Application Note #5
# Taking back control of an IT8.7/4 file with wrong patch IDs

1. Introduction

This application note shows how to use PatchTool to assign the proper IDs to IT8.7/4 files which were not saved with this target's customary patch IDs. Please note that, while we focus this application note on the IT8.7/4 target, similar procedures as the ones presented herein can also be applied to an ECI2002 target.
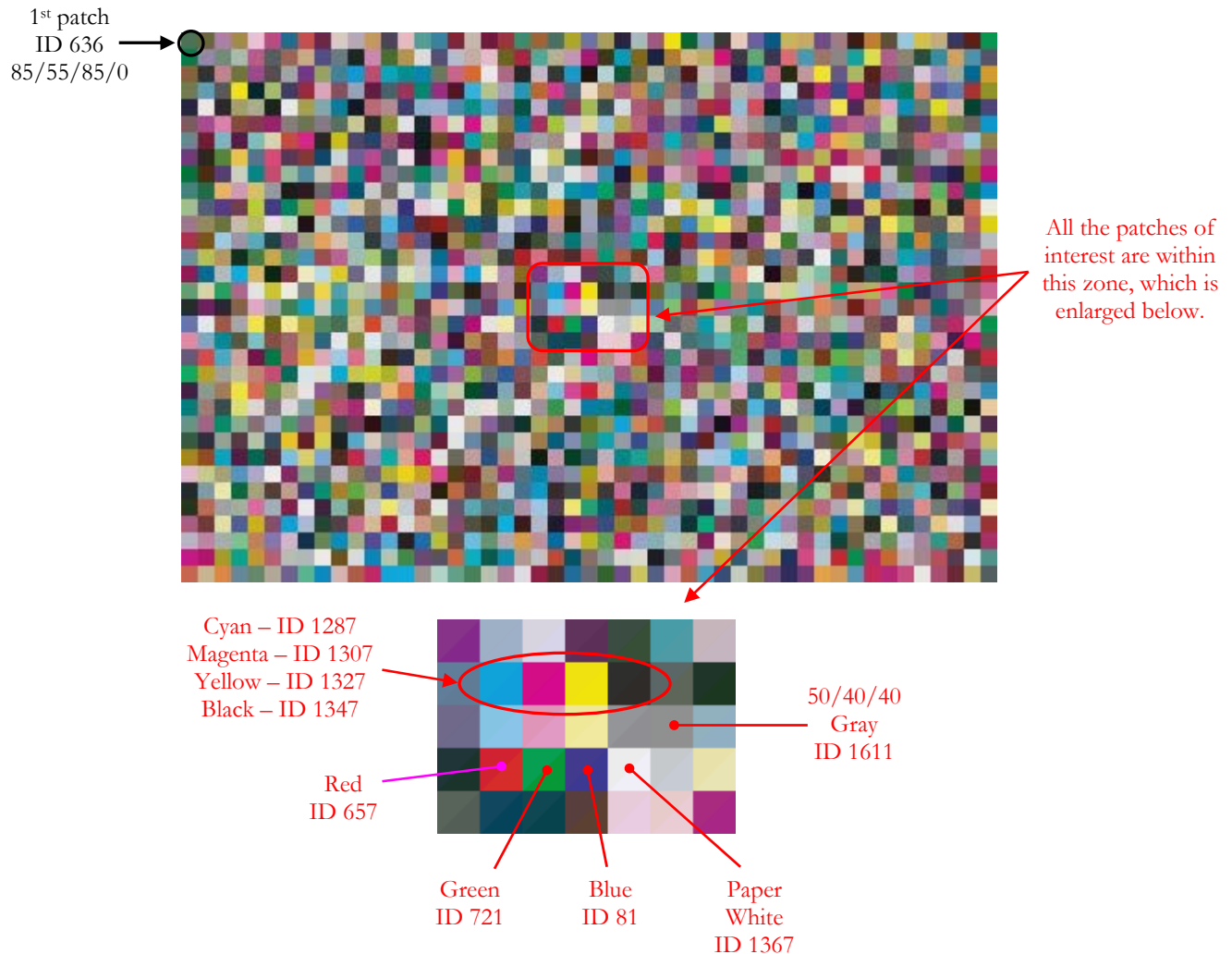
1.1. The standard IT8.7/4 target layouts

