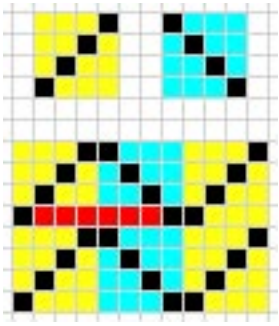
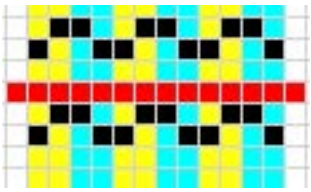
Fixing floaters

Floaters are threads which "float" above a fabric's surface for an unacceptably long distance; by doing so they disturb the surface texture and create loops subject to snagging on sharp objects.

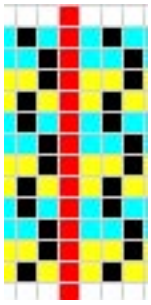


Floaters are created along the boundaries between different weaves. In essence a floater is created when one weave leaves off just before it would have caused an interlace and is followed by a weave which would have interlaced earlier.

Consider the two 4x4 Twill weaves shown to the right. Each weave has an inherent float length of 3. However, when placed side-by-side they create the weft float of 6 (highlighted by the red line), even though each weave is "playing out" in full repeats.



The situation is more complicated when the design features are smaller than the dimensions of the weaves being used - thus preventing each weave from completing full repeats. The Twills in this example are 4x4 while the "features" shown are 2 wide or 2 high. In such cases we can get very long floats indeed!



Most Jacquard designs fall into this latter category - so it is always necessary after the weaves have been applied to find and repair the "*floaters*".

There are 4 flavors of floaters: *warp-face*, *warp-back*, *weft-face* and *weft-back*, which differ only in whether it is a warp or weft thread that is floating and whether it is floating above the top (face) surface or below the bottom (back) surface. In the first example we see a (horizontal) weft-face floater where no warp is passing over the weft, leaving the weft unattached on the face, and in the second a (vertical) warp-back floater where no weft is crossing under the warp, leaving the warp unattached along the back.

The length of a floater is its defining characteristic. Threads float in all weaves - an 8-shaft weft satin by design contains weft-face and warp-back floats of length 7. A "*floater*" exceeds the normal float length by some amount. A fabric based on 8-shaft satins must accept floats up to 7 as inherent, but the designer might define a length of 11 or above as a "*floater*" in need of repair. Floats between 8 and 10 would thus be accepted by that designer as acceptable consequences of mixing weaves.

The maximum acceptable float length depends on many things - the yarn densities, the intended use, whether both surfaces are exposed and subject to wear, etc. For instance in upholstery fabrics the back surface will be hidden so longer back floats can be tolerated while the face will be exposed to constant wear so face floats must be tightly controlled. On the other hand, both surfaces of apparel fabrics are visible and exposed to wear so control of floats is important on both surfaces. As a very approximate rule of thumb, a 1/4 inch float may be OK while a 1/2 inch float will be easy to snag; the exceptions are far more common than the rule...

"Fixing" a floater is done by changing a Miss to a Cut or vice-versa. Weft-face and warp-back floaters are fixed by inserting a Cut to force a warp to cross over a weft, thereby binding down the weft-face floater or the warp-back floater. Weft-back and warp-face floaters are fixed by inserting a Miss, forcing a warp to cross under a weft. Of course the question is: where?

The first step in float fixing is to evaluate the problem. JacqCAD's **Measure » Float Lengths** provides a chart which summarizes the frequency of each float length and type. This provides data to help the designer in deciding which lengths should be considered floaters - a trade-off between excessive control (floater lengths set too low) which requires excessive editing versus too relaxed an approach (lengths set too high) which minimizes the editing but might compromise quality.

The next step is to locate and fix the floaters. Locating is easy, fixing a bit more complicated because fixing a floater can create a new one. For example, when fixing a weft-face floater one needs to bring up a warp end. But if the End chosen happens to be down under the float but up in picks above and below, raising it may create

a new warp-face floater. In other words, the "fix" must be based on its context.

JacqCAD's **Measure » Float Lengths** creates a chart similar to the one shown here. This is from a design based on 5-shaft satins which have a normal float of 4 in weft and warp. Notice a number of "floaters" of lengths 7 to 10 which clearly need repairs. It may even be possible to repair lengths of 6, though certainly not those of length 5.

