opened as a Grosse DES or WEA from DOS . Files from the older model Grosse systems must be copied using the Floppy 853 application in conjunction with the SCSI 853 floppy drive.

HELL Scanner

Open HELL Scanner files from 8 inch disk using the Floppy 853 drive.
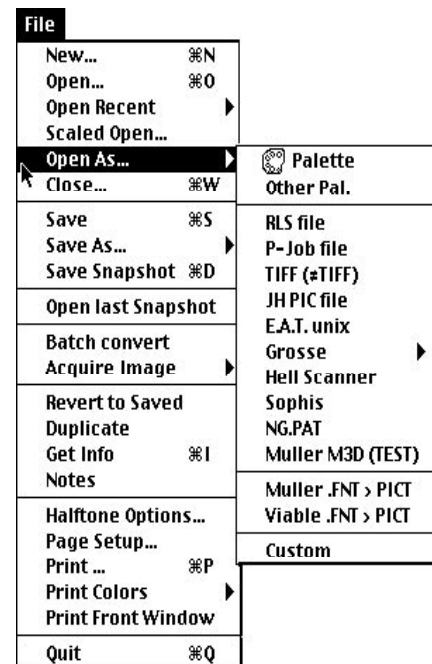
Sophis

Sophis files can be read either via a network connection, or via floppy disk, by using the Unix DISK or TAR applications. Usually these files are compressed and must be de-compressed using MacCompress. The original aspect ratio is imported but the color lookup table is not.

NedGraphics

In NG.PAT-format, colors 64...127, 128...191, and 192...255 appear to be modified copies of colors 0...63 (in order of brightness: 128...191, 192...255, 0...63, and 64...127); we assume, but do not know, that these are used for various forms of shading or weave indications. JacqCAD does NOT automatically adjust colors 64...255 so you may need to create a special palette with appropriate shades in those colors (#64...#255), or you may be able to do so on the NedGraphics system.

Muller M3D

Muller .m3d design files can be read via a floppy disk (DOS) and edited. This is still in the testing stages.

Muller .FNT>PICT   Viable .FNT>PICT

These options allow Muller and Viable custom font files to be opened and converted to .pict files. JacqCAD creates a tall, narrow .pict file with each character.

Custom

If Custom is selected then Width is the width of the image in pixels and Height is the number of lines in the image. The maximum value that can be entered for Width is 16,000 and for Height is 30,000. Offset specifies the number of bytes JacqCAD MASTER® will skip before it starts reading the pixel data. For example, use an offset of 512 to skip over a 512 byte file header.

JacqCAD MASTER® computes the minimum and maximum pixel values of 16-bit images and uses this information to scale to 8-bits. Check Swap Bytes if importing 16-bit images from "little-endian" systems, such as the IBM-PC, PDP-11, or VAX.

Custom will not work with files containing compressed data.

> *Note: this type of image import is recommended as a last resort for importing an image because of the wide range of possibilities that exist in graphic image formats.*

Hundreds of other industry image formats can be accessed by using widely available programs such as Graphic Converter, Debabelizer, or Photoshop.

Close... ⌘ W

Closes the currently active image or Histogram window, i.e., the window with the highlighted title bar. Hold down the Option key to close all currently open image windows. Typing Option-Command-W or Option-Clicking in the close box of an image window will also close all the image windows. When closing many windows, pressing Command-Period will bypass intermediate screen updates, causing the windows to close quicker.
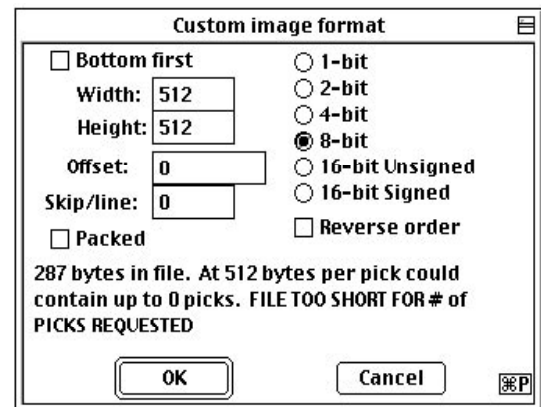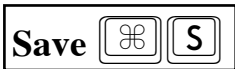
Save ⌘ S

Re-saves the currently active image to the disk. In the case of a window that was newly created using New, Duplicate, or Open As..., there will be prompted for a name. PICT, Expanded Image, and TIFF files are re-saved in their original format. In other words, TIFF files are re-saved in TIFF format, PICT files are re-saved in PICT format, and Expanded Image files are re-saved in Expanded Image format. An exception to this is RLS files which will be saved as new PICT files. If being saved in PICT or Expanded Image format, the Y-ratio in effect is also stored with the file for use as a file unique value at subsequent openings.

Hold down the Option key (notice how Save changes to Save All) to save all currently open image windows.

Save As...

Saves images, color palettes, selection outlines, or histogram values to the disk.

'**Save As...**' changes to '**Save Selection As...**' if a rectangular selection is active, allowing you to save a subsection of the image.

PICT (default format)

Saves the currently active image to a PICT file. PICT files can be exported to many other Mac programs. Because they are compressed, PICT files also have the advantage of being more compact if the image contains large areas of uniform density, which is typical of computer generated images. Unfortunately, the run length compression scheme used with PICT files is ineffective with most scanned images. Changes to Save Selection As PICT if a rectangular selection is active.

If being saved in PICT format, the Y-ratio in effect is also stored with the file for use as a file unique default value at subsequent openings.

Expanded

Expanded Images will normally be saved as full Expanded image files, but can be converted to PICT files by selecting PICT format in which case all Pick, Shuttle, and Regulator information will be lost.
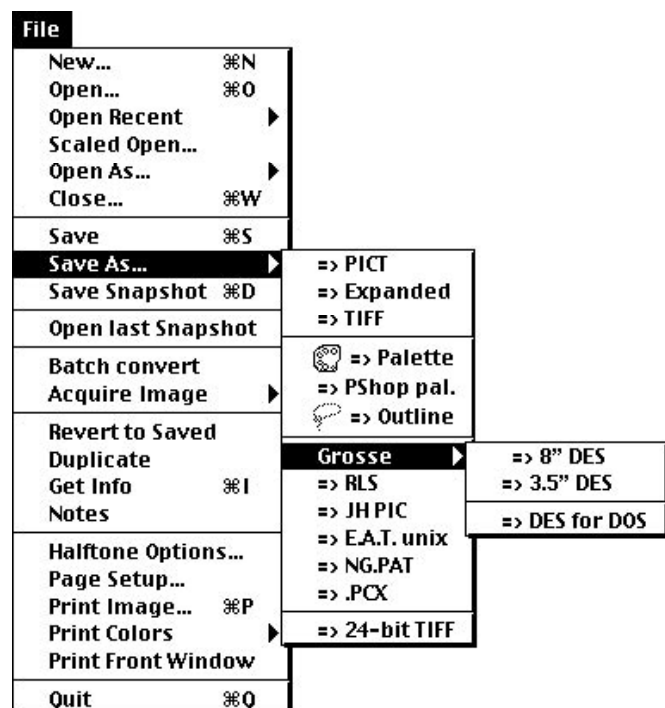
TIFF

Saves the currently active image to a file in 8-bit grayscale or color TIFF format. The options for color TIFF are as follows:

Byte Ordering

This option allows the user to use either Macintosh or Intel Byte Ordering. This gives the user greater cross platform compatibility between Macintosh and other industry wide platforms.

Gray scale image

This option saves the image in 8 bit gray scale format.

Optional Tags

Prevents the inclusion in the TIFF file of JacqCAD specific information. Although programs that read TIFF are supposed to ignore information they don't recognize, we have found one example of a CAD program that chokes instead.

Compression

None
Creates an 8 bit uncompressed Color or gray scale TIFF image file.

LZW Compression
Creates a compressed TIFF image file using the LZW compression scheme with either 'Normal' (default) or 'Differencing' preprocessing. 'Differencing' improves compression on certain image types.

PackBits Compression
Creates a compressed TIFF file using PackBits compression.

When clicking on OK button, there will be a prompt to enter a name for the new file.
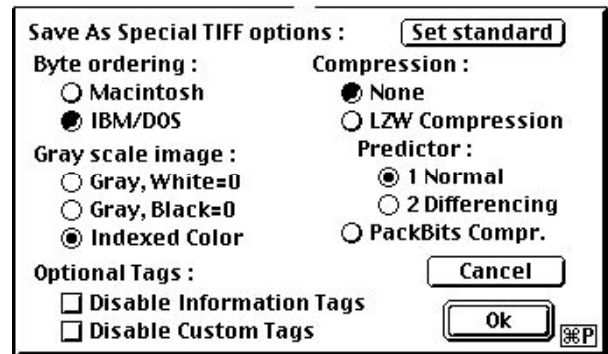
PShop Pal

Saves the current pallet as a Photoshop Palette for use in Photoshop.

Palette

Saves the color palette as a Palette file which can be opened and applied to any imagecurently open. This can be useful in representing different colorways to be applied to the same image.

Outline

When opening the Outline file, the outline will be displayed within a blank image window. It can be transferred to another image window by selecting Edit: Copy, then click on the other window and select Edit: Paste, then press the delete key to empty the selection leaving the outline in place.

Grosse

Saves the currently active image as a Grosse design file for 8 inch or 3.5 inch disk. The image can contain only colors numbered zero through sixty three, or a warning will appear.

RLS

Saves the currently active image to a RLS file. RLS files can be exported to a Weavette® system. User will be prompted for a 'Job Name' and description for compatibility with the Weavette® software.

JH PIC

Saves the image as a DOS Based PIC image file. The JH Pic format refers to DOS based PC's currently operating in the knitting industry which produce an isolated form of the PIC image format.

EAT Unix

Creates a file compatible with EAT, must not contain colors numbered zero or greater than 125.

NedGraphics

If exporting a design to .PAT-format,it is desirable to edit the image without using color #0, and then use Change Colors to move the appropriate color to color #0 just before using Save As.....NedGraphics appears to only support design colors 0...63; if the design includes higher colors there will be warning about their presence while saving in .PAT format.

24 Bit TIFF

Saves the currently active window as a 24 Bit TIFF image. Although JacqCAD MASTER® can save images in this format, reopening files in the 24 Bit TIFF file format is currently not supported.

Save Snapshot... ⌘ D

Re-saves the currently active image to the disk using a serially numbered name. Used to record a sequence of intermediate editing stages.
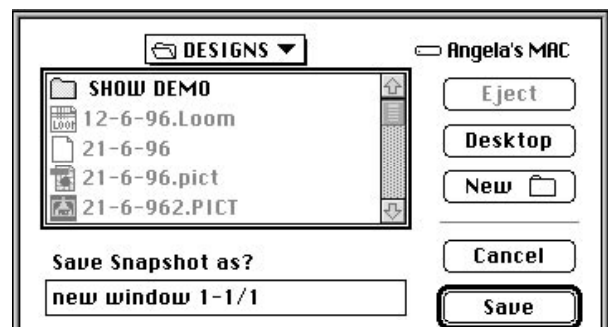
Open last Snapshot

Opens the last sequentially numbered snapshot taken of the current image in a new image window.

Batch convert

Utility to quickly convert one graphic file format to another. The user selects from the left column what type of graphic files to convert "from" and on the right what the final format will be converted "to". Supports RLS (Viable), EAT, PICT, TIFF, NedGr (Nedgraphics) and Sophis file conversions.

Make a text log file
Choosing this option creates a text file of the files converted. It is a tab delineated file listing the source file (original file), the converted file(new file), width, height and aspect ratio.
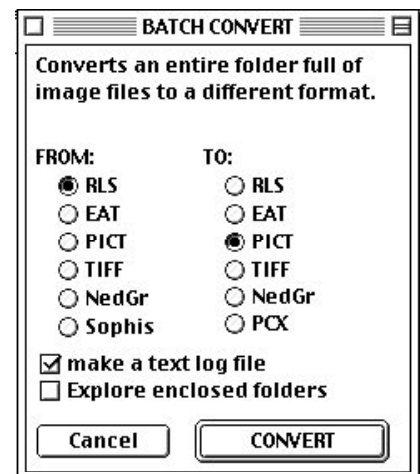
Explore enclosed folders

Within the selected folder of files, checking this will look in any folders included within the select-ed folder to identify and convert image files.

Convert

Opens the window at the right. When the desired folder containing the files to Convert appears on the rectangular "Select" button at the bottom, click on the Select button. The "Select Folder for Converted ... Files" window opens. Again choose the "Select" button at the bottom when the desired folder appears there. If the "make a text log file" option is choosen, the user will be prompted where the file is to be saved and what to name it.

> **Select folder of RLS files TO CONVERT**
>
> ▤ Desktop ⬍   ⬛ Macintosh HD
>
> 🖥 automount/Servers   [Eject]
> 💾 Macintosh HD
> 🖥 Network   [Desktop]
>
>   [Cancel]
>
>   [Open]
>
> [Select "Macintosh HD"]
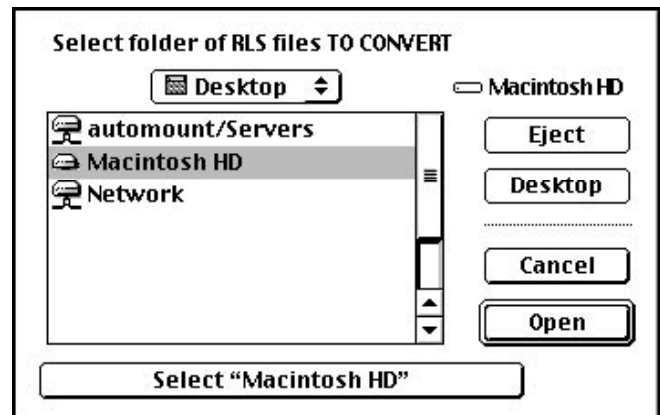
Revert to Saved

Reverts to the most recently saved version of the file, effectively undoing all changes made since the last Save command. Reverting does not work with imported images (e.g. EAT/RLS/Sophis files), but will work with all TIFF, PICT, and Expanded images.

Duplicate

Creates a new image window containing a duplicate of the current image window or selection with the same color palette as the original image. The duplicate can be edited separately and repasted into the original image or saved as a different image altogether.

Get Info ⌘ I

Displays a window giving information about the currently active image window and the status of the system. Expanded Image files will be indicated by Type:Expanded or ExpandedFile.

The entries "Magnification: 1:1" and "Y-ratio: 1.00 (1.00)" indicate that the image is currently being displayed with an overall magnification of 1:1 and that the re-quested Y-ratio of 1.00 is actually being displayed at a ratio 1.00 (the amount of difference depends on the size of the image and window and the overall magnification, but is rarely larger than 1%).

Save
Saves info about image in a text file

Print
Prints the text file.

Cancel /Done
Closes Info About window.

> lth: 3,072
> ght: 440
> e: 1,351K
>
> ation Date: Tue, Oct 11, 2005 3:22:30 PM
> t Modified: Tue, Oct 11, 2005 3:22:30 PM
> ume: "Macintosh HD" (2,097,000K free)
> lsers"
> caroljustice"
> "JacqCAD Files"
> "Tech notes"
> "Joan Fabric"
> "CastoutOct2005"
>
> e: ExpandedFile
> or Table: System
> nification: 1:1
> ck/End ratio: 1.00 (1.00)
>
> e RAM: 18,937K
> gest Free Block: 18,809K
>
> ection Type: Rectangle
> ottom Left (End,Pick): 429, 204
> Size (Ends, Picks): 160, 133
>
> rce: Carol Justice | JacqCAD MASTER® S/N
> 72814 | 10/11/05 3:22 PM
>
> [ave] [Print] [Cancel] [Done]

Halftone Options...

Used only when the user wants to overide normal halftoning; the user must also set the printer driver to "Black & White" mode.

Page Setup

Used to specify printing orientation (portrait or landscape) and scale (25% to 400%).

Note: It is recomended that scaling be specified through the JacqCAD MASTER® print dialog box. This dialog allows for the addition of scaling options, printing with grid lines, and proportional printing.
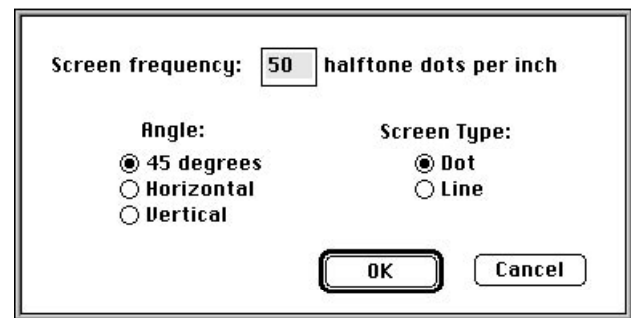
Print Image... ⌘ P

This command lets allows for printing images, selections and histograms. Color printing is supported on Postscript and QuickDraw printers. What gets printed is determined by which window is active at the time and the print command changes accordingly (e.g., to Print Image, Print Selection, or Print Histogram).

If the Histogram Window is in front then **Print Histogram** is shown in the menu; selecting it will cause the Histogram window to be printed just as it appears on the screen. (A numeric tabular version can be printed or exported as text through **Measure::Show Results::Histogram**)

When an image window is active (is the front window) the menu will show either:

Print Selection
available if a rectangular selection is active, and only the contents of the Selection will be printed, or

Print Image
in the absence of a rectangular selection, and the entire image will be printed.

In either case the following dialog shown will appear. The dialog indicates the printer being used, the dimensions of the design in Ends and Picks and the number of colors found in the design.

The horizontal resolution may be set to any value between 4 to 400 **Ends/Inch**. The vertical resolution is automatically adjusted to print the design in the specified **Pick/End Ratio** (which is preset to the design's aspect ratio, but can be changed if desired in this dialog). The dimensions of the resulting print are shown in the **Size (inches)** area.

The **reset** button returns the Pick/End Ratio to its initial setting.

Scale to fill 1 page
adjusts the Ends/Inch setting so that the design fills a single pages as fully as possible.

The schematic display indicates the number of pages required to print the design based on the resolution and ratio settings. In the example, the design is being printed at 50 Ends/Inch is shown as requiring 4 pages.

Center on page
will cause the design to be printed in the center of the page; if unchecked the design will be

printed to the upper left.

Print Title
causes the name of the window to be printed along the bottom of the page.

Top first
only relevant when multiple pages are required both horizontally and vertically; if checked the pages along the top will be printed first, if unchecked the pages in the first column will be printed first. In all cases printing begins at the top left corner.

Separations
when checked will cause each color in the image to be printed separately. The image being printed in the example above contains 29 colors so checking Separations would result in 29 separate prints (possibly only 28 if one of the colors was color #0 - white). Since each print in the example requires 4 pages, a total of 4 x 29 = 116 pages would be printed! This setting is normally used only with images containing a small number of colors - usually for designs to be screen printed.

Print Grid
when checked causes a grid to be printed over the image. The grid can be set to print as white, gray, or black lines - gray is often the best choice if the design contains both very light and very dark areas.

Fine Grid
If the horizontal resolution is set to less than 30 Ends/Inch, Fine Grid can be checked to produce a combination of thin and fat lines. The horizontal and vertical spacing of the fat lines each can be set independently to any value between 2 and 64. The default values are 8 x 8.

Print Colors

The various Print Colors options are used to print sheets of color patches organized as:

1. **Color Palette** - a simple page of 256 patches displaying the colors in the current palette
2. A series of color charts designed to quantify the performance of your color printer, including:

   • **Hue Chart**s - 256 patches varying in Hue

   • *Saturation Charts* - 256 patches varying in Saturation

   • **Lightness / Value Charts** - 256 patches varying in Lightness or Value

   • **Color Books** - multi-page book containing up to 16 pages of up to 1024 patches each which systematically explore the printer's color space

File

New...	⌘N
Open...	⌘O
Scaled Open...	
Open As...	▶
Close...	⌘W
Save	⌘S
Save As...	▶
Save Snapshot	⌘D
Acquire Image	▶
Revert to Saved	
Duplicate	
Get Info	⌘I
Halftone Options...	
Page Setup...	
Print Image...	⌘P
Print Colors	▶
Quit	⌘Q

Print Colors submenu:
- Color Palette
- Select Color Space...
- HSL Hue Chart
- HSL Sat. Chart
- HSL Light. Chart
- HSL Color Book

Color Palette

Prints the currently active color palette as 256 color patches in a full-page 16x16 array, see example at right. Each patch is labelled with its color number (0..255).

Color Palette
Printed Sunday, March 22, 1998 9:29 PM on LaserWriter 8 (QMS magicolor 2 CX)
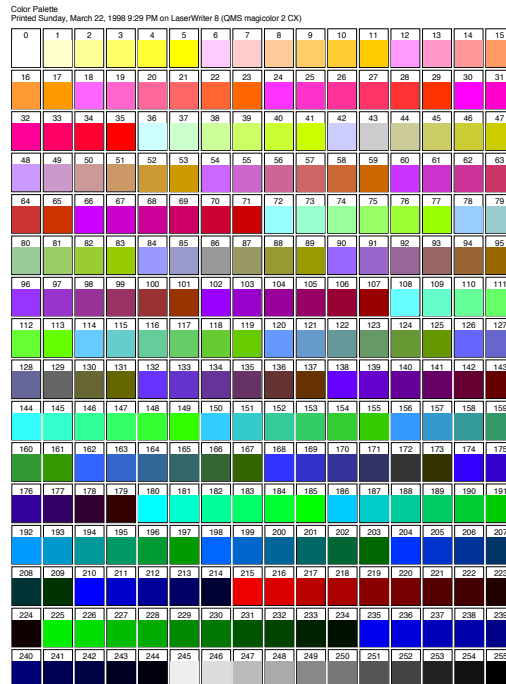
When printing the color charts, Print Colors supports both the **HSV**(**H**ue, **S**aturation, **V**alue) and the **HSL** (**H**ue, **S**aturation, **L**ightness) color spaces.

The color charts are for use with color printers to help determine the actual output of the target color printer. These charts, described below, provide the exact values of Hue Saturation and Brightness used to output each color patch. The numerical values provided with the color patches are based upon the Macintosh Color Picker which can be accessed in *JacqCAD* MASTER® by double-clicking on the Eye Dropper tool or on a color in the Color Micro-Palette.

(More information on changing colors can be found in the Options Menu chapter of this manual.)

Select Color Space…

Allows the selection of the color space and units to use when printing the color charts.

The term "color space" refers to the 3 dimensions used to describe a color (any color description involves at least 3 values). Common color spaces include "RGB" (Red Green Blue) for displays, "CYM" (Cyan Yellow Magenta) for printing, and a wide range of other derivative spaces.
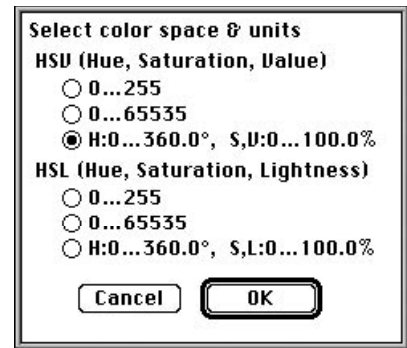
RGB

color space describes a color by specifying the amounts of Red, Green, and Blue light which are added to produce a color. This is a common color space for discussing colors displayed on a CRT monitor since these colors are formed by mixing light from each the the CRT's Red, Green, and Blue beams. Full equal contribution from all 3 beams produces white light; zero contribution produces a black display. The figure shows how other mixtures of the primaries create other colors, for example equal amounts of Red plus Green together produce Yellow.

CYM color space describes color by specifying the amounts of Cyan, Yellow, and Magenta inks which are mixed to produce the color when printing on paper. Where no inks are applied the white paper is visible while full contributions from all 3 inks result in a black surface. In practice the "black" produced by a mixture of the three inks tends towards a muddy brown, and an excessively wetted page, so most printers include a fourth pure black ink resulting in the "CYMK" color space.
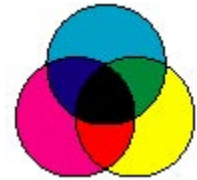
CYM color space is *subtractive* while the RGB space is *additive*; they are opposite sides of the same coin. In RGB space the contributions of each color light add to produce the final color. In CYM space each ink subtracts (absorbs) some of the white light to provide the color. For example, Yellow ink absorbs Blue light ("Minus Blue") so paper coated with yellow ink reflects only the Red and Green light towards the eye where they add to create Yellow as shown in the RGB example.

The Macintosh system provides Color Pickers for the RGB and CYMK color spaces - see examples below. In practice, users find the RGB and CYM or CYMK color spaces awkward to use. Both work in arbitrary values which do not relate in a direct way to the way we tend to conceive of colors.
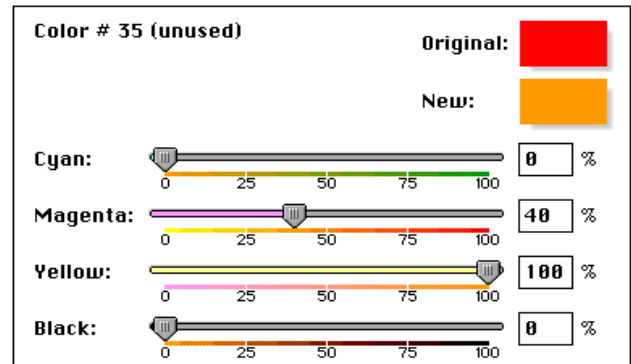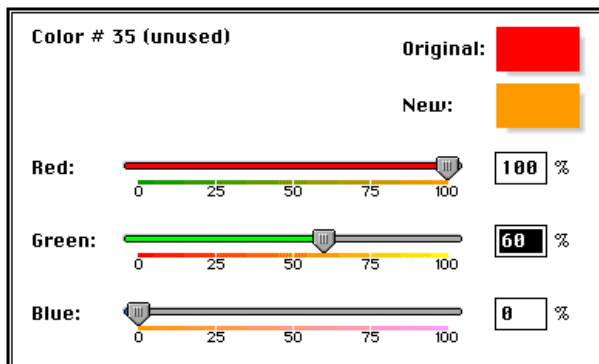
The Macintosh supports two other color spaces - **HSV** and **HSL** - which are easier to use for adjusting a color because they more closely approximate our perception of color relations.

Both use **Hue** (**H**) as the first dimension which corresponds to our sensation of color, i.e., the difference between Red and Yellow. Both treat Hue as a circular value - we begin with Red, go through orange, yellow, green, blue, purple, and back to red.
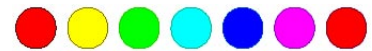
Both use **Saturation** (**S**) as the second dimension corresponding to our sense of vividness, i.e., the difference between pastels and strong colors. A 100% saturated color is as pure a color as can be produced on the screen; the addition of white de-saturates the color (turns a red into pink) until it becomes pure gray at 0% saturation.

The third dimension corresponds to brightness, i.e. the difference between a dark and bright color, but the two systems handle this dimension somewhat differently. The HSV system uses **Value** (**V**) while the HSL uses **Lightness** (**L**) for this dimension. The dots at the right show the HSV system for V=40% to V=100%.
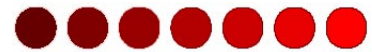
Examples of the **HSV** and **HSL** Color Pickers are shown below. Hue is measured as the angle from the horizontal while Saturation varies from 0% at the center to 100% at the rim of the color circle. Value or Lightness is adjusted separately by a slide under the color circle. The cross-hair shows the location of the adjusted color - 36°counter clock-wise from 0 (red) and 100% saturated.

Notice that the **HSV** display is shown at 100% V while the corresponding **HSL** display is at L=50%. In **HSL** L values above 50% also de-saturate the colors (see the second **HSL** display at L=90%) until only pure white is shown at L=100%.

Select either the **HSV** or the **HSL** space and the units used for the dimensions as either:

    0..360° for Hue, 0..100% for Saturation, Value, and Lightness (preferred), or

    0..255 or 0..65,535 for all 3 dimensions (obsolete)

Color Charts (HSV/HSL Hue, HSV/HSL Saturation, HSV/HSL Brightness)

Each prints a single page chart containing 256 patches varying in either Hue, Saturation, or Lightness, with the remaining two values being set by the user to fixed values. *(Example: Hue = 256 steps; Saturation = 100%; Lightness = 50%)*

The description box in the lower portion of the dialog allows the user to enter a brief description of the chart to be printed in the header area of the chart.
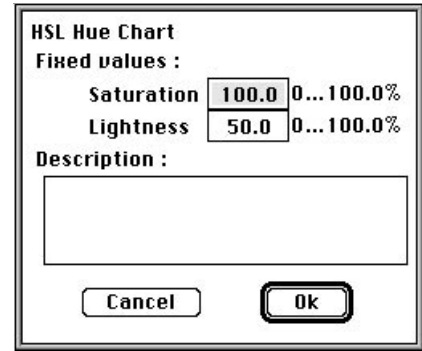
HSV/HSL Hue Chart

Prints a chart displaying a range of 256 Hue values, with user selected values of Saturation and Value/Lightness.

HSV/HSL Saturation Chart

Prints a chart displaying a range of 256 Saturation values, with user selected values of Hue and Value/Lightness.

HSV/HSL Lightness chart

Prints a chart displaying a range of 256 Value/Lightness values, with user selected values of Hue and Saturation
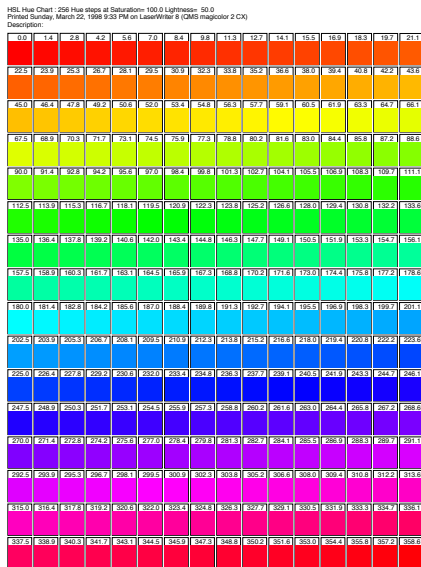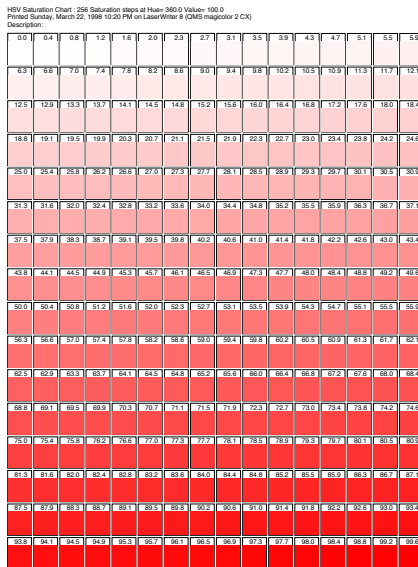
HSL Hue Chart   **HSV Saturation Chart**   **HSL Lightness Chart**
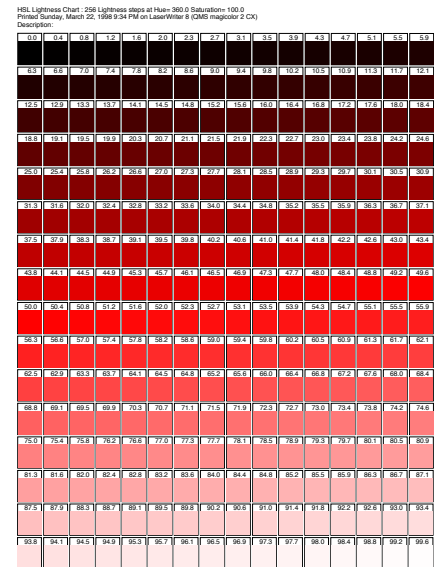
Color Book

Prints a multi-page, 4 panel per page color chart with a user defined number of color patches in the X and Y direction for each panel, which is based on the number of Saturation and Brightness steps to be printed.

The user can define the number of pages to output which automatically determines the number of Hue steps to be rendered (4 Hues per page). The user can also define the number of Saturation and Brightness steps to be defined per panel as well as the begining and ending step for each of the different color values.

(Note: The more steps for Saturation and Brightness, the smaller the sample of color patch will be printed. Allowable choices are from 6 to 16 steps.)

Color sampler layout   (4 hue panels/page)
    using HSL color space
# of pages 8
                        Values: 0...360.0°, ...100.0%
# of steps :   First   Last   Step
        Hue   32   0.0   348.8   11.3
    Saturation 10   10.0   100.0   10.0
    Lightness   10   10.0   100.0   10.0
Description (note special driver settings) :

8 pages   Set step   Cancel   Ok
of 10x10   sizes

The illustration to the right shows a single page which was set to print in the **HSL** space using Hue steps of 20° beginning at Hue=0. Each panel was set to print 10 Saturation steps (10…100% in steps of 10%) and 10 Lightness steps, also 10…100% by steps of 10%.

```
LaserWriter 8 (QMS magicolor 2 CX)  Printed Sunday, March 22, 1998 9:36 PM   page 1 of 1
HSL Book, Description:
    Step :    1     2     3     4     5     6     7     8     9    10
    Sat. :  10.0  20.0  30.0  40.0  50.0  60.0  70.0  80.0  90.0 100.0
Lightn. :  10.0  20.0  30.0  40.0  50.0  60.0  70.0  80.0  90.0 100.0

Saturation==>       Hue =    0.0                          Hue =    20.0
```
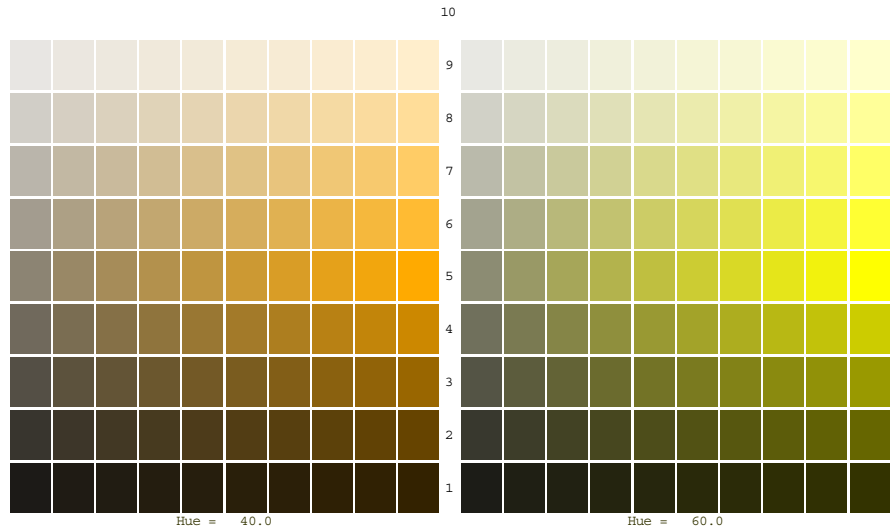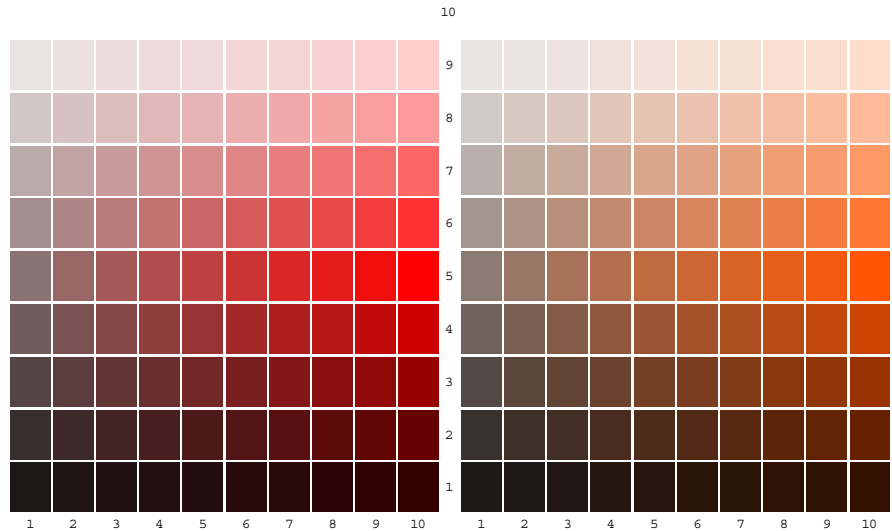
Print Front Window

Prints the active window open on the JacqCAD Master desktop.

Quit - ⌘ Q

Closes all image windows after asking, in each case, whether changes made during the session should be saved, then quits to the Finder. The "Save Changes?" dialog boxes will be not be displayed if you hold down the Command and Period keys while quitting, and any changes will not be saved. Pressing the Command and period keys also bypasses intermediate screen updates, causing windows to close more quickly.

CHAPTER 3: THE EDIT MENU

Undo ⌘ Z

Reverses the effect of the last editing or filtering operation (in this example, a Paste), including Undo itself so repeated Undos will toggle between the image before and after the change. Requires that the Undo Buffer is at least as large as the part of the image changed.

Repeat ⌘ =

Repeats most recent menu selection (a Paste in this case).

Cut ⌘ X
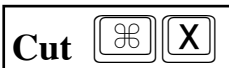
Copies the contents of the current selection to the Clipboard and fills its previous location with the current background color (erases it).

Copy ⌘ C

Places a copy of the contents of the current selection on the Clipboard.

Click and drag within the selection with the mouse while holding down the Command Key, the selection will be copied and pasted at the same time.

Edit	
Undo Paste	⌘Z
Repeat Paste	⌘=
Cut	⌘X
Copy	⌘C
Paste	⌘V
Repeated paste...	
Set Selection	⌘,
Clear	⌘E
Select All	⌘A
Paint Fill	⌘U
Draw Boundary	⌘B
Paint Borders...	
Shape Binders	
Gradients	▶
Flip,Rotate,Scale	▶
Show Paste Control	⌘Y
Change CLIP colors...	
Show Clipboard	
Discard Clipboard	

Paste ⌘ V

Displays the contents of the Clipboard in the currently active image window as a 'floater' that can be dragged around and does not become part of the image until it is set into the image (see following paragraph). The floating paste object is automatically selected, allowing movement by clicking on it and dragging or by using the Arrow Keys. With rectangular floaters, click and drag on the re-size handle in the lower right corner to expand or contract the selection (this will distort the floating object to fit the re-sized window).

A floating paste becomes permanent, i.e. becomes part of the image, when...
1. another Paste command (cmd-V) is given (for multiple pasting).
2. the Set Selection Tool is clicked upon (or cmd-Comma keys are pressed).

Selection tools   Grabber *(Scroll)*   Magnifying Glass Tool *(Zoom)*

A floating paste is cancelled when the Delete Key is pressed, but the selection remains active.

Clicking on any painting tool in the Tools window (Pencil, Brush, etc.) eliminates the floating copy preventing an accidental paste. Another Paste will bring up a new floating copy.
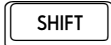
The Grabber and Magnifying Glass do not affect the floating paste object, so it is possible to 'navigate' around in the image while a floating paste object is present.
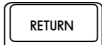
If instead of clicking in the Tool Box the Paste option is used again, then the first floating paste is pasted into the image and a new floating copy is provided. A series of identical pastes are done by Paste (gives floating copy), positioning, Paste (pastes in first, provides new floater), positioning, etc.... After positioning the last floater, paste it in by clicking on the Tools (to avoid bringing up yet another floating copy).

Pasting of regular repeats is supported through the Tab, Return, and Enter Keys. After the first Paste, the Tab, Return, and Enter keys move the paste area about in steps related to the size of the cut. Each time the Tab key is pressed, the paste area moves to the right by one width (of the paste area); Return key moves it down by the height of the paste area. A line of repeats can be made by Tab (cmd - V), Tab (cmd - V), etc. The Enter key moves down one step and back to the beginning (just like return on a regular typewriter). Holding the Shift key reverses the direction of any of the 3 keys.

The following table lists the repeat pasting key functions:

TAB   Moves the paste 1 selection width to the right of the current paste.

SHIFT **TAB** Moves the paste 1 selection width to the left of the current paste.

RETURN Moves the paste1 selection height below the current paste.

SHIFT **RETURN** Moves the paste 1 selection height above of the current paste.

Double-clicking in the Tools window on the Grabber Tool brings up a dialog that allows change to the amount of motion for Tab and Return. Each key's horizontal and vertical increments can be changed in this dialog so it is possible to set up repeats with End and/or Pick shifts, including combined and/or overlapping repeat patterns.

If Locked is not checked, then each Copy or Cut will automatically adjust these settings to provide a simple 'checkerboard' style repeat of the selection based on the selection's overall Width and Height, i.e. Tab horizontal = Width, Tab vertical=0 and Return horizontal = 0, Return vertical = Height.

Checking the Locked checkbox in this dialog will prevent this automatic adjustment. This is useful when you wish to apply the same repeat spacing to a sequence of different sized selection.

Locked is set to UN-checked every time JacqCAD is restarted.

Rectangular selections can also be converted into Tile Brushes to achieve side-by-side repeats for use throughout the image. Refer to the Tools chapter for more information on using Tile Brushes.
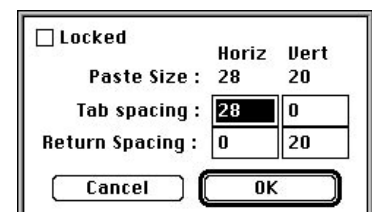
Repeated Paste

First Cut or Copy the selection to be repeatedly pasted. Then select Repeated Paste in the Edit Menu which will bring up a dialog box in which you control the repeated pastes.

Repeated Paste can create repetitions in one dimension (in a line) or in two dimension (on a grid); the repeats along each dimension are created from the starting point in the image and can be set to just fill out along one direction or to also wrap-around. The direction of each dimension is completely adjustable; in the example below the first (**A**) dimension is moving towards the lower right (34 pixels to the right and 17 pixels down between each repeat) while the second (**B**) dimension is moving 10 to the right and 35 down between each row. The only constraint is that the angle between the A and B directions must be at least 10°.

Choices:

Directions to do
  • First Only   (single line of re-peats)
    • Both (2-D repeat grid)

First direction (only important when repeats overlap or if 1-D repeat)
    • A first (step along A first, then B)
    • B first (step along B first, then A)

Limits
    • From start only
    • Full image (wrap-around)

Reversed direction
    √ A (checking it reverses A direction , e.g., would go left & up)
    √ B
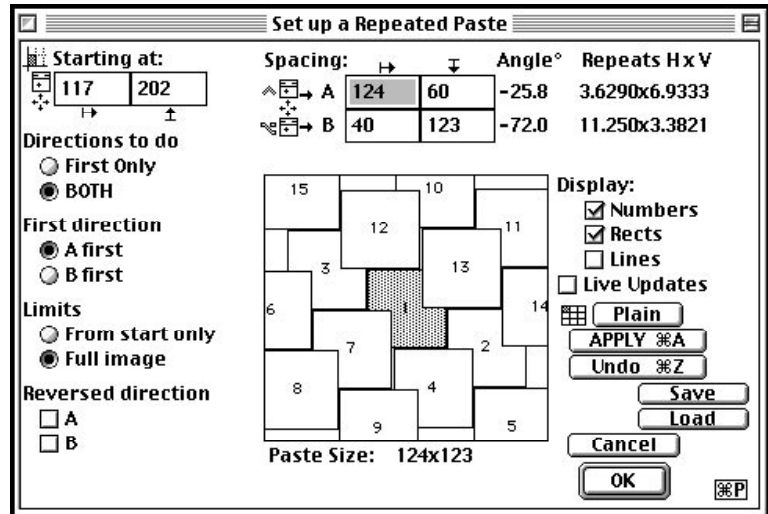
The display centers the first repeat, numbered 1 and, grayed in. Subsequent repeats are numbered in the order in which they will be placed. Note in the example that the next repeats, #2, #3 are being placed using the A dimension spacings. Because Full Image is selected, the repeats wrap-around producing #4 and 5. After the first (A) dimension has been fully played out, a step in the second (B) dimension is taken which moves the starting point to step #6 and the next set of repeats along the first (A) dimension are made.

In the Display area checking the Lines checkbox will show the grid as lines - heavy for A, light for B (see example at right). Any combination of Numbers, Rects, and Lines can be used as long as at least one is checked.
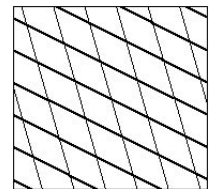
The spacing along each axis, and the starting location for the first paste, can be entered numerically in the appropriate boxes, or they can be set graphically as follows:
    • Clicking in image sets position of Lower Left Corner of first paste that will occur.
    • Ctrl-click and drag in image sets direction and spacing of the "A" axis of repeats.
    • Opt-click and drag in image sets direction and spacing of the "B" axis of repeats.

The Apply button applies the repeat to the image without leaving the dialog; the Undo button restores the image to what it was when the dialog was entered. OK applies the current repeat to the image and exits the dialog. Several Apply can be done to overlap a number of repeat pattersn. Save can be used to save the current spacing settings for later reuse.

Set Selection   ⌘ ⌐

Sets floating paste object into the image. (Undo will remove it.) Selection outline is still present just as a selection outline.

Clear   ⌘ E

Erases the current selection to the current background color. The color can be changed after the selection has been cleared by changing the background color.

Select All   ⌘ A

This command is equivalent to using the rectangular selection tool to select the entire picture, including portions that may be offscreen. Once the selection has been made, **Select All** changes to **Deselect All**, deactivating the selection. The selection can also be deactivated by clicking on any tool other than one of the selection tools, the grabber, or the magnifying glass.

Paint Fill   ⌘ U

Fills the current selection with the current foreground color. The color can be changed after the selection has been filled by changing the Foreground color. Click on Set Selection to set new color into the image.

Brush Fill   ⌘ CONTROL U

Holding the Control key down changes Paint Fill to Brush Fill which fills the current selection with the current Brush pattern. Click on Set Selection to set new pattern into the image.

Draw Boundary   ⌘ B

Outlines the current selection using the current foreground color and line width. Both the color and line width can be dynamically changed as long as the selection is still active. Change the line width by double clicking the line tool to enter the number of pixels for width and height. (Enter 0 in one of these fields if the border is only on the Top/Bottom or Sides.)

The Option and Control modifier keys can be used to draw the boundary outside the selection (instead of inside), and to paint the boundary with the selected brush pattern instead of the Foreground color, or both, by using the following combinations :

⌘ option B   Draw Outside Boundary

⌘ CONTROL B   Draw using Brush Pattern instead of Foreground color

⌘ CONTROL option B   Draw Outside using Brush Pattern instead of Foreground color

Paint Borders...

Replaces existing colors along shape boundaries where two or more colors meet. The user defines the colors or groups of colors to be used as boundaries. Paint Borders can be applied before or after expansion.

The top left section of the box contains the first color or group of colors.
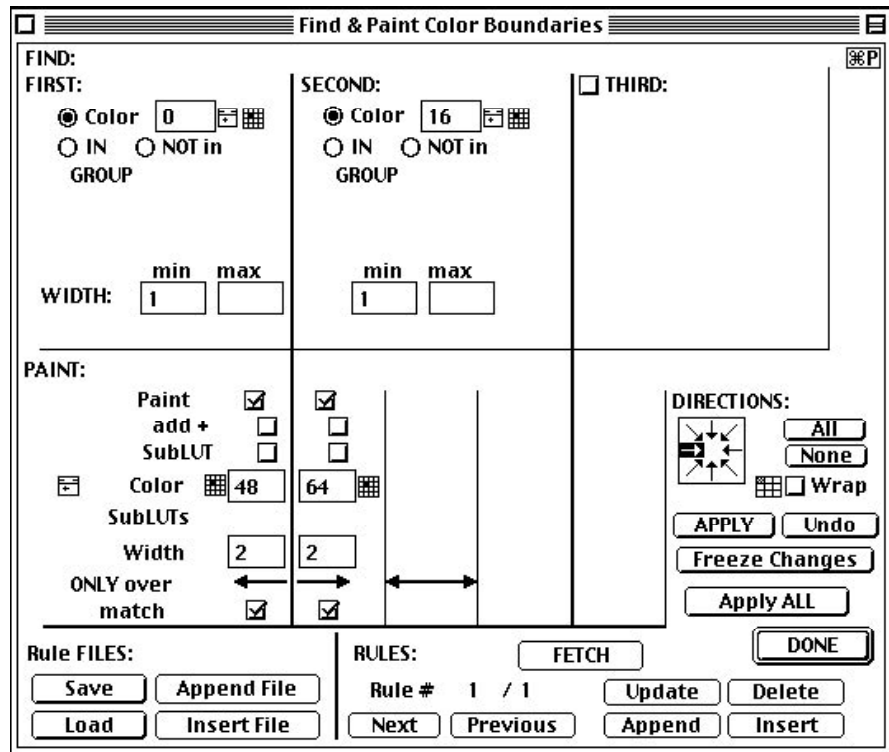
FIND:

FIRST:

Color

In the example, Color # 0 is the first color selected for use. To define a color, type the color number in the text box to the right of the word Color, click on the color in the design window or choose a color from the color palette by clicking on the palette icon grid.

IN NOT in GROUP

Choosing IN or NOT in opens another selection area to define the color group to be used as a boundary. When using color groups, any pre-existing color group can be loaded. Select IN GROUP to pick a saved color group. Click in the Rectangle window below the word GROUP and choose from the list of saved Color Groups.
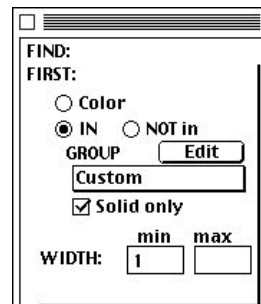
Edit

Creates a new, custom color group. This custom Color Group will be in addition to the possible 16 color groups and will be available only in the Paint Borders dialog.
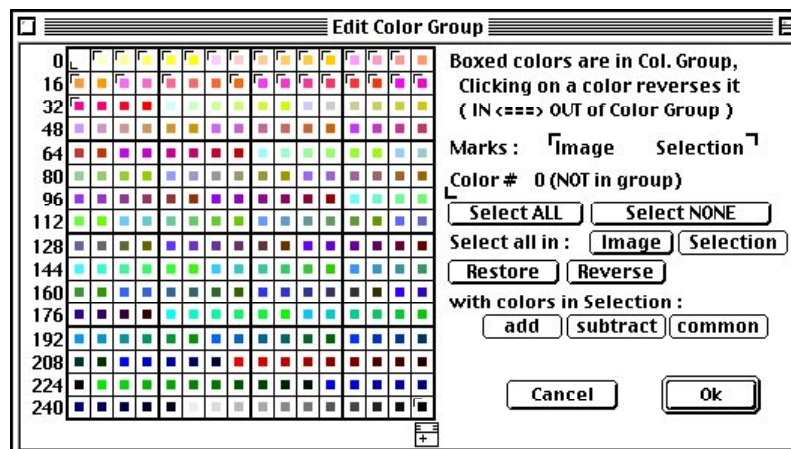
Solid only

Checking this box will look at the width requirement(see below) and paint only on individual colors in the group that meet the width defined. When left unchecked the width requirement will match any combination of the color group colors, treating the color group as a single entity.

WIDTH: min max

Entering a minimum and maximum WIDTH in the Find dialog box limits the search. Often a single pixel width is not useful in the context of paint borders. Limiting the search to a range of pixels provides additional control.

SECOND:

Located to the right is the section to define the SECOND: boundary color or color group. This section is defined in exactly the same way as discussed previously. If the color or color group is not used in the .PCT or Expanded file, the rules will not work and no border will be applied.

PAINT:

Directly below the **FIND: FIRST:** section is the **PAINT:** definition box.

Paint

A check indicates that the color or color group defined in the FIND section above will have a color boundary painted on it.

The Paint color number can be defined as one of the following:

    A specific color number

    Adding to the original color number(s)

Replacing original color with a Substitution Look Up Table (SubLUT)

    add+

    A check will add the number in the Paint Color box (see below) TO the original FIND color. For example: if the FIND colors in a color group are #24, #58 and #79, and #10 is in the Paint: Color text box (and the Paint: Paint box and the add+ boxes are checked) then the boundaries painted on boundaries painted on #24 will be #34, on #58 will be #68 and #79 will be #89

Color

The color number used for painting the boundary. Entered numerically, by clicking in the design window, or from the color palette. Also used in **add+** above.

SubLUT

The SubLUT (Substitution Look Up Table) allows the user to apply a unique replacement color to each of the colors in a color group. Checking the SubLUT box changes the color text box to an Edit button with the SubLUT rectangle below. Clicking in the rectangle opens the Substitution LUT window. Selecting the Rectangle in this window lists the saved SubLUT files. The Edit button permits the user to change the definition of the color substitutions.

Width

Defines the number of pixels that will be painted on the original color number.

ONLY over match

When checked, if the minimum in the Find area is smaller than the width to paint, the user must decide if the pixels to be painted should overlap into an area of a color not included in the Find area. If ONLY over match is checked, the painting will occur only on the colors defined in the Find area. If unchecked, the painting will paint the full count of pixels, overlapping into other colors than the Find color(s).

DIRECTIONS:

Locate in the bottom right side of the dialog box; the direction determines the direction for painting. Left/ Right and Top/Bottom are most appropriate for boundary weaves. The other directions are most commonly used for decorative effects.

Click directly on the arrow diagram to choose the direction or directions to be used. All and None are shortcuts.

Wrap

When checked, wrap will look along the edges of the document to look for matches. This is critical for files that are units of repeat.

Apply:

Clicking on the Apply button applies the current settings.

Undo:

Clicking on Undo restores the image to the original state when first entering the Paint Borders dialog (unless freeze changes has been used).

Freeze Changes

Keeps all changes made since entering the dialog. Undo will only undo changes made since the last time freeze changes was used. This is helpful when multiple rules need to be applied without exiting the dialog. Each change made to the image can be "frozen". Additional changes can be undone using the Undo button or can be kept using Freeze Changes button. If Freeze Changes is not used, Undo will undo every change made to the image since first entering the dialog.

Apply All

Is not yet implemented. Apply all will use the multiple rules option - currently in gray in the lower right of the dialog.

Done

Exits the dialog, keeping all changes made to the image.

Rule FILES:

Save

Saves all of the settings in the current Paint Boundaries rules. This is especially useful when using color groups to define rules that will be applicable to multiple future files. The file will have the extension .PBR. This file can only be opened in the Paint Borders dialog.

Load

 To use a previously saved Paint Borders settings.

Rules

Fetch is in gray. This function is not yet implemented but will allow the user to load and apply multiple Paint Borders rules.

FIND:

THIRD:

Checking **THIRD:** opens a column on the far right to select another color or color group boundary.

The third boundary color or group of colors is chosen in the same manner as the Find: First and Second. Notice in the Paint: "sections" located below the Find: sections, the arrows indicating WHERE the painting will take place. When the **THIRD**: is checked, Paint information for the "sandwiched" color (SECOND Color) is added. This color is also defined in the same method as Paint: for Find: FIRST and Find: SECOND.

In the example, "where" Color 0 borders color 16, two pixels of color 48 will be painted on color 0 and 2 pixels of Color 64 will be painted on Color 16. Then, all of Color 16 between Color 0 and Color 2 will be painted Color 32(notice arrows). Finally, "where" Color 16 borders Color 2, two pixels of Color 56 will be painted on Color 16 and two pixels of Color 49 will be painted on Color 2.

Shape Binders

Used to apply binders following the shape of a particular color or group of colors.
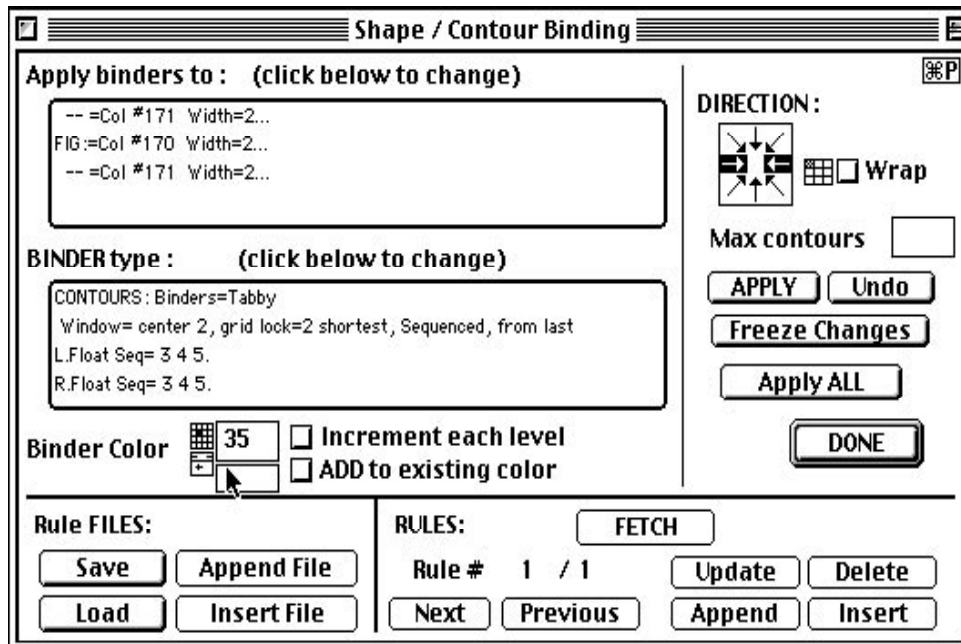
Apply binders to:(click below to change)

Opens dialog box to define area to apply binders.

