BarCode Technology for Herbarium and Museum Biological Collections

Technical Report

Increasingly, herbaria and museums are using BarCode technology as an automatic identification system for the management of their collections. BarCodes allow data to be collected accurately and rapidly. This technology has several benefits for the curation of collections. For example, it accurately and rapidly monitors the movement of collections through the exchange and loans programs.

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BarCode Formats

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There are several BarCode formats, with the ***UPC*** (Universal Product Code) format the most popular, being used extensively throughout supermarkets as a Product code. It is a 12 digit number, with the last digit a 'checksum' digit. This format has been available since the early 1970s. It is known worldwide and is universally recognized.

Other PRODUCT codes include

- ***EAN*** (European Article Number);
- ***APN*** (Australian Product Number) formats.

Other NUMERIC formats include:

- ***CODE 25*** (Interleaved 2 of 5) BarCode format that has the flexibility of having from 2 to 30 digits;
- ***CODE 128*** BarCode format that can also code alphanumeric information;
- ***Codabar*** BarCode format:

a **numeric** code with 14 special characters (**a b c d e n t - / $ = : .**).

The latter format is widely used in library applications.

Since **Product codes** are **numeric only**, with the exception of ***CODE 128***, they are less useful for herbaria and museums. Therefore, for Automatic Identification Applications, BarCode ***CODE 39*** (or '3-of-9' Code) format has tended to become the recognised standard for Government, Manufacturing, BarCode Industry, Education, and Business applications.

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Recommended BarCode Format for Herbaria and Museums

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BarCode CODE 39

CODE 39 Format is recommended because of its:

- ease of use;
- ability to code numbers and letters (hence, alphanumeric capabilities);
- variable (flexible) length capability (hence, BarCodes with any number of characters can be generated);
- universal reading capability (that is, BarCode equipment from any manufacturer can read this format).

The following characters (and the space) are supported in ***CODE 39*** Format:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 - . * $ / + %

CODE 39 Specifications

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Each data character encoded in a Code 39 symbol is made up of 5 bars and 4 spaces for a total of 9 elements. Each bar or space is either "wide" or "narrow", with 3 of the 9 elements always "wide" (hence - *Code 3 of 9*).

The symbol includes:

- a beginning quite zone (10 X-Dimension)
- the start character "*"
- the encoded data
- the stop character "*"

- and a trailing quite zone

The height of the bars must be at least 0.15 times the symbol's length. The overall length of the symbol is:

L = (C + 2)(3N + 6)x + (C + 1)I Where:

- L = length of symbol (not counting quite zones)
- C = number of data characters
- X = X-dimension
- N = wide-to-narrow multiple
- I = intercharacter gap width

Code 39 does not normally include a check character.

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Examples of CODE 39 BarCode Format

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In the following examples from several herbaria, the barcode identifier is the primary (unique) 'key' to each specimen, as defined by a collection.

CANB	MA	MEL	NSW	NY	P	PERTH

Select Another Example

- ***The Australian National Herbarium*** (CANB)

CSIRO, GPO Box 1600, Canberra, ACT 2601, Australia.

The barcode consists of (left to right):

CANB or CBG (Index Herbariorium code)
space
unique numeric (number)

Notes: Those collections originally from the CSIRO collections have the herbarium code of CANB, whereas, those originally from the Australian National Botanic Gardens collections (ANBG) are CBG numbers. All new accessions will be CANB numbers.

The CANB numbers consist of 8 digits, left padded with zeros, whereas, the CBG numbers consist of 7 digits, with the first two (left) digits referring to the year of accession, the remaining digits refer to the

actual accession (collection), with the centre 'padded' with zeros (if necessary).

Examples: CANB 24577491; CANB 00033861; CBG 0008572; CBG 0913559

Select Another Example

- ***Real Jardin Botánico*** (MA)

Plaza de Murillo 2, 28014 Madrid, Spain.