Leng	Weft Face	Weft Back	Warp Face	Warp Back
1	160711	504370	505124	160791
2	12041	12310	19113	18952
3	10763	12298	18819	16991
4	477404	129705	113139	461345
5	9198	10513	16587	15403
6	102	0	12	205
7	0	0	3	1
8	0	0	5	0
9	0	799	1001	0
10	0	0	2	0

Both surfaces of this fabric are exposed and the warp and weft densities are comparable (about 30/inch) so a float of 6 is 6/30 or about 0.2 inches. OK from a snagging perspective but 50% longer than the inherent floats so possibly visually distracting.

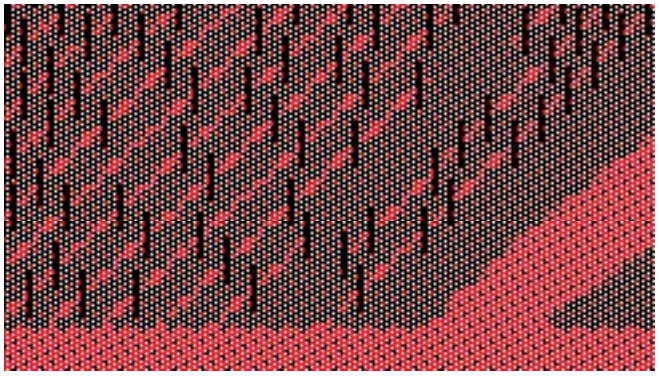
At present the floats are determined by treating color #255 (black) pixels as "Cut" and all other colors as "Miss". So as a first step you must cut your weaves into the design (save a copy before hand!).

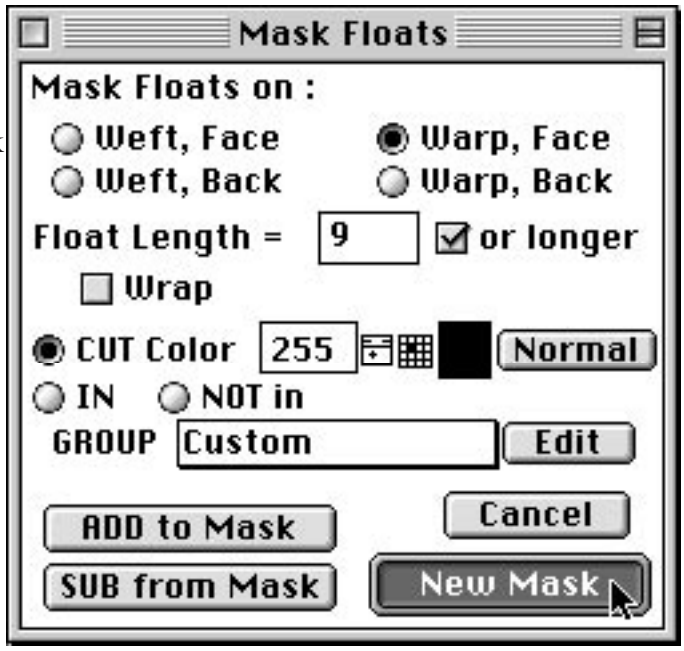
The Float Lengths are measured within a selected area (or the entire image if no selection is present). This makes it possible to analyze selected areas of a design if desired. The more important purpose is to let the user select only the design area when the image also includes other zones such as selvedges, weft selectors, regulators or other controls.

So, unless your image only contains design (pattern), the first step is to create a rectangular selection which includes all the design and none of the extras. It is convenient to use **Special » Outline Mem » Copy to Mem** to save this selection for later re-use - you will want to call **Measure » Float Lengths** repeatedly to evaluate progress as you fix the design so having the selection in the Outline memory for instant recall will be a time saver.

Having gotten the Float Lengths chart, decide on your first phase of float fixing. I generally find it best to start with a group of extra-long floaters, for example 9 and higher in the example we are using. The reason for this gradualist approach is that the context of a 9-long warp-face float is likely to be quite different from one 6-long; concentrating on a small range of lengths make it easier for me to spot recurring patterns to which I can apply the same solution.

