Barcode Label Guide

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OVERVIEW

Most of our customers are introducing or significantly enhancing their IT asset management process, and barcode labels, also called "asset tags", are often part of the discussion. This document is intended to show the various options that are available for barcode labels, including:

- Pros and cons of undertaking a new tagging effort
- Material/cost choices for the labels themselves
- Designing the numbering scheme for the labels
- Label placement

If you elect to proceed with asset tagging, AMI can assist on designing the labels, supplying them, and maintaining the numbering scheme so that uniqueness is maintained across resupply orders. Regardless of who provides the tags, there are things you should know about them.

To Tag or Not to Tag?

Assets must be uniquely identified, quickly, accurately, and consistently. There are two basic schools of thought:

1. Rely on manufacturer serial numbers and avoid implementing your own tags.
2. Implement your own asset tags.
   a. Affix the tags yourself
   b. Have your manufacturers/vendors affix the tags before they ship

Option #1 is a gamble... a gamble that some of our largest customers choose to take. They save the cost and process complexity of tagging, but they also pay the costs:

- The biggest problem is that **serial numbers are not globally unique,** so given an asset environment with diverse manufacturers and assets counts over 100,000, you're pretty much guaranteed to run into duplicate serial numbers. For a smaller installation, this means a headache for the asset manager who has to analyze and scrub the data. For a larger installation, it can really gum up the works as hundreds of assets appear to change from one model to another on a regular basis.

- **Data quality.** Since there is no uniform pattern to serial numbers, you can't verify be certain that your data is 100% accurate. You can't really be sure whether the serial number was scanned or the service tag (or some other barcode) was scanned instead accidentally. This is discussed in more detail later in this document.

- **Tag placement** is another concern. Manufacturers often put their serial numbers in the most inconvenient possible place for an inventory/audit sweep:
    - Behind desktop computers where you're climbing under a desk to find the tag in the dusty dark. Often, these are very small and multiple barcodes are stacked together.
    - Behind rack mounted servers where humans often can't access.
    - On the bottom of laptops where users must be interrupted and/or undocked to access the tag and very inconvenient when laptops are stacked in a storeroom.
    - Behind the battery of a mobile device.

- **Tag identification**. Many manufacturers place multiple barcodes on equipment, e.g. Serial number, part number, service tag number. Worse, they're often right next to each other, inviting a data collector to scan the incorrect tag.

Option #2 avoids these pitfalls, but at the cost of process complexity:

- You may want to undertake an up-front tagging effort to tag all of your existing, deployed assets.
- Moving forward, there will be an additional step, usually at staging time, where assets must be tagged. Moving this burden to the equipment vendor is a common approach to reduce the impact to your teams.

If there is energy and budget to undertake the tagging effort, we recommend that approach.
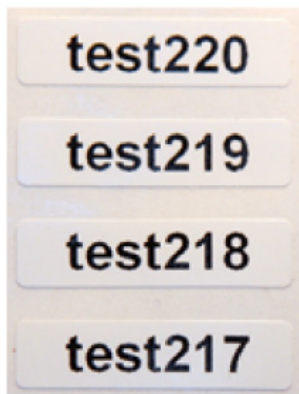
LABEL FEATURES

LABEL EXAMPLES:

The self-printing option.

The main disadvantage with self-printed labels is durability. Without a protective coating, the ink inevitably fades or chips, and the labels themselves peel off. One of our customers, a Las Vegas casino, mentioned that waitresses habitually and consistently picked at labels on their equipment, causing rapid failure.

You're also on your own when it comes to enforcing the uniqueness and numbering scheme of the barcode values.

Bottom line:
Not recommended. They're unsuitable for anything other than temporary use.

"Destructible" polyester labels

This a step above DIY in that they're polyester, come in a roll for easier dispensing, and have a security feature: Once affixed, these labels will shred if you attempt to remove them. In addition, your barcode vendor can manage the numbering system and guarantee uniqueness.

The significant disadvantage of these labels is they cannot have a laminate coating as this makes them less destructible. Lacking a laminate coating means that the ink can be scratched or worn off over time, and thus we don't recommend them for IT asset management.

Bottom line:
Not recommended.

Standard two-color polyester label with a protective laminate coating.

This is a durable, cost-effective label that is the most popular choice for IT asset management. These can be adapted to outdoor use by choosing a UV-resistant laminate and strong adhesive.

In this example, the base material is silver in color, simulating the more expensive aluminum labels, but a white background is more popular.

Bottom line:
Recommended

Standard single-color polyester label on with a protective laminate coating and second label.

This example has a label with a barcode, which is recommended, as well as an example of a second label sticker being put on the roll so that you have a history of what tags have been issued, or for some other business process.

Bottom line:
Recommended

Two-color polyester server labels.

Made of the same materials as the standard labels above, their small size makes them suitable for use on the front of 1U servers where there is a limited amount of available surface area. Note the use of color to distinguish these tags from other tags that might be affixed to an asset, either from the manufacturer or other tagging efforts.