The IT8.7/4 target has 1617 patches most often disposed in two standard layouts. The first layout groups the patches in small sets where we can see stepwise mixes of two primaries while the two other primaries are fixed. To these, stepwise progressions of each primary are added, as well as many other specific patches helpful in controlling a press behavior. Because these progressions are systematic, they form a visually recognizable target which is called, appropriately, the **visual** layout, shown below, with some key patches identified.
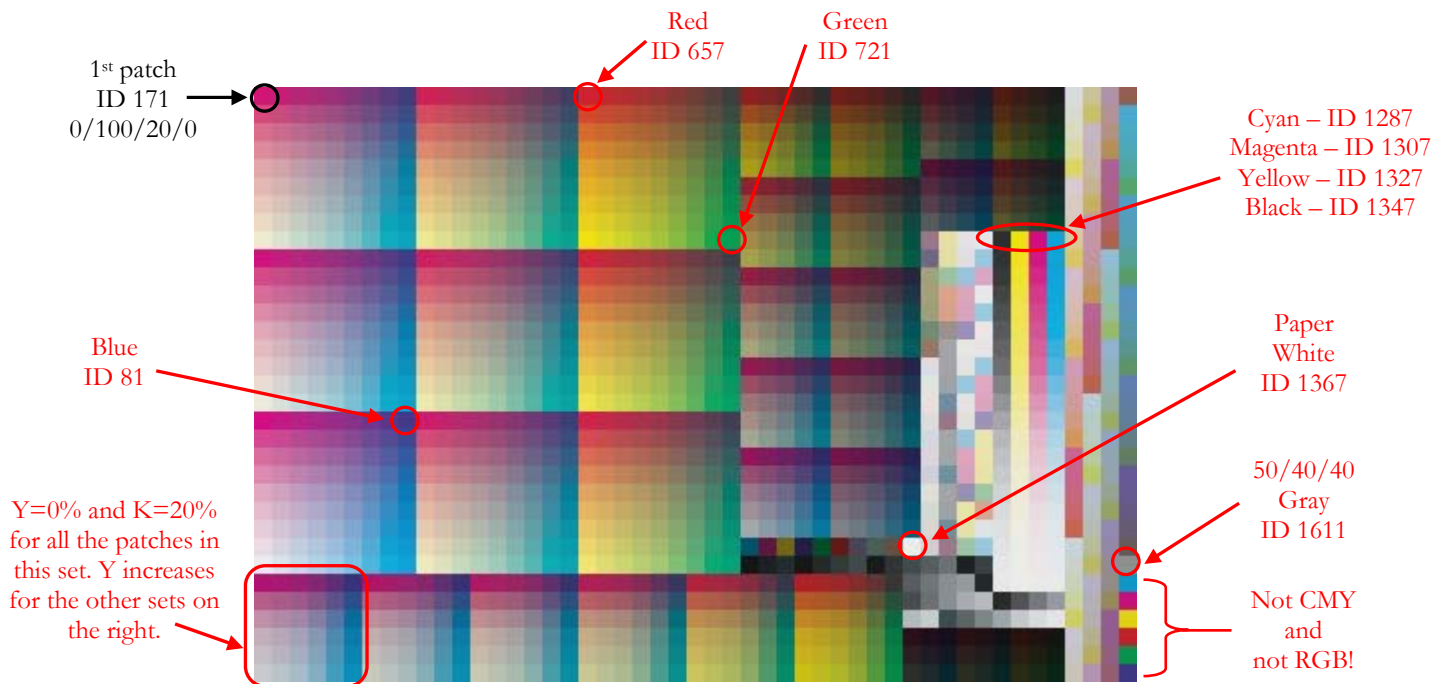
The patches colors are specified as CMYK values, a device-dependent color space. The target's primary use is to calibrate printer and presses. In the calibration process, the device-dependent CMYK values are used to define an image which is printed by the device requiring calibration. By associating the measured L*a*b* values of the printed image with each CMYK reference, it is possible to create an ICC profile dedicated to this specific printing device.

However, when printing the target, the visual layout does not use the printing inks uniformly across the target, for instance certain zones have a heavier cyan ink content while others have almost none, and this may cause a calibration bias. To minimize this bias, the patches are disposed in a **random** layout. This randomization is in fact

"pseudo-random", because each patch has an ID number and the random layout is precisely defined in terms of where each patch is located. The random layout can be recognized by the group of patches located in the middle of the target. These patches are identified below.

1st patch
ID 636
85/55/85/0

All the patches of interest are within this zone, which is enlarged below.

Cyan – ID 1287
Magenta – ID 1307
Yellow – ID 1327
Black – ID 1347

50/40/40
Gray
ID 1611

Red
ID 657

Green
ID 721

Blue
ID 81

Paper
White
ID 1367

Note: The IT8.7/4 target is also used by IDEAlliance for printer and monitor proofing. However, since proofing requires **absolute** (i.e. device-independent) color values, IDEAlliance provides reference values for three standard paper types (GRACoL Coated-1, SWOP Coated-3 and SWOP Coated-5). In IDEAlliance files, each patch is characterized by the CMYK values of the standard plus the absolute L*a*b* values to be achieved on a specific paper. Please consult the PatchTool documentation and Application Notes 3 and 4 for more information on how to use the IT8.7/4 target for certification purposes.

1.2.   When is there a problem with an IT8.7/4 measurement file?

Many IT8.7/4 files are saved with the patches in an order corresponding to the random or visual layout, but with improper IDs. This is quite common, even in reference files! The problem becomes more difficult to handle when the file was generated from measurements, and from a random layout, where the rows may have been scanned backwards, or where the rows were considered columns, and vice-versa. In these cases, the file data often looks garbled when first opening the file. Being unable to see the measurements in the visual layout makes it quite hard to judge the quality of the measurements and can even make the data useless for a profile creation program. Fortunately, in most cases, this can easily be fixed in PatchTool.

2. Using PatchTool to "fix" an IT8.7/4 measurement file

2.1. Example-1: A simple reassignment

If the opened file layout corresponds to the "visual" or "random" layout shown in the Introduction, you should check the ID of the first patch, in the upper-left. For a visual layout, the ID should be 171 (and CMYK = 0/100/20/0), while it should be ID 636 (and CMYK = 85/55/85/0) for the random layout. You may often find that the first patch has an ID of "1", as shown below; this is a sure sign that all IDs are incorrectly assigned.

