

Competitive Test Report

Xenon 1900 Scanner with 2DTG's DPM Decoder against DataMan 7500, DS3508-DP20185R and Mobile Hawk

Contents

1. Objective	1
2. Test Scope	1
3. Test Procedure	2
3.1. Samples	2
3.2. Definitions	3
4. Test Results	4
4.1. Success Decode Rate	4
4.2. Average Operating Range	5
4.3. Performance-to-Price Ratio	5
5. Conclusion	6

1. Objective

The objective of this study was to compare performance of the **Honeywell Xenon 1900 Scanner** upgraded with **icEveryCode™ DPM Decoder** with the other DPM (Direct Part Marking) scanners in the market.

6 devices were selected for this study:

- 1.1 **Xenon 1900 HD by Honeywell Corp.**, upgraded with the **icEveryCode™ DPM Decoder** (DPM decoding software) by 2DTG.
- 1.2 **DataMan 7500 DPM Scanner by Cognex Corp.**
- 1.3 **DataMan 7500LR DPM Scanner by Cognex Corp.**
- 1.4 **DS3508-DP20185R DPM Scanner by Motorola Solutions, Inc.**
- 1.5 **MobileHAWK DPM Scanner by Microscan Corp.**
- 1.6 **Xenon 1900 HD by Honeywell Corp.** with the original (“system”) decoding software

2. Test Scope

Three performance parameters were measured on the 2 representative sets of DPM marks:

Competitive Test Report

Decode Rate or Success Rate - defined as a ratio equal to the percentage of the successful decoding within the given set of samples - (Number of successfully decoded samples) / (Total number of samples).

Operating Range - one of the most challenging performance parameters for any DPM reader along with Decode Rate. Industries require DPM readers to be capable to decode DPM marks at the distance up to 2 inches from the exit window for the small DataMatrix symbols, having module size in the range of 5-7 mils, and up to 8 inches for the 20-40 mils symbols. **Operating Range** was calculated as the difference between the maximum and minimum **Reading Distance**.

Decode time - defined as the full time required for successful decoding: from starting to aim at the symbol until it is decoded.

3. Test Procedure

3.1. Samples

Two representative sets of DPM samples, comprising “typical” materials (steel, duralumin, plastic, etc.), surfaces (cast, polished, etc.) and type of DPM marks (Dot Peen, Laser etching, ink jet) were selected for the test. Some of the samples have been chosen intentionally challenging. Though the spectrum of the samples was broad enough, most of them came from automotive industry.

Set #1

Set contains 22 Data Matrix DPM samples: laser etched - 11, Dot panned - 10, Ink jetted - 1. Module size is ranging from 6 to 38 mil; average module size – 18.7 mil. Sample images - as captured by Xenon1900 - are shown in the Exhibit 1.

Set #2

Set contains 24 Data Matrix DPM samples: laser etched - 8, Dot panned - 16. Module size is ranging from 4.4 to 31 mil; average module size – 19.0 mil. Sample images - as captured by regular camera - are shown in the Exhibit 2.

Dot Peen samples, depicted on the pictures as having “red dots” (and marked with letter “F”) - HF13-HF22 - were not considered (decoded) in this analysis.

Sample # H11 was excluded from the analysis since it's out of specs (cell size is < 5 mil) for 2 scanners (Xenon and DS3508) used in this test.

Samples ## H18 and H22 were excluded from analysis since they could not be decoded by either scanner.

The following table shows which Sample Set was used for which device:

Competitive Test Report

Set 1	Xenon 1900HD + 2DTG's Plugin	DataMan 7500LR	Xenon 1900HD	
Set 2	Xenon 1900HD + 2DTG's Plugin	DataMan 7500	DS3508-DP20185R	MobileHAWK

Sample proper handling and reading angle(s) with all the devices were based on the manufacturers' user guidelines depending on their illumination designs.

3.2. Definitions

All decode results fall under the 3 categories:

- **“Stable Decoding”** – meaning that decoding was successful from the first try – no lighting or distance adjustment, or aiming angle optimization was required.
- **“Conditional Decoding”** - decoding was successful, but some adjustments had to be made during the image capturing process:
 - For most of the scanners studied image capture has to be performed under the certain angle to the surface (from 45 to 65 degrees) to avoid direct light reflection from the substrate. “Optimal” value of this angle as well as distance from the target depends both on surface condition and ambient light. Accordingly, this “optimal” angle and distance has to be worked out by operator experimentally and capture time depends on operator experience.
 - For scanners 1.2 and 1.4 “angle adjustment” is less important as they have built-in illumination system providing diffuse-like lighting.
- **“Undecodable”**

The time stamp for the **“Stable Decoding”** we considered to be up to 2-3 sec; for the **“Conditional Decoding”** – up to 2 sec; and for **“Undecodable”** – more than 5 sec.