The most important tool is **Special » Preset Finds » Make Mask from Floats**. This creates a Mask which protects (hides) everything except the targeted floats. In the example (from the design we are using) I have created a mask which shows only warp-face floaters longer than 8. As expected, the floaters are occurring in areas where the figure elements are small compared to the weaves.



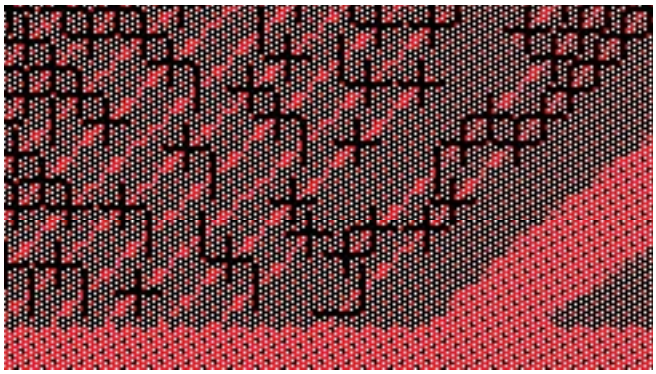


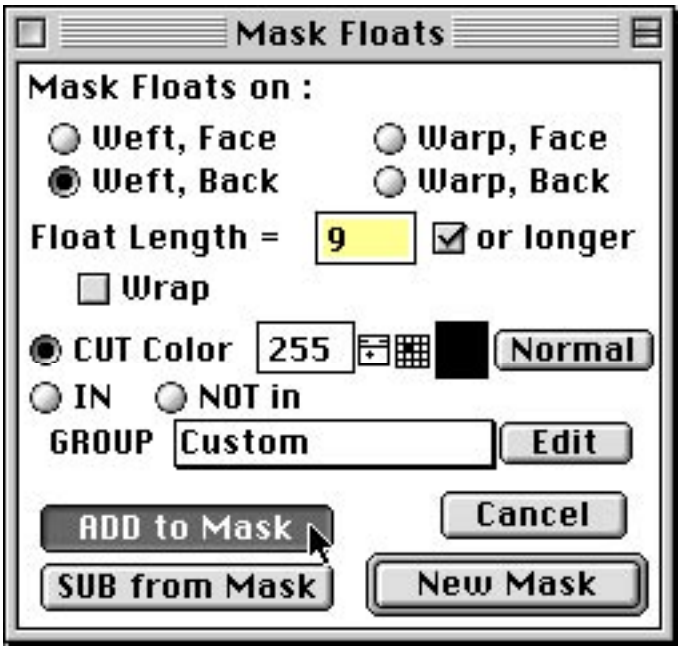
Each warp-face floater shows up as a vertical column of 9 (or more) black pixels. Each floater can be fixed by changing one those black pixels to a non-black color - which will break it into 2 shorter warp-face floats by forcing the warp the leave the front to cross under a weft.

We also have a large number of weft-back floaters; these will show up as horizontal rows of 9 (or more) black pixels. Each can be fixed by changing one of those black pixels to a non-black color - which will break it into 2 shorter weft-back floaters by forcing a warp to pass under the weft.

In some cases the warp-face and weft-back floaters may cross each other, in which case we could fix both by changing a single pixel at their intersection.

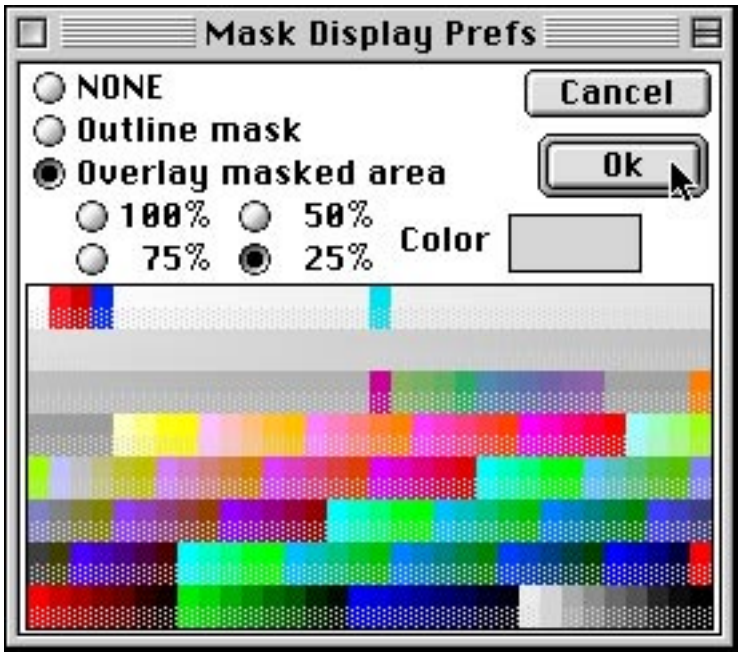
To investigate this possibility we can create a Mask which combines both types of floaters. With the warp-face mask still present, we again call on **Make Mask from Floats**, this time asking it to look for weft-back floaters and using **ADD to Mask** instead of New Mask. The result, shown below, displays both the warp-face and weft-back floaters,





