

## Chapter 13

# Warp Tapestry

For most weavers the term tapestry means a weft-faced textile with discontinuous wefts creating motifs in the cloth. For the general population, the term brings up images of unicorns and young women, historical textiles that are in fact woven in weft-faced plain weave; but it also has come to be used to describe narrative cloth, usually a wall hanging, and in that usage it has no relationship to structure.

The industrial textile world, using fully electronic looms where all wefts go from edge to edge, has come up with a compound structure that appears to have discrete areas of color, but still carries the weft from selvedge to selvedge. There is not much written on the topic, but when it appears, it is usually under the label of warp tapestry, warp-face tapestry cloth, or Gobelin weave. This type of fabric is very popular for upholstery because there are no long floats, making the cloth extremely durable and resistant to wear. Also, once the mill has established a series of weave structures that yield a rainbow of color, designers can substitute an abundance of imagery. You might know this structure from the popular and inexpensive throws and blankets that have become a staple of the tourist industry.

Essentially a warp tapestry is composed of a repeated sequence of colored warps and a rotation of wefts (usually two thick figuring wefts, one dark and one light, and one thin binder weft). There are many structural variations possible with this compound setup, but we will describe a common one.

### Imagery

When designing for a warp tapestry, design for the face of the cloth and then expand it before putting in the weaves. This is one of the few structures where a single pixel of color in the image is okay, because the expansion will make it large enough to become an interlacing area. Since you don't have to worry about pixellation (in fact, here is your chance to use those pixellated

images you love), your main concern is the number of colors in the design. Remember, the number of colors will translate into the number of structures in the cloth. Warp tapestry structures are very similar to one another, varying according to which warps are raised and which weft works on the face. Mathematically and practically warp tapestry yields a great number of hues and their tonal variations. It is not unusual for a warp tapestry cloth to have more than twenty structures, that is, twenty colors in its original design. This type of cloth will allow great freedom in the initial designing. Get your digital camera and capture the beauty of the changing leaves this fall. With warp tapestry you will be able to put them all into your final fabric.

## Structure

In warp tapestry a sequence of colored warps is repeated across the cloth in a sett that is very warp-faced. The number of warp colors will vary with the particular mill. Sometimes the mill will have the color rotation change in striped areas (called a “planted” warp), allowing even more variation in color without increasing the number of warp systems used. In some mills, a separate, thinner warp, wound on its own warp beam, is used as a binder warp. Other mills just assign their regular warps as the binder, making sure that the use is evenly distributed in their structures.

The rotation of wefts, composed of two figuring wefts and one binder weft, is kept constant throughout the cloth. The binder weft is thinner than the figuring wefts. It is important to design the weave structures keeping the sequence of warp colors and weft systems in mind.

The face of a typical warp tapestry appears to be a plain weave rep cloth, while the back—again, depending on the mill—might look like a twill, satin, or plain weave with longer floats. There are really so many possibilities of interlacement when you just consider the elements of a series of differently colored warps and a sequence of several wefts, but we will detail a structure based on double cloth.

## Warp Tapestry Using Four Warps And Three Wefts

In this example, the loom is set up with a rotation of four warps, all the same size: cyan, magenta, yellow, and black. Working on a jacquard loom (TC-1) with a sett of 30 epi, we chose 5/2 cotton for the warp. Since only one warp is raised to the surface, it means a sett of 7.5 epi on the face ( $30 \div 4 = 7.5$ ). The three wefts used in this sequence are black, white, and gray binder. The black and white figuring wefts are both 3/2 cotton, while the black binder is a 30/2 cotton.

The structure can be thought of as a stitched double cloth with some of the warps floating in the center of the cloth. Since a separate binder warp is not included, it is important to rotate the choice of the warp that acts as a binder

**Note: Follow along with our instructions, on your own files or on our demo files found in the CD, in the Chapter 13 folder. If you take one step at a time, you will understand what is happening.**

in the different structures. This way, we will not have one warp interlacing more often than the others, causing unwanted tension problems.

Here is the plan: first we want to create structures with the black weft on top. The choice of which warp acts as binder will affect the appearance of the structure, too. There are four warp colors, and combining each of these as top warp with any of the others as binder gives us twelve possibilities (cyan/magenta, cyan/yellow, cyan/black, magenta/yellow, magenta/black, magenta/cyan, etc.). Then we want to create structures (colors) that have our warps working with the white weft on top. That gives us the same warp combinations as above, only with the white weft on top, hence an additional twelve structures. Then we will consider other variations. All of the variables –warp color, weft color, binder color, weave structures, sett, yarn grist–will influence the final color, and we recommend that you do sampling on your own loom, with your specific yarns, to make your decisions.

## Describing the Structural Elements

Let's try to analyze what we want in a warp tapestry structure. On the face of the cloth, we will have a plain weave where the predominant warp color is raised over one of the figuring wefts and under the binder weft, while the binder warp completes the plain weave by floating under the top figuring weft and over the binder weft. At the back of the cloth we will have a warp-faced twill, bound by one of the figuring wefts, that we will designate as the back warp. It will look like a warp-faced twill when you look at the back of the cloth, but looking from the top down (when you make your structures) it will be a weft-faced twill. At the points where the back warp is above the back figuring weft, the binder warp will stitch below that weft. The other warps will float in the middle of the cloth. In other words, we have a double cloth with a plain weave on the face, a warp-twill on the back, stuffing warps in the center, and the two cloths are stitched together by the binding warp.

Let's make a chart that will help us in making our weaves. We will designate a top warp, a binder warp, a back warp, and a center warp, as well as noting which figuring weft works on top. Charts 1 and 2 use single warps as a figuring warp while Charts 3 and 4 use two figuring warps on top, and no center warp.

**Chart 1 – One Warp on Top, Black Weft on Top**

#	Top Weft	Top Warp	Binder Warp	Back Warp	Center Warp
001	Black	Cyan	Magenta	Yellow	Black
002	Black	Magenta	Yellow	Black	Cyan
003	Black	Yellow	Black	Cyan	Magenta
004	Black	Black	Cyan	Magenta	Yellow
005	Black	Cyan	Yellow	Black	Magenta
006	Black	Magenta	Black	Cyan	Yellow
007	Black	Yellow	Cyan	Magenta	Black
008	Black	Black	Magenta	Yellow	Cyan
009	Black	Cyan	Black	Magenta	Yellow
010	Black	Magenta	Cyan	Yellow	Black
011	Black	Yellow	Magenta	Black	Cyan
012	Black	Black	Yellow	Cyan	Magenta

**Chart 2 – One Warp on Top, White Weft on Top**

#	Top Weft	Top Warp	Binder Warp	Back Warp	Center Warp
013	White	Cyan	Magenta	Yellow	Black
014	White	Magenta	Yellow	Black	Cyan
015	White	Yellow	Black	Cyan	Magenta
016	White	Black	Cyan	Magenta	Yellow
017	White	Cyan	Yellow	Black	Magenta
018	White	Magenta	Black	Cyan	Yellow
019	White	Yellow	Cyan	Magenta	Black
020	White	Black	Magenta	Yellow	Cyan
021	White	Cyan	Black	Magenta	Yellow
022	White	Magenta	Cyan	Yellow	Black
023	White	Yellow	Magenta	Black	Cyan
024	White	Black	Yellow	Cyan	Magenta