To correct the situation, use the "Re-map" popup menu to assign the IDs for the corresponding layout. Once this is done, you can reliably change the layout and export the data in a file which will be recognized by other applications. If the first patch ID is correct, you should also check a few of the key patches shown previously for each layout, but nothing prevents you of re-assigning the patches, just in case.

This file's IDs are not properly assigned. Use the "Re-map" menu to correct.

Info

File : SWOP2006_Coated3.txt
Name : A1
ID : 1

File :
Name :
ID :

C : 0,0 %
M : 100,0 %
Y : 20,0 %
K : 0,0 %
File values

L : 47,91
a : 70,50
b : 6,55

D50, 2 deg.

ΔE* ▶
CIEDE2000

ΔE*   ΔL*   Δa*   Δb*

⊗ Show spectrum

SWOP2006_Coated3.txt (IT8.7/4M #1617)

Patch view   Tabular data

Change layout to IT8.7/4 Measured
Change layout to IT8.7/4 Random
Change layout to IT8.7/4 Visual

Turn 180°
Turn 90° CW
Turn 90° CCW

Flip Horizontal
Flip Vertical
Flip R/C

Assign IDs for IT8.7/4 Random layout
Assign IDs for IT8.7/4 Visual layout
Renumber the IDs
Rename the patches

Reset ALL changes

Re-map: ▶   □ More info

## 2.2.	Example-2: A rotated target

In this second example, we have a file with measurements taken with a DTP70 scanning spectrophotometer controlled by the ColorPort software; the spectrophotometer and the measuring software are both from X-Rite. Here is a screenshot of the file where we see the file header plus the first data points.


This is a well structured CGATS type file, with the Illuminant and Observer identified as per the CGATS.17 standard. However, we observe that the patch IDs, the first data column labeled "SAMPLE_ID" as per the CGATS standard, start at "1", which indicates that some ID reassignment will be required. On the right, we see how the file appears in PatchTool when opened.

The first thing we notice is that the patches are not disposed in a full rectangular shape, either horizontally or vertically, where all columns are of the same length. We see that the "Row QTY" is "In file: floating", which simply indicates that no values were found in the file for this quantity. CGATS file often have a "LGOROWLENGTH" tag which defines this value, but this tag is not part of the CGATS standard and is not used by all vendors.

The last column is shorter.

In its standard horizontal layouts, an IT8.7/4 target has 33 rows and 49 columns (33 x 49 = 1617). We can change the number of rows by selecting one of the preset values in the "Row QTY" menu or by writing the value in the "Custom rows" field and pressing the *Return* key.

Since the target layout may be turned 90 degrees, we do not know yet if we should specify 33 or 49 rows. Let's try both; the two layouts are shown on the next page.

The key patches as they are seen in the random layout.

