

SATO
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Accelerate Your Business with RFID



satoeurope.com

What is RFID

Short for Radio Frequency Identification, RFID is auto-ID technology that is anticipated to enable advanced information services and bring us closer to a ubiquitous society.

Besides barcodes, two-dimensional (2D) barcodes, and magnetic stripe cards that are conventionally used to carry data, newer technologies such as RFID, voice recognition and biometrics are now being introduced at a greater speed for improving business operations and security.

As RFID develops and its product lineup continues to expand, the technology is set to become an increasingly important tool for item-level identification, traceability, environmental sustainability, and many other applications in various industries such as manufacturing, logistics, retail, service and transportation.

Advantages of Using RFID

✓ Read and write Identification data without making contact

RFID tags need not be held right next to reader devices like barcodes, meaning that they can be read even from tall shelves. Lesser hardware failure for RFID systems compared with magnetic card systems.

✓ No line of sight required

RFID tagged items in boxes can be scanned accurately without being unpacked as the tags can be read/written even when they cannot be physical seen. Reliable performance even when used in dirty outdoor environments.

✓ Bulk reading

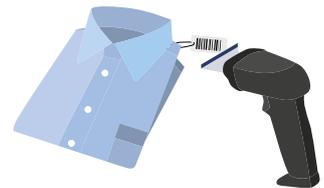
Large volumes of RFID tags can be read simultaneously and do not have to be scanned individually like barcodes.

✓ Data rewrite capability

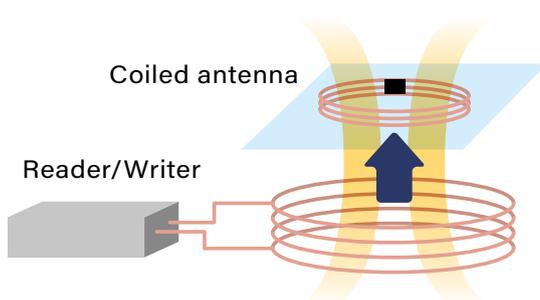
Information in RFID tags can be overwritten repeatedly for different usages so there is no need to keep changing tags, for example, when reusing returnable containers.

✓ High levels of security

Suitable for secure applications as RFID chips cannot be easily copied. Provide enhanced counterfeit protection when used for personal identification cards and tickets.



How RFID Works



The interrogator/reader radiates electromagnetic energy, which may, depending on application, be received both in far field (radiating waves) and near field (inductive magnetic coil), by an RFID tag antenna connected to an RFID chip.

The RFID chip is powered up by this energy, enabling a communication link between reader and tag, for wireless writing and reading of data stored in the chip memory.



Transit ticket

Keyless car entry

E-money

Stocktaking

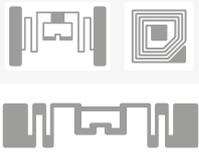
Comparison with other Auto-ID Technologies

	RFID	BARCODE	2D BARCODE	MAGNETIC STRIPE CARD
Data capacity	Several kilobytes*	Several tens of bytes*	Several kilobytes*	About 100 bytes*
Rewritability	Supported	Not supported	Not supported	Supported
Line of sight	Not required	Required	Required	-
Multiple reads capability	Supported	Possible, subject to conditions	Possible, subject to conditions	Not supported
Replication	Difficult	Easy	Easy	Easy
Resilience against dirt	Strong	Weak	Weak	Slightly weak
Resilience to interference	Slightly weak	Strong	Strong	Weak to magnetic fields

*8 bytes is one character (Alphanumerical letter or number)

SATO's RFID Lineup

Leveraging its know-how as a leading global provider of auto-ID technologies, SATO offers RFID solutions combining RFID labels/tags it produces with RFID printers it develops for printing the labels/tags themselves and writing data to the RFID chips embedded within.

<p>RFID-ready printer</p> 	<p>RFID tags/labels</p> 	<p>Peripherals</p> 	<p>Support for system setup</p> <p>Consultation on implementation</p> <p>Know-how from experience</p>
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SATO offers total RFID support for customers, starting from sourcing readers/writers most suited to your usage, to developing and providing the software you need.