**Chart 3 – Two Warps on Top, Black Weft on Top**

Note that there is no Center Warp in this series

#	Top Weft	Top Warp	Binder Warp	Back Warp
031	Black	Cyan, Magenta	Yellow	Black
032	Black	Cyan, Magenta	Black	Yellow
033	Black	Cyan, Yellow	Magenta	Black
034	Black	Cyan, Yellow	Black	Magenta
035	Black	Cyan, Black	Magenta	Yellow
036	Black	Cyan, Black	Yellow	Magenta
037	Black	Magenta, Yellow	Cyan	Black
038	Black	Magenta, Yellow	Black	Cyan
039	Black	Magenta, Black	Cyan	Yellow
040	Black	Magenta, Black	Yellow	Cyan
041	Black	Yellow, Black	Cyan	Magenta
042	Black	Yellow, Black	Magenta	Cyan

**Chart 4 – Two Warps on Top, White Weft on Top**

Note that there is no Center Warp in this series

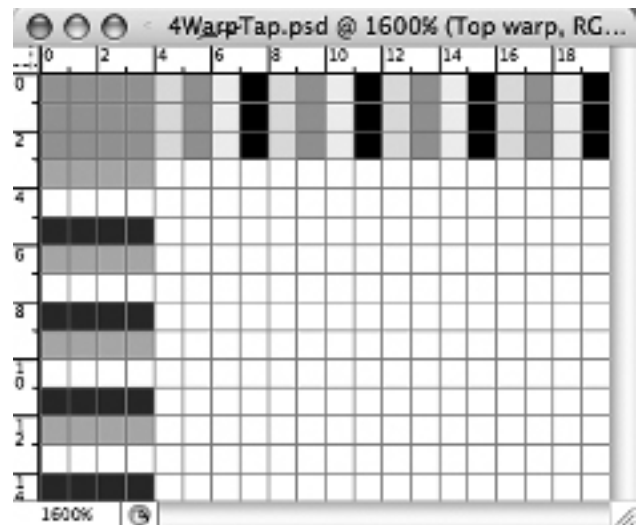
#	Top Weft	Top Warp	Binder Warp	Back Warp
043	White	Cyan, Magenta	Yellow	Black
044	White	Cyan, Magenta	Black	Yellow
045	White	Cyan, Yellow	Magenta	Black
046	White	Cyan, Yellow	Black	Magenta
047	White	Cyan, Black	Magenta	Yellow
048	White	Cyan, Black	Yellow	Magenta
049	White	Magenta, Yellow	Cyan	Black
050	White	Magenta, Yellow	Black	Cyan
051	White	Magenta, Black	Cyan	Yellow
052	White	Magenta, Black	Yellow	Cyan
053	White	Yellow, Black	Cyan	Magenta
054	White	Yellow, Black	Magenta	Cyan

All of these weaves are saved as Pattern Presets in the file *4colwarptap.2.pat*, on the accompanying CD, in the folder Chapter 13. Descriptions of weaves 001–024 may be found in the file *4WarpTapWeaves+labels.psd* and descriptions of 031–054 in *4WarpTapWeaves+labels2.psd*. A weave blanket, called *Blanket 96a.tif*, woven on 880 ends on the TC-1 is found in this folder as well. The descriptive key for the blanket is in the file *Blanket 96a Key.doc*.

You can also find the Pattern Presets in the master Weave Presets folder of the CD. You are encouraged to test these weaves on your loom by weaving this blanket, using other yarns and sett, to discover your own palette. Then when you are ready to assign weaves to your image, you may refer to the actual blanket for accurate color representation.

## Making Weave Structures In Photoshop

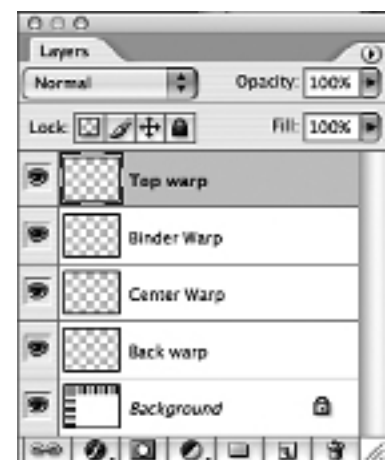
Open Photoshop and make a new file with the dimensions 20 pixels wide by 15 high. Save it as a template, with the name *4WarpTap.psd*. We are going to paint in a visual representation of the warp and weft colors along the top and left side of the file, leaving the remainder of the window area for the actual weave structure. The weave structure area will be 16 pixels wide by 12 pixels high. The reason it is 16 wide is that we want the back weave to be a 1/3 (total 4 ends) twill. Each face pixel of the design is going to be expanded to 4 pixels, one for each warp system. We will need four warps of one color, or system, to make that twill, so we need four repeats of our warp sequence for the width of our structure (4 warps x 4 repeats = 16). We need four repeats of the weft sequence for the twill too, so we need to increase the height to 12. In our example, each face pixel of the design will be expanded in height to three pixels, one for each weft system (3 wefts x 4 repeats = 12).



13-1

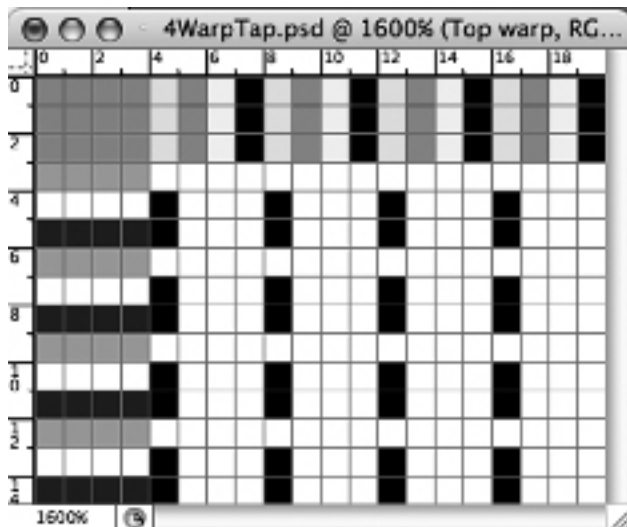
With the Pencil tool (make sure it has a dimension of 1), paint in the sequence of warps on the top columns (cyan, magenta, yellow and black from left to right) and the sequence of wefts (black, white, and grey for the binder, from bottom to top) on the left columns. The brown squares in the upper left corner are not used. Save this file.

This is the Background layer. We will now add four new layers, one for each warp system. **Layer>New>Layer**, and name the layer *Top Warp*. Do this a second time and name this layer *Binder Warp*; a third time and name this one *Middle Warp*; and a fourth time for the layer named *Back Warp*. The image still looks the same, as the new layers are transparent (they have no information in them yet); but the Layers palette now looks like Figure 13-2.

