The Global Language of Business

Apparel & General Merchandise

Implementation Guideline

Format & Symbol Placement for the Electronic Product Code (EPC)

Release 1.3, August 6 2024

Table of Contents

About GS1

GS1® is a neutral, not-for-profit, global organization that develops and maintains the most widely used supply chain standards system in the world. GS1 Standards improve the efficiency, safety, and visibility of supply chains across multiple sectors. With local Member Organizations in over 110 countries, GS1 engages with communities of trading partners, industry organizations, governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards. GS1 is driven by over a million user companies, which execute more than six billion transactions daily in 150 countries using GS1 Standards.

About GS1 US

GS1 US®, a member of GS1 global, is a not-for-profit information standards organization that facilitates industry collaboration to help improve supply chain visibility and efficiency through the use of GS1 Standards, the most widely used supply chain standards system in the world. Nearly 300,000 businesses in 25 industries rely on GS1 US for trading partner collaboration that optimizes their supply chains, drives cost performance and revenue growth, while also enabling regulatory compliance. They achieve these benefits through solutions based on GS1 global unique numbering and identification systems, barcodes, Electronic Product Code (EPC®)-based RFID, data synchronization, and electronic information exchange. GS1 US also manages the United Nations Standard Products and Services Code® (UNSPSC®).

Document Summary

Document Item	Current Value
Document Title	Implementation Guideline - Format & Symbol Placement for the Electronic Product Code (EPC)
Date Last Modified	August 2024
Document Description	The purpose of this document is to support organizations with their implementation of radio-frequency identification (RFID) by outlining the details on the format and symbol placement of the EPCs.

Log of Changes

Release Number – Date	Changes
Release 1.0	Release/publication
Release 1.1 – August 2014	The materials herein are proprietary to GS1 US following the merger of GS1 US with Voluntary Interindustry Communication Standards® (VICS) in 2012 and does not contain any other material changes.
Release 1.2 – October 2020	Updated and expanded the placement guidelines by category of merchandise.
Release 1.3 – August 2024	With use of RFID expanding, the scope of this document has been expanded to provide guidance on EPC tag placement for both softlines and hardlines.

1   Introduction

1.1   Preface

The GS1 US Apparel and General Merchandise RFID Tag Placement Workgroup is providing this guideline for the implementation of the Electronic Product Code (EPC®) as a service to the industry.

Since 2003, GS1/EPC global® has been developing hardware and software standards for radio frequency identification (RFID) technology. The standards that support the identification, capturing, and sharing of data about physical objects are known as the GS1 Standards Architecture.

In 2010, as RFID technology was taking hold in the apparel industry, VICS organized a committee to develop guidelines which would assist in the rollout of RFID. The committee was comprised of suppliers, retailers, as well as technology and service providers. In June 2010, the VICS Board approved the use of *GS1® Apparel Guidelines: Format and Symbol Placement* and *VICS' Voluntary Guidelines for Floor-Ready Merchandise* as the foundation and starting points for the RFID standards and guidelines in this document. This document has subsequently been updated in 2014, then again in 2020, and now with this revision, in 2024.

1.2   Problem Statement/Business Need

RFID technology has taken hold in the apparel industry and is expanding from softlines (e.g., apparel and other textiles) to hardlines (e.g., general merchandise items). To help suppliers comply with EPC standards and remain efficient within their supply chains, it is imperative that retailers agree on a set of guidelines. Adherence to a set of guidelines should enable suppliers and retailers to improve the value of products delivered to the consumer with the potential of increasing profit.

Obviously, the best economics will be obtained when there is a consistency of a given service and the EPC application happens simultaneously with the item tagging or labeling process, usually at point of manufacture. Understanding that not all companies are ready to tag at point of manufacture, these guidelines offer several tag placement options. The expanded tagging of hardlines necessitates a more nuanced evaluation of tag placement given the dielectric properties of hard goods.

1.3   Mission

Provide suppliers, retailers, technology providers, and service providers with guidelines for the efficient identification, serialization and placement of EPC tags.

1.4   Scope

The scope focuses on the apparel, footwear and general merchandise categories.

1.5   Audience

This document is designed to be used by suppliers, retailers, technology providers, and service providers.

2 General Placement Guidelines

2.1 Bidirectional Conversations to Ensure Successful EPC Rollout

Best practices require bidirectional communication between supplier and retailer during EPC implementation to determine optimal EPC type and placement with the goal to minimize work effort and keep implementation costs low.

Although the guidelines ask that retailers mandate these placement options, it is important that the supplier confers with the retailer prior to implementation. In cases where products or packaging are composed of metallic content or contain liquids, the services of an accredited lab may be required to ensure proper tag performance.

2.2 General Intent to Leverage Current UPC or Retail 2D Tag Placement

The general intent is to use the current Universal Product Code tag (UPC) placement guideline as a starting point. Noting that this also applies to the placement of a 2D barcode that likewise is used for product identification at point-of-sale. For the purposes of this document, any reference to the UPC barcode will likewise include such a 2D barcode which may be used to supplement or replace the UPC. As such, the EPC tag should be placed on or embedded in the UPC (or Retail 2D) tag, media, trim, or packaging that is attached to the item itself and is removable by the customer after purchase. Alternatively, the EPC tag could be affixed separately and placed in a location ideal for tag protection and readability. For certain product categories, there will be trade-offs to consider between product aesthetics, product labeling processes, and merchandising presentation.

- **Product aesthetics**: Product packaging will vary in degree of aesthetic sensitivity. Also noting that as consumers become accustomed to scanning QR codes, it is possible that such codes would be more readily presented.
- **Product labeling processes**: Tag placement should be informed by product manufacturing and packaging processes to maximize process efficiencies and quality control.
- **Merchandising presentation**: This includes considerations as to if an item will be stacked, hung, or on shelving. Boxed items typically have the UPC on the lower back side of the box or sometimes underneath the box. Given that a common RFID tag pressed against metal is detuned, an RFID tag should never be placed underneath a box. For tags on the back plain of a box, this introduces a potential missed tag read if the box were to lay flat on its back on a metal shelf.

2.3 General Placement to Optimize Readability

For optimal readability there are certain placement options that should be avoided:

> ⚠️ **Caution!** *Metals, be it solid, foil-based, or inks detune RFID tags when directly touching them. Never place an RFID tag directly on a metallic surface.[1]*

An RFID tag should be at least ¼ inch away from metal to ensure the tag is not detuned. The tag should be "offset" from metal, meaning it should not be placed in such a location as to be directly touching metal shelving (if an item is designed for shelf placement the bottom of the item should not be RFID tagged). The tag should also not be "shielded", meaning it should not be masked by a metallic

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[1] The most common product-attached RFID tags are not designed for on-metal applications. There are specialty on-metal tags more commonly used in manufacturing applications, such as tagging assets such as tooling.

barrier (such as a large metal surface that could be located between the tag and reader). For example, a tag on the back middle of a washing machine box will be blocked by the product metal content if a reader is at the front of the machine, however something like a metal zipper or button is not sufficient cause for concern (so long as the RFID tag is not directly touching it).