and indeed quite a few do overlap in a cross form.

You can use **Special » Mask Preferences...** to change the appearance of the Mask. Since we are looking for solid black sections it helps to set the Mask so that it "lightens up" whatever it covers. I find setting a 25% coverage using a light gray overlay color does a good job of making the solid black areas stand out while not obscuring the context.

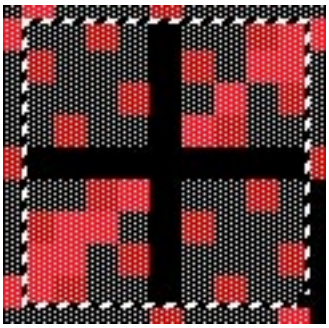


Later, when we are looking for warp-back and weft-face floaters, we might want to change the Mask's overlay color to a darker gray to make the uncovered non-black areas look brighter by contrast. You might also want to adjust the design colors themselves (double-clicking on the Eyedropper in the Tools window) to be brighter.

At this point we could simply zoom up a bit and scroll around the image applying our fixes, i.e., using the Pencil tool to paint single non-black pixels at the cross intersections (always safe because it can't create an opposing floater) and in non-crossed floaters after thinking a bit about each environment.

However, even if most of the floaters do happen to be crossed we are still looking at around 1,000 to be hand painted - a feasible but painfully laborious process.

This is where **Find & Replace** becomes useful!



We select one of the targets, as shown at the right, then **Special » Find** (or Cmd-F) to enter the Find & Replace dialog. In there we click on **Pat Size = Select Size** which sets up the Find pattern dimensions to match our 9x9 selection, followed by clicking on LOAD Selection **into Find** to copy the pixel values. We now have a Find & Replace pattern which matches this context.

We can alter the Replace pattern so that it will change the central pixel to some bright non-black color to fix both floaters.

This can be done by direct editing within the Find & Replace dialog. An alternative approach is to exit the dialog with **Don't Find**, to avoid scrolling the display to a different Found match, edit our original using the Pencil tool, then use Cmd-0 (command zero) to restore the selections, Cmd-F to renter the Find & Replace dialog and this time click only on **into Replace**, which loads the changes into the Replace pattern (lower number in the chart). Either way we end up with a chart showing a single change to be made when any match is found.

255	255	2	255	255	255	255	2	1
2	255	255	255	255	2	255	1	1
255	255	255	2	255	255	1	255	2
255	2	255	255	255	1	2	255	255
255	255	255	255	255 231	255	255	255	255
255	255	2	1	255	255	255	2	255
2	1	1	255	255	2	255	255	255
1	1	255	2	255	255	255	255	2
1	2	255	255	255	255	2	255	255

Exit using **Don't Find** (just to keep in the same location), then **Special » Replace All** (or Cmd-9) to search for all matching patterns and apply the "fix". Or one can use **Find Next** (Cmd-G) to find each match followed by either **F** (by itself, no Cmd key) to replace and find next or Cmd-G to leave unchanged and find next.

Because the pattern to be matched is so specific we usually will not find a large number of matches. Even so, being able to do a half-dozen at once is an improvement.

However, we don't need to be so specific. In the case of these crossed floaters there is only 1 place to put the Miss (at the crossing) and doing so can't cause any problems by creating new floaters. So in fact all we need to find is the cross by itself.

