GO2 Partners®

WHITE PAPER

THE PRODUCT GUIDE TO RFID FOR MANUFACTURERS AND THE SUPPLY CHAIN

What Is RFID?

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RFID AND BUSINESS

RFID is an innovative adaptive technology that delivers benefits to businesses across a range of industries. Asset tracking, data collection, synchronized information, loss prevention, inventory visibility, process monitoring and more — all are possible through RFID technology and applications.

This is not a static, mature technology. New tech innovations, miniaturization, the Internet of Things (IoT) and automation are all trending technologies that are transforming RFID applications.

The rapidly changing technology and market landscape can make it difficult for businesses to select an RFID solution. Even with a specific problem to solve, matching the right technology to the end user's need while considering current and future requirements can be problematic.

Often, the result is a lackluster solution that creates additional inefficiencies — solving one problem while adding others.

> **According to RFID Journal, RFID technology can increase inventory accuracy to levels as high as 95% or better.**
>
> **Another study reported 96% of all retailers plan to implement an RFID solution on apparel products.**

In this guide, we'll review RFID products. You'll see the capabilities, strengths and weaknesses of leading products on the market. We'll also go over steps you can take to implement a solution and optimize its impact on your business.

WHAT IS RFID?

RFID (Radio-Frequency Identification) stores and transmits digital information. **Placed in a tag or label, RFID connects a physical object to digital information stored in a database.** Information can be transmitted, via an electromagnetic field like a radio wave, from the tag to another device like an RFID reader.

Tags and labels using RFID are AIDC (Automatic Identification and Data Capture) technology. The tag automatically identifies an object, gathers information and transmits it to another system. This allows vast amounts of relevant data to be collected and processed with little human interaction or error.

TYPES OF RFID TECHNOLOGY

There are a wealth of variations and options out there when it comes to RFID technology. As such, it's important to find a solution that not only meets business requirements, but also works seamlessly as a comprehensive system.

The components we cover in this guide include:

- RFID tags and chips

- RFID readers

- RFID printers

- RFID software

While this list is not comprehensive, it does provide a strong starting point for research into an RFID solution. Many businesses will turn to a custom solution, based on a mix of products from this list, to better meet requirements.

RFID TAGS AND CHIPS

An RFID tag has two components. The first is a microchip or circuit to store information, and the other is an antenna to collect and transmit data. Passive RFID tags use energy from an RFID reader to transmit the data, and an active RFID tag uses a battery to transmit. Tags can be placed on almost anything, from a simple adhesive label to something more durable like imprinted metal.

INSIDER TIP

All RFID tags have a frequency they transmit on.

Passive tags could be Low Frequency (LF), transmitting at 125-134 KHz, High Frequency (HF), transmitting at 13.56 MHz, or Ultra High Frequency (UHF), transmitting at 865-960 MHz.

UHF is also known as Near-Field Communication (NFC).

Alien Technology Higgs Series IC (Integrated Chips)

There are four different chips in the Higgs series, ranging from the large memory Higgs 3 chip, to the mass-market optimized Higgs 4, to the Higgs 9, which offers next-gen optimized memory options. While all options offer substantial chip memory and a unique TID, or serial number, the Higgs-EC and Higgs 9 offer best-in-class read/write sensitivity and a longer read distance — up to 13m (42 feet).

Impinj R Series Reader Chips and Modules

Impinj has focused on the RFID applications for the Internet of Things (IOT). Impinj offers a range of chips in their R series — from the low-cost R500 to the high-performance RS2000, which offers an integrated surface-mount module to provide additional sustainability for demanding applications. Impinj chips utilize supporting software and the Impinj RAIN RFID platform, but don't provide the same flexibility when integrated with other solutions.

