

Innovative Technologies for Two-Dimensional Identification Coding

NASA offers companies the opportunity to license and jointly develop technologies related to data-intensive product marking symbols that are hidden, covered, or embedded.



Researchers at NASA Marshall Space Flight Center (MSFC) have developed a series of technologies for marking and detecting images of two-dimensional matrix symbol patterns used to identify and track manufactured items. These matrix symbols can be hidden from view (e.g., beneath coatings or on the backside of a surface) or embedded in an assembly. As part of an automatic identification scheme, these matrix symbols offer high information density and security.

Benefits

- **High-density information**—The encoded information can be 100 times more detailed in the 2-D format than with traditional bar code technologies.
- **Unique reading capabilities**—These technologies can be used to read symbols beneath coatings, laminates, and foams and in low-light environments.
- **Increased security**—Because the matrix is marked directly on the surface, codes cannot be removed, altered, or falsified. And, the symbols may be layered in an ultrasecure, stacked arrangement.
- **Comprehensive**—These technologies expand the range of materials that can be marked with encoded information.

Commercial Applications

These technologies are particularly useful for quality control, anticounterfeiting, and parts tracking activities associated with a variety of manufacturing industries:

- Aerospace
- Airplane parts
- Automotive
- Computer chips
- Designer clothing
- Electronics
- Guns
- Jewelry
- Scuba tanks
- Tires
- Welding tanks

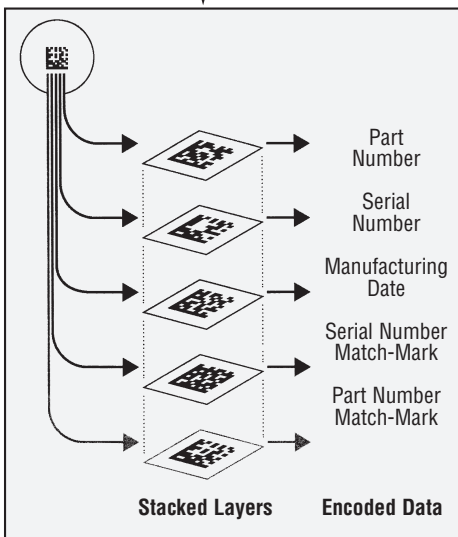


The Technologies

These technologies stemmed from work at NASA Marshall Space Flight Center to develop visible marks for tracking Space Shuttle parts for lifetime analysis. NASA needed an identification system that enabled more detailed information to be coded than with traditional bar code technology. MSFC's solution was the use of a 2-D matrix symbol that carries up to 100 times as much information in the same amount of space.

Researchers went on to develop five technologies that enabled the detection of "invisible" 2-D matrix symbols. Symbols embedded beneath protective coatings or within assemblies for security, aesthetic, and symbol-protection reasons can be read using these technologies (see table below). The marking materials, which are applied directly to the surface, differ from the base material in the detection characteristic (e.g., acoustic impedance properties, infrared emission).

Detection Method	Symbol Size	Detection Distance	Details
Magneto-optic	<1 inch ²	<0.5 inches	Best used under thin coatings (e.g., paint). Environmental magnetic fields may interfere with readings. Researchers developed a hand-held magneto-optic unit that can read a mark through 5 sheets of paper (0.015").
Ultrasound	0.5 inch ²	Contact and noncontact	Can read marks on the backside of surfaces (e.g., inside of a car door to keep outer paint surface smooth). Researchers are developing a hand-held scanner.
Radar	0.5-1 inch ²	0.5-200 feet	Can read backside marks through frame walls or wooden containers. Coatings must be radar neutral.
Combination of all detection methods			Symbols may be stacked. Each layer would be marked with a substance that is sensed by a different method. See diagram at left.



Partnering Opportunities

These technologies are part of NASA's technology transfer program. The program seeks to stimulate development of commercial uses of NASA-developed technology. MSFC has patented, or filed for patent, on the three detection technologies and the stacked symbol technology. NASA invites companies to license or to consider a partnering arrangement where NASA and the licensee share development costs.

For More Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

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