

Executive Summary**CODE 16K AND CODE 49
DATA INTEGRITY TEST**

The Center for Automatic Identification at Ohio University conducted a bar code symbology test under the sponsorship of AIM USA and HIBCC and under the specific direction of the AIM Technical Symbology committee. This test examined the reliability of Code 16K and Code 49 bar code symbologies when scanned under controlled uniform circumstances. Autodiscriminating decoding included Code 39 with a check character, Code 128, and UPC-A.

The statistical objective of the test was to determine if Code 16K and/or Code 49 could be expected to exhibit one character error or less in one million characters scanned and decoded. The level of confidence was set at 95%. Based on using 1,000 symbols of each symbology, each containing an average of 16 characters, it was calculated that a sample size of 15,700,000 bar code data characters should be scanned for each symbology. Each symbol was mounted on a plastic carrier sheet on one of four surface shapes representing commonly encountered health care surfaces; i.e., wristband, pill bottle, flat package, or test tube. Various print technologies were represented.

An automated test apparatus was constructed and used for the test. The apparatus included a robot which loaded carrier sheets onto oscillating stages that were moved under four fixed mounted, "hand held" moving beam, visible laser diode bar code scanners. Scanner output was a series of digital pulses. Decoding of all symbols was performed in a computer using software programs based on standard reference decode algorithms. Each symbol was scanned by each scanner until 283 decodes were obtained.

A total of 69,163,997 bar code data characters were decoded. An error occurred and was recorded whenever the decoded data did not match the encoded data for a given symbol. There were 23 observed errors. There were no errors observed in Code 16K and Code 49 symbols. There was one error each recorded in Code 39 and Code 128 symbols, and there were 21 observed errors in UPC-A symbols.

Based on the statistical criterion for the test and the test results, it can be stated with 95% confidence that Code 16K and Code 49 will have error rates of one or less errors per million characters scanned and decoded. Computed confidence intervals, based on 95% certainty, indicate the error rate for Code 16K is no worse than one character in 5,395,387 characters and no better than one character in 315,112,007 characters. For Code 49, the worst case is one error in 5,292,171 characters and the best case is one error in 309,083,773 characters.

Generalized Error Rates

Symbology	Worst Case (95%)	Best Case (95%)
Code 16K	1 error in 5.4 M	1 error in 315M
Code 49	1 error in 5.3 M	1 error in 309 M
Code 39	1 error in 2.5 M	1 error in 34 M
Code 128	1 error in 2.8 M	1 error in 37 M
UPC-A	1 error in 394K	1 error in 800K