Adding PANTONE® 9520

Digimarc strives for full watermark coverage on every package. To enhance packages with large **white** or **clear** areas, we recommend adding an ink station for **PANTONE 9520 C**.

A **binary** Digimarc watermark consists of dots of **100% ink** distributed throughout an area with no screening. The Digimarc watermark is colorized using a PANTONE color that is dark enough to be easily detected by a scanner but is light enough to be difficult for the human eye to see. This technique is available for **all print technologies**.

PANTONE® 9520 on Opaque Substrates

Suggested Ink Formulation and Test Guidelines

Why PANTONE 9520?

- Good red light detection
- Less visible to human eye
- Single pigment to mix

Digimarc is in the process of enhancing packaging artwork for better scanning performance by retail point-of-sale scanners, which commonly use red light to scan codes. Digimarc has identified 670 nm as the point on the red spectrum where contrast must be maintained to specified levels for performance in retail scanning. PANTONE 9520 has good detection at this wavelength. Since areas with no ink require a detectable ink to be added, we have identified PANTONE 9520 as the best choice for opaque substrates.

NOTE: *Pantone color names are provided for informational purposes only. Pantone trademarks are the property of Pantone.*

Suggested Ink Formulation

1. The goal is to add the minimum amount of colorant to a clear varnish to achieve a Δ670 nm of at least **0.20**. All testing uses **Green 7** (primary base ink PANTONE Green™ or PANTONE Green 0921™).
2. We suggest starting with **2 parts Green 7** + **98 parts clear varnish**; or resin, extender, vehicle, etc.
3. Measure drawdown for point-of-sale scanner performance and Digimarc watermark visibility with a spectrophotometer, adjusting ink formulation based on test results.

   The ink should have a delta reflectance at red light (670 nm ± 10 nm) between the ink and the final substrate of at least Δ670 nm ≥ **0.20** when measured on a black backing. This ensures performance on both red-light and white-light devices such as point-of-sale scanners and mobile phones.

   If Δ670 nm is too low (≥ **0.20**), we suggest adding more Green 7.

Optional Visibility Guidelines

1. The ink should have the smallest CIE ΔE_{00} (color error) between the solid ink and final substrate as possible when measured on a white backing. This reduces the visibility to the human eye.
2. If CIE $\Delta E_{00} > 12$, confirm the pigments are Green 7 and then add more varnish, keeping Δ670 nm above **0.20**. This is the solid portion and not the Digimarc watermark, so this delta may be higher than expected. In the Digimarc watermark, it will be closer to CIE ΔE_{00} 1.5.

Performance Test Guidelines

1. To check performance when spectral data is not available, CIELAB values can be used. The measurement is the difference between the final substrate and the solid ink on that substrate with a black backing. With the optimization:
   - Minimum CIE Δa* (the red-green chroma) ≤ -9
   - Minimize any changes in CIE L* and CIE b* to match the substrate values
2. See acceptable example data below with ink formulation of **2 parts Green 7** + **98 parts varnish**:

Measurement	Reflectance	CIELAB
Substrate: Coated opaque	0.92	95, -0.7, 1.7*
PANTONE 9520	0.70	92.1, -10, 0*
Δ670 nm (Substrate - Ink)	0.22 ✓	10.7*

** The [CIE]LAB values for Pantone-named colors are based on Digimarc measurements. The [CIE]LAB values for Pantone-named colors are not provided by Pantone and are not intended to be used in place of Pantone-provided [CIE]LAB values for Pantone-named colors.*

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