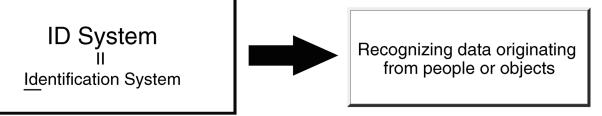
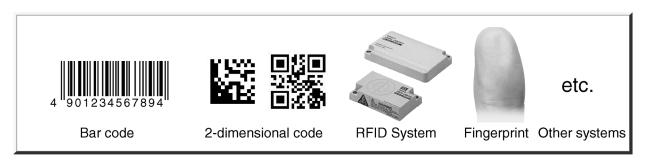
ID Systems - An Overview

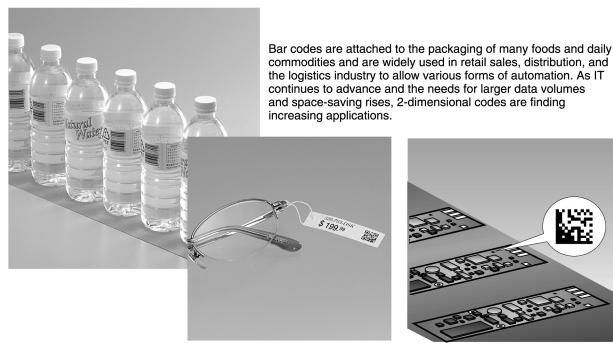
Auto-Identification and Data Capture (AIDC) refers to methods in which equipment, both hardware and software, automatically reads and recognizes data via bar codes, 2-dimensional codes, RFID, fingerprints, voice prints, retinal prints, etc., without the aid of a person.

Basically, any system that reads and recognizes "data originating from people or objects" is called an ID system.





■ Bar Code/2-Dimensional Code Applications



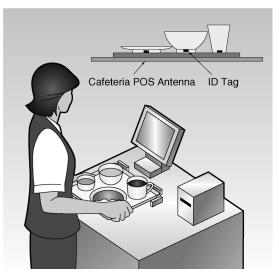
■ RFID Applications

RFID is an acronym for Radio Frequency Identification. An RFID System is a wireless ID system that exchanges data by communicating between a "tag" (or Data Carrier), which is attached to an object or carried by a person, and an antenna (or Reader Writer).



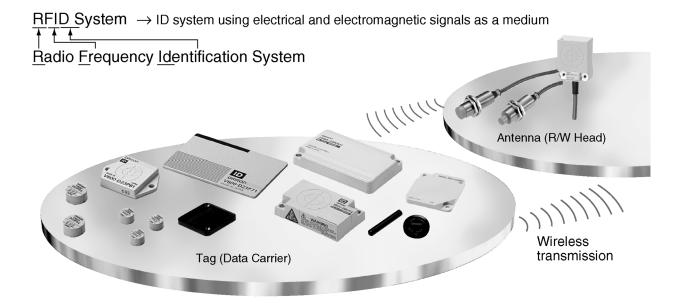


Typical examples include non-contact commuter passes for train station gates, and non-contact ski lift passes. In these examples, the commuter pass and ski lift pass serve as tags, and the station and ski lift gates serve as antennas. Another example which is less obvious is an automatic calculation system in a cafeteria. In this system, a tag is attached to each of the plates and cups, and an antenna is built into the calculation table where the diner places the tray. Such a system makes it possible to automatically display the price of the meal and other information, such as the total calories for the meal.