Assign the number of rows in this field.
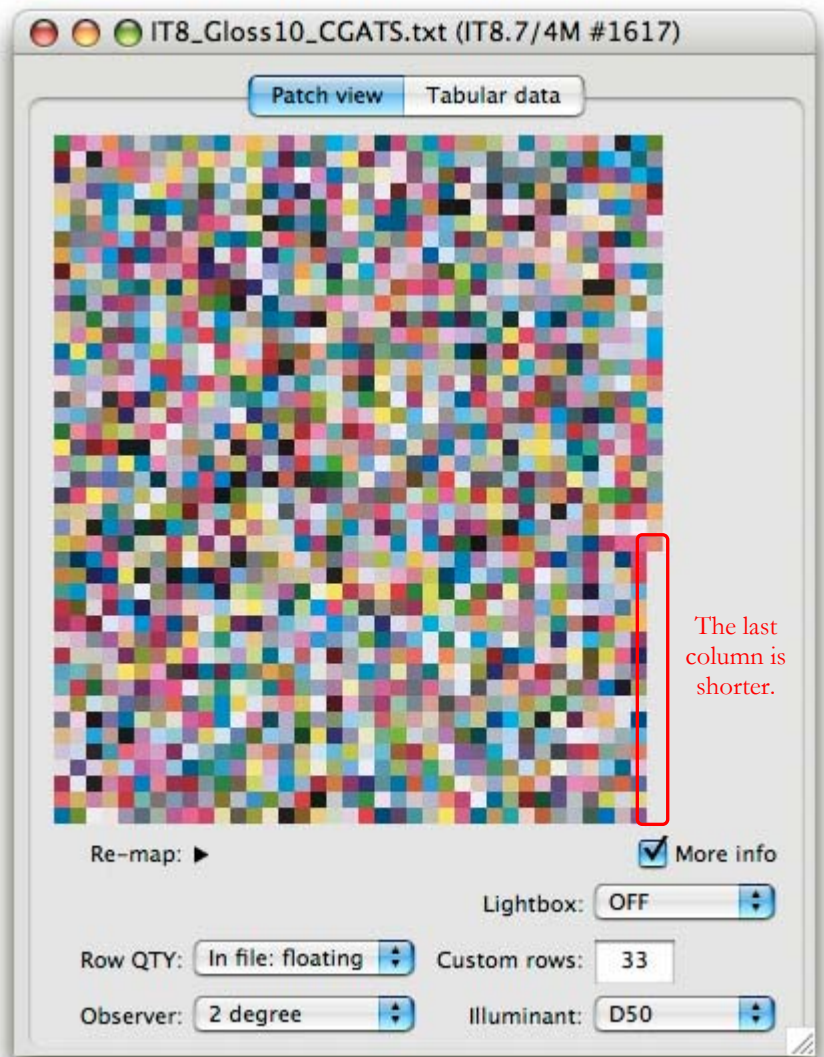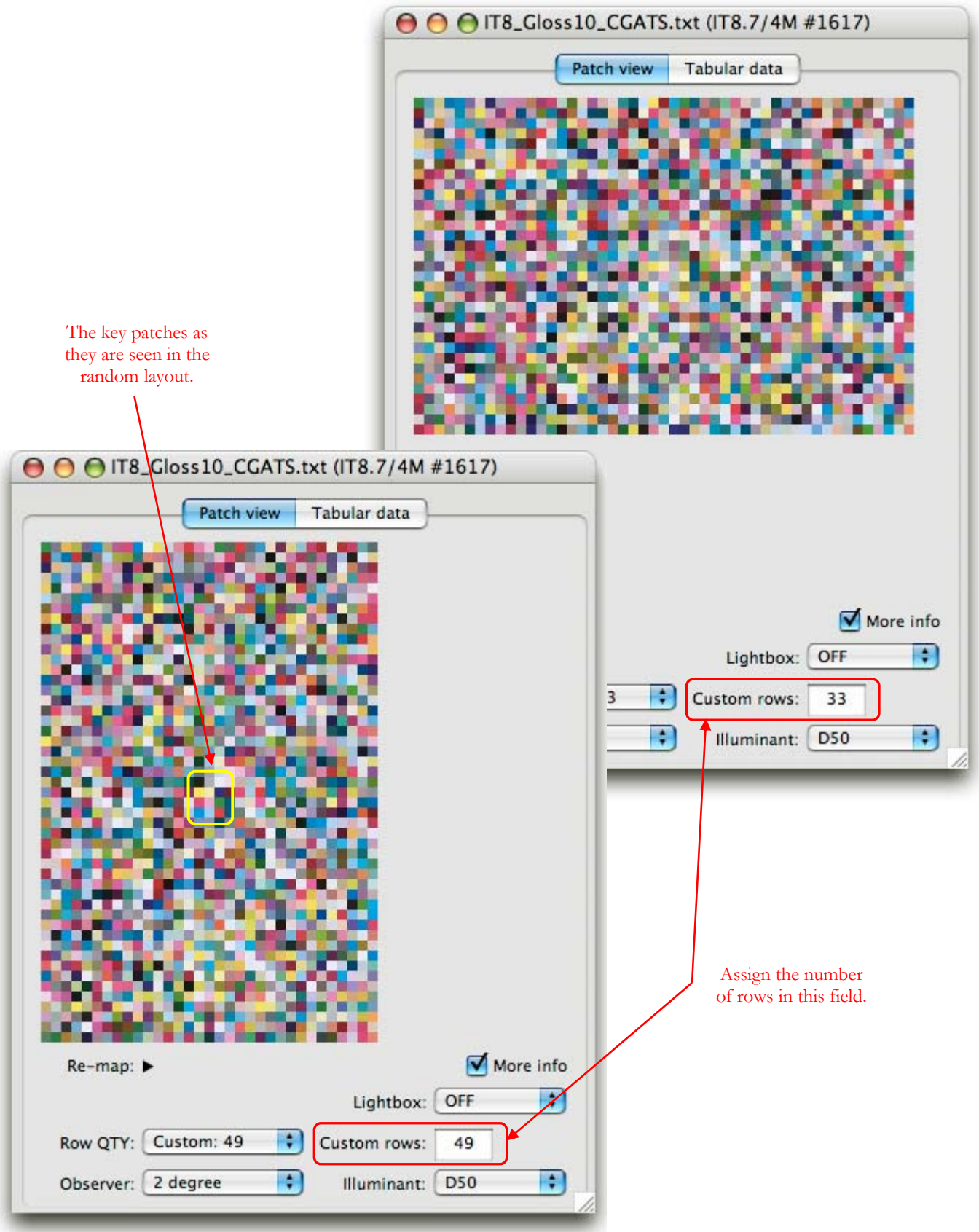
While both layouts have no partially filled columns, the one with 49 rows has a group of patches in the middle which is characteristic of the random layout. We now need to decide what other changes we can do to see our file correspond to the standard random horizontal layout.

The next step is easier to perform if we have a known "good" image of a random IT8.7/4 layout to compare to. Without one we can still make informed decisions based on a few characteristic patches. We see below our opened file against the reference random layout. Apart from the key patches in the layout center, we notice that the green and brown patches of the first column in our opened file correspond to the last patches of the first row in the reference file.