Edge 1

This column defines the first edge adjacent to the area to the binders will be applied to.

Color - Enter the color number by typing it directly in the box, choosing from the image window or selecting from the color palette.
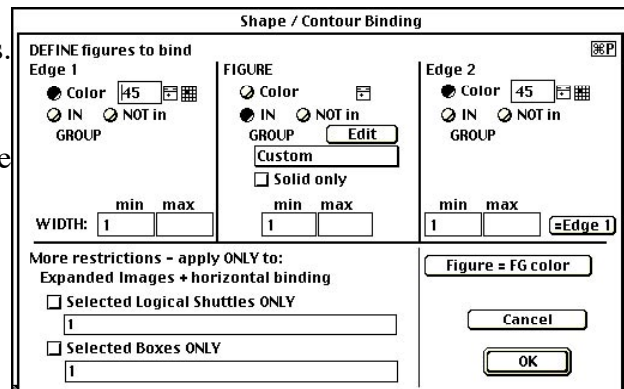
In Not In Group - to define a figure edge that is made up of one or more colors from a previously saved Color Group by selecting from the list that is revealed by clicking on the rectangle box under the word Group.

Edit - To define a color group without leaving the Shape Binders tool. Opens a color palette to create a color group using the options below. Clicking on a palette color toggles between selected and unselected.
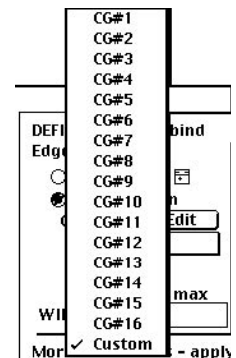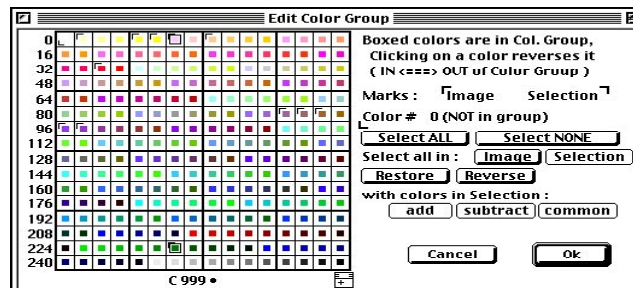
Select ALL - Includes all the colors in the palette.

Select NONE - Omits all the colors in the palette.

Select all in: Image Selection - Adds all the colors in the image to the color group. If a selection area is active, all colors in the Selection area are in the color group.

Restore - Restores the color group that is active when the window is opened.

Reverse - Reverses the palette selections in the color group.

with colors in Selection:

add - This option will add colors contained in the selection area to any previously chosen colors in the color group.

subtract - Takes the colors in the active selection area out of the color group.

common - Only colors included in BOTH the color group and the selection area will be included in the new color group.

Cancel - Closes the Edit Color Group window without making changes.

OK - Saves changes to the color group and exits back to the Shape/Contour Binding box.

Solid only - For use only when a color group is used as an edge or for the figure to allow a width requirement to match *any single* color in the color group rather than any combination of colors in the color group adding up to the width value. When left unchecked, the width requirement will match *any combination* of colors from the color group. If the width value is two and solid only is unchecked, a match will occur where there are two pixels of any colors from the color group.

WIDTH: min max - To enter Minimum and Maximum width requirements for the colors used in the edge and figure areas.

FIGURE

Used to define area the binders will be applied to, either an individual color or group of colors. Selection options are identical to the edge assignment column. (See previous)
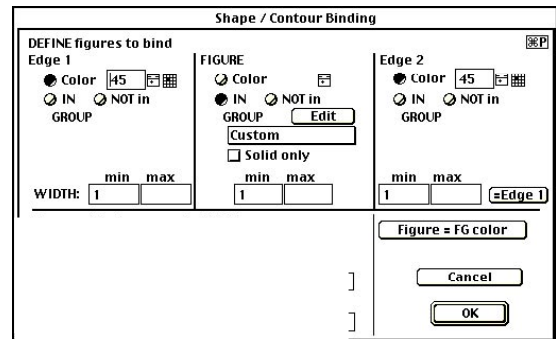
Edge 2

Used to select the opposing adjacent edge of the area to apply binders to. May be selected in the same manner as Edge 1.

=Edge 1 - Short cut to assign Edge 2 if it is identical to Edge 1.

Figure=FG color - Shortcut to assign the Foreground color to the Figure (binding area)

More Restrictions - apply ONLY to:
  Expanded images + horizontal binding

Options to apply shape binders in an expanded image to Logical Shuttles or particular box assignments.
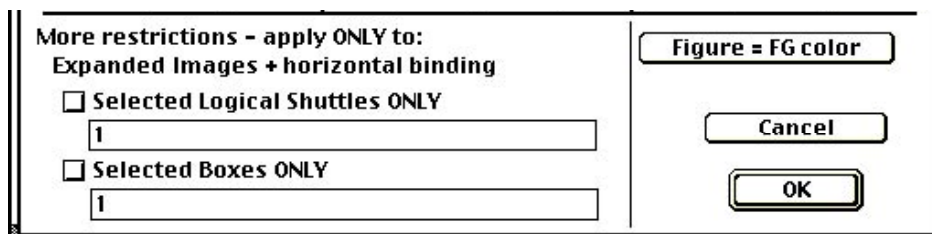
Selected Logical Shuttles Only

Checking the box to the left allows binders applied to ONLYto Logical Shuttles listed in the rectangle field below.

Selected Boxes ONLY - Same as above, but limits to only specified box assignments.

Cancel - Closes Shape/Contour binding window without making changes

OK - Closes Shape/Contour binding window with new Edge and Figure assignments.

BINDER Type: (click below to change)

Opens the Binder type window to specify binders.

Binder type

contours ({ })

single edge (((
Select one to indicate binder type, either from both edges or from a single edge.

Binding Pattern

Solid - Creates a solid color "binder" the width indicated in the Binding Window selection area.

Tabby - Binders will be a 1 and 1 pattern, the Binding window value will automatically be assigned a value of 2 to allow for a "repeat" of the pattern.

Weave - Opens the Select Weaves window allowing any weave pattern to be used for the contour binding.

Open Wve - File Located midway down on the left side, this button opens the window to choose the desired weave or weave library (see the Weave Menu). The Select Weaves window is identical to the Select Weaves window in the Assign Weaves>Load Weaves option in the Weave Menu.

Print Wve File - Allows user to print the selected weave or library of weaves.

ISO - Weave Opens the window to define ISO weaves and select it as the shape binder pattern.

The right side of the Select Weaves Window shows the selected weave. Checking **+Repeats** in the top right fills the weave window with repeats of the weaves. The Width and Height indicate a single repeat of the weave.

Allows the user to flip the selected weave in all the directions indicated, left to right, top to bottom, or both.
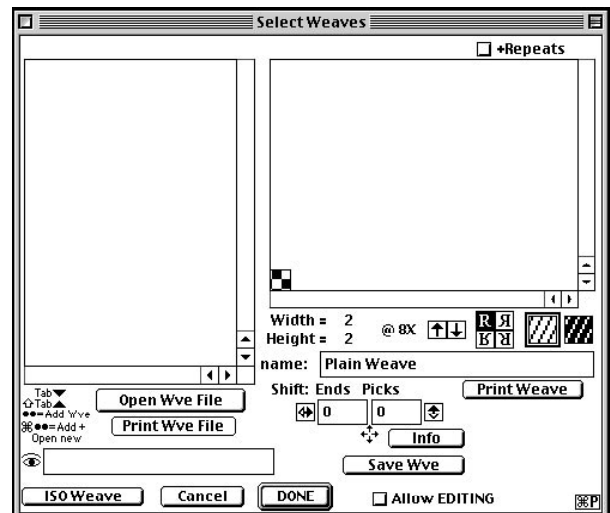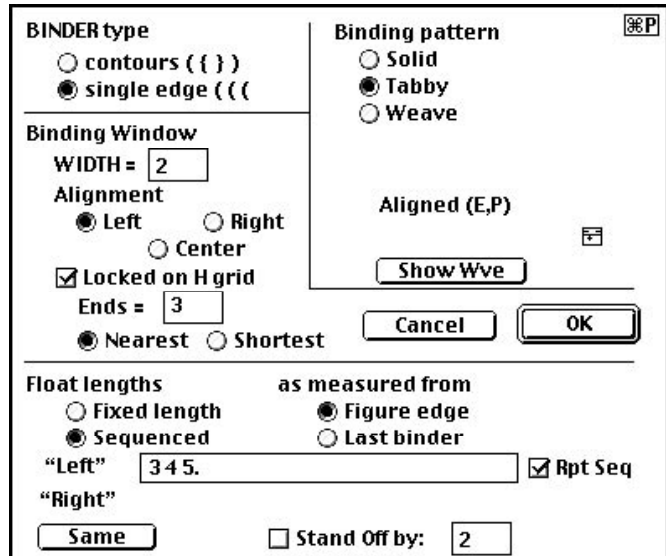
Choosing the square on the right (predominately black)reverses the weave.

Name: displays the name of the current weave displayed above.

Shift: Ends Picks Allows the user to "roll" the weave the desired ends and/or picks.

Print Weave - Prints the individual weave displayed in the weave window.

Info - When chosen an information window opens displaying information about the weave including: Width, Height (of repeat) Percent of Warp coverage, Percent of Warp and Weft Activity, Length of Face and Back floats of the Warp and Weft. The window may be printed.

Save Wve - Allows user to save the weave as a new weave especially after editing.

Allow EDITING - Activating this option allows editing of the weave displayed.

Cancel - Exits this dialog without any changes

Done - Exits and applies the currents selection of weave for use in binding

Binding Window

This section of the Shape/Contour Binding window defines the width of thebinder pattern to be applied. As mentioned earlier, if Tabby is chosen the window automatically defaults to 2, though can be over-ridden by the user.

WIDTH= Used to specify the width of the binding area.

Alignment

Left Right Center - The user defines how the binding window is aligned over the area that will receive the binders

Locked on H grid - Used to control the binding on warp positions. This is useful for multiple color rotation warp set-ups.

Locked on H grid: Shifts binding to align to horizontal spacing (warp ends)

Locked on Grid:

1 = even warp

 2 = odd warp

3 = every third warp

Nearest Shortest - Choosing nearest grid location will lengthen float Choosing shortest grid location will shorten float Nearest grid location and shortest grid location does not apply unless Locked on H grid is checked.

Float Lengths

The Float length can be defined as a single, fixed number, or a sequence of numbers. Contour binding allows independent settings for each of the two edges.

Fixed Length/ Sequenced - The sequenced float definition makes it possible to bind at shorter intervals near the edge of a figure and longer intervals near the center, for example.

Rpt Seq - Defines the sequence repeat from its beginning. Ex. 4,6,8,4,6,8... without "Seq Rpt" checked the length will repeat at the increment defined by the last number in the sequence. Ex. 4,6,8,8,8,8,...

Stand off by - The value entered in the text box is the minimum distance between the far edge of the figure and the last binder that will be placed.

Cancel - Exits without changes

OK - Exits with changes

Binder
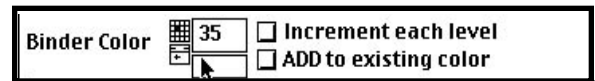
Color
Entered by the user directly from image, typing the color number into the dialog box or from the color palette.

Increment each level
Checking this option adds 1 to the color entered in the Binder Color box. For example: If color 35 is entered as the Binder Color the first set of shape binders will be color 35, the next will be color 36 and so on until all the contours are created (dependant upon the number of contours entered into the Max Contour Box (see below).

Add to existing color
Choosing this option ADDS the amount entered into the Binder color box. If the Figure color is color 10 (the area the binders will be applied TO) and color 35 is entered into the Binder Color box with ADD to exsisting color checked, the binders will applied with color 45 (Color 10 + 35). If both options are selected, then the first set of binders will be color 45, the next will be 46, etc.

Direction:

Locate on the right side of the dialog box; the direction determines the direction for the edge of the binder pattern. Single edge will allow only one direction to be selected. Left/Right and Top/Bottom are most appropriate for shape binders. The other directions are most commonly used for decorative effects.

Wrap - When checked, wrap will look along the edges of the image to find matches. This is critical for files that are units of repeat.

Max Contours - Allows a limit to be placed on the number of binders placed on the image. Leaving this field blank will fill the entire specified area with the binder pattern.

Undo: - Clicking on Undo restores the image to the original state when first entering the Paint Borders dialog (unless freeze changes has been used).

Freeze Changes - Keeps all changes made since entering the dialog. Undo will only undo changes made since the last time freeze changes was used. This is helpful when multiple rules

need to be applied without exiting the dialog. Each change made to the image can be "frozen". Additional changes can be undone using the Undo button or can be kept using Freeze Changes button. If Freeze Changes is not used, Undo will undo every change made to the image since first entering the dialog.

Apply All - Is not yet implemented. Apply all will use the multiple rules option - currently in gray in the lower right of the dialog.

Done - Exits the dialog, keeping all changes made to the image.

Apply: - Clicking on the Apply button applies the current settings.

Rule FILES:

The user may save the current rules in the bottom of the Shape Binder window by selecting "Save" under Rule FILES: Clicking on Save opens the Save dialog box where the user can specify the file name. The Shape Binder Rules have the .SBR extension. A description of the SBR may given in the next window. To recall a saved file, click on Load. The remaining section is not yet implemented.

Gradients

Tool to fill a selection area with a user defined gradient of two or more colors that transition from one color to the next. A gradient must first be defined by the user in the Create/Edit Gradients dialog.

Create/Edit Gradients

The top of the dialog is a visual of the current gradient. The top section shows the gradient dithered and the bottom banded colors. Below the visual of the gradient is the creation window. Each square of color represents a step in the gradient. Colors used in the gradient are indicated in the Color Palette with a heavy border around the appropriate color. Clicking on a color allows the user to change the active step (the color rectangle with the black border around it) to another color by clicking on the color in the palette on the left side of the window or by entering the color number in the field to the right of Color =.
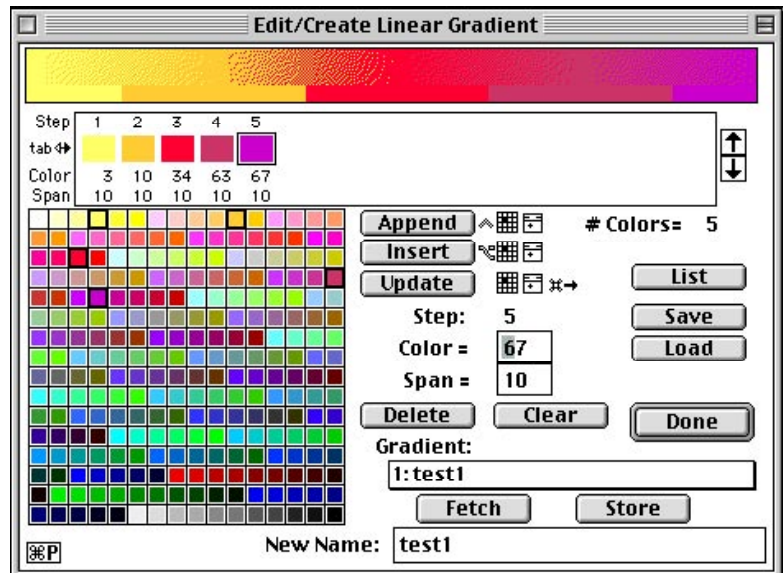
Append - Adds a step (square of color)on the right end of the gradient.

Insert - Inserts a step to the right of the active step in the gradient.

Update - Updates the active color step to reflect changes in the Color or Span.

Step - Indicates the active step in the gradient window.

Color = - Allows user to enter the color number for the selected step.

Span = - User specified numeric length of the span of a color in the gradient. Must choose Update to make the change.

List/Save/Load - Not implemented.

Delete - Deletes the active color step.

Clear - Deletes all color in the gradient except for color 0 and 255.

Done - Exits Edit/Create Linear Gradient dialog.

Gradient: - Clicking on the Rectangle to the right reveals a drop down window of 30 gradient storage "drawers." Clicking on "Empty" allows a new Gradient to be stored. Any filled drawers may be overwritten.

Fetch - Loads the specified Gradient listed in the Gradient selection into the Gradient window above to modification.

Store - Saves the current gradient into the active gradient "drawer."

New Name: - Enter the name of the new gradient before storing.

Gradient Fill

Opens the Gradient Fill dialog. An active selection area in the image is required to have the Gradient Fill option available. Watch the rectangle at the bottom of this dialog box for hints to create the desired gradient.

Gradient: - Click in the rectangle below to open the drop-down to select one of 30 saved gradients.

Kind:

Basic: Linear - Click in the image window and dragthe line to define the length and direction of the linear gradient.

<<I>> - Choosing this option defines the gradient to flow from last step to first step and back to last step.

Radial - User must click and drag to indicate the center of the "circle" and the length of the gradient. The center is the 1st color ending with the last step on the outside "ring."

H/W - Height to Width ration of the radial gradient. Change this value to elongate or flatten the radial gradient.
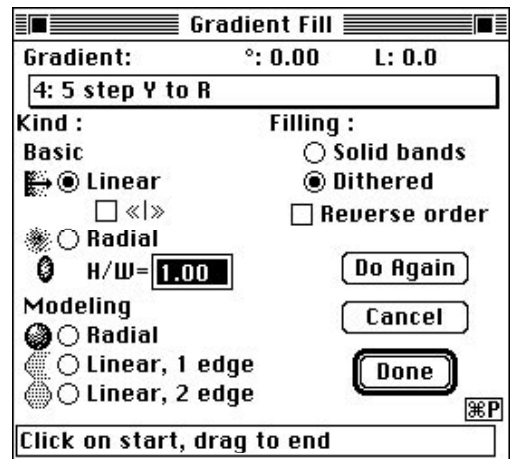
Filling:

Solid bands - This option makes solid stripes of the gradient with no intermingling of the colors.

Dithered - Mixes the colors in the gradient between steps to create smoother transitions from one step to another.

Reverse order - Selecting this option begins the gradient with the last step, ending with the first, thus reversing the order of the gradient.

Modeling

Radial - This gradient fill requires the user to click the center point of the gradient which will follows the edges of the selection area.

Linear, 1 edge - Click and drag within the selection area to define the direction and length of the gradient beginning at one edge of the selection. The gradient mirrors the selection edge.

Linear, 2 edge - Similar to Linear, 1 edge, the user clicks and drags to indicate direction and length of the gradient which begins at opposing edges and meets in the center of the selection area.

Do Again - This button allows the user to try different gradient effects without exiting the Gradient dialog box. For example: changing from Solid Bands to Dithered then clicking **Do Again.**

Cancel - Exits dialog box without creating a gradient fill.

Done - Exits dialog box making the gradient within the selection area a permanant part of the image.

Contour Gradient

The Contour Gradient option is dependant on having an active slection area in the image. The gradient is selected from the Saved Gradients availabe in the drop-down menu under **Gradient:** located in the top of this dialog box.

Reverse order - To reverse the order of the colors in the gradient check the box to activate.

Fill type:

Solid bands - Creates solid bands of the gradient colors within the selection area following the contour of the selection.

Dithered - This option mixes the neighboring colors in the gradient to give a smoother transition from one step of color to the next.

Partial depth only
Depth - Placing a check in the box for **Partial depth only** limits the gradient length from the selection edges. This depth can be changed by entering numeric values in the Depth= box.

Apply - The **Apply** button must be selected to generate the desired gradient within the selection area.

Cancel - Exits the Contour Gradient Fill window without changing the image.

Done - Exits the dialog box using the current gradient settings and applies them to the selection area.

Flip, Rotate and Scale, Scale Selection

Scale Selection

Reduces or enlarges the contents of the current selection by a factor ranging between 1% and 5000%. The selection can be scaled by pixels or by percent, whichever is preferred. Scale selection supports several new scaling modes which are useful when scaling to reduce the size of the selection:

Normal - tends to let black dominate

Dither - improved appearance, but may increase the number of colors.

When reducing 3:1 or more in both Ends & Picks, the following choices under Sampled are useful:

Popularity - preserves the color most often seen in the sampled area (see Sampled Area below).

Averaged - only useful for Grayscale images, averages the sampled area (see Sampled Area below).

Sampled Area: - when reducing, for example, 5:1 horizontally and 4:1 vertically, 20 (5X4) pixels will scale down to one. When more than a 3x3 area is being reduced to a single pixel, you can limit the Sampled Area to the just the 3X3 pixels in the center, to 30% area which samples just the central 30% (about 60% of Ends and 60% of Picks), or to full area which samples all the pixels (up to a maximum of 15x15). Limiting the sampling area can be helpful in avoiding edge effects, for instance grid lines or boundaries between different colors.

Rotate and Scale

Rotates, skews and/or scales the contents of the current selection an arbitrary number of degrees. Even when the aspect ratio is not equal to 1:1 *JacqCAD* MASTER® maintains the shape of the rotated selection.

Degrees
The selection can be 'skewed' *(slanted)* on either the X or Y axis. The Rotation or the skew will be clockwise if you specify a positive number and counter-clockwise if you specify a negative number.

Scaling
Reduces or enlarges the contents of the current selection by a factor ranging between 1% and 5000%. The selection can be scaled by pixels or by percent.

Any of the above selected values can be adjusted by clicking and dragging in the image to set the direction or size (a live shadow outline will be displayed during the drag if Show Shadow is checked)
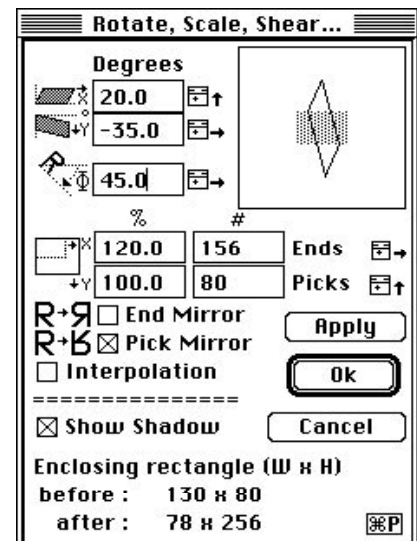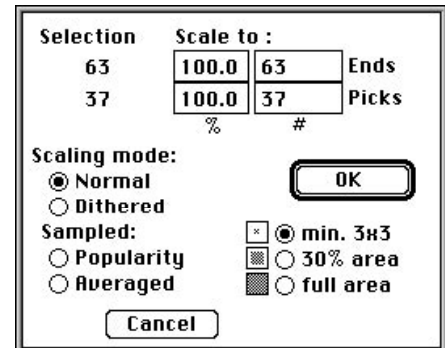
End Mirror / Pick Mirror

Check boxes are provided in the Rotate & Scale dialog box to enable End and Pick mirroring in addition to the rotate and scale process.

Rotate CCW *(Counter Clock Wise)*

Rotates the contents of the current rectangular selection counter-clockwise 90˚ without scaling. Hold the Option key down to erase before rotating. The shape will change if the aspect ratio is ≠1.0.

Rotate CW *(Clock Wise)*

Rotates the contents of the current rectangular selection clockwise 90˚ without scaling. Hold the Option key down to erase before rotating. The shape will change if the aspect ratio is ≠1.0.

Flip Vertical

Flips the current rectangular selection upside down. Dynamic Pick Mirroring, which is available during a Paste operation through the Paste Control Window, is a more useful approach than Flip Vertical.

Flip Horizontal

Flips the current rectangular selection horizontally around a vertical line through its center. Dynamic End Mirroring, which is available during a Paste operation through the Paste Control Window, is a more useful approach than Flip Horizontal.

Flip Horiz +Vert

Flips the current rectangular selection horizontally AND vertically in one operation.

Show Paste Control ⌘ Y

Used to modify the paste selection in orientation and appearance.
Mirror/Rotate: - use the R to change the orientation of the floating paste.

Paste Mode

> **Normal Copy -** Pastes the selection into the image "as is" without changes in color numbers. This could result in an unexpected outcome if pasting from an image with a different color palette than the target image.
> **Transparent -** drops the color in the paste selection that matches the current background color patch so that it does not paste.
> **by Color -** very useful when pasting a selection from an image whose color palette differs from the target image. The system selects the closest match, which may result in unexpected colors if the image palette is limited. Some colors in the paste selection could be merged into one color.
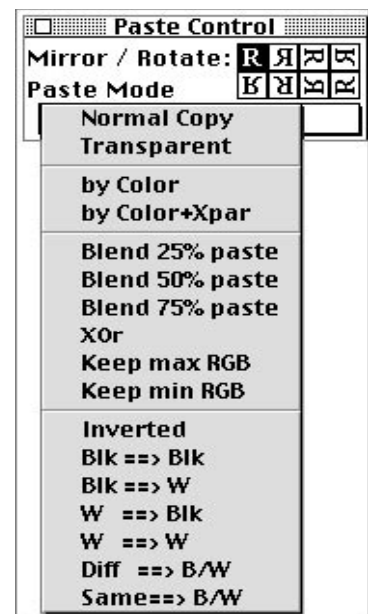
by Color+Xpar - same as **by Color** except the background color is "dropped out" or transparent and does not paste.

Blend 25% (50%, 75%) paste - blends the paste selection onto the background image creating more colors in the image. The blend can be changed by the percentage used.

XOr, Keep max RGB, Keep min RGB and other options - provides more options for pasting selections with varied results depending on the image pasting from, the image pasting to, and the palette of both and are more helpful when using grayscale images. With experimentation some interesting effects may be achieved using these tools.

Change Clip Colors

Brings up the Change Colors dialog to change colors in the Paste (Clipboard) object.

Show Clipboard

Creates a new window the size of the picture currently on the clipboard, and then displays it. This window, which will have the title Clipboard, will not be updated if the Clipboard later changes.

Discard Clipboard

Discards the contents of the current Clipboard releasing the memory being taken up by the clip image to the rest of the application.

CHAPTER 4: THE OPTIONS MENU

Posterize… ⌘ [

The Posterize function allows the reduction of the overall number of colors in a design to a manageable few. This is exceptionally useful for scanned images where the number of colors in the image is often more than 200.

Colors can be selected by clicking on a pixel in the image:

> Simple click - selects as "Target Color"
> Ctrl- click - adds color to selected colors (like adding to selection)
> Opt- click - UN-selects the color (like subtracting from selection)
> Ctrl- Opt- click - UN-selects all except the color (common)
> Shift-click - toggle the color: select if not selected, UN-select if selected

Options

Posterize...	⌘[
Change Colors...	⌘]
Reduce Colors	▶
Map to new Palette...	
Change Palette...	▶
Re-order Colors...	
Set Repeat View...	⌘R
Make Repeats Window...	
Update Repeats Window	⌘'
Live update	
Text...	⌘T
Change Aspect Ratio...	
Ins/Del Ends/Picks...	
Ins/Del E/P by Color Strip	
Preferences...	

Sort by...

Number - Sorts the Color Palette in the posterize histogram by assigned value number.

Hue, Saturation, & Brightness - Sorts the posterize histogram by proximity weights of Hue, Saturation, and Brightness.

Red, Green, Blue, Yellow, Cyan, & Magenta - These methods of sorting the posterize histogram use the amount of the specified color in each value to sort the palette.

Proximity - This option sorts the histogram in proximity to the selected color. To select a color, use the mouse to click on the 'Select' button and the color palette will appear. Click on
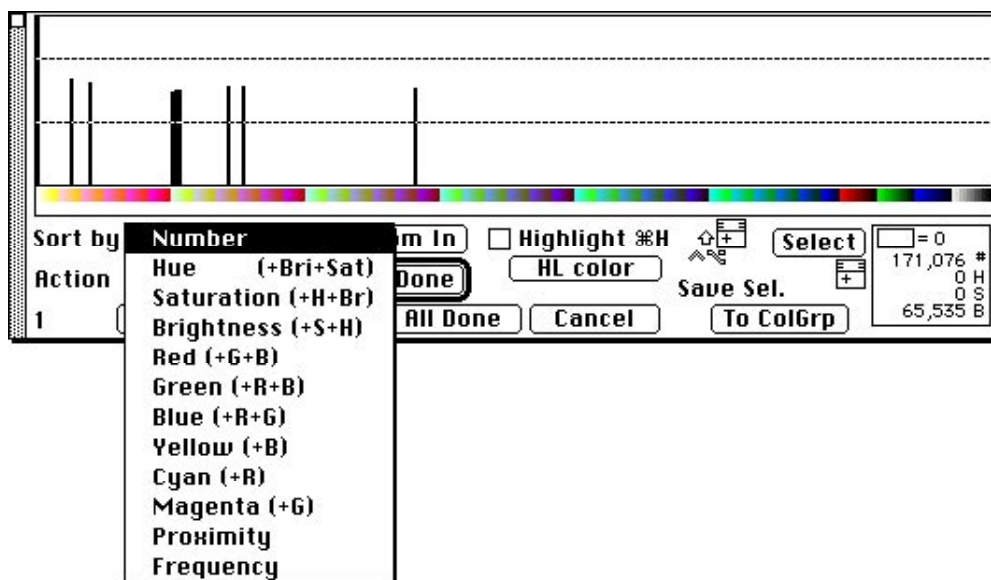
the color to sort the palette in proximity to and the histogram will sort accordingly. This can be useful when several colors in the image are very similar and it is necessary to change them to the selected color.

Frequency - Using this option sorts the histogram by the frequent use of the colors in the image starting with the least used on the left side of the histogram and the most frequently used colors indicated towards the right side of the histogram. Vertical black lines indicate all used colors in the histogram. The height of these lines indicates the distribution of the colors being inspected. The total number of pixels of a particular color can be found by clicking on the histogram line of that color. The information pertaining to any particular color is listed in the information area just below the Select button of the Posterize palette.

Action...

Adjust Colors - The Adjust colors dialog is activated when you click on Do It. This allows the change of selected color's Hue, saturation, and Brightness. For each there are two slide bars - one to change the level and a second to change the differences. These are most easily understood in the context of Brightness - level corresponds to a Contrast control. Similarly, the slide bars for Hue adjust the actual Hue and the spread of hue differences, which is useful for exploring other color ways. As always, White (color 0) and Black (255) cannot be adjusted; to have full control avoid these two locked colors in the design by using substitutes in the 1..254 range.

Avg. Hue, Avg. Saturation, & Avg. Brightness - These options average the selected colors in the histogram by either Hue, Saturation, or Brightness.

Merge to 1 color - The 'Merge to 1 color' option gives the ability to reduce the number of colors in the image by replacing all the selected colors with the target color.

Sel Image Cols (Colors) - selects all colors used in the image

Sel Selection Cols (Colors) - Selects just the colors used in the current image selection. Once the colors have been selected, the 'Zoom' button can be clicked to "zoom" in on the selected colors omitting the unselected colors from view.

Select Color Group - Selects the colors that are in the active color group. As in editing, this can be used to treat many colors as a single value.

Reverse Select - Reverses the current histogram selection.

Preferences… - Allows alterations to the proximity weights of Hue, Saturation, and Brightness, which are used when the colors in the histogram are being compared and sorted. Supports Proximity sorting based on CIE Lab (adjustable weights for brightness(L) and Color(ab)). Requires that the ColorSync extension have been installed.
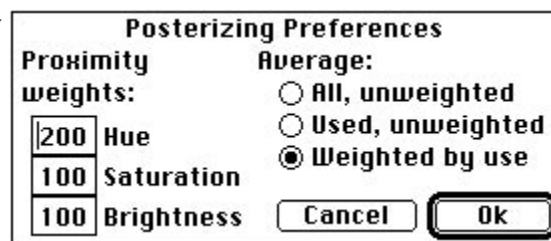
Do It - Implements the action designated by the user in the action menu. The action performed by this button is only undoable by a complete cancel from the 'Posterize' dialog box.

Preview - Gives the user the ability to "try out" the options selected in the 'Action' menu. Selections implemented with the 'Preview' button can be reversed by clicking **'Undo'** leaving the histogram unchanged or can be made semi-permanent by clicking the **'Keep'** button if the results of the action taken are acceptable.

Zoom In - Allows user to focus just on selected colors in the histogram. First select a number of colors, and then click on zoom in to display just the selected group.

Select - Used for choosing a color from the current color palette to be applied during the posterizing process. The selected color appears in the information box on the right side of the Posterize dialog window. Other methods of selecting this color are:
  1. Double-clicking in the histogram above the color to be chosen.
  2. Holding the option key down while clicking in the histogram area above the color to be selected. The selected color is used for replacing existing colors or groups of colors, therefore reducing the number of colors used in the image. It is also used to sort the palette by proximity, whereby the selected color is the point from which the remaining colors will be evaluated and sorted based on the proximity weight of each color's Hue, Saturation, and Brightness.

Done - Used when portions of the image have been altered, but some posterizing functions are yet to be done. Clicking Done will also Zoom out of the focus area of the histogram.

 All Done - When all of the image changes have been made clicking on All Done returns the user to the editing window.

*Note: None of the Posterizing functions are permanently applied to the image until the '**All Done**' button is clicked.*

Hilight - Checking this option is useful to highlight the selected colors in the histogram to reveal their location within the image by causing the selected colors to temporarily turn red (or other user-selected color). Cmd - H can be used for toggling Highlight on and off.

Save Sel. - To ColGrp. supports saving of the current color selection to a Color Group.

Change Colors... ⌘ 1

Changes colors in the image - the color palette stays the same, but the image pixels (color numbers) are changed. If a selection is in effect, the changes only occur within the selected area. This is especially useful for reducing the number of colors in an image as several similar shades can all be changed to the same final shade. Also useful for replicating figures that while geometrically identical should differ in color.

Swap Colors - Interchanges two selected colors.

Change To - Changes the first color to the second. Colors are selected by clicking on their patch in the palette display, or by directly entering their color numbers into the boxes.

Color Group to ===> - Allows user to change every color in the currently defined Color Group (see Special Menu) to a selected color. To use this feature, first double click on the desired color to ensure that its number is entered into the right hand (to) window, then click on Color Group to ===>. This approach is a quick method of posterizing scanned images.
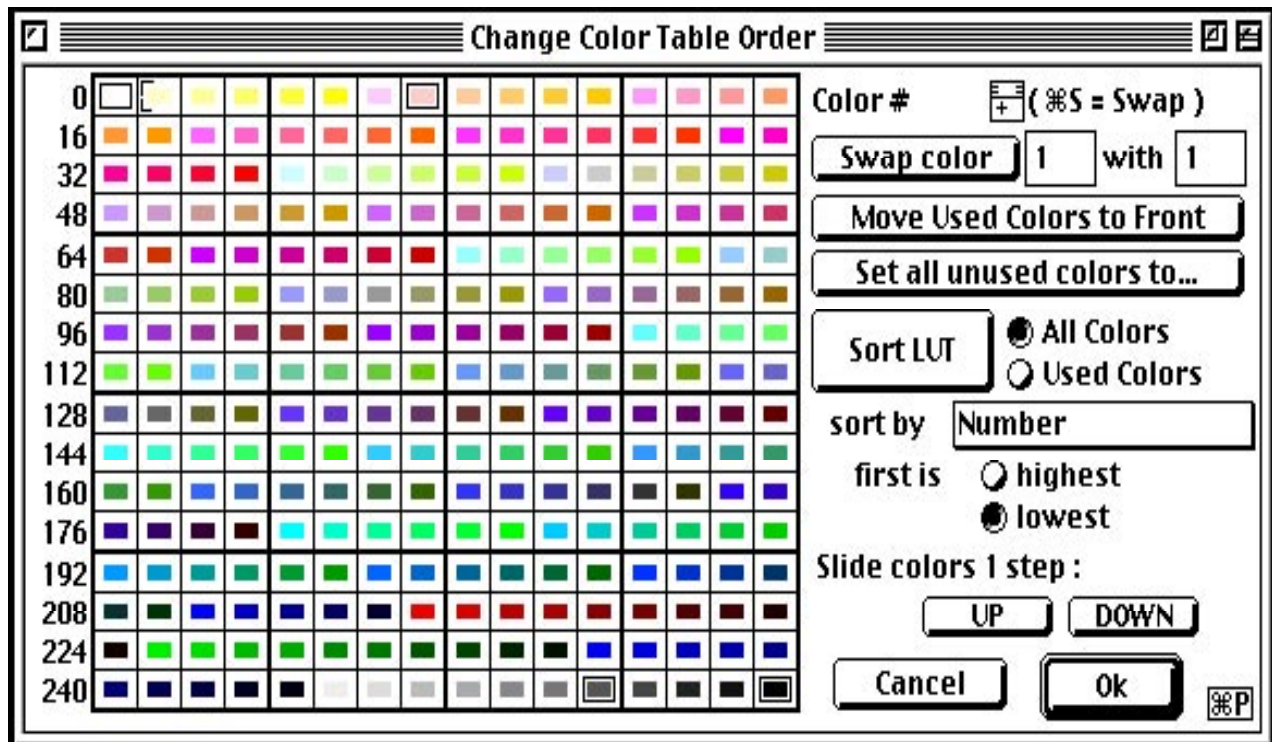
ALL except Color Group - Will change all the colors not in the currently defined color group to the selected color.

Selected colors are indicated by marks in the upper corners of their patches; upper left for first color and upper right for the second color.

An outline around the color patch indicates the colors used in the image. If a used color is reassigned (by Change To or Swap), its outline is removed and the number of the color it has been changed to is written onto its color patch.

A color that has been assigned is indicated by a mark in the lower right corner of its patch. A color may have both a corner mark and a box, thereby indicating that it is used in the design, has not been re-assigned, and that some other color has been merged into it.

In the figure, colors 208, 224, and others are used; color 15 has been selected as the 2nd color, color 28 as the first and assigned to 15, etc.

The selection logic has been designed for ease of use in merging multiple colors; the first click after any operation always selects the first (left hand box) color; the second click selects the second color; subsequent clicks move the 2nd color to the first and select a new second color. To merge, for example, colors 5..9 into color 10, use the following sequence:

Click	then	Click	then	Click
Color 5		Color 10		Change To >>
Color 6		Change To >>		
Color 7		Change To >>		
Color 8		Change To >>		
Color 9		Change To >>		

Note that color 10 remains selected throughout as the 2nd color.

Load Last - Displays color assignments of the last entered color substitutions.

LOAD SubLUT - Allows user to reload any previously saved Substitution Look Up Table (Sub-LUT).

Save SubLUT - Choosing to save the substitution lookup table allows the user to recall the information entered changing one color (or group of colors) to another color. This SubLUT can be used as a tool in other areas of the program.

Clear - Clears all the entries in the Change Color Palette.

Cancel - Exits dialog box without making color substitutions.

OK - Exits dialog box making color substitutions permanent.

Preview button

Shows new colors (except 0,255) until user clicks Done. Cmd - V does Preview (auto Window Shade etc.). Can be used when dialog is 'window shaded' (followed by Return to exit from the Preview mode. The Preview Done button always appears near the top left of the screen. Clicking Done restores the full dialog window.

Note: Colors can be "flashed" to white to show where a color is used in the image by cmd-clicking on a color patch in the Change Colors...

Reduce Colors

Useful tool in reducing colors in an image by making sample selections of different color areas in the image. Works the best on simple scanned images that will be only a few colors.

```
Options
  Posterize...              ⌘[
  Change Colors...          ⌘]
  Reduce Colors          ▶      BEGIN color reduction

  Map to new Palette...         Add sample            ▶
  Change Palette...      ▶
  Re-order Colors...            View/Edit target

  Set Repeat View...     ⌘R     Apply reduction
  Make Repeats Window...
  Update Repeats Window  ⌘'

  Text...                ⌘T

  Change Aspect Ratio...
  Ins/Del Ends/Picks...
  Ins/Del E/P by Color Strip

  Preferences...
```
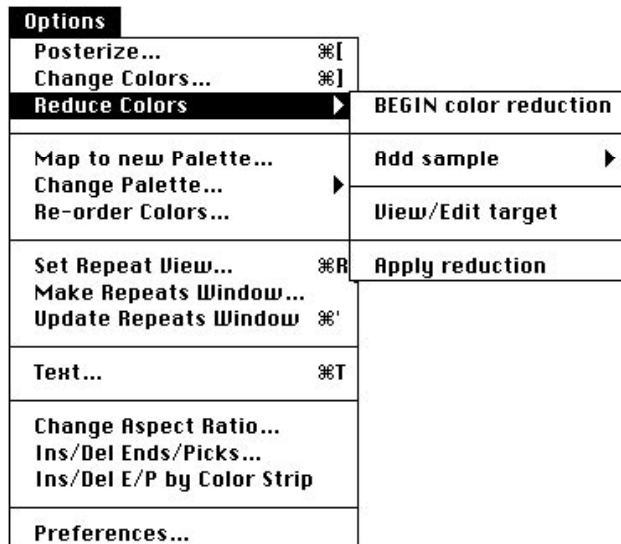
BEGIN Color Reduction - User must choose to activate the other choices in this menu option.

Add Sample - For each target (final) color, use the Lasso or other selection tool to select a representative patch of that color in the scanned image. Click on Add sample and New Target Color. Any previously entered Target Colors will be listed.

New Target Color
Open the Set up a new Target Color dialog box.   Each new target color can be given a name. The most frequently used color in the selection sample area will appear in the Target Color Box. The user may over-ride this and enter a color number. An average of all the colors may be used as the target color by clicking on the Average button. Click Cancel to exit without changes or OK to add the new sample to the Target Color list. CMD = (repeat last operation) is a shortcut to creating subsequent target colors.
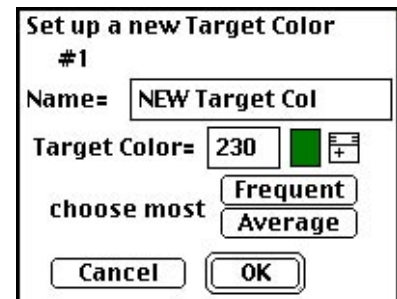
```
Set up a new Target Color
   #1
Name=  NEW Target Col

Target Color=  230  [■][⊞]

              Frequent
choose most   Average

 Cancel      OK
```

Getting good samples of each color is important for the best result, i.e., if there are variations in the original, try to include all the variants in the sample patch for that target color (use Control-Selection tool to add together patches). If later notice there is a variant missing, it can be add as a sample of it to the target color.

View/Edit target - This is not yet implemented

Apply Reduction - The result will be an image that contains only the target colors selected during sampling.

.

Map to New Palette

Selecting **Map to New Palette** will open the **Map Image Colors Into a New Palette** dialog. Along the top edge of the dialog box is the legend of symbols and keyboard shortcuts. The palette at the left is the "old" palette; numbers in the color patches indicate which color in the new palette it is assigned to. Use the arrow icons at the lower left of each palette to scroll the palette.
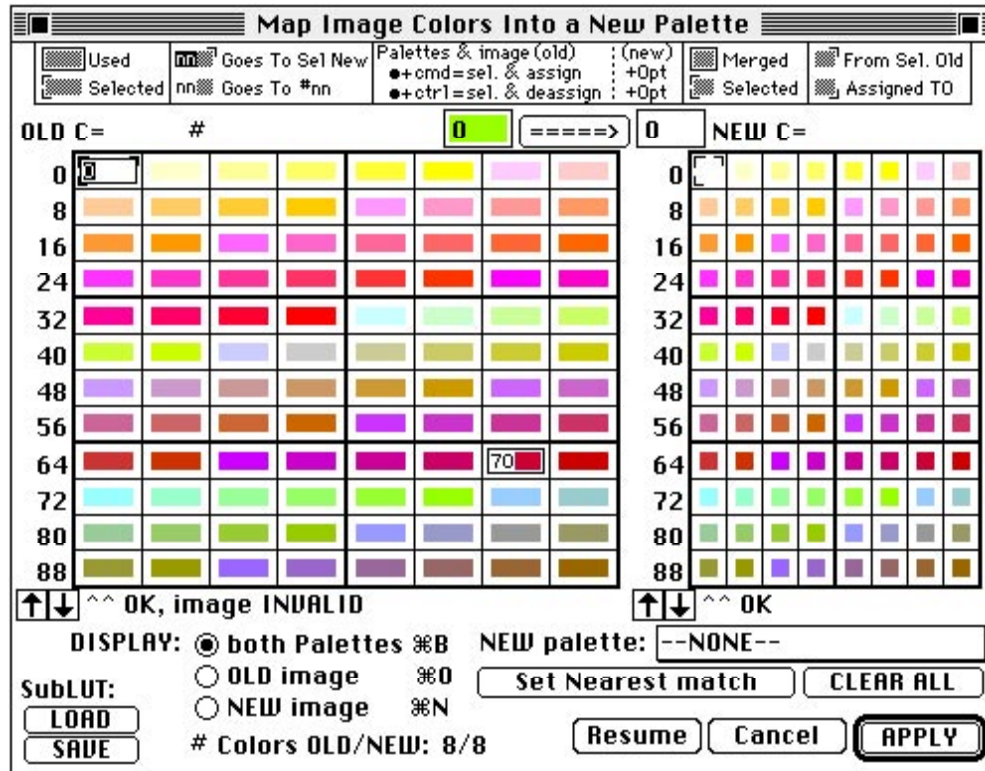
0 -------> 0 - The user enters the old palette color in the left and the new color from the palette on the right clicking on the -----> button makes the assignment.

NEW palette: - The new palette is selected by clicking in the rectangle to the right to reveal a drop down menu of choices from any of the standard palettes, any of the user's custom palettes, or "borrowed" from any image file.

Set Nearest Match - Used to set initial reassignments. These will be the equivalent of opening the file using "Keep LUT"**.**

   CLEAR ALL Reverts the old palette back to the original color numbers.

   Resume - Used to "resume" assignments when reopening the palette after exiting via Cancel.

   Cancel - Exits the dialog box without making any changes.

   APPLY - Makes the indicated changes in color palette and exits dialog box.

DISPLAY:
both Palettes - Setting used to display either both Old and New palettes (the image's colors will display incorrectly),

OLD image - Use this setting to view the image using the old palette making both palettes incorrect.

NEW image - Uses the new palette forcing both palettes display incorrectly because only 256 colors can be displayed at any time.

Note: Map to New Palette supports Cmd - B, Cmd - O, Cmd - N to select display of Both, Old or New palettes respectively. Also can be used when the dialog is "window shaded" to compare Old and New images.

SubLUT:
LOAD Option to load previously saved Substitution Look-up Tables to change colors numbers from one to another.

SAVE - User can save the SubLUT for use later.

Change Palette

The Change Palette sub-menu allows changes to the palette being used by the front window. *JacqCAD* MASTER® provides a number of alternate color palettes. Selecting any of these palettes while an image is active causes it to replace the image's color palette; the color numbers (pixel values) of the image will not change but the appearance of the image will change. Any of these palettes can also be chosen prior to beginning a new design.

> **Grayscale -** Consists of 256 shades of gray.

> **System** - This is Apple's standard color palette for the Mac II family and higher. It is the same as many of the standard paint programs for Macintosh computers.

> **Spectrum** - This is a continuous color spectrum with all colors the same brightness.

Invert LUT - Flips the current color palette. Unlike the Invert command, Invert LUT does not alter pixel values, only the way the image is displayed on the screen. The first (0) and last (255) entries of the color palette, which are always set to white and black, are not inverted, since these entries are used for drawing the menu bar, title bars, dialog boxes, etc.

Palette - Allows user to open a previously saved JacqCAD Master® palette.

Other Pal - This option allows user to use a palette from any image created in JacqCAD. Choose the desired image in the dialog box to apply its palette to the current image.

Import Text Pal./Export Text Pal.
Color palettes may be exported as a text files. The there are several options for the exported text file. The text file can be opened by any text editor software and even in spreadsheet software to allow for creating palettes based on the numerical relationship of color values.
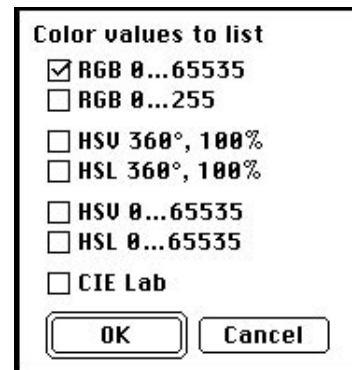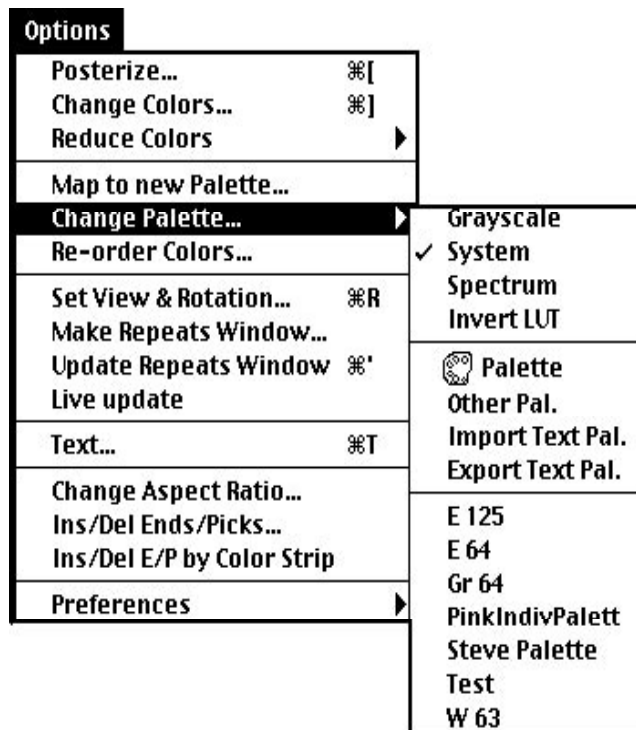
Miscellaneous (other palette choice)

The lower third of the Change Palette window represents color palettes comparable to the color palettes found within various design systems in the industry, which are indicated by a letter followed by a number. The letter indicates the type of color palette and the number, the total number of usable colors. For example, W63 is comparable to the Viable Weavette™ color palette, which contains a total of 63 colors**.**

Frequently used palettes may be saved and added to the list of miscellaneous palette choices by saving the palette and placing the palette file in the JacqCAD MASTER Palette folder. Restarting JacqCAD will then have the new custom palette add to the list.

Note: "Usable" refers to the colors to be used in order to remain compatible with one of these systems. The total number of value numbers in any of these palettes is still 256.

Re-order Colors...

Allows changes to the *sequence* of colors in the color palette without changing the appearance of the image itself (the image's color numbers will be changed to match the new color palette).

Re-order colors can also be used to prepare an image for some filtering operations. Filtering operations and thresholding, assume a gray-scale image, i.e. one in which the color numbers are related to each other along a continuous scale. Sorting the colors by Brightness may allow, for some color images, the use of the Smooth or Reduce Noise features in the Image Menu. Similarly, sorting by Brightness or by Hue may make Thresholding useful in reducing the total number of colors in an image.
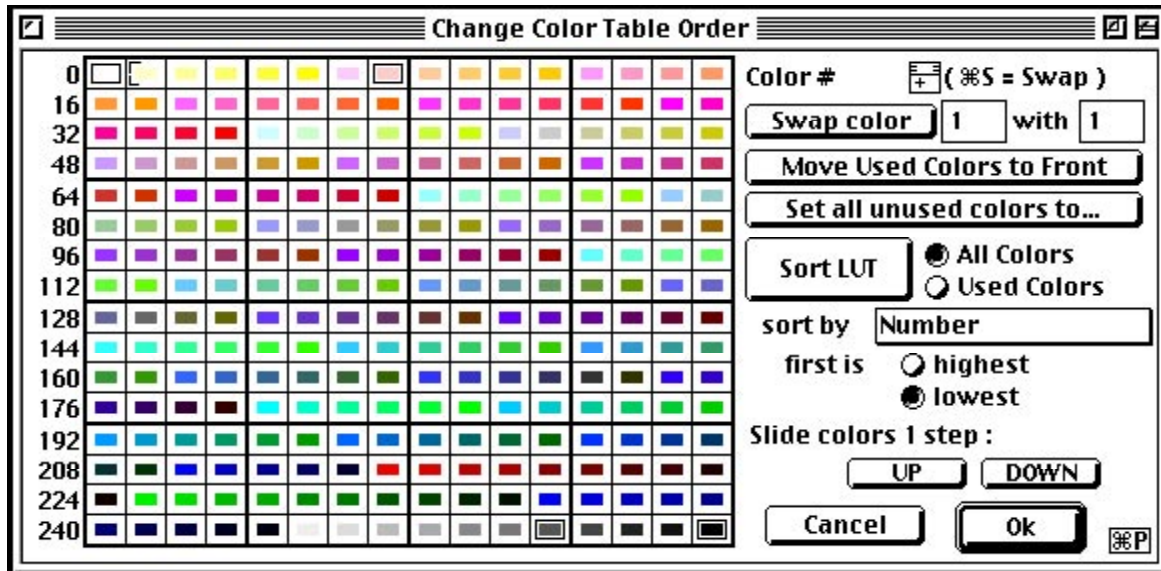
Enter the two numbers to change locations in the color table and click on the **Swap color** button.

Moves all the image colors to the "front" or beginning of the color palette, changing the color number, but not the appearance of the color.

Set all unused colors to...   Click on this button to open the color palette to set all unused colors to gray or some other color.

Sort LUT   ● All Colors   ○ Used Colors

sort by   Number

first is   ○ highest   ● lowest

Option to allow sorting the current color table by number, hue, saturation, brightness, red, green, blue, yellow, cyan, magenta and frequency. (See note above about filtering) The user can also chose the sort order by clicking highest or lowest.

Slide colors 1 step :
UP   DOWN

Cancel   Ok   ⌘P

Slide colors 1 step - Clicking on Up and Down will move all colors in the palette on color number higher or lower depending on choice.

Cancel - Exits dialog box with no changes to palette.

OK - Exits dialog while executing changes to palette.

Set View and Rotation... ⌘ R

The **Set View and Rotation** option allows the user to view and edit all 'repeat seams' of patterns that are to be repeated either by:

1. orientation
2. simple repeats
3. repeats using a Pick Shift of half the image height
4. repeats using an End Shift of half the image width

Repeat View works by dividing the image into quarters and re-arranging the quarters to form the desired repeat pattern. The resulting image is fully compatible with all of *JacqCAD* MASTER™ 's features; note however that the Pick, Logical Shuttle, and Physical Shuttle data of Expanded Images will no longer correspond to the desired values. Repeat View should be used primarily before expansion in order to clean up repeat boundaries.

Important Note: If the image view is changed there will be a check mark next to the Set View and Rotation in the Option menu to indicate that the image is not in normal view. Saving the image while in the alternate view will bring up a caution. Choosing Cancel will overwrite the image's orientation, Continue will save the image and change the image to the Normal view.
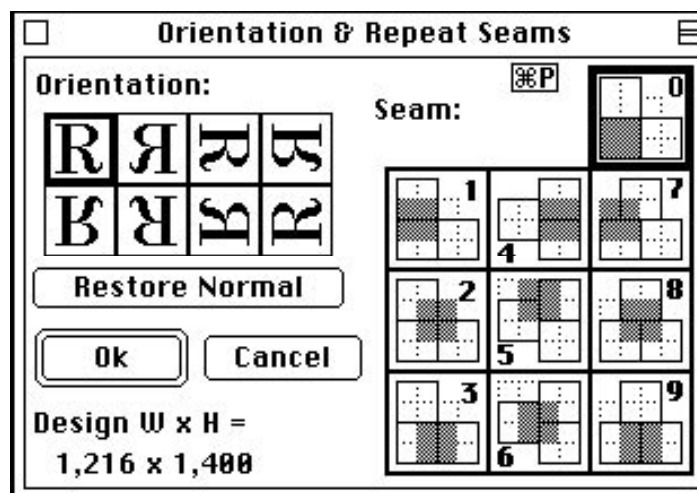
Orientation:
Choosing one of the **R** choices rotates the current image in the direction indicated by the letter R. A heavy black outline indicates the selected rotation.