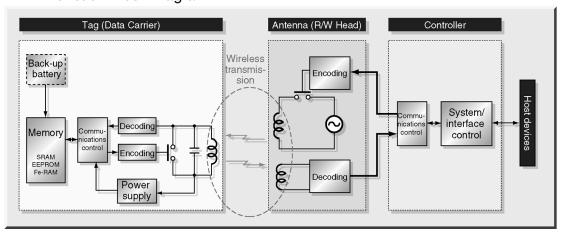


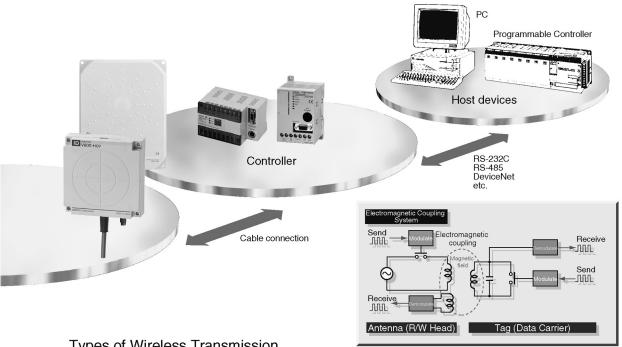
RFID Systems - An Overview

RFID Systems use electrical and electromagnetic signals for non-contact data reading and writing. They allow data to be read and written without being affected by the material or surface condition of the target object. They can be used over a large communications area, and offer highly reliable communications. Introduction of an RFID System makes it possible to "integrate objects and data" to configure highly flexible and reliable systems.

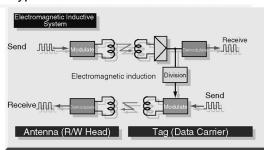


RFID Function Block Diagram





Types of Wireless Transmission



nun Send Microwave System Reflector circuit Flat Antenna Microwaves Antenna (R/W Head) Send Receive MA Tag (Data Carrier)

■ Main RFID System Features

· Non-contact data reading and writing.

Tags can store the large amount of data (8,000 bytes max.) that is necessary for production control. The data required for each process (process history, inspection data, etc.) can be overwritten freely and without contact. This promotes paperless production lines, and eliminates several factors that lower yield within each process.

 Integrating objects and data allows highly flexible and reliable systems.

Data is distributed to lower the burden on the host system. This cuts system development costs, dramatically speeds up system start-ups, and enables flexibility in making system changes. Integrating objects and data allows accurate, error-free production, process, and quality control. Also, up-to-the-minute data storage enables offline processing in the event of an emergency, to drastically shorten the time required to restore operation.

 Advanced wireless transmission technologies and protocols enable highly reliable communications.

Unlike bar codes, in which "1s" and "0s" must be distinguished, the RFID System uses highly advanced wireless transmission technologies and protocols. The transmitted data includes a 16-bit CRC (checksum), and burst error detection for 18 bits or more is 99.9985% min., ensuring highly reliable communications. The system also has no mechanical parts, as there are in raster scanning bar codes, so there is much less chance of a malfunction or other problem.

 Communication by electrical and electromagnetic signals allows reading and writing even with rough positioning and non-visible tags.

In contrast with bar codes, the RFID System communicates with electrical and electromagnetic signals. This eliminates the problem of data errors or not being able to read data due to soiling, moisture, oil, etc., on the target object. Communication is not affected by resin, moisture, or other matter, except for metals, positioned between the Antenna and the Tag. Further, because the communications area is relatively large, there is no need for extremely precise positioning of the target object, which reduces both time and cost in mechanical design.

Bar Codes and 2-Dimensional Codes - An Overview

As defined by ANSI (American National Standards Institute), a bar code is a rectangular code containing information in the form of bars and spaces in various widths in accordance with a predetermined pattern.

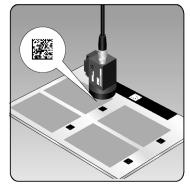
Bar codes are commonly used in distribution and logistics. As the use of bar codes continued to spread, demands began for versions that could hold more information and be printed in smaller spaces. Two-dimensional codes were developed in response to this demand. By positioning the data vertically and horizontally, 2-dimensional codes are able to increase the amount and density of the information contained.