Main Frequencies used in RFID Systems

RFID systems operate in various frequency ranges. Primarily used are the low frequency (LF), high frequency (HF), ultra-high frequency (UHF) bands, and RFID labels/tags read differently at each of these frequencies. SATO offers a wide range of mainly UHF and HF (including NFC) products, tailoring its RFID solutions to meet customers' needs and applications.

Differences in read range and field



Comparison of RFID Frequencies

RFID systems behave differently depending on the frequency used.

X: No/Not good Δ: Moderate O: Yes/Good

FREQUENCY	READ RANGE	DATA READ RATE	READ FIELD	SIMULTANEOUS IDENTIFICATION	TAG STANDARDIZATION	PERFORMANCE NEAR LIQUIDS	PERFORMANCE NEAR METALS ¹
Under 135 kHz (LF)	3–30cm	Δ	Δ	Δ	X	O	O
13.56 MHz (HF)	5–50cm	Δ	O	O	O	O	Δ
860-960 MHz (UHF)	3–8 m	O	O	O ²	O	Δ	Δ

¹When attached directly to metal surfaces, RFID tags will become unreadable regardless of frequency
²Dependent on frequency range (bandwidth)

Characteristics of UHF (860–960 MHz) RFID

UHF

UHF RFID technology has long read range and wide directivity, making it suitable for far-field operations. The tags have anti-collision capabilities that ensure excellent read efficiency.

✓ Bulk Reading

Simultaneous scanning of multiple tags to speed up stocktaking of apparel items, for example, at retail stores and their backrooms.



*Stocktaking time can be reduced to as much as 10% in some use cases.

✓ Long Read Range

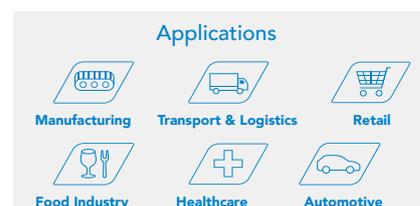
Typically used at reading distances between 3m and 5m, ideal for supply chain applications such as the management of receiving and shipping processes in large warehouses and distribution centers.



RFID Labels / Tags

SATO thermal RFID labels (also known as 'RFID tags') are carefully crafted with the highest quality label materials and RFID antennas. SATO RFID labels are specifically designed and manufactured to ensure optimum performance in your SATO printer. SATO printers are available in HF and UHF models and SATO can supply RFID labels in either frequency.

Whether you need stock RFID labels off-the-shelf or custom constructions with specific adhesives and face materials you can expect that your SATO RFID labels will perform to the highest standards when used in the SATO desktop printer or SATO print engines. Pre-printing, flood coating, customisable platform face stocks, adhesives and label sizes are also available.



Characteristics of HF (13.56 MHz) RFID

HF

HF RFID technology is suitable for operations that require reliable reading at close range. As the tags use inductive coupling to communicate with readers, they are less susceptible to interference from metals or liquids.

Reliable Reading at Close Range

Used in a wide variety of applications including production tracking. Data can be collected accurately in the vicinity of production lines without stoppages or productivity losses.



Capable of Reading Around Liquids

Well-suited for use in intravenous medication labels and patient wristbands as the read performance remains stable in the presence of liquids.



Characteristics of NFC/Felica Lite (13.56 MHz)

NFC

NFC/FeliCa Lite is a type of HF RFID chip that is designed for close-proximity communication. Besides being commonly used in personal identification cards, it is also popular among many low-cost consumer services due to its high compatibility with smartphones and tablets.

Tap for Identity Verification

Proximity technology is the ideal choice for employee/student IDs, membership cards, and other forms of personal identification. It can also be used in the office together with electronic locks and computer login tools for greater security.



Linking to Online Content

NFC tags can be embedded into smart posters for online-to-offline (O2O) marketing, while NFC wristbands can be used to increase information touchpoints for tourism services and events.