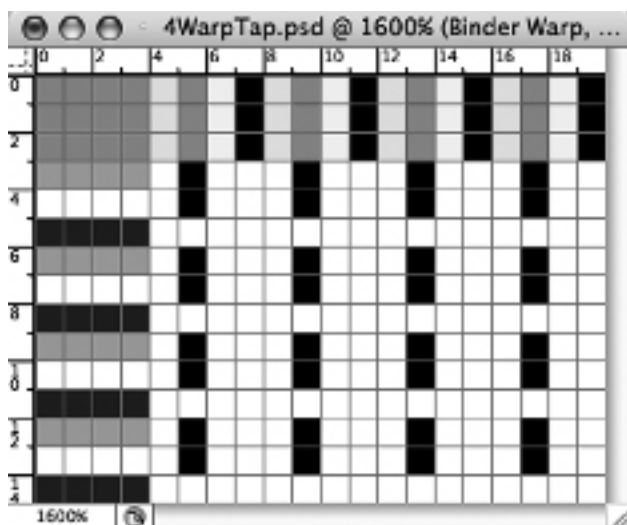


13-2

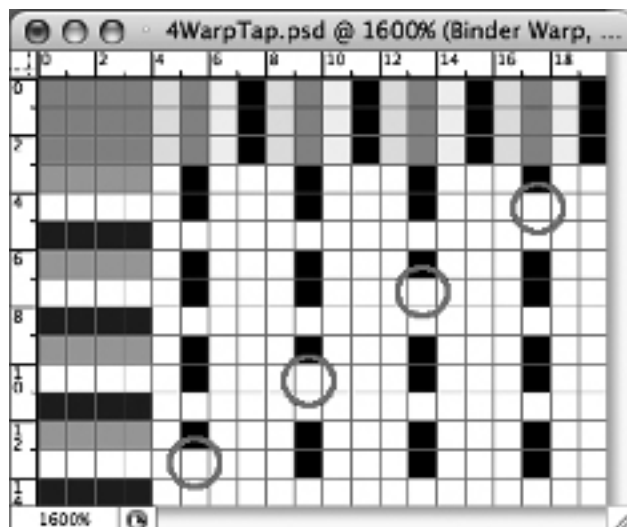
Referring to Chart 1 above, let's make the first weave structure, which has the following elements: Figuring weft black, top warp cyan, binder warp magenta, back warp yellow, center warp black. We want the cyan warp to be raised over both figuring wefts, but to lie under the binding weft. Highlight the *Top Warp* layer in the Layers palette. Choose the Pencil tool, 1 pixel size, color black (black indicates risers, or warp up). Now paint in the risers for the cyan warp on this layer (Figure 13-3 shown on the next page).



13-3



13-4



13-5

We want the magenta warp to be the binder warp. The binder warp is raised over the back figuring weft and the binder weft, but it lies under the top figuring weft. In the Layers palette highlight the *Binder warp* layer, unclick the eye icon on the *Top Warp* layer to make it invisible, click on the eye icon in the *Binder warp* layer to make it visible, so that it is the active layer. Draw in the risers on the magenta warps over the white and grey picks (13-4).

Remember we said that the binder warp also stitches the two layers of the cloth together? We need to go back and remove one stitching point in each group of four threads. The binder warp stitches under the back figuring weft, so remove the riser on the first magenta warp where it intersects the first white weft, then remove the riser on the second magenta warp where it intersects the second white weft, then remove the riser on the third magenta warp where it intersects the third white weft, and finally, remove the riser on the fourth magenta warp where it intersects the fourth white weft. We have circled the sinkers in Figure 13-5.

You probably used the white background color with your Pencil to remove those risers, but we want to eliminate them. In the Layers palette, remove the eyes to the left of all the layers except your *Binder Warp* layer. You should see a transparent ground, your black stitching points, and the four white squares where you removed the black. Select the Magic Eraser tool, making sure the Option Bar has a tolerance of 0, and that neither anti-aliased nor contiguous is checked. Click on one of the white squares and all of them will disappear. Turn the Background layer back on.

Now we need to paint in the back warp. This warp will look like a warp-faced twill viewed from the back of the cloth, but when we make our structures, we are looking down from the front of the cloth, so we need to paint in a weft-faced twill. Actually, this is easier for us because it is fewer risers to paint in. The back warp here is the yellow warp. It will be raised over the white figuring weft. We only need to paint in four risers, once in each warp color repeat. Be sure to highlight the

*Back warp* layer in the Layers palette, and turn off the eye icons in the other layers. Now paint in the four risers, where the yellow warp stitches over the white figuring weft (Figure 13-6)

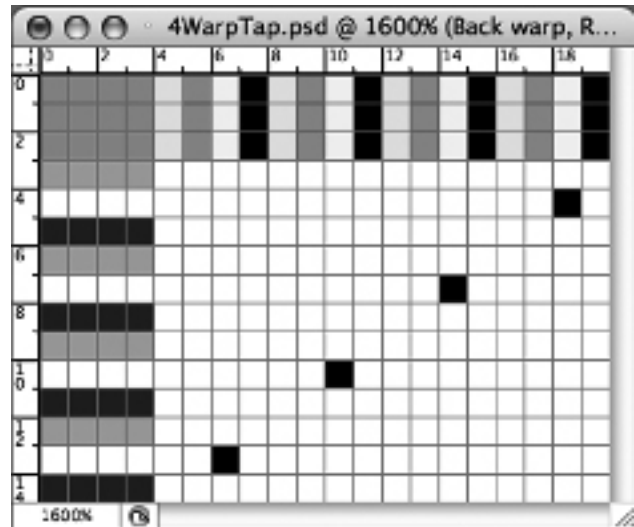
Now we need to paint in the warp that will float in the middle of the two layers. Highlight the layer called *Center Warp* and turn off the visibility of the other layers except the Background layer. We need the black (center) warp to exist above the back twill and below the top plain weave, so we need to raise it above the back white figuring weft, and keep it below the top black figuring weft and the binder weft. Paint in risers on this warp wherever it intersects the white weft (Figure 13-7). Turn on the layer visibility for all the layers (by clicking in the leftmost column of all layers in the Layers palette to reveal the eye icons). Our file now looks like Figure 13-8, with the structure in black and white in the lower right of the window, the warp color indications along the top, and the weft color indications along the left.

We are going to use the layered figure that we just created as the basis of the other weaves, so we want to save it as it is, with all the layers, then duplicate it so we can flatten it and save the structure as a pattern. So save the file. We saved ours as *4WarpTapModelBlackWeft*. Now go to **Image>Duplicate** and work on the duplicate.

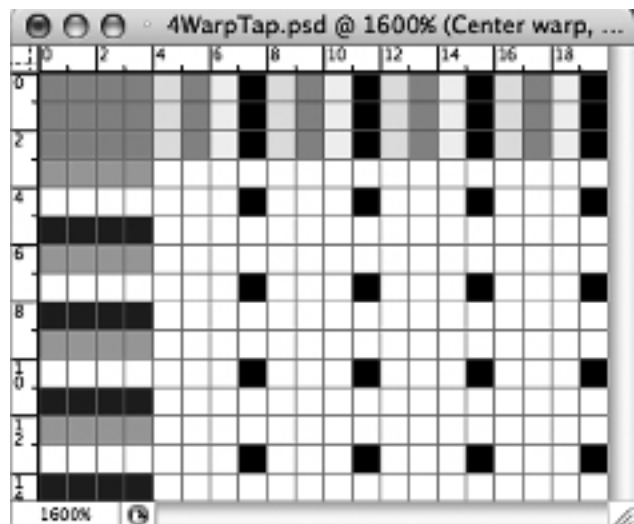
Click on the Rectangular Selection Tool in the Toolbox. On the Options Bar, set Style: Fixed Size, Width 16 pixels, Height 12 pixels. Click on the image so that the rectangular marquee encloses only the black and white squares of the weave image. **Edit>Copy Merged**. **File>New**, **Edit>Paste**, and then **Layer>Flatten Image**. Zoom in to maximum size. **Select>All**. (We will get back to this in a moment, but please read on.)