AMI designed the second set for United Airlines. The first one is in use by Customs and Border Protection.

The United tag also has a UV-resistant polyester laminate which makes them suitable for outdoor use.

Bottom line:
Recommended for servers

Two-color polyester tamper-proof labels.

These are the type of tags in use at Microsoft. Note the use of color to easily distinguish company-owned asset from other assets, and the use of a prefix (a distinct pattern) in the numbering scheme.

These labels have a tamperproof security feature where, if removed from a hard surface (like a computer), the word "void" will appear on the label and leave the word "void" in adhesive residue on the equipment surface.

Bottom line:
Recommended

Durable polyester

This label is made of a different polyester that is more durable than standard polyester. It has a polycarbonate (lexan) coating which makes them stronger and stiffer. It uses a durable adhesive that can withstand the harsh treatment (e.g. heat, water, rough handling) of fire department use.

Bottom line:
Recommended for outdoor or rough handling scenarios.

Aluminum

Aluminum is the top of the line for durability, but they're the most expensive and overkill for indoor office scenarios.

Bottom line:
Recommended for outdoor or rough handling scenarios.

LABEL FEATURES

The following features affect the performance of your labels and their cost. Typically, AMI works with you to understand your requirements and make a recommendation.

Material
- Die-cut paper (store-bought DIY asset tags). Inherently not durable; ink not protected from scratching or fading.
- Polypropylene: Cheapest non-DIY option, primary drawback is it's low temperature rating.
- Polyester: Standard material for indoor environments
- Durable polyester: Suited for outdoor environments
- Aluminium: The most durable and expensive material

Adhesive

You need to know what you need to stick to in order to select the right adhesive. For example, asset tags made for the fire department use an "outdoor adhesive" that is designed to stick well to metal, plastic, and even semi-porous material and can withstand heat, water, and rough handling very well.

Laminate

The ink on the label must be protected in some way, or else it will fade, scratch, or smear.   Polypropylene (gloss or matte - matte is always more expensive)
- Polyester (gloss or matte)
- UV Polyester. Affords additional durability against fading over time.
- Polycarbonate (lexan plastic). This puts a plastic-like matte shell on the label and makes it extremely rugged.

Security Features
- "Destructible" polyester labels will rip if someone tries to remove them. Unfortunately, in order to be destructible, no laminate is applied to them, so they're not durable and poorly suited to asset management.
- VOID labels: If you attempt to remove a label with this feature, the label will show the word "VOID" on it and leave the word "VOID" in adhesive residue on the surface to which it was attached.

Color

Using color is recommended because it lets your data collectors, frequently temporary workers with limited training, rapidly distinguish your asset tags from other labels that may be on the asset.
Using a additional colors (in addition to black) is approximately $100 per color.

Quantity

Order quantity affects cost. There is a $250 setup fee per production run, so small orders (usually reorders) are sometimes impacted. This $250 is spread across all of the labels, resulting in a higher per- label cost at lower quantities.

The following table is an example price list for a two-color standard polyester label with UV-resistant laminate and standard adhesive. These costs included AMI's management of the numbering scheme, in this case using a MOD137 check digit.

Example price schedule intended to demonstrate price breaks at different volumes.

Quanity	Price per Label	Total
1,000	$0.77623	$776.23
2,500	$0.34632	$865.80
5,000	$0.20436	$1,021.80
10,000	$0.20436	$1,271.40
20,000	$0.08021	$1,604.20

Recommendation

For typical office scenarios, we recommend a standard two-color durable polyester label with a protective laminate coating and a high-tack adhesive. The "Property of Clackamas Community College" label pictured above is an example, although white is a more standard color.

DISPENSING

- Labels generally come in rolls vs sheets, and you can specify the number of labels per roll in chunks of 500. We recommend rolls of 2000 labels or less. Above 2000, you run the risk of the roll being wound so tightly that the adhesive is squeezed out from under the label which would result in dispensing problems. The optimal number of labels per roll is usually a function of the number of tagging stations.
  - Dispensing options are either:
  - Just the roll itself.
  - A dispenser that is conceptually a big scotch tape dispenser (Max 5000 labels per roll)
  - An applicator gun (not really suited to ITAM)
- 3" is the standard diameter of the roll core, so most dispensers support this diameter. If you're using a special dispenser or applicator gun, however, you should verify the supported core sizes.
- There's no real science to picking a dispenser. Simply googling "label dispenser" and picking one that looks good and will support your label size is fine.

BARCODE NUMBERING OPTIONS

NUMBERING CONCEPTS

Uniqueness

Above all else, an asset's identifier should be globally unique. Old numbers should not be reused. Whatever numbering scheme you choose must ensure global uniqueness over time.

Meaninglessness is good

Customers are often interested in embedding business meaning into barcode values. This seems like a good idea, but it's actually a bad idea.

