

**Future Developments: RFID Shelving**  
Reading RFID tags on pallets stored on metal shelves can be difficult, but Intermec has produced a shelving prototype that increases the read range and ability to work within highly reflective metal environments. Existing metal structures can be upgraded by adding RF reflective surfaces between scan locations. This can also be achieved through the use of multiple antenna readers and several RF Coaxial switch options.



A similar application for eaches-level tracking has been demonstrated using tags within the apparel industry. This involves the use of existing retail shelves, eliminating the need to replace metal shelves with wooden or plastic shelves.

**RFID Shelving Application Equipment\*:**

- Intellitag 915 MHz RFID Serial Reader
- 915 MHz Circularly Polarized Antennas
- Remote Host Computer
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Intellitag 915MHz RFID Tags (Within Pallets)
- Shelf Scanner Structure
- Proximity Sensors (Optional)
- Various Coaxial Switches (Optional)
- Intellitag Multiple Antenna Reader (Under Development)

**Factors Impacting RFID Performance**  
RF performance degradation can occur when reading tags through certain materials, such as:

- metal or RF reflective or RF absorbent surfaces;
- materials containing more than .15% carbon colorant by weight;
- materials submersed in water, or placed on porous, moisture soaked material;
- body tissue.

Intermec offers unique tag designs for particular surfaces, as well as inserts that can be easily tuned to offset many RF impediments. When used in conjunction with impeding surfaces, RFID tags must be placed on the outside of the item to be tagged facing the reader and offset from the impeding surface.

With RFID solutions, the manual processes required in bar code technologies (locating and presenting the correct bar code, etc.) can be eliminated. Total elimination requires:

- Well-defined RFID field patterns that take into account the tag's orientation, trajectory, and surrounding environment while being scanned.
- Redundancy within the scan process. This includes sufficient dwell time within the field to account for the worst-case tag-to-antenna link as well as redundant scan stations.
- RFID tags designed for the tagged asset's composition, the environment to which the asset is exposed, and the intended RFID scan applications.

**Contact Intermec today for more information about the Intellitag RFID products that complement bar code technology for your manufacturing, warehousing, logistics or other supply chain needs.**



**Application Guide**



**REAL - WORLD RFID SOLUTIONS**

RFID is a flexible technology that is convenient, easy to use, and well suited for automatic operation. It combines advantages not available with other identification technologies. RFID can be supplied as read-only or read/write, does not require contact or line-of-sight to operate, can function under a variety of environmental conditions, and provides a high level of data integrity.

Intermec's Intellitag® technology is being used in dozens of applications today, tracking goods at the eaches<sup>†</sup> (item or work-in-process), container, and pallet levels. And because Intermec has the industry's most extensive experience in successfully installing RFID systems, it brings a wealth of knowledge in making its customers' implementations successful in a wide variety of applications. Typical applications include:

Tracking Level	Eaches (item or work-in-process)	Container	Pallet
Overhead Scanner	Not Recommended	Possible	Recommended
Portal Scanner	Not Recommended	Possible	Recommended
Conveyed Container	Recommended	Recommended	Not Recommended
Stretch Wrap Scanner	Not Recommended	Possible	Recommended
Handheld Scanner	Recommended	Recommended	Recommended
Forklift Scanner	Not Recommended	Possible	Recommended
RFID Shelving	Possible	Possible	Possible

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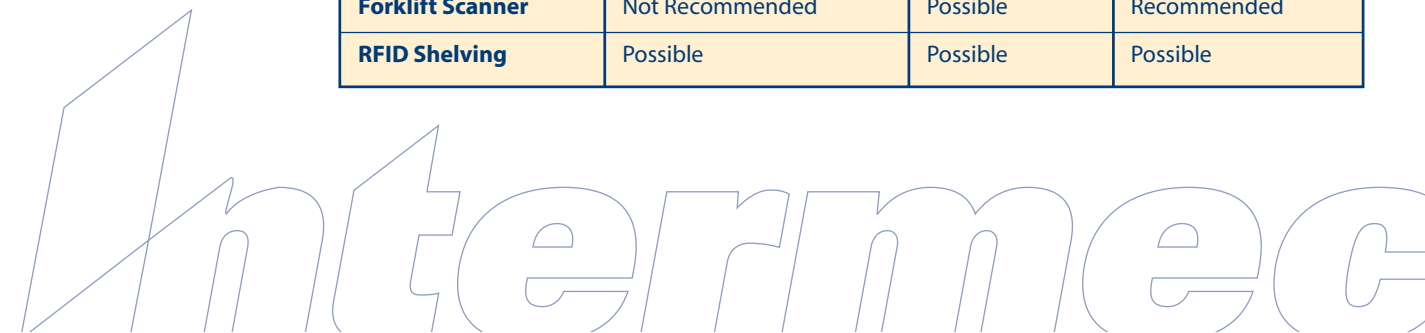
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**Overhead Scanners**

Overhead scanners are ideal for capturing pallet-level and large-sized item data. They feature a single set of antennas that radiate downward to a RF-reflective surface where the tagged items are scanned. RF-reflective surfaces magnify the RF field for reliable reading and can be quickly constructed, enabling freedom of motion for forklift operators.

Overhead scanners should use circularly polarized antennas and an RF reflective surface on the floor with motion detectors to activate the scanner upon approach. RFID tags should be designed and tested for the container material used and tag placement should be unobstructed with skyward orientation.