## Preset Manager

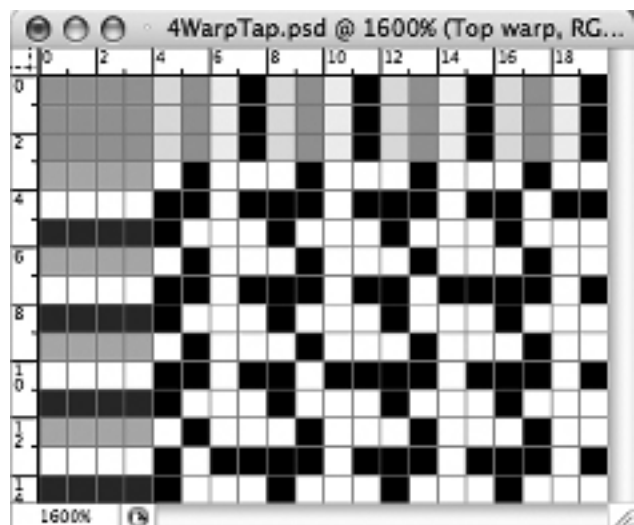
We have discussed Preset Manager with you before, but we will go over the steps again. We like to save groups of weaves that we will use together as folders under a master Weave Presets folder found in the Pattern folder of the application. To clear the Pattern Presets, so you can start with a fresh group, go to **Edit>Preset Manager** and



13-6



13-7



13-8

under the Preset Type select Pattern. If there are patterns loaded, click on the top pattern to highlight it, then scroll down to the last one, and holding the Shift key, click on that too. All your saved patterns will be highlighted, and choose Delete (ONLY do this if you have saved them previously). If you are not sure that you have saved them, save them first, then delete them.

## Naming Your Weaves

Now we will begin to save our weave structures. How will we name these tapestry structures so we will be able to identify them in the future? That is a big question, and one that you need to address for yourself. Just remember that weave structures build up quickly, and fancy names might get you in trouble. Figure out a system that will work for you, not against you. One system we know uses the first letter or letters of the top warp as a capital letter, then the first letter or letters of the stitching warp as a small letter, then a K (for black) or W to identify which figuring weft works on top. That would mean our weave example would be called CmK. Another system is to use the number of the warps and wefts. So this structure would be 1W for the first warp on top, 2B for the second warp as binder, and 1w for the first weft working on top, giving you 1W2B1w as the name of the structure. We use a simple system of three-digit numbers, with the letter “a” to indicate face of cloth and “b” to indicate reverse of cloth, to identify all of our structures in Photoshop.

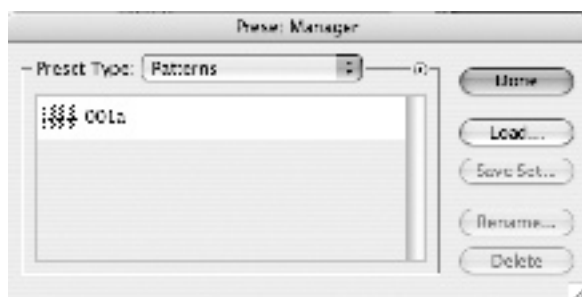
Besides having a collection of these weaves saved in the computer as Pattern Presets, we also create a document that contains a visual image of each of the weaves labeled with its name. We can then print out a hard copy of this document. Let’s open a new document that we can use for this purpose, as we make our structures. Go to **File>Open** and make a page 8.5 inches wide by 11 inches high, with a resolution of 30 pixels per inch, which will give us images that are large enough to read. Call this document **4WarpTapestryWeaves**.

Now we can save the weave structure, which has been patiently sitting there selected. Go to **Edit>Define Pattern**. A dialogue box will open; type in

*001a* or whatever name you have decided to use. Do you want to see if it got saved as a Pattern Preset? Go to **Edit>Preset Managers**, then choose Patterns and you will see it at the bottom of the list. If you cleared the list as we suggested, it will be the only item under Patterns (Figure 13-8b).

Now let’s save the image of the weave structure to our page. It should still be selected, if not, go to **Select>All**. In the Toolbox, click on the Move Tool, which is the icon in the upper right corner of the

Toolbox. When your cursor goes over the selected structure, you will see it turn into a little scissors. Click and drag the image onto your weave page document. Once it is there, you can use the Move tool to place it where you want it on the page .



13-8b



## Reverse Sides of Weaves

Think we are done? We didn't mention this before, but there is no reason why you can't use the twill weaves that appear on the back of your cloth as structures on the front of the cloth. This does not happen often in industry because the longer floats of the twill will abrade faster than the plain weave side of the structure. Abrasion will reduce the wearability of the fabric giving it a lower industrial rating, which can be a significant factor in terms of sales and meeting state mandated standard. If this is a concern for you, then you can ignore the next steps. However, if you are making wall hangings, or home furnishings that won't be subjected to industrial standards, then by all means follow our suggestions. You will see that from our base 24 weaves, we immediately have 48 weaves, with very little extra work.

Your weave structure should still be selected. If not, **Select>All**. Now go to **Image>Adjustments>Invert** (shortcut is **Command(Control)-I**). The black squares turn white and the white squares turn black. This is the structure that will bring what you see on the back of your first structure to the face of the cloth. The image should still be selected, so choose **Edit>Define Pattern** and type in a name. We called ours *001b* ("a" for the plain weave, or face structure, and "b" for the twill, or back structure to the face). Now bring the inverted structure to the weave page by choosing the Move tool and dragging your image to that document (Figure 13-11 and 13-12). Save your document, just to be safe. You no longer need the flattened copy of the weave, so you can eliminate that small temporary file.

## Structural Variations

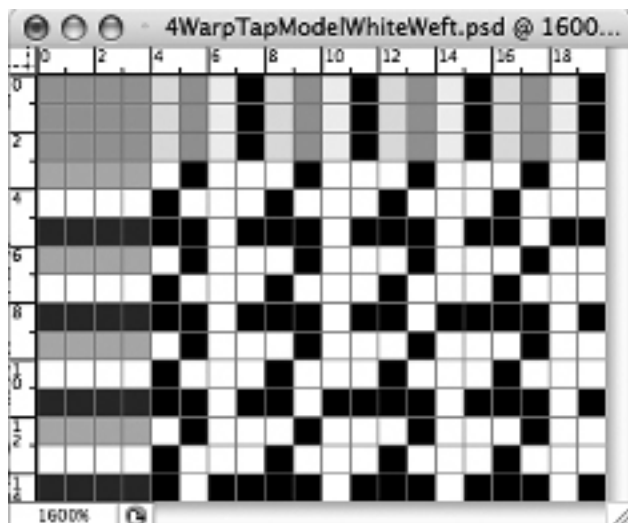
You can make three variations of these tapestry weaves for each warp color, rotating which warp is used for the binder, working with the black figuring weft as the top layer. This makes a total of twelve weaves. If you add the reverse sides of the weaves to your Presets, you then double the count to 24 weaves. If you then construct the same weaves with the white figuring weft as the top layer, you double the count again. There are now 48 weaves. In each instance, the main warp color will dominate, but it will be influenced by the addition of the binder color. In our experience, many of the colors are similar, and you probably will edit it down to a smaller, usable palette. However you can't edit until you see them in the actual cloth configuration of your warp and weft colors and sett. We suggest you continue and make each possibility on your own. It will be good practice, and you will be able to make your own determination about whether the variations are useful to you or not. Before you do this, though, continue with us, making some other structures from our charts.