- Avoid contact with metals (including and/or noting metallic thread, foil-based packaging, or anticipated placement directly on metal shelving) and liquids, as this impacts the read performance of a tag

- Avoid placing a tag where it may be behind a metal or liquid barrier between tag and reader

- Avoid folding the tag and minimize bending of the tag

- Avoid attaching the tag directly to a hanger or placing the tag where the hanger clips might go

- Avoid inserting a tag loosely within a package

- Avoid placement that would allow two RFID tags to be in direct contact with each other, as this will detune both tags.

3   About the EPC Tag

3.1   EPC Tag Types

- A combined EPC/UPC ticket where the inlay is sandwiched (encapsulated) between tag layers. This could be a hangtag (affixed to a product with a barb), a label (sticker-attached to product), a Joker (tear off tag woven into product seam), or a C-Card (wrapped around edge of product and barb attached).

- A secondary tag that has EPC functionality but does not have a printed UPC barcode. This could be a hangtag or label.

- A woven or embedded tag, located in the product packaging (including corrugate) or the product itself.

- The following tag types are options for metallic or liquid products:

    - A flag tag is a label that has the RFID inlay protruding away from the product.

    - A barbel tag is similar to a flag tag, it varies in shape but also protrudes from a product for the same purpose of tagging metallic items.

    - A circular ring tag is placed on the neck of a bottle and provides a similar offset as the above examples.

3.1.1   Secondary Tag Best Practices

A secondary tag does not have the UPC (or retail 2D) barcode printed on it. It may be visible to consumers or may be embedded in product packaging. A best practice is to (at a minimum) print the GTIN, short product description, and EPC logo on the secondary tag for quality control purposes. This is recommended since the secondary tag does not have the UPC (or retail 2D) barcode printed on it and may be visible to consumers or may be embedded in product packaging.

3.2   Required Information on the EPC Tag

The EPC seal is to be visible on the human-readable side of media, packaging or trim that has the tag. In the event that the RFID tag is not visible to the consumer, the EPC seal is to be visible in proximity to the UPC or equivalent 2D barcode. A machine-readable serialized Global Trade Item Number® (stun) is acceptable, but not deemed necessary for this guideline. Guidance on the use of EPC/RFID for consumer products may be found here: *https://www.gs1.org/standards/epc-rfid/guidelines*. This provides details on public policy and consumer notification symbols.

3.3   Woven or Embedded Tags

Woven or otherwise embedded RFID tags may be used as an alternative to the tag placement guidance outlined below, so long as trading partners are in agreement. In this case, the product is to have the appropriate EPC seal visible to indicate that the item has an RFID tag present. At the time of this document publication, GS1 Global is developing updated guidance regarding best practices for woven labels. This will include consumer notification considerations and may be found at this location: *https://www.gs1.org/standards/epc-rfid/guidelines*.

Note that, as with any other RFID inlay, woven or otherwise embedded RFID tags should be placed in a manner as to avoid contact with metal (e.g. away from potentially touching a metallic hanger) and to avoid being folded (e.g. away from a portion of the garment that would be typically bent when folded).

4 Placement Guidelines for Softlines

By Category of Merchandise

4.1 Accessories

Accessories contribute in an ancillary manner to a primary outfit.

4.1.1 Backpacks

This category includes items such as backpacks, knapsacks, and fanny packs. GS1 US guidelines suggest UPC is affixed through the left strap buckle. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.2 Boxed Jewelry or Accessories

This category includes boxed items that may be pegged.

GS1 US guidelines suggest UPC is affixed to the side or top of the box, not the back or bottom edge as those surfaces may touch metallic racking.

Do not place the EPC on any metallic or foil packaging and avoid placement near liquids. Note that some jewelry boxes are metal covered by felt, and thus not suitable for direct tagging.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.3 Carded Accessories

This category includes accessories mounted on cardstock.

GS1 US guidelines suggest UPC is affixed to the back of the card stock, avoiding any contact or proximity within ¼ inch of metal (including magnets).

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC
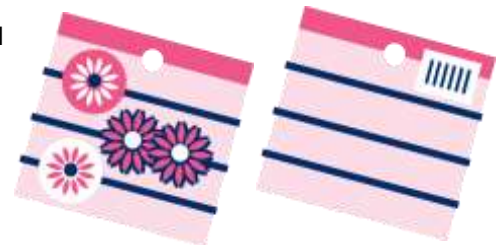
4.1.4   Handbags - Hinged

This category includes items such as clutches, coin purses, and dop kits.

GS1 US guidelines suggest UPC is affixed (preferred) through an outside hinge joint or (alternate) to the inside of a main compartment.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.5   Handbags, Purses

This category includes purses and cinch sacks.

GS1 US guidelines suggest UPC is affixed (preferred) around the main outside strap, handle, zipper, or frame joint or (alternate) to the inside of a main compartment.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.6   Jewelry - Carded

This category includes items jewelry that is sold attached to a card such as earrings, pins, broaches, charms, hair clips, tie tacks, cuff links, and studs.

GS1 US guidelines suggest UPC is affixed (preferred) to the back of card or (alternate) to the bottom of the box if the card is mounted in a box. However given that the box may be placed on a metallic shelf, the RFID tag placement should not be on the bottom of the box, but rather either embedded in the top fabric of the box, or attached directly to the product.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.7   Jewelry - Loose

This category includes items such as necklaces, chains, bracelets, bangles, and rings.

GS1 US guidelines suggest UPC is affixed through the item. There is no alternate location.

EP EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.8 Wallets

This category includes items such as wallets, billfolds, and trifolds.

GS1 US guidelines suggest UPC is affixed to the inside of the bill compartment or (alternate) if the wallet contains RFID blocking and a hanger, then attach to the hanger.

E EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
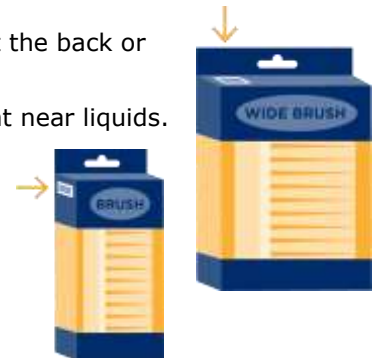Alternate: Affix separate EPC tag close to the UPC

4.1.9 Watches - Displayed in a Box or Case

This category includes items such as watches and pocket watches.

GS1 US guidelines suggest UPC is affixed to the base of the wristwatch or the stem of the pocket watch AND an additional symbol on the back of the box. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

### 4.1.10 Watches - Displayed in Watch Cuff Only

This category includes items such as watches.

