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Technical bulletin

Prinergy Web Growth Compensation

This technical bulletin describes how to use the web growth compensation option in Prinergy. Note that in Prinergy 2.0, only linear web-growth is supported, not new enhancements like non-linear and split-plate web-growth.

The document includes the following sections:

- Calculating Web Growth
- Which Files Does the Option Use?
- Setting Up a Profile File and a Tower-Color File
- Example: Web Growth Profile File
- Example: Tower-Color File
- Non-Linear Web Growth Compensation
- Split-Plate Web Growth Compensation
- Using the Web Growth Profile Process Plan Option
- Setting and Clearing a Web Growth Profile
- Archiving

The traditional approach to web growth compensation is to shift pages in the imposition by different amounts for each separation. With Prinergy, you can digitally compensate for press distortion using the web growth compensation option.

Note: The Web growth compensation option is also available in Print Console 2.1 or higher.

To use the web growth compensation option:

1. Measure your distortions on press.

   See *Calculating Web Growth*.

2. Use a text editor to enter the measured distortions in a web growth profile file.

   See *Setting Up a Profile File and a Tower-Color File*.

3. Apply the profile file to each signature in a Prinergy job.

   See *Setting and Clearing a Web Growth Profile*.

   Prinergy uses the percentages from the web growth profile to change the image for each plate for a specific press/paper combination.

Calculating Web Growth

This section describes how to compute the percentage of web growth from measurements on press sheets or from traditional page shifts.

The standard process for determining web growth compensation parameters is to print press sheets with no compensation, then measure the discrepancies between the separations at different points on the surface. Some printers print an image of a grid of lines with .5-in. or 1-cm spacing. Others print a typical surface with pages, and measure the discrepancies between the page centers or other marks.

Note: Printers measure the *difference* between two separations at a particular point. Printers are usually concerned with register between the separations rather than with absolute geometrical accuracy. For this reason, a base separation is typically identified and not adjusted. Prinergy 2.0 always uses the last ink down as the base separation. Prinergy 2.1 and higher uses any separation.

On a web press, the main direction of growth is across the web. There is also some growth along the web, but it is usually small enough to be ignored. On a sheet-fed press or flexo press, you may find more significant growth in the direction of paper travel.

The examples in this document explicitly discuss across-the-web growth; however, the same procedures are used for along-the-web growth. The web growth compensation option in Prinergy can simultaneously compensate for growth both across and along the web/sheet.

Prinergy provides “linear” and non-linear compensation. The term “linear” is often misconstrued in a web growth compensation context to mean that all pages are shifted by the same amount, or that the compensation for each separation is the same. What we mean by linear growth in Prinergy is that the expansion of the paper as a percentage is the same across the paper—that is, the percentage growth on the left side is the same in the center, as well as on the right side. We use the term “linear” because a graph of the registration discrepancies plotted against the position across the web is almost a straight line. In practice, paper growth on a web is not exactly linear, but it is close enough for practical purposes.

How to Calculate Web Growth

Simply put, to calculate the growth percentage for one separation relative to another, add the discrepancy at the farthest left pair of marks to the discrepancy at the farthest right pair of marks and divide by the distance between the pairs.

Following are two detailed examples of how to compute the web growth figures:

- Example 1: Displacements From Yellow Separation Across a Grid
- Example 2: Page Shifts to Compensate for Web Growth

Example 1

The first example includes a table of measurements (in millimeters) from a press sheet of grids printed with the ink order KCMY. This is a common ink order, as is CMYK. Because yellow is the last ink down, it is the "base" separation against which all other separations are measured.

Each column (except the first and last) corresponds to the vertical grid line at a particular horizontal position. A true "grid" would typically contain far more lines, but measurements have been taken only at selected lines in compiling this table. Following the table is an explanation of the labels and numbers in the table.

Table 1: Displacements from the yellow separation across a grid

	Distance in mm Negative numbers indicate distances to the left Non-negative numbers indicate distances to the right								**Growth %age**
X	-886.8	-584.0	-252.0	-12.7	12.7	315.5	584.0	886.8	N/A
K-Y	-1.38	-.82	-.36	.10	.13	.64	.95	1.40	(1.38 + 1.40)/ (2 x 886.8) = .157%
C-Y	-1.04	-.66	-.36	.10	.10	.30	.46	.78	(1.04 + .78)/ (2 x 886.8) = .103%
M-Y	-.52	-.30	-.08	.10	.08	.12	.23	.40	(.52 + .40)/ (2 x 886.8) = .052%

In Table 1, X measures the horizontal distance (across the web) of the vertical grid line from the horizontal center of the sheet. Negative numbers indicate distances to the left, and non-negative numbers distances to the right. The first column corresponds to the left-most grid line, which was 886.8 mm to the left of the center; the last column corresponds to the right-most grid line at 886.8 mm to the right of the center. The entire grid, therefore, was 2 x 886.8 mm = 1773.6 mm (69.8 in.) wide.