Seam:
Selecting one of the available 9 choices will divide and shift the image as indicated in the grid of selections. Some options may be grayed out depending on the repeat of the active image.

The Selected View is also marked in the grid by a heavy black outline - see view 0 above.

> **Restore Normal - will select the 'Normal' view and View 0 and R will be outlined.**

> **OK - will cause the selected view to take effect.**

> **Cancel - will leave the current viewing mode unchanged.**

Each open window can have its own independent Repeat View setting.

Whenever a Repeat View other than Normal is in effect it will be noted by a check mark next to **Set View and Rotation...** in the **Options** menu.

If a rotated or seam view other than Normal is in effect when saving an image, whether by **Save**, **Save As**, or **Close**, the user will be warned and given an opportunity to restore the normal view prior to saving. The Alert will give the choice of **Continue** to first restore and then save the image, and **Cancel** to save the image in its re-arranged form.

Note: it is usually OK to save an image in the re-arranged form; it can generally be restored by opening it and selecting a view that re-arranges it back to the original form. <u>Caution is needed </u>when working with images that have odd width or height (as might be created during expansion) - in these cases the quadrants are not of equal size (some must be larger by 1 to hold the odd End or Pick) and an image saved in re-arranged form cannot be restored fully.

Changing views is very fast, so it is entirely practical to jump from view to view during a design session.

A few things to note:

1. Simple, Pick Shift, and End Shift repeats are supported. Mirroring repeats are not supported - they require that the same End be displayed twice (or more) which creates conflicts if one of the copies, but not the other, is changed. See Make Repeats Window below for working with mirroring repeats.
2. Only half width End Shifts and half height Pick Shifts are supported at present. By definition odd width images cannot be repeated with End Shifts, nor can odd height images be repeated with Pick Shifts, because the odd sized dimension cannot be divided into two equal halves. The illegal views will be 'grayed out' in the dialog window and cannot be selected.

Make Repeats Window/Update Repeats Window

Purpose: To create a "window of repeats" to see the design in repeat.

Effects: Creates a new window containing up to 5x5 repeats. Supports repeats in Plain (simple checkerboard), End Shift, or Pick Drop formats; the latter providing for shifts or drops of 1/2, 1/3, 1/4, or 1/5 of the image dimension where appropriate.

Limitations: Memory requirements can be large, for example a 5x5 repeat requires 25 X the amount of memory as is needed by the basic design. Also, only those shifts or drops which fit exactly in the dimension will be allowed, e.g., a 100 Pick tall design would allow drops of 1/2, 1/4, and 1/5 (corresponding to drops of 50, 25, and 20 picks) but not 1/3 because 100 is not exactly divisible by 3.

Basic Steps:

Use "Make Repeats Window..." to create a Repeats Window from the design.

Select the repeat size (up to 5x5), repeat type (Plain, End Shift, or Pick Drop), and repeat shift or drop (1/2, 1/3, 1/4, or 1/5).

Each cell can be set to arbitrary mirrors in the repeat by clicking on the cell in the dialog's display area and then clicking on the appropriate R to set the mirroring.
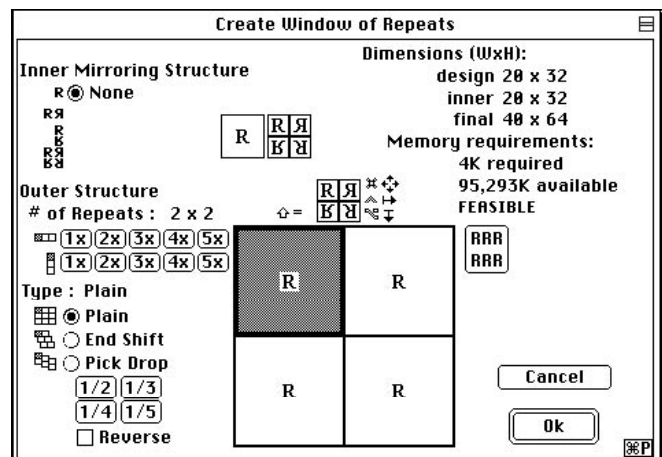
Provisions for an inner mirroring structure are present but disabled at this time (controls are grayed out). Load and Save buttons are similarly present and disabled.

Outer Structure
# of Repeats:
Use buttons to set the number of repeats horizontally and vertically up to 5 repeats in either direction.

> **Type:**
> **Plain -** Repeats line up horizontally and verically.
>
> **End Shift -** Used to shift the repeats in the end direction by shifting the repeat horizontally by half the ends.
>
> **Pick Drop** - Repeats may be shifted in the pick (vertical) direction by use of the 1/2, 1/3, 1/4, and 1/5 buttons depending on the total number of picks in the original repeat, which must be divisible by 2, 3, 4 or 5 respectively.

Different mirroring (none, End, Pick, or End and Pick-mirror) can be set for each cell of the repeat by selecting it (clicking on it) in the schematic display of repeats and then clicking on the desired orientation in the mirror selector box above the display.

Button to set all repeats to the original orientation.

The following shortcuts are provided in the Make Repeats Window dialog:
> Clicking in the mirror selector sets the selected repeat
> After setting the mirroring of any repeat, Shift-click on other repeats both selects that repeat
> and sets it to the most recent mirroring.
> Ctrl-click also sets all repeats to the right in the same row;
> Opt-click also sets all below in the same column;
> Ctrl-opt-click also sets all to right or below.
> Cmd-click sets all repeats.

The Repeats Window will be titled "Repeat of XXX" where XXX is the original window's title.

After a window of repeats has been created, it can be updated from the original (base) window via Options: Update Repeats Window, or Cmd-' whenever the base or the window of repeats is the front window.

Live Update

setting for automatic updating (while its base window is the front window). Automatic update will occur after each drawing operation in the base window. Select Live Repeat again to toggle off.

Notes: A Repeats Window is a standard image, which can be saved, etc. To create a different repeat, first close the current Repeats Window. Multiple Repeats Windows can be linked to a design, so creating a new Repeats Window from a Window of Repeat is possible and the most recent Window is still linked to the first image. Edits in the first window will update all sequential windows. Edits in any other Windows of Repeat will update only those windows created after the edited window.

Text… ⌘ T
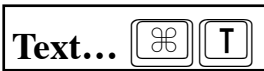
Brings up the Text dialog to select font, size, spacing, etc. This dialog does not disturb the active Text Object (if one is present), so changes made in the Text dialog to Text settings (e.g. Font, size, etc.) will be reflected in the Active Text Object when exiting from the dialog.

An "Apply" button is provided to allow previewing the effects of the changes without leaving the Text Dialog. Typing Return or clicking on the dialog's Go Away box is the equivalent of the Ok button; typing Escape is the equivalent of the Cancel button.

The Text dialog can be moved around the screen by dragging on its title bar - this allows the user to move it out of the way to see the effects of the changes (use Apply to update the screen).

```
Font : Geneva

Size (points) : 12  ▼   Line spacing (pixels) : 24      Font info :
                                                          ascent =  12
Styles :    Alignment:    Horizontal Scale :  1.000      descent =   3
  ☐ Bold      ⦿ Left       [ Set Normal ]              line spacing =  16
  ☐ Italic    ○ Center                                   max width =  15
  ☐ Outline   ○ Right     ☐ Erase Background
  ☐ Underline                                          [ Apply ] [ Cancel ]
  ☐ Shadow            Extra Spacing (pixels):
Special options :        ☐ between Letters 0.00        [      Ok      ]
  ☐ Preserve Shape       ☐ within Spaces   0.00
  ☐ Prefer Outline Fonts
```
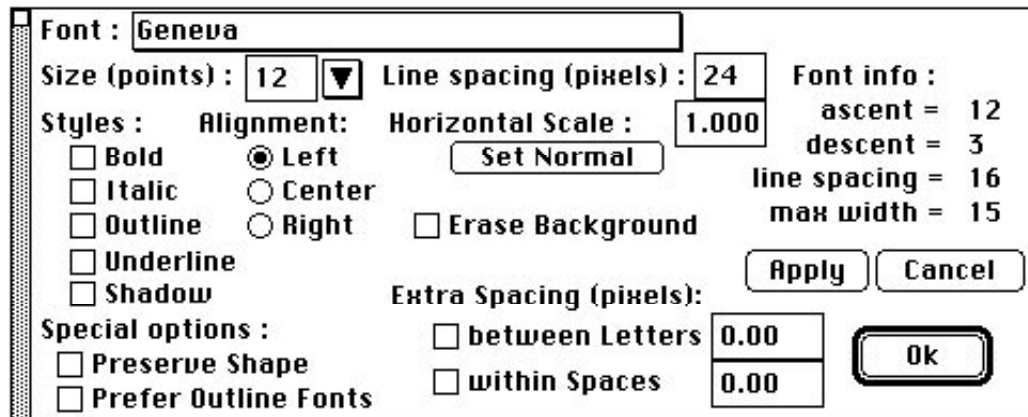
Double-clicking on the Text Tool will also bring up the Text dialog, but this approach does end (make permanent) any Active Text Object. Double clicking is provided as a convenient way of accessing the Text dialog before starting to enter type.

Font info (upper right corner)

This is information provided by the system about the currently selected Font in the selected Font, Size and Style. These values are provided only as a guide to spacing and positioning.

Ascent = the height in pixels above the baseline (bottom of upper case letters) of the tallest letter in the font.

Descent = distance in pixels below the baseline of the lowest descender in the font, for example the 'tail' on a 'j'.

Line Spacing = the recommended (standard) line-to-line spacing in pixels. This is the sum of the Ascent + Descent + a recommended Leading (spacing between the descenders of the line above and the ascenders of the line below.

Max Width = width in pixels of widest symbol in the font.

Font

This pop-up menu allows the selection of any installed font.

Size (points)

Chose type in any desired size using the keyboard (between 6 and 999 points), or click on the arrow to the right to bring up a pop-up menu of some standard sizes. Only integral sizes are supported (i.e. 10 or 11, but not 10.5). Size in points is the standard typographic description of a size and corresponds approximately to the closest line-to-line spacing in pixels that can be used without the lines looking very crowded.

Line Spacing (pixels)

This value is updated anytime a new font or size is selected, but can set to any desired value thereafter. It controls the vertical spacing between lines of type, i.e. how far down the insertion point moves when typing a Return.

Horizontal Scale

This controls the difference between horizontal and vertical scaling; the allowable range is from 0.20 to 5.00. This allows distortion to the typeface so that it will appear normal when woven. Setting this value = to the Pick/End ratio will preserve the intended font shape; other values can be used to intentionally distort the font.

Set Normal

Sets the Horizontal Scale = to the Pick/End ratio of the current image for closest 'as woven' reproduction of the font.

Erase Background

Normally only the 'black' parts of each letter are drawn into the image using the Foreground (Paint) Color; the 'white' parts of each letter are transparent, i.e. do not affect the image. Checking this option will cause the 'white' parts of each letter to also be drawn in the image using the Background (Eraser) Color; in other words the text will appear in Foreground Color on top of a rectangular area of Background Color.

Note: when using Erase Background there appears to be a problem in how certain printer fonts are handled in ATM (Adobe Type Manager). This results in a background area that, with certain fonts and when the Horizontal Scale it other than 1.00, can be somewhat too wide and that does not erase fully during screen updates.

Extra Spacing (pixels)

Provides for slight adjustments to the width of a line of text, often used to 'justify' the line of text (line up left and right edges) or otherwise adjust its appearance. The extra spacing is specified separately for "between letters" and for "between words" and can be specified in units of 0.01 (1/100) pixels each.

For example, if a line of 15 characters and 4 spaces needs to be widened by 3 pixels overall, it can be done by adding 0.20 (3/15) pixels per letter, or by adding 0.75 (3/4) pixels per space, or any equivalent combination.

Negative values will decrease the spacing.

Apply

Clicking this button will immediately apply the settings to the Active Text Object and update the screen so that the results can be viewed. If the text is under the dialog window the dialog window can be moved to a better location by dragging on its title bar. Apply does not over-ride Cancel, if the user subsequently uses Cancel to exit the text will be restored to the original settings.

Styles

These are the standard font Style modifications; any combination can be used. These style modifications are done using simple rules, for example Bold is done simply by printing the letter a second time shifted right by one pixel. Note that fonts are often provided in several faces, e.g. Garamond, Garamond Bold, and Garamond Italic, to provide more sophisticated changes. In other words, better results will be achieved by selecting Garamond Bold rather than selecting plain Garamond and then selection Bold in this dialog.

Alignment

These are the standard alignments: Left (text extends to the right of your starting point), Center (text centers around the starting point), and Right (text extends to the left of the starting point).

Special Options

These apply only when you are using System 7 and have Outline Fonts installed.

Preserve Shape:

The normal behavior is to force the type to fit between the Ascent and Descent lines. Certain special characters, e.g. Å, have parts that go above the font's Ascent line and normally these will be shrunk so as to fit. If Preserve Shape is enabled (checked) such letters will be allowed to extend above the ascent line.

Prefer Outline Fonts:

fonts are installed as "Screen Fonts" and as "Outline" or Printer Fonts. The Screen fonts are hand tuned for a specific size whereas the Outline fonts are intended for a wide range of sizes. For compatibility the normal behavior is to use the Screen font when both it and an Outline font are available. Checking Prefer Outline Fonts will cause the system to use the Outline Font even if a correct size Screen font is available.

Change Aspect Ratio

The Aspect Ratio (Pick/End or Y ratio) can be changed using "Change Aspect Ratio..." in the Options Menu.

Ins/Del Ends/Picks

Insertion and/or deletion of ends and/or picks is now supported in two ways:

"Ins/Del Ends/Picks..." opens the dialog box shown allowing the user to specify the ends/picks to be added or deleted from the current image window. Choosing one of the desired operation button will

For example, 4 end of color 12 can be inserted before End 1, then Delete 5 Ends following End 9, and duplicate End 15 6 times, etc.

The Ends and Picks specified must occur in numerical order, in other words, the user must delete the Ends following End 9 before duplicating End 15.

The amount of picks cannot be modified in an expanded image.

Activating the "Keep original image open" option will create a new image window with the user defined additions, subtractions and duplications with + added to the beginning of the original image name (ex. +image.pct).

```
Insert or delete Ends or Picks
(any combination, but must
do in numerical order)
[ Insert Ends ]   [ Insert Picks ]
[ Delete Ends ]   [ Delete Picks ]
Last command:

                      Ends  X  Picks
Original size    1216 X 1400
   New size      1216 X 1400

□ Keep original image open

     [ Cancel ]   [[ Done ]]
```

```
Insert Ends
# to insert = 4
following #  0   [max]
            [+] ( 0=before #1)
○ as duplicates
● as solid color           [+]
     of color #  12  ▮

[ Cancel ]      [[ Done ]]
```

Ins/Del E/P by Color Strip

Ins/Del E/P by Color Strip uses "color strips" in the image to guide the insertion, duplication or deletion. These color strips are part of the image and can be painted as usual. Use Ins/Del Ends/Picks above to insert color strips in the design (usually along the top or right edges, but can be anywhere desired).

A full width horizontal strip is used to guide horizontal (Ends) insertion and deletion.

A full height vertical strip is used similarly for Pick insertion and deletion.

```
Delete / Duplicate by color strip        ⌘P
 ☑ ENDS, color strip @ Pick #  1400   [+]
 ☑ PICKS, color strip @ End #  1216

□ Keep original image open

    [ Cancel ]          [[ OK ]]

Color strip coding :
255 = delete        2... 32 = duplicate 2...32 X
0,1 = keep 1        102...132 = keep + 1...31 white
others = "  "       201...232 = replace w/ 1...32 W
```

One or the other or both may be used, i.e., if only making changes in Ends then no vertical color strip is needed.

The color codes used in the color strips are:

255 = delete

0 or 1 = keep (also all other colors not defined below)

2...32 = replicate into 2...32

102...132 = keep 1 copy & follow with 1...31 inserted white (color 0) for a total of 2...32

201...232 = replace with 1...32 inserted white

For example, if Ends 1...5 are marked in the color strip as follows:

End	Color Strip	Result
1	color 255	Deleted (not copied)
2	color 1	Copied, no changes
3	color 15	Copied 15 times (15 total)
4	color 115	Copied once followed by 14 white ends (15 total)
5	color 215	Replaced by 15 white ends

Note that 15, 115, and 215 all result in a single end or pick being replaced by a total of 15 ends of picks in the new image - the difference is in the composition of the 15 items, not in the count.

Preferences

Displays a dialog box that allows changes to various *JacqCAD* MASTER™ parameters.

Preferences ▶	General Prefs...
	Save Copy As...
	Default Folders...
	Thumbnail Size...
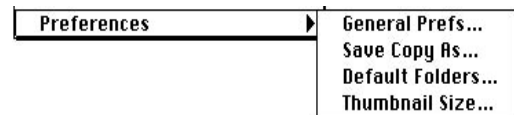
General Prefs

General Preferences allow the user to specify the amount of memory set aside for the Undo buffer. The Undo Buffer should be as large as the largest image that you intend to work on. The required size can be computed by:

Buffer size in K = Width X Height / 1024

Twice this amount of memory will be set aside when Jacq-CAD MASTER™ starts up and will no longer be available for images. The Undo buffer must be at least as large as the image in order for Cut & Paste to work. In the event that the memory is not available, then JacqCAD MASTER™ will respond according to the selected option under '**Paste / Objects'** and '**Dragged Paint tools'**.

Min. Clip Buffer - The **Min. Clip Buffer** allows the user to specify the minimum amount of memory required by Jac-qCAD MASTER™ for you to copy a selection. This means that if enough memory is not allocated for the clip buffer, then regardless of the size of the clip JacqCAD MASTER™ will allocate no less than the minimum amount of memory required to copy anything to the clipboard.
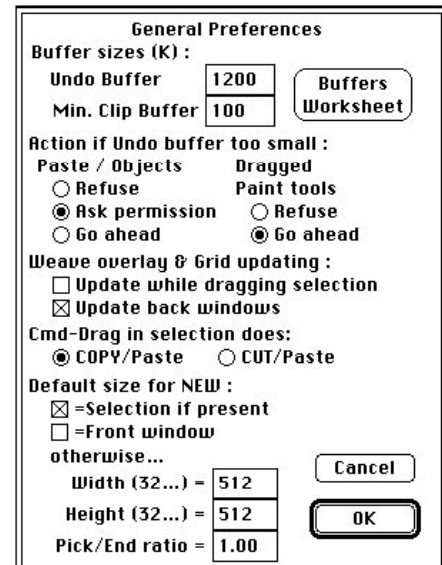
Paste / Objects and **Dragged Paint Tools** 'Refuse', (the default setting) disallows any operation that will exceed the current 'Undo Buffer'. 'Ask permis sion' allows the user to proceed with the desired operation with a dialog box warning that the operation will not be undoable. The 'Go ahead' selection allows the operation to proceed without the warning dialog.

Default Sizes - The Default Sizes for the Width and the Height for a new image are set in the lower portion of the General Preferences dialog box. The range for image sizes is from 32 to 7168 in both width and height. This allows you to set a 'standard' size with which new windows will be created. In the example below, the standard width and height have been set to 512 x 512 with the Y-Ratio at 1.00.

Pick/End ratio - Sets the ratio of pixel height versus width. Pixels will always be square when the image is first opened, but will become rectangular as soon as zooming is done. This value will be used only for New images or for images that are being seen for the first time by JacqCAD MASTER™.

Buffer Worksheet

The **Buffer Worksheet** is for calculating the amount of memory necessary for a typical job using JacqCAD MAS-TER™. The calculations are based upon Maximum image size, number of simultaneous open images, **Maximum** Expanded size, Weaves, Cut & Paste function, and ability to use 'Undo'.
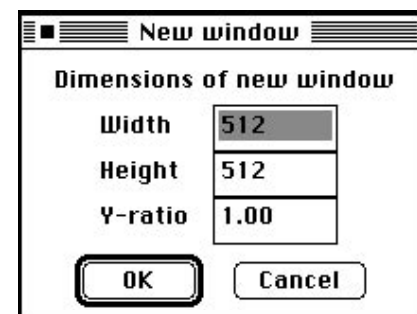
Maximum image size

The Maximum image size should be based upon the largest image size that you anticipate creating with JacqCAD MASTER™. For example, in the picture shown, the maximum image size is 640 high by 700 wide.

of simultaneous images

This entry is for the number of windows of the maximum size that will be opened simultaneously.

Will create Expanded Image

Check this selection if Expanded images will be created.

Will use Weaves

Check this option if images with the weave overlay applied will be displayed.

In ALL Windows

Choose this option if more than one window with weaves applied will be needed.

Average weave size (Height,Width)

The estimated average size of the weaves being used.

Maximum Cut / Paste Buffer size (Height,Width)

Enter the largest size of the anticipated selection to copy. It is common for this amount to be equal to the maximum image size.

```
Worksheet for Buffer Allocation (all mem sizes in K bytes)
Images :                                              K bytes
        Maximum image size (W,H) :   [640]  [700]     needed
           # of simultaneous images : [2]               996
        ⊠ Will create Expanded Image
           Max. Expanded size (W,H) :  [1152] [1400]    1,790
        ⊠ Will use Weaves
              ☐ In ALL windows
           Average weave size (W,H) : [64]   [64]
                 Number of weaves : [256]                153
Cut/Paste Buffer :
           Max. CUT/PASTE size (W,H) :  [640]  [480]     300
UNDO Buffer :
        ○ Only partial Undo, size (W,H) = [640]  [480]
        ○ Full Undo for images
        ● Full Undo for   "    and Expanded Image       1,586
JacqCAD internal requirements :                        1,040
                                                      =======
TOTAL memory required :........................        5,863
Memory available (Get Info) to JacqCAD :              11,817
Spare memory  ( - =not enough)                         5,955
┌──────────────────────────────────────────────────┐
│ Appears to be sufficient memory                    │
│                                                    │
└──────────────────────────────────────────────────┘
          ( Cancel )                  (  Ok  )
```

Undo Buffer

1. 'Only partial Undo' - This provides for the Undo feature in a limited respect to the amount of currently available memory.

B. 'Full Undo for images' - Selecting this option will provide enough memory for full undo on the Maximum image size, but not for Expanded images.

C. 'Full Undo for images and for Expanded images' - Using this option provides a complete Undo for potentially all cases.

JacqCAD internal requirements

The amount of memory necessary for the application to run.

Once the worksheet has been completed, the worksheet shows the calculations in the bottom section of the dialog.

TOTAL memory required

Calculation of the total memory allocation needed for JacqCAD MASTER™.

Memory available (Get Info) to JacqCAD

The current amount of memory that has been allocated to JacqCAD MASTER™.

Spare memory (- = not enough)

Once the Buffer Worksheet has been completed this text field at the bottom of the dialog box indicates if there is enough memory currently allocated to the program. If not, the necessary amount to be added to the current memory allocation will be specified. Upon leaving the Buffer Worksheet, the calculations will be placed into the proper spaces in the General Preferences dialog box.

Save Copy As....

The Preference file is saved when exiting JacqCAD MASTER™. Save Copy As... allows the user to save a copy of this Preference file for use on other computers or for particular type jobs. The information is stored in "BootVolume/System Folder/Preferences/JacqCAD MASTER Prefs" The only active Prefs file is the one in the System Folder, and its name must be exactly "JacqCAD MASTER Prefs". Settings saved in the JacqCAD MASTER Prefs file include: Default Recent Files List, Folder Settings, Color Groups, SubLUTs, Saved Brushes, MicroPalette, Gradients settings, Weave Display Prefs, Shape Binder defaults and 8x8 Patterns.

Default Folders...

To specify the exact path and folder each file type is located in. The user can indicate the following locations for each file format used in *JacqCAD* MAS-TER™. The options are: **whichever is open** (which ever folder is open at the time), **Design's Folder** (same folder as front design window), **Recent Group Folder** (folder most recently used for this file type), and **Specific Group Folder**. Choosing Specific Group Folder opens a window the enables the user to choose a specific path to locate the exact folder to be opened when saving or retrieving a particular file group.
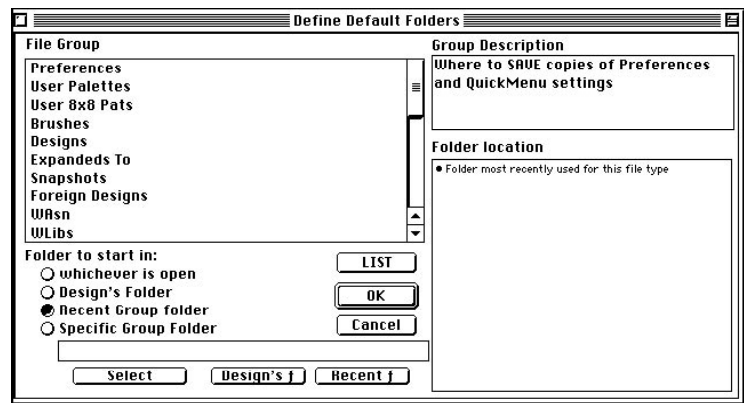
Highlighting individual file groups located in the top left section of this dialog box will give the user information about this file type. The **Group Description** window to the right describes what the default folder setting will do, such as where the file is saved or looked for or if the option is currently implemented. The **Folder location** window indicates the currently selected option for the selected file type.

Thumbnail size...

Lets user temporarily change the size of the ThumbNails saved with PICT files. Size reverts to 128 pixels each time JacqCAD is restarted. Allowable range is 80 (standard size used by Photoshop, etc.) to 480, and is useful for creating large thumbnails for import by image cataloging programs such as iView Media. JacqCAD's thumbnails are scaled to present the correct aspect ratio; also, small designs are scaled up to fill the thumbnail size.

Increasing the Memory

To change the amount of RAM (Random Access Memory) allocated to *JacqCAD* MASTER™:

1. If the program is running, quit the program.
2. Single-click on the *JacqCAD* MASTER™ application icon to highlight it and choose **Get Info**' in the **File** menu(or Command I keys).
3. Enter the amount needed for *JacqCAD* MASTER™ into the entry box marked '**Preferred Size**'.
4. Close the window and restart the program.
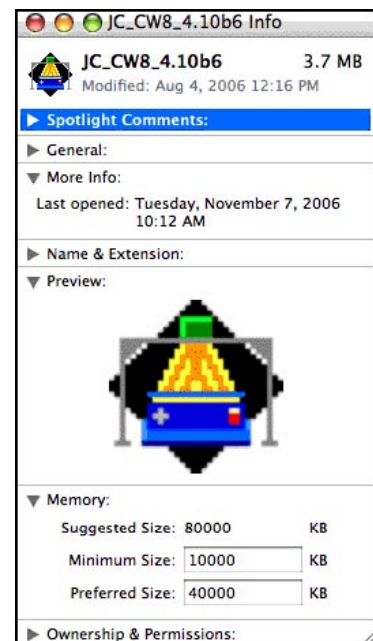
CHAPTER 5: THE IMAGE MENU

Filters

Filtering functions generally assume that a gray-scale image is being filtered; this is because filtering operations are based on the assumption that the pixel values (color numbers) are part of a continuous scale. For example, smoothing effectively *averages* the pixel values in a small area; in other words it assumes that replacing a mixture of pixel values 60…64 with value 62 makes sense.

Filtering colored images only makes sense if the color palette is arranged so that color numbers form an 'averageable' sequence; in a few cases sorting the color palette by brightness, or by hue, ***may*** satisfy this requirement.

These functions, with the exception of Isolated Pixel, Median, Popularity and Dither, are implemented using 3 x 3 spatial convolutions, where the value of each pixel in the selection is replaced with the weighted average of its 3 x 3 neighborhood. For correct operation, they require a grayscale image. Filtering is not limited to rectangular selections. The entire image will be filtered if no selection is active. Filtering operations can be aborted by typing Command-Period.

Image

Filters ▶	Isolated Pixel
Dither	Isolated +
Invert	
Convolve...	Smooth
	Smooth +
Text Seq To Col.Strip	Sharpen
Col.Strip To Text Seq	Sharpen +
Enhance Contrast	Median
Equalize	Popularity, all pix
Convert to Grayscale	Popular., Fg pix only
Binary ▶	Popular., adjustable
	NW Gradient
	NW Edges
	Kirsch Gradient
	Kirsch Edges
	Max Value
	Min Value
	Range
	Sum Variance

Isolated Pixel & Isolated + (all images)

The purpose of these functions is to search for isolated instances of color and replace them with the colors surrounding them; they are especially useful for cleaning up scanned images.

Isolated Pixel - replaces colors with the colors surrounding the individual pixels and does no averaging between the values. The Isolated Pixel filter replaces pixels whose color is not matched by any of its 8 neighbors (4 edges and 4 corners).

Isolated + - replaces pixels whose color is not matched by any of its 4 neighbors (4 edges) (note that it will delete single width diagonal lines since these are only connected at their corners). Pixels to be replaced are filled with the color of their 'left edge' neighbor; holding the Option key down will use the 'right edge' neighbor's color instead. The diagrams below illustrate the conditions best suited for the uses of these filter functions.

Using 'Isolated Pixel'

Before   After

Using 'Isolated +'

Before   After
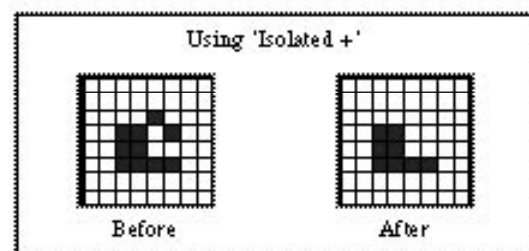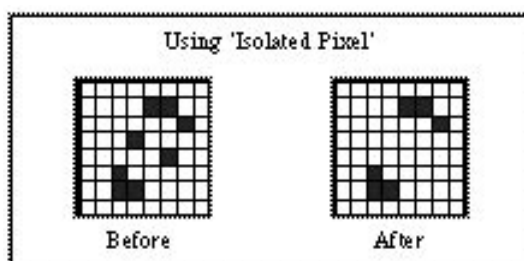
Convolution filters (Smooth, Sharpen):

The 3 x 3 tables shown below are the coefficients for the filters, which use spatial convolution. The value of each pixel is multiplied by the corresponding weight and added into a total that is then averaged to produce the new value. For example, the Smooth filter sums 1X each of the 8 surrounding pixels plus 4X the central pixel, then divides the total by 12 (sum of the weights 8 + 4) to arrive at the new filtered value for the central pixel. Custom convolution filters using up to 63x63 pixels can be created and used with the 'Convolve' function mentioned later in this section.

<u>Smooth</u>

This filter blurs (softens) the selection area. It can be used to reduce noise in an image. Hold the Option key down for increased blurring. This is a convolution filter.

1	1	1		1	1	1
1	4	1		1	1	1
1	1	1		1	1	1

(If Option key down)

<u>Sharpen</u>

Another convolution filter that Increases contrast and accentuates detail in the selection, but may also accentuate noise. To minimize this problem, you can Smooth and/or Reduce Noise before using Sharpen. Hold the Option key down for increased sharpening.

-1	-1	-1		-1	-1	-1
-1	9	-1		-1	12	-1
-1	-1	-1		-1	-1	-1

(If Option key down)

<u>Median</u>

Used to reduce noise in continuous images - replaces central pixel with median (middle) color value found in the 3x3 neighborhood. Sorts values in numeric order, picks the middle one.

<u>Popularity</u>   (all image types)

It looks at the 3x3 area around the pixel to be filtered and finds the most popular (most often used) color with which it replaces the center pixel. These filters can be used with color images because they do not create any new colors; they are very useful for reducing stray pixels, e.g., in scanned images. If no "popular" color is found, for instance if all 9 pixels are different colors, then no change occurs.

<u>**Popularity, all pix**</u> - filters all pixels - use this for reducing isolated pixels.

<u>**Popular. Fg pix only**</u> **-** only filters pixels whose color matches the current foreground color.

<u>**Popular.,adjustable**</u> - allows selection of which center colors to filter, which colors to count, and of thresholds for the minimum vote needed to replace the center pixel.

Which to filter - controls which pixels will be considered for replacement - All, Foreground only, members of a color group, or non-member.

Which to count controls - which pixels will be allowed to "vote" in the popularity contest.

Replace if highest count is - controls what is required for a color to

Settings for Complex Popularity filter

Filtering area :
(●) 3x3   ( ) 5x5   ( ) 7x7

Which to filter
(●) ALL
( ) only if Fg Color
( ) only if IN ColGrp #   [1]
( ) only if NOT in ColGrp#

Which to count
(●) ALL
( ) only if IN ColGrp #   [1]
( ) only if NOT in ColGrp#

Replace if highest count is
( ) 1 or more   ( ) 1/2 or more
(●) 2 or more   ( ) 2/3 or more
( ) 1/3 or more ( ) at least [2]

UNLESS center color's count is
higher than [999]

[Save]
[Load]
[OK]
[Cancel]   ⌘P

"win" the contest - for example, "1/2 or more" requires that at least half of the pixels allowed to vote (see above) be of the same color.

UNLESS center color's count is - option to suppress replacement if the center pixel's color is seen in the indicated number of pixels.

NW Gradient, NW Edges, Kirsch Gradient, Kirsch Edges

For continuous (gray scale) images; Gradient filters replace image with gray-scale value indicating how fast image brightness was changing. Edges filters do same followed by a thresholding.

Max Value, Min Value

For continuous (gray scale) images; replace each pixel by the Maximum (Minimum) color number found in the 3x3 neighborhood.

Range

For continuous (gray scale) images; replace each pixel by the difference between the Maximum and Minimum color numbers found in the 3x3 neighborhood.

Sum Variance

For continuous (gray scale) images; replace each pixel by the sum of differences between the color numbers of the center pixel and those of its neighbors in the 3x3 neighborhood.

Dither

Dither is useful only with gray-scale images; it uses the Floyd-Steinberg error diffusion algorithm to convert the current selection to a binary (black and white only) image. Dark areas are converted to almost all black pixels, light areas to almost all white pixels, and mid-gray areas to a 50-50 mixture.

Dithering can be useful for exporting pictures to applications such as MacPaint, which can only accept binary images. Dithering can also be used for printing on the ImageWriter, or other non-PostScript printers.

An especially interesting use of dithering is for converting a gray scale image into a weave.

Invert

This function flips the color palette in relation to the color values (numbers) and not the compliments on the color wheel. The exception to this would be true grayscale palettes, where the negative is the product of the inversion.

Convolve...

Does spatial convolutions using kernels, which are read from a text file, than can be up to 63 x 63 in size. Any text editor program can be used for creating or examining these kernels.

As discussed under Smooth and Sharpen, convolution kernels are arrays of weights to be used in "averaging" the pixels around the pixel being filtered. Convolution filters are only applicable to images in which the color values are related in a meaningful way - primarily gray-scale images in which the color number is its brightness, but also images using the Spectrum palette where color number relates to Hue.

For an example, use a text editor to create the following file and then use the Convolve command to try it out on a gray-scale image.

This is a 9 x 9 "Mexican hat" filter that will do both smoothing and edge detection in one operation. Each line should be terminated with a carriage return, and the coefficients should be separated by one or more spaces, or by a tab.

This filter gives the most weight to the center pixel (24), lesser weights to its immediate neighbors, and negative weights to more distant pixels.

Entire books have been written on the topic of image convolution and the design of filters.

```
 0   0   0  -1  -1  -1   0   0   0
 0  -1  -1  -3  -3  -3  -1  -1   0
 0  -1  -3  -3  -1  -3  -3  -1   0
-1  -3  -3   6  13   6  -3  -3  -1
-1  -3  -1  13  24  13  -1  -3  -1
-1  -3  -3   6  13   6  -3  -3  -1
 0  -1  -3  -3  -1  -3  -3  -1   0
 0  -1  -1  -3  -3  -3  -1  -1   0
 0   0   0  -1  -1  -1   0   0   0
```

Text Seq to Col. Strip

Allows user to import a text file of a list of numbers (that represent color numbers) into the image as a color strip. Choosing this Image menu option opens a window to located the text file to import followed by the Text Sequence to Color Strip dialog box. The name of the text file and the number of entries in the file are noted in the top of the box. The color strip can be horizontal or vertical in orientation and the numbers in the text file can begin at either end of the color strip as indicated in the dialog box.

Starting from End# / Pick # - indicates the starting point of the color strip on the active image.

using: - The total number of pixels used in the color strip. Clicking on 1 Repeat will change to the to entries in the text file. The text file will continue to repeat unless this button is selected. Using the all button will select the total number of ends or picks of the horizontal or vertical color strip respectively.

Step only if UN masked - this option will skip over any masked pixels in the color strip when applying the text file.

Draw It - imports the file to the color strip indicated and will exit the dialog box.
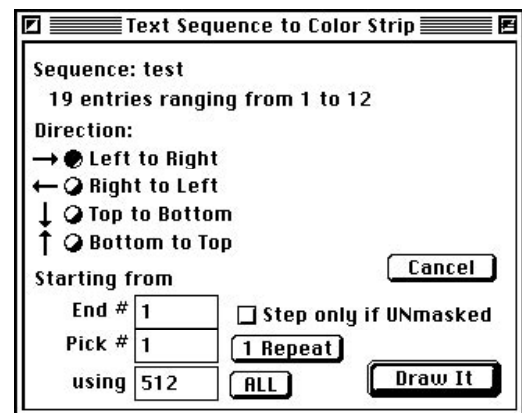
Col. Strip to Text Seq

This is the reverse function of the Text Seq to Col. Strip, provides a way to export a color strip to a text file. The resulting Color Strip to Text File dialog box provides the user the options to define the direction, location, length and format of the Text File.

Direction - Select the appropriate radio button to define the direction of the color strip: left to right, right to left, top to bottom or bottom to top.

Starting from - Enter the location of the first end and pick in the sequence.

using - allows the user to limit the length of the text sequence.

Format: The sequence information in the "Text Sequence" file can be any combination of the following 3 forms:

C1 C2 C3   creates a text file listing each color of the color strip individually by color number.
            C1 C2 C3... 1 3 2 4
"+ M * Col the resulting text file indicates the number of occurrences of the following color
            number   6*2 = 2 2 2 2 2 2
" + N [...]   text file listing repeats broken into bracketed color number patterns
            3[1 2] = 1 2 1 2 1 2
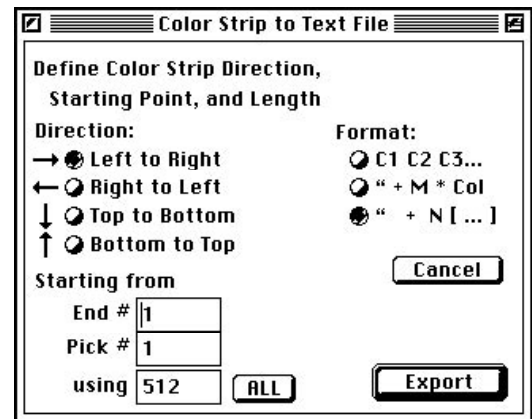
Enhance Contrast

This function is exclusively designed to work with grayscale images. Enhance Contrast increases the contrast between hues in the image.

Equalize

Performs histogram equalization based on the density histogram of the current selection. A new gray map look-up function is generated which more evenly distribute the gray values of the image. This will usually improve contrast. The newly created look-up table function is displayed in the Gray Map window. Use the Apply LUT to make the contrast change permanent. Equalization only works with grayscale images.

Apply LUT (gray images) or Convert To Grayscale (color images) ⌘ L

Applies the current (Color Palette) to each pixel in the current selection (or of the entire image if there is no current selection) and then restores the default look-up table (the identity function). This modifies the gray values so that when the image is viewed using the default Color Palette it will look the same as it did before. This command provides a way of making brightness and contrast changes permanent. It can also be used to convert color images to grayscale.

Binary

This submenu is used to process binary (black/white) images. These operations may be of use to textile designers when dealing with a poor quality outline drawings (in black and white). Using Outline followed by Dilation will often fill in gaps in the lines widening and extending them; Skeletonize will then reduce the lines back to single pixel width.

Set Iterations & Threshold

Sets number of iterations for the above processes in this menu. For example, if set for 5 iterations then choosing Erosion will result in 5 repetitions of erosion being applied to the image.

Erosion

Removes pixels from the edges of objects in a binary image, where contiguous black areas in the image are considered objects, and the background is assumed to be white. A pixel is removed (set to white) if four or more of its eight neighbors are white. Erosion separates objects that are touching and removes isolated pixels.

Dilation

Adds pixels to the edges of objects in binary images. A pixel is added (set to black) if four or more of its eight neighbors are black. Dilation connects discontinuous objects and fills in holes.

Opening

Performs an erosion operation, followed by dilation, which will smooth objects and remove isolated pixels.

Closing

Performs a dilation operation, followed by erosion, which will smooth objects and fill in small holes.

Outline

Generates a one pixel wide outline of objects in a binary image.

Skeletonize

Repeatedly removes pixels from the edges of objects in a binary image until they are reduced to single pixel wide skeletons. Command-period can be used to abort the thinning process.

CHAPTER 6: THE MEASURE MENU

Show Histogram ⌘ H

This Measure option displays a plot showing the distribution of pixel values within a selected area of the image or, if no selection is present, within the entire image. Any type of selection is suitable.

The plot shows each of the 256 colors, along the bottom, and the number of pixels of each color in the selection. Placing the cursor over a histogram bar in the Histogram window displays the information for that color. The upper portion of the dialog box provides detailed information, such as the color, color number, the total number of pixels of that color, the percentage of that color within the selection or image, and the color values in reference to the Color Picker. A strip at the bottom of the histogram displays the corresponding colors.

Using the Copy command when the histogram window is active will copy the histogram plot (as a PICT) to the clipboard. If the color palette is a non-system palette, the image colors may be appear incorrectly when importing into another application. The histogram data values (as a single column of text) are available by selecting **Measure, Show Results**. These values can then be saved to a text file using **Export**.

Histogram data for colored images is helpful in determining which colors are used within any desired area (selection).

Clicking on the **Settings** button brings up the Set Histogram Display Type dialog allowing changes to the histogram data displayed.

The 'Zoom' box in the right corner of the Histogram Log window toggles the display between 1X and 2X widths.

Measure menu:
Show Histogram ⌘H
Color Use Summary
Warp balance
Float Lengths
Detect 2 in Shed
Detect 2 in Warp
Dobby (test)
Measure selection

Show Results ▶

Meas. Options...
Clear All Meas.

Calculator...

Special funtions ▶

Log by # Histog. of "4096 Sys.PICT"
C 28 [Settings] R 255 H 0.0°
7,723   G 51   S 80.0%
% 3.57   B 51   V 99.7%

Set Histogram Display Type

Horizontal	Vertical
◉ by Color #	○ Linear
○ by R & G & B	◉ Logarithmic
○ by H & S & V	

RGB values:	HSV values:
○ 0...65,535	○ 0...65,535
◉ 0...255	○ 0...255
○ 0...100%	○ 0...100%
	◉ 0...360°, 0...100%

[Ok] [Cancel]

Color Use Summary

Color Use Summary creates a text list of each color used in the design, the First and Last Cards in which that colors occurs, and the total number of Cards the color occurs on. This table can be displayed, printed, or exported as a 'tab delimited' file (columns of numbers separated by Tabs for import to a word processing or spread sheet application).

For Expanded images it will also report on Logical Shuttle and Box usage by <u>Pick</u> in which they appear for the first and last times and on the total number of Cards on which they appear; this provides a quick and easy way of calculating yarn usage. The report on Design Color use remains organized by 'card' for both normal and expanded images.

```
╔═□══════════ Color Use Summary ════════╗
║ Tuesday, July 28, 1998   1:24 AM   file:4096WM.Exp
║ JacqCAD MASTER® v3.41ß8 25jun98
║  Fletcher Applied Sciences, Inc. system # 3 Key 22872066
║
║ Expanded Image
║
║  Range 1..376 = 376 cards
║
║ BY LOGICAL SHUTTLE : # of Log Shut used =   1
║    Log.Shut  First PICK   Last PICK Total Cards       %
║         1          1          376         376  100.000
║
║ BY SHUTTLE BOX : # of Boxes used =  3
║       Box    First PICK   Last PICK Total Cards       %
║         1          1          376         126  33.511
║         2          2          374         125  33.245
║         3          3          375         125  33.245
║
║ Color Use Summary : # of colors used = 29
║     Color  First Card   Last Card Total Cards       %
║         2          1          376         376  100.000
║         3          1          376         218  57.979
║         4          1          376         241  64.096
║         5          1          376         261  69.415
║         6          1          376         279  74.202
║         7          8          374         289  76.862
║         8          1          376         315  83.777
║        11          1          376         332  88.298
║        12          1          376         327  86.968
║ [Export] [Print] [Clip] [Reset]  ◄▓▓
```

Warp Balance

This option measures how frequently each warp end changes faces (goes from Cut to Miss or vice-versa) that relates to the amount of warp tension. A warp end that is more active than average will "take up" more resulting in increased tension; an end that is less active can become slack. The result of this analysis is shown in a graph for further inspection. The mid-line represents the average activity of all warp ends; lines that protrude above represent more active warps; those below are less active.

To test a file the weaves must have been assigned and cut into the image. This allows the Warp Balance feature to analyze the cuts' and 'misses' in the design. Positioning the cursor over a graph line will display the data for that warp end - the End number (59 in the example to the right), number of face changes (150), deviation from average activity as a % (-15.7%) as compared with the average activity (178) of all warps, and percent of the time the warp is Up (65.7%).

```
╔═□═════ Warp Balance, grid = 20% steps ═════╗
║ [warp balance graph]                        ║
║ |||||  |  ∂#✕  -49.9 %  ✕ 226  ⊤ 343  [Text] [Print] [ ++ ] [ -- ]
║ #✕ 113  %⌐.. 11.1 %  #✕       ⊥ 110
```
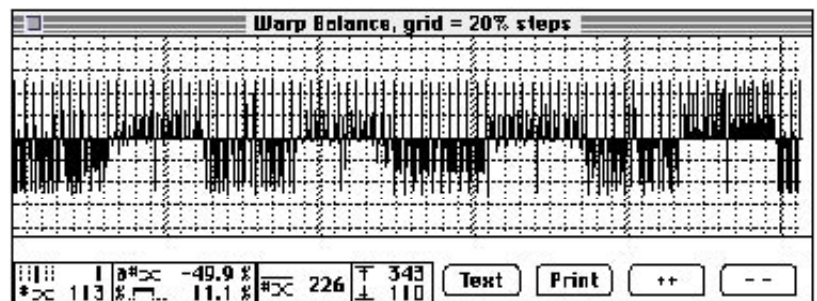
```
┌─────┬─────────┬───────┐
│|||||  59 │∂#✕  -15.7 %│ #✕  178 │
│#✕  150 │%⌐.. 65.7 %│         │
└─────┴─────────┴───────┘
```

Note: This graph provides a measure of relative activity. The amount of deviation from average which will cause trouble depends strongly on the particular construction and the yarns being used - experience with your constructions is the only accurate guide.

Float Lengths

Measures float lengths of warp face & back, weft face & back.

```
≣□≣≣≣≣≣ Float Length Histogram values ≣≣≣

Tuesday, June 24, 1997   03:39 PM   file:+paisthrowcut.Exp
JacqCAD MASTER® v3.32β0 26mar97
 Fletcher Applied Sciences, Inc. system # 3 Key 22872066


Float Lengths, Ends 1…1776  X  Picks 1…2336 :
     floats also end at right & bottom edges


  Length    Weft Face    Weft Back    Warp Face    Warp Back
    1        525325       528409       366385       378518
    2        312407       320455       163872       141428
    3         45192        35393        66845        79448
    4         21916        23099        22877        17048
    5        122348       121502        14733        14332
    6         12735         7298         8383        17213
    7          2685         5880       122629       113864
    8            20            0         1030         7049
    9           296            0         6706         5676

[Export] [ Print ] [  Clip  ] [Reset]   ←▐▊▌         ➡
```
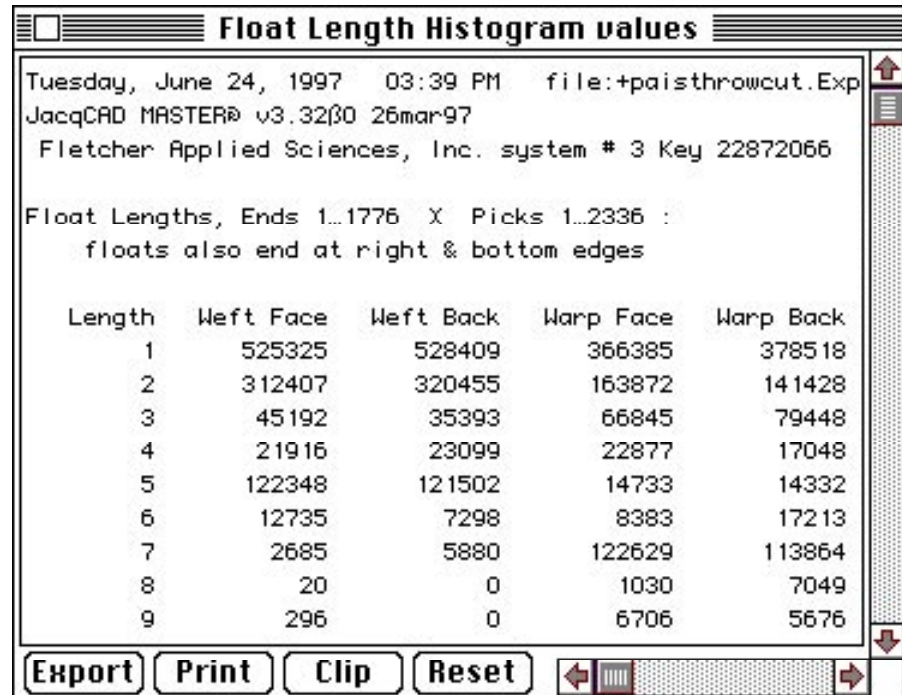
Detect 2 in Shed

Finds wefts that are following identical pathways [identical patterns of cut (black) / miss (non-black)]. Can be set for which picks above the pick being examined are to be compared - relative picks 2....8 can be selected in any combination. For example selecting 2 means that the pick being inspected (#1) will be compared to the pick just above it, whereas selecting 3 results in the pick (#1) being compared with pick #3, i.e. skipping #2 in between. User sets maximum acceptable width of identical sections; longer lengths are reported as a "2 in the shed problem" area. Can be set to create a mask protecting all the image except those areas identified as problem areas (both the reference pick and the pick it is being compared to will be un-protected over the entire length of the run of identical path). Can be limited by rectangular selection, otherwise analyzes entire image.

Detect 2 in Warp

Finds warps that are following identical pathways [identical patterns of cut (black) / miss (non-black)]. Can be set for which ends to the left of the end being examined are to be compared - relative ends 2...8 can be selected in any combination. For example selecting 2 means that the end being inspected will be compared to the end next to it, whereas selecting 3 results in the end (#1) being compared with end #3, i.e. skipping #2 in between. User sets maximum acceptable width of identical sections; longer lengths are reported as a "2 in the warp problem" area. Can be set to create a mask which will protect all the image except those areas identified as problem areas (both the reference end and the end it is being compared to will be un-protected over the entire length of the run of identical path). Can be limited by rectangular selection, otherwise analyzes entire image.

Dobby (test)

This function evaluates an image, or a rectangular selection of the image, to determine the number of harnesses that would be required to weave the pattern on a Dobby loom.

If during the analysis more than 100 harnesses are determined to be necessary, the Dobby function exits immediately with a "Much too complex" message. If more than 32 harnesses are required (but less than 100), the function completes its evaluation & exits with a message "too complex) plus the number of harnesses required as an indication of the extent of excess complexity. If 32 or fewer harnesses are required, then the function creates a display showing End to Harness assignments and a Threading chart which shows which harnesses to be lifted on each pick. This display can be printed or exported to a text file.

Measure Selection

Computes the area and mean density of the current selection and displays the results in the Results window. In addition, the Meas. Options dialog box can be used to enable other measurements, such as perimeter length. Undo will delete the last measurement. If the minimum density is less than 1, or the maximum is greater than 254, then a message will be displayed indicating the possibility of saturation. A counter will be incremented each for each measurement. The maximum number of measurements is 250. Use Show Results to list, print, or export the current measurements, and Reset to reset the counter to zero.

The most efficient way to record measurements is to have a spreadsheet on the screen while using *JacqCAD* MASTER™. Make a series of measurements, display them and Clip them to the Clipboard, click on the spreadsheet to activate it, select the cell where the measurements will be placed, Paste the results (Command-V), click on the image window to reactivate *JacqCAD* MASTER™, and finally, Reset the measurement counter.

Show Results

Displays a list of the current measurements. At the bottom of the display window are buttons that can be used to *Export*, *Print*, or *Clip(to* the Clipboard) the readings, or to *Reset* the measurement counter.

Export

Saves the measurements as a tab delimited text file that can be Opened by many Macintosh data processing programs. For correct display, it may be necessary to adjust tab settings when opening an exported file with a word processing program. Hold down the Option key when using Export or Clip to include column and row headers with the output.
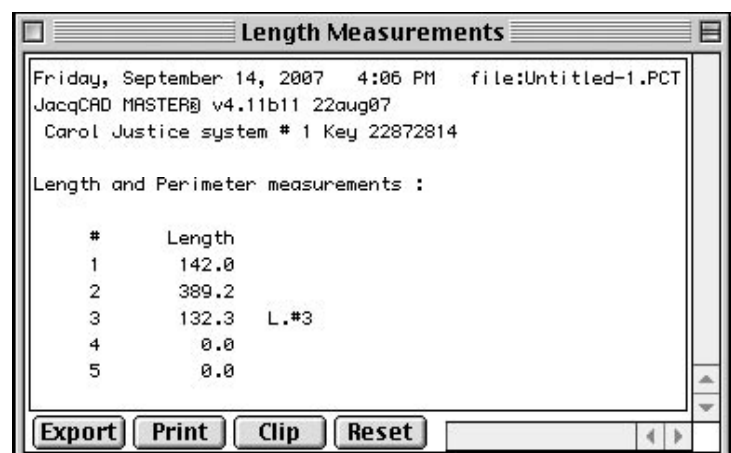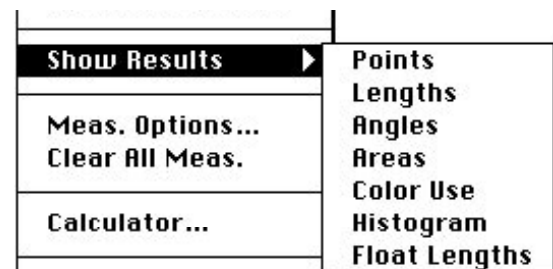
Print

Sends the data to the selected printer for output.

Clip

Copies the data to the Macintosh clipboard for immediate transfer into a spread sheet program. Tab-delimited format is used for export.

Reset

Clears the summary values so that new ones can be made.

Measure Options

Option to specify which measurements are to be made by the Measure Selection command and displayed (and Exported, Printed or Clipped) by Show Results.

Area

Area of the selection in pixels.

Mean Value

Average gray level of the pixels within the selection.

Standard Deviation

This is the standard deviation of the pixel densities used to gene ate the mean density.

Modal Value

Most frequently occurring gray level within the selection. Corre sponds to the highest peak in the density histogram.

Center Position

Gives the location of the center of the selection in X and Y values in the Area Measurements Window. If the entire image has been selected, then it will indicate the center of the design.

Perimeter

Length around the outside of the selection. Only computed for freehand and polygon selections.
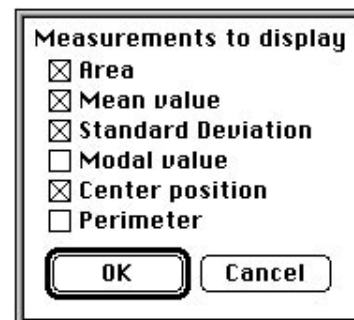
Clear All Measurements

Deletes the specified region measurement and renumbers any subsequent measurements.

Calculators

Yarn Measure...

The upper section of the "Yarn Calculator" converts between various yarn measures including: Denier, English Cotton Count, Worsted Count, Linen Count (wet spun), Jute Count, Metric Count, Tex, Deci Tex. It also converts a yarn measure into other units of Weight (g, Kg, Oz, Lbs) per length (mm, cm, m, inch, ft, yd) and length per weight. These conversions are exact because all the yarn measures are defined in terms of length/weight or weight/length.

The middle section of the Yarn Calculator calculates the corresponding yarn diameter and yarn density at 100% coverage - these calculations depend on the yarn's structure and fiber density as well as its measure; consequently these conversions are only approximate. Typical density values are provided for a range of materials (cotton, silk, wool, etc.) and yarn constructions.