GS1 US guidelines suggest UPC is affixed to the top of the base of the watch cuff or (alternate) attach a tag via string or barb. Note that only one RFID tag should be on each item.

EP EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.1.11 Watches - Loose

This category includes items such as watches and pocket watches.

GS1 US guidelines suggest UPC is affixed to the base of the wristwatch or the stem of the pocket watch. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2 Apparel

Apparel refers to items composing a primary outfit.

4.2.1 Banded Apparel

This category includes such as packaged socks, with labels placed around the product. Items in this category do not have an outer cover or package.

GS1 US guidelines suggest UPC is affixed on the center back portion of the label. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.2 Belts

This category includes items such as belts.

GS1 US guidelines suggest UPC is affixed (preferred) inside the base of the buckle or (alternate) through the buckle.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.3 Bibs

This category includes items such as free-hanging infant bibs.

GS1 US guidelines suggest UPC is affixed through the left-hand seam or (alternate) if the bib material cannot be attached to but has a header card, attach the tag to the back of the header card.

<u>EP EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.4 Boxed Apparel - Flap

This category includes apparel packaged in boxes with a flap lid that are to be merchandised with the product, such as men's underwear and slippers.

GS1 US guidelines suggest UPC is affixed on (preferred) the top right quadrant of the package or (alternate) on the front upper right corner of the box. Note that for items with a narrow top, the back of the box is a possible alternate location, however the caution for this is the possibility of the box laying flat on its back on a metal shelf, which impacts tag readability.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.5 Boxed Apparel - Lid

This category includes apparel packaged in boxes with a removable lid, such as shoes.

GS1 US guidelines suggest UPC is affixed on the side of the box next to the size identification. There is no alternate location. Note that the RFID inlay should be above the bottom inch of the box, to avoid contact with metal edging.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
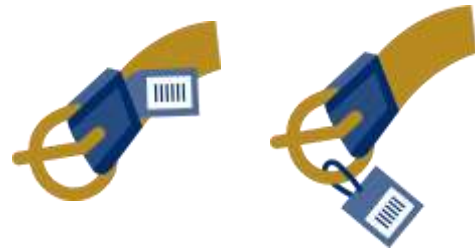Alternate: Affix separate EPC tag close to the UPC

4.2.6 Bras - Hanging

This category includes items such as bras intended to be merchandised on hangers.

GS1 US guidelines suggest UPC is affixed (preferred) through the left side seam or (alternate) through the front left strap.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

Don'ts
Do not place the EPC tag on external packaging that could get separated from the garment itself. For example, do not affix the EPC tag to media that is attached to the hanger.

4.2.7 Camisoles, Teddies, Crop Tops, Slips, One-Piece Swimwear, Bodywear, Dancewear - Hanging

This category includes items such as camisoles, teddies, crop tops, slips, and one-piece swimwear, bodywear, and dancewear.

GS1 US guidelines suggest UPC is affixed (preferred) through the top left side (arm hole) seam or (alternate) through the manufacturer label or care label.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

Don'ts
Do not place the EPC tag on external packaging that could get separated from the garment itself. For example, do not affix the EPC tag to media that is attached to the hanger.

4.2.8 Caps, Visors

This category includes items such as caps that do not have a full brim or headband such as baseball caps, berets, visors, and beanies.

GS1 US guidelines suggest UPC is affixed through the outside center back seam or center of the headband. There is no alternate location.

EPC placement options
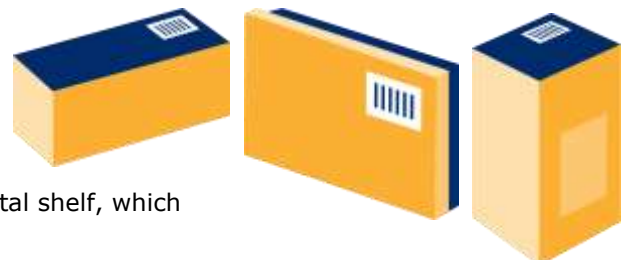
Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.9 Carded Apparel - Flap

This category includes merchandise that is affixed to a cardboard for display purposes.

GS1 US guidelines suggest UPC is affixed on the face of the card. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.10 Cummerbunds

This category includes items such as non-packaged cummerbunds.

GS1 US guidelines suggest UPC is affixed adjacent to the fastening device. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.11 Dickies, Collars

This category includes items such as dickies and collars.

GS1 US guidelines suggest UPC is affixed through the manufacturer label or care label. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.12 Dresses with Sleeves

This category includes all length of dresses that have a constructed sleeve. If the dress has an outer jacket, the sleeve of the jacket is considered part of the dress for symbol placement purposes.

GS1 US guidelines suggest UPC is affixed (preferred) to the left sleeve hem or (alternate) inside the collar through the manufacturer label or care label.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.13 Dresses, Sleeveless

This category includes items such as dresses that have no constructed sleeves.

GS1 US guidelines suggest UPC is affixed on (preferred) the left arm hole seam or (alternate) inside the collar through the manufacturer label or care label.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.14 Flat-Packed Apparel

This category includes product packages that are thin and have no sides, such as women's hosiery.

NOTE: If metal dividers are used for display purposes, placement that may occur on the back of the package should be affixed next the top of the package to avoid direct contact with metal. This will affect tagged item performance and readability of the product.

GS1 US guidelines suggest UPC is affixed on the front upper right corner of the package. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.15 Gloves, Mittens

This category includes items such as gloves and mittens.

GS1 US guidelines suggest UPC is affixed through the connecting string of the gloves or mittens.

There is no alternate location.

E EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.16 Hats

This category includes items such as hats with or without a brim such as cowboy hats, straw hats, fedoras, pillbox hats, felt hats, and dressy hats.

GS1 US guidelines suggest UPC is affixed inside the hat through the headband. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.17 Hats, Knit

This category includes items such as unconstructed hats with no brim or headband such as knit hats and ski masks.

GS1 US guidelines suggest UPC is affixed through the outside top of the hat. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.18 Men's Sport Coats, Blazers, Suits, Tuxedos, Outerwear Coats and Jackets

This category includes items such as men's and boys' sport coats, blazers, two-piece and three-piece suits and tuxedos, trench coats, overcoats, raincoats, ski jackets, leather jackets, bombers, quilted flannel shirts, wind breakers, and ponchos.

GS1 US guidelines suggest UPC is affixed (preferred) on the left sleeve cuff of jacket or (alternate) to the left sleeve seam of jacket or (alternate) attach to the seam at the armhole using a barb and hang tag.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.19 Neckwear

This category includes items such as unknotted ties, clip-on ties, and bow ties of all fabrication.

GS1 US guidelines suggest UPC is affixed through the manufacturer label. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.20 Overalls, Shortalls, Rompers - Hanging

This category includes items such as fabrications of bib and sku overalls, shortalls, and rompers.