The figures in row K-Y measure the displacement from the black separation to the yellow separation for corresponding grid lines. C-Y measures the displacement from the cyan separation to the yellow separation, and M-Y measures the displacement from the magenta separation to the yellow separation.

Let's look at the K-Y row in detail. The -1.38 in the column where X is -886.8 indicates the black separation is 1.38 mm to the *left* of the yellow separation at the left edge of the sheet. The 1.40 mm in the column where X is 886.8 indicates the black separation is 1.40 mm to the *right* of the yellow separation at the right edge of the sheet. Thus, the black separation is larger than the yellow (by about 1.38 + 1.40 = 2.72 mm). This is expected because the black was printed before the yellow, and the paper grew while traveling from the black ink unit to the yellow ink unit. The growth of the black separation, relative to the yellow, is (1.38 + 1.40) / (2 x 886.8) = .157%, as shown in the column labeled "Growth %age" at the right of the table.

Similarly, for the C-Y and M-Y rows, the growth of these separations relative to yellow is calculated in the same way and shown at the right side of the table. Note that the growth of the cyan is about twice that of the magenta, while the growth of the black is about three times that of the magenta. This is normal for equally spaced ink units.

The only data used to compute the growth was the displacements at the outer edges, so the percentages reflect the average growth across the sheet.

For K-Y, the average growth on the left side is (1.38 + 1.0)/(886.8 - 12.7) = .169%, and on the right side is (1.40 - .13)/(886.8 - 12.7) = .145%. So they are different, but the difference is small enough that it can be to ignored, or compensated for with press adjustments.

At this point you are finished calculating web growth and can enter the percentages into the web growth profile for the press/paper to which this growth applies. You must enter values for both the upper and lower surfaces in the same web growth profile. (In a future version of the web growth compensation option, the default will be that the opposing surface uses the same values, but this option is not yet ready.)

Notes:

- The percentages in the web growth profile represent what happens on press; they don't specify how Prinergy compensates for web growth. Prinergy takes the percentages from the web growth profile and uses an algorithm to compensate for the web growth. The numbers in the web growth profile should decrease from the first ink tower (first down, so largest growth) to the last ink tower (last down, so no growth).

- If only across-the-web growth is to be compensated for, only the horizontal percentages appear in the file. If a percentage is missing, as it is for all the y / along-the-web parameters, it is assumed to be zero. The growth for tower 4 (corresponding to yellow according to the **TowerColorMap.txt** file) could therefore be left out, given that it is zero. For true web growth, the percentage growth values for the lower surface (side="L") are the same as for the upper surface (side="U"). (If the upper and lower surfaces grew differently, the paper would curl.)

Example 2

In this example, page shifts used to *compensate* for web growth are specified, instead of grid measurements, as might appear in a table in the job jacket where traditional compensation methods are used. The ink order is the same as the first example (KCMY), but all measurements are in inches. The imposition is 4-across, and the pages are 12.5 in. wide.

Following the table is an explanation of the labels and numbers in the table.

Table 2: Page shifts to compensate for web growth

Page	Left Outer	Left Inner	Right Inner	Right Outer
K	0.005 -->	0.002 -->	-0.002 <--	-0.005 <--
C	0.003 -->	0.001 -->	-0.001 <--	-0.003 <--
M	-	-	-	-
Y	-0.004 <--	-0.002 <--	0.002 -->	0.004 -->

In this example, the black and cyan pages are moved in. Specifically, the left outer black page is moved *right* by .005 in.—that is, towards the center. The right outer page is moved *left* by .005 in., also towards the center. The yellow pages are moved out, and the magenta separation is not adjusted at all. (Such tables often use explicit arrows to indicate direction of movement rather than the signs of the numbers.)

Note: Table 2 specifies the *compensation* to be applied, whereas Table 1 specified the *displacement* on press. Furthermore, in Table 2, magenta is used as the base separation; however, the Prinergy 2.0 web growth profile always uses the last ink down as the base separation.