NXP RFID and NFC-integrated Circuits (ICs)

NXP offers a range of RFID and NFC chips for many industries. This includes the UCODE chips designed to work off the NXP software platform as a RAIN RFID solution. Other product lines include the HITAG chips which use low-frequency technology suitable for harsh and demanding environments, providing high-reliability data transmission. NXP also supplies chips to numerous companies, including Avery Dennison RFID and Datamars.
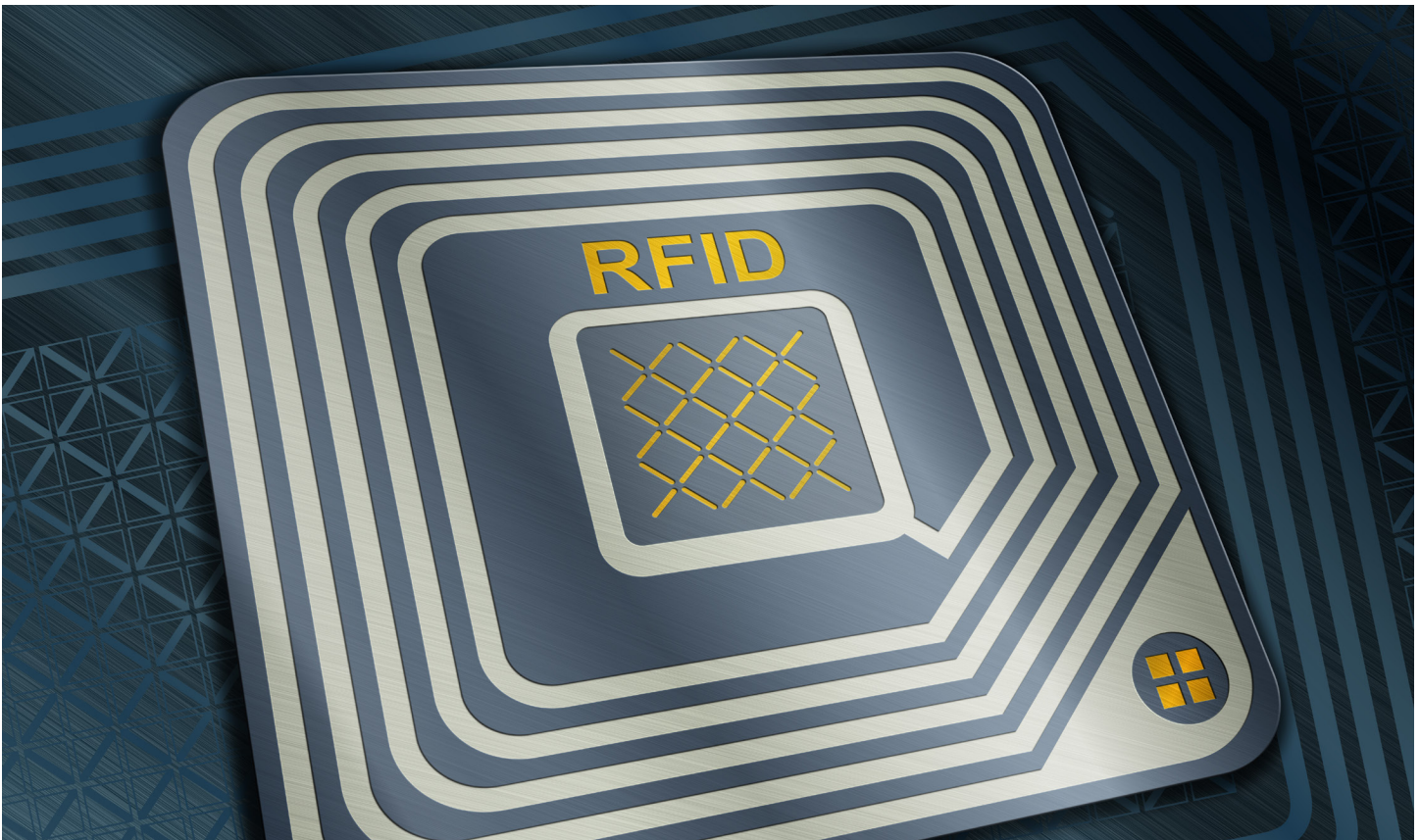
RFID READERS

An RFID reader is a two-way radio transmitter and receiver. It emits a signal to the antenna in the RFID tag initiating the transmission of data. From there, the reader is typically connected to a database and software system that ultimately processes and stores the data.

There are several types of readers. Fixed RFID readers are designed to be mounted on a door or wall, tracking RFID tags that move through an area. Mobile readers are not limited to an area, and can be moved to increase the scanning range. Hands-free mobile readers can be attached to a forklift, cart or car. Handheld mobile readers can be held and manipulated by users.