**Overhead Scanner Equipment\*:**

- Intellitag 915 MHz RFID Serial Reader
- 915 MHz Circularly Polarized Antennas
- 2101 Wireless Access Point (802.11b)
- Remote Host Computer
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Intellitag 915 MHz RFID Tags
- Overhead Scanner Mounting Structure
- Proximity Sensors (Optional)
- TTL Control Circuitry and Operator Notification Light/Buzzer (Optional)



**RFID Stretch Wrap Scanners**

Using RFID at stretch wrap stations, the final step prior to shipping, virtually guarantees container and eaches-level integrity. An RFID-enabled stretch wrap station exposes all exterior sides of containers to an RF field during the wrapping process, allowing ample time to identify and categorize items on pallets. Identification is virtually certain because the tags are constantly entering and leaving the RF field during the spinning of the pallet.

The stretch wrap process provides ample time to identify and categorize items on pallets and to associate them with RFID-enabled pallets.

**Stretch Wrap Scanner Equipment\*:**

- Intellitag 915 MHz RFID Serial Reader
- 915 MHz Linearly Polarized Antennas (Typical)
- 915 MHz Circularly Polarized Antennas (for Random Orientation of Containers/Tags on Pallet)
- Intermec 2101 Wireless Access Point (802.11b)
- Remote Host Computer
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Intellitag 915 MHz RFID Tags
- Stretch Wrap Antenna Mount Equipment



**Portal Scanners**

Instead of a single set of antennas radiating from one direction, portal scanners have antennas mounted on three different axes, adding more diversity to the RF field. This enables containers or items to more readily transact with the scanners. The maximum number of tagged assets, the speed of the forklift, and the orientation of tags will affect the required length of a portal.

Portals are ideal for pallet-level tracking. Container-level tracking through a portal is best with containers that can provide a fixed tag orientation (e.g., stacked, reusable plastic containers) and separation from the forklift.

**Portal Scanner Equipment\*:**

- Intellitag 915 MHz RFID Serial Reader
- 915 MHz Circularly Polarized Antennas or 915 MHz Linearly Polarized Antennas
- Intermec 2101 Wireless Access Point (802.11b)
- Remote Host Computer
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Intellitag 915 MHz RFID Tags
- Industrial Quality Portal Tunnel Structure
- Proximity Sensors (Optional)
- TTL Control Circuitry and Operator Notification Light/Buzzer (Optional)



**Conveyed Container Scanner Equipment\*:**

- Intellitag 915 MHz RFID Serial Reader
- 915 or 2450 MHz Circularly Polarized Antennas (Random Orientation of Container)
- 915 or 2450 MHz Linearly Polarized Antennas for Assembly Line Applications
- Remote Host Computer
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Intellitag 915 or 2450 MHz RFID Tags
- Industrial Quality Portal Tunnel Structure (Optional)
- Proximity Sensors or Presence Indicators (Optional)
- General Purpose Input Output Sensor to 915 MHz Serial Reader

**Conveyed Container Scanners**  
Conveyed container scanners are recommended for container and eaches-level tracking. Conveyers permit containers and items to be separated while scanned. Adding multiple antennas or increasing the dwell time provides more opportunities to actively transact with the tags.

Intermec has demonstrated 99.99% reliability in conveyed container scanners to customers like UPS® at belt speeds of up to 450 feet-per-minute. At the eaches-level, Intermec has achieved similar results with retail clothing items inside of cardboard containers (60 per container). Georgia-Pacific recyclable plastic containers with Intellitags have also proven the effectiveness of conveyed container tracking.



**RFID Forklift Scanners**

The Sabre 1555 can be quickly and easily tethered to vehicle-mounted data collection terminals or mobile computers to provide forklift operators the ability to rapidly inventory items, containers, or pallets.

While it dramatically increases the efficiency and accuracy of today's processes, RFID still requires some operator intervention. New solutions for container and pallet tracking, employing specialized antenna cabling systems to capture information from RFID-enabled pallets and Intellitag-enabled fixed mount vehicle readers for forklifts and truck portals, are on the horizon.

**Mobile Handheld Forklift Scanner Equipment\*:**

- Sabre 1555 Bar Code/RFID Scanner at 915 or 2450 MHz for Batch/Stand Alone Operations
- Sabre 1555 Bar Code/RFID Scanner Tethered to a Vehicle Mount Terminal (Several Terminals Available)
- Intellitag 915 or 2450 MHz RFID Tags

- Intermec 700 Series Mobile Computer (Optional)
- Any Mobile or Fixed RS-232 Serial Input Device (Optional)
- Various Accessories (Holsters, Cables, Configuration Software)

**Fixed Mounted Forklift Scanner Equipment\*:**

- Intellitag 915 MHz Serial Reader Unit
- Intellitag 915 MHz PCMCIA Card Readers
- Intellitag 915 MHz Enabled Pallets (Under Development)
- Standard and Specialized 915 MHz Antennas
- 5055 Vehicle Mount Unit - Wireless Data Terminal
- ANSI INCITS 256:2001 Compliant RFID Software Application
- Remote Host Computer (Optional)
- Intermec 2101 Wireless Access Point (802.11b) - (Optional)
- Various Specialized Accessories (Power and RF Coaxial Cables)

\*Eaches, sometimes referred to as singulated units, is identified as individual units in a tray or individually packaged units in a box or in a container on a pallet.

\*Listings are provided as a reference and should not be used as a final bill of materials or quote without consulting an Intellitag Certified Systems Consultant or Intermec Solutions Provider.