Table 3 re-expresses the data of Table 2 in the format of Table 1. Consider the left outer page: the black is shifted .005 mm to the right, and the yellow .004 to the left. As a result, relative to the yellow, the black page is shifted .009 mm to the right. Because Table 2 indicates how much to shift each page to align the *centers* of the pages, and the pages are 12.5 in. wide, the page center of the left outer page is at 1.5 x 12.5 in. = 18.75 in. left of the signature center. The *displacement* of the black relative to the yellow at -18.75 in. from the center, then, is -.009 mm.

Table 3: Displacements from the yellow separation at page centers

	Distance in inches **Negative numbers indicate distances to the left** **Non-negative numbers indicate distances to the right**				**Growth %age**
X	-18.75	-6.25	6.25	18.75	N/A
K-Y	-.009	-.004	.004	.009	(.009 + .009)/(2 x 18.75) = .048%
C-Y	-.007	-.003	.003	.009	(.007 + .007)/2 x 18.75) = .037%
M-Y	-.004	-.002	.002	.004	(.004 + .004)/(2 x 18.75) = .021%

Note that to compute the growth we have again used only the data for the outer pages. Note further that the displacements are accurate to only one significant figure, so there's no need to use more than two figures for the growth percentage.

Which Files Does the Web Growth Compensation Option Use?

The web growth compensation option uses the following files:

- A web growth profile file in XML (extensible markup language) format (**<file name>.wgp**)
- An DTD (document type definition) file (**WebGrowthProfile.dtd**) in XML format
- A tower-color file (**ColorTowerMap.txt**)

A profile file describes press distortions for a specific press, paper stock, humidity, ink coverage, and/or other factors. You measure your distortions on press, and then use a text editor to modify an existing profile file to use the measured distortions. You can then apply a profile file to each signature in a Prinergy job. Prinergy uses the profile to change the image for each plate for a specific press/paper combination. A sample profile is stored in the **CreoAraxi\data\WebGrowthProfiles** folder on the home server.

The DTD file contains the definitions and comments that describe the XML tags in the profile file. The profile file uses the DTD file; you do not use the DTD file. You can either store both files in the same folder or store the files in separate folders and include the location of the DTD file in the profile file.

The tower-color file is a text file that specifies the names of the color separations in a job and the number of the color "tower" (actually the ink unit) running the color. Each color name is associated with a press color tower number. A sample tower-color file is stored on the home server. The sample tower-color file is **CreoAraxi\data\WebGrowthProfiles\ColorTowerMap.txt**

Setting Up a Profile File and a Tower-Color File

To set up a web growth profile file:

1. Using a text editor, open the sample profile file that is shipped with Prinergy: **CreoAraxi\data\WebGrowthProfiles\SampleProfile.wpg**.

   We recommend that you modify the sample file to help avoid errors or omissions.

2. Add the stretch percentages to the sample profile.

   See *Example: Web Growth Profile*.

3. Save the profile file with a .wgp extension—**<file name>.wgp**.

   Note: Some text editors will automatically append ".txt" to the file name. If this happens, you must rename the file.

Along with the web growth profile file, Prinergy uses a tower-color file, which specifies color names and the number of the color tower running each color.

To set up a tower-color file:

1. Using a text editor, open the sample tower-color file that is shipped with Prinergy: **CreoAraxi\data\WebGrowthProfiles\ColorTowerMap.txt**.
2. Type the names of the color separations in the job files, as well as the number of the color tower running each color.

   See *Example: Tower-Color File*.

   Don't use the following characters in the color names:

   - Leading or trailing tabs or spaces
   - Tabs embedded in the file name
   - Wide characters, for example, CJK (Chinese, Japanese, Korean) characters

   Note: Accented characters may or may not work, so are best avoided.
3. Save the tower-color file as **ColorTowerMap.txt**.

   The tower-color file must have this name for Prinergy to be able to find it.

   You can save the tower-color file in the same folder as the profile file. This is the default tower-color file. You can also create a custom tower-color file for a job, and place it in the **<Job Folder>\Control** folder.

   Prinergy first searches the **<Job Folder>\Control** folder for a tower-color file. If it can't find a tower-color file, it uses the tower-color file from the same folder as the profile file.