It is important to understand the limitations of this data. The effective density of a yarn can vary over a 3:1 range depending on the degree of twist and other parameters; this corresponds to a 1.7:1 range in diameters and yarn density at 100% coverage!

The yarn's density depends on the fiber density times the 'fiber fraction' which is the fraction of the yarn occupied by fiber (the remainder being air). For a monofilament this fiber fraction is 100% while typical "standard warp twist" yarns have a fiber fraction of 60% (i.e., 60% fiber, 40% air). Very lofty and soft yarns can go as low as 35%, though with significantly reduced strength.

Fiber fraction values do not seem to be readily available, so experience must be the guide. In general, using the standard 60% value will produce reasonable cover values. The weight values (oz/sq.Yd, etc.) are based on straight yarns, in other words they do not take into account warp crimp or fabric shrinkage.

The bottom section of the Yarn Calculator provides a conversion from twist per length, e.g., twists per inch, into the helix angle in degrees for the selected yarn diameter.

Repeats...

The Repeats Calculator provides assistance in determining which smaller numbers will fit a whole number of times into a larger number. This information is useful for deciding such issues as:
1. which weaves will be compatible with a given design width. If the harness is repeating a design across the loom then it is crucial that each weave roll out a whole number of times across the design.
2. how many times a given size motif can be repeated in a distance, and how wide the margins between each repeat must be
3. or the opposite - how large a motif must be to repeat out a certain number of times.

In the upper section of the Repeats Calculator the user enters a number (called the Total Size) and clicks on **Calculate** to find the factors of this number; factors are the smallest numbers which when multiplied together result in the total size. In the example given, 1152 (a common warp count on single-head looms) is calculated to be made up of the factors 2 x 2 x 2 x 2 x 2 x 2 x 2 x 3 x 3**.**

The calculator also shows all the repeats widths or counts which can be derived from these factors. For 1152 these include 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 32, 36, 48, and so on. Any weave whose repeat width is one of these values will fit a whole number of times across 1152. Conversely, any

```
┌─────────────────────────────────────────────────────────────────┐
│ □ ═══════════════ Repeats Calculator ═══════════════════════ ▤ │
│ Total Size                                                   ⌘P   │
│   = │1152     │  [ Calculate ]                                    │
│  ┌──────────────────────────────────────────────────────────┐   │
│  │ Size = [ 2 x 2 x 2 x 2 x 2 x 2 x 2 x 3 x 3 ]             │   │
│  │ whole repeat sizes or counts :                           │   │
│  │   2 x 576      3 x 384      4 x 288    6 x 192   8 x 144  9 x 128 │
│  │  12 x 96      16 x 72      18 x 64    24 x 48   32 x 36   │   │
│  │                                                          │   │
│  └──────────────────────────────────────────────────────────┘   │
│                                                                   │
│  Repeat Size or Count                      [ Done ]              │
│   = │ 36      │  [ Calculate ]                                    │
│  ┌──────────────────────────┬───────────────────────────────┐   │
│  │ 38 X 30 = 1140 (-12)     │ 39 X 30 = 1170 (+18)          │   │
│  │ 37 X 31 = 1147 (-5)      │ 38 X 31 = 1178 (+26)          │   │
│  │ 36 X 32 = 1152 •         │ 37 X 32 = 1184 (+32)          │   │
│  │ 34 X 33 = 1122 (-30)     │ 35 X 33 = 1155 (+3)           │   │
│  │ 33 X 34 = 1122 (-30)     │ 34 X 34 = 1156 (+4)           │   │
│  │ 32 X 35 = 1120 (-32)     │ 33 X 35 = 1155 (+3)           │   │
│  │                          │                               │   │
│  │ 34 X 33 = 1122 (-30)     │ 34 X 34 = 1156 (+4)           │   │
│  │ 35 X 32 = 1120 (-32)     │ 35 X 33 = 1155 (+3)           │   │
│  │ 36 X 32 = 1152 •         │ 36 X 33 = 1188 (+36)          │   │
│  │ 37 X 31 = 1147 (-5)      │ 37 X 32 = 1184 (+32)          │   │
│  │ 38 X 30 = 1140 (-12)     │ 38 X 31 = 1178 (+26)          │   │
│  │ 39 X 29 = 1131 (-21)     │ 39 X 30 = 1170 (+18)          │   │
│  └──────────────────────────┴───────────────────────────────┘   │
└─────────────────────────────────────────────────────────────────┘
```

weave whose width does not appear will not fit a whole number of times. For example, a weave of width 14 would not fit because 14 can not be created from the factors of 1152.

The lower section allows the user to enter a specific repeat size or count and to check how it will fit into the total size.

In the example we are checking how 68 (either the width of a repeat or the number of repetitions) will fit in 1152. Since 68 does not appear in the upper section we already know it will not fit perfectly.

The lower section shows that 68 can fit imperfectly either 16 times (leaving 64 unused ends) or 17 times (running short by 4 ends). It also shows the nearest perfect fits - 72 x 16 and 64 x 18.

Fabric Setting

Given Warp & Weft yarns (selected via Yarn Measure Calculator), and a representative weave (chosen via Select Weave dialog) calculates theoretical maximum densities for 3 basic constructions:
  1. Warp rib - weft straight, all bending in warp
  2. Weft rib - warp straight, all bending in weft
  3. Balanced - both warp and weft bend

Calculates the "crimp" - the extra amount of yarn required by the bending. By definition the weft crimp = 1.000 for Weft Rib (because the weft is straight) and warp crimp = 1.000 for Warp Rib.

Crimp of bending yarn(s) is larger than 1.0; a crimp of 1.25 would indicate that 125" of yarn would be needed for 100" of fabric. Calculates the "Cover Factor" - always 1.000 in the rib constructions where either the warp or weft is "shoulder to shoulder" across the fabric, but is less than 1.0 for balanced constructions. A value of 0.92 would indicate that 92% of the area is covered

by warp, weft, or both, and 8% is open. The representative weave is used to determine the dimensions of the weave repeat and the (average) number of face changes made by the warp and weft within each repeat. A 2x2 tabby (plain weave) results in the lowest yarn densities because each weft is separated from its neighbor by a warp which is changing faces, and vice-versa. Weaves with lower activities, such as satins, permit higher densities because most of the time adjacent wefts are not separated by warps nor are adjacent warps separated by wefts.

For example consider a 5-shaft satin:

_____   _____   only 1 out of 5 wefts is separated from

    oooo\o/oooo\o/   its neighbors by face-changing warps

     -     -   so the spacing for 5 wefts = 5 weft + 2 warp

```
┌──────────────────────────────────────────────────┐
│ □      ≡  Fabric Setting Calculator  ≡          ▤ │
│ ┌─Select Warp─┐                                   │
│ │ # 10.0000 [English cotton count] Cotton, Reg.Wrp.│
│ │ Twist; full coverage at 88.4620 yarns/inch     │ │
│ ┌─Select Weft─┐                                   │
│ │ # 10.0000 [English cotton count] Cotton, Reg.Wrp.│
│ │ Twist; full coverage at 88.4620 yarns/inch     │ │
│ ┌─Select Weave─┐ │ Tabby                          │ │
│                            Warp   Weft            │
│                 Repeat Size │ 2    │ 2            │
│                 Face Changes│ 2    │ 2            │
│ Units: Yarns/  │ inch  │                          │
│ ─────────────────────────────────────────────    │
│ Calculated Fabric Settings :                      │
│             Density        Crimp        Cover     │
│ Type:      Warp   Weft    Warp   Weft   factor    │
│ WEFT Rib   44.2   88.5    1.000  1.571  1.000     │
│ WARP Rib   88.5   44.2    1.571  1.000  1.000     │
│ Balanced   51.1   51.1    1.209  1.209  0.821     │
│               ┌──── Done ────┐          ⌘P        │
└──────────────────────────────────────────────────┘
```

Please bear in mind that these calculations provide at most a useful starting point. The analysis assumes that the yarns are round in cross-section and incompressible - both demonstrably inaccurate.Solid warp and wefts are assumed - in other words one size for all warp yarns and another size for all wefts. The representative weave is assumed to affect all warps uniformly, and the same is assumed for wefts. Single layer fabric is assumed. Despite the above limitations, this tool can provide a useful starting point for experimentation. For multi-layer fabrics simply use the weave which will be applied to one layer. A mixed weft tap construction, which includes 2 thick fillers plus a thin binder, can be analyzed by interpolating values for just the 2 fillers with the values calculated for 3 fillers - the "truth" will lie somewhere inbetween.

CHAPTER 7: THE SPECIAL MENU

Find... ⌘ F

Provides a method for defining and locating a pair of arbitrary size rectangular patterns: the Find pattern and the Replace pattern The Find pattern is used to find matching patterns in the image which can then be replaced, if so desired, by the Replace pattern. The two patterns are of identical size and may contain as few as one cell up to as many as 3072 cells in a rectangular pattern (4x768, 6x512 ... 48x64, etc.).

Each cell in the Find pattern can be set to either
- a. require a specific color,
- b. require the absence of a specific color, or
- c. to match any color ('don't care' condition)
- d. a cut or miss
- e. a color included in a color group
- f. absence of a member of a color group

A match occurs when the requirements of all cells are simultaneously satisfied.

Each cell in the Replace pattern can be set to either
- a. to leave the underlying image color unchanged,
- b. contain a specific color which will replace whatever color is at that position in the image,
- c. contain a number to be added to the color found in the image, or
- d. to copy the color from any of the 8 neighboring pixels.

Special

Find...	⌘F
preset Finds	▶
Find Next	⌘G
Count All	
Make Mask from Find All	
Replace	⌘8
Replace All	⌘9
Repl. All w/mirrors	
Show Last Found	
Color Group #1	▶
Outline Operations	▶
Outl.Mem 1 (Rgn 1K)	▶
Reactivate Outline	⌘0
Undo Outline Change	⌘\
Masking on	⌘M
Msk. Display ONLY	
Reverse Mask	
Create / Edit Mask...	
Mask Preferences...	
Mask »» Outline	
Discard Mask	
Guide Lines...	
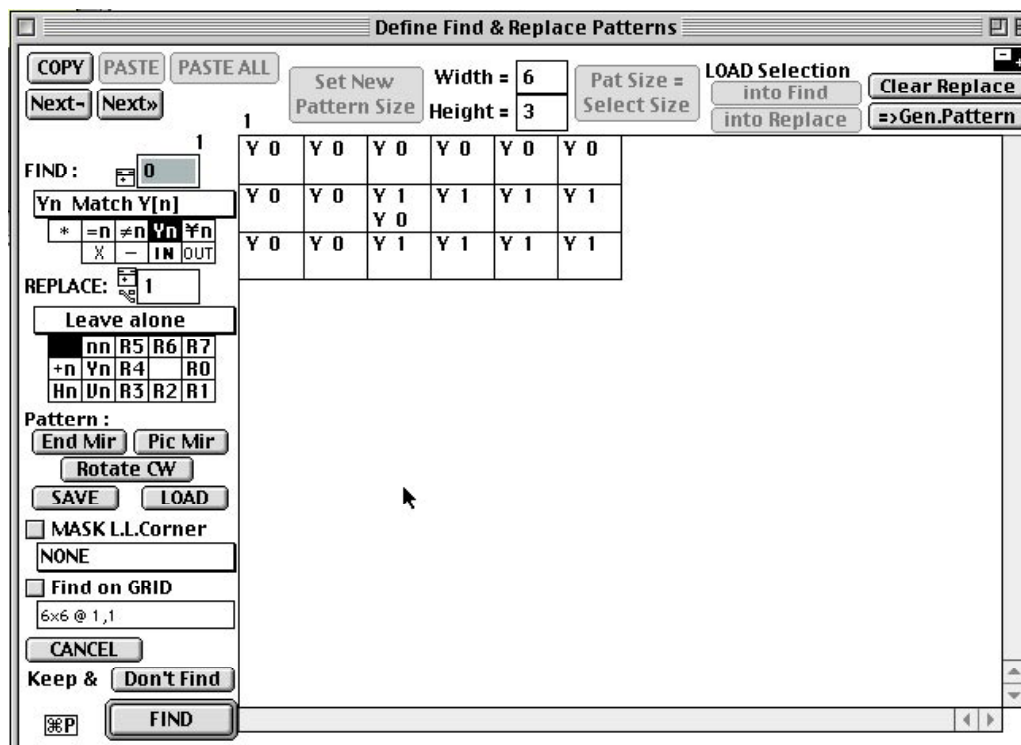
"Symbolic" colors are supported; this permits the conversion of a Find pattern from one which contains specific colors to one which searches for patterns. For example, a specific match pattern might look for a boundary between color 10 and color 20; the equivalent Symbolic pattern would look for color 'A' next to color 'B' and would match not only 10 next to 20, but also 30 next to 5, or 5 next to 30, etc.

Patterns may be defined either by entering colors one by one in the Find dialog (by typing in color numbers or selecting colors from a palette), or by selecting a part of the image prior to choosing Find, the dimensions and contents of this selection can then be used as the Find pattern. Similarly, the Replace pattern can be loaded from an image selection (the Find pattern should be loaded first as doing so clears the Replace pattern).

Each cell in the pattern contains the Match color in the upper half and the replacement color in the lower half. In the Find & Replace pattern to the left, all the upper values (values to be matched) are filled in with specific color numbers while only three of the Replace values (lower halves) are filled in. This pattern will only match a very specific pattern of colors 5, 14, and 22, and replace it (if Replace is used) with an equally specific pattern that will include color 10 to 'bind' the left edge of color 14:

5	5	22 10	14
5	5 10	14	14
5 10	14	14	14
5	5	22	22

A much more general pattern can be defined using 'symbolic' colors : instead of listing specific colors, we will use the symbolic colors Y0, Y1, and Y2 to represent the three colors in the original pattern.

Find pattern					Replace pattern			
5	5	22	14		5	5	10	14
5	5	14	14		5	10	14	14
5	14	14	14		10	14	14	14
5	5	22	22		5	5	22	22

Y 0	Y 0	Y 1	Y 2
		10	
Y 0	Y 0	Y 2	Y 2
	10		
Y 0	Y 2	Y 2	Y 2
10			
Y 0	Y 0	Y 1	Y 1

Note that the 'shape' is the same as above, but now any combination of 3 differing colors that create this shape will be recognized as a 'match', see example to the left.

5 5 22 14		22 22 37 55		1 1 2 3
5 5 14 14	or	22 22 55 55	or	1 1 3 3
5 14 14 14		22 55 55 55		1 3 3 3
5 5 22 22		22 22 37 37		1 1 3 3

It is important to understand exactly how the specific colors get assigned to the symbolic colors. The rules are: 1) the first occurrence of a symbolic color (e.g. Y0) in the pattern 'picks up' its color from the underlying image, subsequent occurrences must match the color seen in the first one; and 2) every symbolic color must be unique, in other words Y0 must not be the same as Y1, etc.

The patterns are scanned from left to right starting with the top row. In the example, the upper left corner is the first occurrence of Y0, hence this is where Y0's color will be picked up from the image; similarly the first occurrence of Y1 is in the third cell of the top row while Y2 occurs for the first time in the 4th cell of the top row.

A cell in the pattern can be selected by 'clicking' on it; clicking on the top half will also select the Find color number while clicking on the lower half will select the Replace color number instead (as shown to the right). Colors are changed by editing their color number in the usual way in the Find and Replace displays to the left, or by clicking in the color patches to the right of the color values which will bring up a palette from which a color can be chosen.

Y 0	Y 0	Y 1 10	Y 2
Y 0	Y 0 10	Y 2	Y 2
Y 0 10	Y 2	Y 2	Y 2
Y 0	Y 0	Y 1	Y 1

The values in each **Find** cell can be one of 5 kinds (selected from the pop-up menu or by clicking on the appropriate icon) :

'*'   = "don't care", i.e. any color is acceptable

'n'   = color n must be found

'≠n'   = any color except n is acceptable.

'Yn'   = the color defined as Yn

'¥n'   = any color except Yn; note that Yn must also be used in the pattern

'X'   = any cut (indicated by color 255)

'-'   = any miss (indicated by color that is not color 255

'IN'   = IN Color Group X (1..16)

'OUT' = NOT IN Color Group X (1..16)
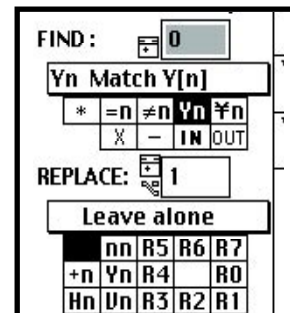
The **Color Group** settings can be used to match (or not match) any color in a previously defined color group. For example you could define color group 1 containing all the "background" colors in your design, and color group 2 containing all the foreground colors, and then find the boundaries by using "G1 G2" in the Find pattern which will match any background color next to any foreground color.

Each **Replace** cell can be of one 14 kinds :

blank = the image should be left unchanged

'n'   = replace by color n

'+n'   = n should be added to whatever color is found

'Yn'   = the color defined as Yn; note that Yn must have occurred at least once in the Find Pattern so that it will have a defined value at replace time.

'Hn'   = place Horizontal (weft) binder using color n . If necessary the location of the Weft binder will be moved one pixel to the left or right in order to avoid identically colored pixels directly above or below. See discussion on binders on page 7.7.

'Vn' = place Vertical (warp) binder using color n. If necessary the location of the Warp binder will be moved one pixel above or below in order to avoid identically colored pixels directly to its left or right. See discussion on binders on page 7.7.

'R0' through 'R7' which replace a pixel with the color of one of its 8 neighbors. The choice is presented as which direction to replace from - i.e., from the East (R0), SE (R1), South (R2), SW (R3), West (R4), NW (R5), North (R6), or NE (R7).

```
Leave alone
 n  Replace
+n  Add to color #
Yn  Repl. w/ Y[n]
Hn  -Binder (n)
Un | Binder (n)
←  R0  repl. from E
↖  R1  repl. from SE
↑  R2  repl. from S
↗  R3  repl. from SW
→  R4  repl. from W
↘  R5  repl. from NW
↓  R6  repl. from N
↙  R7  repl. from NE
```

Changing the value in the Find window automatically sets it to the 'n' format, i.e. to be matched. Changing a value in the Replace window automatically sets it to the 'n' format, i.e., to be used to replace the existing color.

Patterns are always rectangular but it is easy to define patterns of other shapes through the use of 'don't care' cells. The example at the left shows a Find pattern that will match a narrow diagonal pattern. All the other cells in this pattern, marked by *, are set to "don't care" so they will match any color in the image; in other words only the 4 cells on the diagonal impose any requirements that must be met. Patterns of any arbitrary shape can be similarly created as long as they fit within the maximum size rectangle (3072 cells or less).

Set New Pattern Size - changing either width or height enables this button and clicking on it will change the pat-

```
┌──────────┐  Width = 1    ┌──────────┐  ┌─────────────────┐
│ Set New  │               │ Pat Size =│  │ LOAD Selection  │
│Pattern Size│ Height = 1  │Select Size│  │    into Find    │
└──────────┘               └──────────┘  │   into Replace  │
                                          └─────────────────┘
```

tern size as desired.
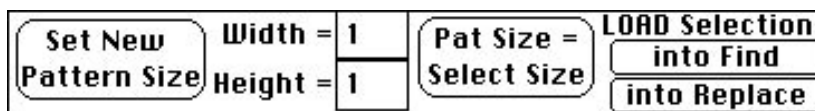
Pat Size = Select Size - changes pattern size to active rectangle selection size.

Load
into Find - copied the image colors from the selection into the current Find pattern
into Replace - will load the image colors from the selection into the current Replace pattern. In short, the procedure for defining a selection as the match pattern is as follows :
  • make a selection in the image
  • Select **Find** in the Special Menu
  • click on **Pat Size = Select Size**
  • click on Load Selection **into Find**.

To load a Replace pattern, return to the image, select the replace pattern (must be same size as Find), select Find again, and this time click on Load Selection **into Replace**.

It is possible to load the selection into a different sized pattern - this is why separate buttons are provided for setting the pattern size and for loading the selection.

When a non-rectangular selection is loaded, the overall Find/Replace pattern will be the size of that selection's "enclosing rectangle". However, pixels outside of the selection (but inside of the rectangle) will be set to "don't care" in the Find pattern and to "don't change" in the Replace pattern.

Clear Replace
Will set all the values in the Replace pattern to color 0 and Don't Care.

=>Gen.Pattern
Will convert the existing pattern to a Symbolic one; in other words, specific colors will be replaced by symbolic ones wherever possible. There are certain limitations to this process which will prevent values from being converted; these include : 1) in the Find pattern, a specific color to not be matched, such as ≠5, can only be converted to ≠Yn if 5 was seen elsewhere in the pattern, and 2) a specific color in the Replace pattern will only be replaced by Yn if that same color was seen in the Match pattern and converted to the Yn format.

End Mir - flips the patterns horizontally.

Pic Mir - flips the patterns vertically.

Rotate CW(Clockwise) - rotates the patterns 90 degrees in the clock-wise direction.

Save Pattern - stores the current pattern in a file from which it can be recovered using Load Pattern.

Any sequence of these buttons may be used to yield all 8 possible arrangements of the original pattern.

Controlling where Find tries to find a match:

Normally Find checks every possible position for a match, in other words having tried one position and failed to find a match it moves the Find pattern to the right exactly one pixel (end) and tries again. Once it has tried the last possible position on a line it moves back to the left edge and down one pixel to begin the next row of attempts. This requires a very large number of comparisons - for example searching an 1152 x 1000 design with a 10x10 pattern will result in over one million attempts, each failed attempt requiring between 1 to 99 comparisons between a pattern pixel and a design pixel.
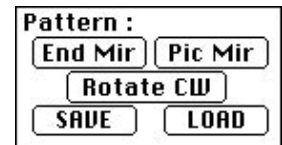
Under many circumstances it is neither necessary nor desirable to attempt to find matches at all possible positions. Often you may only want to find matches that are aligned to certain ends or picks, for example for binding. In other cases you may only want to search within a certain figure.

Three means of limiting the search area are provided and employed in any combination proving a very flexible control of the Find process:
    1. limiting the search to a rectangular ara
    2. limiting the search through a LLC (Lower Left Corner) Mask
    3. limiting the search to positions on a Grid.

Rectangular area : if a Rectangular Selection is present when a Find is started, the search will be restricted keeping the entire Find (and Replace) pattern within the selected area. An exception occurs if the rectangular selection is used in the Find dialog to set the pattern size or to load a pattern - in this case Find assumes the selection is for that purpose and it disables the active selection prior to starting the search (the selection can be re-activated using cmd-0 (zero) or Reactivate Outline in the Special menu, see Outline Operations below).

LLC Mask : use any one of the 8 Saved Masks (see pg. 7.23) to control Find attempts which will only be allowed when the Lower Left Corner (LLC) of the Find pattern aligns to a black area in the selected mask. This provides extremely flexible control on a pixel by pixel basis - for instance Find attempts are limited to within a complex figure, to specific Logical Shuttles or assigned Boxes, etc.

Select the Saved Mask to use from the pop-up menu just below the Mask LL Corner check box - selecting a mask will also turn on the check box. Note that only masks that are exactly the same size as the image can be used. The name of the selected mask will be displayed.

Find on Grid : define a Grid by the width & height between the grid lines and the starting End and Pick to which the grid is aligned. Find will only look for matches where the Lower Left Corner (LLC) of the Find pattern aligns to the grid.

Click on the text area below the Find on Grid checkbox to bring up the Grid dialog (shown at right) used to set the grid values; doing so will also turn on the Find on Grid checkbox. The grid settings will be reported in the text area as Width x Height @ starting End, starting Pick, e.g. "6x6 @1,1". Clicking on =Selection uses the current rectangular selection to define the grid - useful for finding weave repeats.

Controlling where Replace makes changes:

Normally Replace makes whatever changes are specified in the Replace pattern. However these changes are filtered by the current Image Mask if Masking is turned on (see Masking below) so that changes will only be made on the unprotected (black in Mask) pixels of the image.

Any combination of the above 4 restrictions is permissible; in other words the Find area can be limited to a rectangular area AND further restricted via a LLC Mask and/or further control where replacements will be allowed via an Image Mask.
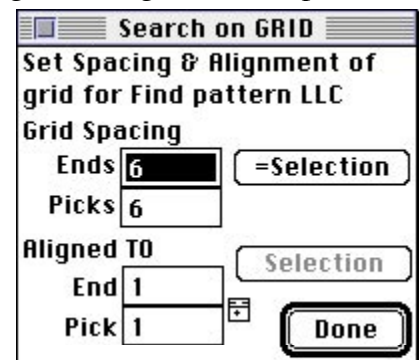
Cancel
Exits from the Find dialog without changing the design.

Don't Find
Stores the pattern ('Keep &') and exits back to the image.

Find
Starts a search for the first match. Note that if a rectangular selection was in effect when Find was entered (perhaps to define a pattern), the search will only occur within that selection; consequently the usual approach in this case is to exit using Don't Find, remove the selection (Option S) and then calling Find Next in the Special Menu.

Copy (Cmd-C) - remembers the settings of the currently selected cell

Paste - duplicates copied cell settings in any subsequently selected cell; opt-Paste pastes into the current cell and all cells to its right; ctrl-Paste pastes into the current cell and all cells below it.

Paste All - duplicates those remembered cell settings into all cells, but first it brings up a dialog which allows you to choose whether to paste into only the Replace pattern or into both the Find and Replace patterns.

COPY   PASTE   PASTE ALL
Next¬   Next»

Next¬ moves the selection down one row or Return.
Next», or Tab , moves right one column; holding down the Shift key reverses the direction of the Next buttons. Holding down the Option Key causes the Next keys to do a Paste followed by the appropriate move. Combinations of Shift and Option keys are permitted.

If the pattern is larger than the window, the scroll bars will be enabled so you can move around in the pattern. The numbers at the upper left corner of the display window will indicate the number of Rows and Columns that have scrolled above or to the left of the visible area.

…About Horizontal & Vertical Binders

Simple binders are implemented in the Replace pattern; these use the format **Hn** and **Vn**, for Horizontal and Vertical binders respectively, where **n** is the binder color to use (usually color 255, but any color may be used for special effects).

Binders are only placed if they will not result in 'in a row' binding. Horizontal binders will only be placed if no pixels of the binding color are already present above or below; vertical binders will only be placed if no pixels of the binding color are already present to the left or right.

Horizontal binders (**Hn**) will first try to place a binder at the indicated position, if this fails an attempt will be made one end to the left, and finally an attempt will be made one end to the right. Before placing the binder the ends above and below the binder position being considered are checked, if either end matches the binding color the attempt fails.   If all three attempts fail then no binder will be placed.

Vertical binders (**Vn**) will first try to place a binder at the indicated position, if this fails an attempt will be made one end above, and finally an attempt will be made one below. Before placing the binder the ends to the left and to the right of the binder position being considered are checked, if either end matches the binding color the attempt fails. If all three attempts fail then no binder will be placed.

A margin of at least 1 cell is required all around any binder to allow room for the alternate positions and for the checking of adjacent ends. Attempts to enter **Hn** or **Vn** along any edge of the Replace pattern would violate this requirement - *JacqCAD* will beep and refuse to enter the binder symbol. This margin requirement can be met with "don't care" cells, for example the Find/Replace pattern: will find any horizontal runs of 8 or more ends of color 2 and will attempt to bind them with color 255 first at the 5th end, then at the 4th, and finally at the 6th end.

In a solid vertical stripe of color 2, say 8 ends wide, this Find/Replace pattern would result in the following pattern of binders:

*/.	*/.	*/.	*/.	*/.	*/.	*/.	*/.
2/.	2/.	2/.	2/.	2/ **H255**	2/.	2/.	2/.
*/.	*/.	*/.	*/.	*/.	*/.	*/.	*/.
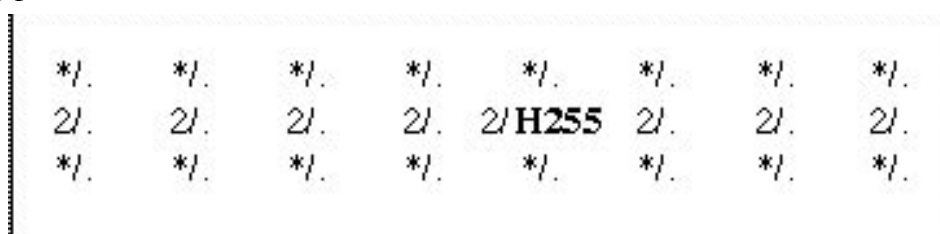
Note that no binding occurs in the top pick because the second row of the pattern contains the binder to meet the requirement for a margin of 1 around binders (if this is a problem, Set Repeat View can be used to fold the upper edge into the center and the Find & Replace repeated). The 2nd pick binds at the requested position but the 3rd pick cannot bind there because of the binder placed in the 2nd pick; consequently it tries End 4 where it succeeds. The 4th pick binds once again at the requested position (End 5) because there isn't any existing binder above or below it.

2	2	2	2	2	2	2	2
2	2	2	2	255	2	2	2
2	2	2	255	2	2	2	2
2	2	2	2	255	2	2	2
2	2	2	255	2	2	2	2
2	2	2	2	255	2	2	2

Any pattern, including symbolic or mixed ones, can include any number of binders, subject only to the margin requirements. As always the patterns are evaluated from left to right starting at the upper left corner of the pattern, so binders that occur first in the pattern will affect, but not be affected by, binders that occur later. Similarly, the pattern is stepped along the image in a left to right direction starting at the upper left corner of the search area (whole image if no selections are in effect) which will determine the sequence in which binders are placed - once again earlier binders affect later ones but not vice-versa.

Find Next ⌘ G

Once a Find pattern has been defined using Find…, Find Next can be used to find matches one by one. The matching area will be outlined and the image will pan as required to bring the area into view. Each subsequent Find Next command will cause the search to continue from the current search position.

Count All

Finds all the pattern matches within the selection rectangle (or entire image if no selection is active) and reports in the Results Window the total number found.

Make Mask from Find All

This command executes a virtual"Find & Replace All" which affect the Mask instead of the image (which will not be changed). Pixels which would have been changed by theFind & Replac are instead marked in the Mask; pixels which would not have been changed, either because they were not in a found Match or because they were set to "don't change" in the Replace pattern, are not marked in theMask. Holding the **CTRL** key before clicking on the Special menu will change this option to **Add to Mask from Find All**. The **OPT** key give the **Sub**(tract) **fr**(om) **Mask from Find All**.

Replace ⌘ 8

Replace will cause a Replace to occur on the most recently found match; if it was not preceded by a Find Next, then it will first invoke Find Next and then replace the 1st match that is found.

The positioning logic for **Find Next** and **Replace** is as follows:

1. Find…, **Count All,** and **Replace All** reset the current search position to the upper left corner of the search area (or of whole image if no rectangular selection is in effect). The current search position will also be reset by changes in the position or size of the rectangular selection, if one is present, or by starting a search in any other window.

2. **Find Next** causes the search to resume starting from just beyond the current search position, in other words from one end to the right of the last match that was found.

3. **Replace** causes the search to resume starting at the current search position (not beyond it) and replaces the first matching pattern that is found. If a Find Next is immediately followed by a Replace, the pattern found by Find Next will be the one replaced by Replace.

If Find…, **Find Next**, or **Replace** find a match, the matching area will be outlined by a thin blinking line and the image will be panned as required to bring the outlined area into view (zoom levels are not changed).   If the matching area is too large to display, the image will be panned to ensure that its upper left corner is visible plus as much as possible of the area; i.e. any invisible parts will be along the right and bottom edges.

The thin blinking outline is cleared by any mouse or key clicks, but the current search position is remembered. **Find Next** or **Replace** will continue from the remembered position and, if successful, will cause the outline to reappear.

Replace All ⌘ 9

Finds all pattern matches within selection (or entire image if no selection active) and replaces each with the replacement pattern. Search starts in upper left corner and moves horizontally from left to right, then moves down one line and continues the search. The number of replacements done is reported in the Results Window; note that this number may be less than the number reported by Count since each replacement may reduce the number of matches found later in the search.

Replace All w/mirrors

Option to select any combination of End Mirror, Pick Mirror, or Rotate. A Replace All is first executed, then if End Mirror was checked the pattern is flipped horizontally and a new Replace All is done; if Pick Mirror is checked then the pattern is flipped vertically and another Replace All occurs, etc. The number of Replace All passes will be:

1 if no options are selected (only the basic pass)
2 if 1 option is selected
4 if 2 options are selected
8 if 3 options are selected.

for example, if both End and Pick mirrors are selected, the following four Replace All passes will be done using:

1. original pattern
2. End mirrored pattern
3. Pick mirrored pattern
4. End and Pick mirrored pattern

Show Last Found

Shows the last replace found. Holding the Option key changes this function to "SELECT Last Found" which will replace the current selection (if any) with a rectangular selection around the most recent match found by Find & Replace. The selection outline will be displayed instead of the Found outline. This is useful for selecting the most recent match, for instance to load it after making changes into Find & Replace's replace pattern.

Tips about using Find and Replace

In its simplest mode Find uses *explicit* values for both the Find and Replace patterns, in other words it searches for specific colors (e.g. **15**) or *not* specific colors (e.g. **≠15**) and replaces with specific colors. For example, suppose that the design contained a number of 2 end wide fingers' of color 2 poking into areas of color 1 and that these 'fingers' were too thin to weave properly. We wish

```
        Original                          End Mirror
   Find          Replace             Find          Replace
1   1   1         .   .   .        1   1   1         .   .   .
1   2   2         .   1   .        2   2   1         .   1   .
1   1   1         .   .   .        1   1   1         .   .   .
        left                              right
```

```
        Rotated                       Rotated & Pick Mirror
   Find         Replace              Find          Replace
1   1   1         .   .   .        1   2   1         .   .   .
1   2   1         .   1   .        1   2   1         .   1   .
1   2   1         .   .   .        1   1   1         .   .   .
        up                                down
```

to 'blunt' the fingers by reducing them to the width of a single end; in addition to these 'left pointing fingers', we also want to do the same to 'fingers' that point to the right, up, or down. A total of 4 Find & Replace patterns will be required, though the last 3 can be created by mirrors and/or rotations.

Of course the above 4 patterns only 'repair' fingers of color 2 that intrude into color 1. Suppose that similar cases occur that involve other color combinations, e.g. fingers of color 1 into color 2, or fingers of color 10 into color 22, etc. - separate explicit patterns would be required for every case. In the most extreme case, there could be 256 finger colors, each of which could lie on one of 255 other colors for a total of 65,280 specific color combinations - a clearly impractical number to handle with explicit patterns.

```
        Find                Replace
    Y1  Y1  Y1            .    .   .
    Y1  Y2  Y2            .   Y1  .
    Y1  Y1  Y1            .    .   .
```

Find's **symbolic** mode provides a powerful facility for handling this sort of problems in which the <u>shape</u> matters rather than the specific colors. The equivalent symbolic pattern for finding and repairing all 'left pointing fingers' is :

The first **Y1** (in the top left corner) indicates the first occurrence of **Y1** in the pattern (as scanned from left to right starting at the upper left corner); the color in the image that lies under **Y1** will be picked up and will be the value of **Y1** throughout the rest of the pattern.   Similarly, **Y2**'s color will be picked up at the first occurrence of **Y2**. A match will only occur if all **Y1**'s lie over the same image color as is under the first occurence of Y1, all **Y2**'s lie over the same image color as is under the first occurence of Y2, <u>and **Y1** is not the same color as **Y2**</u>. If, and only if, a match is found, then the pixel under **Y1** in the Replace pattern will be replaced by the color of **Y1**.

Consequently this pattern will match any of the following (the first occurence of Y1 and Y2 are underlined) :

```
1  1  1    2  2  2    5  5  5    8  8  8
1  2  2    2  1  1    5  3  3    8  7  7
1  1  1    2  2  2    5  5  5    8  8  8
```

and will change them to (changed pixel underlined):

```
1  1  1    2  2  2    5  5  5    8  8  8
1  1  2    2  2  1    5  5  3    8  8  7
1  1  1    2  2  2    5  5  5    8  8  8
```

The pattern initially positioned in the upper left corner of the search area and the above matching process is done. The pattern is then shifted over one pixel and the process repeated, including the picking up of colors under **»1** and **»2**; consequently each match attempt uses the locally found colors and is capable of detecting a 'left pointing finger' no matter what the colors are. Note that in order for a match to occur all symbolic colors must be unique (i.e. **Y1** cannot equal **Y2** or any other **Yn** color).

The other 3 orientations (right, up, and down) can be handled by rotating or mirroring the pattern and repeating the search.

In a 100 x 100 design matches would be attempted with the upper left corner of the pattern aligned to (End 1, Pick 100), then (End 2, Pick 100), ... (End 98, Pick 100), then (End 1, Pick 99), etc. until the last attempt at (End 98, Pick 3); i.e. a total of 9,604 (98 x 98) attempts would be made. Note that only 98 matches are attempted per line because the first is done with the pattern's left edge aligned to the design's left edge while the last is done with the pattern's right edge aligned to the design's right edge; in other words the search process does not wrap around past the image's edges (the correct approach as the type of repeat is not known). To also find any matches that occur across repeat boundaries, first use Set Repeat View to select the appropriate repeat pattern and then repeat the search.

A common requirement is to find a specific pattern that needs repair, to repair it, and then to repeat that repair for all other occurrences. An efficient approach is to…

1. select the problem area and turn it into a Find pattern (using **Pat Size = Select Size** followed by **Load Selection into Find**);
2. exit from Find and make the repairs to the pattern, use **cmd-Ø** (Reactivate Outline) to reactivate the selection outline (which will be in its original location),
3. re-enter Find and this time use **Load Selection into Replace.** If the repair is only shape dependent, then use **==>Gen.Pattern** to convert the Find and Replace patterns into Symbolic form, otherwise just use them in their color specific forms.
4. Use **Find Next** and **Replace** or **Replace All** to perform the repairs.

preset Finds

Provides a number of pre-defined Find & Replace patterns - e.g., for finding Floats and for reducing jaggedness in scaled up images. Since these pre-defined patterns are handled as full-function Find & Replace objects, they can be modified by the user as desired.

After selecting the preset Find pattern, the user can either use Find Again to simply find matches (for manual correction), or Find and Replace to use the automatic replacement.

Find Floats 1 & 2 : these look for Floats, i.e., vertical or horizontal runs of consecutive Cuts or Misses exceeding a user specified length. Find Floats 1 sets the replace pattern to place a cut (miss) at the mid-point of the float; Find Floats 2 uses a 3 x Length Find pattern and Find & Replace's Binder cuts to place a cut (miss) near the mid-point while trying to avoid existing cuts on either side.

Corners 1 … 4 : corners such as would be created by scaling up an image ("the jaggies"). Corners 1 & 2 look for the corners in a 3x3 area while Corners 3 & 4 only require a 2x2 corner area. All replace the corner pixel with the color of a neighboring pixel to "blunt" the corner. Corners 1 & 3 will blunt a corner even if it results in a "corner connected" line whereas Corners 2 & 4 require that the blunted corner retain "edge connectedness". All look for corners that point NW (towards upper left); after fixing all the NW corners, re-enter Find and use Rotate CW to re-orient the pattern for different directions.

Paint Weave Repeats: requires a rectangular selection which contains at least one cut mark (color 255). The assumption is that you have selected one full repeat of a <u>weave</u>, and the intent is to let you find all other repeats of that same weave. Note that the Find is done "on the grid" so that weave repeats must match both the pattern <u>and</u> the alignment. The same weave pattern shifted over, say, by one end will not match. Paint Weave Repeats is primarily used for converting from punch files back to colored designs.

```
Paint repeats of weave
Match by                    Size   18 x 16
 ⦿ Cut/Miss         Aligned to  169,378
 ○ Exact
Replace                        with Color #
 ⦿ Solid
 ○ Keep Cuts          ⊞[1]  ☐  ⊞
Action
 ⦿ Replace ALL       ( Cancel )  [ OK ]
 ○ Find First
```
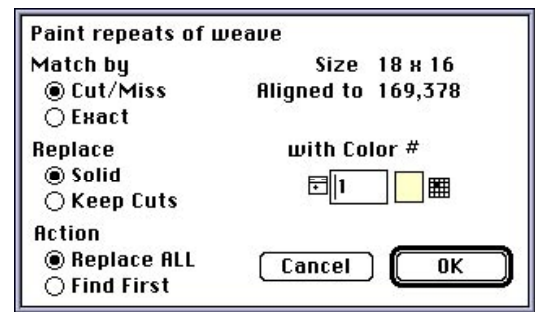
Match by - (set the match to be either):
• Cut/Miss in which case the pattern insid the selection will be treated as a weave, in other words just as a pattern of Cut (color 255) versus Miss (any other color) marks
• Exact all colors must match, including the exact color of each Miss.

Replace - (set the replacement pattern to be either):
• Solid will replace the entire weave repeat with the solid color selected
• Keep Cuts colors only the Miss marks - in other words the result will still contain the weave as black cut marks, but now on the color background selected.

Action
• Replace All all matching weave repeats will be found and replaced exiting by clicking on the **OK** button
• Find First will simply find the first matching repeat.

Find Weave Repeats: checks a rectangular selection to try to find a "repeat", in other words, to find a smaller area which can recreate the entire selection when repeated (tiled) out over the selection searching for only Cut/Miss (color 255 versus not 255). The "repeat" can remain where found within the rectangle selection (KEEP where found) or align the repeat to the horizontal and vertical grid (ALIGN to WxH grid).

Find Pattern Repeats: similar to Find Weave Repeats except the "repeat" must match exactly the size and color number within the repeat. The "repeat" can remain where found within the rectangle selection (KEEP where found) or align the repeat to the horizontal and vertical grid (ALIGN to WxH grid).

Jog Sel. to Grid - moves selection outline right-wards and up-wards to align it with its own "grid" - defined by the width and height of the selection (or of its "enclosing box" if not a rectangular selection). If such shifting would cause the selection to move past the edges of the image, then no change is made and the program beeps to warn the user.

Define F&R Macro: user can create macro from previously saved Find and Replace patterns. These patterns can be run together to streamline error correction. Command-Period cancels execution between patterns. Image updates after each pattern in the macro file so user can watch progress. Files are saved as .fMcr

Execute F&R-Macro: Opens and excutes previously saved Find and Replace macros.

Color Groups

A Color Group is a list of colors; it can contain as few as no colors and as many as 256 colors. A color group can be used :

    a. in conjunction with the **Wand Tool** allowing all colors within the group to be treated as single color. A color group based Wand selection will start under the Wand, assuming the color under the wand is in the color group, and will flow out from that point over any of the colors in the group - this permits complex design elements to be selected as long as their edges are bounded by colors not in the group.

    b. as a very quick way to **Change Colors…** to merge a group of colors into one.

    c. as a border choice in the **Paint Borders** and **Shape Binders** tools.

    d. in **Edit or Create Mask** to build a mask that will protect all the colors in a Group.

    e. to help define a Find and Replace pattern locating colors IN or OUT of the color group.

    f. in **Posterize** select a group of colors.

Of the 16 Color Groups provided, only one is active at any moment (referred to as the "Current Color Group"). Its number is displayed in the Special Menu; selection of the Current Color Group is done at the bottom of the Color Group sub-menu using Select #1 through Select#16.

New CG

A Color Group is built by selecting an area of the image (using the Lasso tool or other selection tool) which contains the colors desired. Then in the Color Group sub-menu, choose New to load these colors into the current Color Group; other color group tools include:

Add CG - which adds the colors in the selection to the existing color group,

Subtract CG - which removes colors in the selection from the group,

Common CG - which keeps only those colors that are common to both the selection and the group.

Reverse CG - flips all the colors, i.e. all that were in the group are removed and all that were not are added to the group. This action is not affected by the image selection.

Edit CG - displays the current Color Group allowing selection or de-selectiomn of colors at will. The entire palette is displayed; colors that have been used anywhere in the image are marked by an upper left corner mark, colors used in the current selection (if present) are marked by an upper right corner mark; colors that are in the group are surrounded by a box. Clicking on a color in the palette (or in the image) reverses its membership, i.e. removes it if it is in the group, adds it if it is not. Buttons within the Edit Color Group window are for ease of creating the color group.
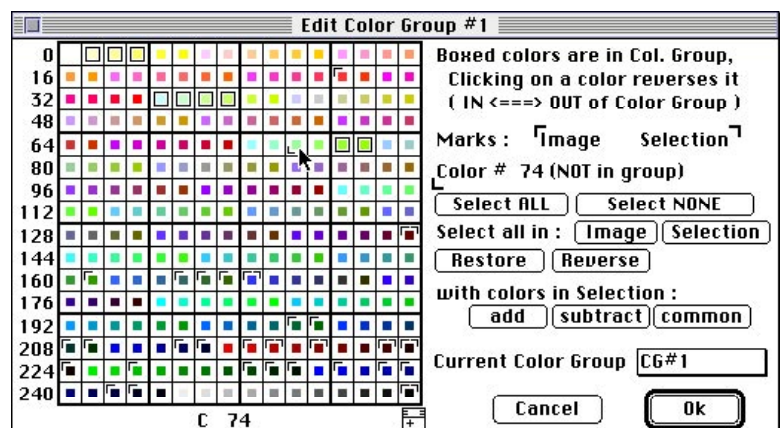
<u>Select Cur. CG</u> - provides a drop-down menu to select which of the 16 available color groups will be the "Current Color Group"; a check-mark is displayed next to the currently selected group. Typing the desired color group number and q (#Q) is the keyboard shortcut for this option.

JacqCAD MASTER® stores the Color Group information in the JacqCAD MASTER Prefs file making these group available after restarting JacqCAD. When switching between image windows bear in mind that the group consists of color numbers while the actual visual colors depend on the color palette in use; for example the group of colors 2, 3, & 4 could be closely related yellows in one window but widely separated hues in another.

Outline Operations

Outline operations modify the currently active selection outline; they do not affect the underlying image.

Outline Operations	▶
Outl.Mem 1 (Rgn 1K)	▶
Reactivate Outline	⌘0
Undo Outline Change	⌘\

- ℝ Reverse
- ℛ Flip horizontal
- ℝ Flip vertical
- ⊅ Rotate CW
- ∝ Rotate CCW
- ⊙ Expand
- ⊙ Shrink
- Move
- Move To
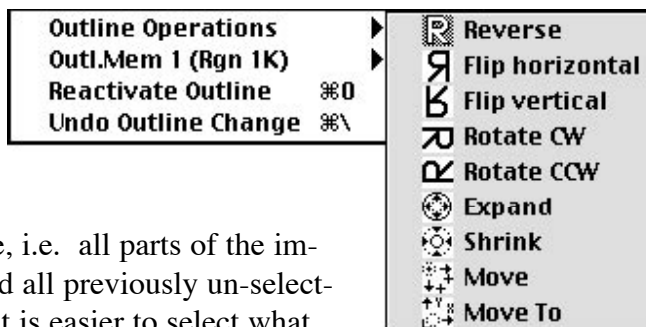
Reverse
Reverses the currently active selection outline, i.e. all parts of the image that were selected become un-selected and all previously un-selected parts become selected. Very useful when it is easier to select what you don't want.

Flip Horizontal
Flips the selection outline horizontally.

Flip Vertical
Flips the selection outline vertically.

Rotate CW (Clockwise)
Rotates the selection outline 90 degrees clockwise.

Rotate CCW (Counter Clockwise)
Rotates the selection outline 90 degrees counter clockwise.

Expand
Expands the selection outline on the right and left sides or the top and bottom edges or on all sides by the number of pixels designated by the user.

Expand selection by

| 0 | each side |
| 0 | top & bottom |

[Cancel] [Ok]
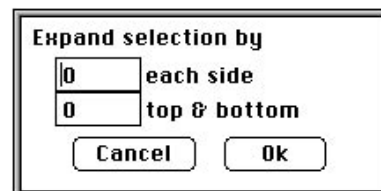
Shrink
Shrinks the selection outline on the right and left edges or the top and bottom edges or on all sides by the number of pixels designated by the user.

Expand selection by

| 0 | each side |
| 0 | top & bottom |

[Cancel] [Ok]
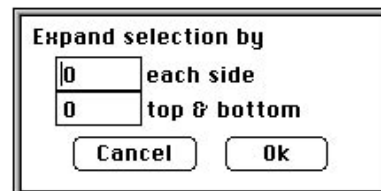
Expanding Selections
Selection outlines and floating selections can be altered using the keyboard with the following combinations of keys;

Expand left side   [CONTROL] [←]

Expand right side   [CONTROL] [→]

Expand top edge   [CONTROL] [↑]

Expand bottom edge   [CONTROL] [↓]

Shrinking Selections
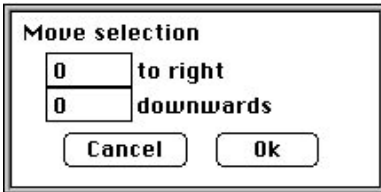
Shrink left side	CONTROL option →
Shrink right side	CONTROL option ←
Shrink top side	CONTROL option ↓
Shrink bottom side	CONTROL option ↑

Note: By pressing the ⌘ (command key) in addition to the keys shown above, the increments of expanding or shrinking a selection are increased from one pixel at a time to 10 pixels.

For example if the selection is currently 40 x 20, using the command key with the key sequence to shrink the right side would then yield a selection of 30 x 20. Holding the keys down will repeat the action until the arrow keys are released.

Move
Moves the selection a designated number of pixels to the right, left, up, or down. To move the selection to the left or up, designate the number of pixels for the selection to move as a negative number. For example, -1 in the 'to right' box will move the selection 1 pixel to the left.

Move selection
0   to right
0   downwards
Cancel   Ok

Move To
Relocates the position of the selection based on the coordinates of the lower left corner of the selection.

Position LLC at
126   End
330   Pick
Cancel   Ok

As with the expand and shrink functions, the move functions can also be accessed manually by using the arrow keys to navigate the selection to the desired location. The location of a selection is indicated in the results window as follows:

The lower left pixel of a selection or a pasted image is shown to give the user the exact location of the floating object. The lower left corner of all images is designated as pick 1 / end 1.

The command key in conjunction with the arrow keys will again increase the number of pixels the selection will move at one key press from 1 pixel to 10.

Outline Memory

Eight Outline Memories are available; these provide a place to temporarily store Outlines for later reuse. Stored outlines can be brought back into the image, or into another image, or they can be used as components of more complex operations.

Only one Outline Memory is active at any moment. A number of operations can be performed either to the contents of the active outline memory, or between the active memory and the current selection in the image window. Note that only selection outlines are affected; the image will not be changed.

Copy to Mem

Stores a copy of the current selection outline into the active outline memory, replacing whatever may have been there.

Paste From Mem

Copies whatever outline is stored in the active memory to the current image, replacing any selection that may have been present (this replaced outline can be recovered via Undo Outline Change).

Swap With Mem

Swaps the outlines in the active memory and the active image; very helpful when you want to subtract the previously selected from subsequently selected areas - store the first selection, make the second and then use Subtract Mem.

```
Outline Operations        ▶
Outl.Mem 1 (Rgn 1K)       ▶   Copy To Mem
Reactivate Outline    ⌘0      Paste From Mem
Undo Outline Change   ⌘\      Swap With Mem

                              Select Memory     ▶    # 1 (Rgn 1K)
                              memory TO Outline       # 2 (Rgn 1K)
                              ▓ Add => Outline         # 3 (Empty)
                              ▤ Subtract => Outline    # 4 (Empty)
                              ▣ Overlap => Outline     # 5 (Empty)
                              Outline TO Memory        # 6 (Empty)
                              ▓ Add => Memory          # 7 (Empty)
                              ▤ Subtract => Memory     # 8 (Empty)
                              ▣ Overlap => Memory
                              in memory only
                              Ⓡ Reverse Mem
                              Я Flip horizontal
                              Ꙗ Flip vertical
                              ↻ Rotate CW
                              ↺ Rotate CCW
                              Clear Mem
                              Mask => Mem
```

Select Memory

Selects which of the 8 Outline Memories will be the active one, i.e. the one which will be used by Use Outl Mem (see next). This item displays the # of the currently active one (=1 in the figure) and whether it is Empty, contains a rectangular selection (Rect), or a more complex outline (Region).

memory TO Outline
Add => Outline

Adds the outline in the active memory to the outline in the active image, just like holding down the Control key while using a Selection Tool. Previous outline in the image is placed in the Undo Outline buffer.

Subtract => Outline

Subtracts the outline in the active memory from the outline in the active image, just like holding down the Option key while using a Selection Tool. Previous outline in the image is placed in the Undo Outline buffer.

Overlap => Outline

The current image selection is merged with the active stored selection. The overlapping area of the two selections becomes the new selection.

Outline TO Memory
Add => Memory

Adds the active selection area in the image to the active memory outline. The image does not change or the visable selection does not change.

Subract => Memory

Subtracts the active selection area in the image from the active memory outline. The image does not change or the visable selection does not change.

Overlap => Memory

The current image selection is merged with the active stored selection. The overlapping area of the two selections becomes the STORED selection.
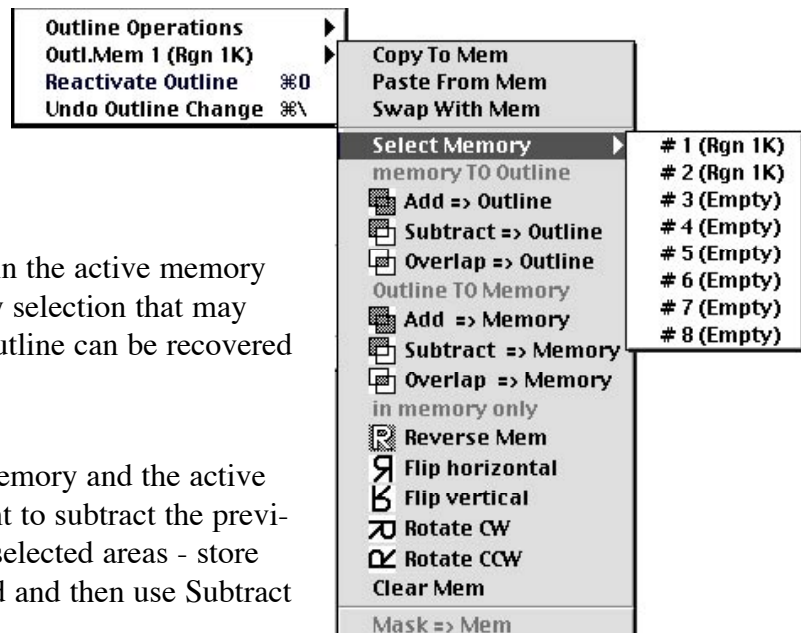
in memory only
Reverse Mem
Reverses (turns inside out) the selection in the active memory.

Flip horizontal
Horizontally flips the active outline memory.

Flip vertical
Flips the active outline memory vertically.

Rotate CW (Clockwise)
Rotates the active outline memory 90 degrees clockwise.

Rotate CCW (Counter Clockwise)
Rotates the active outline memory 90 degrees counter clockwise.

Clear Mem
Discards the contents of the memory, useful for reclaiming the up to 32K bytes that can be consumed by a complex outline. Not undoable.

Mask >> Mem
Saves the current mask into the active outline memory space; this will only complete if the mask can be converted to a selection outline; if the mask is too complex an error message will be given.

　　　These Outline Memories and operations can be extremely powerful tools as they make possible complex 'region arithmetic'.

Masking on   ⌘ Ⓜ

Masking allows changes to be made only to selected parts of the design while protecting the other parts. Protected areas are protected from all painting tools, including the Brush, AirBrush, Pencil, Eraser, Line, and Text Tools. Protected areas will also be unchanged by Change Colors, by Filters, by Cut Weaves Into Design, and by Find & Replace. The mask is indicated by black areas which are 'selected' and can be edited, white areas will be protected. When first opening this dialog, the box will be entirely white, in other words no parts of the image have yet been selected as 'paintable' so the mask would protect the entire image.
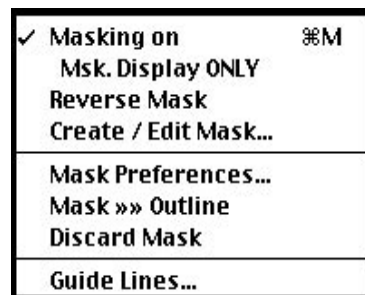
Saved masks can also be used as "LLC Masks" to control Find & Replace (see Find and Replace).

Masks may be created on the basis of any combination of shape (selection outline), color or group of colors, range or pattern of Ends or Picks, or, in the case of Expanded images, of Logical Shuttles or Box assignments. Unlike Selection Outlines, a Mask can be of unlimited complexity.