GS1 US guidelines suggest UPC is affixed on the left side waistband seam. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC ``

4.2.21 Panties, Control Garments - Hanging

This category includes items such as panties, briefs, and girdles intended to be merchandised on hangers.

GS1 US guidelines suggest UPC is affixed (preferred) through the left side seam or (alternate) through the manufacturer label or care label.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

<u>Don'ts</u>
Do not place the EPC tag on external packaging that could get separated from the garment itself. For example, do not affix the EPC tag to media that is attached to the hanger.

4.2.22 Pants, Slacks, Jeans, Shorts - Folded

This category includes items such as denim, twill, woven, fleece, and knit pants, slacks, and jeans with either a constructed, elastic, or drawstring waistband that are intended to be folded.

GS1 US guidelines suggest UPC is affixed on left rear waistband or (alternate) if the item contains a joker ticket, the tag may be affixed to the joker ticket so long as the thread or staple does not puncture the tag.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

<u>Environmental/display considerations</u>

Metal shelving will affect readability

4.2.23 Pants, Slacks, Jeans, Shorts - Hanging

This category includes items such as denim, twill, woven, fleece, and knit pants, slacks, jeans, shorts, swim trunks, bike shorts, and boxer shorts with either a constructed, elastic, or drawstring waistband that are intended to be hanging.

GS1 US guidelines suggest UPC is affixed on either the left rear waistband or left side waist seam.

<u>EPC placement options</u>
Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
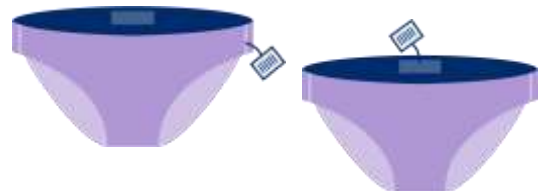Alternate: Affix separate EPC tag close to the UPC

<u>Environmental/display considerations</u>
Do not place the EPC tag where a hanger clip might go
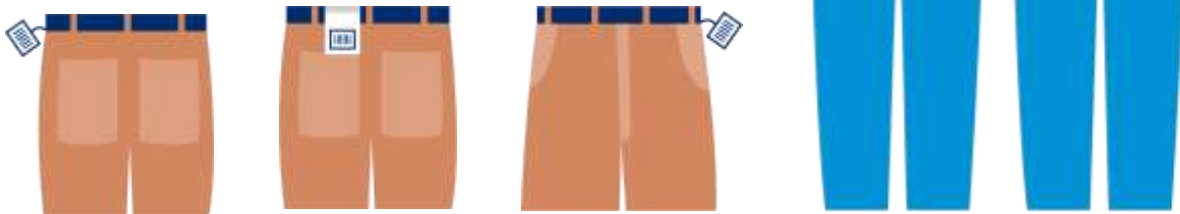
4.2.24 Plastic-Packaged Apparel

This category includes merchandise wrapped in plastic that may or may not include cardboard inserts, such as packages of underwear or socks.

NOTE: If metal dividers are used for display purposes, placement that may occur on the back of the package should be affixed next the top of the package to avoid direct contact with metal. This will affect tagged item performance and readability of the product.

GS1 US guidelines suggest UPC is affixed (preferred) on the front upper corner of the package, (also preferred) on the back of the package, or (alternate) in a location that is easily discernable and readable by the consumer.

<u>EPC placement options</u>
Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.25 Poncho, Parka

This category includes pullover outerwear without waistbands such as ponchos and parkas.

GS1 US guidelines suggest UPC is affixed through the manufacturer label or care label.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.26 Robes

This category includes items such as pajamas, bathrobes, housecoats, and nightgowns.

GS1 US guidelines suggest UPC is affixed on (preferred) the left sleeve cuff seam or (alternate) inside the collar through the manufacturer label or care label.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.27 Scarves and Shawls

This category includes items such as winter scarves, silk scarves, and shawls.

GS1 US guidelines suggest UPC is affixed through the manufacturer label or care label. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.28 Shirts - Packaged

This category includes woven shirts with an outer packaging to be merchandised with the shirt.

GS1 US guidelines suggest UPC is affixed on back lower right corner. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Affix separate EPC tag close to the UPC

4.2.29 Skirts

This category includes items such as denim, twill, woven, fleece, and knit skirts with either a constructed, elastic, or drawstring waistband.

GS1 US guidelines suggest UPC is affixed (preferred) on the left side waistband seam or (alternate) on the left rear waistband seam.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

<u>Environmental/display considerations</u>
Do not place the EPC tag where a hanger clip might go.

4.2.30 Suspenders, Braces

This category includes items such as suspenders and braces.

GS1 US guidelines suggest UPC is affixed to the inside seam of the rear clip or button loop. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

Note that some suspenders may be displayed in a bellyband (wrapped around card stock). The EPC can be placed on the back of the bellyband. Note that the EPC should be placed to avoid point of contact where metal may touch the tag.

4.2.31 Sweatbands

This category includes items such as sweatbands, headbands, wristbands, and ankle bands.

GS1 US guidelines suggest UPC is affixed through the middle of the band. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.32 Swimwear, Two-Piece

This category includes items such as bathing swimwear sold as a two-piece set.

GS1 US guidelines suggest UPC is affixed (preferred) through the top left side seam or (alternate) through the back of the top.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC tag close to the UPC

Environmental/Display Considerations:
Do not place the EPC tag where a hanger clip might go

4.2.33 Tops, Long Sleeve - Hanging
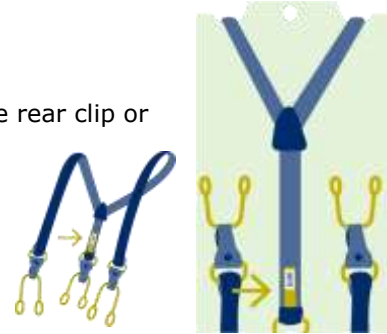
This category includes items such as woven and knit long-sleeved shirts, sweaters, turtlenecks, and blouses that are intended to be merchandised hanging.

GS1 US guidelines suggest UPC is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left cuff seam or (alternate) attach to the seam at the armhole using a barb and hang tag.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.34 Tops, Short-Sleeved - Hanging

This category includes items such as woven and knit short-sleeved shirts, sweaters, polos, and blouses that are intended to be merchandised hanging.

GS1 US guidelines suggest UPC is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left sleeve seam or (alternate) attach to the seam at the armhole using a barb and hang tag.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.35 Tops, Sleeveless - Hanging

This category includes items such as woven and knit sleeveless shirts, blouses, tank tops, sweater vests, and halter tops that are intended to be merchandised hanging.

GS1 US guidelines suggest UPC is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left armhole seam.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.36 Tops - Folded

This category includes all sleeve lengths of tops, such as woven or knit skirts, blouses, sweaters, and turtlenecks that are intended to be folded merchandise.