Example: Web Growth Profile

This section shows the content of a sample web growth profile file.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE profile SYSTEM "WebGrowthProfile.dtd">
<profile>
   <plate tower="1" side="U">
      <expansion xpercent=".157" />
   </plate>
   <plate tower="2" side="U">
      <expansion xpercent=".103" />
   </plate>
   <plate tower="3" side="U">
      <expansion xpercent=".052" />
   </plate>
   <plate tower="4" side="U">
      <expansion xpercent="0" />
   </plate>
   <plate tower="1" side="L">
      <expansion xpercent=".157" />
   </plate>
   <plate tower="2" side="L">
      <expansion xpercent=".103" />
   </plate>
   <plate tower="3" side="L">
      <expansion xpercent=".052" />
   </plate>
   <plate tower="4" side="L">
      <expansion xpercent="0" />
   </plate>
</profile>
```

The "ypercent" tag does not apply to pure web growth, but it could apply to plate stretch or sheet-fed growth. The following sample profile file includes ypercent tags.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE profile SYSTEM "WebGrowthProfile.dtd">
<profile>
   <plate tower="1" side="U">
      <expansion xpercent="1.0" ypercent="0.30" />
   </plate>
   <plate tower="2" side="U">
      <expansion xpercent="0.8" ypercent="0.25" />
   </plate>
   <plate tower="3" side="U">
      <expansion xpercent="0.6" ypercent="0.20" />
   </plate>
   <plate tower="4" side="U">
      <expansion xpercent="0.3" ypercent="0.15" />
   </plate>
   <plate tower="1" side="L">
      <expansion xpercent="1.0" ypercent="0.30" />
   </plate>
   <plate tower="2" side="L">
      <expansion xpercent="0.8" ypercent="0.25" />
   </plate>
   <plate tower="3" side="L">
      <expansion xpercent="0.6" ypercent="0.20" />
   </plate>
   <plate tower="4" side="L">
      <expansion xpercent="0.3" ypercent="0.15" />
   </plate>
 </profile>
```

Example: Tower-Color File

This page shows the content of a sample tower-color file. The tower-color file is always named **ColorTowerMap.txt**.

```
##### Tower-color mapping file
##### for use with the Prinergy Web Growth Compensation option

#### Entries are of the form:
#### ColorName  TowerNumber
#### 1 entry per line

Black             1
Cyan              2
Magenta           3
Yellow            4
```

Non-linear Web Growth Compensation

In cases where it is impractical to assume that the web growth is linear across the paper, you can create a non-linear web growth profile to capture the actual displacements from the base separation. With linear web growth the amount of stretch or shrink is constant over the entire width whereas with non-linear web growth the amount of stretch or shrink varies significantly across different regions of the paper. Non-linear web growth does not need to be selected in the process plan editor, providing a non-linear web growth profile activates it.
The following example of a web-growth profile uses the same displacement measurements from *Table 1: Displacements from the yellow separation across a grid* in Example 1 from the previous section *Calculating Web Growth*. Plate tower 1 is for the black separation; plate tower 2 is for the cyan separation, and plate tower 3 is for the magenta separation.

Example 1: Non-linear Web Growth Profile (across the web)

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE profile SYSTEM "WebGrowthProfile.dtd">