For example, "V00391399-01" can express in a human-readable way that:

- The V prefix designates that this is an asset leased from our managed services provider, not a company-owned asset.
- The first three numbers (003) designate the deployment type, i.e. that it's used by field operations and is subject to higher security requirements.
- The last two numbers (01) designate the budget/department code of the asset.

The problem with "burning business information into the tag" this is that the information can change. The asset can be purchased from the leasing company or transferred to a different department, or the numbering scheme can be abandoned and replaced by another scheme that works differently. These situations can invalidate the business meaning or worse, require the identifier to change. The idea of an identifier changing over time is a horrifying concept for data managers.

Thus we recommend that the identifier be as meaningless as possible.

Simple sequence vs distinct patterns

A simple sequence that monotonously increments by one is perhaps the most common numbering system that people use. Strictly speaking, there's nothing wrong with this kind of scheme as long as the numbers are unique, but it lacks many advantages below.

Establishing a machine-recognizable pattern for barcodes has a number of benefits. A pattern can be a simple structure, like "A0000485" which is described as "A followed by 7 digits". The main requirement for the pattern would be that it's sufficiently distinct, i.e. a hardware manufacturer would be highly unlikely to coincidentally generate a serial number value that also used to the same pattern.

Example of a numbering scheme that produces values that are not distinct enough: A simple 10-digit number with no pattern, e.g. 1239483837. If you used this kind of scheme for your asset tags, there

would be no way for a machine to confidently know that it's an asset tag; it's highly likely that you'll run into manufacturer serial numbers, PO numbers on packing slips, old labels, etc that use this simple scheme.

Example of a numbering scheme that produces values are distinct enough: "A followed by 7 digits", e.g. "A0000485". It is very unlikely that some other process would've generated this value, therefore the pattern is sufficiently distinct.

Once you have a distinct pattern to work with, you have the following advantages:

- Your data entry process (i.e. AssetTrack) is faster and more accurate. Consider that barcodes are often located in dark, inconvenient places, often placed tightly with other barcodes (serial number, service tag). AssetTrack can be taught to detect your pattern(s) when they're scanned, and the value will be plopped into the correct field. Without a pattern, it's incumbent on the data entry user to tell AssetTrack what the next scanned value will be, since AssetTrack cannot distinguish between asset tags and serial numbers. This usually means that the user must scan barcodes in a set sequence (e.g. first serial number, then asset tag). With a pattern, the user can scan quickly in any order without looking at the screen and rely on AssetTrack to do the right thing with the scanned data.

- Your data scrubbing/integrity/audit process can immediately find non-conforming data that has accidentally leaked into the asset tag field.

Check digits

Check digits is a loose term that we use to describe numbers that are generated by a predefined mathematical formula so that any given number can be absolutely determined to be valid or invalid. Your credit card number is an example – if you are one number off, the result will likely be an invalid, unusable number that must be corrected in order to proceed. Put simply, when entering data, the scanner is never wrong, but humans often are; check digits help prevent human "fat fingering" errors.

Unlike distinct patterns, however, a barcode that uses check digits doesn't necessarily yield a distinct pattern. – it's just a string of digits that could be an asset tag, serial number, or whatever.

MOD137 is one particular check digit formula that we recommend - see the appendix for the algorithm.

Symbology

There are about fifteen common barcode symbologies, and each one specifies the width of the bars, character set, and other details. Of these, we recommend Code 128. It is widely supported and has excellent density and scanner readability.

Recommendation

The best of all worlds is something that implements both distinct patterns and a check digit, and is encoded to the label using Code 128 symbology. For example, AC10100015, which can be described as "AC followed by an 8-digit MOD137-compliant number".

LABEL PLACEMENT

Labels should be placed on to hardware so that they can be read and scanned without interrupting users that are using it or needing to move them. Consider common situations that they might be in, like deployed in an employee's office, in a server rack, or stacked up with many other assets in a storeroom.

- **Front of desktop workstations.** The top of the workstation can sometimes be difficult to reach if many desktops are stacked in a storeroom.

- **Top or front of laptops.** Again, consider what will be exposed when many are stacked. Also consider that many users use docking stations, and having to undock a laptop to scan a label placed on the bottom surface can be inconvenient.

- **Front of servers.** When racked, getting behind servers can be difficult.

For more detail on process (e.g. when in the process to label equipment, please refer to the AMI Asset Tracking Guide).

APPENDIX A: The MOD137 Check Digit Algorithm

Given the number 10100015, the MOD137 check digit verification algorithm uses at the last digit (5) as the check digit, then starts with the second-to-last digit iterates through each of the digits, multiplying the "current" digit by 1, 3, or 7 in turn:

1x 1= 1
0x 3= 0
0x 7= 0
0x 1= 0
1x 3= 3
0x 7= 0
1x 1= 1

Then sum all of the products together (1+0+0+0+3+0+1 = 5). This number must equal the check digit of the original number. In our case it does, so 10100015 passes MOD137 validation.

In this case, the sum is a single-digit number (5) but if the sum is multiple digits in length, you would take *only the last digit*.