Notes regarding MobileHAWK:

- almost no samples were decoded within 10 sec. However, we decided to keep the results in the comparison table for completeness.
- “Dot Peen Enhancement” mode for this scanner provided no visible improvement compare with the default setting.
- Operating range comparison for this scanner was done for conformance purpose only – this is basically “contact” device – reading distance for ~70% of samples was less than 1 inch.

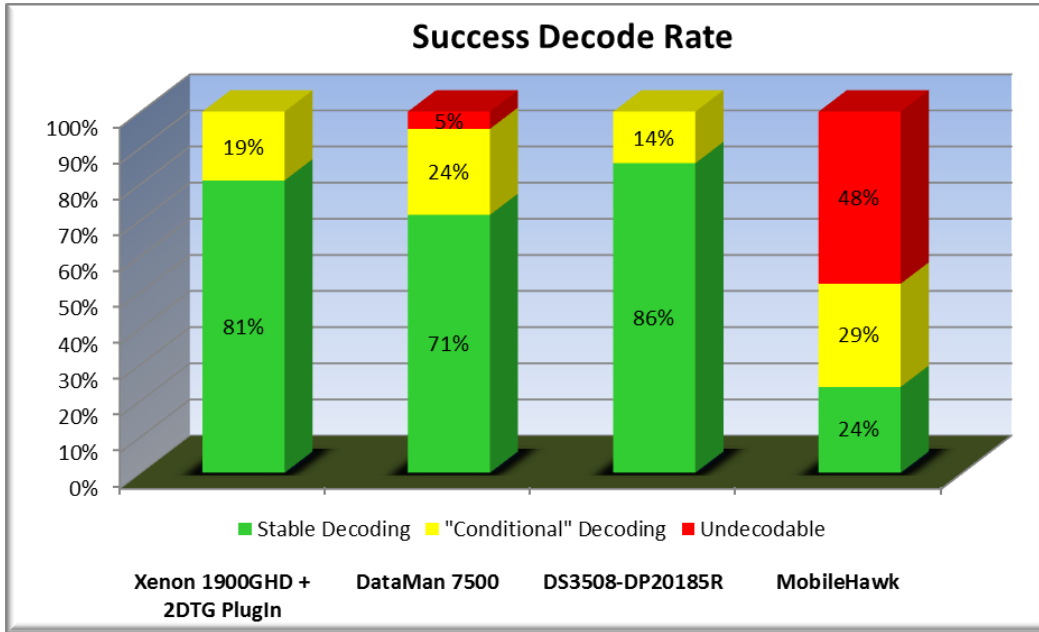
Competitive Test Report

4. Test Results

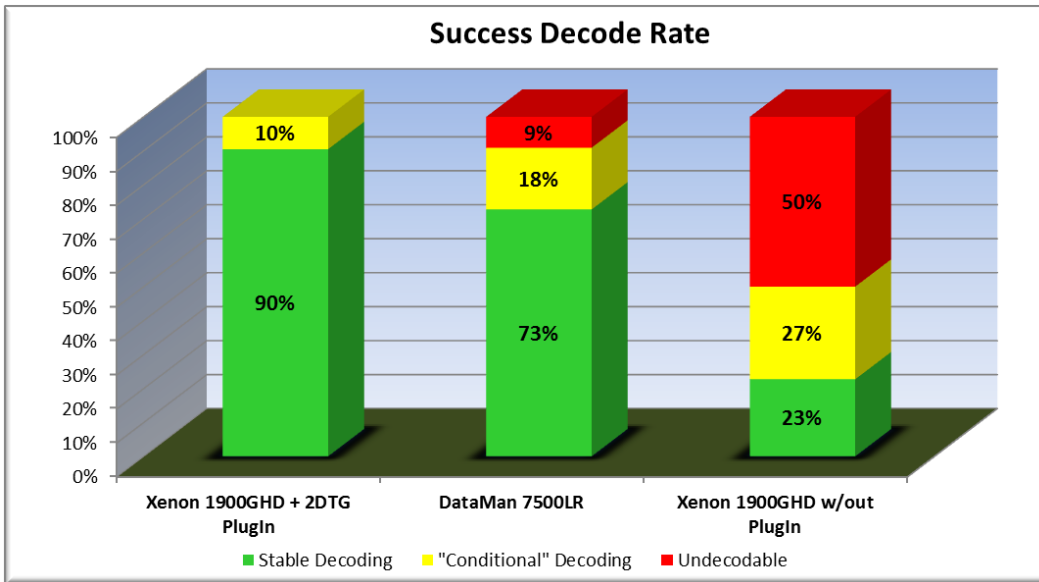
Overall results of the side-by-side comparison of the Xenon 1900HD with 2DTG's Plugin with the other DPM scanners in the market are demonstrated by the diagrams below.