<profile>

      <measurePosition x = "1" y = "1" unit = "mm" />

      <measureShift x = "1" y = "1" unit = "mm" />

      <plate tower="1" side="U">

            <xshift x= "-886.8" dx= "-1.38" />

            <xshift x= "-584.0" dx= "-.82" />

            <xshift x= "-252.0" dx= "-.36" />

            <xshift x= "-12.7"  dx= ".10" />

            <xshift x= "12.7"   dx= ".13" />

            <xshift x= "315.5"  dx= ".64" />

            <xshift x= "584.0"  dx= ".95" />

            <xshift x= "886.8"  dx= "1.40" />

      </plate>

      <plate tower="2" side="U">

            <xshift x= "-886.8" dx= "-1.04" />

            <xshift x= "-584.0" dx= "-.66" />

            <xshift x= "-252.0" dx= "-.36" />

            <xshift x= "-12.7"  dx= ".10" />
```

```
            <xshift x= "12.7"   dx= ".10" />
            <xshift x= "315.5"  dx= ".30" />
            <xshift x= "584.0"  dx= ".46" />
            <xshift x= "886.8"  dx= ".78" />
      </plate>
      <plate tower="3" side="U">
            <xshift x= "-886.8" dx= "-.52" />
            <xshift x= "-584.0" dx= "-.30" />
            <xshift x= "-252.0" dx= "-.08" />
            <xshift x= "-12.7"  dx= ".10" />
            <xshift x= "12.7"   dx= ".08" />
            <xshift x= "315.5"  dx= ".12" />
            <xshift x= "584.0"  dx= ".23" />
            <xshift x= "886.8"  dx= ".40" />
      </plate>
</profile>
```

Note that the **xshift** element has two attributes: **x** is the horizontal distance across the web, and **dx** is the displacement from the base separation.

In the profile, the **measurePosition** element specifies how the measurements are spaced along the plate, and the **measureShift** element specifies the units used for the displacement measurements themselves. In the above example web growth profile, all measurements are in millimeters.

For another example, assume that the measurements are made every 8 inches across the drum, and displacements will be measured in 1-millimeter increments:

```
            <measurePosition x = "8" unit = "inch" />
            <measureShift x = "1" unit = "mm" />
```

The "origin" of the across-the-drum measurements is the center of the plate. As a result, the left-hand x coordinates are negative, and the right hand positive. If the plate is 44" wide, and the first measurement is 2" in from the left edge, this leftmost x coordinate will be (44/2 - 2) / 8 = -2.5. Because the measurements are spaced by **measurePosition**, they will have the x coordinates -2.5, -1.5, -0.5, 0.5, 1.5, and 2.5. The "origin" of the around-the-drum (y coordinate) measurements is the plate's leading edge. As a result, the coordinates start from 0 and are always positive, but otherwise the idea is the same as the across–the-drum measurements. The **yshift**

element has two attributes, **y** and **dy**, which specify the y-offset and the displacement in the y-direction respectively. An example web growth profile with non-linear web growth in both the x and y directions for a 40” by 15” plate is shown below:

Example 2: Non-Linear Web Growth Profile (Across and Around the Drum)

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE profile SYSTEM "WebGrowthProfile.dtd">

<profile>

      <measurePosition x = "8" y = "2" unit = "inch" />

      <measureShift x = "1" y = "1" unit = "mm" />

      <plate tower="1" side="U">

            <xshift x= "-2.5" dx= "-1.58" />

            <xshift x= "-1.5" dx= "-.72" />

            <xshift x= "-.5"  dx= "-1.54" />

            <xshift x= ".5"   dx= ".28" />

            <xshift x= "1.5"  dx= "1.28" />

            <xshift x= "2.5"  dx= "1.57" />


            <yshift y= ".5"   dy= "-3.28" />

            <yshift y= "1.5"  dy= "0" />

            <yshift y= "2.5"  dy= "-2.57" />

            <yshift y= "3.5"  dy= "-4" />

            <yshift y= "4.5"  dy= "-2" />

            <yshift y= "5.5"  dy= "0" />

            <yshift y= "6.5"  dy= "-2" />

            <yshift y= "7.5"  dy= "0" />

      </plate>

</profile>
```

Split-Plate Web Growth Compensation

Some presses allow mounting of two printing plates on their cylinders. The two plates are butted together on the press cylinder, and each is imaged separately (see Figure 1).

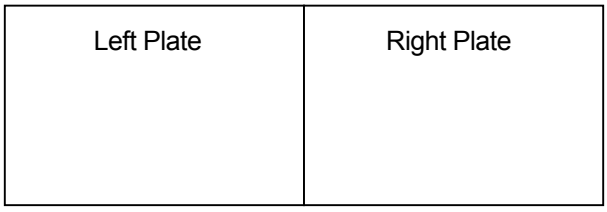


Figure 1: Positioning of plates for split-plate press cylinder

When web-growth is applied to a plate, it assumes that the center of the plate is aligned with the center of the press cylinder and applies compensation to the raster, usually shrinking it towards the center. On split-plate press cylinders, the center of the cylinder is one of the edges of the printing plate, not the center of the plate. Figure 2 shows the default direction of web-growth compensation across the plate, in the x-direction towards the center:

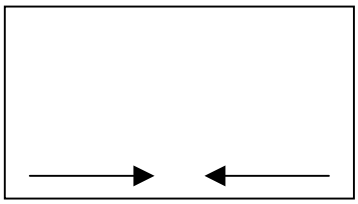


Figure 2: Default direction of web growth compensation in the x-direction for a single plate

For a split-plate application, the compensation applied to each plate must be towards one of the edges of the plate (for example, towards the junction of the left and right plates, as shown in Figure 3).