- Bar Code Features
- Widespread Use Facilitates Introduction
- High-speed Processing

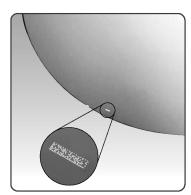
■ Main Types of Bar Codes



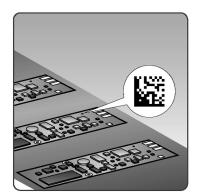
Applications



LCD glass substrates



Wafers (Data Matrix T7)



Substrates (Data Matrix)

2-Dimensional Code Features

- Much Higher Data Density than Bar Codes
- The same number of digits can be expressed in 1/10th to 1/100th the space of bar codes due to higher density.
- Two-dimensional codes can be printed in tiny spaces where bar codes simply will not fit.
- Large Data Volume
- Maximum data volume of 1 KB. This is the equivalent of about 7,000 English characters.
- Error Correction Function Provides Strong Resistance to Soiling and Scratches
- When the code is soiled or damaged, this function makes it possible to restore the read data to the original data.
- The error correction level can be set when encoding. When set to the maximum level, codes can be restored even when 1/2 or more of the code has been damaged.
- High Flexibility in Reading Direction and Angle
 - Using a 2-dimensional CCD scanner, codes can be read from all directions (360°).
 - Work efficiency is increased because the object with the 2-dimensional code can be read from any angle.
- Data Can Be Printed Directly onto Objects
- Using a Laser Marker or similar device, codes can be printed directly onto objects, making it possible to integrate objects and information.

■ Main Types of 2-Dimensional Codes

Most Commonly Used Codes

Data Matrix QR Code





MAXI Code





■ Printing Bar Codes and 2-Dimensional Codes

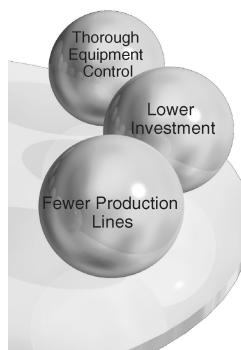
Labelers and printers for printing bar codes or 2-dimensional codes onto labels are widely used in the fields of distribution and logistics. Taking advantage of the error correction function of the 2-Dimensional Code Reader, codes can be directly printed onto objects (such as LCD glass substrates, wafers, electronic components, metallic parts, etc.), thus making it possible to integrate objects and information. This ability allows the use of bar codes and 2-dimensional codes in a wide range of applications that have been considered to be difficult until now. Laser Markers and pin stamping machines are available for use in direct marking for applications such as these.

Objectives For Introducing an RFID System and It's Effects

One of the main objectives for introducing an RFID System is to raise productivity by "integrating objects and information." Naturally, there are various factors involved in raising productivity, including increasing product yields, shortening lead times, and achieving flexible production control. Two other factors that cannot be ignored are responding to environmental problems and legal regulations. By writing information into the Tags of an RFID System, it is possible to "integrate objects and information." This will lead to solutions for a variety of factors Less **Improved** Lower Costs related to productivity. Inventory Product Quality **Improved** Work Quality Improving Product Quality and **Productivity** Work Quality *Improvements* Human errors can be avoided in production processes. Increased When processes are completed, the production process history can be **Yields** controlled by writing information to an inspection data Tag. By controlling the quality-related information (model type, features, etc.) in the Tag, optimal control of Shorter Lead each product can be achieved, and Greater Flexibility **Times** products can be exchanged or replaced in mid-process. Increased Yields, Shorter Lead Times, Greater Flexibility Production line changes can be dramatically speeded up by reading the model data in the Tag and automatically changing processes. By designing the production line in a series of modules, functions can be expanded or changed by adding or exchanging module units. By writing data to the inspection data Tag (simplified data for NG items), ISO14001 adjustments can be quickly processed. Promoting a Circulating Recycling Society **Energy Savings** Environment Environment Information management by Tag memory can help to achieve paperless operations. Tags with read/write capability are used, so a system can be introduced without generating new waste materials. • The RFID System lets you add functions in module units to your present system, making it easy to utilize existing assets.