Structure 001a has the first warp system (cyan in our example) weaving on top with the first figuring weft system (black in our example). Structures 001 through 012 represent the variations in the Chart 1. If we have the same structure with the white figuring weft (second weft system in our example), the color in the cloth will be lighter. This will be true with all our structures—black weft darkens the hue and white weft lightens the hue. So let's make

a new structure, 013a, that has the cyan warp on top with the white weft, keeping the same binder warp (magenta), back warp (yellow), and inner warp (black)—Chart 2 is the same as Chart 1, except that in the column Top Weft we have indicated White.

Open up your file, *4WarpTapModelBlackWeft* (or whatever it is you called it). Duplicate it, close the original and work on the duplicate. Rename it *4WarpTapModelWhiteWeft*. You will see you have all the layers available to you. The Background layer, which shows the warp and weft layouts, remains the same. Your Top Warp layer, which shows the cyan warp floating over both figuring wefts, also remains the same. The center warp must be changed. In the Layers palette, click on *Center Warp* to highlight it, and turn off the visibility of the other layers, but leave the Background visible. Choose the Move tool (keyboard shortcut V). Click the down arrow on the keyboard once, to move the risers for the black (center) warps from the white wefts to the black wefts (remember, the center warp floats between the top figuring weft (white) and the bottom figuring weft (black)).

We must also change the stitching of the binder warp, and the stitching of the back warp. Let's change the *Binder Warp* layer. Click on its name, so that you have selected that layer to work on. If you click on the eye next to the *Top Warp*, *Middle Warp* and the *Back Warp* layers, they will become invisible. Do this if it helps you to see your work, as we have done, so you are seeing just the Binder Warp and Background layers. What do we want this to look like? We want the binder warp to be raised over the back and binder wefts and to be under the top weft (in this case, the second weft, or white weft). Then we want to remove one stitch point in each column so that the binder is under the back weft (under the black weft). First, paint back the stitcher points that were removed—one on each column, so each binder warp is under one, over two, up the column. Click on the Move tool, and move the layer down twice (you can click on the down arrow of your keyboard twice to do this). Paint in the top pixel of each column, where the binder warp is raised over the binder pick.



Now we need to remove one riser in each column, to create the stitching of front to back layers. On the first column, using your Pencil tool with white fill, click on the intersection of the first black weft and the first binder warp; then the intersection of the second black weft and the second binder warp, then the intersection of the third black weft and the third binder warp, and finally the intersection of the fourth black weft and the fourth binder warp. We want to remove the white squares from the layer, so click the eye next to the Background layer to make it invisible, letting you see those white squares. Select the

Magic Eraser and click on one of the white squares to remove all of them. You have redone your *Binder Warp* layer.

Now we will change the *Back Warp* layer. Right now, it stitches a weft face twill on the yellow warps and white wefts. We want it to stitch this structure with the yellow warps and the black wefts. It stitches up when the binder warp stitches down. Click on the layer name *Back Warp*, so you are working on that layer, and using the Move tool, bring the layer down by one pixel, using your down arrow key. It only takes one click on the down arrow to make this change.

Be sure to save this new layered structure, because it will become the model for the white weft. We called ours *4WarpTapModelWhiteWeft*. See Figure 13-9.

We have created a new weave structure, which we want to save both to the Presets and to our structure page for printing. Duplicate the template and work in the duplicate. Make a Fixed Selection Marquee 16 pixels wide x 12 pixels high. Click on the image in the top left square of the structure to select only the structure. If you have clicked in the wrong spot, you can use your arrow keys to move the Selection Marquee to the right place. When properly aligned, go to **Edit>Copy Merged**, then open a new file (it will automatically have the 16x12 pixel dimensions), **Edit>Paste**, and **Layer>Flatten Image**. **Select>All**, then **Edit>Define Pattern**. A dialogue box will appear allowing you to name your structure. We called it *013a*.

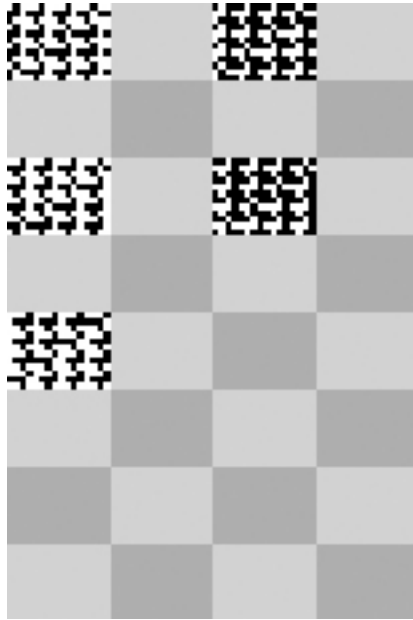
With the image still selected, choose your Move tool, and drag the structure onto your structure page. Still using the Move tool, move it into the place you want it, and deselect on that page.

Go back to your image, which is still selected, and choose **Image>Adjustments>Invert**. Now choose **Edit>Define Pattern** and give it a name. We called ours *013b*.

Finally, with the Move tool, drag the inverted structure to your weave page and move it to the place you want it. Remember, the arrow tools will let you move the image one pixel at a time, in the direction of the arrows. Deselect and be sure and save your Weave Page. It should have four weaves on it now, and eventually it will have all your tapestry weaves. You will not be able to label the weaves yet, because the image resolution of this page is only 30 pixels per inch—perfect for weave images but not for text. The labeling comes later.

## Managing the Weaves Page

To keep the weave images lined up nicely on the page, we have found it helpful to start with a background of rectangles exactly 16x12 pixels. To do this, create a temporary file 32 pixels wide by 24 pixels high. Zoom in to the maximum level. Select the upper left quadrant (16 by 12 pixels) and the lower right quadrant and fill with pink. Select upper right quadrant and lower left quadrant and fill with mint green. Now **Select>All** and **Edit>Define Pattern** (call it something like Quadrants). Go to the Weaves page and select the Background in the Layers palette. **Edit>Fill**, and choose **Fill with Pattern**.



13-10

In the Fill window, scroll down until you see your new checkerboard pattern. Click OK. The background of the page will now flood with a checkerboard pattern, starting at the upper left corner. This is exactly what you want! You may now dispose of the temporary 32x24 pixel file.

This checkered background is useful in two ways—if weaves are dragged onto it or copied onto it, they may be moved with the Move tool until they line up exactly over pink rectangles, keeping everything neat. If you should want to add weaves to the page via the Pattern Presets, the checkerboard ensures that the weaves flow in correctly from the upper left corner. Here is how to do it: Work on a new layer in the file (you may want to name this layer *Weaves*) With the Selection tool, fixed size 16x12, click on the screen, aiming for a pink rectangle. If you are slightly off, move the marquee around until it exactly coincides with a pink rectangle. Then **Edit>Fill**, fill with pattern, and scroll down until you find the weave you are adding to the page. The Pattern Preset will flood in correctly from its upper left corner.

