Date: October 2018   **Impact/Severity**: Medium
Region: WW   **Support Area**: Using Product
Audience: Support   **Confidentiality**: Public

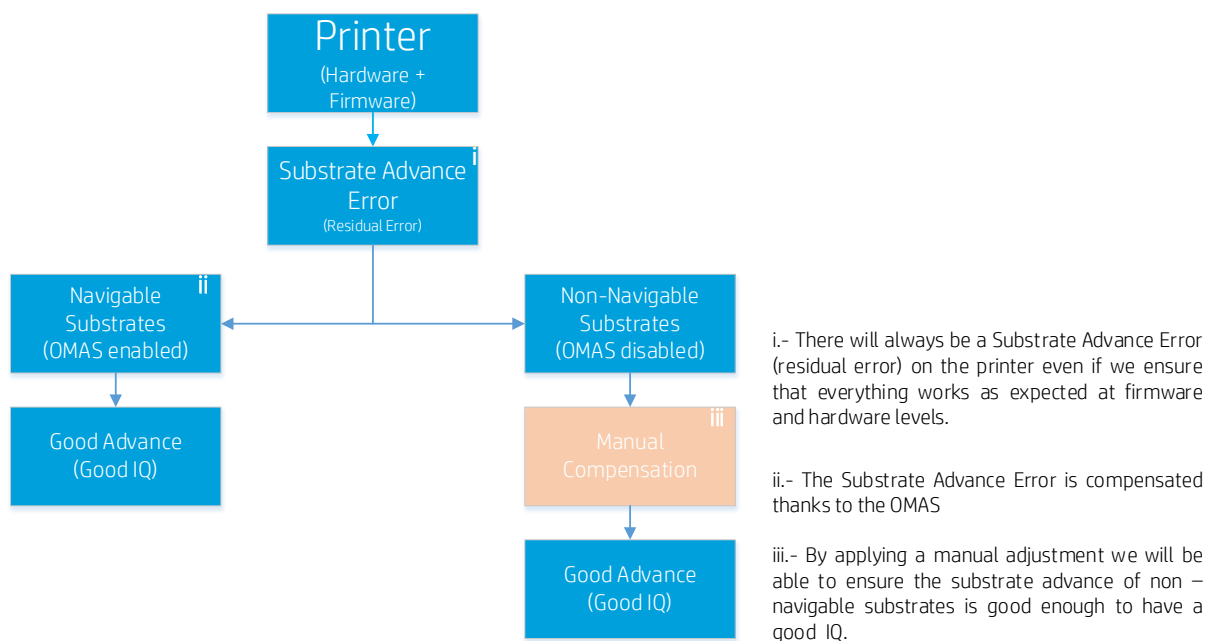## Obtaining Good Substrate Advance on HP Latex 3x00s and HP Latex 1500s

The Image Quality (IQ) provided by the printer directly depends on several factors such as printhead alignment, print mode, substrate settings, etc. Among them, we can highlight **Substrate Advance** as an important factor that must be taken into account (when good IQ is required).

Substrate Advance defines how much substrate the printer needs to advance in each carriage pass to ensure the proper placement of the ink drops on the substrate. If the substrate does not advance the proper distance between carriage passes, IQ issues like graininess or banding can appear.

