

Executive Summary**DATAMATRIX AND PDF417
DATA INTEGRITY TEST**

The Center for Automatic Identification at Ohio University conducted a test to evaluate data integrity of selected tow dimensional, high density, high capacity coding symbologies for use in selected automatic identification applications. The test was part of the US Army's PM-AMMOLOG project. Specific symbologies tested were Datamatrix from International Data Matrix, Inc. and PDF417 from Symbol Technologies, Inc. As a reference, Code 39 (MIL-STD 1189) symbology was tested under the same conditions.

The statistical objective of the test was to determine if Datamatrix and/or PDF417 symbologies could be expected to exhibit one error or less in two million characters scanned and decoded. The level of confidence was set at 95%.

Symbols for Datamatrix and PDF417 included 50, 100, 250, and 350 encoded characters for each of three levels of error corrections, identified as low, medium, and high. Each Code 39 symbol contained 15 to 25 characters. Based on a populations of 1080 symbols per symbology, sample size was calculated to be 31,438,998 characters per symbology. Actual characters scanned and decoded exceeded the calculated minimum. Each symbol was printed on 3-inch square white paper label stock using a thermal transfer printer. Each symbol was mounted on a plastic carrier sheet on one of two surface shapes; flat or curved.

An automated test apparatus was used to assure uniformity of test conditions. The apparatus included robotic loading and unloading of carrier sheets onto scanning stations. Scanning for Datamatrix symbols was performed using fixed mounted RS-170 CCD cameras. PDF417 and Code 39 symbols were scanned using "hand-held" rastering visible laser scanners mounted in fixed positions and software triggered. Decoding of all symbols occurred in decoders supplied with the scanners using the respective manufacture's proprietary decoding algorithms. Each symbol was read a total of 288 times.

Software was developed to monitor and control the test apparatus and to assure proper collection of data. Decode data, including the number of non-reads, errors, and total number of characters scanned, was collected for each symbol and was logged into three data files.

Over 94 million characters were decoded during the test. Analysis of test results indicated no errors attributable to either Datamatrix or PDF417 symbologies. Eleven errors were recorded for Code 39. Based on the statistical criterion for the test and the test results, it can be stated with 95% confidence that Datamatrix and PDF417 will have error rates of one or less errors per 10,494,626 million characters scanned and decoded. Results were based on a 95% confidence interval for character substitution errors in each symbology.

Generalized Error Rates

| Symbology | Worst Case (95%) | Best Case (95%) |
|------------------|-------------------------|------------------------|
| Datamatrix | 1 error in 10.5 M | 1 error in 612.9 M |
| PDF417 | 1 error in 10.5 M | 1 error in 612.4 M |
| Code 39 | 1 error in 1.7 M | 1 error in 4.5 M |