You will notice by now that every time a new weave is added to the weaves page by dragging or pasting (not by a Pattern Fill), it is put into a new layer. These layers may be merged by having the layers you want to be merged visible (their eye icon shows), and highlighting the layer whose name you want to keep (be sure the Background layer is not visible). Go to **Layer>Merge Layers**. Now turn on the visibility of the Background Layer. It has retained its identity as a separate layer and the checkered background remains visible where there are no structures.

After you complete filling the page with structures (read on), we will explain how to label the structural images for printed reference.

### **Adding Structures**

You don't need your flattened structures (*013a/b*) image anymore, so you can delete it. You do have two files, both in layers, which are models of structures using the white or black wefts on top. You will start with these models to create the other structures in your list. We will quickly go through the demonstration of having the magenta warp on top with yellow as binder, black as back warp, and cyan in the center. Structures 002a and 002b will have this configuration with the black weft on top, and then inverted. Structures 014a and 014b will have this configuration with the white weft on top, and then inverted.

Start with your *4WarpTapModelBlackWeft* file; duplicate it, then put away the original and work on the duplicate file. Make the Background layer the only visible layer. The Background remains the same, and remains the same for all your structures with this warp and weft configuration. Make the *Top Warp* layer visible and the active layer. Click on the Move tool, and click once with your right arrow. You have moved the top warp risers onto the magenta warps. (When you make your structures for the other warp colors,

you will move these marks to those warps, that is, to the yellow and to the black warp columns.)

Make the *Binder Warp* layer visible and active. Move the marks from the magenta warp to the yellow warp.

Now make the *Back Warp* layer visible and active. Move the marks from the yellow warp to the black warp.

We need to raise the cyan warp, which is the center warp that floats between the top and back layers. Make the *Center warp* layer active and visible, with all the other layers, except the Background, invisible. Move the marks so they fall on the cyan warp columns.

If you click on all the eyes now, letting you see all the layers, you have a completed new structure. In case you need to change something, save this with all its layers as **002.psd**. Select the structural area (the lower right section) with a fixed 16x12 Selection tool, copy it, make a new file the same size, paste, flatten, select all, **Edit>Define Pattern** (our name is 002a) and also drag it onto your weave page (placing it in a pink quadrant). Then invert the selection, save it as a Preset (we called it 002b), and then drag that to the weave page. Resave your weave page, which now has 6 structures. You no longer need the flattened image, so you can delete that file.

Open the *4WarpTapModelWhiteWarp* file, and duplicate it. Work on the duplicate. Follow the same steps as above, moving the marks on each layer so they fall on the proper warps and picks for Preset 014a (see Chart 2). Save both this version and the inverted version (014b) as Presets and on your weave page.

Create the remaining structures from Charts 1 through 4, including their inverted versions. Just follow the steps above, and you will be okay. You may see the final weaves page in Figure 13-11 and 13-12 (but first we tell you how to add labels to your page). Try to make them yourself, and then compare your flattened image to ours to see if you have made them correctly. If there is a difference, try to find the reason, and correct your file.

## **Adding Labels to the Weave File**

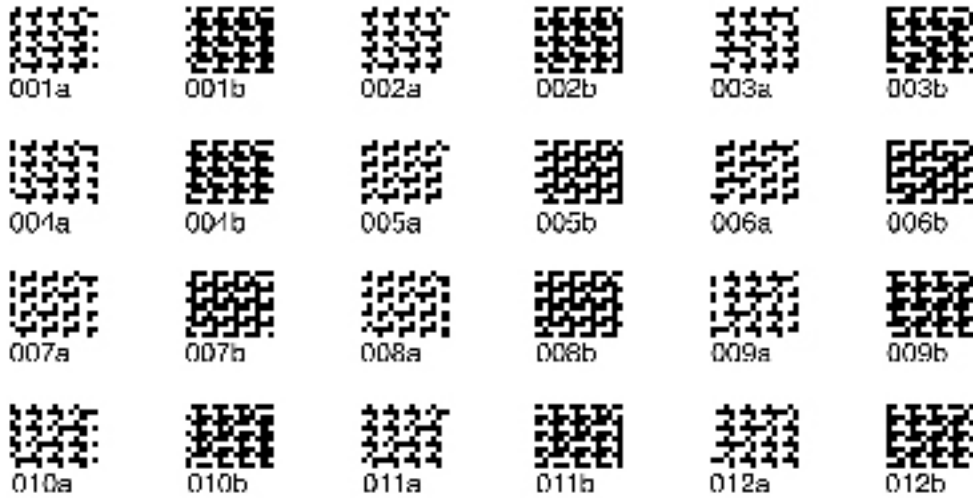
After all the weaves are added to your Weave File, it is time to add the labels to the page. The page was created at a resolution of 30 pixels/inch. We will now convert this image to a resolution of 150 pixels/inch (150 being an exact multiple of 30, and sufficiently large to permit readable text). **Image>Image Size**, and in the Image Size window check the Constrain Proportions and Resample Image boxes; Resample Image should be set to Nearest Neighbor; and in the Resolution box, enter 150 pixels/inch. Click OK. Choose the Text tool, set the font size to 12 points in the options bar, set the color to black, click beneath the first weave image, and type *001a*. Hit the space bar repeatedly until the cursor is beneath the second image, type *001b*, and continue in this way along the entire first row of weaves, adding the appropriate labels. At the end of the line, click the check mark in the options bar to accept the labels. For the second row, click beneath the first weave in the second row, type in the label and proceed as for the first line. You will notice that each time you

---

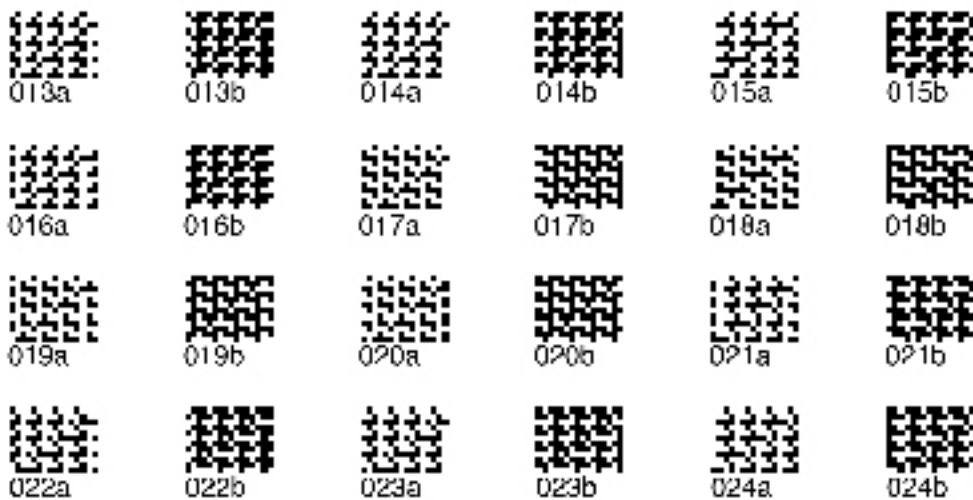
# 4 Color Warp Tapestry Weaves

One warp on top

## Black Weft on Top



## White Weft on Top



13-11

start a new row of labels, a new text layer is created in the Layers palette. You may edit text in a layer by highlighting the layer in the palette, then clicking an existing text with the Text Tool.