GS1 US guidelines suggest UPC is affixed (preferred) inside the left arm seam. Alternate locations are through the manufacturer label or care label or looped through the center buttonhole on the back of the folded shirt or affixed through the inside left neck seam.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.2.37 Vests

This category includes items such as vests for men's, women's, boys, and girls.

GS1 US guidelines suggest UPC is affixed (preferred) through the lower left arm hole seam or (alternate) to the front lower panel of the vest.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC
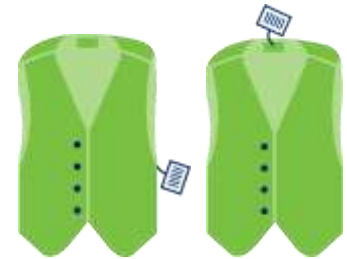
4.2.38 Women's Sport Coats, Blazers, Suits, Tuxedos, Outerwear Coats and Jackets

This category includes items such as women's and girls' blazers and suits.

GS1 US guidelines suggest UPC is affixed (preferred) to the left sleeve seam of jacket or (alternate) to the left sleeve cuff of jacket or (alternate) attach to the seam at the armhole using a barb and hang tag.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.3 Bottled Liquids, Creams, Gels, With Non-metallic Cap

This category includes bottled items with a non-metallic cap.

GS1 US guidelines suggest EPC is affixed to the side or end of the non-metallic cap, with a minimum distance of at least ¼ inch from metal or liquids. Tag testing is advised to ensure a suitable read range.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag, if practical to place on the cap
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.4 Footwear - Display Item Tagging

This category includes items such as footwear that are on display (e.g. just the left or right shoe for a given style-color). Source tagged items (which may use the ITIP identification key) are excluded from this guidance, as this is for in-store tagging guidance only.

GS1 US guidelines suggest that the UPC is affixed to each display item.

Environmental/display considerations
Avoid placing tag on bottom of shoe to avoid contact with metal shelving
Avoid placing tag near embedded electronics/metal/batteries (e.g. smart shoes) or metal grommets or metallic thread.
Do not staple tag
Ensure that tag has visual indicator, readily visible by store staff, to recognize that a display item has an RFID tag
Align display tagging with existing processes where applicable

4.4.1 Footwear - Individually Tagged (Each Shoe)

This category includes items such as footwear that are individually tagged and yet sold as a pair. Such items will likely use the ITIP identification key.

GS1 US guidelines suggest UPC is affixed to each item. Avoid placing tag on bottom of shoe to avoid contact with metal shelving. Avoid placing tag near embedded electronics/metal/batteries (e.g. smart shoes) or metal grommets or metallic thread. Do not staple tag.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the U.P.C

4.4.2 Footwear - Open

This category includes items such as sandals, slippers, athletic shoes, or other footwear that is banded together and intended to be sold loose or unboxed.

GS1 US guidelines suggest UPC is affixed to the connecting string. There is no alternate location.

Avoid placing the tag on the bottom of the shoe, as it may be placed on metallic shelving or contain metal in the sole.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.5 Glasses

This category includes items non-prescription eyeglasses such as sunglasses or pre-made readers.

GS1 US guidelines suggest UPC is affixed around the left arm of the glasses. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.6   Keychain

This category includes items such as keychains.

GS1 US guidelines suggest UPC is affixed around the key ring. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.7   Luggage, Briefcase

This category includes items such as briefcases, suitcases, garment bags, and duffle bags.

GS1 US guidelines suggest UPC is affixed around the main carrying handle. There is no alternate location.

<u>EPC placement options</u>

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.8   Towels

This category includes folded textile items such as towels.

GS1 US guidelines suggest UPC is affixed to the edge of the product.

<u>EPC placement options</u>
Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

Tag type options include Joker, Hang tag, or C-Card.

4.9   Umbrellas

4.9.1   Umbrellas - Loose

This category includes items such as umbrellas.

GS1 US guidelines suggest UPC is affixed around the base of the handle. There is no alternate location.

<u>EPC placement options</u>
Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

4.9.2 Umbrellas - Packaged

This category includes items such as packaged umbrellas.

GS1 US guidelines suggest UPC is affixed at the handle end of the package. There is no alternate location.

EPC placement options

Preferred: Incorporate EPC into/onto UPC tag
Alternate: Incorporate EPC into/onto current media
Alternate: Incorporate EPC into/onto current trim
Alternate: Affix separate EPC tag close to the UPC

5 Placement Guidelines for Hardlines

Hardlines describes durable goods also commonly referred to as general merchandise. Softlines are often composed of textiles, whereas hardlines will often be composed of more durable materials and will frequently be boxed. For this reason, placement of RFID tags for hardlines can require more evaluation and may necessitate the services of an accredited laboratory to assess ideal placement of tags on items containing liquids or metals.

The following examples provide a building narrative that demonstrates various considerations for tag placement. Icons are included to highlight the narrative topics and aid in scanning the document for particular examples. Note that if a product has a UPC label attached, the preference is to incorporate the RFID tag into that label while placing it in a well performing location. If the UPC is directly printed on product packaging, then the RFID label may be located at a different location than the UPC barcode better suited to the tag performance.

## 5.1 Boxed Items - Basic Guidelines and Methodology

Generally speaking, for boxed items that are not designed to be on hangers, the ideal tag placement is on the top plane of the box provided that the box does NOT contain metallic content at its base AND the box may be stacked with the same product. (In such a situation, it is conceivable that a second box stacked on the first would obscure or otherwise impact the first product tag with the metal at the bottom of the second product.) Alternate locations would be to tag the top back of the box (assuming the back of the box would not normally lay flat on a shelf) or tag the top side of the box (assuming the side of the box would not normally lay flat on a shelf). Boxed items that are designed to be on hangers (e.g., have a tab and cutout set for hanging) do not pose the same concern regarding stacking.

Note that typical packaging practices place an air gap at the corners of a box, which has shown in lab testing to be the best place for tag performance. There are also options to place tags inside the box or embed the tag in the corrugate.

When deciding where to place an RFID tag, the following examples illustrate various factors to evaluate. The examples illustrate various considerations and build from less to more complex.