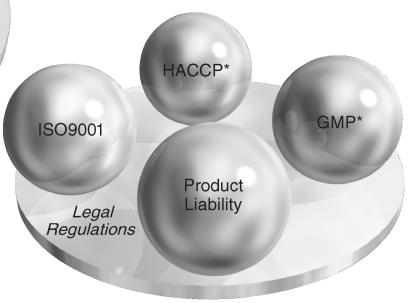
Lower Costs, Less Inventory

- It is possible to reduce costs for losses or mistakes due to human errors (mis-reading characters from a sheet of paper, mistakes made when writing information elsewhere, etc.).
- Storing model data onto Tags makes it possible to respond to the diversification of product needs.



Thorough Equipment Control, Lower Investment, Fewer Production Lines

- Lines can be operated more efficiently by configuring multi-product, mixed lines with switching processes based on quality information.
- The burden on the host computer can be lessened by distributing information, and lines can be started up more quickly (tracking, error handling, and interruption processing can be simplified).
- By managing the number of products remaining, the product history, etc., prior warnings can be issued for maintenance.

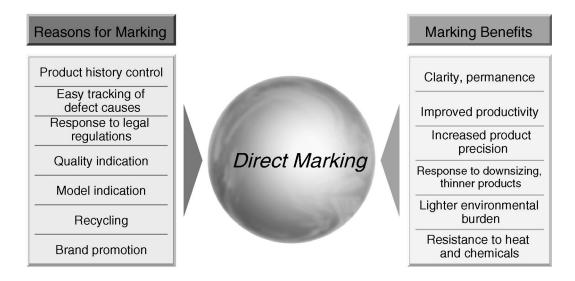


Legal Regulations

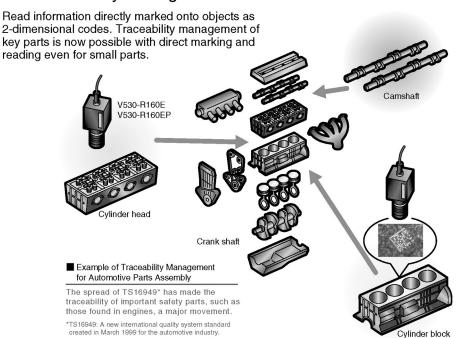
- By writing quality information onto Tags, the quality of individual products can be easily controlled.
- Product histories can be automatically controlled without having to newly introduce a high-cost system.
- By using the RFID System to build the automated portion, the personnel, material, and financial burden required to respond to HACCP* and GMP* can be minimized.
- Quality control for individual products can be achieved with quality information.
 - * HACCP: Hazard Analysis Critical Control Point
 - * GMP: Good Manufacturing Practice

Direct Marking With a High-precision Laser

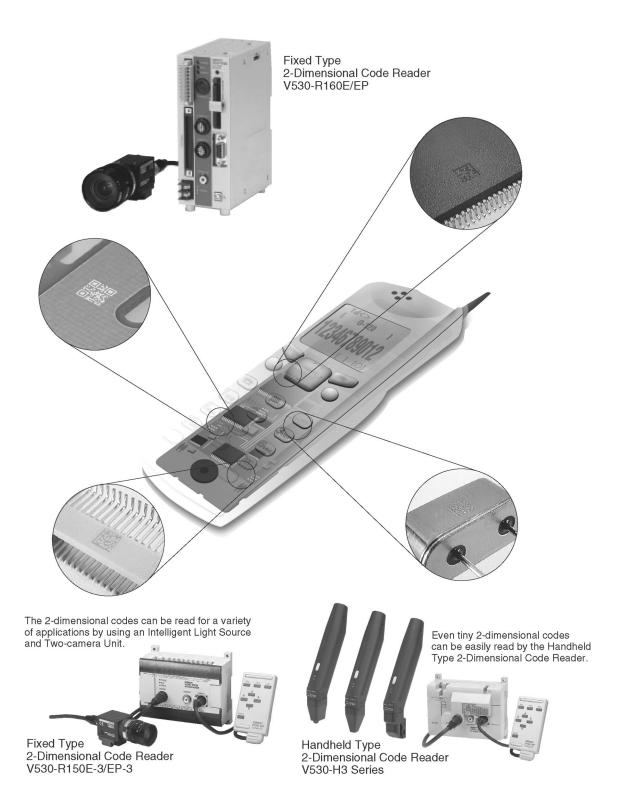
Directly marking products with characters or 2-dimensional codes is an extremely effective means of controlling product histories or managing information for QS9000. Omron refers to this method of furnishing each object with information as, "integrating objects and information." High-density 2-dimensional codes complete with an error correction function are imprinted with a Laser Marker or dot peening machine, and read by a 2-Dimensional Code Reader.