4.1. Success Decode Rate

SET 2:

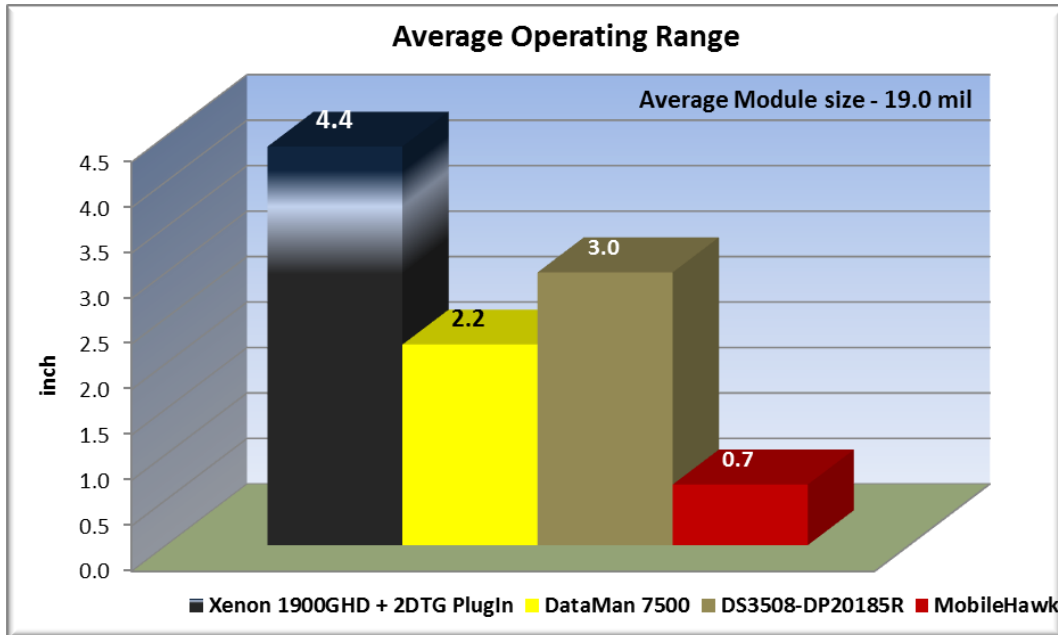


SET 1:

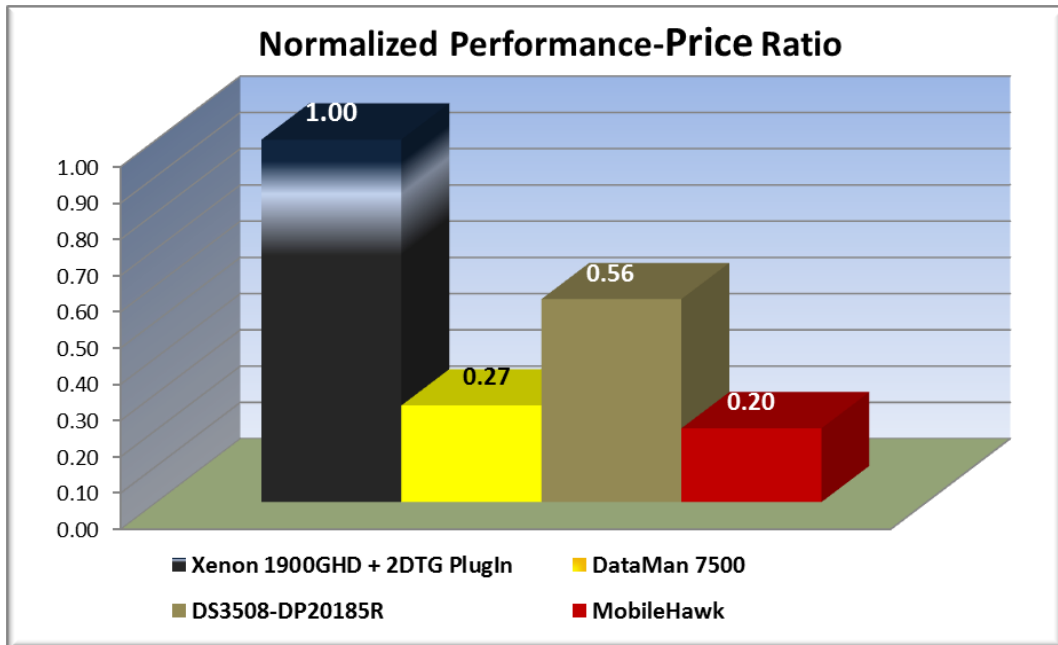


Competitive Test Report

4.2. Average Operating Range (Set 2)



4.3. Performance-to-Price Ratio (Set 2)



“Performance-to-Price Ratio” was calculated as (Decode Rate) / (Scanner List Price) and then normalized

Competitive Test Report

to the ratio for Xenon 1900 w/Plugin.