5.1.1 Small Appliance Example: Coffee Maker

This is an example of a box that would likely sit in an upright position when merchandised, with a low likelihood of the box laying flat on its back. The recommended location is at a corner, ideally a top rear corner to take advantage of the packaging air gap found in corners. Assuming the product is packaged in a foam offset at the base or corners, the potential for metal blockage from stacking is eliminated.
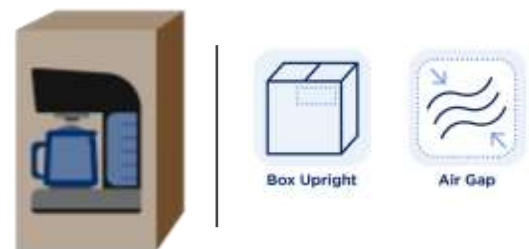
The recommended RFID tag location is on the top plane (corner is preferred for air gap), or an alternate tag location is the back plane (preferably a corner)

5.1.2 Small Appliance Example: Hair Dryer

This is an example of a box that would sit in an upright position or could quite normally be positioned on its back in the course of merchandising. If a label is used, then it is likely that direct contact with a metal shelf would occur if and when the product is laying on its back. Given this, the preferred tag location is on the top plane of the box at a corner. Unlike the above coffee maker example, the guidance is to avoid tagging the outside back plane of the box.
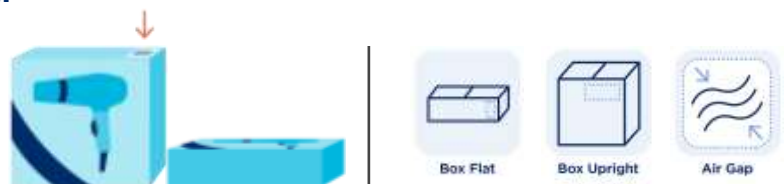
5.1.3 Interior or Side Tagging Example: Box of Golf Balls

If the manufacturer of a box has a certain aesthetic look and locating a label on the top of the box is undesirable, another approach may be to place the tag inside the box at a corner to be located away from the base. If the RFID tag is a secondary tag, then it may be placed inside the box in a location not near or behind where metallic product parts are located.

In this example, an option for exterior tagging could be to tag one of the short sides, given the likelihood that the product will not be placed on its side when merchandised.

5.1.4 Metallic Base Example: Brake Pads

Given that this product does not have a packaging offset, but rather likely has metal resting directly on the bottom of the container, this highlights the need to avoid tagging the top plane of the box (due to the potential for stacking product to result in metal in close proximity to an RFID tag. In general, an RFID tag will perform properly so long as it is at least ¼ inch away from metal and is not otherwise blocked by an area of metal located between the reader and the tag. Tags tend to operate easily enough in metallic environments so long as they are not touching (or within a ¼ inch) or blocked.

The recommended tag location is to attach to the narrow ends toward the top of the box. A secondary location would be back plane (depicted in the right image) towards the top, at a location expected to be above where the metallic part is resting in the box.

5.1.5 Miscellaneous Metal Product Example: Electrical Connector Kit

While the previous example has clearly defined metallic content, allowing tagging at an air gap, this example poses a different challenge. The product itself is densely packed with a combination of plastic and metal. Given the consistency of metal and lack of a defined air gap, the recommendation would be to have an accredited lab evaluate the product for optimal tag placement.

5.1.6 Convex and Partial Box Example: Inflated Ball

The packaged product shape shows that while the boxes may be stacked or placed upside down or on a side, the convex surface of the ball ensures that the front and back planes of packaging would not be able to be laid flat against any surface, making those ideal locations for tagging. As with other examples, placement of the RFID tag inside the box is also a viable option.

5.1.7 Plastic Partially Boxed Example: Rachet Straps

This example shows a (partially) boxed item designed to hang, as noted by the top lip and cutout. The object has some hardness and weight which the plastic housing offers protection against, so tagging the inside of the container may be preferred if operationally feasible when packaging the product. While the product contains some metal, it is not likely to have sufficient area to block an RF signal (though a lab test will confirm this assumption). If the product could be laid flat on its back, attaching a label to the outside of the back plane of the product could impact readability. Placing a label on the top plane or inside the plastic housing is ideal.


5.1.8 Large Boxed Product Example: Shelving Kit

The storage and merchandising of large or bulky metallic products is important to determining proper tag location. Typically, such products are positioned in such a way as to have their key product information (such as UPC barcode and descriptive information, often in the form of a label) facing "out" (facing an area that a consumer or associate can readily see or scan) for ease of identification. Given the product shape and size, this typically means the product information is on a short end of the box. The tag should be placed at that location.
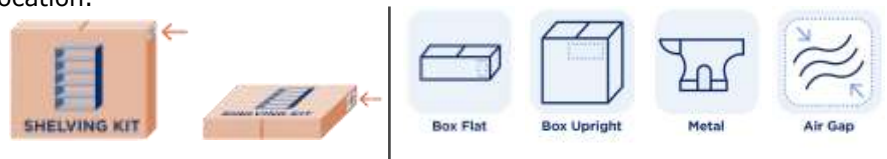
5.1.9 Large Boxed Appliance Example: Washing Machine

The storage and merchandising of large or bulky metallic products is important to determining proper tag location. For boxed appliances, the ideal locations are either the top plane of the box or upper edges of sides (at a location not blocked by metallic product material inside the box). For unboxed items, if the item is shrink wrapped then place the label on the highest-available area of shrink wrap (ideally the top plane) with a minimum ½ inch distance from metal. If an unboxed item is not shrink wrapped, apply a flag tag to the area least vulnerable to damage resulting from handling in transit or in-store.
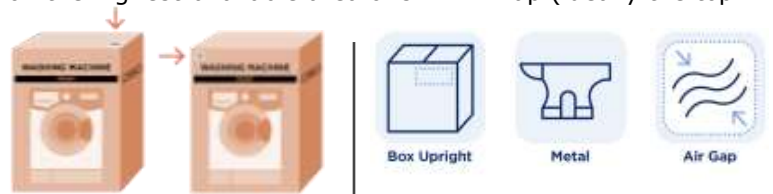
5.1.10 Plastic Bin Stacking Example

This example denotes how multiple products may be stacked one on another. In this case it is best to keep the tag location consistent so there is a minimum distance of 3/8 inch between tags if items are stacked. Note the effect of stacked bins for tag shielding. The tag may be embedded in an existing label and placed on a narrow side. Do not place on the bottom.

5.2 Heat Shrink Wrap Items

The following examples illustrate several considerations for heat shrink wrapped items. Note that partial bending of an RFID tag will not substantially impact performance, but more severe bending or folding of tags will impact performance.

5.2.1 Stacked Items with Merchandise Presentation Considerations Example: Lampshade

Absent other merchandising presentation considerations, a label or hang tag might be considered for this item. Consideration should be given to how the product may be stacked or nested one on top of another or potentially demonstrated in-store. In this case, a label located away from the metallic framing is preferred, whereas a hang tag suspended from the upper metallic framing is not preferred as it may rest on other metallic framing if nested with other lampshades or may rest on a lamp frame if merchandised as such.