NRF 2019
SATO RFID
Solutions
YouTube



SATO Retail
Solutions
www



SATO RFID
Solutions
www



SATO CLNX
Series Printers
YouTube



New York
Weather
www

RFID Applications in Manufacturing Industry

Production History and Shipping Management



Use RFID tags and their unique identification codes to maintain full production history and prevent shipping errors (missing, incorrect, duplicate item or shipment).

Warehouse Receiving

Improve receiving efficiency by reading incoming materials all at once.



Product Management

Work automation with RFID and robotics

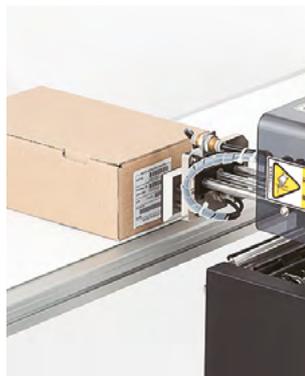
Easing labor shortage

RFID Print & Auto-apply

⚠ Customer challenges

- Need to enhance productivity due to lack of qualified resources
- Demand to pack products and apply labels in a single run
- Necessity to automate tagging operations

- ✓ Encoding, printing and applying RFID labels
- ✓ Standardize and streamline operations
- ✓ Batch read/write data of products in motion using RFID



Material Management

Procurement forecasting

Cross-check parts and materials against work order data at picking to manage their inventory accurately and determine when new orders need to be placed without causing delays in production.



Process Management

Track each production line

Track progress at each production stage accurately to help prevent assembly errors. Even if product components or subassemblies on production lines differ in sizes and are tagged at different positions, data can still be read automatically.



Security and Productivity Management

Control entry and exit to work areas and production floors to keep out unauthorized personnel while enabling worker location tracking at the same time. RFID access control can also be extended to collect data on who's done what and when for the purposes of tracking and managing productivity.



Asset Management

With RFID, time for stocktaking can be largely reduced compared with barcodes. Frequent and accurate stocktaking allows to improve accuracy, while reducing downtime from lack of spare parts.



Improve productivity and accuracy

Plant Asset Management

⚠ Customer challenges

- Reducing the time to log items such as spare parts and tools by hand or reading barcodes

“ Thanks to faster stocktaking, we now stocktake every month as opposed to several times a year. This has improved accuracy, while reducing downtime from lack of spare parts ”

Market Leader for Deep Sea Pumps

“ Stocktaking now takes 1/20 of the time it took before with barcodes ”

Midsized Company for Pet Appliances



RFID Applications in Logistics Industry

Receiving and Shipping Management



Automatically read data of incoming/outgoing parcels all at once, and centrally manage warehouse processes starting from receiving to inventorying and shipping.