When in effect, the mask can be invisible or can be displayed as a dotted outline around simple masks, or as a 'screen' of any color covering the protected parts with a coverage density of 25, 50, 75, or 100%.

Using the Command **M** toggles the Mask on or off.

Msk Display Only

The Mask Overlay remains visible but Masking is OFF and the masked areas are NOT protected.

Reverse Mask

Reverses the mask, i.e., protected parts will become un-protected and vice-versa.

Create / Edit Mask

Opens the Create or Change area Mask window for ease is protecting specific image areas.

Source - used to define areas of the mask. Although only one "source" can be defined at a time, any number of source combinations can be used to define the final masked area.
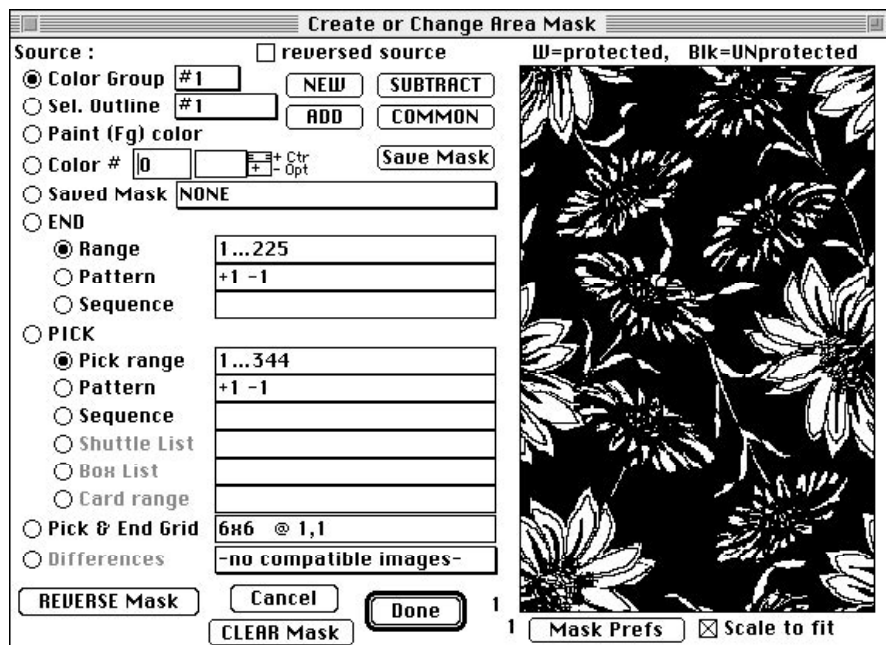
Color Group #1…16 - Selects all pixels whose colors are included in the selected Color Group. Use the pop-up menu to the right to select which of the 16 previously specified Color Groups to use.

Sel. Outline - Allows the choice of one of the 8 Outline Memories - all pixels inside an outline will be selected (painted black). If a selection outline is active in the image when entering this dialog then the top choice will be "Main" followed by #1 … #8; selecting "Main" will use the selection outline that is active in theimage. Use the pop-up menu to the right to select which of the Outline memories to use.

Paint (Fg) Color - selects all pixels whose color is the current Paint (foreground) color.

Color # -allows the selection of any color then creating a mask of all pixels of the selected color. Colors can be chosen in three ways : 1) by entering its color number in the first box, or 2) by clicking on the color patch to the right bringing up a standard 256 color palette or 3)touching any color in the visable image behind the Create Mask Window.

Saved Mask - allows the use of a previously saved mask as the source. The pop-up menu to the right will display all mask memories which contain previously saved masks whose width and height match the active image (saved masks whose dimensions are different cannot be used, these will automatically be 'grayed out' and un-selectable).

End - options to select specific Warp Ends in a variety of ways :

End Range - masking by selection ranges of ends: for example all Ends between 20 and 140. Note that if Reversed Source is checked then all Ends except for those in the specified range would be selected. Clicking on the box to the right brings up a dialog (shown to the right) where the starting and ending End numbers are entered.

```
End range =
First   1
Last    576     ( Done )
```

End Pattern - this allows the selection of a 'pattern' of Ends, for instance to select all odd numbered ends. Clicking on the box to the right brings up the pattern definition

```
END pattern
+n = include, −n = skip    Repeat length = 2
1    −1    0    0    0    0    0    0    ( Done )
```

dialog where the pattern is defined. Up to 8 entries are allowed; the first 0 entry ends the pattern. In the example given, the pattern (1 -1) means "keep 1 skip 1" which would select all odd numbered ends. Positive numbers show how many Ends should be selected, negative numbers indicate the number of ends to skip. The Repeat length displays the total number of Ends covered by your description. The pattern defined will then "roll out" from left to right across the width of the mask. Example : assume a Warp sequence of 6 yarns and the need to select the first, third and fourth ends in each warp repeat: the pattern +1 -1 +2 -2 will select 1 (#1), skip 1 (#2), select 2 (#3,4) and skip 2 (#5,6) for a total repeat length of 6. When this patterns rolls out across the design it will select all first, third, and fourth Ends in the 6 yarn repeat.

End Sequence - When added this will allow much more complex sequences of Ends. Currently unavailable.

Pick - allows the selection of specific Picks (Weft yarns) in a variety of ways :

Pick Range - Similar to End Range above. If the image that will be masked is an Expanded image, then all Cards within the specified Pick Range will be selected, i.e., if each Pick includes 4 cards (shuttles), then selecting a range of 10 Picks would select 40 cards.

Pick Pattern - Similar to End Pattern above, except selects Picks.

Pick Sequence - see description of End Sequence

Shuttle List - available for expanded images only, allowing the selection of one or more Logical Shuttles . Clicking on the box to the right brings up the selection dialog shown to the right. Can be used, for example, to select just one shuttle in a tissue job.

Box List - Expanded images only, allows you to select one or more Boxes (physical shuttles) using a similar selection dialog as the Shuttle List.

Card Range - Expanded images only, similar to Pick Range except selection is by card number rather than by Picks.

Pick & End Grid- selects a grid of single ends by specifying the grid spacing (width and height) and grid alignment (starting End and Pick).

Differences- compares the current active image to any other compatible (same sized) open window. The mask created this way protects areas that are the same in both images; differences are UNprotected in resulting mask. Useful for checking what changes have been made between different versions of the same image (for example, before and after automatic Find & Replace of floats).

Reverse Mask- located at the bottom left, reverses the entire current mask - i.e. white and black (protected and unprotected) are interchanged. Alternatively using "Reverse Mask" in the Special Menu after exiting will accomplish the same end.

Cancel - exits the Create Mask dialog box without making any changes.

Clear Mask - resets the mask to all white (protected); can then use Reverse Mask to reverse to all black (unprotected)

Done - exits from the dialog and turns on masking**.**

Action buttons located at the top, center of the dialog window:

Reversed Source check-box - if checked then the selected source is reversed before being used for New, Add, Subtract, or Common, i.e., the source's white pixels become black and its black pixels become white before they are used.

New - clears the mask to all white (protected) and then adds in (paints in black, un-protects) the selected source pixels.

Add - adds the selected source to the existing mask, i.e. paints black all the pixels selected by the source, but does not erase any of the black pixels already in the mask. Control-Click on a color within the image selects the color and adds it to the Mask.

Subtract - subtracts (removes) the selected source pixels from the existing mask, i.e., paints in white (protects) all the pixels selected by the source. Option-Click on a color within the image now selects the color and Subtracts it from the Mask.

Common - keeps only those pixels that are common to the selected source and existing mask. In other words it only keeps those pixels that are selected (black) by both the source and mask.

Save Mask - provides the user with a choice of 8 memories in which to save the current mask. It also asks the user for a short name for the saved mask.

Scale to Fit - checkbox located at the bottom right controls how the mask is displayed. When checked, the default condition, the entire mask is scaled to fit at the correct aspect ratio into the display area. When un-checked as much as possible of the mask is displayed at 1 to 1 with End 1 Pick 1 positioned to the lower left corner of the display area. Scale to Fit mode provides a useful overview, but because of the scaling can obscure details . For example the selection of only even numbered ends might still appear as a solid black mask in Scale to Fit mode, but would appear as alternating black and white columns in unscaled mode.
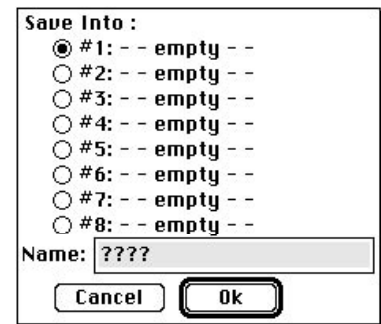
Mask Prefs - See below.

Mask Preferences...

Opens the Mask Preferences dialog in mask color settings are available for selecting how the mask will be displayed over the image it belongs to.

None - this option does not change image appearance but editing tools will take effect only in the un-protected (selected) areas.

Outline - this choice is only available when the mask's outline is simple; it displays a 'marching ants' pattern around the selected areas. Remember that Selection Outlines cannot exceed some level of complexity - if creating a more complex outline the "Too complex" message will appear. The same is true of mask outlines and Outline will only be offered for those masks whose outlines would have a complexity of less than 16K (as displayed in the Results window for Selection Outlines).

Overlay Masked Area- this choice covers the protected areas with a screen leaving only the selected (un-protected, paintable) areas uncovered. The screen's coverage can be set to total (100%) coverage or to lesser values (75, 50, or 25%) to allow some visibility of the protected parts of the image. Initially the mask is set for 50% coverage using White. The coverage is accomplished by
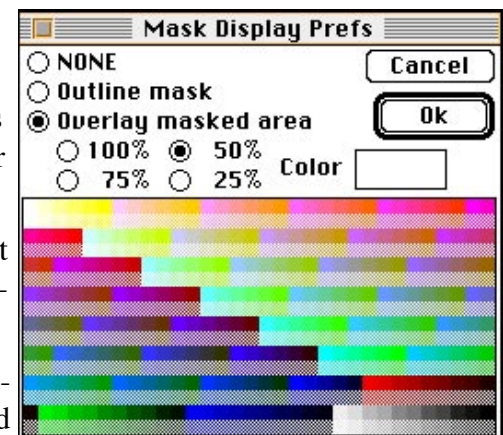
painting 1, 2, 3, or 4 out of every 4 pixels in a 2x2 area with the screening color. A coverage of 25% allows the largest amount of image through, but can produce a 'grainy' appearance because only 1 out of 4 pixels are masked; 50% coverage provides a smoother appearance at the expense of reduced visibility of the underlying image.

The color used for screening is also selectable - simply click on the box to the right of "Color" to bring up a 256 color palette from which you can select the screening color. For most images selecting a light gray and a 50% coverage seems to give the most pleasing results.

The display box in the dialog shows all 256 colors, each patch having its bottom half masked, so the results of the overlay selections is visable. You can also see the effects of changes in those parts of the image that are visable beneath the Prefs window.

Mask »» Outline

This menu option attempts to convert the mask into a Selection Outline; it can only do so if the resulting outline does not exceed the complexity limits of outlines. In many cases the mask will be too complex and an error message will be given. If successful, Masking is turned off and the newly created outline is displayed in its place.

Discard Mask

Masks consume a significant amount of memory. Discard Mask turns off masking and recycles the memory used by the mask. It also allows the ability to discard Saved Masks that have been created.
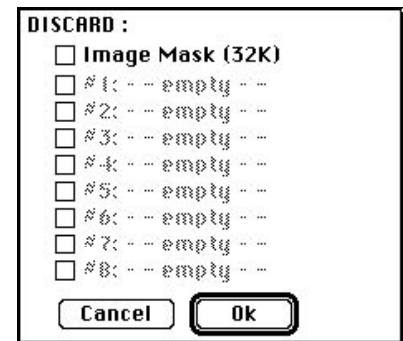
Guide Lines

Allows the use of guide lines that can be turned ON or Off, to select the units (End/Pick, Inches, or CM) used to specify the locations, to set the positions of up to 8 horizontal and 8 vertical guide lines, to select the color to use for the guide lines and to turn On or Off rulers along the left and top edges of the image.

This dialog can also be accessed by double-clicking on the Ruler Tool.

Guide lines will appear below and to the left of the position set. For example, a horizontal guide set at Pick 7 will 'underline' that Pick, while a vertical guide set at End 7 will draw just to the left of that End.

Distances are measured from End 1 pick 1 based on the   settings (in this dialog) for Ends Per Inch and Picks Per Inch. To set a guide line simply enter its desired position in any of the 8 slots provided - the order does not matter. To remove a guide line simply select and delete its position.

Alternatively, clicking in the image sets a Horizontal or Vertical guideline into currently selected entry and moves to next entry - in the example above, clicking in the image will set the fourth Vertical guide because that entry is selected for entry (contains the text insertion cursor) and move the cursor to the fifth slot.

Guideline color can be selected by entering a color number, by clicking on the color patch (brings up the palette) or by **Option - click** in the image on the desired color.

Clear All - deletes all existing guide lines.

Tab - moves through the entries.

Shift + Tab - moves in the reverse direction.

Show Guides - must be checked for the guidelines to be displayed.

Show Rulers - when checked, enables rulers along the left and top edges of the image.

Units - to use for both the guide line locations and the rulers can be selected from Ends/Picks (the default), Inches, or CM.
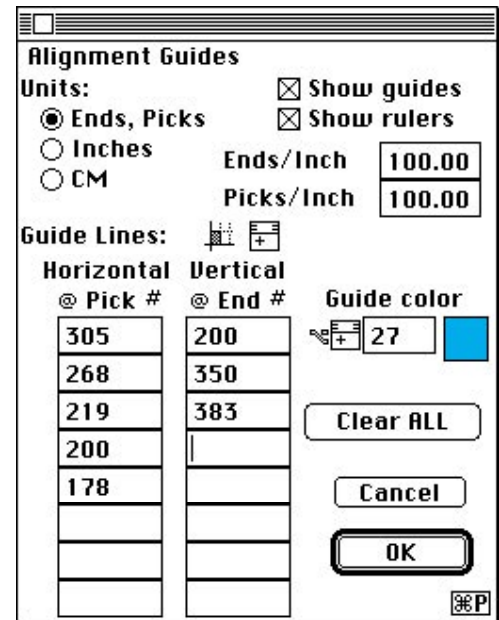
Masking Discussion and Examples :

The power of masking comes from its generality, i.e., the many selection sources that are available, combined with the ability to create complex masks through a sequence of actions which combines a number of different sources. The examples below provide a small sample of the wide variety of techniques that are possible.

Protecting versus Selecting : as noted above, the convention used is that "selected" pixels are shown as Black pixels in the mask and will allow changes in the image. It is crucial to understand that this is purely a convention, not a limitation. Depending on the task at hand it may be more natural to select those pixels that need to be changed or, in other circumstances, to select the pixels to protect; either approach is equally feasible. If those pixels to be changed are selected, then simply exit via the "**Done**" button when finished - the mask will allow changes whatever was selected (black in the mask). On the other hand, if the selected pixels need to be protected, then simply click on the "**Re-Mask**" button before clicking on the "**Done**" button; **verse** will reverse the mask so that all the pixels select- this (black in the mask) will become UNselected (white ed in the mask), and vice versa, and the mask will protect in the selected pixels.

Layering - masking can allow the ability to define a 'top layer' under which the user can paint or paste into a 'bottom layer'. In the example given, the flowers have been not-selected, i.e., protected. If while using this mask, one of the flowers is cut and then pasted, the pasted flower will appear to slide around 'under' the existing flowers.
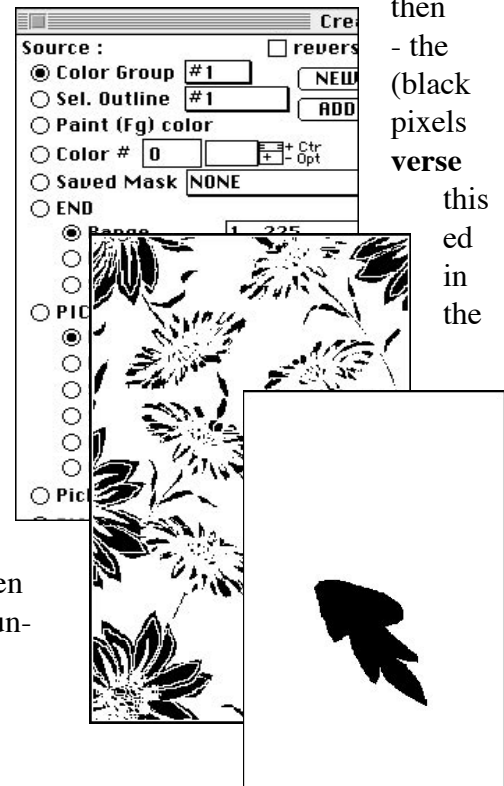
How the example mask was created : the Lasso Tool was used to se-
lect a representative area of the background, this was converted into
a color group using **cmd-~** (or Special:Color Group: New) which
thus contained a list of all the colors found in the selected area. The
Create / Edit Mask dialog was entered, Color Group #1 was se-
lected as the Source and made into a mask using the "**New**" button.
The result was a mask that selected all pixels whose colors were
part of the color group, i.e. most of the background (except some
background at the top and bottom which used different colors - these
could have been included by including them in the color group).
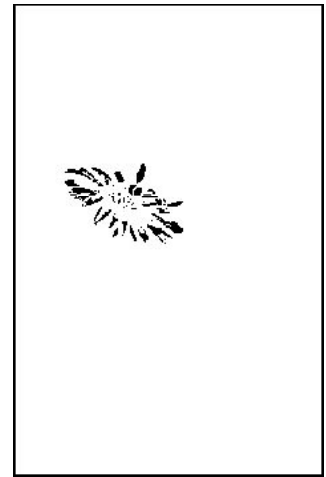
To now select a single flower : simply use the Lasso Tool to create a
selection that includes all of the desired flower and none of any other
flower (but can include background areas), then re-enter the **Cre-
ate / Edit Mask** dialog. Click on "**Reverse Mask**" to reverse the mask so that the flowers are
selected and background is un-selected, choose **Sel.Outline Main** (the outline in the image)
and click on the "**Common**" button - this will leave selected only the areas that are selected in
both the mask (all the flowers + some top and bottom background) and in the Main Selection
(the selected flower plus some of the central background) - since only the flower is common
to both, only it will be selected. To protect this flower, simply reverse the whole mask again
before exiting.

To select only certain shuttles : assume that the design is in Expanded image form and that
the flower selected above was being woven as brocade (tissue) fabric using Shuttle 1 for the
ground, Shuttle 2 for the yellow petals and Shuttle 3 for the orange center. To select the orange
center only on those cards that are actually weaving the orange center, having already selected
the single flower, simply re-enter the **Create / Edit Mask** dialog, select **Pick Shuttle List** as the
source, select Logical Shuttle 3, and click on the "**Common**" button. The resulting selection
will include only those sections of Logical Shuttle 3 that fall within the orange centers of the
selected flower.

A complex selection using mask memories : as a final example, assume that a selection two of
the flowers is needed, but that one of the flowers uses shades of blue and green on a mixed yel-
low and orange background while the other flower uses shades of yellow and orange on a mixed
blue and green background - clearly one cannot select both using color groups since selecting
one would also select the background of the other. The solution is simple:
Simply select the first flower as was done above - the result is a mask which is black only over
the first flower; click on the "**Save Mask**" button to save this mask to mask memory #1.
Then select the second flower in the same way, and once it is selected choose **Saved Mask
#1** as the source and click on the "**Add**" button to add in the first flower. Presto!

CHAPTER 8: THE WEAVE MENU

Weave Display Preferences...

The dialog below allows selection of the weave overlay display mode (central dot versus entire Wel(weave element)) and flexible control of the colors to be used for the corner, central dot, or entire Wel marks. These settings can be stored with the job so that they are automatically invoked anytime the job is reopened. These settings do not affect the job itself, only the way that weaves are *displayed* on the screen; never-theless, a bit of attention here will quickly be repaid by easier working conditions.

Recommended use:

The intended use of these settings is to examine the colors used in the design (indicated by boxes around the color patches in the palette) by clicking on them in the palette and observing the sample patches, modify any poor marking color assignments (using Shift-, Control-, or Option-click to select better colors from the palette), and save these changes with **Sv LUTs->PICT.**

Ends that would be 'cut' by the overlain weave are marked in one of two ways : either the color of entire rectangle representing that end is changed - referred to as Whole Wel (*Weave ELement*) marking, or a dot of contrasting color is placed in the center of the end - referred to as Center mark-

ing. Center marking is only useful at higher zoom levels where the dot is a small percent of the end, but it has the advantage of minimizing the change in the design's appearance that results from the weave overlay. On the other hand, Whole Wel marking works well at lower zoom levels, including 1:1, but requires more care in the choice of colors used for that marking.
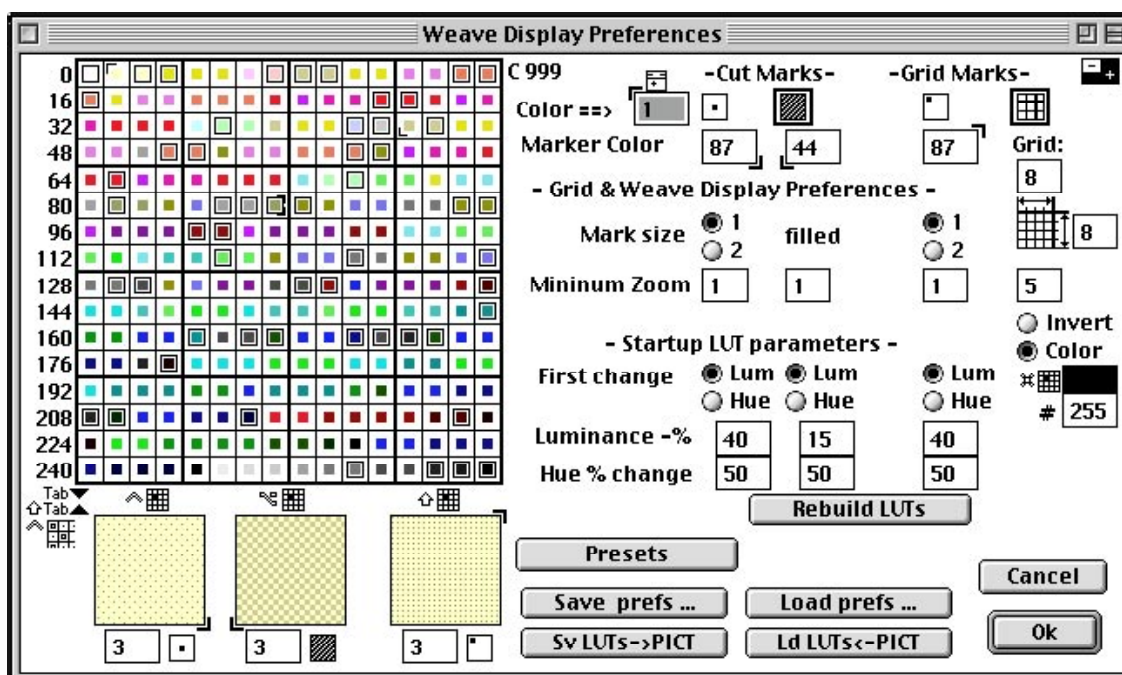
The marking colors, whether for Whole Wels or Center dots, come from the same palette used by the image; in other words a color used in the design may also be used to mark some other color. *JacqCAD* MASTER®automatically creates a set of LUTs (Look Up Tables) that assign marking colors to design colors; these LUTs are generally adequate but can often be greatly improved upon by some editing. A major purpose of the Weave Display Preferences dialog is to allow the user to view and modify these marking color assignments.

The color palette is displayed and those colors that have been used in the job are marked by an outlining box. A color is selected by clicking on its color patch in the palette display (or by directly editing its color number).

Weave Overlay Colors

The selected color, its number and the marker colors are shown in the upper right of the dialog. Each color has 3 other colors associated with it; they are:

1. the color that will be used for 'center marks' (for 'cut' *Wels* in center marking) which is 87 in the example to the right.
2. the color that will be used for 'whole *Wel*' (for 'cut' *Wels* in whole wel marking), color 44 in the example.
3. the color that will be used for 'corner marks' (every *Wel* if Wel Grid 'Dots' is enabled), example color 87.

The appearance of each type of marking is displayed in the 3 sample boxes below the main palette display along with the Zoom level of each sample. The zoom level can be changed individually for each sample by editing the zoom level number, by clicking on the sample window to zoom up, or by holding the Option key while clicking on the sample window to zoom down.

The **Selected Color** and its associated colors are also indicated in the palette display by corner marks;
   a. upper left for selected color
   b. lower left for 'whole Wel'
   c. lower right for 'center mark'
   d. upper right for 'corner mark'
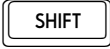
'Center mark' versus 'Whole Wel' mode is selected by clicking on the appropriate icon in the upper right of the dialog; the mode in effect is indicated by an outlining box around the icon.

A key for moving around the color palette is located at the bottom left corner of the color palette. Tab will move the color selection from low number to a higher number. Shift Tab moves from higher to lower.
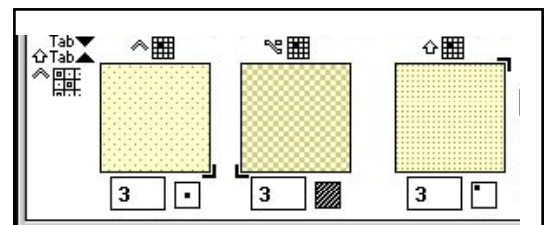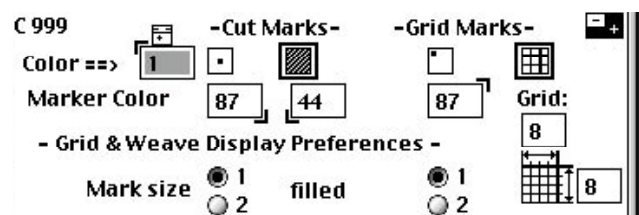
Each of the 3 associated colors as well as the 'Grid' color can be changed to improve the appearance; this change is most directly done by selecting colors from the palette as follows:

SHIFT + 'Mouse Click' changes the 'corner mark' color associated with the current Selected Color.

**CONTROL** + 'Mouse Click' changes the 'center mark' color.

option + 'Mouse Click' changes the 'whole Wel' color.

⌘ + 'Mouse Click' changes the 'Grid' color.

Mark Size - size of the dots used for 'corner marks' and 'center marks' can be selected individually in the Mark Size section of the dialog to be one or two pixels wide. Single width for corner marks and double width for center marks is recommended.
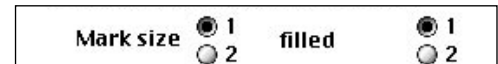
Grid Marks - creates bolder grid lines (2 pixel thickness) at set increments. The grid settings shown in the dialog at the right indicate that the bolder lines of the grid will be spaced 8 pixels apart in the X and Y axis. The grid lines between the bolder lines display at 1 pixel width.
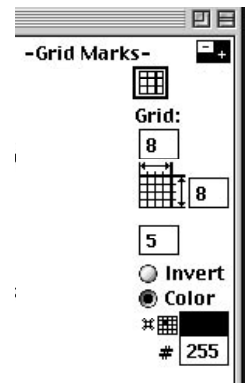
Invert - inverts the color of the grid depending on the image color beneath the grid.

Color - default grid color is black (255) but may be changed to any color in the palette.

Minimum Zoom - The Minimum Zoom at which marks will be displayed can also be set individually for each type of mark.

Corner and Center marks - should not be used at zooms of less than 3:1, otherwise they will obscure the image (at 1:1 each Wel only occupies a single screen pixel, so the mark would completely replace the Wel).

Whole Wels - can be used all the way down to 1:1 zoom.

Grid Lines - The bold grid lines appear at zoom level 1:1 while the individual grid lines are set to appear at the minimum zoom level. 3:1 is the recommended value for the minimum zoom for the grid lines.

Startup LUT Parameters

The first time an image is opened in *JacqCAD*
MASTER™, Three 'LUT's (Look Up Tables) are creat-
ed that map from the selected color to the marking color.
The Startup LUT Parameters determine how these LUTs
are created - for example whether changes in Luminance
(brightness) or in Hue should be tried first and the % of
change in each to try.
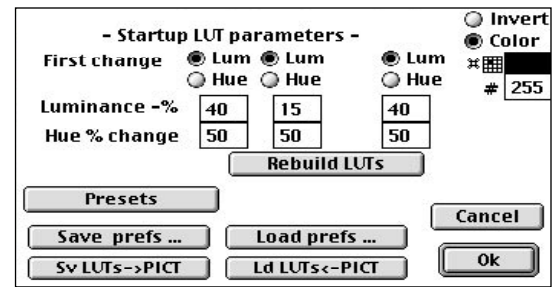
    JacqCAD MASTER™ does a reasonable job of assigning overlay colors, sometimes some of
its assignments do not work, either because the difference between the image color and a marking
color are too great or too small. For this reason it is possible to change the assignments 'by eye' for
improved results.

    The effect of each change will be immediately apparent in the sample windows. The usual goal
is to find marking colors that will be clearly visible while having a minimal impact on the overall
appearance of your design. In difficult cases where the palette in use doesn't provide suitable 'mark-
ing' colors, unused colors can be modified to colors that are better suited for marking (double click
on the eye-dropper tool).

    Rebuild LUTs - recreates the LUTs associated with the image.

    Save prefs... - Stores only certain settings into JacqCAD MASTER®to be used as default selec-
tions with new files (not into the job file). The settings that are stored are:
     • Wel marking mode (center versus whole Wel)
     • Minimum zooms
     • Startup LUT parameters to be used in creating new LUTs

    Load prefs... - Restores those settings; again mostly used to 'revert' to the default after making
changes.

    Sv LUTs->PICT - Will store all the settings to the PICT (job) file; next time the job is opened the
user will be asked if these settings should be reloaded.

    Ld LUTs<-PICT - Will also reload the settings stored in the PICT (job) file; primarily useful for
'reverting' to the stored settings if the changes just made need to be discarded.

    Cancel - Exits dialog without changes.

    OK - Exits and applies any changes.

Wel Grid

No Grid - Deactivates the current wel grid indicator.

Line Grid - Overlays 'Grid Lines' onto the image. The settings for the grid lines are set in the 'Weave Display Prefs' dialog box.

The use of the grid can be helpful in the case that the aspect ratio is not 1:1 and the pixels are elongated. Generally, the grid displays best at the higher magnifications than at the lower ones. The bold lines of the grid designate a specified parameter of the grid spaces.

Note: In the 'Inverted' mode colors in the middle areas of the color table may not reveal the overlain grid with as much contrast as colors towards the ends of the table.

Dot Grid - Enables the marking of the corners of the Wel grid (Weave ELements) with small dots as an aid to 'navigation' around the image. These corner dots are only useful at zooms of 2:1 or higher; they are especially helpful with images that contain large areas of solid color (where Wel boundaries are otherwise hard to determine).

Weave Cuts

Wve Marks OFF - Disables the Weave overlay indicators.

Whole Wve Marks - Enables the weave 'Whole Wel' overlay. The 'Whole Wel' (Weave Element) overlay indicator uses the entire Wel to display the overlain weave. The weave overlay colors are determined by the settings in the Weave Display Preferences dialog box.

The weave overlay defaults to a 2x2 plain weave until other weaves have been assigned and Update Wve Overlay has been called.

Dot Wve Marks - Enables the Weave overlay in the form of 'Dot' weave cut indicators. The dots color and width are determined by the settings in the Weave display preferences Dialog box.
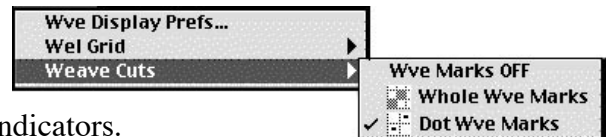
Convert Select to Weave...   ⌘ ;

Converts a rectangular selection into a Weave File. Choosing this Weave Menu option will open the Save dialog to name the new weave. The following dialog window allows for a description of the new weave.

The final dialog show to the right permits the user to click on the color patches in the palette to toggle them between Cut (marked by 2 corner marks along bottom edge of the patch) versus Miss. The dialog summarizes the number of colors set to be Cut colors and lists as many as it can fit. For more information see the **'Weave Files'** section of this chapter.
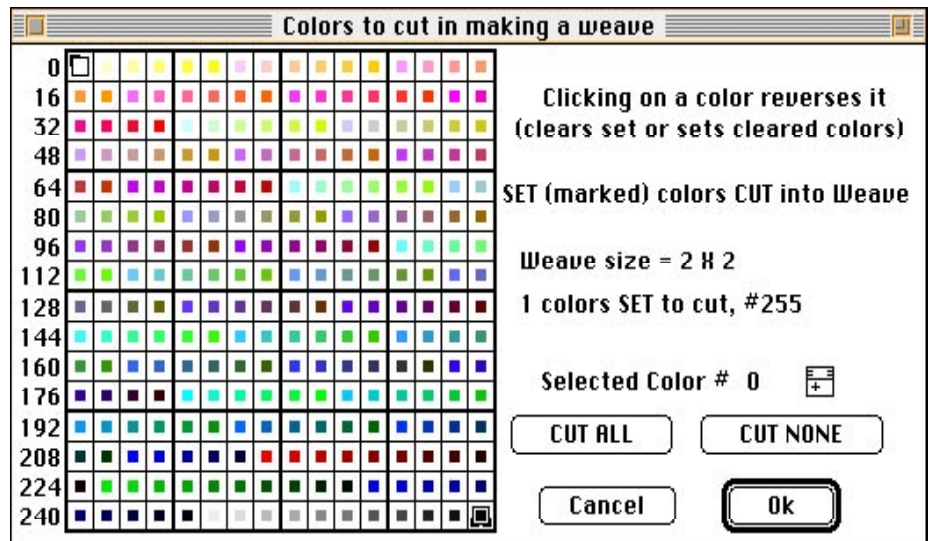
Assign Weaves...   ⌘ K

Assign weaves to design colors. Weaves are loaded in from various types of weave files (see below) and can be assigned to any number of colors, each color assignment with its own Starting End and Card positions, weave advance mode, polarity, and Cut Color (the color to cut into the design if Cut Weave to Design is selected).

This dialog is also used to create Weave Library (WLib) and Assignment (WAsn) files. Also, an immediate update to the weave overlay may be applied, using the 'Apply' button, without leaving the dialog. This is useful for checking changes in assignments.
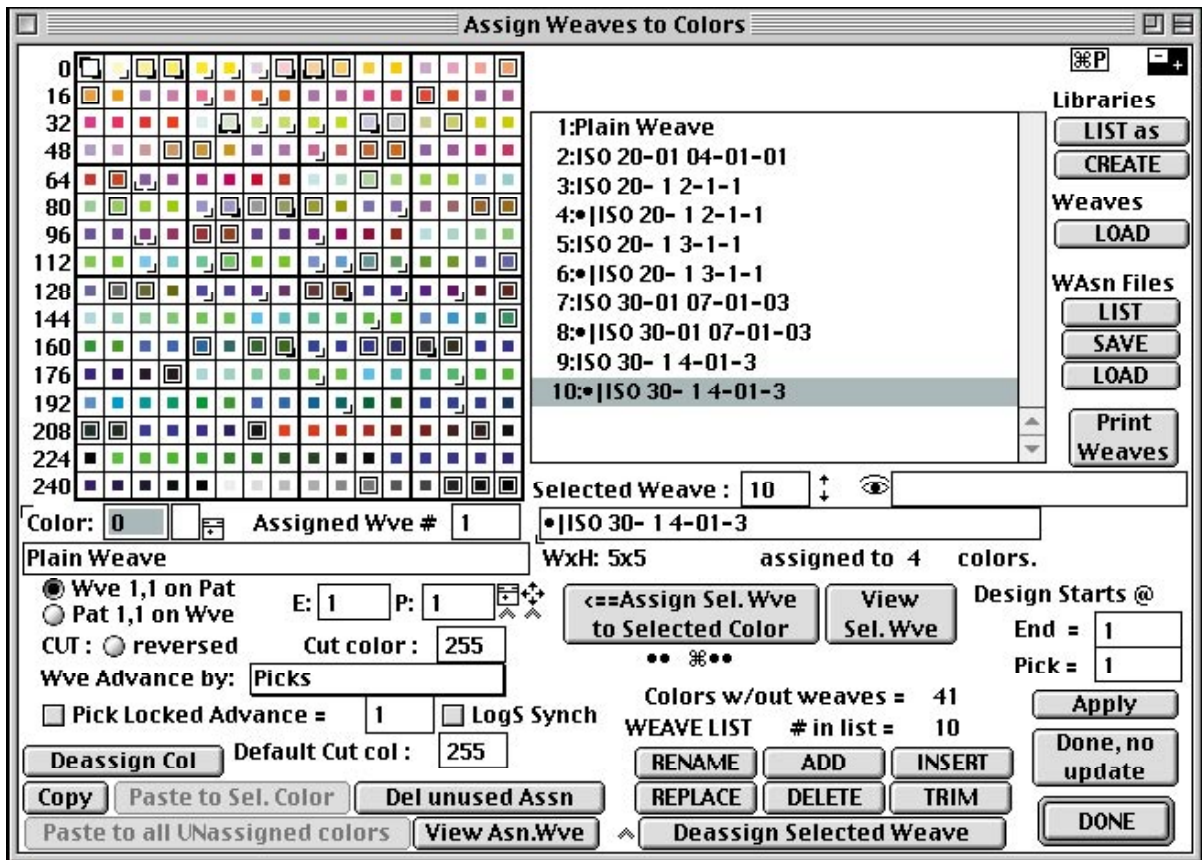
Libraries

Weave Library (WLib) - files are general purpose collections of weave that can contain up to 256 weaves per file. Each library file should contain a single group of logically related weaves, for example a series of weaves that grade smoothly from warp to weft dominance. A library file is created by building a weave list (located in the rectangle section to the right of the color palette, usually by combining a number of individual weaves from .Wve files, and then saving the list of weaves into a WLib file using the **CREATE** button. The entire list of weaves is stored in the library file along with a brief user supplied description of the library.

List as - Creates a text file containing the weaves in the "library" column. The resulting text file can be saved as a text file, viewed on screen or printed.

Create - Creates a WLib file using the currently loaded set of weaves. The newly created file can then be imported into the weave assignment dialog of any design.

Weaves

Load - Opens the Select Weaves dialog. The left side of the dialog window will display individual weaves or weaves in a weave library. The right side of the window shows one repeat of the selected weave in the bottom left corner.

  +Repeats - Checking this options fills the entire display window with repeats of the selected weave.

Weave information is indicated directly below the repeats window. Width, Height and magnification of weave view. Up and down arrows located just to the right increase and decrease the image size.
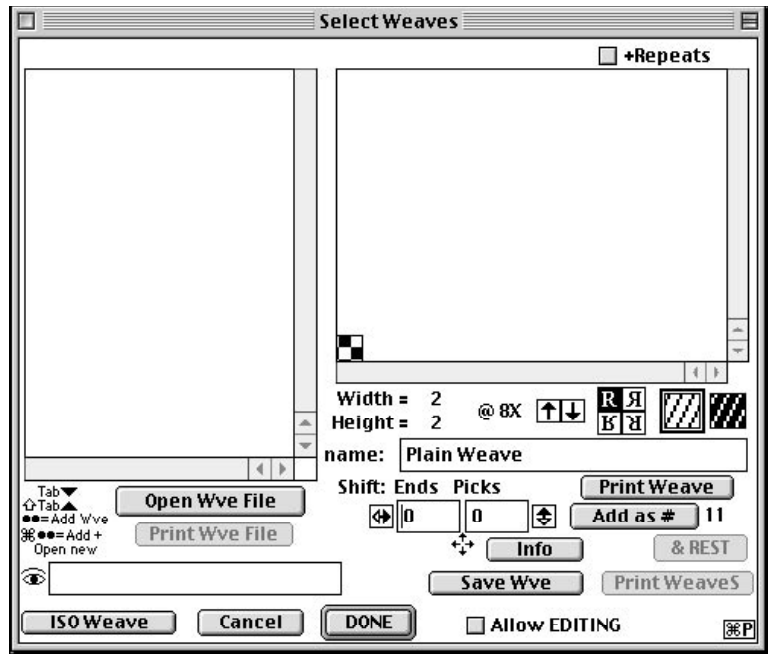
Rs to flip weave horizontally and vertically. Other indicates normal display of cuts and misses or inverting (cuts become misses and misses become cuts)

name: - Indicates the name of the selected weave.

Shift: Ends Picks - User can roll the selected weave in the end or pick direction.

Print Weave - Used to print selected weaves.

Add as # - After choosing the desired weave, clicking on this button adds the new weave to the list in the weave list in the Assign Weaves window. Each new selection will advance the number in the list.

& REST - After selecting one weave from the current weave library, this option allows selecting the remaining weaves in the list and adding them to the Assign Weave list.

Info - displays the weave's name, its width height and the following measurements:
  • %Warp cover - i.e., the cuts as a % of (cuts + misses)
  • Longest float lengths on Warp face, Warp back, Weft face, Weft back
  • %Warp activity - the number of changes from cut to miss or miss to cut as a % of the maximum number which would occur in a 2X2 tafetta
  • %Weft activity - same as above, except measured in the weft direction.
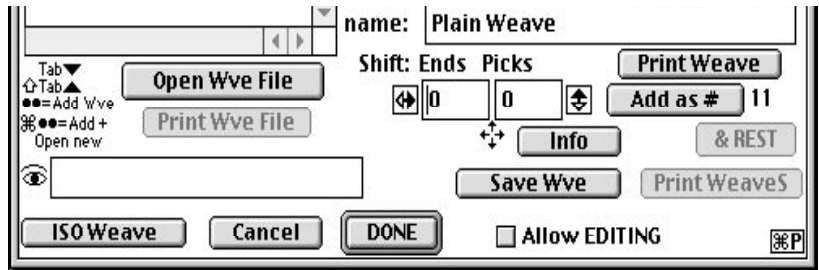
Save Wve - After editing a weave it can be named and saved.

Allow EDITING - activating this check box will allow the displayed weave to be edited.
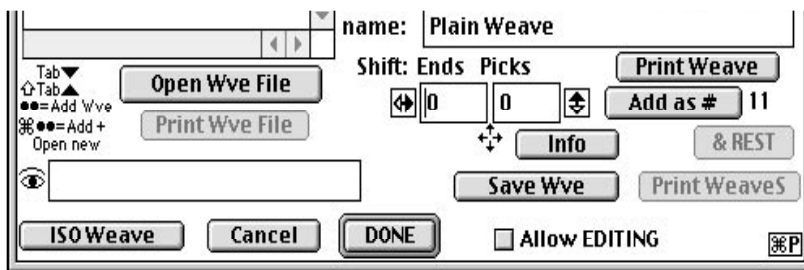
Print Weaves - will print all weaves in the currently open weave file. Any Weave Library or WAsn (Weave Asignment) file can be printed this way.

Note: All the weaves will be printed at the same user selected Ends Per Inch (EPI); the supported range being 5 to 30 with a default value of 15 recommended.

> *Exception: large weaves will be scaled down as required to fit on a single page.*

> *Each weave is labeled with its number and name in the form "23:[weave name]".*

> *Grid lines include heavier lines at intervals of 8.*

Open Wve File - Used to select individual weaves from a file.

Print Wve File - To allow printing weave in list above.

       Used to Search an open weave library for a specific weave by name.

Cancel - Exits dialog without making changes.
Done - Also Exits dialog stepping back to the Assign weave window.

ISO Weave - Opens the Create an ISO 9354 weave dialog. The maximum size of the created weave is 48 ends x 32 picks. The weave is repeated filling the entire window with the single repeat visable in the lower left corner with grid lines.
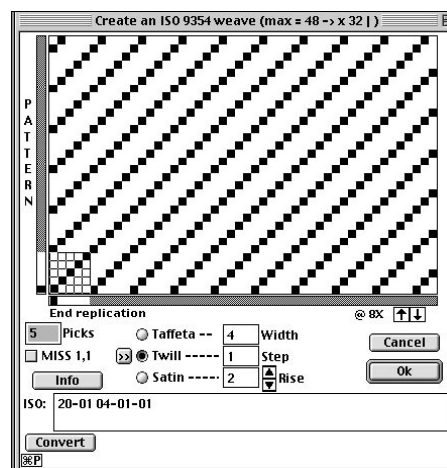
Picks used to enter the height in picks of the weave repeat. Use the ▶▶ to apply to the selected quality.

Taffeta, Twill, Satin Use the radio button on the left edge to select the desired base weave.

Width - the size of the weave in the end direction.

Step - indicates the placement of the next cut in relation to the first cut which is placed at end 1, pick 1.

Miss 1,1 - Checking this option inverts the weave to end 1, pick 1 is a miss and all the rest is cut.

Rise - used to determine the placement of the cut on the second end in a satin weave.
Info - See Info on 8.7
Cancel - Exits Weave window without changes.
OK - Exits window loading selected weave into the previous dialog where the weave may be added to the Assign Weaves list or edited.

WAsn Files

List - option for creating a text file containing the weave assignments in association with each color used in the design or printing the information directly to a laser writer or other printing device. When a WAsn file is listed, the text file can be opened and printed at any time with any text editing or spread sheet application.

**Save -** Saves the current Weave Assignment file as a WAsn file onto the hardisk for future reuse.

Load - Loads a previously saved WAsn file. Loading a WAsn file replaces all existing weaves and assignments with the contents of the WAsn file.

Print Weaves - will print one weave or only the assigned weaves in the WAsn file.

Note: **WAsn** files are created by building a weave list, assigning weaves to all used colors , and then using the **[Save WAsn file]** button.The **Selected Weave** is highlighted in the list and its number, name, dimension, and the number of colors it has been assigned to are displayed in the '*selected weave information*' area (see figure). A weave is selected either by clicking on its name in the list, or by changing the weave number in the information area.

The Palette Display

• The Palette Display shows patches of all the colors in numerical order from 0 in the upper left corner down through Color 255 in the lower right corner.

• Colors that are used in the design are indicated by a box around the color patch.

• The current Selected Color is indicated by a small black corner mark in the upper left corner of the color patch (see Color 1 in the figure).

• Colors to which any weave has been assigned are marked with a small corner mark in the lower right corner of the color patch.

• Colors to which the current Selected Weave has been assigned are marked with a small corner mark in the lower left corner of the color patch.
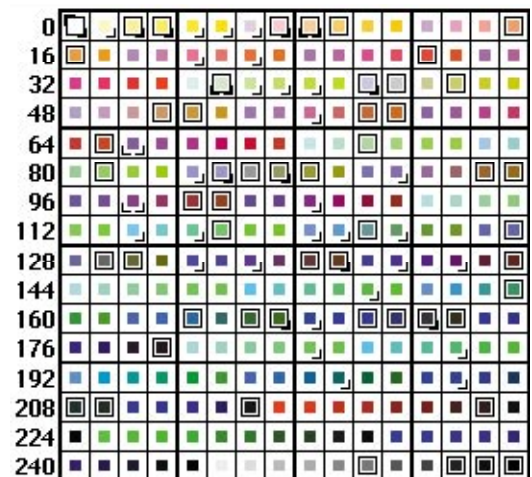
Selecting a Color

• The number of the Selected Color is displayed in the 'selected color information' area along with the number and name of the weave assigned to it (if any), and the settings for Starting End, Starting Card, Advance mode, Pick Lock (on/off, step size) cut polarity (normal or reversed), LogS Synch and Cut Color.

• A color is selected by clicking on its color patch in the palette display, or by changing the color number displayed in the Selected Color information area.

Selecting a Weave

• Any weave in the list can be selected by clicking on its name. The selected weave's name will then be displayed in the 'selected weave information' area along with its number, dimensions (WxH) and the number of colors it is assigned to. Lower left corner marks in the palette display will be updated to mark the colors to which this weave is assigned.

Assign Weaves: - Cmd - Double click on a weave in the Weave List now assigns that weave to the Selected Color and then advances the Selected Color to the next color used in the image. Useful for quickly assigning weaves to all used colors.

Assign Sel. Wve to Selected Color - The Selected Weave is assigned to the Selected Color by using this button. Alternatively, the number of the assigned weave can be directly changed (double click on it, then type in the new number).
> • Once a weave has been assigned to the Selected Color, the remaining settings (Starting End and Card, Weave Advance mode, Pick Lock, LogsS Synch, Step, Cut polarity, and Cut Color) can be adjusted as required by directly editing the settings in the Selected Color information area.

Control-Arrow key presses adjust the Selected Color's weave's alignment (Left/right adjusts end, up/down adjusts picks). Control-Click in image sets the Selected Color's weave's alignment such that the weave's End 1 Pick 1 will align to the location clicked upon in the image.

Note: It is important to remember that each color has its own settings which are independent of all other colors; in other words even though several design colors may have the same weave assigned to them, each color has its own copy of the weave with its own starting position, advance mode, etc.

View Sel. Wve - Opens window to display selected weave in the list of weaves.

Weave Advance mode selection

Weaves can advance in a number of modes which depend on the structure of the image they are applied to; a summary of the structures follows:

Simple images - (un-expanded)
Do not contain any 'structural' information - each line on the screen is a 'Pick' and a 'Card' and no Logical Shuttle assignments are present. For these images, Advance by Card is the same as Advance by Pick and Advance by Shuttle list has no meaning.

Expanded images
Have a more complex structure : the image is organized into Picks (usually corresponding to fabric advance) and each Pick contains one or more Logical Shuttles, each of which will result in the creation of a Card (i.e. a weft thread).

**Wve Advance by:** - is selected from the 'pop-up menu'. The following choices are offered:
> **Picks -** The weave steps once for every Pick; this differs from by Card only when an Expanded Image is being overlain.
> **Cards -** The weave steps once for every line on the screen, i.e. for every Weft thread.
> **Color Use -** The weave steps once for each card in which its assigned color occurs.
> **Shuttle List -** The weave steps once each time any of the Logical Shuttles in the list occurs. The user defines which Logical Shuttles are to be included in the list (which may be different for every color).
> **&- Default List -** this sets the current color to advance by Shuttle List and to use the default list (so the user doesn't have to enter the shuttle list again).
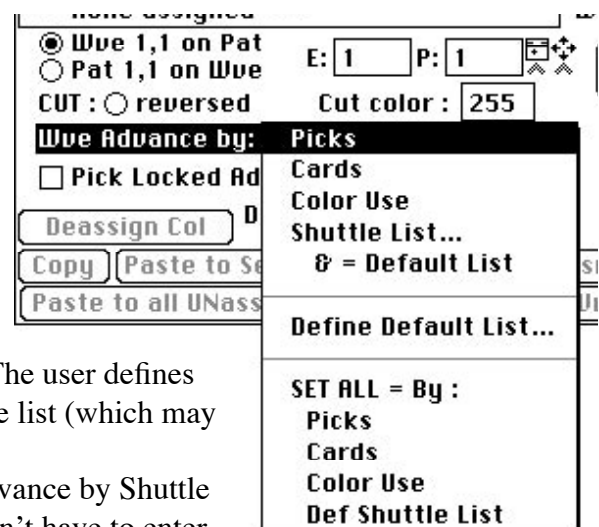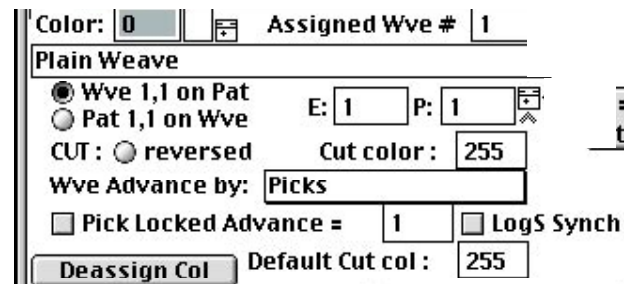
Define Default List... - permits the user to define a default shuttle list which can thereafter be used by selecting the option above.

Set All -By :

Picks - this option sets all assigned weaves to advance by Pick.

Cards - will set all weaves to advance by Card.

Color Use - all weaves will be set to advance by Color Use.

Def Shuttle List - uses the default shuttle list to set the advance for all image color weaves.

Pick Locked Advance - used to advance the weave within a Pick, but also to ensure that it remains aligned to the underlyng Picks, especially if the number of cards per pick is variable. If Pick Lock is checked on, then at the start of each pick the weave's current position is recorded and at the end of each pick the weave's position is reset to the starting position plus the Pick Advance value. In other words, Pick Lock guarantees that the weave will advance by the desired value from pick to pick, no matter what happens within each pick. Pick Advance can be set to a negative value (must first type in the number, then re-position the cursor and type in the '-' sign). Weave advance within a Pick is still controlled by selection of By Pick, By Card, etc., except that if Pick Lock in checked and Pick Advance is negative then the advance within each pick is also reversed. This makes it possible to fully "pick mirror" any weave (but only if using Pick Lock).

LogS Synch - PicLock and LogS Synch are only meaningful when the design has been expanded into a Pick + Logical Shuttle structure, in other words when each Pick contains more than one Logical Shuttle (card). Consider the following example which shows the roll-out of a 3 pick weave over an expanded design which contains up to 3 Logical Shuttles per Pick.

Structure		Weave roll-out			
Pick	LogS	byCard	+PicLock=3	+LogS Synch	Notes:
====	====	======	==========	===========	============
1	1	1	1	1	(bottom of design)
1	2	2	2	2	
1	3	3	3	3	=> PicLock resets
2	1	1	1	1	weave to mult of 3
2	2	2	2	2	
3	1	3	=> 1	=> 1	<-- LogS Synch effect
3	3	1	2	3 <--	aligns to Logical
4	1	2	=> 1	=> 1	shuttle
4	3	3	2	3 <--	

note that a 3 pick weave has been shown for simplicity.

Deassign Color - clears (removes) any weave assignment from the current Selected Color and resets its settings to the default values.

Copy - copies the selected weave assignment for use with another color.

Paste To Sel Color - After a color has been selected then the weave assignment that has been copied from another color can be applied by clicking this button.

Del unused Assn - This button will clear assignments from all colors that have not been used in the design; this is often useful when a WAsn file from a different job has been loaded (and contains assignments to colors that were not used in the current job).

Paste To all Unassigned colors - will do a 'paste' to all colors that are used in the design but to which no weaves have yet been assigned.

View Asn. Wve - opens a window with the currently selected color's assigned weave.

 Colors w/out weaves =   indicates the number of image colors not assigned weaves.
WEAVE LIST # in list= indicates the number of weaves in the current weave list above.

RENAME - used to rename weave in current list.

ADD - Loads a .Wve file. Loading a .Wve file simply adds its weave to the existing weave list without disturbing any existing weaves or assignments.

INSERT - allows the addition of another weave to the list above a selected weave in the existing list.

REPLACE - replaces the selected weave with a new weave from a .Wve file.

DELETE - removes the selected weave from the list, moves all following weaves down one step to fill the gap (subtracting 1 from their weave numbers), and adjusts the weave numbers used in any existing assignments. Important point : assume that Weave #5 is the '3x3 Twill' and is assigned to Color 20, if Weave 4 is deleted, then the '3x3 Twill' becomes Weave #4 (sliding down in the list) and Color 20's assignment will be changed appropriately to Weave 4 - in other words the same actual weave will be assigned to Color 20, but its number will have been adjusted.

TRIM - Deletes any unused weaves from the current list. Helpful when loading previously saved WAsn files with more image colors assigned weaves than the current image file.

Deassign Selected Weave - Clicking this button will remove all assignments to the current **Selected Weave**. Holding CTRL key down changes **Deassign Selected Weave** button to **Deassign ALL Weaves** and clicking on it removes all weave and color assignments. Weaves remain in list. Colors are reset to default values for advance mode, offset, etc.

Apply - immediately updates the weave overlay without leaving the dialog. Useful for checking changes in assignments. Control-Arrow key presses adjust the Selected Color's weave's alignment. Control-Click in image sets the Selected Color's weave's alignment such hat the weave's End 1 Pick 1 will align to the location clicked upon in the image.

Done, no update - Exits dialog without changing and updating the image.

Done - exits the dialog window while updating the weave overlay. The user is warned if there are colors without weave assignments or if the WAsn file is not saved.
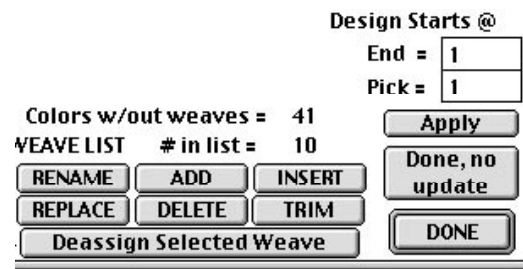
Update Wve Overlay ⌘ -

Updates the Weave overlay; used after assigning weaves or making significant changes to the design. Because of the relatively large amount of time taken by weave overlaying, it is only done upon user request rather than being done automatically after every change in the image.