On the HP Latex 3x00 and HP Latex 1500 printers, the printer's Substrate Advance characteristics are defined by the Substrate Path Subsystem. This subsystem includes all the elements responsible for providing smooth and accurate motion of the substrate, thus ensuring consistent and controlled substrate advance. An important element of this Subsystem is the **Optical Substrate Advance Sensor** (OMAS).
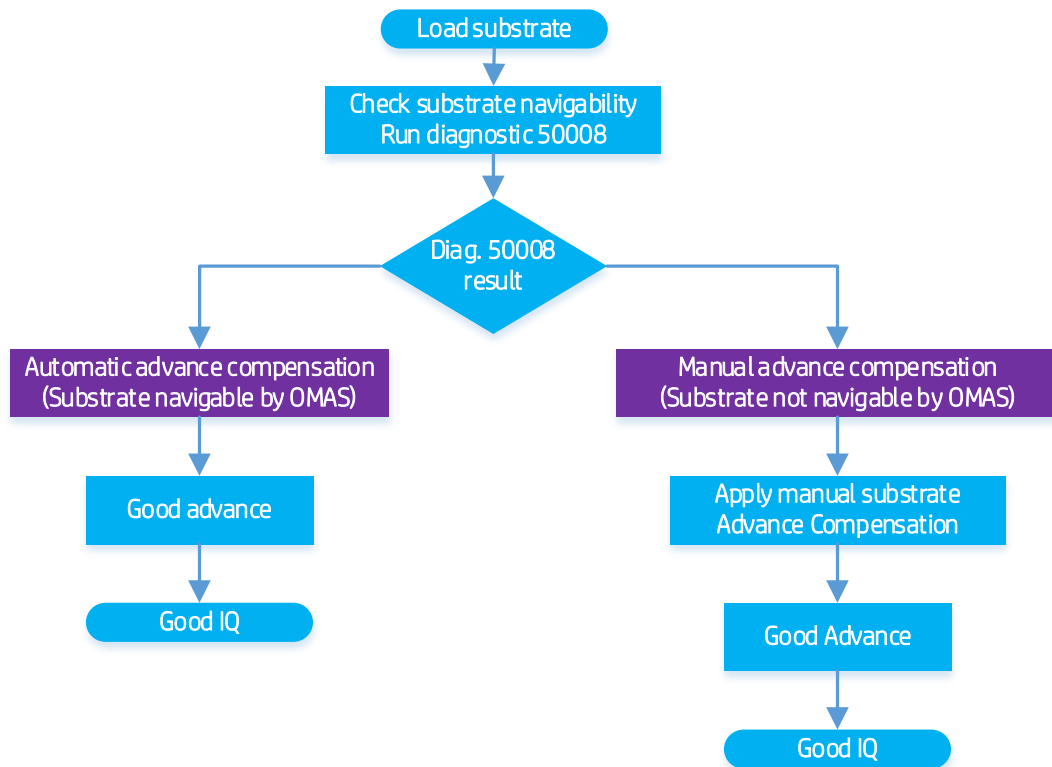
The **OMAS** is an optical sensor located underneath the print platen that takes pictures of the fibers on the back of the substrate as it moves across the platen. These pictures evaluate the precision of the substrate's movement. The evaluations result in a set of values that describe the "Substrate Advance Error" and are used to make automatic precision adjustments while the substrate is being printed on.

On certain substrates, the OMAS is not able to see the fibers properly (non-navigable substrates), in which cases it is not possible to know the precision of the substrate's movement. In this case the substrate advance adjustment should be defined manually by running the Manual Compensation. See the workflow chart below for better understanding.

i.- There will always be a Substrate Advance Error (residual error) on the printer even if we ensure that everything works as expected at firmware and hardware levels.

ii.- The Substrate Advance Error is compensated thanks to the OMAS

iii.- By applying a manual adjustment we will be able to ensure the substrate advance of non – navigable substrates is good enough to have a good IQ.

Ensuring Good Media Advance for a Certain Substrate

Every time a new substrate is used for the first time in the printer, you can ensure good substrate advance using the following:

```
                        ┌─────────────────┐
                        │  Load substrate │
                        └─────────────────┘
                                 │
                  ┌──────────────────────────────┐
                  │  Check substrate navigability │
                  │    Run diagnostic 50008       │
                  └──────────────────────────────┘
                                 │
                          ◇ Diag. 50008 ◇
                          ◇   result    ◇
                  ┌───────────────┴───────────────┐
    ┌───────────────────────────┐       ┌───────────────────────────┐
    │ Automatic advance          │       │ Manual advance             │
    │ compensation               │       │ compensation               │
    │ (Substrate navigable by    │       │ (Substrate not navigable   │
    │ OMAS)                       │       │ by OMAS)                   │
    └───────────────────────────┘       └───────────────────────────┘
                  │                                  │
         ┌─────────────────┐             ┌───────────────────────────┐
         │  Good advance   │             │  Apply manual substrate    │
         └─────────────────┘             │  Advance Compensation      │
                  │                       └───────────────────────────┘
         ┌─────────────────┐                          │
         │    Good IQ      │             ┌─────────────────┐
         └─────────────────┘             │  Good Advance   │
                                         └─────────────────┘
                                                  │
                                         ┌─────────────────┐
                                         │    Good IQ      │
                                         └─────────────────┘
```

After loading a new substrate, the first step to ensuring good media advance is to check whether your media is navigable by the OMAS or not. Diagnostic 50008 has been designed for this purpose.