Asset Management

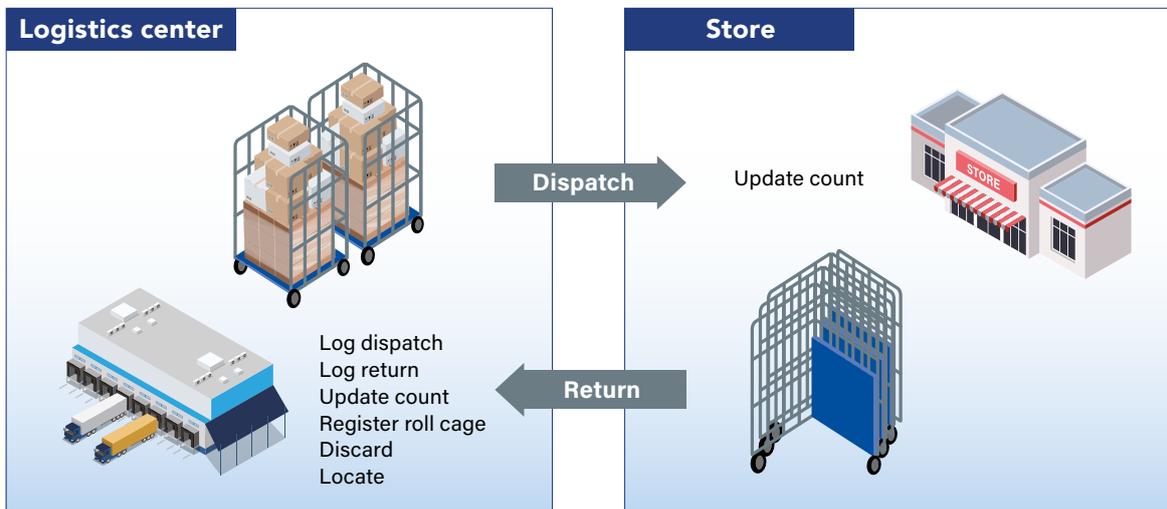
Less loss of assets, more profits

Manage Roll Cages (returnable transport items)

⚠ Customer challenges

- Cannot keep track of damages or losses to roll cages, leading to costly reinvestments

- ✓ Attach RFID tags to roll cages, scanning them at dispatch and return for accurate asset tracking



Location Management

Track information of tagged parcels together with their pallet or shelf identification. Manage parcels that are stacked or placed at tall shelves easily as RFID tags can be read even from a distance.



Sortation

Sort parcels according to their intended destinations in a shorter time and at a higher accuracy with less human error via RFID's high speed reading capability.



Vehicle Management

Tag vehicles to track their entry and exit. Also control access to only admit drivers with valid IDs for reinforced security.



Temperature Control

Use RFID sensor tags to collect and monitor temperature data of products during transportation in real time.

They can be scanned at destinations to confirm that temperatures were maintained at optimal levels throughout transit.



Implementation

- 1) Tag roll cages and cart trolleys
- 2) Scan tag at dispatch and return
- 3) Keep accurate track of reusable assets



Collapsible crates



Roll cages and pallets

RFID Applications in Retail Industry

Asset Management



The ability to do multiple batch readings significantly reduces time needed for stocktaking. As there is no need to scan price tags one by one, store clerks can free up more time to serve customers and acquire product knowledge, leading to improved customer service.

RFID also contribute to search items efficiently at retail stores and their backrooms.



Product Management

Less manual work, better customer service and satisfaction

Quick and accurate stocktaking

⚠ Customer challenges

- Taking too much time to scan barcodes one by one
- Losing sales opportunity due to the inaccurate stock

- ✓ Batch reading saves time needed for stocktaking significantly and reduces human errors
- ✓ Concentration on customer service contributes to increasing sales



Locate item easily and speedily

⚠ Customer challenges

- Take too much time to find item
- Cannot manage inventory accurately due to random location storage

- ✓ Cut search time significantly
- ✓ Keep accurate track without moving inventory
- ✓ Find specific item from identical looking cartons or cartons containing mixed loads



Receiving Management

Verify incoming goods without unpacking, regardless of whether they are transported in single or mixed loads. This shortens the receiving process so that items can be stocked to retail shelves with speed.



Loss Prevention

Tag and manage inventory with RFID, and save the hassle of attaching EAS security tags. RFID tags work great for loss and theft prevention as they can be read while hidden.



Attendance Tracking

Have staff tap their ID cards on RFID reader/writer to accurately track and record their in and out times.



Customer Service

RFID-enabled checkout at POS register cut time in queue. RFID enables batch scan purchases at cashier to cut checkout time radically.



Asset Management

Less loss of assets, more profits

Manage uniforms (together with access control)

- ❗ Customer challenges
 - Want to loan uniforms efficiently
 - Want to guard assets against loss, theft or misappropriation

- ✔ Attach linen tags to uniforms, scanning in bulk to save time when they are issued or returned
- ✔ Track assets upon loss or theft with tags that can be concealed discreetly



Customer Service

Cut time in queue with RFID-enabled checkout at POS register

- ❗ Customer challenges
 - Want to reduce wait time at checkout counters
 - Aim to serve inbound tourists and other shoppers in a limited time



Three-point Verification

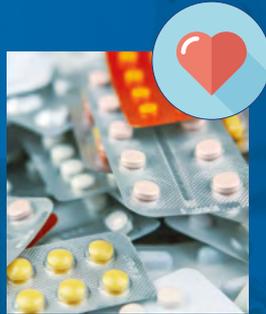
Cross-check data on patient ID, nurse ID and medication label using RFID at point of administration to give patients assurance of accuracy and ease burden on hospital staff.