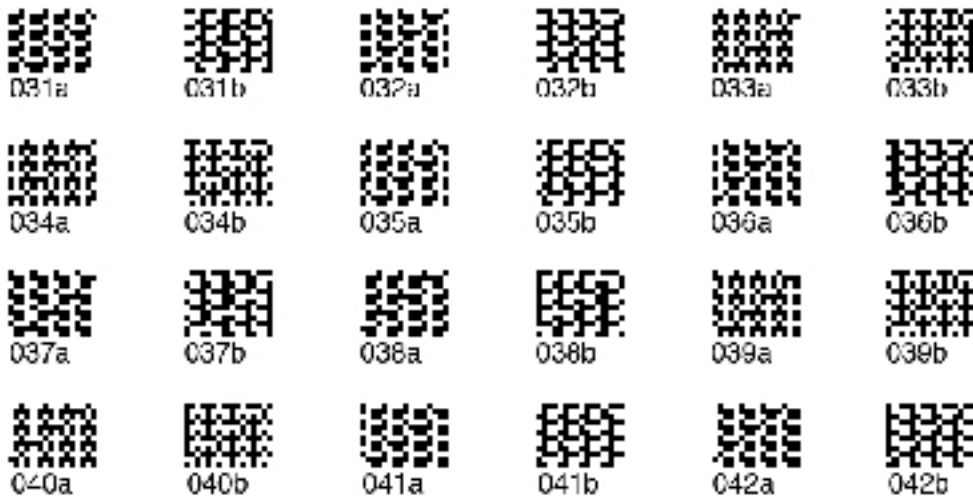
If you wish to print out the Weave File for handy reference, one more step is needed. Highlight the Background layer, then **Layer>New>Layer** to

---

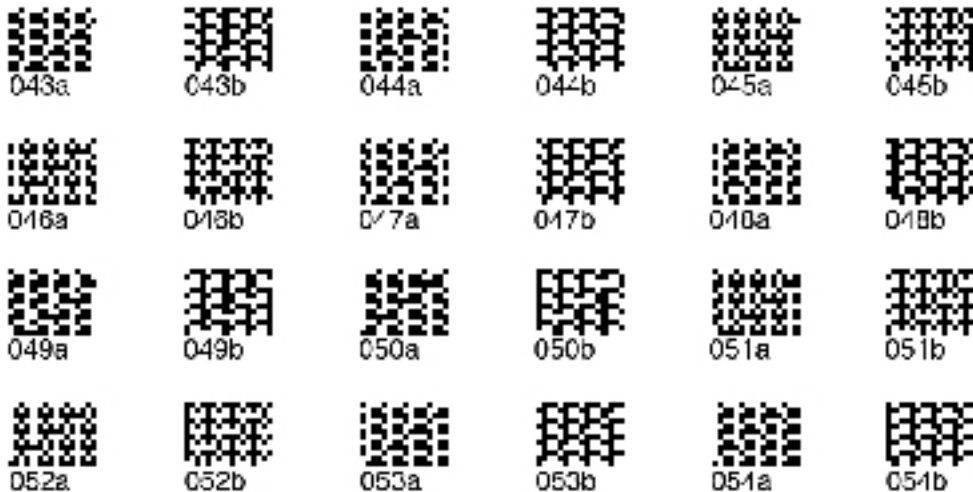
# 4 Color Warp Tapestry Weaves

Two warps on top

## Black Weft on Top



## White Weft on Top



13-12

create a temporary layer to hide the checkerboard, and fill this layer with white (**Edit>Fill**, use White).

The file now looks like Figure 13-11. We have created an additional 24 structures (and named them 031 through 054, a and b), by bringing two warps at a time to the top layer and eliminating the center warp. These structures were created according to Charts 3 and 4, above, and can be seen in Figure 13-12.

## Structural Variations within this System

If you weave all of the structures in plain weave, you will see that you have shades and tints of the four warp colors. The warp color is affected by the color of the figuring weft—in this case, white or black. If you use a different color weft, you will shift the tone of color. Just remember that it will shift all weave structures since the wefts work edge to edge.

All the structures are modified by various factors: which warp or warps is on top, which warp is the binder, which weft is on top. You can see that color is limited only by your willingness to make new structures and test them.

## Designing with the Tapestry Warp Presets

You now have a collection of structures that you can use in any image designed for Warp Tapestry with a 4-end color rotation. Most mills make structural blankets that their designers use—selecting color for their designs from the cloth. We recommend that you also make weave blankets that you can use for your work. As we said, there are many structural variations, and after you test them, you can compress your choices to give yourself a working palette that will have tonal variations in large steps as well as small ones.

We are going to create a design file, assuming a warp of 880 ends set at 30 epi. Although this is not a common sett for industry, we wanted to create an example of warp tapestry that we could weave on a TC-1 with a warp sett of 30 epi. We recognized that the size of our yarn might interfere with the way the colors visually blend.

## Design for the Face of the Cloth

We design for the face of the cloth. In our example, with a rotation of four warp colors, we must divide 880 by 4, which gives us the width of our design ( $880 \div 4 = 220$ ). 220 is not very big, but it will do. This means we must take the design, whether it is from a digital image, a scan, or a drawing on the computer, and bring it down to 220 pixels wide. We are working with square pixels, and later we will resize for the true Pixel Aspect Ratio of the cloth.

As we mentioned earlier, because we will expand the design (in our case, each pixel of the face design will become four pixels wide by three pixels high), we do not have to worry about stray single pixels. We started with a digital photograph 1600 pixels wide by 1200 pixels high, with all corrections and adjustments made to the image, *FrangiTapStyled.psd* (you can find it on the CD under Chapter 13, folder *FrangiTap Workfiles*). We duplicated this file, put the original away, and worked on the copy. We resized it proportionately to 220 by 165 and flattened it. We also changed the resolution to 7.5, which is the face epi of our cloth. The image is 29.3 inches wide by 22 inches high.

The main work we have on the file is to reduce it to the number of colors we want to use. We have woven a blanket with samples of all our warp tapestry weaves, and we would like to use eight of them in our first project. So we will have to reduce the number of colors in the design to eight.

**Image>Mode>Indexed**, Palette: Local (Adaptive), Colors: 8, Forced: None, Transparency unchecked, Dither: Diffusion, Amount 100% (you may



choose to have no dither). If the Preview box is checked, you will immediately see the effects of your choices. Choose different numbers of colors in this window and see the results. When satisfied, click OK. If you are working with a mill and have 6 or more colors in your warp rotation, your sample blanket may provide a huge palette, and you might want to have 20 or more colors in your design. But if you are working with only 4 warp colors on a handloom and have a correspondingly smaller palette, you will most likely choose fewer colors. It is interesting to see how few colors you can use and still have an acceptable image. We have reduced our choices to as few as four colors on occasion and still had a pleasing result with warp tapestry. In this particular example, as we previously mentioned, we have chosen to work with 8 colors. Our indexed file, *FrangiTapIndexed.psd*, is in the *FrangiTap Workfiles* folder of Chapter 13.