Our reference IT8.7/4 random layout.
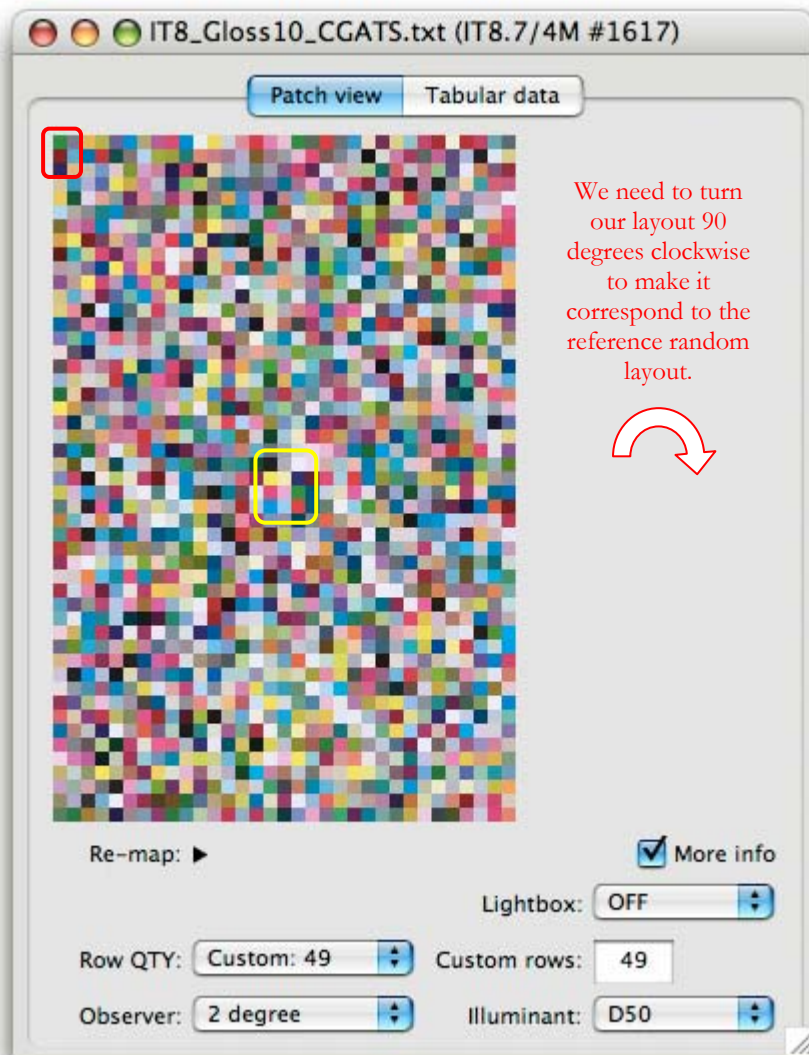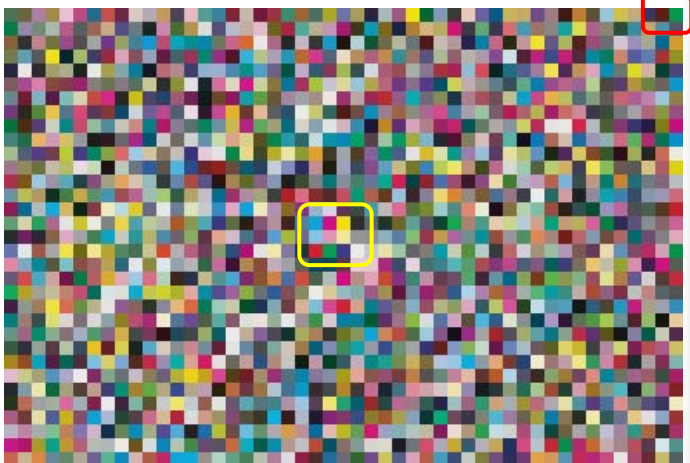
From these observations, we can conclude that our file is turned 90 degrees relative to the reference layout. To turn the file layout, use the "Re-map" popup menu and select "Turn 90° CW" (90 degrees clockwise), as shown on the next page.
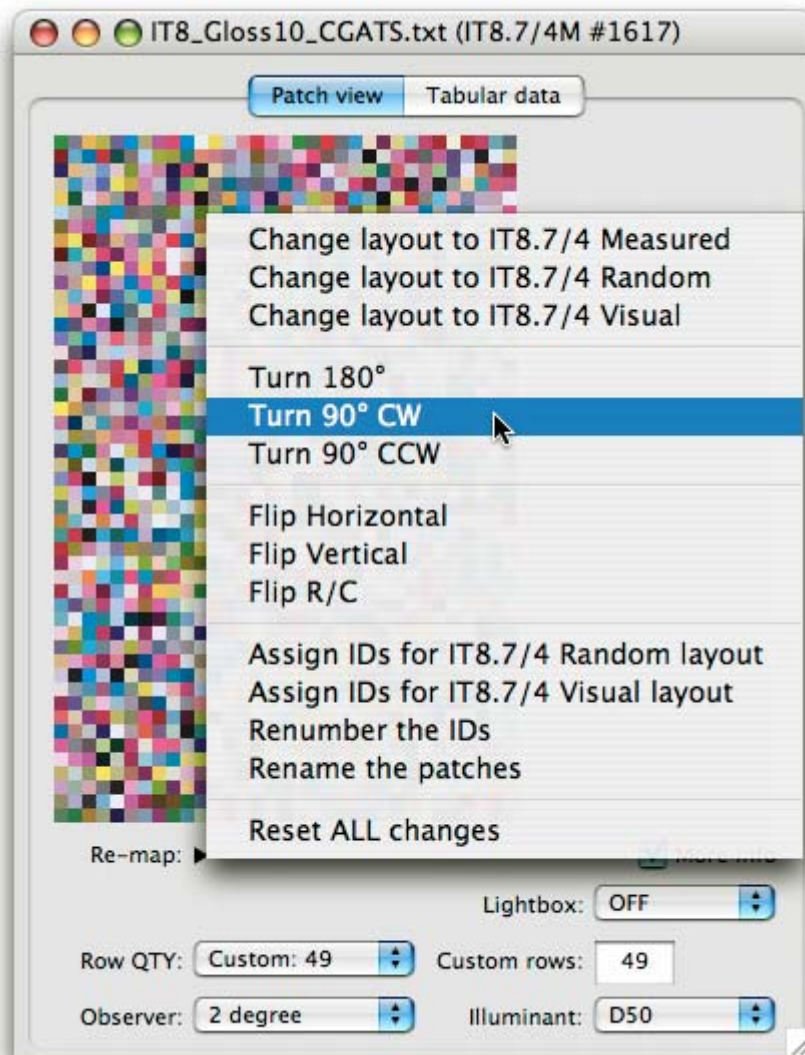
After the rotation, our file is now in the same layout as the reference random layout. As a last step, we need to assign the IDs for the random layout, also using the "Re-map" menu. From there, we can change to the visual layout and save our "fixed" file.