For patients, RFID wristbands can be read from even over a blanket, without waking them if they are sleeping.



Prevention of Medical Errors

Batch scan RFID-tagged/labeled medical ampoules for each patient to ensure that the right injection drugs are mixed correctly.



Hospital Asset Management

Use RFID stickers to track medical devices/equipment and manage their maintenance. Even if the stickers are applied to the back of assets, scanning can be done without having to get behind the assets physically.



Prevention of Medical Errors

Three-point Verification Using RFID

- ❗ Customer challenges
 - Want to ensure accuracy of medication confirmation
 - Reducing physical strains of barcode medication administration on patients

- ✔ Accurately track and manage which medicine was administered to which patient and by whom
- ✔ Allowing nurses to read a patient's wristband from even over a blanket, without waking the patient up



RFID Applications in other Industries

Data Protection

Protect files from any unauthorized removal while improving overall efficiency. Combine with employee IDs to enable real-time tracking of which employees are removing or replacing which documents. Employee IDs can also be used in the office together with electronic locks and computer/copier machine login tools for greater security.



Children Safety

Support the unobtrusive monitoring of students going to and from school with RFID. Parents need not worry about their children's safety as they can be kept informed about their whereabouts via email.



Concert/Event Ticketing

Admit only valid ticket holders in a swift and seamless manner with RFID that helps to effectively prevent ticket fraud.



Asset Management

Automatic database creation with a single scan

Manage Office Assets

- ❗ Customer challenges
 - Take time and effort to record assets manually
 - See discrepancies between records and the actual quantity after stocktaking

- ✔ Issue assets instantaneously without error by scanning their RFID tags at one go
- ✔ Stocktake assets in high/low locations with ease

Implementation

Tag furniture, computers and other assets in the office environment using RFID. Integrate tags with a software package for more efficient stocktaking, issue and return of assets.



RAIN RFID Solutions

SATO works closely with the leading provider of RAIN RFID solutions, Impinj, to provide a best-in-class service.

Working together, SATO and Impinj focus on providing high-end RFID technology solutions for three key markets: retail, healthcare, and supply chain. The partnership enables both companies to deliver cutting-edge, value added RFID solutions to each of the core markets on a global scale.

With more than 250 patents issued, Impinj helps businesses and people wirelessly connect billions of everyday items, including apparel, automobile parts, luggage and shipments, to the internet. The company's platform uses RAIN RFID to deliver data about these everyday items to various business and consumer applications across the world.

Impinj also co-founded the RAIN RFID Alliance, of which SATO is a member, to promote awareness and increase the adoption of RAIN RFID in business and consumer applications.



RFID Printer



Equipped with an RFID module, SATO solutions can print text and barcodes on the surface of RFID tags and labels while encoding data into them continuously. Printers are also capable of verifying the function of RFID tags before printing.

*RFID printers are only available in specific countries. Please contact your local SATO dealer about availability in your country.

S84-ex S86-ex

A flexible and convenient solution

A significant industry advancement in quality imaging, exceptional throughput and incomparably easy operation, setup and maintenance

User-friendly layout and operation

- Stress-free operation with simple setting, downloading and uploading of data
- Right (RH) & Left (LH) models available with multiple language support to enhance user experience

An industrial print engine to maximise productivity

- 4" and 6" print head
- Print resolution
- 203 dpi (8 dots/mm)
- 305 dpi (12 dots/mm)
- 609 dpi (12 dots/mm) (only for 4")
- Face in/Face out ribbon support
- Quick label printing with speeds of up to 406mm/s – 16" per second
- Environmentally friendly ribbon saver mode
- RFID UHF

CT4-LX

Compact in size, big on performance

The perfect blend of compact dimensions and powerful performance.