If the result of the diagnostic is **automatic advance compensation**, then the media that is loaded is navigable, and no further advance-related checks are necessary. The OMAS will automatically compensate for the Substrate Advance Error.

If the result of diagnostic 50008 is **manual advance compensation**, the printer is *not* able to compensate automatically for the Substrate Advance Error (a residual error) and the OMAS becomes disabled.

Under these circumstances, a manual Advance calibration of your media is necessary. Follow the next indications to manually adjust the Advance compensation:

Manual Substrate Advance Compensation

For substrates that the printer is able to navigate, the Substrate Advance Error (a residual error) will be compensated by OMAS action automatically. However, for those substrates that are not completely navigable or cannot be read by the OMAS, the Substrate Advance Error will need compensating for by a manual compensation.

The process below is intended to explain how you can get the *Manual Compensation value* for a substrate—a value that needs to be introduced into the Print Adjustment dialog of the IPS to compensate for the Substrate Advance Error. The process is based on getting this value by using the IPS's Substrate Advance Calibration.

1. Load the Substrate:
    - Load the substrate for which you want to get the Manual Compensation value

2. Clone the Substrate:
    - In case you are using a generic substrate, you need to clone it first to be able to edit the fields you need
    - In the IPS go to **Substrate > Clone** and enter a new name for the cloned substrate

    Modify the settings based on the customer's application, if needed:
    - In the IPS go to **Substrate > Edit** and select the name given to the cloned media. This will allow you to modify all the important settings in the substrate preset as required by the customer's application (print mode, curing and drying settings, etc.)

3. Make sure that the PHs are in good condition and aligned. Refer to the section <u>Making sure PHs are in Good Condition and Aligned</u> for further details.

4. Advance Calibration test:

    The Substrate Advance test allows you to determine the proper Manual Substrate Advance Compensation in order to obtain good Substrate Advance. In the Internal Print Server, select **Printer > Advance calibration**. The printer will print several repetitions of a special numbered pattern (based on Vernier's principle[1]).
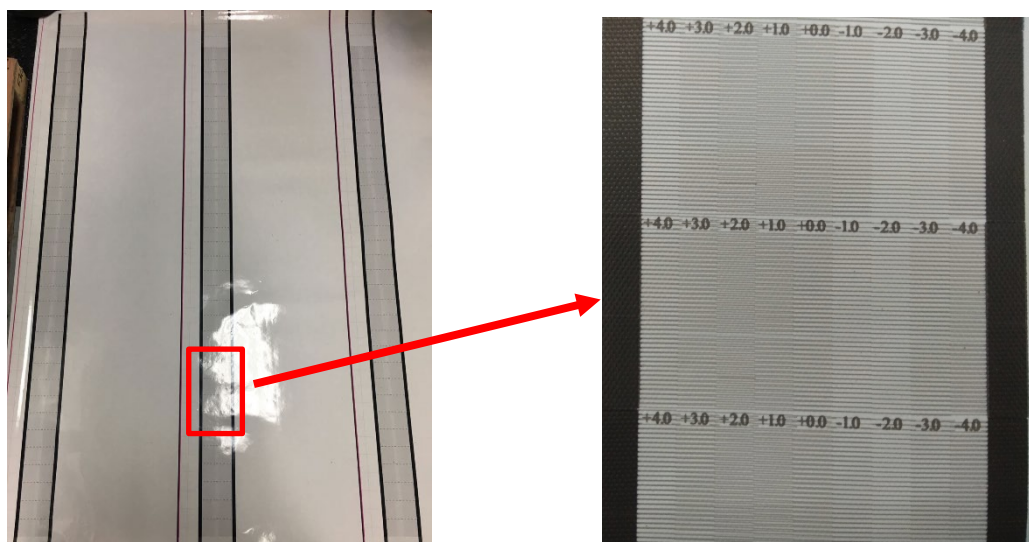
[1] *The Vernier scale works on the principle of using an alignment of line segments displaced by a small amount to make fine measurements and determine measurement errors.*