To wrap-up, here are the three steps we did to fix our file:

 i-   Assign a custom "Row QTY" of 49 and look for key patches
 ii-   Rotate the layout 90 degrees clockwise
 iii-   Assign the IDs for the random layout

2.3. Example-3: A target with flipped rows and columns

This last example is from another measurement file. The measuring instrument and the software package are shown in the file header, shown just below. As in Example-2, the IDs start at "1", and a reassignment is required. However, here we see that the LGOROWLENGTH tag is present and set to "49". This is why, in the opened file, we see a full rectangular layout with all rows and columns of the same length.

Our reference IT8.7/4 random layout.

While we can recognize the characteristic patches of a random layout in our opened file, they are not in their proper location. As well, the green and brown patches are at the bottom of the first column. This means that a simple rotation will not fix the layout. There are two methods we can use to realign this layout.

**Method-1: Rotate 90 degrees and flip horizontally**
Even if we know that a rotation will not fix the layout, let's do it nonetheless. Using the "Re-map" popup menu, we turn the layout 90 degrees **clockwise** (CW). Below, we see the rotated layout against the reference random layout.

Our reference IT8.7/4 random layout.
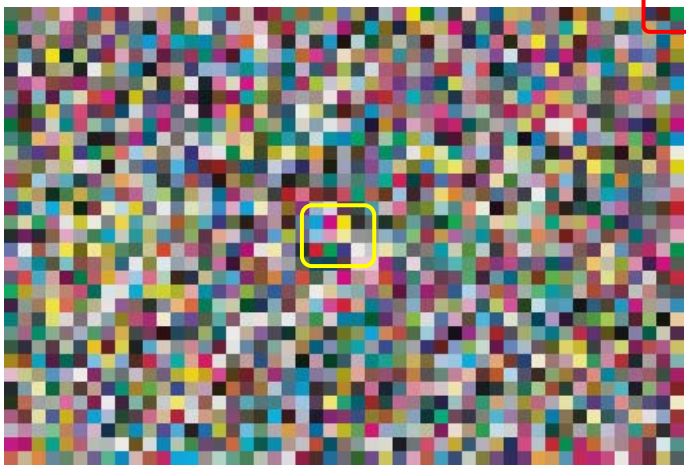
The layout after a 90 degrees clockwise rotation.

The next step is to flip the layout horizontally.
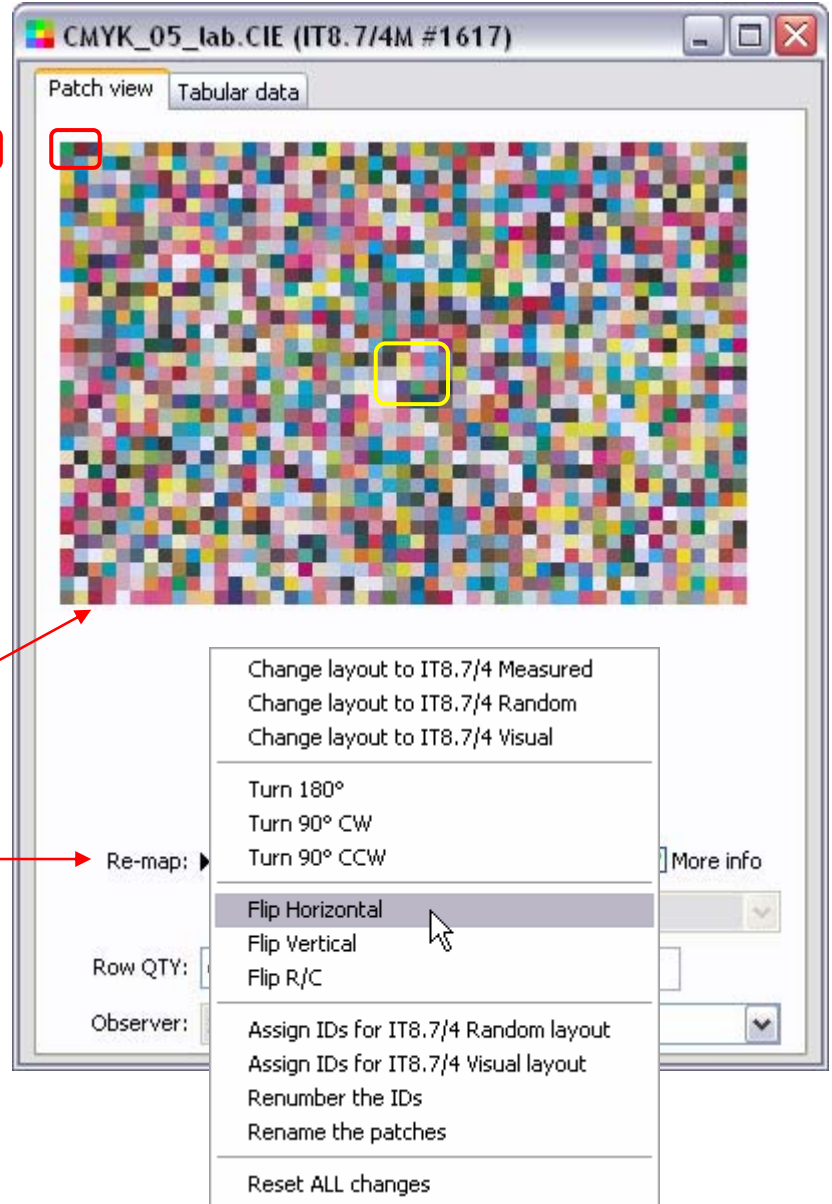
After the rotation, with both layouts horizontal, we realize that our file is a mirror image of the reference layout. We can fix this by flipping our file layout horizontally with the "Flip Horizontal" command of the "Re-map" menu.