Zebra RFID Readers and Antennas

Zebra offers both handheld and fixed RFID readers. Handheld options include long-range UHF RFID readers for increased accuracy suitable for jobs like warehouse management, manufacturing and transportation. Other readers include the RFD2000 UHF RFID Sled, which works in conjunction with the TC20 touch mobile computer to provide tag read/write capability and location functionality.

Options like the MC9190-Z RFID reader are suitable for demanding jobs, with a rugged build that delivers excellent read range and performance. The fixed readers provide excellent coverage, with increased throughput and capacity when paired with the matching reader antenna.

RFID readers from Alien Technology

Alien Technology RFID Readers

Alien offers a range of RFID reader solutions, from the enterprise-level ALR-F800-X and ALR-F800 fixed readers with multiple reader management, to handheld readers like the ALR-H450 and ALR-S350, which support Android and Apple iOS operating systems. All Alien RFID readers offer advanced filtering and intelligence which reduce network traffic and the need for external network infrastructure. All readers provide best-in-class read/write performance and industry-leading security features. Alien readers will work with any antenna, but provide additional efficiency and benefit when paired with Alien antennas.

Applied Wireless Identification Group (AWID) RFID Readers

AWID offers fixed and portable (handheld and hands-free) readers, many offering an included antenna to increase the range of throughput. Each reader includes a frequency range, making them suitable for custom solutions. AWID RFID readers include long-range readers like the LR-2000, LR-2200 and the LR-3000, which combine UHF technology and a traditional proximity Wiegand communications protocol.

RFID PRINTERS

RFID printers print labels and tags with an RFID chip and antenna embedded in them. They print and encode information on RFID labels or inlays, saving time and effort by eliminating the need to manually encode chips.

The RFID printer uses an RF encoder which transmits and encodes data on the chip, and then tests the chip, ensuring the encoded data is correct. RFID printers allow a business to print RFID labels on demand for applications like an inventory control system, shipping information, or even handling instructions.

RFID thermal printer from Zebra

There are several types of printers, depending on job requirements.

- **Industrial RFID printers:** With extreme durability, industrial printers can handle the most demanding jobs and a high volume of labels (10,000+ labels/day).

- **Desktop RFID printers:** Suitable for an office environment, they can manage most low-volume jobs (500+ labels/day).

- **Mobile RFID printers:** More convenient than the industrial or desktop RFID printers, especially in a warehouse or shipping environment. Most mobile RFID printers require special media and handle only low-volume work (200+ labels/day).

Honeywell RFID Printers

Honeywell printers come in a range of options, including the PC43t, PC43d and PC23d for desktop and light-duty use. The PX6i and the PX4i are built to withstand harsh environments for reliable performance. High-speed, reliable print options include the PM43, PM43c and PM23c. All Honeywell printers will simultaneously encode, print and verify, and will work with a range of media products and labels. Additional options and accessories for the units further increase Honeywell solutions for RFID.

Zebra RFID Printers

Zebra offers RFID printers for a range of applications, such as industrial printers in the ZT600 series, a mobile UHF RFID printer for low-volume applications, and metal asset tagging with the ZT410 printer for Silverline tags. For more complex jobs, Zebra has the ZT400 series with advanced features like adaptive encoding for media flexibility, as well as greater connectivity features so they can be more easily managed even from remote locations.

SATO RFID Printers

SATO provides an RFID printing option on their CL4NX industrial thermal printer and S84-ex print engine. Both printers offer a range of accessories and options in addition to features that come standard. The CL4NX RFID option delivers UHF/HF smart tags and labels in addition to scan-ready barcodes and text. The S84-ex provides industrial RFID printing capability for high-volume work and supports UHF smart tags and labels.

RFID SOFTWARE

RFID software is a critical component in any RFID solution. **The software system will process and store the data received by and sent to the RFID tags and readers.** The capability and functionality of the software should be determined by the business requirements of the solution.

Some systems work as a simple database, while other systems can be used to produce custom tags and labels or integrate with the readers and provide built-in data analytics. RFID middleware applications provide remote monitoring and hardware configuration.