5. Conclusion

Xenon 1900/1902, upgraded with DPM Plugin, demonstrates very good DPM performance – **Success Decode Rate** - on par with the industry leaders: DS3508-DP20185R (Motorola Solutions, Inc.) and DataMan 7500 (Cognex Corp.).

However, in terms of **“Performance-to-Price Ratio”** Xenon 1900GHD with 2DTG Plugin is certainly superior to all the competitors, since it demonstrates advanced DPM performance for a fraction of DPM platform cost.

Competitive Test Report

Exhibit 1










SET #1 Samples

1 Painted Al 26x26; 15 mil	2 Intel chip 18x18; 10 mil	3 Chrome-plated Steel 18x18; 9 mil	4 Chrome-plated Steel 18x18; 9 mil	5 Zinc-plated Steel 18x18; 9 mil
6 Zinc-plated Steel 18x18; 9 mil	7 Milled Al 8x32; 20 mil	8 Milled Al 18x18; 14 mil	9 Milled Al 18x18; 28 mil	10 Cast Duralumin 18x18; 22 mil
11 Cast Steel 16x16; 31 mil	12 Curved polished Steel 18x18; 20 mil	13 Painted Steel 22x22; 25 mil	14 Curved polished Steel 14x14; 31 mil	15 Polished Steel 12x12; 7 mil
16 Fluoroplastic 14x14; 13 mil	17 Celeron Chip 18x18; 6.5 mil	18 Mirror-like Steel 14x14; 13 mil	19 Painted Steel 26x26; 30 mil	20 Polished Steel 22x22; 28 mil
21 Painted Metal 64x64; 38 mil	22 Cast Duralumin 26x26; 24 mil			




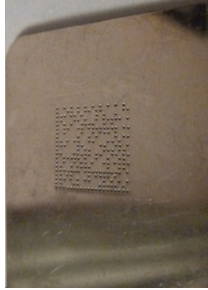
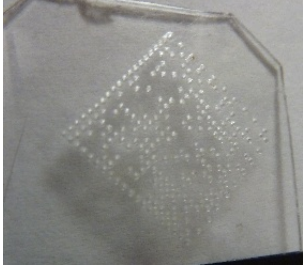



Competitive Test Report

Exhibit 2

SET #2 Samples

H1 Casted Duralumin 26x26; 24 mil	H2 Casted Duralumin 18x18; 20 mil	H3 Polished Steel 18x18; 10 mil	H4 Chromem-plated Steel 18x18; 11 mil
			
H5 Painted Al 26x26; 21 mil	H6 Painted Plastic 12x12; 23 mil	H7 Polished Al 12x12; 23 mil	H8 Black Plastic 12x12; 20 mil
			
H9 Polished Al 26x26; 12 mil	H10 Polished Al 14x14; 11 mil	H11 AMD chip 18x18; 4.4 mil	H12 Black Plastic 12x12; 21 mil
			

Competitive Test Report

<p style="text-align: center;">H13 + H13F Milled Steel 20x20; 26 mil</p>	<p style="text-align: center;">H14 + H14F Milled Brass 20x20; 22 mil</p>	<p style="text-align: center;">H15 + H15F Milled Cooper 20x20; 16 mil</p>	<p style="text-align: center;">H16 + H16F Polished Duralumin 20x20; 24 mil</p>
			
<p style="text-align: center;">H17 + H17F Organic Glass 20x20; 30 mil</p>	<p style="text-align: center;">H18 + H18F Teflon 20x20; 30 mil</p>	<p style="text-align: center;">H19 + H19F Colored Organic Glass 20x20; 30 mil</p>	<p style="text-align: center;">H20 + H20F Textolite 20x20; 16 mil</p>
			
<p style="text-align: center;">H21 + H21F Duralumin, distressed 20x20; 16 mil</p>	<p style="text-align: center;">H22 + H22F Curved polished steel 16x16; 17 mil</p>	<p style="text-align: center;">H23F Duralumin 20x20; 18 mil</p>	<p style="text-align: center;">H24F Duralumin 20x20; 28 mil</p>