Product History Management



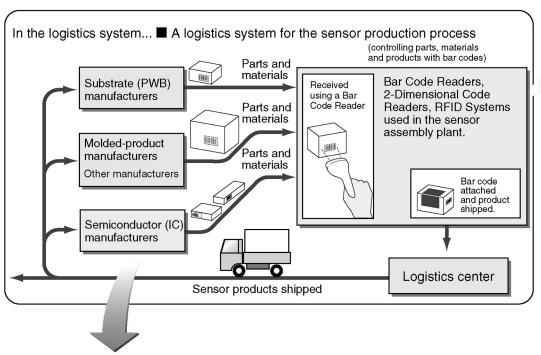
OMRON

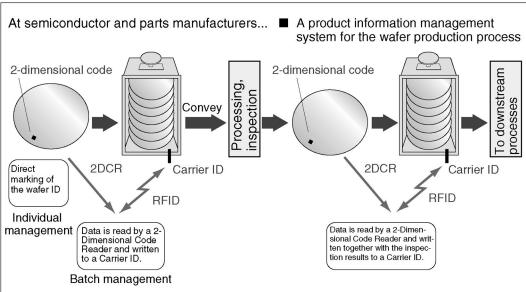


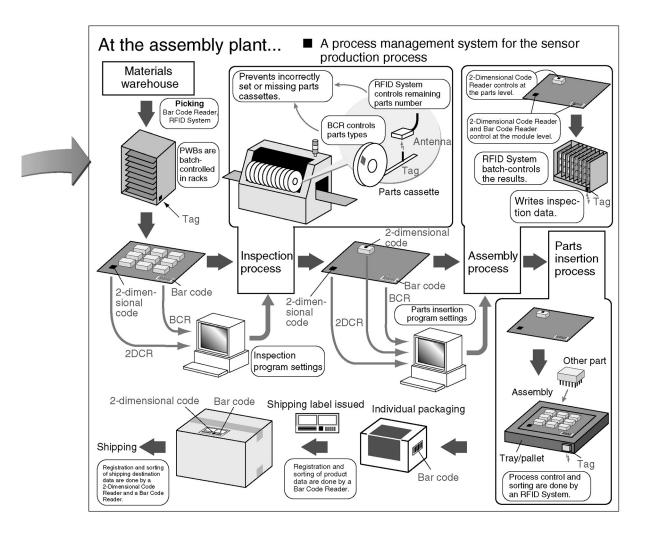
Omron's Total Information Management System

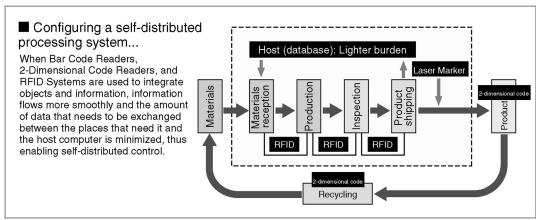
A variety of information management steps are required throughout a product's life cycle, from raw materials to recycling. Omron offers a complete line of management tools, including Bar Code Readers, 2-Dimensional Code Readers, and RFID Systems, to provide the most suitable system for each application.