As in Example-2, the last step is to assign the IDs for the random layout. This three steps procedure can be described as follow:

i-   Locate the key patches and rotate the layout 90 degrees clockwise
ii-   Flip the layout Horizontally
iii-   Assign the IDs for the random layout

Method-2: Flip rows and columns

If we compare closely the reference layout with our file, we see that the first reference row is the first file column; the second reference row is the second file column; and so on. This can also be observed in the key patches.

Our reference IT8.7/4 random layout.
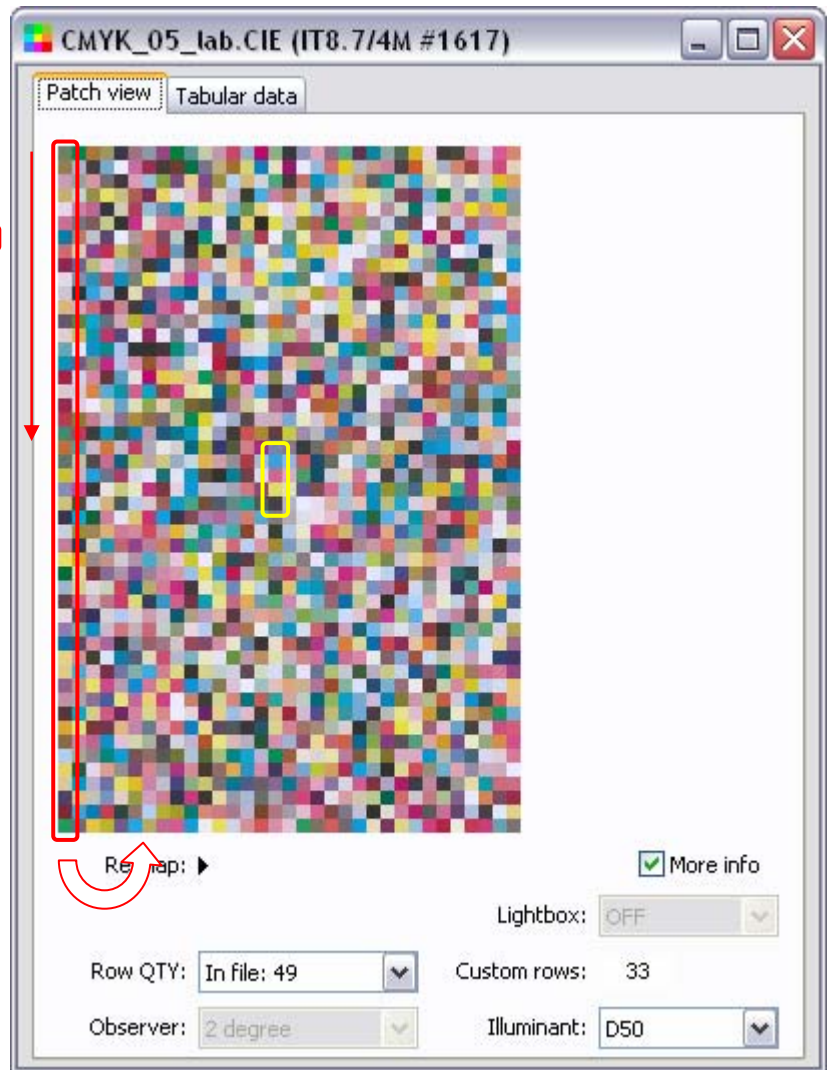
What we have here is not a simple rotation (we already know this since we did it as the first step in Method-1 of this example) but a substitution where rows and columns are interchanged. To arrange the layout, we should start with the first column, turn it 90 degrees counter-clockwise (CCW) so that it becomes our first row, then take the second column, turn is similarly, and place it **under** the first row, etc. This is quite a task to do manually, but it can be done in a single "Flip R/C" (i.e. Flip Row/Column) command of the "Re-map" popup menu.