The following steps describe the process to determine the Advance Compensation value that should be introduced in the IPS **Printing adjustment** dialog:

1. The Advance plot is composed of several columns (Figure 1), each one located between two black lines. Each of these columns contain numbered patterns and one column corresponds to each number.
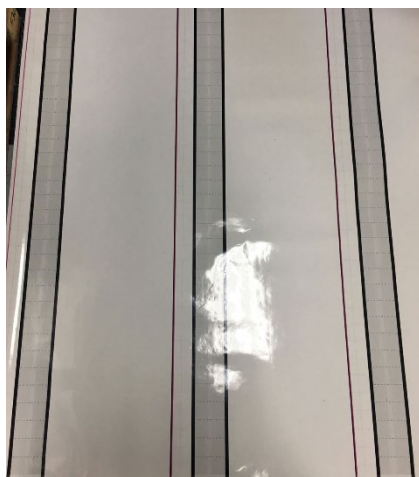

Figure 1: Advance plot with several columns

2. While the test image is being printed, locate **all the values** that correspond to **the lightest columns** (Figure 2). Do this for each column on the advance plot (the columns between the black lines). Once all the values are located, **calculate the average** of the values of each column. Once the average values of each column are calculated, calculate the average of these values. For **dual roll** setups, the same procedure should be followed; in said cases, one image will be printed for each roll.
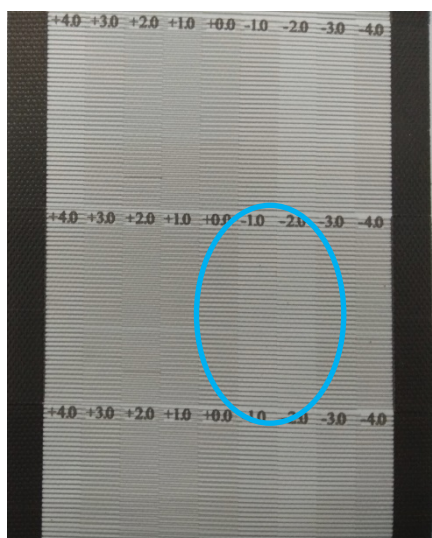

Figure 2: Lightest columns in advance plot

TIP: In case the test shows two possible values (two adjacent light columns), the selected value will be the average of both values. For example, if the test says the value could be +2.0/+3.0, consider +2.5 to be the value.

3. In the **IPS > Printer > Printing adjustments** dialog, look for the current **Advance** value set and add to this number the value chosen in step number 2. For example, if the value shown in the *Printing adjustment* dialog is -2.0 and the chosen value in the first step is +2.5, the value to be introduced into the **Advance** field should be +0.5.

4. The result of the previous addition is the value that should be set as the Advance Compensation. Click the **Apply** button to implement this change.
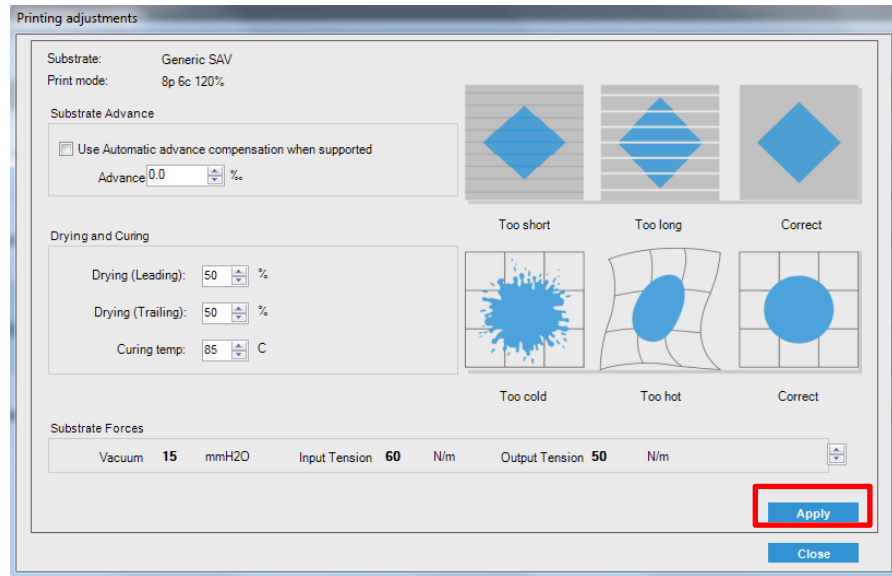