Cut Weave into Design...

Cuts the weave overlay into the design itself (permanently changing the pixels). Control of which colors will be cut into and of the color that will be used in cutting is accomplished through assigning the Cut Color in Assign Weaves (if Cut Color is the same as the color, then no cutting occurs).

Expansion... ⌘ ←

The Expansion process prepares a file for the punching of a loom ready file. The file created during this process is referred to as the Expanded file. The Expanded file contains the technical information relative to the file being prepared for the punching process. The Logical Shuttles, Weaves, and Box assignments are all a part of the Expanded file.

```
┌─────────────────────────┐
│ Expansion mode:         │
│   ◉ Simplified  E x P   │
│   ○ Color Strip         │
│   ○ Complex (manual)    │
│   ○ Supervised Macro    │
│   ○ Automatic Macro     │
│ Results:                │
│   ⊠ Expanded Image      │
│   ☐ Record Macro File   │
│   ┌────────┐ ┌────────┐ │
│   │ Cancel │ │   OK   │ │
│   └────────┘ └────────┘ │
└─────────────────────────┘
```

```
┌──────────────────────────────────┐
│ Weave                            │
│ Wve Display Prefs...             │
│ Wel Grid                       ▸ │
│ Weave Cuts                     ▸ │
│                                  │
│ Convert Select to Weave...   ⌘; │
│                                  │
│ Assign Weaves...             ⌘K │
│ Update Wve Overlay           ⌘- │
│                                  │
│ Cut Weave into Design...         │
│                                  │
│ Expansion...                 ⌘J │
│   Open Exp. Temp file            │
│                                  │
│ Assn Warp Seq & Colors...        │
│ Assn Boxes & Regulators        ▸ │
│ Assign Var. Pick Dens...         │
│                                  │
│ Make Castout File...             │
│ Punch As                       ▸ │
│ Card Image From                ▸ │
│                                  │
│ Fabric View                    ▸ │
│                                  │
│ Dobby                          ▸ │
└──────────────────────────────────┘
```

Overview of Expansion Modes (which to select, etc.)

Simplified ExP

Used for the most simple type of expansion, often called "N for 1" as in "3 for 1".

The entire design is expanded by a fixed amount (1, 2, 3, 4, 5, or 6X) in the Ends and Picks dimensions.

End expansion can either be
   • *Replicate* - which magnifies the design to fill the width by duplicating each end the desired number of times.
   • *Repeats* - which repeats the design N times across the desired width, end 1 through the end and starting again with end 1.

Logical Shuttles can be set to either

```
┌──────────────────────────────────────┐
│        Simplified Expansion          │
│ File: Untitled-1                     │
│   144 Ends X  144 Picks              │
│ End expansion                        │
│   expand by: (1X)(2X)(3X) ◼▶◀ ◉ Replicate │
│              (4X)(5X)(6X) RRRR ○ Repeats  │
│                                      │
│ Pick expansion            Creating : │
│   expand by: (1X)(2X)(3X)   144 Ends @ 1X │
│              (4X)(5X)(6X)   144 Picks @ 1X │
│                                      │
│ Logical shuttles      Box Assignments │
│   ◉ 1 1 1 1 1 1       ○ = Logical Shuttle │
│   ○ 1 2 3 ... 1 2 3   ◉ =0, no assignment │
│                                      │
│   ┌──────────┐  ┌──────────┐         │
│   │  Cancel  │  │    OK    │         │
│   └──────────┘  └──────────┘         │
│                                  ⌘P  │
└──────────────────────────────────────┘
```

   • *1 1 1 1* - meaning that all the expanded picks will contain only a single Logical Shuttle #1 (card). If a 100 pick design is being expanded 3X the expanded design will now contain 300 picks, each containing a single Logical Shuttle, or

   • *1 2 3 ... 1 2 3* - meaning that each orginal pick is expanded to contain several Logical Shuttles (cards) numbered serially. If a 100 pick design is being expanded 3X, the expanded design will contain 100 Picks each of which contains 3 Logical Shuttles (cards) numbered 1, 2, and 3.

Box Assignments can be set to either:
  • *Logical Shuttle* - meaning that each card will be pre-assigned the same number box (e.g., Box 1 to Logical Shuttle 1, Box 2 to LogS 2, etc.), or
  • *0, no assignment* - meaning that no box assignment will be made. This will result in a warning if you try to punch the job before making explicit box assignments.

Color Strip

Uses a multi-column strip of colors (usually along the right edge, but any location can be used); the columns can be right next to each other or spaced evenly apart. Each column corresponds to a Logical Shuttle (1...), and the color within each column corresponds to the Physical Shuttle (Box) to be assigned to that Logical Shuttle. Color 0 indicates a skipped logical shuttle, i.e., do not create a pick or card. Colors 1...16 indicates that a pick should be created and that box 1...16 should be assigned.

End Expansion

expand by: - Enter the amount in the ends each image end needs to be expanded by.   The ends can be replicated or repeated. See Simplified Expansion above.

OMIT Color Strip & Beyond - this option deletes the color strip from the resulting expanded file.

Define Color Strip - Opens the dialog window shown at the right.

# of active columns (1...32)   Enter the number of columns or Logical shuttles here. Each column represents a logical shuttle.
Strip left edge at End #   enter the end just to the left of the color strip.
Margins within strip: Colors strips may contain margin colors that separate each logical shuttle.   Indicate how many ends **to the left of the first, between columns,** and t**o the right of the last**.
Margin color #   the default margin color is 12, though any color may be used and indicated here.

Allow +50, +100, +150 for Regulators - A**d**ding 50, 100, or 150 to the above color also controls the regulators as follows :
  + 0 -   no effect
  + 50 -   turn on fabric regulator
  + 100-   turn on warp regulator
  + 150-   turn on both regulators
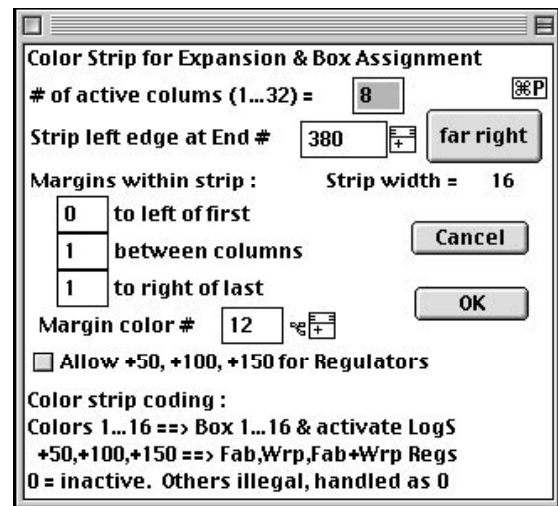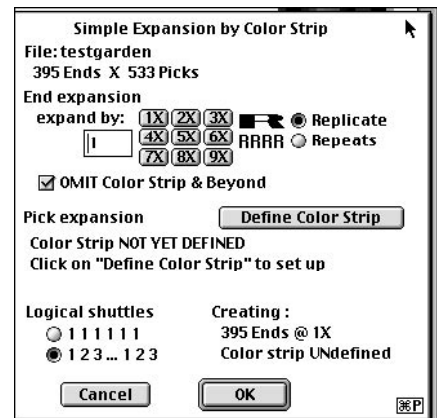
Color strip coding: notes the code for assigning the boxmotions, warp and fabric regulators to logical shuttles.

Example: assume that the Color Strip contains the following colors in Pick 1:

column	1	2	3	4	(Corresponding to Logical Shuttles #1...4)
color	3	52	0	151	(colors indicate what should be done)

Pick #1 will expand into 3 card as follows:

Logical Shuttle #1 with Box 3 assigned

Logical Shuttle #2 with Box 2 + Fabric regulator turned on (2 + 50)

Logical Shuttle #3 - do NOT activate (0 = no pick created)

Logical Shuttle #4 with Box 1 + Fabric & Warp regulators on (1 + 150)

far right   button used to locate the far right edge.

Cancel   Exits dialog without defining the color strip.

OK   Exits dailog using the values indicated.

A Note About Multiple Jacquard Heads

JacqCAD MASTER™ handles multiple head patterns as single images during the Expansion process. Patterns requiring to be split for 2 or more mechanical jacquards are separated at the time of punching when the castouts will be applied. (See the 'Punch As...' section later in this chapter.)

Complex (manual)   User must save the tmp.tmp file before the following dialog box comes up. Complex expansion is used when the designer wants complete control over every aspect of the resulting expanded image, especially when tissue picks are used.

Overall Expansion Dimensions

Define the total width in Ends of the expanded image and the number of Pick Ranges that will be used during expansion; a temporary file is opened to hold the expanded data.

```
┌──────────────────── Overall Expansion Dimensions ────────────────────┐
│ Define expanded width & # of Pick ranges                              │
│ Src: testgarden                                                       │
│   Containing 395 Ends, 533 Picks                                      │
│                                    (1X)(2X)(3X)                        │
│ Expanded width =  │ 395 │         (4X)(5X)(6X)  [ Cancel ]  [  Ok  ]  │
│ # of Pick ranges= │  1  │         (7X)(8X)(9X)                 ⌘P     │
└──────────────────────────────────────────────────────────────────────┘
```
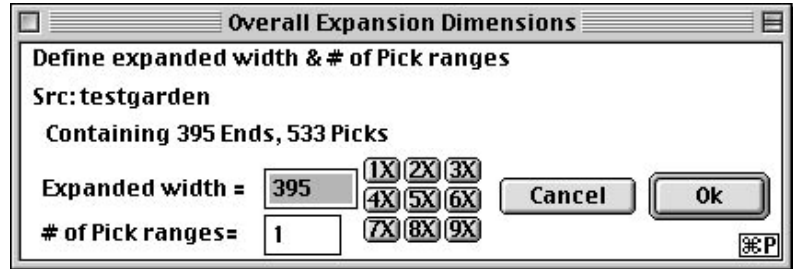
Expanded width=   used to define the total number of ends in the expanded image. 1X, 2X, 3X, etc are for ease in entering the value. At the beginning of expansion, the size of the final image must be set; the first step is to define the width of the Expanded Image which will remain constant throughout expansion. The number of Pick Ranges to be used during expansion is also set at this point.

# of Pick Ranges - Expansion is done in one or more Pick Ranges; except for the Expanded Image's width, all other expansion variables can be set independently for each Pick Range. The Expanded Width remains constant throughout the remainder of expansion (a job whose width varies doesn't make sense). For each Pick Range :

a) Define Pick Range : First Pick, Last Pick, Step Size, and Replication Factor determine the order and number of Design Picks that will be converted into Expanded Image Picks.

b) Define End Expansion to occur within the Pick Range : the rules used to copy Design Ends into Expanded Image Ends.

c) Define which Logical Shuttles should be used within the Pick Range (any combination of 1…32).

d) Define Pick Expansion : the rules to expand each Pick created by step (a) into one or more Logical Shuttles (Lances), each of which can be either Always Active or Conditionally Active, and which have Default Colors and Warp & Fabric Regulators. Also define the mapping of each Design Color (0…255) to Shuttle Colors (none or 0…255) on a shuttle by shuttle basis.

e) Pick range then expands into the temporary file

The Expanded Image

After the last Pick Range has been expanded, the Expanded Image is loaded from the temporary file into a *JacqCAD* window. An Expanded Image differs from normal images in several important ways :

a) It has a more complex structure as it is organized into **Picks** and **Shuttles**, each line on the screen corresponds to a Logical Shuttle (and represents a Card) and is also part of a Pick.

b) The cursor position display in the Results window changes to reflect this added complexity, when an Expanded Image is present the display will include :

X : End # (same as before)

Y : 'Card' #, 1…

Pic : Pick #. 1…

LogS : Logical Shuttle # followed by : 'A' if Always Active, and 'W' and/or 'F' for Warp & Fabric Regulators respectively

PhyS : Physical Shuttle # or 'x' if none yet assigned

c) Expanded images are stored in special 'Expn' files; these are similar to PICT files, but are not directly compatible (for instance it is not possible to open an Expn file with any application other than *JacqCAD*). The incompatible format is needed to maintain the extra structural information required in an Expanded image.

Define Pick Range:

First Pick, Last Pick, Step Size, Replication Factor

Pick Ranges are always defined in terms of *Design* Picks while the expanded Picks always start with Pick 1 and the Pick numbers increase as new picks are created. Each Pick Range is defined by a First Pick, a Last Pick, a Step Size, and a Replication Factor.

```
═════════════ Define Pick Range ═════════════
Define Pick Range #  1, begins with :
  expanded Pick #   1, Card #   1

Source Picks :           Each Source Pick to
   First Pick = 1            replicate into = 2
   Last Pick = 200          # Picks created = 400
 Stepping by : 1
# Picks used = 200              ( Ok )
                         ( Cancel )
```

The First Pick and Last Pick are the *Design* Picks to be used in the Pick Range. The Step Size indicates how many *Picks* to step between expansions; it is normally =1 meaning that every pick between the First and the Last is to be expanded, but could, for instance, be set =2 to indicate that only every other pick should be used. The Replication Factor indicates the number of *Expanded* Image Picks to create for each *Design* Pick used.

Examine the following examples:

1: a Pick Range defined as :

First Pick =	1
Last Pick =	200
Step Size =	1
Replication Factor =	2
= 400 Expanded Picks	

Example 1 would expand Picks 1…200 from the *Design* into *Picks* 1…400 in the *Expanded* Image because the Replication Factor of 2 would indicate that 2 expanded picks should be created for every *Design* Pick used.

2: Pick Range defined as :

First Pick =	200
Last Pick =	1
Step Size=	1
Replication Factor =	2
= 400 Expanded Picks	
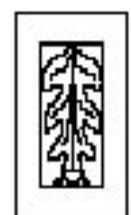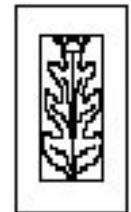
This example would also create 400 expanded picks, but these would be in 'Pick Mirror' form since the first Expanded *Image* Pick created would come from *Design* Pick 200.

3: Pick Range defined as :

First Pick =	1
Last Pick =	200
Step Size=	2
Replication Factor =	3
= 300 Expanded Picks	
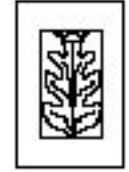
This example would take every other Pick between 1 and 200 (i.e. 1,3,5,…,197,199), due to Step Size=2, and expand these 100 chosen Picks into 3 *Expanded Image* Picks each; this would result in 3 x 100 = 300 *Expanded Image* Picks being created.

End Expansion

End Expansion rules define how Ends are copied from the *Design* Pick to the *Expanded Image* in order to create the necessary number of *Expanded Image* Ends. The rules take the form of a list of simple definitions similar to the Pick Range definitions.

Source Ends:
  First End=   first image end used in the expansion.
  Last End=   last image end to be expanded.
Step Size= indicates which end to use next in the image. 1 uses every end in the end range indicated in the setting above (First End, Last End), 2 would use every other end in the range, 3 would use every third end and so forth.

Expanded Ends:
Replication Factor=   this value indicates the number of times each end in the range is expanded or duplicated.
Ends Created=   useful for checking that the current rules creates the desired expanded ends.
Pick Shift= can be set to any value between + and - the Design Image's height to create Pick Shifts. The only limits placed on the Pick Shift value is the size of the image (i.e. if the image size is 250 then the pick shift limit is from 0 to 249), Complex repeats can be created such as quarter-height Pick Shifts. See the examples below.

TOTAL Ends created=   Rules are added to the list until enough Expanded Image Ends have been created to fill the width of the Expanded Image.
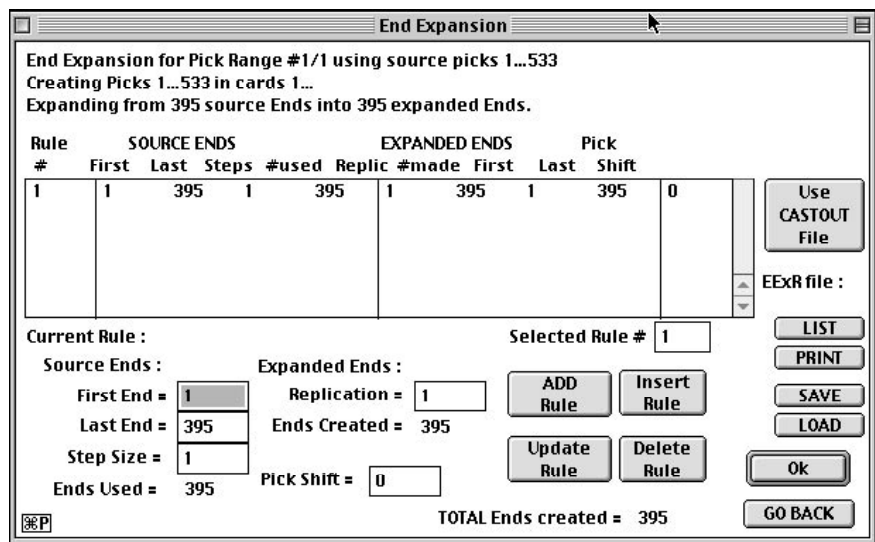
End Expansion always creates *Expanded Image* ends starting at End 1 just as the Pick Ranges create Picks starting with Pick 1.

For example, an End Expansion Rule defined as :

> First End =   1
> Last End =   100
> Step Size=   1
> Replication Factor =   2
> Pick Shift =   0

    = 200 Expanded Ends

This End Expandsion Rule would expand Ends 1…100 from the *Design Image* into Ends 1…200 in the *Expanded Image* because the Replication Factor of 2 indicates that 2 expanded Ends should be created for each *Design*   End used.

A pair of rules such as :

Rule #1

> First End =   1
> Last End =   100
> Step Size=   1
> Replication Factor = 2
> Pick Shift =   0

Rule #2

> First End =   100
> Last End =   1
> Step Size=   1
> Replication Factor = 2
> Pick Shift =   0

These Rules would copy Ends 1…100 into *Expanded Image* Ends 1…200 followed by Ends 100…1 into *Expanded Image* Ends 201…400, thereby producing a double width copy followed by a double width End Mirrored section. The End Mirror shown in would be created by a similar pair of rules.

Rules are added to the list until enough *Expanded Image* Ends have been created to fill the width of the *Expanded Image*.

The Pick Shift value in each rule is normally =0, but can be set to any value between + and - the *Design Image's* height to create Pick Shifts. For example, given a *Design Image* that is 200 Ends wide by 150 Picks high, the following pair of rules :

Rule #1

> First End =   1
> Last End =   200
> Step Size=   1
> Replication Factor =   1

Pick Shift =   0

Rule #2

First End =   1
Last End =   200
Step Size=   1
Replication Factor =   1
Pick Shift =   25

would replicate the *Design Image's* Pick X into Ends 1…200 followed by Pick X+25 into Ends 201…400. The resulting pattern is shown above. As the limits placed on the Pick Shift value are bound only by the size of the image (i.e. if the image size is 250 then the pick shift limit is from 0 to 249),

The End Expansion Rules can be saved to, and later reloaded from, 'EExR' files. Also, the rules used in one Pick Range become the starting point for the next Pick Range.

Use CASTOUT File - for complicated image ends to expanded ends previously created castouts can be used.

EExR file:

List - option to save the resulting end expansion rules (EExR) as a text file.

Print - used to print the end expansion rules.

Save - saves the end expansion rules for use later.

Load - loads previously saved End Expansion rules.

OK - exits dialog using the specified rules.

Cancel/GO BACK - Exits the expansion series. Holding the Command Key allows stepping back to the previous dialog box.

Select Shuttles to Use

(Any combination from 1 to 32)

This decision is not 'binding', it is simply used to set up the following Pick Expansion Rules dialog with the desired shuttles. Shuttles can be added or deleted in the Pick Expansion Rules dialog, though not as conveniently. The shuttle selection made in one Pick Range become the starting point for the next Range; if no changes are made then the Pick Expansion Rules (see below) established during the previous Pick Range will be used as the starting point for the next. Range.
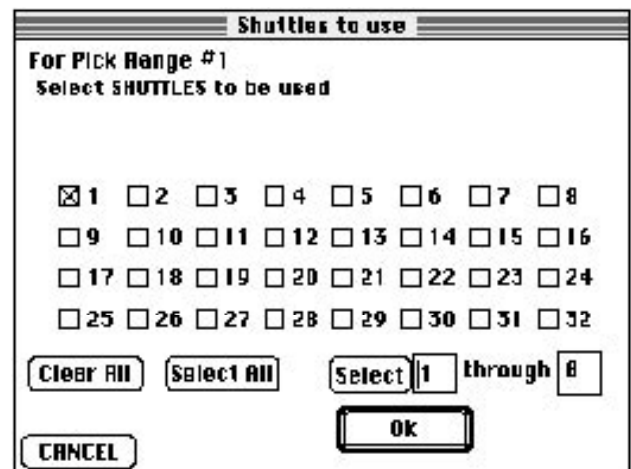
Clear All - clears all shuttles selections

Select All - selects all the shuttles (1-32)

Select ____ through _____ - enter the first logical shuttle and the last shuttle, then click on Select for quick shuttle selection.

OK - continues to the next dialog box.

Cancel/Go Back - Cancel to exit expansion process, hold the Command key to change to Go

Back to step back to the previous dialog box.
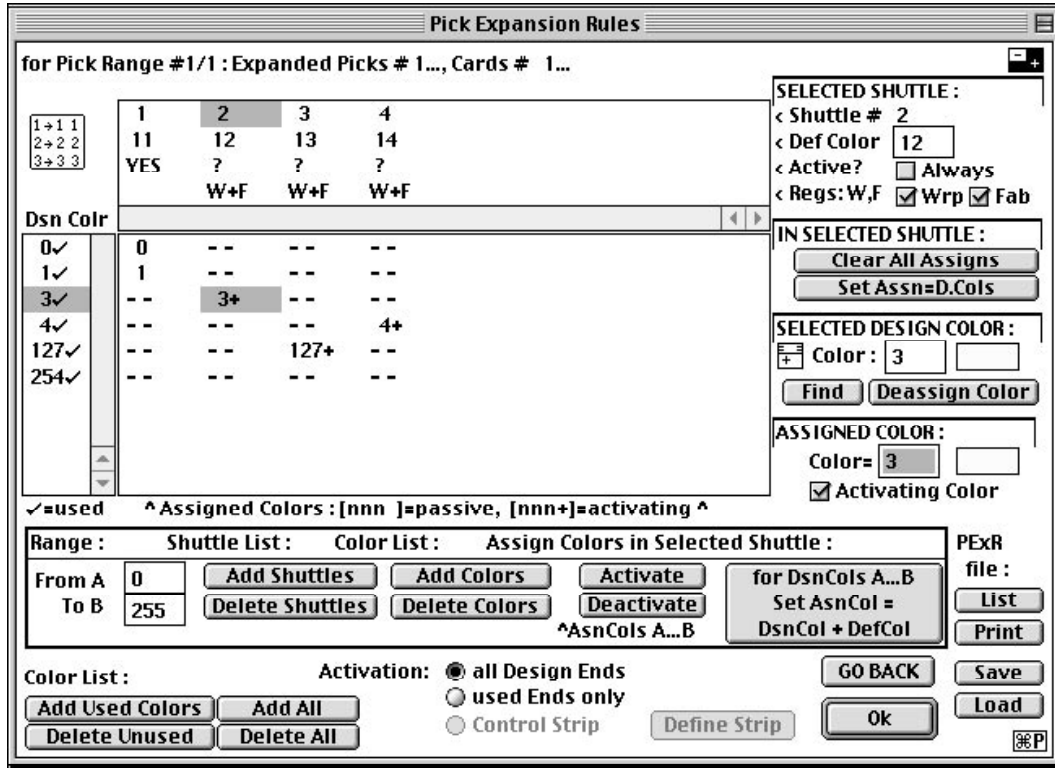
Pick Expansion Rules

The next step is to define the Pick Expansion rules which will determine how each *Expanded Image* Pick in the current Pick Range will be expanded into Logical Shuttle Throws (*Lances*).

The Logical Shuttles that will be used were defined in the previous step : this can include as few as 1 or as many as 32 logical shuttles and any combination of shuttles can be used, e.g. 1, 5, 15, and 31. The shuttles will always be expanded in numerical sequence - i.e. shuttle 5 will always occur before shuttle 6.

Shuttle Header Section :

The Logical Shuttle number(s) will appear in the Header section (column labels) of the 'spread-sheet' followed by 3 lines of information about the shuttle(s). The second line contains the 'Default Color' for that shuttle; this is the color which will be cut into the Lance unless some other color supersedes it. The third line will contain either "YES" or "?" depending on whether the shuttle is "Always Active" (YES) or "Conditionally Active" (?). The Selected Shuttle's values for Default Color, Always Active, and Regulators are displayed to the right in the Selected Shuttle display and can be altered by changing those settings.

Def Color - the default color for the selected shuttle may be changed here.
Active? - Checking **Always** will change the regulator assignement to YES.
Regs: W,F - checking one or both options will activate a warp or fabric regulator for the indicated conditional shuttle. Conditionally Active shuttles will only become active (create a Card) if an Activating color is placed in them; see below. The fourth line will contain "W" if the Warp Regulator is enabled and/or "F" if the Fabric Regulator is enabled.

One shuttle is 'selected' at any moment; this is indicated by its shuttle number being highlighted in the Header. Shuttles can be selected by clicking anywhere in the Shuttle Header, or by clicking in the main spread sheet. If more shuttles are being used than can fit across the spreadsheet, the Scroll Bar under the header can be used to bring any desired shuttle into view.

In Selected Shuttle :
Clear All Assigns - will set all color assignments in the selected shuttle to 'blank'
Set Assn=D.Cols - will copy the design color numbers into the shuttle assignments.

Dsn Colr (Design Colors)

The row labels are to the left of the main spread sheet area; these are the Design Colors, i.e. the colors that appear in the Design Image. Colors found in the image are marked by a √ ; initially only those colors found in the image will be displayed so every color will be checked. However, colors can be added to the color list, or may be included in Pick Expansion Rule files that are loaded, which may result in un-used colors which will not be checked.

Selected Design Color: enter the number to locate in the Dsn Colr list. Click and hold on the color swatch to open the color palette to locate a color from the palette. Choose Find to relocate to the desired design color. Use Deassign Color to clear all assignments to the selected design color.

Main Area (spread-sheet) :

The entries in the spread sheet are the colors that will be used (including none -) when a specific design color (left column) is copied into a Logical Shuttle. Clicking in the spread sheet will select the entry clicked on plus the corresponding row (design color) and column (Logical Shuttle).

ASSIGNED COLOR:

Color = enter the color to be assigned to the shuttle and Design Color. Clicking and holding on the color swatch to the right allows selection from the color palette.

Activating Color - will be indicated by a + following the entry and in the Assigned Color area the Activating Color box will be checked. Activating colors are those which will cause activation of the Logical Shuttle if it is only conditionally active. In the example, Design Color 4 is being mapped into Logical Shuttle 4 as color 4+; this means that on a particular Pick if design color 4 occurs this will activate shuttle 4 (a card will be produced) and that design color 4 will appear on shuttle 4 as color 4.   The assigned color can be user specified.
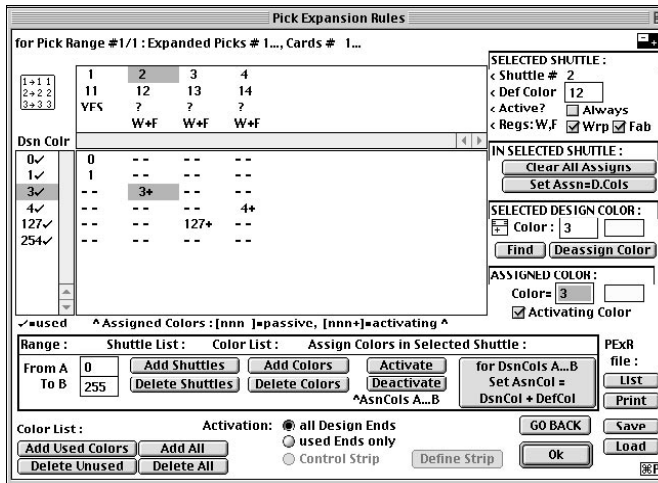
Range Commands :

The range commands perform a series of operations using the values from A to B. These operations provide efficient shortcuts for some lengthy operations.

Add or Delete Shuttles - A…B from the Shuttle list (column labels)
Add or Delete Colors - A…B from the Design Color list (Row labels)
Activate or Deactivate - Assigned Colors A…B in the Selected Shuttle
for Dsn Cols A...B Set AsnCol=DsnCol +DefCol - create Assigned Colors in the current Selected Shuttle whose numbers = Design Color + Shuttle's Default Color. For example, if Shuttle 2 is selected and its Default Color=20, then this command would create Assigned Colors = 20 + Design Color for Design Colors in A…B.

When adding or deleting Shuttles or Design Colors, items that already exist are not duplicated when adding and when deleting items that do not exist are ignored.

PExr File:

List - save a text file of the current Pick Expansion Rules.
Print - print the text file of the current Pick Expansion Rules.
Save - Save the rule for future use.
Load - load a previously save Pick Expansion Rule

Color List:

Add Used Colors - to add any colors used in the image to the row headings on the left.
Delete Unused - deletes any colors not used in the image from the Dsn Colr list.
Add All - adds all the colors in the palette to the Dsn Colr list.
Delete All - deletes all the colors on the Dsn Colr list.

Assign Warp Seq & Colors…

Used to define the number of Warp and Weft colors, a warp sequence and the color for each warp and weft. These colors are chosen from the image's color table or loaded from a previously saved Loom Layout file.

Define Warp Sequence, Wrp & Weft Colors Sequence will cover (total image ends)

#Shuttles=   Enter the total number of physical shuttles for the image.
 # Warp Colors=   Enter the total number of warp ends in the sequence.

Import/Export as Loom Layout File

Load - Opens dialog to find and select a previously saved Loom Layout File. The colors are chosen from the image's color table which most closely approximate the colors specified in theLoom Layout file. Note that this approach can also be a convenient technique for creating Loom Layout files from an existing palette rather than using the Color Picker as is done in Define Loom Layout.
Print - Used to print a text file of the information created including the RGB color numbers for each box and warp color.
Save - Saves the current information as a Loom Layout file for future use.
List - Creates a text file of the current warp and weft colors and sequences.
Display - color strip for:
Warp - Checking the warp color strip option displays a color strip along the top edge of the image window that indicates the warp color across the image. The pattern is defined by the warp sequence entered below.
Weft - If the box motions have been assigned, checking this option will display a color strip along the right edge indicating the shuttle color as defined.

The results window will display the warp color number and color and, if an Expanded Image in which Boxes have been assigned, the weft color number and color, at the cursor position. These are displayed in the Results window under and to the right of the main color patch.

Box Colors (click each to select color):   The number of box sequences are defined above, clicking on each square opens the image color palette where the desired color may be selected.

Warp Colors (Click each to select color): Same as above to define the warp colors.
Warp Sequence: Click on the rectangle area to open the window below. Enter the desired warp sequence. This sequence can be
Saved or **Load**ed as a file.
Cancel - will exit with no changes.
Done - exits dialog using the settings entered.
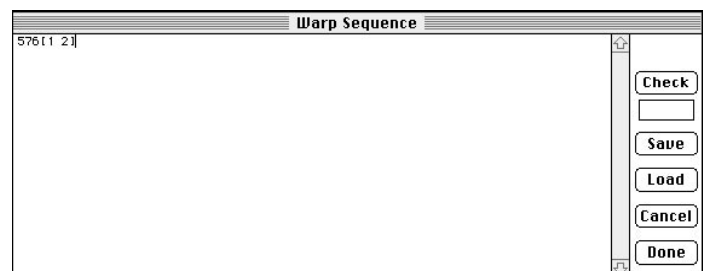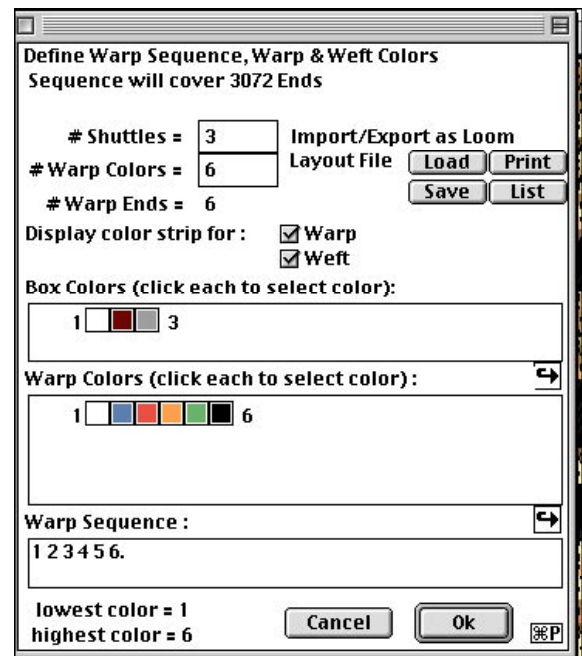
Assign Boxes & Regulators

Used to assign physical shuttles (boxes) to the Logical Shuttles used in the Expanded Image. The assignments are made via assignment rules; box sequences are supported.

Two types of rules exist :
1. Those that define a Box Sequence, e.g. a rule that would define Sequence #1 as being the sequence of boxes 3,4,5.
2. Those that assign a Logical Shuttle to a Box or to a Box Sequence over some range of picks, e.g. a rule which assigns Logical Shuttle 3 to Box Sequence 1 over Picks 1 through 100.

Weave

Wve Display Prefs…	
Wel Grid	▶
Weave Cuts	▶
Convert Select to Weave…	⌘;
Assign Weaves…	⌘K
Update Wve Overlay	⌘-
Cut Weave into Design…	
Expansion…	⌘J
Open Exp. Temp file	
Assn Warp Seq & Colors…	
Assn Boxes & Regulators	▶
Assign Var. Pick Dens…	
Make Castout File…	
Punch As	▶
Card Image From	▶
Fabric View	▶
Dobby	▶

Submenu:
Assign & Edit Boxes…	⌘L
Color Strip TO Box Assigns	
Color Strip TO Fabric Reg.	
Color Strip TO Warp Reg.	
Box Assigns TO Color Strip	
" + Regs TO Color Strip	
Fabric Reg. TO Color Strip	
Warp Reg. TO Color Strip	
Box Sequence TO Text file	
Apply Text File TO Box Seq	
LIST Crd,Pick,LogS,Bx,Reg…	

Assign & Edit Boxes... ⌘ L

Logical Shuttles in use - the total number of logical shuttle are indicated by an X.

Cards: total= indicates the total number of cards in the current expanded file. **unassigned=** indicates the number of cards with no box motion assigned.

Shuttle Assignment Rules: Selected Rule # indicates the selected rule. At any time one of the rules is selected, by double-clicking on it in the rule list window, its contents are duplicated in the Rule Editing area below where they can be changed as desired. In the editing area, the current rule type can be selected as either Define Box Sequence or Assign Boxes.

Update - Clicking on Update overwrites the currently selected rule with the settings entered in the **Current Rule.**
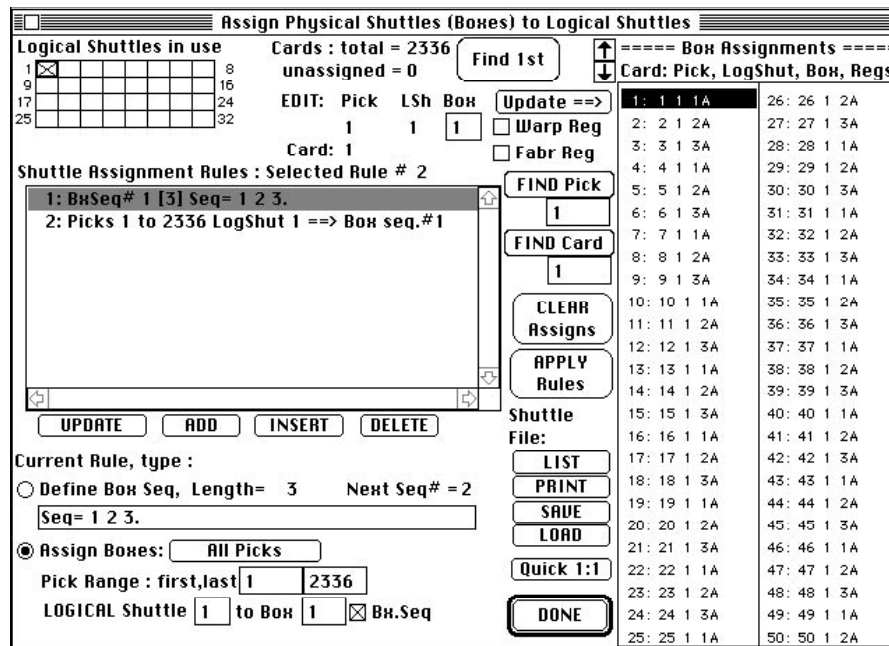
Rule, type:

Add - will add the settings in the rules setting to the shuttle assignments list.
Insert - adds the shuttle assignment just above the selected rule in the list.
Delete - removes the selected rule from the assignment list.

Current Rule, type:

Define Box Seq, Length= used to assign box sequences. The Sequence Number; up to 128 different sequences are supported, each of which can be in excess of 5,000 boxes in length, is automatically assigned. A sequence must be defined before it is used as part of a box assignment. The current Box Sequence is labelled in the main dialog by an abbreviated version in whichever packing format (packed or open) was last selected in the sequence editing window. The Sequence label's format is where [18] would indicate a 18 step sequence, and the label ends either in '…' if it cannot be completely displayed, or ends in '.' if it can be fully displayed. If the current rule type is **Define Box Sequence** then the current sequence is displayed in a small sequence window in the Current Rule area using the same format as for the rules list.

Clicking on this sequence in the **Current Rule** area brings up a **Sequence Editor** window as shown on the right.

Sequence Formats

Values may be typed in using either of 2 formats or mixtures of both:

Sequence of Single Boxes

<BoxA>|<BoxB>|<BoxC> ..., for example 1 3 5, where | is a separator (any of Space, Tab, Comma, Plus, or Return. (1+3+5 is same as 1 3 5)

Repeated Boxes

<count>X<Box>, for example 15X2 means 15 repetitions of Box 2. Either X or * (shift-8 or * on keypad) may be used for the multipler X, but no separators are allowed (15x   2 would be an error).

Mixtures

Mixtures are allowed, for example 1 3 2x5 3 1 is the same as 1 3 5 5 3 1 The various separators (space,tab, comma,+,return) and multipliers (x,*) are supported for ease in entering sequences at the keypad (where + and * are provided) or for creating text files where Tabs may be more convenient.

Whenever **Pack** or **Check** is used the sequence will be converted to a standard form using Space for separators and x for the multiplier.
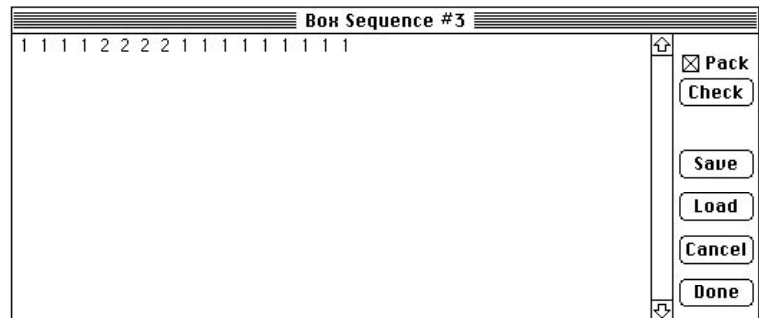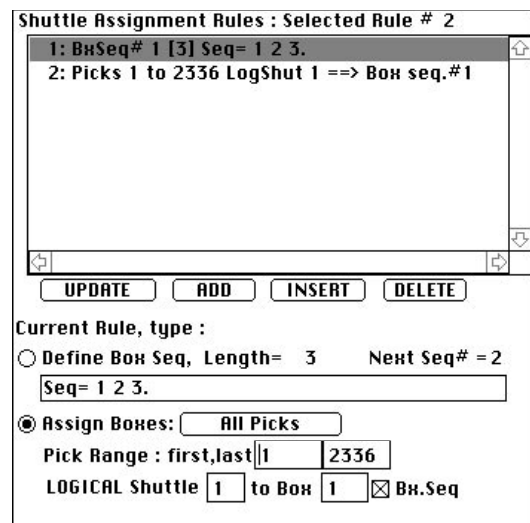
Cut, **Copy**, and **Paste** are available, to use Copy and Paste to build long sequences that contain repeated sections.

Pack - check-box determines which format will be used in the display.   In the top example on the right it is not checked so the sequence is shown in 'open' form, i.e. without repeats. In the example below the check-box is checked so the same sequence is shown in packed format. Clicking on the check-box toggles between formats.
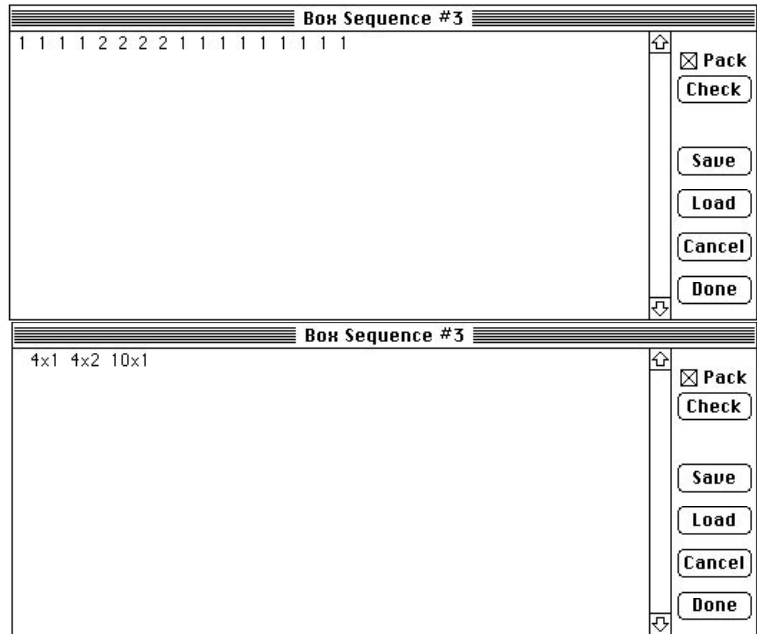
Check - scans the sequence; if no errors are found the cursor is left at the end of the sequence; if an error is found, a beep will sound and the cursor will be left inside the sequence near the error.

Done - automatically does a Check and if no errors are seen returns you to the main dialog with an updated sequence. If an error is seen it is treated as in Check, i.e. you will be kept in the sequence editing window until an error free sequence has been created.

Cancel - returns to the main dialog without changing any sequence that may have been present.

Save - causes the sequence to be saved as a simple TEXT file which can be opened by any word processing program. There is no need to use the Save button unless you wish to create a TEXT file copy of the sequence. See also Box Sequence TO Text File.

Load - loads in a new sequence from a TEXT file. Almost all word processing programs are capable of producing simple TEXT files, usually via their Save As… menu item.

   Note: TEXT files can be useful to create a very long and complex sequences that would be awkward to type in using the basic editing tools provided by this window.

Assign Boxes:
   All Picks - button simply sets the current range to cover the entire job.
   Pick Range: first, last - The Pick Range can be changed to any pair of values as long as the first pick is lower than the last and both are within the job limits.
   Logical Shuttle__ to Box___ - Enter the logical first and the desired box motion to be assigned.
   Bx.Seq - Checking this option will pair the logical shuttle with a previously defined Box Sequence Rule.
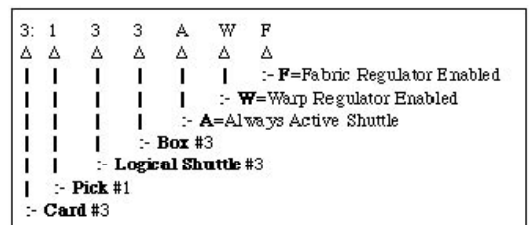
The box assignments in effect can be seen in the display at the right edge of the dialog; this information is formatted as follows :

The same information is displayed just to the left where it can be modified by the user. It is not possible to change the **Card**, **Pick**, or **Logical Shuttle** number, but it is possible to change the **Box** and the **Regulators**.

Find 1st - locates first Card to which no Box has been assigned can be scrolled into view by clicking on .

The Box Assignments display can be 'navigated' by using the **Up** and **Down** arrows to the right of the **Find 1st** button ; these scroll the display by an entire page;(50 cards).

Update==> click to make the changes permanent after making changes,

Box _____   enter the desired boxmotion for the selected Card (to the right). Chose **Update** to make the assignment.

Warp Reg - check this box to add a ward regulator to the selected Card.

Fabr Reg - used to add a Fabric Regulator to the selected Card.

FIND Pick - Enter the specific Pick and click on FIND Pick to move directly to in the listing on the right.

FIND Card - enter the specific Card, then click on FIND Card, to view it in the list on the right.

CLEAR Assigns - clicking on this button removes all box and regulator assignments.

APPLY Rules - new rules or changes are not used until clicking on this button.

LIST - provides the ability to save a text file of the box and regulators.

PRINT - prints a text file of the box and regulator assignments.

SAVE - saves the current box and regulator assignments for future use. The resulting file has a .shut extension.

LOAD - opens dialog to locate and use a previously saved .shut file.

Quick 1:1 - allows the user to quickly assign box motions when the logical shuttle will use the same box motions, for example logical shuttle one will be assigned to box motion one, logical shuttle two will be assigned to box motion two, logical shuttle three to box motion three, and so forth.

DONE - exits dialog box with the current rules in affect. If there are any cards without box motion assignments, a warning window will appear.

Color Strip TO Box Assigns
opens dialog to specify the end location of a color strip to use for box motion assignments, with an option to assign regulators at the same time. The color strip coding is also described.
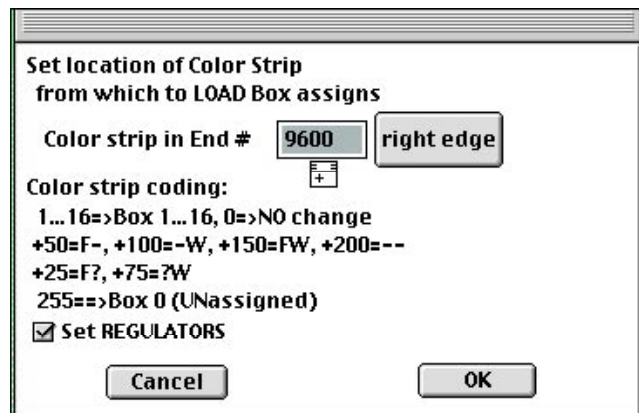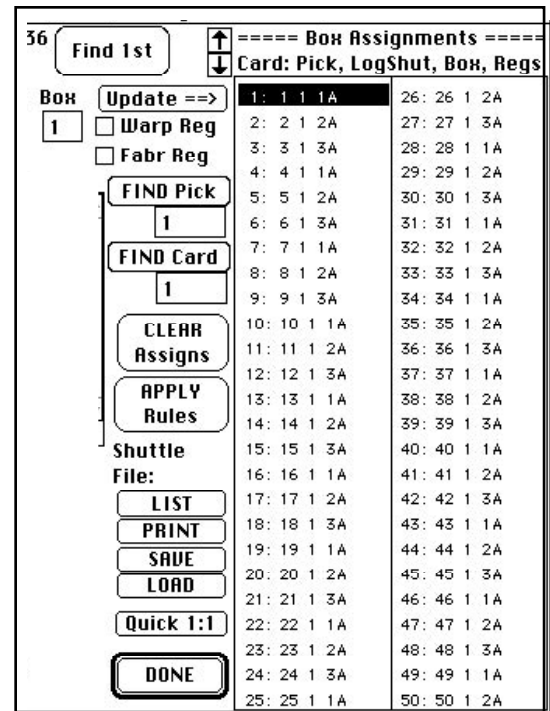
<u>Color Strip To Fabric Reg.</u> - Similar to the option above, but for Fabric Regulator assignments only. The dialog box provides for entering the location of the color strip in the image with colors 0 and 255 the only useful assignment colors. Color 255 trigger a regulator assignment.

<u>Color Strip TO Warp Reg.</u> - Same as the above option, with the regulator assignments for the Warp Regulator only.

<u>Box Assigns TO Color Strip</u> - paints the currently assigned Box motions to an end on the current expanded image. The end will be painted with colors 1 through 16 to represent the assigned box motion of 1 through 16 respectively.

<u>" + Regs TO Color Strip</u> - similar to the above option, allows a color strip to be created from the currently assigned box motions AND regulators. The location of the color strip is specified in the dialog box and the colors 1-16 indicate box motions only. Colors 51-66 indicate box motions + a fabric regulator, Colors 101-116 indicate box motions + a Warp Regulator and Colors 151-166 indicate the box motion + a Fabric AND a Warp Regulator. Color 0 indicates no box motion is assigned.

<u>Fabric Reg. TO Color Strip</u> - paints a color strip of color 0 (no regulator) and color 255 (Fabric Regulator) to a specified end on the image.

<u>Warp Reg. TO Color Strip</u> - paints a color strip of color 0 (no regulator) and color 255 (Warp Regulator) to a specified end on the image.

<u>Box Sequence TO Text File</u>

     This function copies the current box assignments to a "tab-delimited" text file. An Expanded image is required, and boxes must have been assigned to all cards. The text file will contain the assigned boxes as numbers separated by Tabs, twenty per line, e.g., 1 3 5 2 4 ..... If the design contains multiple Logical Shuttles, the Box Sequence for all, for just one, or for any combination of the Logical Shuttles can be saved. This text file can be viewed, printed, or edited using any word processing program.   It can be loaded in as a Box Sequence in the Assn & Edit Boxes dialog. Remember that in this dialog Box Sequences are assigned to a single Logical Shuttle, so you must have a separate sequence for each Logical Shuttle that used.

<u>Apply Text File TO Box Seq</u>

     This function applies a sequence of box assignments from a text file. This text file, which may be created as above or via any word processor must contain a list of appropriate numbers (usually 0 .. 16) separated by spaces, Tabs, Commas, or Returns; the last number must be followed by a separator. The boxes may be listed one by one, or in "packed" format (see page 8.27).   If the design contains multiple Logical Shuttles, the user must specify which Logical Shuttles the sequence should be applied to - selecting all, a single one, or any combination. If the text file contains the wrong number of entries, you will

be warned but allowed to proceed. Assignment begins at Pick 1, so a short file will repeat box assignments through the entire design; the extra entries in an oversized file are simply ignored and do no harm.

<u>LIST Crd, Pick, LogS. Bx.Reg...</u>   creates a text file listing of the design's cards including fields for: Card #, Pick #, LogS (Logical Shuttle), assigned Box, and Regulators.

   Example: listing set for 2 columns, 75 lines per page, Pick 1 first:

   Crd# Pic LS Bx AWF | Crd# Pic LS Bx AWF

     1   1 1 6 A | 76   68 1 5 A

     2   2 1 6 A | 77   68 2 2 WF

    The user can suppress any of the above fields, e.g., to list only Pick # (Pic) and LogS (LS) if so desired. Formatting by Spaces or Tabs can be chosen; Spaces are best for subsequent printing while Tabs are best for import into Excel. In multi-column lists the major columns are separated from each other by:
    Tab - two tabs, thus leaving an empty column
    Spaces - " | " which creates a vertical line as shown above

The design can be listed bottom up (Pick 1 first) or top down (Pick 1 last). The number of columns is user selectable (1..12). Pagination can be enabled to break the listing into pages, separated with a page-break character. The number of lines per page is user-selectable(20..200) as is the presence of column headers at the top of each page. Settings are saved between runs of JacqCAD.

Assign Variable Pick Density…

    Allows the designer to select the picks per inch individually for each color. This function is only available on certain looms.

Make Castout File…

General Information

The Hook Assignment Dialog is used to create or modify "Hook Files", also known as Castout Files. These files contain information used to translate from the Design Ends, Shuttles, and Regulators into the physical hooks used on a particular loom.

Another major function of Hook Files is to permit the specification of "End Repeats" by assigning each Design End to multiple machine hooks. Handling repeats at this level can greatly simplify the earlier design stages where only a single design repeat need be processed; this reduces the image sizes. The Hook Assignment Dialog has been designed to simplify the definition of end repeats.

The Hook Assignment Dialog is reached through the **Make Castout File…** item in the **Weave** menu. It can be started at any time as no open image is required; its only output is a Hook File.

```
Weave
  Wve Display Prefs…
  Wel Grid                          ▶
  Weave Cuts                        ▶

  Convert Select to Weave…     ⌘;

  Assign Weaves…               ⌘K
  Update Wve Overlay           ⌘-

  Cut Weave into Design…

  Expansion…                   ⌘J
    Open Exp. Temp file

  Assn Warp Seq & Colors…
  Assn Boxes & Regulators           ▶
  Assign Var. Pick Dens…

  Make Castout File…
  Punch As                          ▶
  Card Image From                   ▶

  Fabric View                       ▶

  Dobby                             ▶
```


Design End to Machine Hook Map
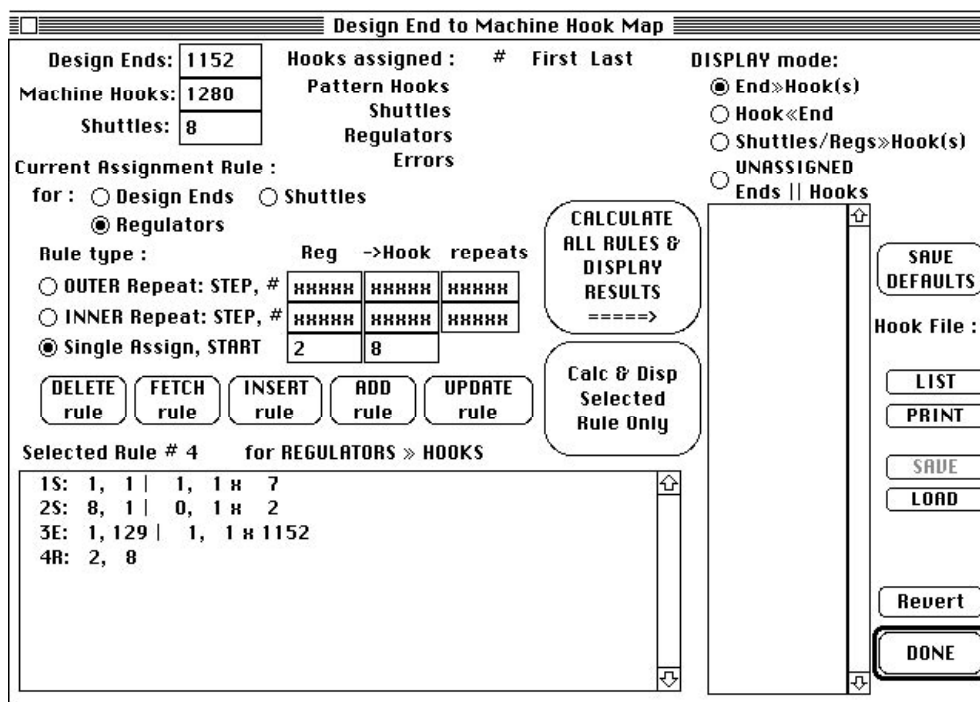
Design Ends: - enter the total number of ends in the image including any color strips used for defining selevedge, leno, boxmotions, regulators, or any other assignments.

Machine Hooks: - the total number of hooks in the head including all unused hooks, and hooks used for box motion or regulators.

Shuttles: - enter the total number of boxmotions for the loom, not the specific job.

Assignment of Design Ends to Hooks is done through a list

Design Ends:	1152
Machine Hooks:	1344
Shuttles:	8

of Rules. The castout is the sum of the effects of all the rules in the list, each being applied in sequence. Each rule in the list can take one of the following three forms :

1. **Simple assignment :** e.g. *"assign End 1 to Hook 129"*

Rule type :		Reg	->Hook	repeats
○ OUTER Repeat: STEP, #		×××××	×××××	×××××
○ INNER Repeat: STEP, #		×××××	×××××	×××××
◉ Single Assign, START		1	129	

2. **Simple repeat :** e.g.

"starting with End 1 and Hook 129,

do the following 1152 times :

   assign the End to the Hook,

   then increase the End by 1 and the Hook by 1"

Rule type :		Reg	->Hook	repeats
○ OUTER Repeat: STEP, #		×××××	×××××	×××××
◉ INNER Repeat: STEP, #	1	1	1152	
○ Single Assign, START	1	129		

This rule builds a list of 1152 assignments ranging from 1->129 to 1152->1280.