Simplify RFID Encoding (UHF model)

- SRA (SATO RF Analyze) allows printers to automatically measure and set RF power and position for encoding RFID data. Enables customers to set up printers in a short time.
- Various shapes of RFID labels can be supported by 2 antennas.
- A uniquely designed antenna which is fitted with thermal printhead allows direct and exact encoding to small-sized inlays.

SRA

SATO RF Analyze (SRA) enables the user to easily move the antenna to measure and set the RFID label configuration settings on the CT4-LX printer. As a result, users can re-measure configuration settings quickly according to each specific production batch that requires a different or unique RFID label. Previously, users would need to send the printer away to be inspected, but with SRA, they can significantly reduce downtime and increase productivity. **Please note SRA will not work for tags shorter than 45mm.**

Easy setting data management

- "Media profile" function allows users to register/save setting information for each label type and enable quick change of setting information.
- Setting information can be easily backed up and duplicated using USB memory.

- | | | |
|--------------------------------------|---|--|
| <input type="checkbox"/> UHF RFID | <input type="checkbox"/> 4" print head | <input type="checkbox"/> 4.3 inch color touch panel |
| <input type="checkbox"/> HF+NFC RFID | <input type="checkbox"/> Print resolution | <input type="checkbox"/> UHF SRA (SATO RF Analyze) |
| | <input type="checkbox"/> 203 dpi (8 dots/mm) | <input type="checkbox"/> Fast label printing at up to 8"/sec (203 dpi model) |
| | <input type="checkbox"/> 305 dpi (12 dots/mm) | <input type="checkbox"/> Auto cloning (Auto file re-writing) |

CL4NX Plus and CL6NX Plus

Industrial durability

- A robust, durable body that is safe for use in harsh environments such as manufacturing and distribution sites.

Accurate and efficient performance

- High speed data processing with 10 ips print speed.
- User can clone settings of a product onto a USB memory and apply settings to batch of multiple products for greater efficiency in configuration and management.

Direct inlay printing solution (UHF model)

- Various shapes of RFID labels can be supported by 2 antennas.
- A uniquely designed antenna which is fitted with thermal printhead allows direct and exact encoding to small-sized inlays.
- Applies to 4" model. It is using a 2nd antenna and is applicable for SRA.

- | | | |
|--------------------------------------|---|--|
| <input type="checkbox"/> UHF RFID | <input type="checkbox"/> 4" and 6" print head | <input type="checkbox"/> 4.3 inch color touch panel |
| <input type="checkbox"/> HF+NFC RFID | <input type="checkbox"/> Print resolution | <input type="checkbox"/> Cutter kit (recommended) |
| <input type="checkbox"/> PJM | <input type="checkbox"/> 203 dpi (8 dots/mm) | <input type="checkbox"/> Designed to offer optimal operability |
| | <input type="checkbox"/> 305 dpi (12 dots/mm) | <input type="checkbox"/> Suited for high-volume printing |
| | <input type="checkbox"/> 609 dpi (24 dots/mm) (only for 4") | |



/ General RFID Printer

Require PC to print RFID label



Long printer downtime



/ SATO RFID Printer



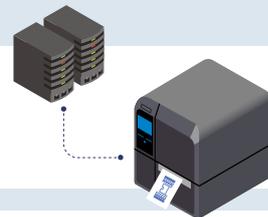
PC-less Label Printing with AEP Reduce Business Cost (not available with S84-ex)

Application Enabled Printing is a powerful on-board intelligence which enables customization of printer operations to significantly simplify labeling processes and reduce business costs.



PC-less

- Minimal equipment needed for printing helps user save installation and maintenance costs
- Intuitive operation reduces errors and training required for users.



Video



Keep your Operations Running & Visible

SOS is a service that makes use of IoT to monitor SATO printers at customer sites 24/7 and enable proactive servicing before issues become critical, reducing downtime significantly.

- Minimize downtime through proactive preventative maintenance
- Keep all printers visible to achieve efficiency with dashboard
- Use SOS to manage all your IT assets on-site

Cut printer downtime by

86%

*Based on survey conducted by SATO in Japan

Video



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