Plastic Wrap | Hang Tag | Label | Stackable
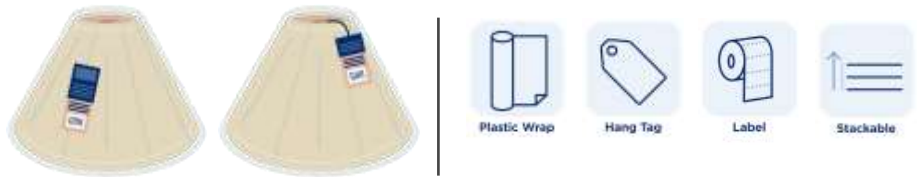
5.2.2 Small, Variable Merchandising Presentation Example: Baseball

This example shows not only a small item, but an item that could be merchandised in a variety of unpredictable ways such as on a shelf or in a bin in varying positions. The non-metallic nature of the product is helpful in overcoming such merchandising variability, though some consideration for the curvature of the tag placed on the surface would lend itself to evaluation by a certified lab.

Plastic Wrap | Lab Test Recommended

5.2.3 Cylinder Example: Candle

The cylindrical nature of the product drives a vertically aligned tag (assuming the tag is rectangular) in order to minimize the bending of the tag. Also note that varying wax dielectric properties may require lab review and categorization of candle (or glass jar) types. As with other examples, the preference is to locate the tag higher on the product wherever possible.

Plastic Wrap | Lab Test Recommended

5.2.4 Multi-Pack and Dense-Liquid-Filled Product Shampoo and Conditioner

Example:

The dense water-based liquid absorbs the RF energy, therefore placement of the tag at the top plane of the product pack sets it above the liquid. The tag is placed on either the top (assuming product will not be stacked) or the side near the top.

Liquid | Top of Box | Plastic Wrap

5.2.5 Completely Metallic Product Example: Baseball Bat

While specialty on-metal RFID tags are available, another approach is to attach a "flag tag" to a metallic product. Such a tag extends the RFID inlay away from the product so that it is not directly touching metal.

Several considerations for this would include:

- If the process of shipping the product might bend or damage a flag tag

- If the merchandising presentation of the product (including anti-theft mechanisms) might interfere with the positioning of the flag tag

However, if the product is not metal (e.g., a wooden bat as depicted in the left image), then a label may be directly attached to the product.

5.2.6 Hollow Cylindrical Example: Tape

Items such as tape may have the interior core tagged, or if shrink wrapped, the face of the wrap tagged.

5.3 Carded Items - Not Hanging

Considerations for carded items include the product composition, avoidance of contact with metal, and protection from abrasion.

5.3.1 Set Orientation Example: Bike Pump

In this example, the tag is placed on the carding away from the metallic cylinder. The likelihood that the product will be standing on its base is high, ensuring that the tag will not be resting against a metal shelf.
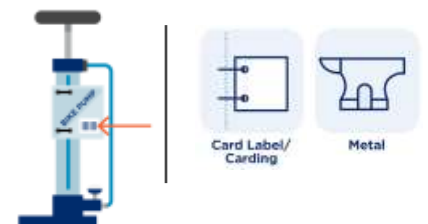
5.3.2 Variable Orientation Example: Baseball Mitt

Placement of the tag on the inside of the carding ensures that the tag will not be resting on metal regardless of how the product is merchandised.
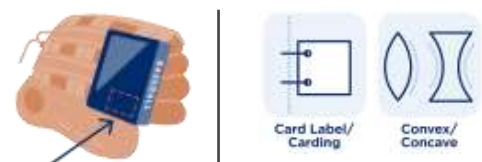
5.3.3 Tag Protection Example: Garden Hose

In this example, we have a garden hose carded. While the tag could be placed on the forward face of the carding, a location that would better protect the tag would be on the back side of the carding (in the middle area offset from the coiled hose). Such placement provides better protection from abrasion/impact.

5.4   Carded Items – Hanging

5.4.1   Non-Metallic Example: Hair Ties

Assuming the UPC barcode is printed on the packaging and not on a label, the recommended placement is to embed the tag in a central portion of product. This protects the tag from impact. Another location is on the rear plane of the product packaging, though some evaluation of back-to-back product placement should be performed to avoid the possibility of two RFID tags directly touching each other or the product laying flat on a metal shelf. Note that the back surface of the carding may have product protruding, which would protect the tag from shelf contact.
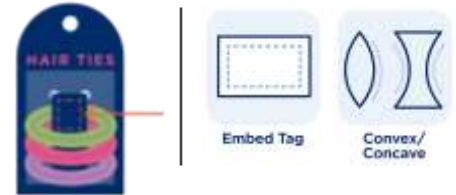
5.4.2   Metallic Examples: Oil Filter Wrench, Hammer, Frying Pan

The recommended action (to offset from the metal) is the top back of the backer card, careful not to staple the tag or put the tag on a staple. Also ensure the tag is not touching or within ¼ inch of metal.

For the hammer, offset at least ½ inch from metal and do not place the tag behind metal in such a manner as for the metal to block the signal from a reader. A second option is to place the tag between the wooden handle and plastic carding. A third option is to use a hang tag.
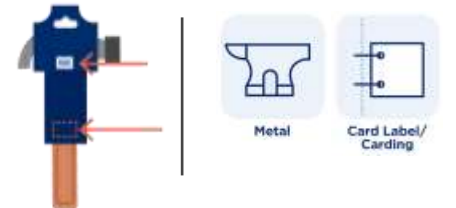
Note that while the frying pan carding allows for the tag to be placed away from metal (e.g., in the center of the carding) consideration must be made for merchandising, such as where multiple frying pans are hanging from a single hangar. In such a case, the metal from the forward frying pan would block the RF signal from reaching tags centered on the carding of items behind it. For this reason, the recommendation is to use a hang tag as shown.

5.5 Blister Pack and Clamshell Items (Hanging)

5.5.1 Trapped Blister with Non-Metallic Product Example: Toothbrushes, Bandage

Such products may have the UPC barcode printed on the lower back face of the carding with various options for RFID inlay placement. Placement may be embedded in forward-facing labeling, or even inside the blister pack area with the product (so long as the product does not have metal content). For non-metallic product inside a blister pack there are several options:

- Embedding the tag in the forward-facing label (per the toothbrushes example)
- Placing the tag inside the blister pack area behind the product (which offers better protection from impact)
- Label the back of the product, though laying flat on a metal shelf will impact readability

5.5.2 Trapped Blister with partial Metallic Product Example: Headlight Bulbs, Lock

The headlights have a small amount of metal, whereas the lock has a great deal more. Adding to the prior example, the tag must offset, meaning it must not touch or be behind the metal product components. Options include:

- Placing the tag inside the blister pack area away from the product
- Label the back of the product at an upper location so not behind metal

5.6 Hang Tags

As with the apparel hang tag examples in section 4, hang tags are commonly used for textiles. A key consideration for hang tag placement is where the tag may lay in a merchandised setting. For this reason, hang tags should not hang low enough to potentially rest directly on metal. Note also the frying pan example at 5.4.2.