3. **Double repeat :** e.g.

"starting with End 1 and Hook 129,

do the following 4 times:

   do the following 288 times

   assign the End to the Hook,

   then increase the End by 1 and the hook by 1

   add 0 to the Starting End and 288 to the Starting Hook to get the new starting values"

Rule type :		Reg	->Hook	repeats
◉ OUTER Repeat: STEP, #	0	288	4	
○ INNER Repeat: STEP, #	1	1	288	
○ Single Assign, START	1	129		

   This rule assigns the 288 Design Ends into 4 repeats spaced equally across the 1152 pattern hooks; in other words, End 1 is assigned to Hooks 129, 417, 705, and 993, End 2 to 130, 418, etc.

   The End and Hook increments used in the repeats are fully adjustable, including negative values. This permits a wide variety of castouts which can include mirrored sections and even interlaced sections.

   A list of rules can contain any number of rules; in the absurd case the whole castout could be defined via a list of 1152 simple assignment rules, though the typing would become most laborious.

   Generally just a few of the repeating rules are all that will be needed.

Rule Types

Castout rules perform one of 3 kinds of assignments :

> **Current Assignment Rule :**
> for : ○ Design Ends   ◉ Shuttles
>   ○ Regulators

Design End - assignments which assign (pattern) Hooks to Design Ends.

Shuttle - assignments which assign Hooks to Shuttle (Boxes).

Regulator - assignments which assign Hooks to the warp let-off and fabric take-up regulators.

The Current Rule

This section of the dialog displays the "Current Rule", which is the Rule that is being entered or changed. Once the correct values have been entered, this rule can then be added to the selected list of rules.

> **Current Assignment Rule :**
> for : ○ Design Ends   ◉ Shuttles
>   ○ Regulators

The Current Rule's kind can be either a Design End, Shuttle, or Regulator assignment and each kind can take one of 3 forms : 1) Single Assignment, 2) Single Repeat, or 3) Double Repeat. The type of rule is chosen by clicking on the appropriate rule type button and the format of the Current Rule display will adjust to display only the information relevant to the chosen rule; irrelevant fields are replaced by 'xxxxx'.

1) **Single Assignment :**

Rule type :	Ds End	->Hook	repeats
○ OUTER Repeat: STEP, #	xxxxx	xxxxx	xxxxx
○ INNER Repeat: STEP, #	xxxxx	xxxxx	xxxxx
◉ Single Assign, START	1	129	

2) **Single Repeat :**

Rule type :	Reg	->Hook	repeats
○ OUTER Repeat: STEP, #	xxxxx	xxxxx	xxxxx
◉ INNER Repeat: STEP, #	1	1	1152
○ Single Assign, START	1	129	

3) **Double Repeats :**

Rule type :	Ds End	->Hook	repeats
◉ OUTER Repeat: STEP, #	0	288	4
○ INNER Repeat: STEP, #	1	1	1152
○ Single Assign, START	1	129	

This last example will be 'walked through' to clarify the structure of a Rule :

1. The process will begin First End = **1** and First Hook = **129** the Inner Repeat specifies that **288** repetitions should occur where the End is Assigned to the Hook
2. Then the End is increased by **1** and the Hook is increased by **1** this will result in 288 End->Hook assignments 1->129, 2->130,....,288->416
3. The Outer Repeat specifies that the above should be done **4** times adding **0** to the starting End and **288** to the starting Hook after each completion of the Inner Repeat.

The 4 passes through the Inner Repeat will thus be done using :

The Rule List

This Rule List shows examples of how each of the 3 rule types are represented in the list. Note

Pass	Assignment
1	Starting End, Hook = 1,129 assigning Ends 1..288 to Hooks 129..416
2	Starting End, Hook = 1,417 assigning Ends 1..288 to Hooks 417..704
3	Starting End, Hook = 1,705 assigning Ends 1..288 to Hooks 705..992
4	Starting End, Hook = 1,993 assigning Ends 1..288 to Hooks 993..1280

that one of the rules (#1) is highlighted (referred to as the Selected Rule) and it is also shown as
"Selected Rule # 1" in the heading. Also, the particular Rule List being displayed (Design Ends rather than Shuttle rules) is noted in the header.

```
Selected Rule # 1      for SHUTTLES » HOOKS
  1S:  1,  1|   1,  1 н   8
  2S:  1, 129|   1,  1 н 1152
```

Only the rules shown in the lists will be used to build the castout. The rules will be executed in the order in which they are listed and all the Design End rules will be executed before the Shuttle rules; if two rules make conflicting assignments, the latter rule will override any earlier assignments.

Each rule is preceded by its number followed by "E:" if it is a Design End rule or "S:" if it is a Shuttle rule. The rules are displayed in a similar format to the Current Rule : reading the rule left to right is the same as starting with the bottom line of the Current Rule display and going upwards as appropriate. The following annotated examples should clarify the format:

Simple Assignment Rules:

Single Assign:	Number	End	Hook
1E:		1	129

Simple Repeat Rules :

Single Assign, Start   Number,   End,   Hook

```
Selected Rule # 1     for DESIGN ENDS » HOOKS
  1E:  1, 129
```
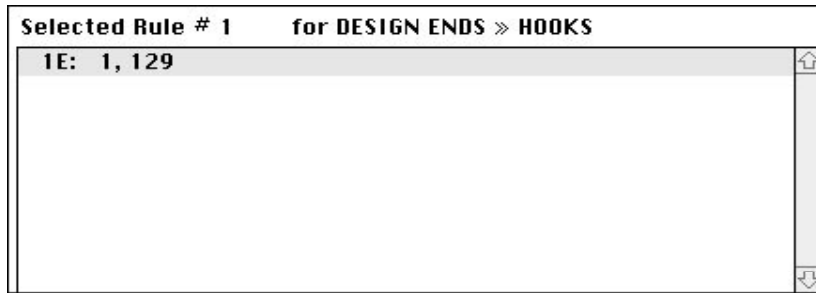
     1E: 1,   129

Inner Repeat Assign: End,   Hook   x Repeats

           1,   1   x 1152

Double Repeat Rules

Single Assign, Start   Number,   End,   Hook

                           1E: 1,   129

```
Selected Rule # 1     for SHUTTLES » HOOKS
  1S:  1,  1 |  1,  1 ×   8
  2S:  1, 129 |  1,  1 × 1152
```
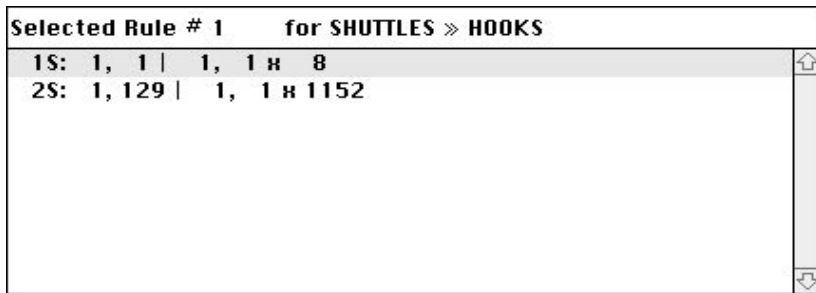
Inner Repeat Assign: Step,   End,   Hook   x Repeats

                      1,   1   x 288

Outer Repeat Assign: Step,   End,   Hook   x Repeats

                      1,   1   x 288

Building the Rule List

The ***Current Rule*** is related to the ***Rule List*** and the ***Selected Rule*** in that list through the 5 'buttons' described here.

```
Selected Rule # 1     for DESIGN ENDS » HOOKS
  1E: 1, 129 |  1,  1 × 288 ||  0, 288 ×   4
```
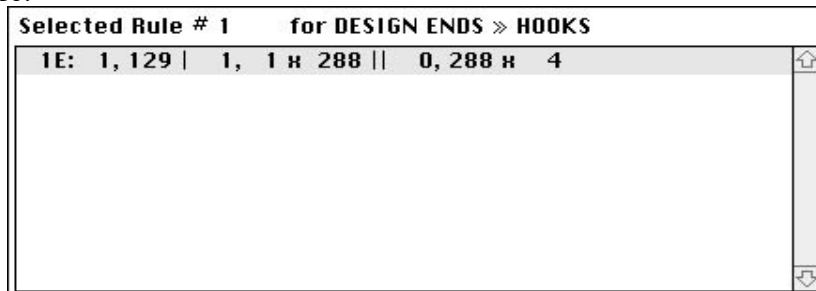
copies the Selected Rule in the Rule List to the Current Rule display.

Important note :

| DELETE rule | FETCH rule | INSERT rule | ADD rule | UPDATE rule |

FETCH rule   ***Single-clicking*** *on a rule in the Rule List simply makes that rule the Selected Rule; doing so does not change the Current Rule.*

Double-clicking *on a rule in the Rule list is equivalent to Fetch rule, it both selects the Rule and copies it to the Current rule.*

- copies the Current Rule to the Selected Rule in the Rule List.

UPDATE rule   **-** adds the Current Rule onto the end of the Rule List.

ADD rule   **-** inserts the Current Rule above the Selected Rule.

INSERT rule   **-** deletes the Selected Rule from the Rule List.

DELETE rule   **Calculating and Displaying the Castout**

Calculate All RULES & Display Results button tells *JacqCAD* to build the complete castout by 'playing' all the rules in sequence (Design End rules, Shuttle rules, Regulator assignments). The newly calculated castout is then available for review (in the Castout display window) and for saving as a Hook File.

| CALCULATE ALL RULES & DISPLAY RESULTS =====> |

Calc & Disp Selected Rule Only button is provided to 'play out' only the selected rule; the results are displayed as usual. This can be useful for troubleshooting a set of rules and for learning how the rules are applied

| Calc & Disp Selected Rule Only |

A "Hooks assigned" display is provided in the top center of the window; after rules have been calculated, it displays for each of Pattern Hooks, Shuttles, and Regulators the # of hooks assigned and the numbers of the lowest and highest hooks assigned .

It also displays an Error count - the errors that are counted include duplicate assignments and attempts to assign to hooks outside the permitted range (1...Machine Hooks).

Hooks assigned :	#	First	Last
Pattern Hooks	1152	129	1280
Shuttles	8	1	8
Regulators	0		
Errors	0		

Any changes in the rules, overall settings, or regulator assignments invalidates the castout, erases the castout display, and disables the Save HookF button; the castout must be recalculated to produce and display a new valid castout. This is to ensure that the rules and the castout agree before allowing them to be saved in a Hook File (or displayed).

Some simple checks of the rules are made prior to starting execution. The total number of hook assignments that will be made by the rules is calculated and compared to the number of machine hooks. If your rules create more assignments than there are hooks in the machine, something likely is wrong about them; *JacqCAD* will display the number of assignments and ask whether to proceed - the safe answer is to Cancel and re-check the logic of your rules. Continuing after this warning should not do any harm, but may tie the machine up for a long time while it handles, potentially, millions of duplicate assignments! (for instance if the repeat counts of both the inner and outer repeats of a rule were at their maximums of 1280, the total assignments would be 1280 x 1280 = 1,638,400)

DISPLAY mode:

End>>Hook(s) - this display is sorted by Design Ends and lists Design End : Hook pairs. In addition, Shuttles are represented as "Sx : hook", and Regulators as "Rx : hook"; both being listed after the Design End listings.

Hook<<End - this display is sorted by Hook number and lists Hook : End (where End is a Design End, Shuttle, or Regulator). A single entry occurs for every hook to which an assignment has been made. An entry is followed by a + if more than a single assignment to that hook was detected. Multiple assignments are usually the results of errors in rule definition, except in the case of Shuttle assignments where hook combinations are normal (for example, Hook 1 is used by Shuttles 1 and 8, Hook 2 is used by Shuttles 2 and 8).

Shuttles/Regs>>Hook(s) - this display lists only the Shuttle and Regulator assignments using the same format as the End>>Hook(s) display.

UNASSIGNED Ends ‖ Hooks - this display lists Ends and Hooks to which no assignments have been made. The format is End ‖ Hook but the End and Hook are not related in any way, they simply share the line to save space. This display is especially useful for detecting pattern hooks that have been overlooked.

The resulting castout is displayed in the Castout display window in whichever of the four Display modes has been selected (the selection can be changed to shift between display modes) :

Creating, Listing, and Loading Hook Files

Hook files are used to store a castout; all the relevant information is saved, including the rules used to create the castout, so that a castout can later be reloaded for editing.

Hook files are saved using the **Save** button. It is only enabled when a valid castout is present (has been Calculated and no rule or assignment changes made since) to ensure consistency between the rules and the resulting castout. The user will be prompted for a file name and for a typed description (up to 255 characters long) which will become part of the file.

Hook files can be loaded using the **Load** button. After supplying the file name, you will be shown the overall settings (Design Ends, Machine Hooks, Shuttles) and the description saved when the file was created, and asked whether this is the desired file. Loading a file replaces all settings with those in the Hook File.

Hook files can also be printed or listed to a text file via the **Print** or the **List** button. The text file, which can be used by most word processing applications, will contain the rules in the same format used by the Rules Lists. An example listing is shown at the right.

```
Text listing file= HardDisc:HookAssigns.TEXT
Date & time: Saturday, August 11, 1990  3:06 PM

   1152 Design Ends
   1280 Machine Hooks
   8 Shuttles

   Regulators :
   Warp let off hook :   8
   Fabric take up hook : 9

   Design End to Hook assignment rules :
       1E:  1, 129|   1,  1 x 1152

   Shuttle to Hook assignment rules :
       1S:  1,  1|  1,  1 x   7
       2S:  8,  1|  0,  1 x   2
```

Revert button

The **Revert** button restores all settings, including Design End and Shuttle rules, to their default values (those used each time the Castout dialog is started).

The default values are :

Design Ends = 1152

Machine Hooks = 1280

Shuttles = 8

Regulators : #1(warp) = Hook 8, #2(fabric) = Hook 9

Design End rules : assign Ends 1..1152 to Hooks 129...1280

Shuttle rules : assign Shuttles 1..7 to Hooks 1..7;   Shuttle 8 to Hooks 1 *and* 2

Done button

The Done button exits from the Castout dialog. If you might have forgotten to save the castout in a Hook File (i.e. if you have invalidated the castout since the last Save HookF), you will be reminded and given a chance to cancel the Done exit.

Save Defaults

The Save Defaults button is not yet implemented; clicking it simply gives an amusing error message.

EXAMPLES :

These examples are all shown in the format used by the Rules List, plus notes to the right:

1. Standard Shuttle Rules

This pair of rules assigns Shuttles 1…7 to Hooks 1…7 and Shuttle 8 to Hooks 1 and 2

        1S: 1,1 | 1,1 x 7   S1 .. S7 ==> H 1… H 7

        2S: 8,1 | 0,1 x 2   S8,S8   ==> H 1 + H 2
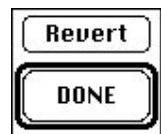
2. Single reversed (mirrored) castout for 1152 Design Ends

      1E: 1,1280 | 1,-1 x 1152   E 1…E 1152 ==> H 1280 … H 129

Note that the Hooks count down from 1280 to 129 because of the -1 Hook increment.

3. Castout w/ 12 repeats of 96 Design Ends across 1152 pattern hooks

      1E: 1,129 | 1,1 x 96 ‖ 0, 96 x 12

    The inner repeat (1,1x96) lays out one repeat of the 96 ends. The outer repeat is causing this to happen 12 times, each time re-starting with End 1 (Starting End increment is 0) but shifting the starting Hook over the width of the repeat (Starting Hook increment = 96).

4. Castout w/ 4 repeats of 288 Design Ends with alternate Mirroring

      1E: 1,129 | 1,1 x 288 ‖ 0, 576 x 2   '< < '

      2E: 288,417 | -1,1 x 288 ‖ 0,576 x 2   '> >'

    The intent here is to take the design '<' and repeat it out as '<><>'. The first rule creates two normal repeats starting at hooks 129 and 705 (129 + 576). The second rule creates the two mirrored repeats that start at hooks 417 and 993; note that the mirroring was done in this case by scanning the Design Ends from right to left (starting End = 288, increment = -1) - this could have been done equally well by layout out the hooks from right to left instead.

5. Castout for a 'wrap-around' tubular design

      1E: 1,129 | 1, 2 x 576 Ends 1…576   ==> Hooks 129, 131, 133 …

      2E: 577,1280 | 1,-2 x 576 Ends 577…1152   ==> Hooks 1280, 1278, 1276 …

    The intent here is to take the left half of a design and map in into the odd numbered pattern hooks while taking the right half of the design, mirroring it, and mapping it into the even numbered pattern hooks. The odd and even numbered hooks form the front and back layers, respectively, of the tube. If the resulting woven 'tube' is cut and layed out flat it would duplicate the original design; the mirroring of the 'back' half avoids the need to mirror it during the design stage. Note that here we are doing the mirroring by placing Hooks from right to left while scanning the Ends from left to right, rather that using reversed End scanning as in Example 4; the right approach is whatever is the easiest to think up at the time.

6. Castout for a strange loom

Some looms use pattern hook layouts that are reversed in blocks of 8 (due to their host computer systems using a reversed bit numbering scheme within bytes); though you are not likely to run into these odd cases, the following example shows how one could make a standard castout for such an oddity. The pattern hooks, going from left to right, are numbered 8,7,…2,1,16,15,…,10,9,24,23.... (they probably would start at some higher number, but the principle remains the same) :

> 1E: 1,8 ∣ 1,-1 x 8 ‖ 8,8 x 144

The inner repeat is handling the reversal of the 8 hook numbers : 1-8, 2-7, 3-6, …, 8-1; the outer repeat is controlling the starting End and Hook setup for the next of the 144 batches of 8 hooks, e.g. E 9, H 16, then E 17, H 24, etc., to be filled in by the inner loop. Because both the inner and outer repeats of a rule are 'used up' to handle the sequence reversal, each design repeat would have to be handled by a separate rule, i.e. up to 12 rules to handle a 96 end design.

Punch As…

Punch As… converts an Expanded Image into a loom control file for the target loom or punch. Weaves must have been cut into the design as only pixels of color 255 (black) and will be stored as 'cuts', while all other colors are stored as 'misses'. Also the Box Assignments should have been made at this point; this is the final step before weaving.

The Punch As… menu selection provides the following choices:
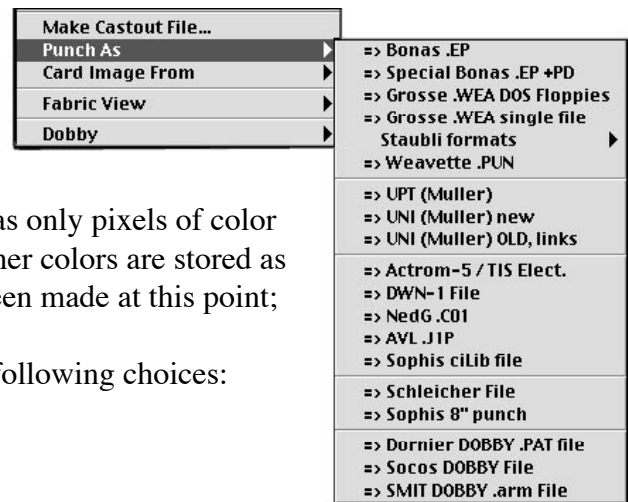
Bonas .EP

.EP files in Bonas™ network format.

The Bonas network controller is a DOS based machine. Files can be transferred from the Mac over a network, e.g. TOPs, or via floppy disc. In order to write a DOS floppy disk the Macintosh must have a 'SuperDrive' (1.44 MByte) floppy drive and use a utility such as DOSMounter to read & write DOS format discs.

Special Bonas .EP+PD

.EP files in Bonas™ network format with the option to add Pick Density.

Grosse .WEA DOS Floppies

Creates Grosse WEA files compatible with Grosse heads. The electronic function hooks are handled in the same way as regular pattern hooks, i.e., through the castout. To use the electronic functions simply create a castout file that is wider by 64 hooks. For example, if the loom head contained 1792 pattern hooks then the number of "machine hooks" the castout creates should be:

    1792 if NOT using electronic functions

    1792+64 if USING electronic functions

When punching, there will be a prompt to use the electronic function option.
 • If the answer is NO, then 64 blank hooks are appended to the hooks created by the castout, the pattern width is set to the width of the castout, and the file header is marked to ignore the electronic functions.
 • If the answer is YES, then the last 64 hooks from the castout are used as the electronic functions, the pattern width is set equal to the castout width MINUS 64 (because those last 64 are not part of the pattern), and the file's header is marked to use the electronic functions.

Also supports jobs that require more than one floppy creating as many files as needed - one for each floppy to be made. A warning message will be given specifying the number of files being created.

Grosse .WEA single file

Creates Grosse WEA files as above except the resulting file is a single file that may be used for networking directly to the loom.

**Staubli formats
=>JC-5 single zone**

The .jc5 format supports "zones" - these allow the use of 32 hooks for "controls" (weft selection, regulators, etc.) from the pattern hooks. When Staubli sets up the JC5 controller it creates a configuration file, similar to a JacqCAD Castout file, to describe the relationship between "hooks" in the .jc5 file and "hooks" in the controller. It is possible to separate hooks into different "zones".

JC-5 single zone creates a .jc5 file for a Staubli controller. Single zone includes all hooks, both pattern and controls. The disadvantage is that when defining a 2688 hook file, some of these will have to be used for weft selectors so there are not 2688 pattern hooks.

The pattern(file) name can contain up to 27 characters followed by ".jct" (31 total characters), but file names should be limited in length if transfers through older Windows systems are necessary. All the hooks are in a single zone labeled "Pattern".   These .jc5 files contain both a header with information about the job (loom width, number of cards, etc.) and the card data itself. No restrictions on the file name, though it is strongly recommend to use".jc5" as the extension to keep things standard.

These files can be copied to standard DOS floppies or transmitted via network. Any FTP Cliet, including those which run on a Mac, can access the JC5's network.

Large files that will be transferred by a floppy will need to be saved in a "segmented" format. This allows segmenting a large file into a number of smaller ones that are named xxx.j01, xxx.j02, xxx.j03, etc. Each file is copied to its own floppy, transferred to the JC5, and rejoined there. These are all "files" and can be shipped around like any other file - making it possible to email the segments to a remote site that needs to use floppies.

=>JC-5 32+Pattern

Creates a .jc5 file with 32 function hooks followed by all pattern hooks.

=>JC-5 Pattern +32
Same as above with the pattern zone followed by the 32 function hooks.

=>JC-4 floppy
Option used to create files for JC4 floppy disks, which are written directly to Staubli's special formatted 3.5" disk. These Staubli-only format disks are not accessible to DOS or Mac. The resulting file has a .StDsc extension and can be saved to a Staubli formatted disk using JacqCAD's StaubliDisk utility program with an old Mac. The newer OS 10 Macs will not allow this application to control the floppy drive. Only JacqCAD and the StaubliDisc utility can read the .StDsc files.

=>JC-4 Network file

Used to create a Staubli network file format file. This file can be sent over a network and contains the simple card data. The file extension indicates the loom width. For example a JC-4 Network file with the name Flower.2688 would be a design for a 2688 wide loom. This 2688 extension is vital in the correct use of the file in the Staubli controller. Caution should also be sued if the file needs to be emailed using a Windows system that may truncate the extension causing the file to be read incorrectly by the Staubli controller.

=>JC-4 ".jc4" files

This option creates a file with a .jc4 file extension. If the final punched file is larger than one disk, the files will be named filename.jc4, filename.j02, filename.j03,... to keep each disk in the sequence separate. Each file will need to be renamed to have the .jc4 file extension to allow the Staubli utility program to read them. Punch As... ".jc4" will create as many .jc4 files as needed. Staubli developed a "Utility program" that will also create these .jc4 files to allow emailing the loom ready files to remote sites. This Utility program runs under DOS or Windows. The Staubli utility will also convert the .jc4 files to a jc4 floppy for use at the loom. This format is only useful for sending copies of JC4 floppies to remote that don't have access to a Mac. If the remote site has a Mac, then it is easier to simply send StDsc files and use the StaubliDisc program in JacqCAD (no JacqCAD key is required to use this utility).

=>JC-3 floppy

JC3 is the oldest of the Staubli file format and like the JC4 file type requires a special Staubli formatted disk.

=>Card Punch

.Staubli files for later transmission to a Stäubli™ punch. These are transferred via serial line to the Stäubli Punch. We supply an auxiliary program that can be run on any Macintosh to control the punch; transfer to this Macintosh may be via floppy disc or AppleTalk network. Because of tight timing constraints in the Stäubli protocol it is necessary to dedicate a Macintosh to the punch while it is punching.

=>Dobby Punch

Dobby files may be created for a Staubli loom. Dobby files and cards are most commonly 40 hooks wide. Most systems reserve 32 of the hooks for harness selection (though most dobby looms have at most 24 harnesses installed), and 8 of the hooks serve for weft selection. Any combination of the 24 hooks (harnesses) can be lifted. Most hand looms are almost dobby looms--the difference being that the hand looms use treadles (foot pedals) to life the combinations of harnesses so as a practical matter only a limited number of combinations can be used--limited by 2 feet and the space for treadles. The true dobby loom allows lifting any combination of harnesses, hence it is more flexible. There are 2^{24} possible combination of 24 harnesses, i.e., around 16 million combinations.

=>Weavette .PUN

.PUN files in Weavette™ format. These can be transferred to the Viable Weavette on 8" floppy discs written in DEC RT-11 format (a special Macintosh compatible 8" disc sub-system is required), or it may be possible to transfer them via serial link.

=>UPT (Muller)
Output for a Muller loom that reads a UPT file. The UPT option supports normal or reversed card order. .UPT files are the older format that are transferred to the loom using a MuLoad controller.

=>UNI (Muller) new
This punch option creates a .UNI file for Muller looms. The files will be loaded to the loom through a Muller MuLoad controller.

=>UNI (Muller) OLD
Muller UNI New - produces the "clean" version of UNI without embedded linkage bytes.

=>Actrom-5
Actrom™ compatible punch file format.

=>DWN-1 File
DWN-1 format for compatibility with Digital Weaving Norway (DWN) TC-1 loom. Optional Weft Color and Warp Color, and Weft Sequence data (if Warp/Weft colors have been set up for image) is included so that DWN's Weave For Windows program can display the weft color.

=>NedG.C01
Creates a standard NedG .C01 format file for "punch data" files. The structure is a header which contains loom width and # of cards followed by card data.

=>AVL .J1P
Creates an AVL .J1P file, but does not support warp or weft color sequences or the optional (but undefined) regulator data. Does not include the optional color table.

=>Sophis ciLib
Creates a Sophis ciLib file for punching. All other files that are typically found in the ciLib "package" are empty.   The included files are the file ID header string, the loom width (# of hooks) and the number of cards.

=>Schleicher file
Used to create a file for the Schleicher Punch.

=>Sophis 8" punch
Supports 8" floppy disc based card punch. Also, supports the Floppy 853 program.

=>Dornier DOBBY .PAT file
Creates hexadecimal text format, 25 bytes/card with 64 hooks per card with the following assignments:

1..28	harness	1..28
29..32	Functions F1..F4	(F4 is "regulator")
33..40	Box 1..8	
41..64	Unknown	

=>Socos Dobby
Supports Socos Dobby files. These files are used with the SOmet THema 11E's Socos controller.

=>SMIT DOBBY .arm File

For creating a SMIT .arm dobby file format (GS900 Dobby loom).

```
File : 1152.Hook
  handles : 1152 Design Ends
              1280 Machine Hooks
  Description : new Hook (castout) file 1152.Hook



Is it the right File?        [ Ok ]  [ Cancel ]
```

Once the correct output f is selected, a previously saved Castout (.Hook) file is requested. The Castout file must be appropriate for the job (correct # of design ends, etc.) and for the target loom (hook assignments, etc.**)**
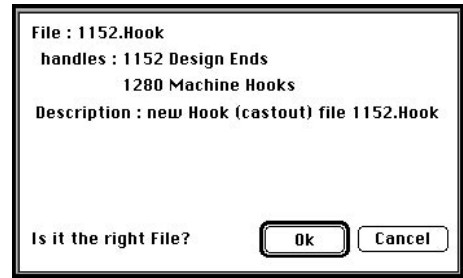
The parameters of the Castout file (name and dimensions), along with whatever descriptive comments were supplied when it was created, will be displayed for confirmation that this is the desired castout file. If the chosen Castout is wider than the design file

being punched, a warning dialog will appear with a warning that the number of design Ends is less than the number of Hooks supported by the Castout chosen.

```
  /!\    Design is WIDER than the Castout
         Design = 2404 Design Ends.  Highest box = 1
         Castout: 1152  Ends » 1152 Hooks. 8 boxes
         CONTINUE to Punch by sections

  [ Continue ]              [ CANCEL ]
```
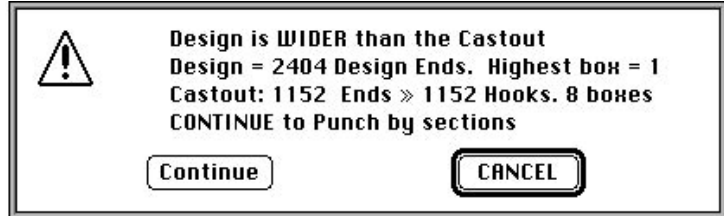
On the other hand, in the event that a design is wider than the chosen castout you have the option to use multiple castouts to punch the design as for use with multiple heads.

Multiple Heads

Multi-head jobs support: a castout that is not as wide as the Expanded Image can be positioned horizontally to start on any End between #1 and (image width - castout width-1); in other words it can be moved horizontally from 'left edges aligned' (of image and castout) to 'right edges aligned'.

Multi-head punching is invoked anytime that the design is wider than the Castout's width (# of Design Ends). This starts with a warning that punching by sections (heads) will be necessary.

```
         Multi-head Castout alignment
  Design width : 2404 Ends
  Castout width : 1152 Ends (source)
  Highest starting End = 1253
  WARNING! Design width is NOT a multiple of Castout!

  [  Next Head  ]    Starting End = [ 1 ]

       [ Cancel ]          [ Ok ]
```
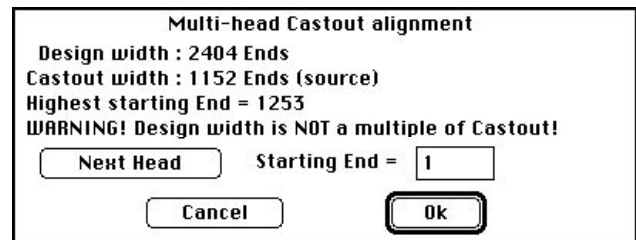
If Continue is selected, then the Multi-head Castout Alignment dialog appears to specify the horizontal alignment of the castout. A "Next Head" button automatically aligns the castout to the next whole multiple of its width, but any other position can be specified directly by changing the Starting End.

Important note: castouts (Hook files) are always specified as assigning Design Ends 1.... For example, during punching of the right hand half of a job, the castout is applied so that the starting end is 'seen' as #1 by the castout.

Normally 2 different castouts will be required since the left half might contain only Regulators in addition to pattern ends while the right half might contain only box motion assignments in addition to pattern ends.

```
  ▣ ═══════ SET UP PUNCHING SEQUENCE ═══════
  "NEIL.Exp" ==> Staubli disc
  Design Ends 1-1152 ==> 1152 Pattern Hooks
  Design size = 2404 Design Ends × 280 Cards
  =================================================
```

SET UP PUNCHING SEQUENCE

The top portion of the Punching Sequence window is for information only. The first line of text indicates the name of the current expanded file (ex. NEIL.Exp) and the output format. This is followed by the total design ends and the total output Pattern hooks. The Design size expressed in total Design Ends and total Cards complete the listing.

PATTERN cards

```
============================================
PATTERN cards                            ◉ NORMAL
    First Card =  1        select all    ○ Raschel 1
    # of Cards = 280         cards       ○ Raschel 2
    ☐ use Advanced Box Motion            ☐ on ODD cards
    ☐ OVERLAY with   – – –
============================================
```

First Card = 1
# of Cards = "Total"   The 'punched' cards can be limited to a sub-range of the job if desired by changing the First Card setting and the # of Cards.

```
select all
  cards
```
   Used to punch all the cards in the file.

use Advanced Box Motion   **-** If selected, the box motion punched in each card will be for the following card, i.e. Card 1 will contain the box motion to be applied to Card 2's pattern, etc. Wrap-around from the first to last cards is automatic.

OVERLAY with ----   **-** option to allow for overlaying the current file with a previously punched file. The primary reason for punching with overlay may be that:

a) a fabric that used a fixed (constant) selvedge, AND
b) that was to be woven on several looms which had diffent selvedge setups

In such a case it might be easier to have the loom-specific selvedges in separate overlay files. These overlays need only be as high as a single full repeat of the selvedge weaves.

EXTRA cards: Leader/Splice/Trailer

```
============================================
EXTRA cards : Leader/ Splice / Trailer
    ☐ Leader =     blank cards
        ☐ incl. ID card :

    [H] Pattern Cards punched here
                                 ○ all holes punched
    ☐ Splice  =    cards of :   ◉ repeat of Cards 1 ...

    ☐ Trailer =    blank cards
============================================
TOTAL cards to be punched = 280
  ( Set Defaults )      ( Cancel )   ( PUNCH )
```

Leader= blank cards   **-** used as spacers between jobs when real cards are being punched (rather than 'electronic' cards such as BonasEP). They can also be used to ensure that each job occupies a multiple of 20 or 40 cards to control the paper's Z-fold alignment. To assist in this a "Total Cards to be punched" value is displayed and updated as changes are made.

incl. ID card: - This is not yet supported, but eventually will result in a 'human read-able' job name being punched into a leader card (using patterns similar to those used by dot-matrix printers). Full width (1344) cards will support 21 characters of ID. Use of the ID card will require a minimum of 3 Leader cards, a blank card, the ID pattern, and another blank card to separate the ID pattern card from job cards.

Splice=   cards of:
   all holes punched
   repeat of Cards 1....
   enter the total number of cards used to provide a glueing zone. Some mills prefer "all holes punched" cards for this purpose while others prefer to repeat the initial cards (i.e. to repunch cards 1,2,...).
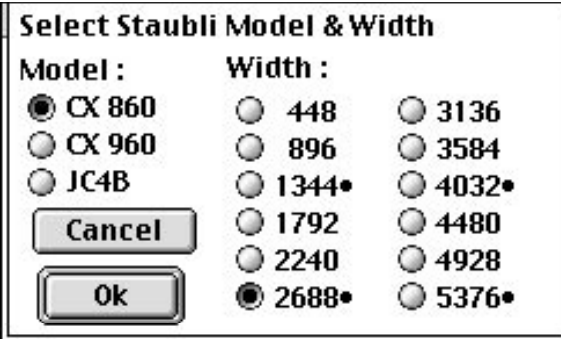
Trailer=   blank cards   used to enter a desired number of blank cards to advance the paper in the punch the correct number of cards to finish the pattern.   The data cards(pattern cards), of course, are punched between the Leader and Splice cards.

If **Punching in Stäubli Disc format**, a dialog to enter the model Jacquard head and width will appear. The widths listed, which depend on which model has been selected, include all the possible widths which could be provided by Stäubli. Stäubli's standard models are indicated by a black dot next to the width.

Stäubli Punch and Stäubli Disc files take the name of the source Expanded Image.

For **Bonas and PUN files** a Pattern Name most be entered that will be embedded within the file header for use by the target system. For Bonas files this should be 8 characters maximum; for PUN files it is limited to 9 characters.

Finally, supply a file name under which the file is to be saved. For Bonas files this file name should not exceed 9 characters in length for compatibility with the MDOS operating system and by default will have a ".EP" file name extension appended; for PUN files it should be limited to 6 characters and will have a ".PUN" file name extension appended.

Card Image From…

Calls up a sub-menu to provide the following choices :

Bonas ™ .EP - Reads .EP files in Bonas network format.

Grosse .WEA, .LIG - Reads .WEA/LIG punch files in the Grosse format.

Stäubli™ formats
Reads Staubli files created for a Stäubli controlers. See **Punch As** for the various formats inclucing JC3, JC4, JC5 and Dobby formats.

Weavette .PUN - Reads .PUN files in Viable Weavette™ format.

Weavette .VPN - Reads .VPN files in Viable Weavette™ format.

Muller UNI/UPT 1...n - Reads Muller UNI or UPT files in a card 1 through final card format.

Muller UNI/UPT n...1 - Reads Muller UNI or UPT files in a reverse order from the final card to the first.

Actrom-5/TIS - Reads files created for the Actrom-5 2688 card punch machine. TIS Loom files use the same format as Actrom-5 files except that the TIS modules are 576 (24X24) wide instead of 448. TIS files usually include 32 'control bits' (just like Bonas EP files) which are used for selection, so the total file width (and the # of hooks to be handled by the Castout file) = 32 + N X 576.

DWN-1 File - Reads files created for Digital Weaving Norway TC1 loom.

NedG.C01 - Reads the Nedgraphic 's standard format "punch data" files.

AVL .J1P - Reads AVL card image plus color table, if present, but does NOT yet load in optional warp or weft color sequences.

Schleicher File - Reads back Schleicher punch file.

Sophis 8" punch - Reads back Sophis 8" card punch files.

Dornier DOBBY PAT file - Opens dobby file from a Dornier Dobby CAD system - uses files found in the Patron folder; these are named "nnn.PAT" where nnn is a sequential number. Extracts the actual job name from this file and offers it as the suggested file name. The Dornier files support 64 'hooks' per card, but only the first 40 appear to be used while the last 24 are all blank in the test files that have been examined. User is offered the choice of using just the first 40 hooks, which results in a 40 end image compatible with Stäubli Dobby mechanisms, or using all 64 hooks.

Socos DOBBY file - for Socos Dobby files. These files are used with the Somet Thema 11E's Socos controller.

SMIT .arm dobby file - for SMIT .arm dobby files.

Custom

Attempts to read in card files of unknown formats by using known parameters.

In all cases the result is a Black/White Expanded Image file; in essence a picture of the cards which would result. These can be useful for checking a punch file prior to punching cards. The image shows Hooks 1… in left to right sequence with Black=Cut, White=Miss. Only PUN files permit recovery of Pick & Shuttle information; EP and Stäubli files are displayed at 1 card per Pick using Logical Shuttle 1. All images leave the Physical Box unassigned (0) because *JacqCAD* cannot determine whether advanced box motion was used or not.

When reading back a Stäubli Disc file the user must choose the actual width from a choice of 3 because Stäubli files are created only in multiples of 1344 (CX860) or 1526 (CX960) hooks. The actual Jacquard width (# of hooks) is known only by the JC controller which is connected to the head. For example the identical file format would serve for a 5120, 5632, or 6144 hook CX960, so those 3 choices will be presented when *JacqCAD* reads in a 6144 wide Stäubli file.

These images are primarily intended for visual inspection prior to punching. It is possible, however, to make minor corrections and to punch from the corrected image using a 1:1 Castout ("End" 1 to Hook 1, 2 to 2, …, 1344 to 1344) without Shuttle or Regulator rules.

Fabric View…

Def Loom Layout

 # Shuttles = used to enter the number of box motions or color selectors.

 # Warp Colors = enter the total number of warp colors here. The warp sequence is entered below.

Ends/inch =

Picks/inch = fields used to calculate the aspect ratio to be used in displaying the image.

Box Colors:

Warp Colors: are each numbered 1…; the numbers used in the warp sequence are limited to 1 … the # of warp colors specified.

Creating the Loom Layout file :

This file is created through the Define Loom Layout menu command in the Weave Menu. It contains two kinds of information, which will be needed to create a Yarn Map:

1. Warp and Weft (box) colors: these are selected on the screen via the standard Color Picker display. Up to a total of 250 separate colors can be specified - up to 32 box colors (though most looms support only 8), and up to 250 - the number of box colors warp colors. For example, if 8 box colors are specified, then up to 242 (250-8) warp colors can be specified. Warp and box colors are each numbered 1…

2. Warp color sequence: this describes the sequence of Warp colors, starting with End 1. For example an alternating warp would be described as 1 2 1 2… while a striped warp might include 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 3 3 3 3 3 3… Full user control is provided so that any arbitrary warp pattern can be specified as long as no more than the maximum number of separate warp colors is required.

The separation into a) color specification and b) sequence definition provides an important benefit: it permits the user to change the colors separately from the warp sequence so existing Loom Layout files can be duplicated and edited quickly to handle warp color changes.

The user can 'import' a TEXT file during Warp Sequence definition; this allows the use of standard Word Processor applications in preparing or modifying a complex sequence.

The following formats for Warp sequence input (direct or via TEXT file) are supported:

Simple listing:

Color1 Color3 …,   e.g. 1, 3, 1, 4, 2, 3, 2, 4

Color repeats:

count* Color   e.g. 5 * 1, 3 * 2 ==> 1 1 1 1 1 2 2 2

Sequence repeats:

count **[xxx]**   e.g. 5 **[1, 2]**   ==> 1 2 1 2 1 2 1 2 1 2

where 'xxx' is any legal sequence, including sequence repeats 'nested' to a depth of up to 10 levels.

Examples :

Solid color warp:

1152 * 1   ==> 1 1 1 1 1 1 1…

Alternating warp:

576 [1, 2]   ==> 1 2 1 2 1 2 1…

Striped warp:

96 * 1, 96 * 2, 96 * 3…==> 1 1 1 1 ... 2 2 2 2

Striped alternating warp:

48 [1,2], 48 [3,4], 48 [5,6]…==> 1 2 1 2 ... 3 4 3 4 ...

Repeating pattern:

8 **[** 48 **[1,2]** , 24 **[3,4]]**

In order to facilitate keyboard entry and editing, several characters are recognized for each kind of 'operator'; these include:

Separators (between items)

"," "+" space Tab Return Enter

Color repeats

"*" "x" "X" "."

Sequence repeat brackets

"[" "{" "("   "]" "}" ")"

Colors are changed by clicking on the individual color squares; this brings up the standard Color Picker dialog.

The **Warp Sequence** is edited by clicking on the Warp Sequence window that will bring to the front a Sequence Editor window. While working in this window **Save**, or **Load** options are available. The defined sequence can be saved as a text file that can also be edited with any standard word processing application - use **Save** to save in TEXT format.

> **Check -** will cause JacqCAD to check that the sequence is 'legal', i.e. doesn't contain any missing parts; it also updates the display of
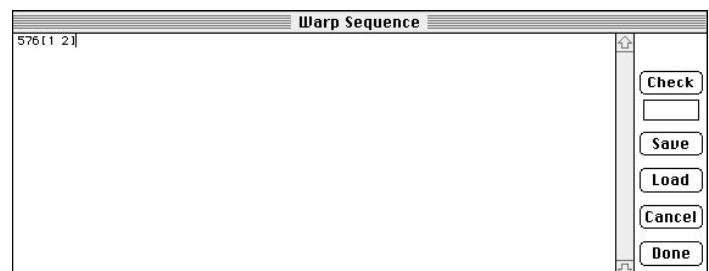
the number of ends handled by the sequence. Upon exit from the Sequence Editor, the total # of warp ends handled will be displayed along with the # of the highest and lowest warp colors used in the sequence.

Load - reads in an existing Loom Layout file. After loading it is necessary to click on the Warp Sequence window to see the actual sequence. Save stores the current definition to a Loom Layout file.

List - saves a listing in readable form to a TEXT file that can later be printed out**.**

Yarn Map Image

A "Yarn Map" image is created from an Expanded Image with weave cuts and boxes assigned. The intent of such an image is to show the actual yarn configuration, in other words which yarn, warp or weft, is 'on top' of the fabric at each warp/weft intersection; either the face or back of the fabric can be selected for viewing.

The process requires three steps:
1. *Create a "loom layout' description file* (mentioned earlier in this section). This file describes the colors used for the warp and weft yarns; complex warp patterns, e.g. single color, alternating, and banded, are fully supported.
2. *Create an Expanded Image* to which weaves have been applied (Cut Weaves Into Image) and to which boxes have been assigned (Assign Boxes), in other words, prepare an image just as if to punch from it.
3. *Create a Yarn Map* by combining 1 and 2.

The Yarn Map image will be the same size as the Expanded Image, i.e. the same # of Ends and one horizontal line for every card. Color is assigned to each End in the Yarn Map image as follows: if the corresponding End in the Expanded Image contains a weave cut (is color 255) then the warp color is assigned for that End, otherwise the weft (box) color for that box is assigned. In effect the color of the 'yarn on top' at each end is displayed.

Yarn Map images are useful as a final check prior to weaving or punching cards; it is for this purpose only that this facility has been provided.

While a Yarn Map 'looks' somewhat like the final woven product, be cautious about its very real limitations:
• Displayed colors are limited to those colors that can be displayed on a computer terminal; this is a much smaller range than the color range of real yarns.
• A Yarn Map cannot reproduce any of the 3-dimensional qualities or textures of the yarns or weaves.
• It does not reproduce any of the physical yarn or weave effects, for example:
   1. Isolated cuts will show as a full pixel of warp color whereas in real fabrics such binders often are covered over by adjacent yarns and are invisible.
   2. Compound weaves which rely on sliding one yarn under another, so that only one is visible, will show both yarns side by side in the Yarn Map.
   3. It will give equal weight to all yarns; in real fabrics 'softer' yarns tend to expand and achieve higher 'on top' coverage than harder yarns.

Colorize Weft

Option used to colorize the uncut parts of a card image. This is useful for colorizing images to help keep track of which weft is being inserted by each card. Useful only in card images in whichthe box assignments have been recovered, for example Mueller .UNI or .UPT, Weavette .PUN, and other files.

Based on
  Assigned Box
  Logical Shuttle - Used to choose how the colors assigned to the uncut parts of each card (pick) of the card image will be colored.

Using Weft
  1, 2, 3 ...
  254, 253 ...   Option to select which colors to "paint" the uncut portions of the Pick.

Active Ends only -   Can be set to colorize only the active ends (those ends which include at least one cut mark).

Ignore Some Ends - set to ignore some ends at left and/or right edges to avoid colorizing the weft selector hooks. Buttons for 16, 32 and 64 are for ease of entry.
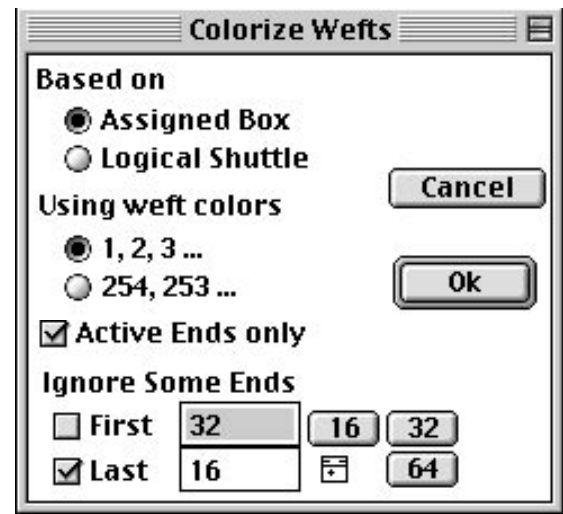
Dobby

Dobby On - turns the dobby function on with the current active window.

    A Dobby pattern consists of three design elements:
1. The Draw-in (threading)
2. The Pegplan (weave) and
3. The Design area (draw down).

For more information about dobby design read the Dobby Function Handout.

A combination of any two of these three elements can produce the third. Once the informaion is entered in the correct location clicking on the "control" in the top right of the dobby image completes function (See Controls below). Here are three ways to use two of the elements to create the third:
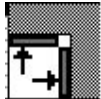
DSN ==>DiD & PgP - Generate a Draw-In or DiD (threading) and Pegplan or PgP from the Design or Dsn (draw down) area. Dsn== >DiD&PgP
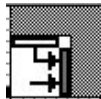
Dsn+DiD== >PgP - Threading with drawdown to produce the pegplan.
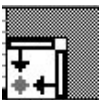
DiD & PgP== >Dsn - Draft the Draw-in or DiD and the Pegplan or PgP and generate the Design or Dsn from them.

ColorStrip ==> DiD - The Draw in can be entered by: clicking on each harness in the grid above, or by use of a color strip or from a design or by entering the information numerically.

DiD ==> ColorStrip - Useful in saving a draw in for future use.

PgP==>Clipboard - The pegplan must be copied and pasted into a window for expansion and punching. It is the Peg Plan alone that is punched as a dobby loom file.

Clipboard ==> PgP - Allows pasting a design from another window to be pasted into the pegplan.

List - Opens the Dobby Analysis Values window that creates a text file of the number of harnesses, the peg plan and the Draw in Diagram.   This file can be Exported to a text file, Printed or coppied to the clipboard.

Print - Prints the information found in the Dobby Analysis Value window described above.

Dobby settings... - dialog allows the ability to amend the default settings of the Dobby function.
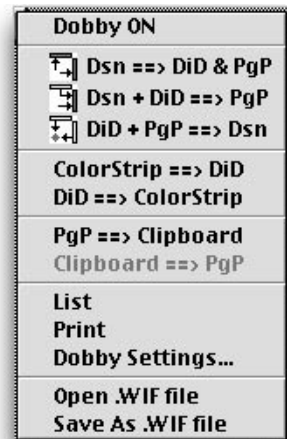
Also provides for the entry the threading numeri-
cally.

Enable Dobby Display - toggles the dobby
displays functions off and on.

Edit mode: choose one of the three options
for generating the three parts of a dobby de-
sign.

CUTs from - defaults to **255 in Design**,
meaning that color 255 will be a cut. Cuts
can be changed to **Wve overlay**, with an op-
tion to make color 0 a miss (**0=MISS**).

CUTs TO - defaults to **255 in Design** can be
changed to **Wve overlay**.

Harnesses Max# (8...48) - set the maximum number of harnesses and also the Minimum
number of harnesses to be displayed.

Maximum zooms (4...10) - Set the number of zoom for the Peg Plan and/or the Draw In.

Discard Dobby data   Removes the Draw In and Peg Plan areas and the control in the top
right corner.

Display design as - options to show the design as a **color image, Black/White Cut/Miss,
Top Yarns**, or **Bottom yarns (mirrored).**

Set/Edit:
  Draw In - Dialog window to enter the draw in numerically.
  Warp Sequence - Window to enter the Warp Sequence, Colors and Number and colors of
shuttles. Exiting the window and the setting window displays the Warp Sequence as a color
strip along the top edge and the Weft Sequence colors along the right edge(if the box mo-
tions have been applied).

Open .WIF file - Opens a Weaving Information File (WIF) format. This file is used by handweav-
ers and Dobby designers for transfering weaves between systems. JacqCAD imports a WIF file
as an Expanded Image with Dobby enabled. If the WIF file contains warp or weft color sequence
information, the window will also include color strips for the warp and/or weft. Weft color se-
quences are also stored as Box assignments.

Save As .WIF file - Saves a WIF file.
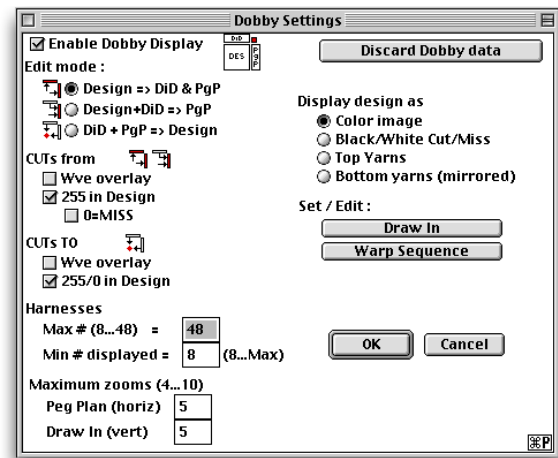
CHAPTER 9: THE WINDOWS MENU

Next Window

Deactivates the current image window and activates the next window in the list of windows shown in the Windows Menu.

Arrange

Allows the user to choose a method to arrange multiple windows for viewing.

Stack Windows - Using this option, all windows are drawn in the same location, at the upper left corner of the screen, next to the tool palette.

Offset Stack - Expands all the image windows to their original size and redraws them slightly offset from each other.

Thumbnails - Creates scaled down 'thumbnails' of each design currently open and places them side by side in the order of the windows list.

Tile Windows - (temporarily disabled) Contracts all the images windows and repositions them so that they will fit on the screen without overlapping. If holding the Option key down the tiled windows will be drawn using "Scale to Fit" mode. Click on the Zoom Box of a tiled window to expand it to fill the screen.
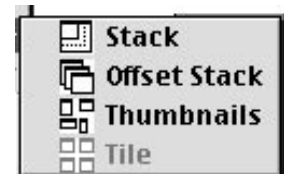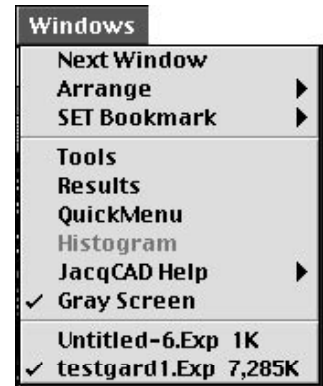
Go To Bookmark

Allows the user to jump directly to specific locations in the images; 16 bookmarks are provided. To place a bookmark in the front image window simply hold down the Option key while selecting the Windows menu (the entry changes to "**Set Bookmark**"), and select which of the 16 bookmarks to place. Useing the Command key and the numbers 1 through 4 will move directly to bookmarks 1-4 respectively. Command 5 jumps back to the previous view.
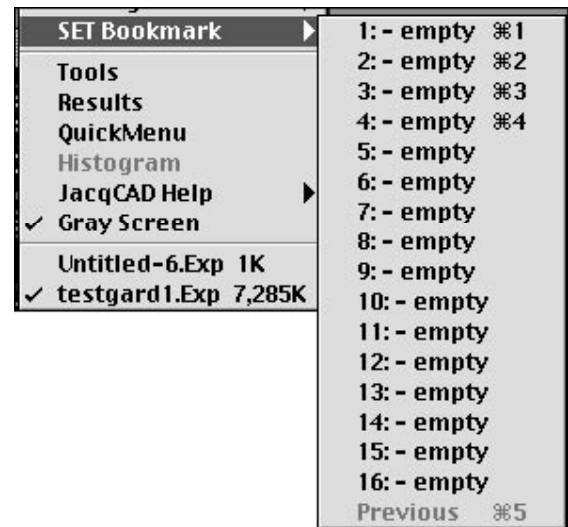
Tools

Toggles the toolbar, which is located on the left edge of the screen, on and off. See Chapter 10 for a full discussion of all the tools.

Results

Toggles the Results bar located at just below the menu bar on and off.
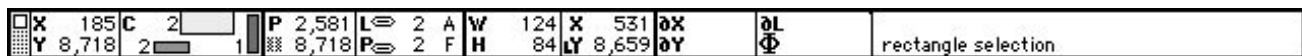
The Results bar gives helpful information about the image.
indicates the location, in X, Y coordinates, of the cursor.

indicates the color number and color patch that the cursor is currently floating over. If the warp and weft color sequences are set these are also indicated.
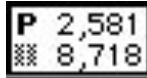
P indicates the Pick the cursor is located on if the image has been expanded. The other number indicates the card.
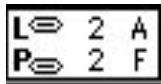
L indicates the Logical shuttle assigned to the card/pick. The **A** designation means the current pick has an active advance.
P is the Physical Shuttle assigned. In this example, the pick also has a Fabric Regulator assigned, indicated by the **F. WF** indicates a warp and fabric regulator.
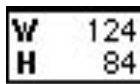
W the width in pixels of the active selection area.
H the height in pixels of the active selection area.
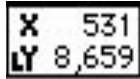
X location of the lower left hand corner of the active selection area in the end direction.
Y location in the pick direction of the lower left hand corner of the selection.

displacement in ends (**X**), displacement in picks (**Y**) of a measurement tool.
The next section indicates the length (**L**) in pixels and the direction as an angle, measured clockwise.
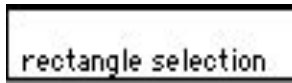
Miscellaneous information about the last action taken, especially helpful when using keyboard shortcuts to indicate what the key combinations do.

Quick Menu

This window provides direct (one click) access to selected menu items. It is fully user-configurated. At start-up the QuickMenu window will be positioned along the bottom (horizontal) or right edge (vertical) of the main screen.

The QuickMenu window can be dragged to other positions; a GoAway box in the title bar will completely hide the window (use Windows Menu to bring it back); a Zoom Box in the title bar will "roll up" the window into just its title bar, the next click unrolls the window back to its normal size.