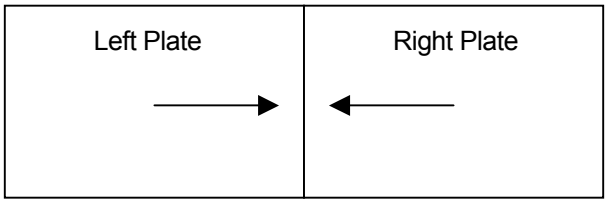


Figure 3: Direction of web growth compensation in the x-direction for split plates

Specifying left-right alignment

In the Prinergy web-growth profile file, a new **alignX** tag has been added to specify whether or not a plate is to be aligned to the right or left. The values for this tag are **R**, **L**, and **C** for right, left, and center respectively. If this tag is not specified, the default assumes the web-growth compensation should be centered with respect to the plate. Below is section of a web-growth profile that demonstrates the use of the **alignX** tag for the left plate of a split-plate pair:

```
<plate tower="2" side="U" alignX="L">
       <expansion xpercent="0.8" ypercent="0.25" />
</plate>
```

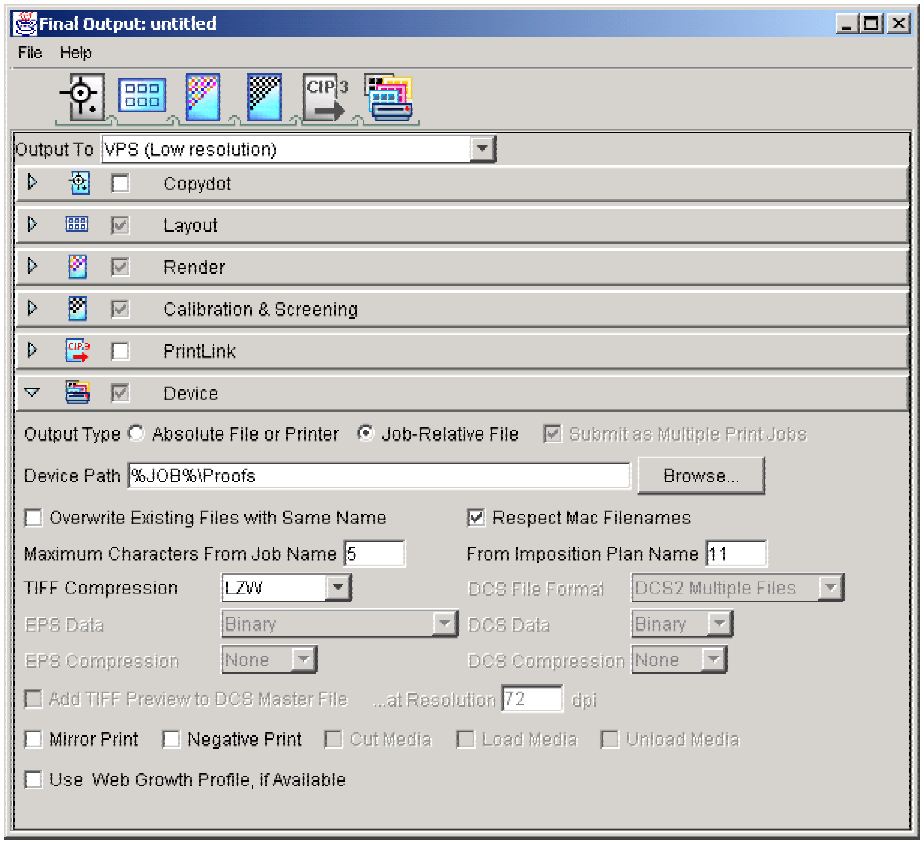
The latest version of the WebGrowthProfile.dtd (Document Type Definition) is required for the split-plate alignment feature to be enabled.

Using the Web Growth Profile Process Plan Option

The Device section of an imposition proof process plan or final output process plan identifies the device that will receive and output the pages.

The **Use Web Growth Profile, if Available** option in the Device section enables Prinergy to digitally compensate for distortion on press using a web growth profile file (**<file name>.wgp**) and a tower-color file (**ColorTowerMap.txt**). Select the **Use Web Growth Profile, if Available** check box to enable this option.

Recommendation: Clear the check box for imposition proofs, and select it for final output.

