TECH NOTES – Summary Analysis

Summary Analysis & Application of PerfecTest *Material Expansion & Shift* Data

I Using PerfecTest To Correct For *Material Expansion*

1) Registration error that is caused by expansion or shrinkage of the core materials used in the B and C stages is reported in the **PERFECTEST SCALING DATA REPORT.**

- When setting up new jobs in CAM, the construction lay-up of the new job is used as the search parameter for scaling data. PerfecTest software searches its data base for previous jobs with the same construction. Because the software knows what scale factor was used and the results achieved on this previous job, it is then able to ***automatically calculate and present the new, corrected scale factor for each layer.***
- It reports this information as the CORRECTED SCALE FACTOR, in both the x and y axis. ***These scale factors can be used on any job where the construction lay-up is the same as the tested job.***

- The PerfecTest software calculates these scale factors as a percentage, inch-to-inch or mm-to-mm. This is the same data format required by most CAM stations when inputting scale data, so it can be transferred directly from PerfecTest to CAM.

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II Using PerfecTest Data To Correct For *SHIFT* Movement

1) Front-to-back registration error on a particular core

When ***front-to-back*** registration on a particular core is off, i.e., layers 2-3, 8-9, etc., ***the error occurred in the exposure frame during dry-film printing***.

- ◊ Causes:
  - If this error is consistent from panel to panel, the problem is in the setup of the artwork in the exposure frame.

- If the front-to-back registration error varies from panel to panel, then the error is caused by the non-repeatability of the mechanical process used to hold the artwork in place during exposure.
- Depending on the particular process used, this could be loose hinges in the exposure frame, worn pins or loose holes.

2) Core-to-core registration error within a panel

When there is error ***from one core to the next***, ***this error occurs during lamination.***

◊ Causes:

- worn pins.
- loose holes.
- inconsistent placement of the holes from one core to the next because of punching inaccuracies.
- to much force used in assembling the stack-up.

3) Overall registration error that is not consistent from panel to panel

When the registration is consistent ***within each panel***, but varies overall from one panel to the next, ***this error occurs because of non-repeatability of the panel position at the drill.***

◊ Causes:

- soft tooling on the drill table may be worn.
- loose or worn pins.
- too much force was used in pinning the panels to the drill.

4) Overall registration error is consistent from panel to panel, but off in the same direction and amount on all panels.

When registration is ***consistent throughout the process, but all the panels have registration error that is consistently in the same direction, the error occurs at the drill.***

◊ Causes:

- Incorrect drill offset.
- Incorrect “0” reference datum in CAM.
- Error in drill tooling hole location.

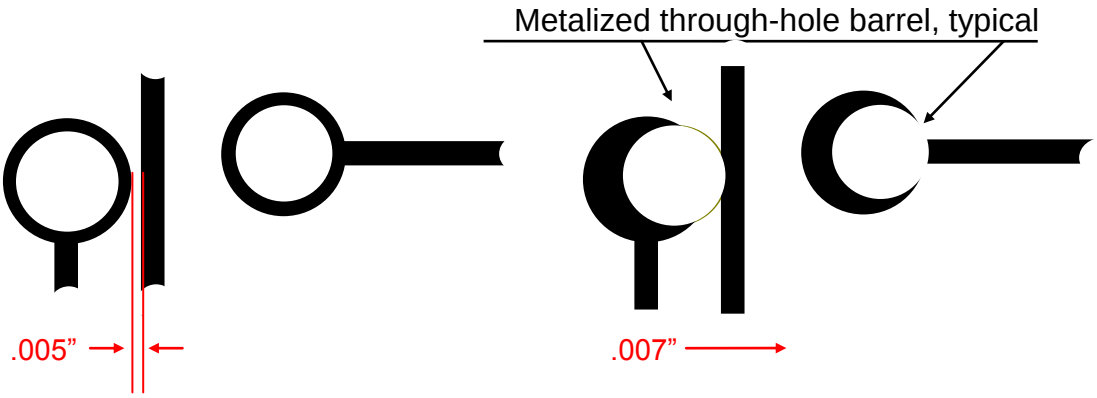
It is important to recognize that the types and causes of registration errors described above usually occur in ***combination*****.** That makes it essential that the ***components*** of registration error be examined, isolated and dealt with individually.