Typically, the RFID software will provide integration to other systems like the ERP (Enterprise Resource Planning), MES (Manufacturing Execution System) and WMS (Warehouse Management System).

INSIDER TIP

RAIN (RAdio frequency IdentificatioN) RFID is a wireless UHF technology and protocol that links RFID data to the cloud and then the internet. It connects the RFID-based data to the cloud where it connects to a software platform that manages, processes and stores the data.

Impinj RAIN RFID Software Platform

Impinj uses a RAIN RFID software platform that connects Impinj devices. This enables increased integration to other business systems and applications, and better intelligence. Using the Impinj platform, users can collect and use the raw RFID data, manage devices, and manage RFID tag encoding from any location.

NXP UCODE RAIN RFID

NXP offers a branded RAIN RFID system known as UCODE. Within the UCODE product line are variations suitable for a range of industries, including supply chain management, long-range automated product identification, retail apparel tagging and fast-moving consumer goods. Data is sent to and managed on the NXP platform by the business. In addition, NXP offers a wealth of developer resources for building custom solutions on NXP.

Custom Software Solutions

Because of the limits and integration challenges that can occur when using a commercial software platform for managing an RFID solution, many businesses choose to build a custom solution. There are several advantages, including integration with existing enterprise and business systems, a better match to current processes, and ownership of the code as requirements and needs change over time.

Custom solutions are typically based on an open database, API integrations and a security application designed to meet business requirements.

GETTING STARTED WITH RFID TECHNOLOGY

RFID technology has the potential to deliver significant cost savings for almost any business. It can reduce errors, automate tasks so employees can be moved to higher-value work, and offer real-time process and inventory visibility.

Overcoming Challenges to RFID Solutions

The struggle for many businesses is implementing an RFID solution. There are problems that must be overcome before the business can see ROI.

- **Security:** RFID chips contain or transmit sensitive information. Active chips with range can be an invitation for hackers.

- **Signal disruption:** The radio frequencies used by RFID can be disrupted and jammed, which can reduce both the efficiency and usability of the solution. Signals from the RFID can overlap and cause interference. Metal, water and other signals can also cause interference.

- **Expense:** There is a high cost for the equipment, so the business needs assurance there will be an ROI for every purchase. Purchasing an RFID printer, only to discover the printer doesn't work with the necessary labels and tags, can lead to downtime, inefficiencies and additional expenses.

- **Complexity:** Challenges like those referenced above can create additional issues, including long, complex and expensive implementations. The hardware, both chips and readers, needs to be tested and calibrated to minimize potential interference and ensure project requirements are met. On-site trials need to be conducted, as well as training for the end users.
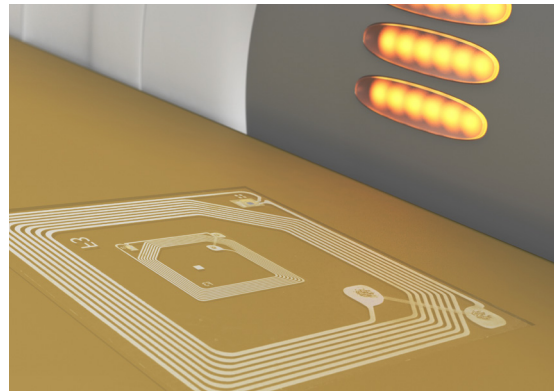
RFID SOLUTIONS FOR MANUFACTURERS AND BUSINESSES

We suggest using an outside resource specializing in RFID solutions when implementing. Experts who understand the industry and technology can select the best options for your requirements. This will significantly reduce the implementation and testing time, and allow for a custom solution that addresses your requirements and work environment. The consultant will work closely with you and your team during planning, often bringing additional expertise that can lead to even more efficiencies and cost savings.

The result is a long-term, sustainable item identification solution that delivers a rapid ROI for the business.

GO2 are experts in RFID solutions. We have firsthand knowledge of the latest best practices and processes around RFID, and work with leaders in the industry like Alien, Sato and Zebra to make sure you are using the best solution, and the best cost, for your processes.

Contact GO2 today to learn more about our RFID solutions and expertise.
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