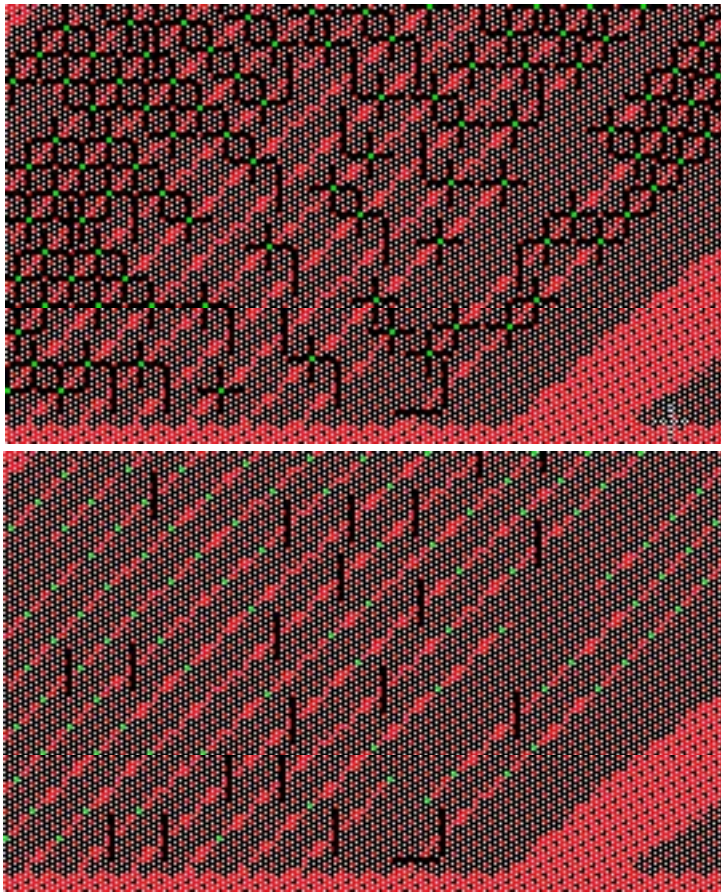
Using the Rectangle selection tool we select the 9x9 area, then using the Option key and the Rectangle tool we can subtract away unwanted portions until only the cross itself remains.

Using the same procedure as above we set this pattern into the Find & Replace. The excluded pixels have been set to "don't care" (blank in chard) and will be ignored in finding matches.

*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*
255	255	255	255	255 231	255	255	255	255
*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*
*	*	*	*	255	*	*	*	*

With this setting a Special » Replace All finds and fixes 767 matches in a single step!

Recreating the Mask for Warp-face plus weft-back floaters now shows a much simpler situation. Almost all the weft-back floaters have been fixed (only one visible in the screenshot) along with most of the warp-face floaters.



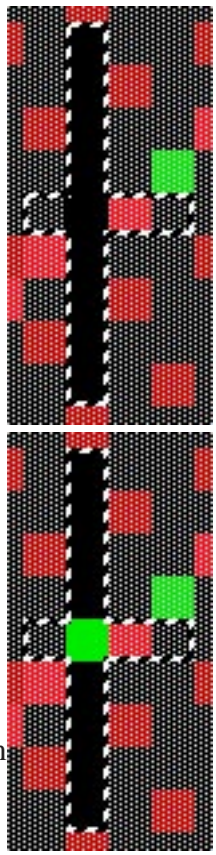
Measure » Float Lengths shows the numbers.

Lng	Weft Face	Weft Back	Warp Face	Warp Back
1	161478	504370	505124	161558
2	12041	12310	19113	18952
3	10763	12298	18819	16991
4	477404	131239	114671	461345
5	9198	10513	16589	15403
6	102	0	12	205
7	0	0	3	1
8	0	0	5	0
9	0	32	236	0

The floaters of length 10 are gone and those of length 9 have been reduced 85% from 1800 to 268.

If there were many weft-face and warp-back floaters we might next try a similar approach with them; however there are very few in this particular design.

So the next step is to attack the remaining length 9 warp-face and weft-back floaters. Since we are now dealing with floaters in a single dimension, we will have to be more careful that our "fix" doesn't create a new floater in the opposite direction. In other words, context will be more important so we will find fewer identical matches for each fix.