Data from **PerfecTest** and **FilmCheck** is designed to focus on the error so narrowly that the user can easily attribute the cause to a ***particular function*** in the process.

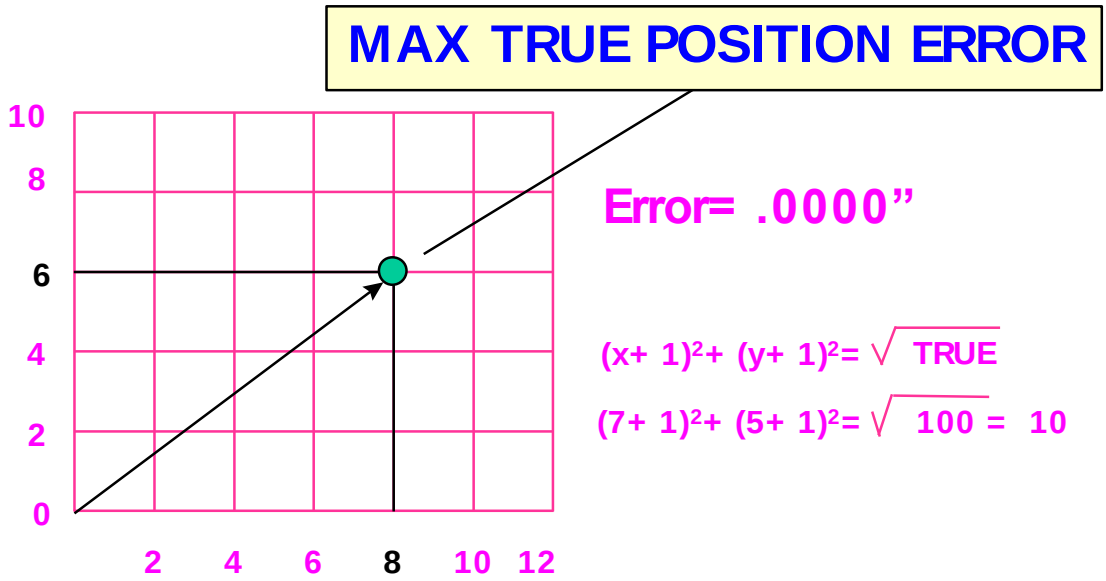
This summary is intended as a quick reference in using the information produced by your systems from PerfecTest Corporation. In addition to the types and combinations of errors discussed in this summary, other registration problems can occur because of random drill wander, warped platens in the press, and environmental effects on artwork, to name only few causes. These problems can also be isolated and corrected using data from PerfecTest and FilmCheck.

Calculating *MAX TRUE POSITION ERROR,* and its effect on the PCB.

The maximum *TRUE POSITION ERROR* is of critical importance to the OEM who uses the PCB. It is an accurate indication of whether or not there will be a short between adjacent features or hole breakout.



When the **MAXIMUM TRUE POSITION ERROR** exceeds the allowable limit as shown above, the PCB may fail bare board test - or worse yet, fail later when the populated PCB is in service. The graphic on the next page illustrates why the worst case **MAXIMUM TRUE POSITION ERROR** is actually greater than the actual X or Y error. PerfecTest software automatically calculates the *polar coordinates* of this worst case position on each panel, and reports it as the **MAX TRUE POSITION ERROR**.



Precise information on true position error is critically important to the end user of the PCB, and is a *powerful selling tool because it enables the fabricator to document and guarantee the accuracy/quality with PerfecTest.*

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Processes and systems described here have become the primary tools for controlling material scaling and registration with fabricators worldwide, ranging from the very largest to some of the smallest. Patents worldwide protect these processes and systems.

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