The second and last step is to assign the IDs for the random layout. This procedure can be described as follow:

i-   Locate the key patches and flip the rows and columns
ii-   Assign the IDs for the random layout
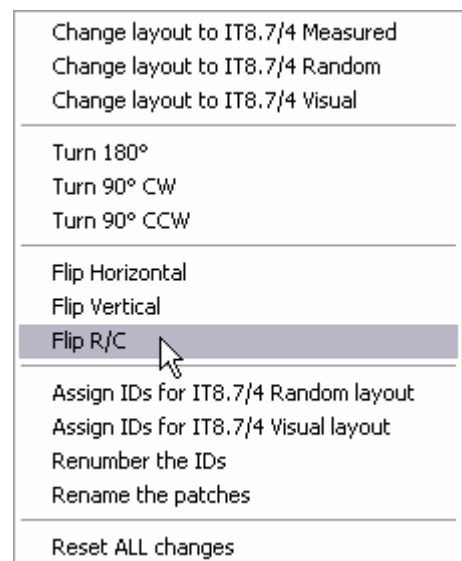
As we mentioned in the introduction, being able to see the target in the visual layout can be helpful in assessing the quality of the data. Once the IDs are assigned, we can easily get the visual layout by selecting the "Change layout to IT8.7/4 Visual" command of the "Re-map" menu. This command will work even if we sort the data in the "Tabular data" or if we change a patch position in this table (by clicking and dragging one or more rows in the table for instance) since this re-ordering does not affect the IDs.

Here we show the Example-3 file in its visual layout. We can clearly see that the press from which the data came from is either not calibrated or has other problems which need to be addressed!
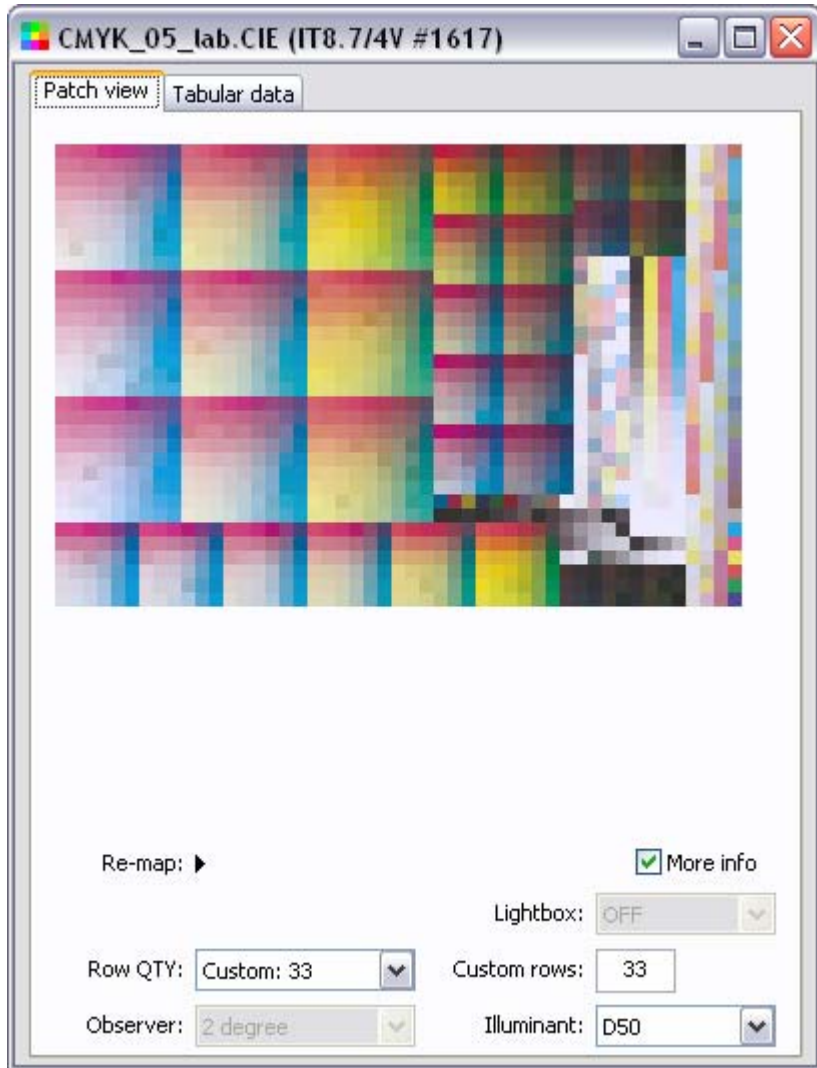
3. Conclusion

We saw three examples of how PatchTool can be used to fix an IT8.7/4 data file where the standard IT8.7/4 patch IDs have been mislabeled and where the file layout was shuffled by the measurement process. You can experiment with any combination of row quantity, rotation and flip, until the layout corresponds to your needs. If the results are not as expected, you can always reset all changes, using the "Re-map" menu, and try another approach.

The BabelColor Company

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info@BabelColor.com
http://www.BabelColor.com