The following shows an example for a sensor assembly plant.



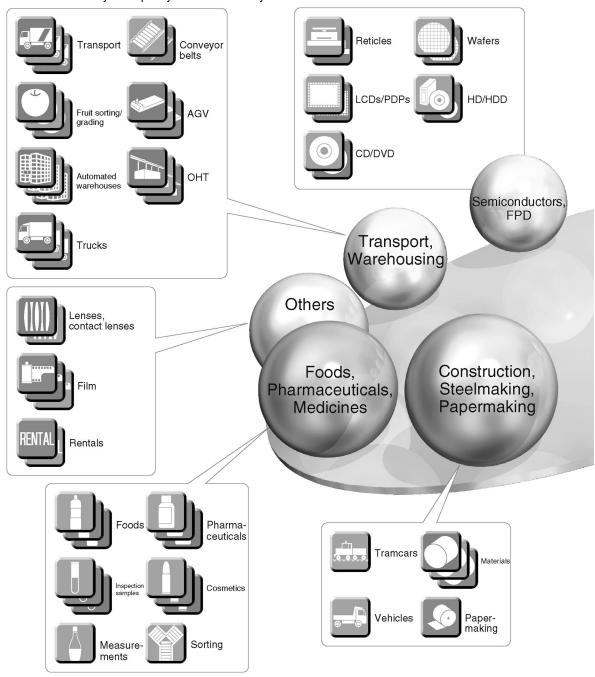




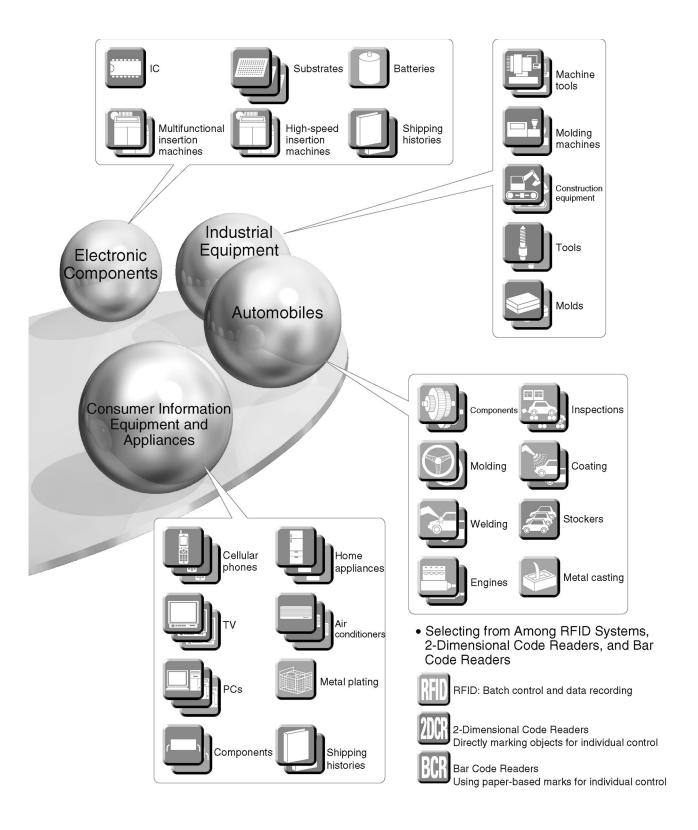


Examples of Equipment Incorporating Auto-ID Components

Bar codes and 2-dimensional codes are finding increasingly widespread use in different and specific applications: bar codes when a small number of digits will suffice, and 2-dimensional codes for holding more information. RFID Systems, which optimize the features of "integrating objects and information," are similarly finding a wide range of applications in variatious industries and fields, working together with both bar codes and 2-dimensions codes. Omron products help each customer to configure the most suitable system quickly and economically.



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