By using diffusion there are many single pixels of color in the image. In another type of cloth construction, these probably would be unacceptable, but here, when the image is expanded, the single pixels become visible, interlaced elements. We really like how they help articulate the images and increase the number of perceived colors. Figure 13-13 shows a blown up section of the indexed file showing the single pixels created by selecting diffusion.



13-13

## Resizing the File

We are ready to put weaves into our file, but first we must resize the image. We already determined that we want our file to be 29.3" wide x 22" high. The face of the cloth was set for the warp, knowing that 7.5 ends per inch would be multiplied by four, giving us 30 epi and a total warp of 880 ends. Go to **Image>Image Size**. In the dialogue box, first uncheck both Constrain Proportions and Resample Image, and then change the resolution to 30, which is the true epi of your loom. Now keeping Constrain Proportions unchecked, check Resample Image and make it say Nearest Neighbor. Change the number of warps to 880. You will see your image size is now 29.3 inches wide. Click OK and look at the image; it still needs to be resized for the weft.

When you weave your structural weave blanket, you will need to count the true picks per inch, which will vary depending on the size of your weft yarns. In our case, we found out that we had 24 picks per inch. Since we want our image to be 22 inches high, we can multiply 22 x 24 to get 528 picks total. Go back to **Image>Image Size**, be sure to have Resample Image set on Nearest Neighbor, and do not have Constrain Proportions checked. Change the height of the design to 528. Click OK and your image is resized and ready for weave structures. Do you want to see if the height is correct? Go back to **Image>Image Size** and uncheck both Constrain Proportions and Resample Image. Make your resolution 24. You will see the height of the design is 22 inches. Just what you want. Just hit cancel and get out of that window. Be sure and save your resized file as *FrangiTapWeaves.psd*, ready for putting in weaves.

### **Viewing the Design with Correct Pixel Aspect Ratio**

At this point the design appears somewhat squashed in height because it is sized so that the ends per inch (30) and picks per inch (24) are accurately counted. If epi and ppi were exactly the same, the image would appear in its correct Pixel Aspect Ratio, but as they are different, the image appears distorted. We may view the image with non-square pixels to make it appear correct on the screen, even though this does not change the actual pixel dimensions.

To find the Custom Pixel Aspect Ratio of the image, divide the picks per inch by the ends per inch. In our example, divide 24 by 30 to get an Aspect Ratio of .8. Go to **Image>Pixel Aspect Ratio>Custom Pixel Aspect Ratio**, and in the dialog box name the new ratio (we called ours *4ColWarpTap*), and fill in a Factor of .8. Now the image will appear correct on the screen, although it is still sized at 880 x 528 pixels. At any time you may switch back and forth between square pixels or your Custom Pixel Aspect Ratio, without changing the actual pixel count in the file.

### **Inserting Weave Structures**

You have already done this with other weave structures. You need to return to RGB mode so that you can make layers for each color of the design. Remember, **Command(Control)-J** is the shortcut for turning a selected color into its own layer. Name each layer (ours are named red, lt gray, med gray, dk green, black, dk gray, lt green, brown).

We have eight layers now in addition to the Background, and we want to assign a weave structure (Layer Style) to each layer. You have done this before. Click on the layer name to make it the active layer, then at the bottom of the Layers palette, choose the Layer Style icon, then choose Pattern Overlay. Uncheck Link with Layer, open the Pattern Presets and select your chosen structure. Do this for every color layer, until your design is completely filled with black and white weave structures.

We chose the following weaves for our eight layers. The colors, while not exact according to the image, are the closest or most pleasing approximations

chosen from the actual weave blanket. Your choices from your blanket may vary. We could also have chosen some of the reverse sides of the weaves, or the “b” weaves, for some of our colors.

<b>Pattern Presets Chosen to Replace Color in Image</b>	
<i>Color in Image</i>	<i>Pattern Preset</i>
<i>Red</i>	<i>002a</i>
<i>Lt gray</i>	<i>017a</i>
<i>Med gray</i>	<i>021a</i>
<i>Dk green</i>	<i>034a</i>
<i>Black</i>	<i>012a</i>
<i>Dk gray</i>	<i>004a</i>
<i>Lt green</i>	<i>048a</i>
<i>Brown</i>	<i>052a</i>

To check that all layers are filled with weave structures, add a temporary layer just above the Background and fill it with a distinctive color not found in the image. We have chosen turquoise in our example. If any turquoise “leaks” into the image, we know there is an error in the layer assignments, and we must recheck them. You might have to change the zoom size to see accurately since images zoomed out sometimes show flows that are not really there. You also might need to view the image with square pixels for this step. So zoom in to see pixels and scroll through the design looking for leaks of the temporary color (turquoise) layer. You can find our image with the temporary color layer and weaves added as Layer Styles, named *FrangiTapWeaves.psd*, in the Chapter 13 folder.

Save the file. Now duplicate and flatten the image. Change to Indexed mode (**Image>Mode>Indexed**) and it should read Exact and 2, meaning it has only black and white in it. Save this file as .bmp or .tif and you can bring it to a loom and weave it. We saved ours as *FrangiTap.tif*.

One caution: be sure to have your weft sequence the same as in your weaves (heavy black, heavy white, and thin binder in our case), or else all your structures will be different, resulting in color variations that you did not anticipate. If you find you calculated your ppi wrong, go back to your weave file (*FrangiTapWeaves.psd* in our case) and resize it correctly. Be sure the height of the file in pixels is a multiple of three, to correspond to the 3-weft repeat. If you saved your file with layers and assigned weaves as Layer Styles, the weaves will snap into place correctly in the layers, regardless of their height, and you will quickly be weaving again.

Vibeke Vestby has given us an ingenious method of showing a cloth simulation on screen, starting with the loom-ready .tif file. Refer to Appendix C



13-14 A Cloth Simulation

for the details of this process. In Figure 13-14 you may see a portion of our simulation of *FrangiTap*, following Vibeke's method. There is also a color photo of the finished weaving in the CD.

## Other Structural Variations

Though we will not detail the possibility of other structural variations from the base warp setup, we want to point out that you have unlimited possibilities here. You can create weave structures with one weft system that raises some warps to the surface, floating the others on the back, stitching them occasionally. You can also do a similar type of cloth but use a secondary weft that acts just to stitch the back warps into a web. Usually this weft is

not thrown on every pick. Again, it is your choice whether you stitch the front and back cloths together or not. It is also possible to turn the warp tapestry construction, so that the multiple warp colors become weft; if your original weave contained fine binder wefts, these would also become warp, and might require a separate beam. Turning the warp tapestry construction 90 degrees means you will be weaving with many shuttles.

If you have access to an interior design center, or are friends with an interior designer, see if you can get some small swatches of current industrial fabrics, known as memo samples. They will give you new ideas about structure, and if you are really into detail, you can pick them apart to figure out the structures. Now that you know about this type of cloth, you will notice examples of it in fabric stores handling home furnishings yardage, as well as in retail stores and mail order catalogs selling novelty throws. Images of state flags, teddy bears, and sunsets abound, but we think you can do more interesting work yourself.

**Note: Appendix D, Preparing a File for an Industrial Stäubli JC5 Jacquard Head, gives you information on designing warp tapestry files for a loom at Beljen Mills. The information is precise, and gives you access to a fantastic weaving opportunity.**