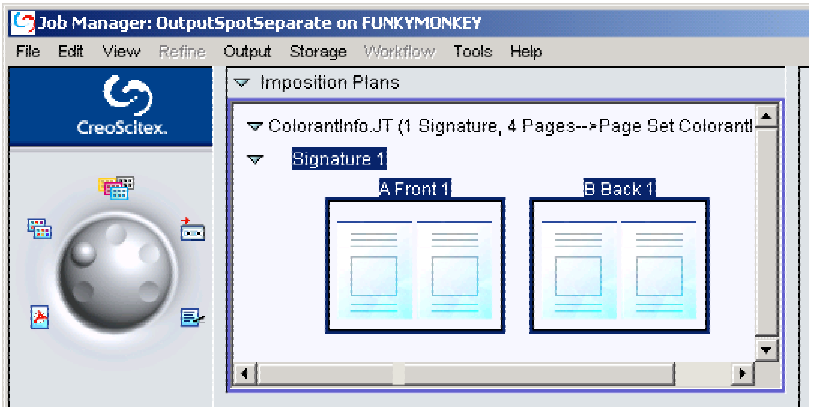


Setting and Clearing a Web Growth Profile

You can apply a web growth profile to one or more signatures.

To set a web growth profile:

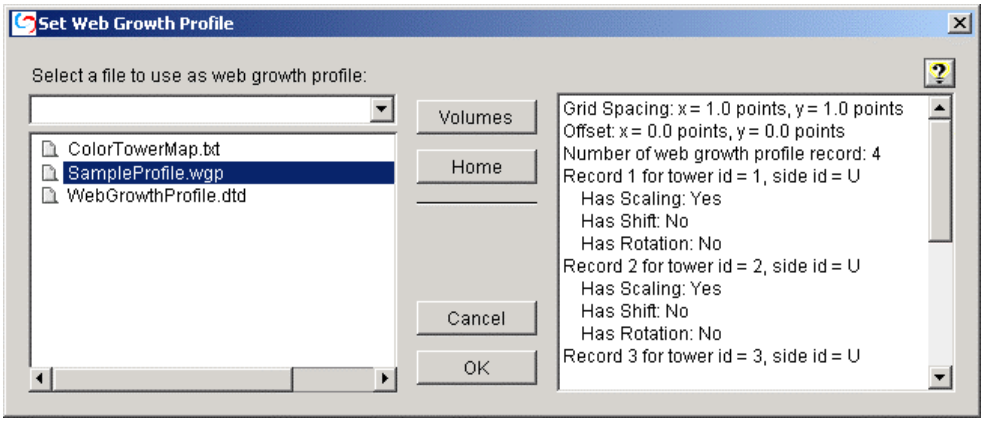
1. In the Signatures or Separations view in the Job Manager, select one or more signatures.



2. From the **Edit** menu, select **Set Web Growth Profile**.

   The Set Web Growth Profile dialog box displays.

3. Locate and select the web growth profile you want to use.



   The box on the right shows the types of distortions associated with the selected profile.

4. Click **OK**.

   The Set Web Growth Profile dialog box closes, and the web growth profile is set for the signature.

5. In Process Plan Editor, select the **Use Web Growth Profile, if Available** option in the Device section of the Imposition Proof process plan or Final Output process plan.

6. Apply the process plan to the signatures in the job.

The process starts, and the system applies the profile file and the tower-color file to the signatures and outputs the files.

Note: The amount of growth that the web growth compensation option can compensate for is limited to 1.56 percent. If a number larger than this is specified for the **xpercent** or **ypercent** fields in the web growth profile, an out-of-range error occurs during output; an error message displays on the render station.

To clear a web growth profile:

1. In **Job Manager > Signatures** or **Job Manager > Separations** view, select one or more signatures.
2. From the **Edit** menu, select **Clear Web Growth Profile**.

   The system clears the association of the web growth profile from the signatures.

Archiving

When you archive a job, Prinergy archives a reference to the profile file it used, but not the profile file itself. If you have to remake plates, you will want to use a current profile rather than the one used when the plates were originally made.

About Creo

Creo is a world leader in solutions for the graphic arts industry. Core product lines include image capture systems; inkjet proofers; thermal imaging devices for films, plates and proofs; professional color and copydot scanning systems; and workflow management software. Creo is also an Original Equipment Manufacture supplier of on-press imaging technology, components for digital presses, and color servers for high-speed, print-on-demand digital printers.

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