*	255	*	*
*	255	*	*
*	255	*	*
*	255	*	*
255	255 231	1	255
*	255	*	*
*	255	*	*
*	255	*	*
*	255	*	*

Here we select one of the length 9 warp-face floaters. We can fix it by changing one of the color 255 Cuts to a miss. Our concern is that in doing so we do not inadvertently create a weft-face floater.

By including 3 more pixels in our selection - a black to the left and a pair of one non-black followed by a black around our proposed Miss location we ensure that placing our Miss will only create a float of 2 and nothing more.

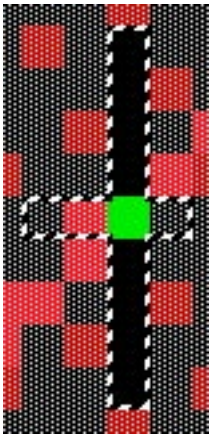
The sequence **Cmd-F**, **Pat Size = Select Size**, **into Find**, **Don't Find** copies this pattern into Find & Replace's Find pattern and returns us to the same location in the image.

Using the Pen we paint in our Miss (green), **cmd-0** (Cmd-zero) to restore the selection.

Cmd-F, **into Replace**, **Don't Find** sets up the Replace pattern

Cmd-9 (Replace All) finds and fixes 76 more floaters!

Next we select another one of the remaining floaters and perform the same sequence - set up Find to match our selection, set up Replace to include the added Miss (green), Replace All.



*	*	255	*
*	*	255	*
*	*	255	*
*	*	255	*
255	1	255 231	255
*	*	255	*
*	*	255	*
*	*	255	*
*	*	255	*

Another 90 floaters fixed. Another pass fixes another large group. Now it is time to check again on our progress.

If the window includes selvedges or controls we first restore the rectangular selection (from Outline memory) which selects only the design area. Then **Measure » Float Lengths**

Lng	Weft Face	Weft Back	Warp Face	Warp Back
1	161307	504370	505124	161729
2	12212	12310	19113	18952
3	10763	12298	18819	16991
4	477404	131410	115013	461345
5	9198	10342	16589	15403
6	102	0	12	205
7	0	0	3	1
8	0	0	5	0
9	0	32	65	0

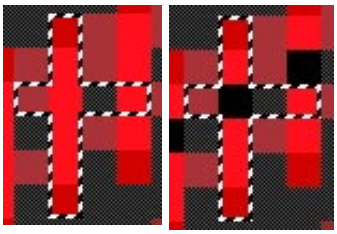
finds great progress - down to only 97 length 9 floaters! Six more passes finished the length 9 warp-face floaters.

The weft-face floaters were attacked using a similar approach, this time looking for the horizontal runs of black; 7 passes finished the length 9 weft-face floaters.

In the end it took only about 20 cycles of select, create find & replace, and Replace All to fix the 1800 length 9 floaters. This left 9 floaters of lengths 7 or 8 which were fixed with a few more passes.

Lng	Weft Face	Weft Back	Warp Face	Warp Back
1	161357	504420	505128	161770
2	12223	12353	19112	18979
3	10771	12283	18888	16995
4	477406	131442	115045	461346
5	9198	10335	16630	15403
6	102	0	12	205

Deciding whether to try to fix the length 6 floats is a judgment call. The basic float length of the 5-shaft satins is 4, so length 6 floats are only 50% longer. At 30 threads/inch, a length 6 float is only 6/30 = 0.20 inches, really quite acceptable. Fixing those floats will mean breaking them into floats of 2 and 3, which are shorter than the base float length. The result is likely to be an excessively "tight" fabric and the extra bindings are likely to damage the surface appearance. On balance it would probably be best to leave them as is.



However, in the interests of this tutorial I decided to continue on with the demonstration, ill advised as the result may be. Find & Replace using the pattern at the right fixed 160 of the warp-back floats in one pass. The remainder were less efficient.

Some of the fixes were decidedly awkward. In this pattern, binding at the 3rd or 4th positions would create weft-back floats of 6. Binding at the 2nd or 4th position is ok, but breaks the floater in lengths of 1 and 5. Best solution might be binding at 1 or 6. A dozen passes were needed to fix all the length 6 floaters