5.6.1 Non-Metallic Example: Plush Toy, Stuffed Animal

For the stuffed animal hang tag the recommended action is to locate the tag where it will not potentially lay flat on a shelf, noting how the product is likely to be transported and merchandised. Also note the product content (e.g. foil) to ensure the tag is not potentially touching metallic material.

5.6.2 Variable approach example: Football Helmet (Not Boxed)

In this example, we have a football helmet not in a box. The recommended action (assuming there is an adhesive label on this item with barcode) is to integrate the RFID inlay into the existing label, provided the label is affixed to non-metallic material (such as a poly-carbonate surface). A hang tag, flag tag, or barbell tag could be attached to the face mask so long as the tag cannot touch the metal face mask.

This example illustrates the importance and impact of product materials as it relates to tag placement. While a polycarbonate material can accommodate a label, adding a metallic decal to the helmet or changing the helmet composition in future product revisions would require a product & packaging change management review.

5.6.3   Variable approach example: Folding Chair

The recommended action is to label the non-metallic surface (if the UPC barcode is already attached via a label). If the product is completely made of metal, an option is to use a barbell or flag tag on the lower metal bar (set away from side metal bars). The tag adhesive prevents it from moving and tag design ensures the inlay is offset from metal contact.
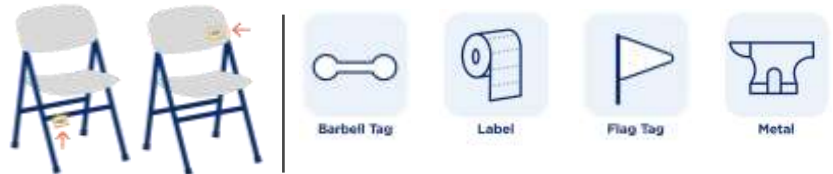
5.6.4   Unassembled and Assembled Examples: Outdoor Grill, Lawn Mower

Items may be in their box (with assembly required) or assembled and on display. In this case the tag needs to be placed in a way that it will read in the box but also when assembled for display. A hang tag on the handle is a best practice, taking note of how the same tag is positioned inside the box of unassembled parts.

5.6.5   Irregular Shaped Bagged Item: Hockey Pucks

The recommended action is a hangtag attached at the top of the item; this minimizes risk of the tag laying on a metal shelf. If the bag material is optimal for label adhesion (such as Tyvek material) an adhesive RFID label may be applied.

5.6.6   Example: Plant or Small Tree

The recommended action is a hang tag, flag/barbell tag, or (if not live plant and therefore no moisture in the base) a stake tag. For live plants, avoid placing the tag at an area that would be watered.

5.6.7 Bagged item example: Sleeping Bag

The recommended action on these is the hangtag, positioned in such a way as to not be able to touch metal shelving.

5.7 Direct-to-product Labeled Items

While the above examples address labeling of boxes and cards, the following offers a set of examples for direct-to-product or product polybag examples.

5.7.1 Always upright example: Car Battery

The car battery will always be merchandised resting on its base. The top plane of the car battery is the preferred location. There is no other location specified.

Note: Please place a minimum of two layers of separators (e.g., hex comb separators, which are commonly used packaging material for such items) between batteries when they are palletized, three layers would be preferable.

5.7.2 Variable positioning example: Car Tires

The tire may be positioned in various orientations, the RFID inlay should be located with existing product information and is best embedded in the existing product label on the tire tread.

5.7.3 Stacked product example: Flower Pot

Place anywhere but the bottom of the item (to avoid contact with metal shelving). Note the potential for product stacking to avoid potential label abrasion.

5.7.4 Small and densely-packed product example: Seed Packet

The recommended action is off center top back (right or left) for the reason that back-to-back items will avoid placing two tags in direct contact.

5.7.5 Small bagged item example: Epsom Salt

For this small bagged item example, the recommended action is an adhesive label located near the top of the bag, which places the tag above the product fill line and in a location not likely to directly touch another tag given the slight convex shape of the bag.

5.7.6 Large bagged item example (stored indoors): Hickory Chunks

Note that large bagged items that are stored outdoors (such as mulch) are likely to be rain-soaked on pallets and not ideal for tagging. For items stored indoors, the recommended action is a tag should be placed on the top where a potential airgap may be or on the side of the bag. Avoid placement were tags from two items may be in direct contact as a result of palletization.

5.7.7 Irregularly shaped item example: Fishing Rod

Apply a hang tag or label to the preferred location, avoiding metal.
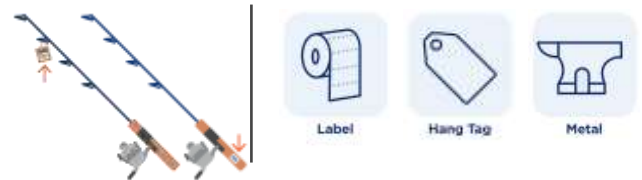
5.7.8 Sporting goods example: Golf Clubs

The recommended action on these is a flag/barbell label on shaft of the club. A hang tag or embedded tag for the bag may be used.

5.7.9 Miscellaneous product example: Cooler

The recommended placement is on a side. A secondary option is to label on the bottom, but this is only permitted if the bottom area is raised a minimum of ¾ inch to ensure the tag is placed in an area that will not touch shelving, and noting that the product itself must not contain RF blocking material. If pursuing this approach testing is recommended.

5.7.10 Media example: Book

The recommended action is an adhesive label on the inside of the front cover or jacket. An alternative could be on the outside. Avoid tagging the back of the book as this will impact performance if the book is on its back on a metal shelf.

5.7.11 Media example: Video Game/DVD Disc

The tag should be placed on the side or towards the top of the product, not in front of or behind the disc inside (as the disk will shield the tag from the reader).

5.7.12 Variable measure product example: Spooled Fabric/Bolt

In this example, the product comes from a tagged spool and is cut at variable lengths. The spool is tagged, but the product (which is cut from the spool and sold separately) is not tagged. The recommended tag location is inside the spool on the core near the end, mindful of tag placement and potential damage if the spool is resting on a peg or pole. This may require lab testing.

5.8 Liquids and Sprays Basic Guidelines and Methodology

Note that water-based liquids impact tag readability as these substances absorb radio energy. However other fluids, such as motor oil, do not impact readability. Tag placement to offset from liquids are assumed, however lab testing may show no impact for non-water-based liquids on tag placement, in such cases the examples below may be modified to non-offset tagging solutions.

5.8.1 Large liquid example: 5-Gallon Fluid Containers

The recommended action is a label on the upper side of lid (as these potentially could be stacked).

5.8.2 Medium liquid example: Household Fluid Containers

The recommended action is a flag tag or circular ring tag around cap or handle.

5.8.3 Spray bottle example: Pump Spray

Given the liquid content, several options for tagging include:

- Attaching a flag tag to the product
- Embedding a tag in the upper portion of the product, above the liquid
- Also note the aerosol spray example is provided in section 4.3.

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