Click on "Edit QuickMenu" (just beneath the title bar) to make changes. A scroll window located on the right side of the dialog lists the items presently installed; clicking on an item selects it (shown by highlighting).

INSERT - adds a new item above the currently highlighted selection.
ADD - adds a new item to the end of the list.
DELETE - removes the selected item.
+ Highlight - selecting this checkbox will highlight the selected item in the list with the color indicated in the box located just below the Highlight checkbox. Clicking on the color patch al-

lows the color to be changed to any of the 256 colors in the palette.

Display
  Vertical - choosing this radio button will change the orientation of the Quick Menu to a vertical display.**Horiz -** this option is the default for the Quick Menu which will be located along the bottom edge of the screen, unless moved.

QM files:
  Save - used to save current Quick Menu to use on another computer and to allow Quick Menu settings for different jobs or users.
  Load - option to load previously saved Quick Menus.
  Cancel - exits Quick Menu dialog without making any changes to the current menu.
  OK - exits dialog with any changes.
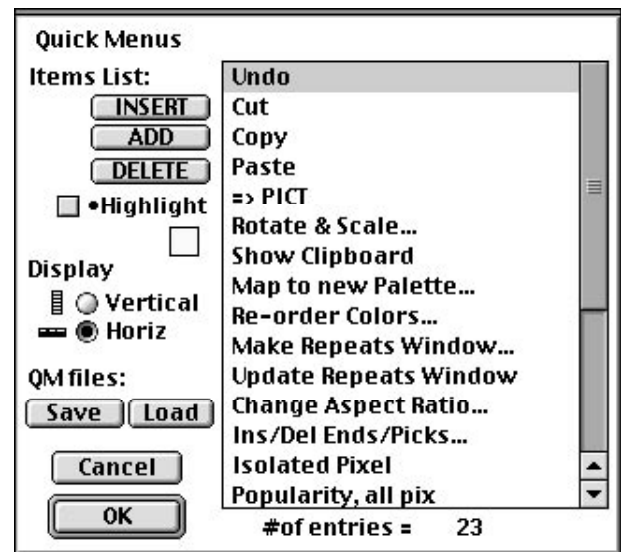
Histogram

     Toggles a previously created historgram of the current image.

JacqCAD Help

A tool to open help windows to aid the user in the usage of JacqCAD Master ® tools. The windows may be printed.

  Tools Windows Help - opens an image of the toolbox with brief descriptions of each tools use.
  Keys & Cmd-Keys - opens a summary of all the keyboard functions along with the command key combinations.
  Results Window - opens a help page for the results window as discussed above.

Gray Screen

Toggles the gray background screen on and off. Turning the screen off (on is the default) allows the desktop to be visable while using JacqCAD.

Any opened images along with their size are listed at the bottom of the Windows menu for quick access.

CHAPTER 10: THE TOOLBOX

General Information

The Tool Box contains many powerful tools for editing and manipulating an image. It includes versatile tools for creating selections, painting, choosing colors, and creating text.

The Tool box, as well as all the other windows displayed by *JacqCAD* MASTER®, can be freely moved around the screen.

Within the Tool Box window, some tool icons include a pair of small dots; these dots indicate that this tool has special 'built-in' functions or settings which can be accessed by double-clicking on the tool icon. The purpose of each function or setting associated with these tools is explained in detail with each tool description.

Most tool icons include a letter indicating the tool can be selected simply by typing that letter on the keyboard, for example typing **R** on the keyboard will select the Rectangle Selection Tool (upper left corner).

The currently active tool is highlighted - in this case the Line Tool.

Any tool, except the Text Tool, can be changed temporarily to the Grabber (for scrolling) by holding down the Space Bar (in Text mode Space is a valid character). Similarly, holding down Space and Command keys will temporarily change to the Magnifying Glass (also hold Option to zoom out).
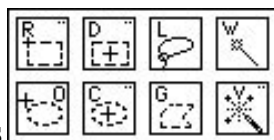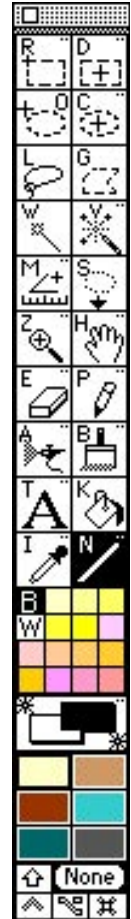
Selection Tools

The 'Selection' tools are for creating selections within the image. Once a selection is made, various functions can be applied to the selection and then made permanent to the image.

The dimensions of a selection are displayed to the right of the W (width) and H (height) indicators in the Results window located above the image editing window

On pasted 'Floaters' and selections, the lower left corner of the selection is also displayed in the Results window; to the right of the X and LY (Lower left)indicators. This location is important for careful placement of 'Floaters' where the exact location of a given Pick and or End is needed.

General Selection Functions

The following list of selection functions apply to all of the selection tools and are considered general selection functions. More specific selection functions also apply to certain selection tools only and are explained with each tool description.

In addition, rectangular selections can be Saved, Scaled, Flipped, Rotated, or Converted to weaves.

De-Select

Option - C, - D, - G, - L, - O, - R, - V, or - W kills active selection without changing the tool to be consistent with option-click on Selection Tool in Toolbox. **Option S** pastes the active selection and de-selects the area.

Special Selection Functions

Fill   ⌘ U

Fills the selection with the current foreground or background color. The foreground color is set by clicking the Foreground color chip in the Toolbox window and dragging the mouse over into the color palette to the desired color and releasing the mouse button. The selected color will then appear in the Foreground color chip.

Eraser Color Fill   ⌘ E

This function is used to fill a selection with the background color.

Boundary   ⌘ B

Creates a boundary or "border" using the foreground color. The boundary that is created is placed on the inside edge of the floating selection (⌘ + OPTION + B places the boundary on the outside of the selection) and is not made permanent until the 'Floater Lock' tool is clicked, one of the painting tools is chosen, or the mouse is clicked just outside of the current selection. The line width in X and Y can be set by double clicking on the Line tool. *(See the information on the line tool in this chapter.)*

Simple Selections

Simple selection creates a new region (de-selecting any existing one). The simple selection cursors are indicated as follows:
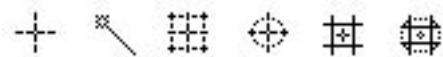
The cursors above are shown in the image area when a normal selection is being created. The last four cursors of the previous list indicate 'Center' selections, *(i.e. selections created by drawing from a center point outward)*.

Complex Selections

All selection tools can be used to build more complex selections as follows :

CONTROL + **selection:** adds the new selection to the existing one. This function is indicated by one of the following cursors:
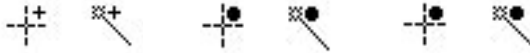
OPTION + **selection:** subtracts the new selection from the existing one. This function is indicated by one of the following cursors:

OPTION + CONTROL + **selection:** intersects the existing and new regions, in other words it keeps only those areas that are in both the old and new regions. This function is indicated by one of the following cursors:

Altering Selections

Positioning the cursor inside the selection will turn the cursor into the Arrow cursor:

Once the cursor has changed to the Arrow cursor, the user can then click and drag the selection to any part of the image area.

When the command key is pressed and the cursor is within the selected area, this region can be instantly 'picked up' into a floating selection as a duplicate by holding the ⌘ key down as the selection is dragged. For this operation, the cursor will change from the arrow cursor to the Duplication-cursor:

Arrow keys, ↑, ↓, ←, →, move the selection 1 pixel in any direction for each key press.

Holding the ⌘ key down in conjunction with the desired arrow key will increase the amount that the selection is moved, grown, or shrunk to 10 pixels for each key press.

CONTROL + **Arrow key**: adds to the selection in the direction indicated by the chosen arrow key.

OPTION + **Arrow key**: subtracts from selection in the direction indicated by the chosen arrow key.

CONTROL + OPTION + **Arrow key**: shrinks the selection by one pixel in the direction indicated by the chosen arrow key.

SHIFT + **Arrow key**: grows or shrinks the selection as follows :

[SHIFT] + [↑] = grows vertically (up and down)

[SHIFT] + [↓] = shrinks vertically (up and down)

[SHIFT] + [←] **=** grows horizontally (left and right)

[SHIFT] + [→] **=** shrinks horizontally (left and right)

Rectangle Selection

> This function requires a
> rectangular selection.
>
> [OK]
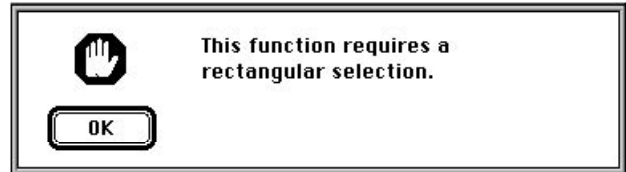
The Rectangle selection tool creates a rectangular selection within the image. To create a constrained (square) selection, hold the [SHIFT] key down while dragging to create the selection.

To select the entire image quickly, double-click the Rectangle Selection tool. *This is the meaning of the small dots in the upper right hand corner for this tool.*

Certain functions in *JacqCAD* MASTER® require that a rectangular selection be used. For example, to create a weave (.Wve) file, the program will only accept rectangular selections to be converted. In the event that a rectangular selection is not active for a function that requires one, then *JacqCAD* MASTER® will give a warning dialog requesting the creation of a Rectangular selection for that function.

> New rectangular selection :
>
> Size =   [45]   Ends
> [Square] [15]   Picks
>
> Position = [65]   End
> (lower left) [10]   Pick
>
> [Screen Center]
>
> [Cancel]   [Ok]
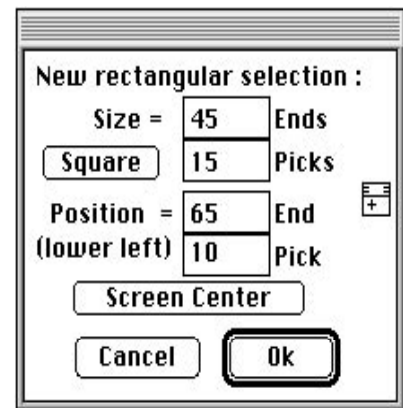
Center Rectangle

This tool is for selecting rectangular areas where it is necessary for the selection to originate from the mid section of the area to be selected. When this tool is selected the cursor changes to This indicates that the selection will begin at the intersection of 4 pixels. By holding the [⌘] key down, the selection will begin centering around the pixel directly beneath the cursor, thus the cursor changes to   The dots in the upper right corner of this tool indicate that when this tool is double-clicked, a dialog appears giving the ability to create a rectangular selection at any desired location with of any number of Ends and Picks. The Center Rectangle also supports clicks in the image file on corner points to define the selection rectangle.

Double clicking on Centered Rectangle tool defaults to the enclosing rectangle of the selection if one is present, otherwise it uses the visible area as the default selection.

Oval

The oval selection tool is for creating oval or circular selections. To create a circular selection hold the [SHIFT] key down as you click and drag.

Center Oval

This tool is for selecting oval areas where it is necessary for the selection to originate from the mid section of the area to be selected. When this tool is selected the cursor changes to ⊕. This indicates that the selection will begin at the intersection of 4 pixels.

By holding the ⌘ key down, the selection will begin centering around the pixel directly beneath the cursor, thus the cursor changes to ⌗.

Lasso

The Lasso or 'Freehand' selection tool is for creating freeform, non rectangular selections.

Polygon

The Polygon selection creates angular selections. Using SHIFT + constrains the selection outline to horizontal and vertical lines.

Wand

Selects a contiguous color area, in other words an area of 'connected' pixels. A very important tool for building boundary zones or selecting figures to copy o cut.

SHIFT + causes all the colors in the currently defined Color Group (see Special:Color Group) to be treated as the same color; the selection will flow outward from under the wand position over any colors in the Color Group until it encounters colors that are not in the group. This is very useful for selecting complex design elements composed of several colors. If the color of the pixel under the Wand is not in the color group an error message will be posted and no selection will be made.

⌘ + causes the Wand to select over the entire image rather than to do a 'seed fill' (paint bucket type of fill) starting from under the Wand; in other words it will select all patches of the selected color, not just the contiguous area.   The selected color will be the color of the pixel under the wand

⌘ + SHIFT + causes all colors in the Color Group to be selected over the entire image; the position of the Wand is not relevant since the pixel under it is neither used to select a color (Color Group used instead) nor is it used as a starting location for a fill.

Proximity Wand

This tool is for selecting contiguous areas of colors which include colors *similar* to the color that is clicked on. The modifier keys used to build selections with the Wand tool also apply to this tool.

Similarity is based upon the weighted sum of differences in Hue, Saturation, and Brightness. Double-clicking brings up a dialog box for adjusting the weights and threshold value used to decide which colors are sufficiently similar to the target color (the color clicked upon) to be treated as being the same color.

Proximity Weights for each of Brightness, Hue and Saturation can be set from 0 to 255 while the **Tolerance** threshold can be set between 1 and 2000.

The Proximity Wand measures the similarity between two colors as follows:
Total Difference = sum of:
     Brightness Weight   X difference in Brightness
    + Hue Weight   X difference in Hue
    + Saturation Weight   X difference in Saturation

The Total Difference (scaled by a constant) is then compared to the Tolerance setting; if it is less than the Tolerance then the colors are "similar"; if it is greater then the colors are different.

For example, if the Hue weight is set at 0, then the Hue differences between colors will be ignored and only differences in Saturation and Brightness will be considered. In this case a red and a green color with the same saturation and brightness values would be seen as similar colors.

Similary, setting the weights to Hue=100, Saturation=50, Brightness=50 would give twice as much weight to differences in Hue as would be given to differences in Saturation or Brightness, so the wand would accept colors that varied quite a bit in brightness or saturation, but would require closer matching in Hue.

The Tolerance setting determines how wide a range of differences will be allowed. Larger values will include a wider range of colors.

The effects of different settings can be tested by clicking on a color in the dialog's palette - boxes will be drawn around all "similar" colors. In the figure above, we clicked on color 53 (identified as the target color by the two corner markings) and a total of 4 colors (#6, 51, 52, and 53) were found to be "similar" - these are marked with boxes.

Once the Similar versus Different decision has been made about all colors in the palette, the Proximity Wand behaves as a normal Wand - it selects all contiguous areas beginning where you clicked in the image and works outwards as long as it finds connected pixels of similar colors.
Clicking on **-> Col Grp** will store all the similar (boxed) colors into the current color group.
Clicking on **-> Substitution LUT** will set the current Substitution LUT to change all similar
    (boxed) colors into the target color (marked by corner marks) for later use.
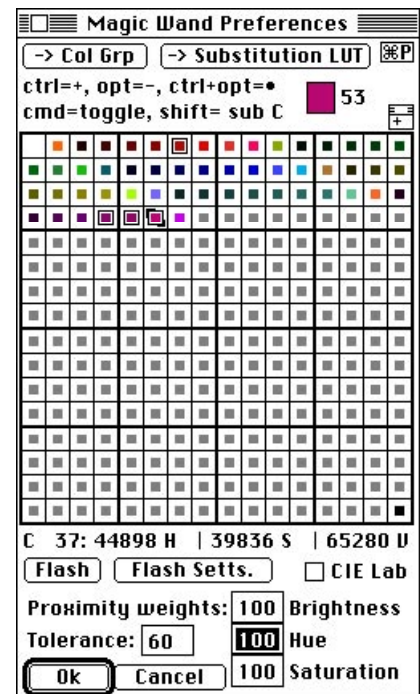
For convenience in building Color Groups or Substitution LUTs, you can use Control-click to add other groups of similar colors, Option-click to subtract groups, Command-click to toggle individual colors, and Shift-click to changethe target color (useful only for Sub-LUTs).

Clicking on **Flash** will "flash" all the similar colors in the image.

Clicking on **Flash Setts.** will let you change the flash color and the number of flashes.

The Hue, Saturation, and Brightness scales used were chosen for convenience in calculating; they are far from perfect from a psycho-physical perspective. For example, a 10° difference in Hue is barely perceptible between two Green colors, but can be the difference between a Red to an Orange color in that part of the spectrum. What this means is that Weight and Tolerance settings which work well among the blue and green colors may be much too inclusive when used among the reds and yellows.

If the system includes Apple's ColorSync® extension, and if it has an active ColorSync profile for the monitor, then the results will be better by checking the **CIE Lab** box. This lets the Proximity wand use a different set of calculations based on the **Lab** color space. This color space (originally developed by Hunter Labs, now an international standard) was developed to improve color difference measurements.

In **Lab,** a color is defined by three values - **Lightness**, **a**, and **b** (hence the name **Lab**) in which **a** and **b** relate in a complex way to Hue and Saturation. In theory the difference perceived by the average human between two colors is accurately and linearly measured by the differences in **L**, **a**, and **b**. In other words, a total difference of 10 points should appear about as big a difference in any part of the spectrum.

When **CIE Lab** mode is checked, the weights are limited to Brightness (differences in **L**) and Color (combined differences in **a** plus **b**). As before lower weight (less influence) can be given to one, say Brightness, and more more weight to the other. The performance of different settings can be tested by clicking on colors in the palette and noting how wide a range of colors are classified as similar.
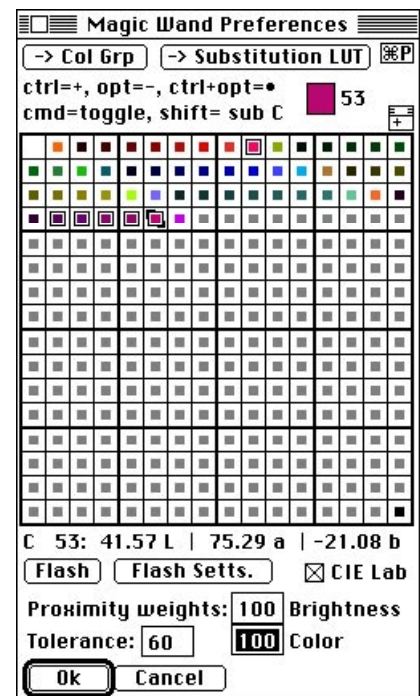
ColorSync assumes that the monitor is calibrated and that its calibration values are correctly stored in the current System Profile, Normally this requires the frequent use of a color measuring instrument to measure the monitor's performance.

However, as a practical matter, simply using the default profile will significantly improve the Proximity Wand's performance, even if the monitor is not well calibrated. Try it, to test the results.

Measure Tool

The Measuring Tool does not write into the image; instead it is used to measure locations, distances, or angles, to report the measured value in to immediate results window, and to store the measured values for later viewing, printing, or exporting via Show Results in the Measure menu. The Measuring tools are combined into a single tool whose functions can be activated through the following key / tool combinations:

Key / Tool Combination	**Cursor**
⌘ + = Length + comment	
OPTION + = Perimeter Measurement	
⌘ + OPTION + = Perimeter + comment	
CONTROL + = Angle Measurement	
CONTROL + ⌘ + = Angle + comment	
CONTROL + OPTION + = Point Location	
⌘ + CONTROL + OPTION + = Point + comment	

When the Command Key (⌘) is held down during a measurement, the user will be asked to supply a label for that measurement; see Length Measure below. This label will be saved with the measurement for display when the values are viewed through Show Results.

Length Measure

Measures linear distances. To measure a distance, click at the starting point, drag to the ending point, and release the mouse button. The horizontal distance (X), vertical distance (Y), and total distance will be dynamically shown in the Results window as the line is drawn.

> **Length comment**
> L.#1
> [OK]   [No Label]

Perimeter Measure

> Perimeter = 269.98
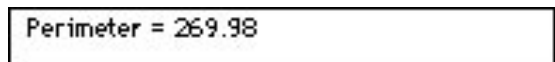
Measures distances along an irregular path. Tracing in this case is done using a technique similar to the way the polygon outlining tool works. Click on the starting point, then click on each bend of the perimeter until returning to the starting point. The measuring is terminated by double-clicking the mouse. It is only necessary to hold the Option key down at the start of tracing.

Lines can be constrained to be either vertical and or horizontal by holding down the Shift key. Distances are given in pixels. Use Show Results in the Measure menu to display all measurement comments.

Point Location

```
Point = 157,271 color=13
```

      Reports the location, (X,Y), and color of the click point of the Measure tool and displays the information in the Results window.

Angle Measurement

```
Length = 187.04  Angle=35.6
```

      Measures the angle formed by two lines drawn through a point by this tool. The value is shown interactively in the Results window.

Guide Lines

      Guide lines are thin lines for use as an aid in alignment.

      The Guides dialog appears when the Measure tool is double clicked (or Guide Lines is selected from the Special Menu). Clicking in the image sets a Horizontal or Vertical guideline into currently selected slot and moves to next slot. In the example to the right, clicking in the image will set the fourth Vertical guide because that slot is selected for entry (it contains the text insertion cursor) and will move the cursor to the fifth slot. Alternatively, simply typing in a value assigns a guide line location.

      Guideline color can be selected by entering a color number, by clicking on the color patch (brings up the palette) or by **Option - click** in the image on the desired color.
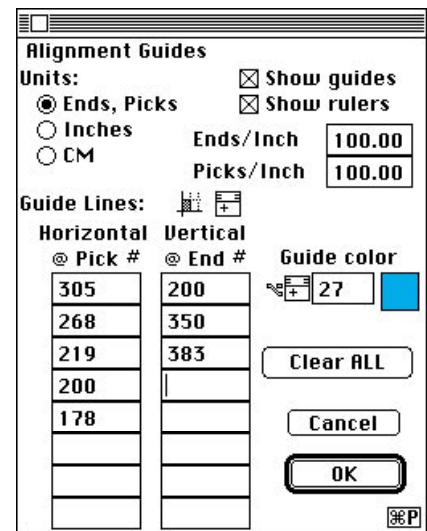
    Clear All - deletes all existing guide lines.

    Tab - moves through the entries.

    Shift + Tab - moves in the reverse direction.

    Show Guides - must be checked for the guidelines to be displayed.

    Show Rulers - when checked, enables rulers along the left and top edges of the image.

    Units - to use for both the guide line locations and the rulers can be selected from Ends/Picks (the default), Inches, or CM.

Floater Lock

      This tool is used to 'lock' floating images down to the paint layer by single clicking. Holding down the OPTION key while clicking the Floater Lock tool will deselect the current selection as it locks it to the paint layer.

Magnifying Glass

The magnifying Glass tool is used to change the magnification of the image (zooming) - clicking on the image zooms in (larger pixels) centering around the location clicked on. Holding the mouse down will, after a short delay, result in increasing zoom levels. Option-click to zoom out.

Double-click on the zoom tool to instantly return the image to the minimum zoom that displays every end - 1:R where R is the aspect ratio of the image.

The maximum zoom level is 16:1, approximately 4.5 ends/inch on a normal display. The zoom stages, from maximum magnification downwards, are 16, 12, 8, 6, 4, 3, 2, 1, 1/2, 1/3, 1/4, ...

The Magnifying tool can also be used while another tool is selected, except the Text tool, by using the following key commands:

⌘ + = zoom in

OPTION + ⌘ + = zoom out

Option-double click - brings up a dialog to ask for specific size desired, specified as Warp or Weft Densities (/inch or /cm), or design size (inch or cm), and actual screen resolution in dpi (dots per inch, default value = 72 for standard displays). Any of the values can be changed. Clicking on the next entry, or on the Calculate button, will cause a recalculation of all dependent values and then calculates and sets the exact zoom required to produce that display size.

This is used to show design in "as woven" size (these settings are remembered only within a session).

ZOOM to as woven size

Units of length
- ◉ Inch
- ○ cm

Set ZOOM to display at

42.0	Warp Density
17.8	Weft Density
13.71	Design Width
21.13	Design Height

Assuming screen at

| 72.0 | Pixel Density |

[Calculate]

1.71 Calculated Zoom

[OK]   [Cancel]   ⌘P

Grabber

The Grabber or 'Hand' tool allows scrolling arbitrarily around the image area. To do this simply click and drag with the grabber tool in the image to move it around on the screen. The Grabber tool can also be used while most of the other tools are in use by pressing the   key. Again the exception to this is the Text tool because the space bar is a valid text character.

Double-clicking on the Grabber Tool brings up the Spacing dialog shown below. Whenever a Selection or a floating object such as a Paste is present in the image, typing the Tab or Return keys will move the selection or object by the amounts set in this dialog.

Normally, each time the Copy or Cut a selection is used, the values are reset to match the width (Tab) and height (Return) of the selection. This automatically sets up the spacing to create plain (checkerboard) repeats with Tab set to move only horizontally and Return to move only vertically.

□ Locked

|	Horiz	Vert
Paste Size :	44	54
Tab spacing :	44	0
Return Spacing :	0	54

[Cancel]   [OK]

For example after Copying a selection, paste a sequence of repeats by typing Cmd-V (to Paste), Tab, Cmd-V, Tab, ... Each Tab moves the object over by its width (shown as 44 above) while each Cmd-V sets the current floater into the image and creates a new floater. Pressing the Return keys moves the object down by its height (shown at 54 above); the Shift key reverses the direction of Tab and Return.

The Enter key acts like a return on a typewriter - it moves down one line and left back to the beginning (under the first Paste in the series). If an adjustment to the position of the paste object is made then the new location becomes the starting point for subsequent moves and the location under which an Enter moves to. If the floating object is readjusted, another Command V will be necessary to paste this floating object into the new location and bring up the new paste object ready to be moved by Enter or Tab keystrokes.

Checking the **Locked** box prevents automatic updating whenever a Copy or Cut occurs, thus locking in the values set. This is useful when copying and pasting a number of different sized motifs on a single grid - set up the spacing, check **Locked**, and then Copy and Paste whatever pieces desired.

Any values for horizontal and vertical motion can be used - for example a Tab to move horizontally by 30 pixels AND vertically by 15 to create a diagonal pattern. Negative values are also allowed and simply move in the opposite direction, e.g., setting Tab's horizontal motion to -20 would cause each Tab to move the selection or object 20 pixels leftwards (instead of rightwards).

Eraser
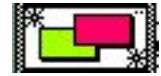
The Eraser Tool is a small square brush that draws in the Eraser (Background) Color. The color of the background color patch in the Toolbox (shown in light green at right) indicates the current Eraser color. The background color is also used by the Cut and Clear commands and as the background color for text. Zooming in close to the image (large pixel size) will erase in single pixel areas. Zooming out (smaller pixels) will increase the size of the erased area, similar to the Screen 16x16 brush size.

The Eraser (Background) color can be chosen by clicking on the Background color patch in the Toolbox to bring up a palette, or can be selected from the image by Option-clicking with the Eraser Tool, or by Command-Option-clicking with any other painting tool, on a color in the image.

Double-clicking the Eraser tool will produce a dialog ask to confirm the intent to erase the entire image - clicking the OK button will fill the entire image with the current background color.

AA selection can be erased with the current background color by using the Clear command in the Edit menu. The key command for this function is:

⌘ + E
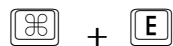
Pencil

The Pencil tool paints individual pixels with the Foreground color. The color of the Foreground color patch in the Toolbox (shown in red at right) indicates the current Foreground color.

The Foreground color is chosen by clicking on the Foreground color patch in the Toolbox to bring up a palette, or selected from the image by Option-clicking with a painting tool such as the Pencil, or by Command-Option-clicking with the Eraser Tool, on any color in the image.

The Pencil will edit with the Background color by holding the ⌘ key.

The cursor can be changed to a cross hair by holding the CTRL key (useful for fine work where the Pencil cursor is too intrusive).

Double clicking on the Pencil Tool brings up the Pencil Fat/Thin dialog to set the pencil's stroke mode. This setting is only relevant when drawing a series of pixels as part of a pencil stroke. When JacqCAD starts up the Pencil will be in its normal "thin" mode, which will produce lines like the left-hand one in the example below. Notice the pixels in thin lines may only be connected at their corners. Selecting a "thin" line with the Wand tool will fail because the Wand tool looks for pixels that connect along their edges, not just at their corners. Unlike the eraser tool (above), the zoom level does not effect the size of the paint area.
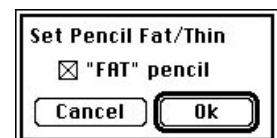
By checking **Fat Pencil** mode the pencil is set to draw strokes with edge-connectivity, i.e., every pixel in the line will join to its neighbor along an edge instead of just a corner, as shown in the right hand line above. Fat Pencil mode only affects lines drawn as a single stroke by clicking and dragging the pencil; single dots can still be drawn. Fat lines can be selected with the Wand tool.
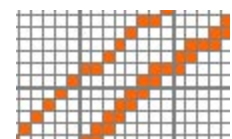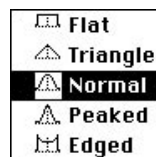
Airbrush

The Airbrush tool is for 'spraying' pixels into the image to provide a 'feathered' or modeled appearance to the image.

Double-clicking the Airbrush tool icon brings up the Airbrush settings dialog box. The settings for the Airbrush tool are described as follows:

Airbrush Size - The Width and Height of the overall spray area of the Airbrush tool can be set up to 64 by 64. The spray shape is by default an oval. The test area in the dialog box allows testing the current settings for the Airbrush tool.

Spray Pat. (Pattern) - used to adjusted to alter the flow of pixels in both the horizontal and vertical directions. The variations are Flat, Triangle, Normal, Peaked, and Edged.

Mask Overspray - This check box allows for slight over spray for feathering when a mask is active.

Flow Response

Normal - adjusts the airbrush spray to a more realistic rate of increase in the amount of pixels being sprayed. Increasing the pressure allows the airbrush to increase in constant increments giving it the feel of a natural spray.

Linear - setting sprays the pixels with a much greater rate of coverage as compared to the same amount of pressure applied using the 'Normal' setting.

Pressure Flow - Tool for use with a stylus pen and tablet. The 'Pressure' setting actually looks for the electronic signal from the pen in order to activate the pressure settings. This function gives the Airbrush tool incredible flexibility to that responds to the amount of pressure applied using the stylus pen.

Droplet Size - The Width and Height settings for Droplet Size allow the creation of the size of the pixels being sprayed. For example, if the Width was set to 4 and the Height was set at 1, then every pixel sprayed using the Airbrush tool would be created with these dimensions.

Grid Aligned - setting is used in conjunction with the Droplet size setting to regulate the droplets by only allowing them to be sprayed at even intervals from one another. In other words, pixels that are larger than 1 x 1 will not overlap if the 'Grid Aligned' check box is selected.

Paint type
  • Solid Color - sprays the current Foreground color.
  • Brush Pat. - sprays the current Brush pattern.
  • Fg/Bk Mix - sprays a mixture of Foreground and Background colors, mixture set as % of Fg color.
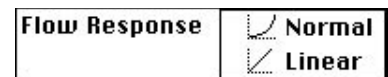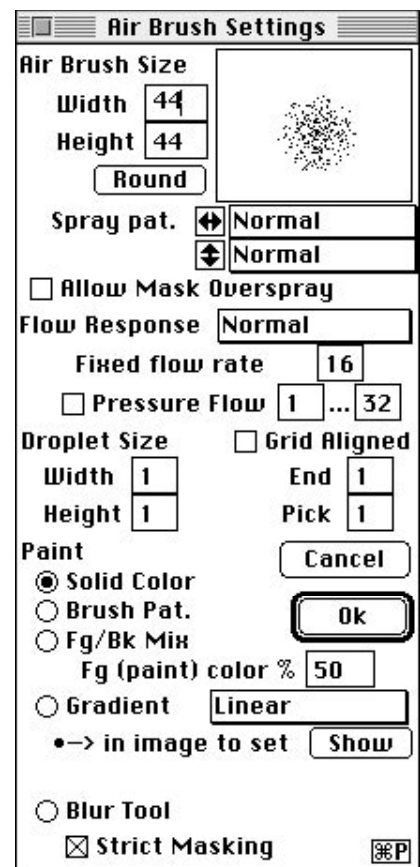
Gradient Airbrush   sprays a graded mixture of Foreground and Background colors whose proportion depends on the position of the brush along a gradient. Set up gradient first by selecting Gradient Airbrush and then clicking and dragging in the image to define the starting point, length, and direction of the gradient.   Supports linear and radial gradients. Click on Show button to see current gradient in image.

Blur Tool - sprays droplet pairs which swap colors to blur / blend a boundary.

Strict Masking - Default setting to protect masking areas from airbrush painting.

Paint Brush

The Paint Brush is the most versatile painting tool. Brush types include Solid, 8x8 Pattern, Tiled, Weave, Stamp, Cloning, Substitution, and Selection. Brush type and shape are selected in the Brush Dialog, which is opened by double-clicking the Paint Brush tool icon or one of the six brush patches in the Brush Micro Palette.

Each of the 6 patches in the Brush Micro-palette represents an independent brush; a black outline identifies the currently active brush. Clicking on a brush patch makes the brush active; double clicking also brings up the Brush Dialog for the newly selected brush.

Brush Micro-Palette

At present, the Brush settings are save in the JacqCAD preference file for use in the next session.

The Paint Brush dialog box contains the following settings:

Shape

Screen •16 x 16 - a round brush whose screen size is fixed at 16 x 16 screen pixels - in other words about 0.22" diameter at all zoom levels (the width in Ends decreases with increasing zooms). The Width and Height settings are ignored.

Oval Rectangle - Oval or Rectangular brushes whose Width and the Height (in Ends and Picks) are specified on the right side of the dialog box. Clicking on the Square button next to the Height field adjusts the Height value so that the brush will be round or square at the current Aspect Ratio setting.

/ \ - diagonal line brushes used for calligraphic effects; the brush is a 2 pixel thick diagonal of the Width/Height box.

Custom Shape - any desired selection shape as long as its enclosing rectangle is less than or equal to 64 Ends x 64 Picks. The current selection outline is taken as the shape by changing the brush shape to Custom or clicking on the **Set Shape** button.
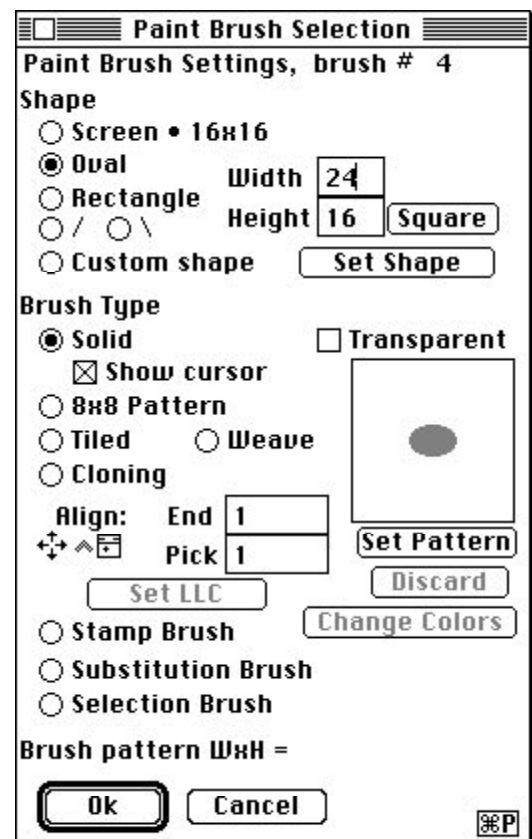
The brush shape and a sample of the brush contents is displayed in the sample box.

Brush Type

Solid - paints solid Foreground color. Unchecking the **Show Cursor** box suppresses the paintbrush cursor - useful when doing fine work with a small brush.
Transparent - checking the Transparent option drops current background color out of the brush.

8x8 Pattern - paints the selected pattern in Foreground and Background colors (if Transparent is checked only paints the Foreground part).

The 8x8 patterns, as their name implies, are all 8 End X 8 Pick patterns; each pattern contains only two colors. When selecting a pattern (see below), black represents the foreground color and white the background color. When painting in the image the current Foreground and Background colors are used instead and each can be set to any color in the palette.
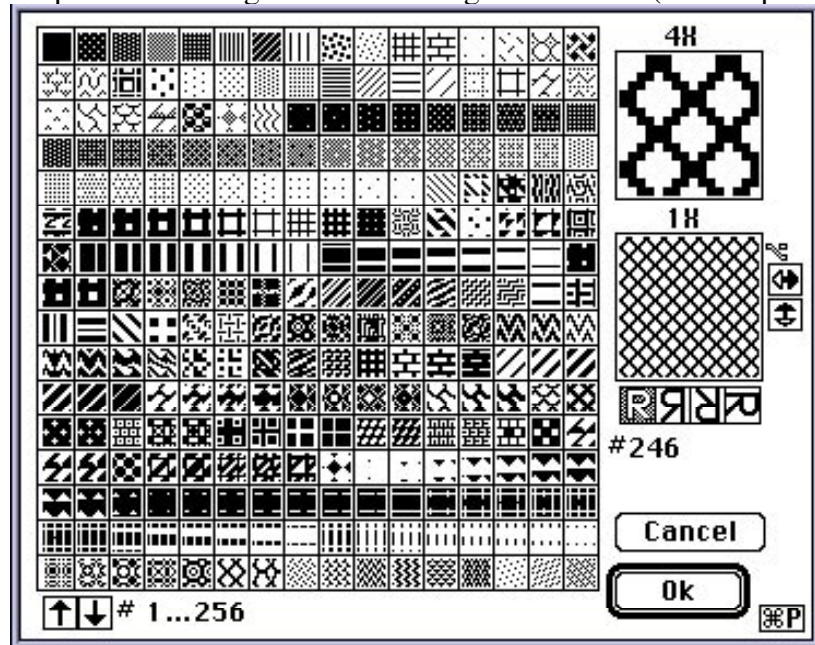
Changing a brush to 8x8 pattern, or clicking on Set Pattern, brings up a palette of 8x8 patterns. Each panel of the 8x8 pattern palette contains 256 different patterns; click on the Up and Down arrows in the lower left corner to change panels.

To select a pattern simply click on the desired pattern in the palette. 1X and 4X views are provided in the small windows to the right.

The selected pattern can be mirrored and/or rotated by clicking on the appropriately oriented R below the 1X view panel. They can also be shifted by clicking on the arrows at the right of the 1X view.

Once the desired pattern is selected, click on the OK button to return to the main Brush Dialog.

The alignment of the 8x8 pattern can be adjusted by setting the End and Pick values - either by entering specific values, by typing the arrow keys, or by Control-clicking in the image to align the pattern's lower left corner to that image location.

Note: when a floating Brush Fill is present which is being filled by an 8X8 pattern, the Shift-Arrow keys will nudge the alignment of the brush pattern rather than moving the floater.

Tiled - any rectangular image selection can be made into a Tiled Brush. The rectangular selection is treated as a tile to be used in a plain (checkerboard) repeat, which is applied through the Tiled Brush.

To Create a Tiled Brush first use the Rectangle Selection tool to select an image area, then enter the Brush Dialog for one of the brushes and either change that brush to a Tiled Brush or click on Set Pattern to load the new tile into an existing Tiled Brush.

A Tiled Brush contains all the colors from the original selection. If **Transparent** is checked, the current Background color will be transparent, in other words it will not paint into the image when the brush is used. The Background color can be changed at any time.

A full image sized Tiled Brush can be used as a form of selective Undo - simply select the entire image and make a Tiled Brush from it. Subsequent changes to the image can be undone selectively by painting back in the original. Similarly, two images can be blended - make full sized tiled brushes of each and then switch back and forth between the brushes to paint in portions of each.

Note: when a floating Brush Fill is present which is being filled by a Tiled brush, the Shift-Arrow keys will nudge the alignment of the brush pattern rather than moving the floater.

Change Colors - brings up the Change Colors dialog to let allow changing colors in the Tiled Brush and Cloning brush (see below).

End
Pick - Initially the tiling will be aligned with the lower left corner of the image - in other words, End 1 Pick 1 of the first tile would align to End 1 Pick 1 of the image. The tiling can be adjusted to align to any given End or Pick by simply typing the starting End and Pick numbers into the 'Align' settings, can be shifted by typing the Arrow keys, or can be aligned to a specific location in the image by Control-clicking on that location.

Weave - any weave can be made into a Brush. Like the 8x8 Pattern brush, a Weave Brush contains only two colors, which are painted using the current Foreground and Background colors. If Transparent is checked then only the Foreground part is painted.

Changing a brush into a Weave Brush, or clicking on Set Pattern, brings up a standard weave selection dialog from which you can select the desired weave.

Initially the weave will be aligned with the lower left corner of the image - i.e., End 1 Pick 1 of the weave would align to End 1 Pick 1 of the image. The alignment can be adjusted to align to any given End or Pick by simply typing the starting End and Pick numbers into the 'Align' settings, can be shifted by typing the Arrow keys, or can be aligned to a specific location in the image by Control-clicking on that location.When a floating Brush Fill is present which is being filled by a Weave Brush the Shift-Arrow keys will nudge the alignment of the brush pattern rather than moving the floater.
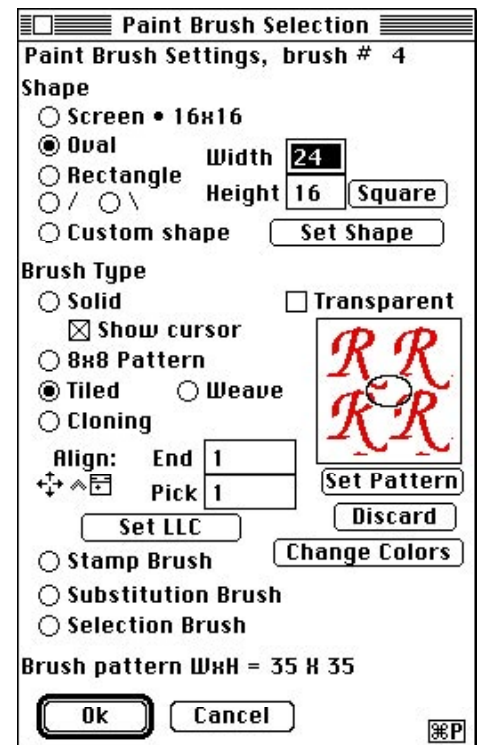
Moving the alignment past the edge of a repeat it will wrap around, e.g., if the weave brush is 40 ends wide a Right Arrow when it is aligned to end 40 will wrap it around back to end 1 alignment.

Cloning - used to make offset copies between two locations of the image - for example to paint a copy of a motif into a different location. In the Brush Dialog only the Brush Shape settings are relevant.

Before painting in the image with a Cloning Brush two locations must defined - the From location and the To location - which define the offset between where the brush will copy from and where it will copy to. These locations are set while the Clone Brush is active by:

Setting the From location :   Command+Control+click in image

Setting the To location :   Command+click in image

and either can be changed at any time as long as a Cloning Brush is the active tool. The cursor changes to a cross-hair with an out-going arrow when setting From and to a cross-hair with an incoming arrow for setting To.

For example, to copy a small flower first Control-Command-click on the center of the existing flower, then Command-click on the desired location for the center of the new flower. Thereafter painting with the Clone Brush will copy from the existing flower to the new location.

Setting the From and To locations define an offset - for example 2" leftwards, 1" down. The Clone Brush simply applies that offset to copy within the image. Another way of understanding the Clone Brush is to think of it as a full-image Tiled Brush which has automatically been offset to align the From location in the Tiled Brush with the To location in the image. The Clone Brush simply provides a quick and convenient way of adjusting that offset.

Stamp Brush - any image selection (any shape, any size) can be made into a Stamp Brush. This is the only brush type whose size can exceed 64x64 - its size and shape is always exactly the size and shape of the original selection.

Clicking in the image with a Stamp Brush paints in one whole copy of the original.

Clicking and dragging in the image, i.e., making a brush stroke, smears the brush image, creating interesting ribbon-like effects painting the colors of the trailing edge of the brush.

A Stamp Brush contains all the colors from the original selection. If Transparent is checked, the current Background color will be transparent, in other words it will not paint into the image when the brush is used.

Clicking on Change Colors will bring up the Change Colors dialog to allow changes to the colors in the Stamp Brush.

The Align settings are not used with a Stamp Brush because it always is aligned to the current position of the brush.

Substitution Brush - the Substitution brush is used to apply color changes to just those areas of the image that are brushed over - for instance to change the colors in the petals of one flower but not in another. The example at right shows the effect of a stroke with a substitution brush which was set to change shades of blue to shades of red.
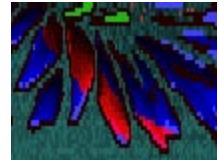
The only relevant settings in the Brush Dialog are the brush shape and selection of the Substitution LUT to be used (which must previously have been defined).

To define a Substitution LUT first use Change Colors (in Options Menu) to define the color changes desired, and save them as a Substitution LUT (after Saving the LUT, use Cancel to exit from Change Colors so changes won't apply to the image).

When selecting a Substitution LUT for a Substitution Brush it will be checked for circular references and rejected if it contains any; in other words, not all Substitution LUTs are suitable for use with a Substitution Brush. Here is the problem: in Change Colors it is perfectly acceptable to change Color 3 to 4 and simultaneously change Color 4 to 3 - simply swapping the two colors. However, this would cause confusion when applying the changes with a Substitution Brush because as the brush strokes over an area it can repeatedly paint the same pixel, which could then flip-flop back and forth between colors 3 and 4. Pixels passed over by a narrow part of the brush might get repainted twice while pixels falling under a wider part of the brush might get repainted 3 times - the former would end up being the original color (3 => 4 => 3) while the latter, because they were painted an odd number of times, would end up in the opposite color!

So, the rule is that a Substitution LUT for use as a brush must only contain "one-step" changes. It can change any color to any other color, but can not then change that second color again, for example, 2=>3 plus 6=>4 is OK, but 2=>3 plus 3=>4 is not. Each color can be mentioned in a Substitution LUT either as a "change from" color or as a "change to" color, but not as both.

Selection Brush - a Selection Brush acts as a selection tool - what is painted becomes a selection. It is useful for creating complicated selection outlines and can be used in conjunction with any other selection tool.

Only the Brush Shape settings are relevant in the Brush Dialog.

As with other selection tools, holding down the Control key adds the latest selection to the existing selection, while holding the option key subtracts. Holding both the Control and Option key (keep common parts of old and new selection) is NOT useful with Selection Brushes.

Text

The Text tool is for adding text to image files. Choosing the Text Tool and clicking into the image allows for the addition of text to the image. The text floats on top of the image until the Return key is pressed. The double click feature opens the Text dialog box allowing the user to change all the font settings. The various settings allow changing the Font, Size (points), Styles, Alignment, Horizontal Scaling, and Spacing. The number of fonts available with JacqCAD MASTER™ is only limited to the number of fonts currently installed into the Macintosh system. For a more detailed description of the Text tools functions refer to the Text portion of the Options Menu Chapter beginning on page 4.14.
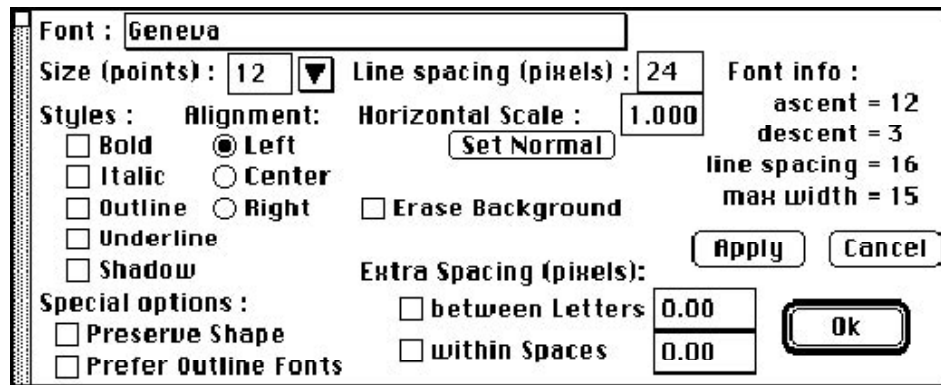
Paint Bucket

The Paint Bucket is for flowing color into contiguous areas of another color or color group (See the Special Menu Chapter for more information on Color Groups) . The Paint Bucket tool paints in the current foreground color or can paint an area with the currently selected custom Brush Patch from the Brush Micro-Palette. The key commands for these functions are as follows:

Dropper

The Dropper tool selects colors from within the image. Click on a color in the image to select it as the new Foreground color; Option-click to select a new Background color.

When using a painting tool (except Text) the cursor is changed to the Dropper while the Option key is pressed. This allows choosing a new Foreground color without having to explicitly change to the Dropper. If using the Eraser tool, pressing the option key and selecting a color changes the current Background color instead. Holding the Command key reverses the logic, e.g., Command-Option-click selects Background when using a regular painting tool and Foreground when using the Eraser. The top of the Dropper cursor is solid for Foreground and hollow for Background.

Double clicking the Dropper tool brings up the Color Picker. The Color Picker is used to show the current color palette and allows changing any of the colors in the color palette.

Line

The Line tool is for drawing lines - click on the starting point and drag to the desired end point to draw a line using the current Foreground color.
Command-click and drag to draw using the Background color.
Option-click to pick up a new foreground color,

Command-Option-click   to   pick   up   a   new   Background   color.
Hold   down   the   Shift   key   to   constrain   the   line   angle   to   multiples   of   45°.
Control-click to draw even single points; normally the Line Tool will not draw anything if the line has zero length (i.e., end point is same as starting point). Holding the control key allows it to draw a single point under those conditions (faster than changing to the Pencil tool). Double-clicking the Line tool icon opens the Set Line Size dialog.

> **Width and Height -** sets the width and height of the line. The maximum allowed values are 64.
> **Square -** adjusts the Height to match the Width at the current Aspect Ratio so that vertical and horizontal lines will have the same weight.
>
> **Fat 1x1 line** - only affects lines being drawn with a Line Width=1 and Height=1; doing so ensures that the line will be drawn with edge-connectivity, i.e., every pixel in the line will join to its neighbor along an edge instead of just at a corner. This is similar to Fat Pencil mode in the Pencil Tool. If Fat 1x1 Line is UNchecked, then the pixels in a 1x1 diagonal line will connect only at their corners.
>
> **DRAW -** opens another dialog window to allow drawing by specifying pairs of numbers entered numerically or by clicking directly in the image on the desired location (select one of the From numbers, click in image, then select one of the To numbers, click in image).
>
> **Straight Line** - after entering the number pairs clicking this button causes the line to be drawn. This approach is useful when the locations of the end-points are known or when scrolling between setting a starting point and an end point is necessary.
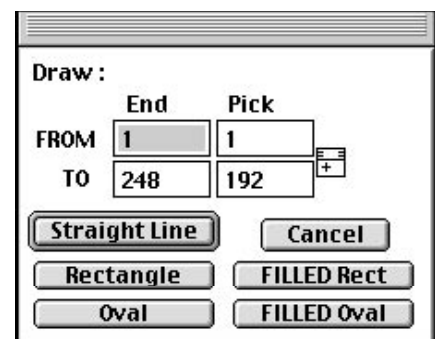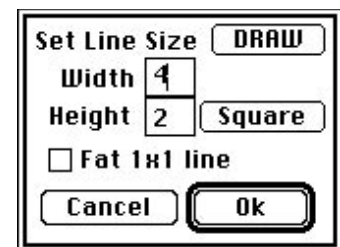
Rectangle - draws a rectangle based on the location of the corners indicated by the FROM and TO values.   The Rectangle will be drawn with a line the width indicated in the previous dialog.

FILLED Rect - same as above tool except the resulting rectangle will be filled with the foreground color instead an outline of the shape.

Oval - draws an oval based on the location of the corners indicated by the FROM and TO values.

FILLED Oval - draws a filled Oval.

Cancel - Exits dialog without making any edits to the image.

Note: the line thickness settings also control the thickness of boundaries drawn by the Edit::Draw Boundary command. As long as a boundary is "floating", double-clicking on the Line Tool and changing the Width and Height settings can dynamically adjust its thickness
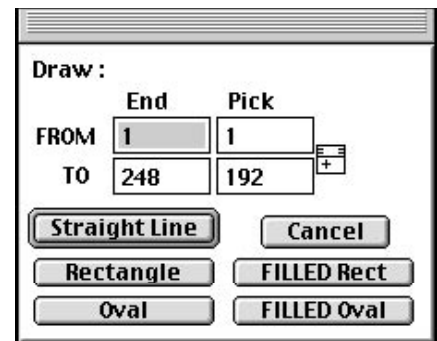
Micro Color Palette

The Micro Color Palette provides quick access to any 14 colors plus Black and White.

Click on any of its 16 patches to select that color as the new Foreground color; Option-click to select it as the Background color.

Control-click on any of its 14 changeable patches to "inject" the current Foreground color, i.e., to save it in that patch.

⌘ - click on any of its 14 changeable patches to load any of the 256 colors from a standard pop-up palette.

SHIFT - click on any of its 14 changeable patches to modify that color with the Color Picker. Using the Color Picker, any one of 16 million colors can be created by adjusting the Hue, Saturation, and Brightness values in the dialog box.
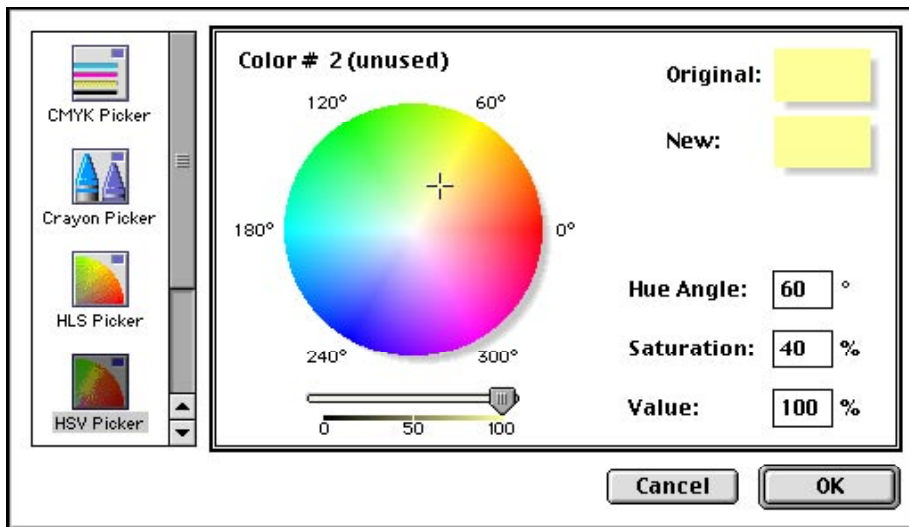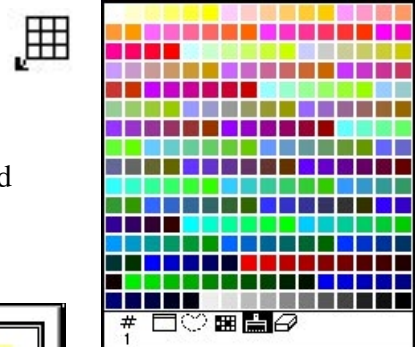
Foreground / Background Color Patches
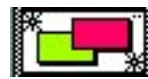
As is indicated by the one patch overlapping the other the color patch in the foreground is the foreground color indicator and the patch in the background is the background color indicator. The respective colors are changed by clicking on the patch to be changed and selecting the new color from the pop-up palette of 256 colors. The newly selected color then fills the space.

The Fg/Bk color patch contains * for both the Fg/Bk colors - clicking on these * flashes the corresponding color in the image. Note that colors 0 and 255 can NOT be flashed because they are locked to White and Black.

Double clicking in the Fg/Bk color patch area, but not on either of the patches themselves or on the *, will bring up the Flash Setup dialog used to set the duration, flash color and count.
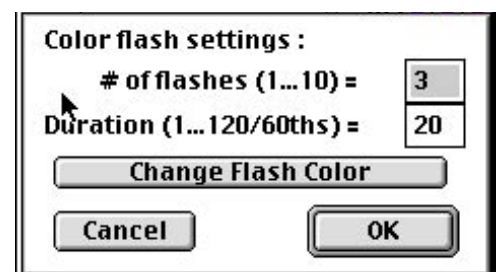
Micro Brush Palette

     This palette by default contains 6 standard 16 x 16 solid 'Screen' brushes. However, custom brushes can be created and stored into these patches. Macintosh Standard 8x8, Tiled, and Stamp brushes are supported. To change the default brush settings of any one of the six patches, double-click on the brush patch. The Brush Settings dialog box for that brush number will appear. In the upper portion of the dialog box are the settings for the brush.

    (For more detailed information on the Brush Micro Palette, refer to the Paint Brush tool portion of this chapter.)

     Located at the bottom of the tool box, these symbols are short cuts for the following keys: Shift (up arrow, in top left corner), Control (bottom left corner), Option (to the right of the Control), Command (bottom right).

     Clicking on any of these is as if the key is being pressed down unless toggled back off be reselecting.

None - deselects any keys previously selected.