By applying the correct Advance Compensation value, the lightest of the columns should be located at value 0 in each of the columns. For dual roll setups it should be on both rolls. This can be seen by reprinting the Manual advance test plot. This means the printer is compensating for the Substrate Advance Error and providing good media feed.

IMPORTANT: The Manual Substrate Advance Compensation obtained through this process is only usable for the media that is currently loaded. It is also important to highlight that this value cannot be used on another printer. If the user plans to use the same media on multiple printers, he needs to go through the whole process on each printer.

Making sure PHs are in Good Condition and Aligned

1. Check the status of the printheads:
   - Print the Nozzle Check Plot from **Printer > Printhead cleaning > Print** and determine whether the printheads are in good shape (only a few nozzles out) or not.
   - If you experience problems with any printheads (many nozzles out), run the hard cleaning routine to recover it. If needed, replace the affected printheads.

2. Check Printhead Alignment:
   - In IPS go to **Printer > Printheads Alignment > Print (Verify alignment)**. The following plot will be printed in order to help you decide whether a printhead alignment is needed or not. Refer to the *Printer calibration > Align printheads* section in the User Guide for further details.
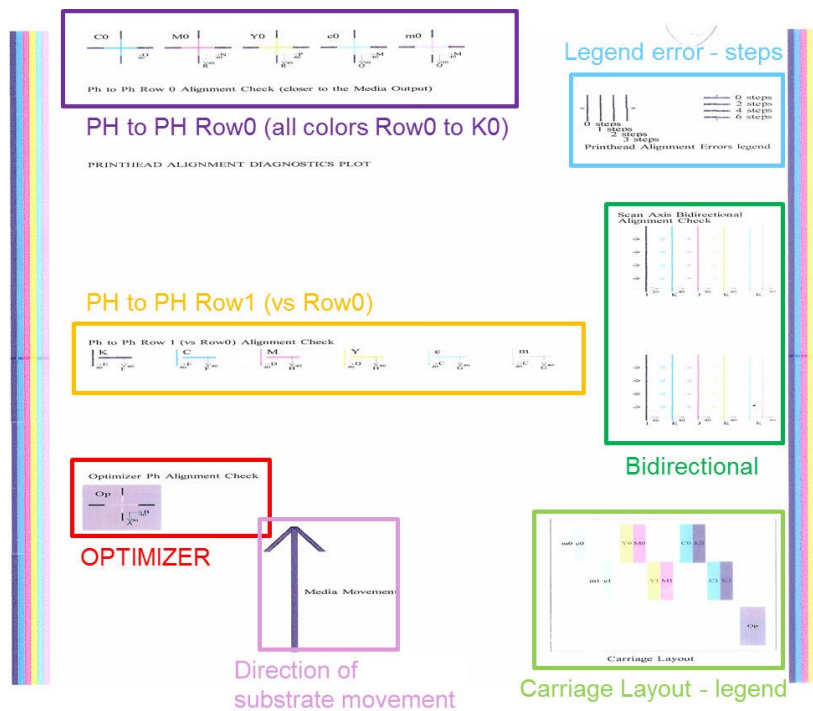
   - In case the Printhead Alignment is needed, in the Internal Print Server select **Printer > Printheads Alignment > Print (Alignment type)**. Refer to the *Printer calibration > Printhead alignment diagnostics plot* section in the User Guide for further details.