The barcode consists of (from left to right):

MA (Index Herbariorum code)
followed by:
hyphen
catalogue code
space
and finally
accession numeric (number)

Example: MA-FUNGI 36000 is the specimen no. 36000 of a fungus collection held in the MA herbarium.

Select Another Example

- ***The National Herbarium of Victoria*** (MEL)

Royal Botanic Gardens Melbourne, Birdswood Avenue, South Yarra VIC 3141, Australia.

The barcode consists of (left to right):

MEL (Index Herbariorum Code)
space
Unique numeric (number)

Examples: MEL 43377; MEL 678072

Select Another Example

- ***National Herbarium of New South Wales*** (NSW)

Royal Botanic Gardens Sydney, Mrs Macquaries Road, Sydney NSW 2000, Australia.

The barcode consists of (from left to right):

NSW (Index Herbariorum code)
followed by
an unique accession numeric (number).

Examples: NSW485; NSW457581; NSW1244336

Notes: Each component of a collection is given a separate unique number.

For example: *Conn 2551* (as held at NSW), consists of two herbarium sheets and one ethanol-preserved specimen. These components are numbered, NSW197391, NSW298270, and NSW-S3668 (respectively).

Select Another Example

- ***New York Botanical Garden*** (NY)

New York Botanical Garden, Bronx Park, Bronx, New York 10458-5126, United States of America.

The barcode consists of (from left to right):

NY (Index Herbariorum code)
followed by
an unique accession numeric (number).

Examples: [To be provided]

Notes: Each component of a collection is given a separate unique number.

Further Information on Barcoding at The New York Botanical Garden

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Select Another Example

- ***Museum National d'Histoire Naturelle Laboratoire de Phanerogamie*** (P)

16 rue Buffon, 75005 Paris, France.

The barcode consists of (from left to right):

P (Index Herbariorum code)
followed by
an unique accession numeric (number).

Examples: P00001256; P00078871; P00185962

Notes: The P numbers consist of 8 digits, left padded with zeros. The accession number is assigned to

each collection when the information of each is electronically recorded in the database.

Each component of a collection is given a separate unique number.

For example: *Labat 2896* (as held at P), consists of two herbarium sheets and one carpological collection. These components are numbered, P00001256, P00001257, and P00001258 (respectively).

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Select Another Example

- ***The Western Australian Herbarium*** (PERTH)

Department of Conservation & Land Management, Locked Bag 104, Bentley Delivery Centre, WA 6983, Australia.

The barcode consists of (left to right):

PERTH (Index Herbariorum Code)
space
Unique numeric (number)
The PERTH numbers consist of 8 digits, left padded with zeros.

Example: PERTH 00459855

Two Examples of Barcode Suppliers

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Example 1:

Supplier:

Watson Label Products
3884 Forest Park Blvd
St Louis, Mo 63108 USA
Phone: (314) 652-6715

Label specifications:

Size 42 x 18 mm
Printing Process Photocomposition
Lamination 1 mil Clear Mylar
Facestock 4 mil Bright White

Polyester Adhesive 5 mil High Strength Acrylic
Symbology Code 39
Barcode density 9.4cpi

They are convenient and easy to peel off the roll and attach to specimens, with good conservation properities, as tested by artificial aging.

If you wish to ask specific questions about the use of this system, then Dr R. Huxley at the British Museum (National History), United Kingdom (r.huxley@nhm.ac.uk) may be able to provide further infomation.

Mail address: The Natural History Museum (BM), Cromwell Road, London SW7 5BD, UK

Select Another Example To Contents

Example 2:

Supplier:

Leigh-Mardon Pty Ltd
PO Box 157
Morrabbin Vic 3189
Australia
Phone: (03) 9556 8111
Fax: (03) 9553 1740

Label Specifications:

Size: 43 x 16 mm
Printing Process: Photocomposition
Facestock: Photographic Paper
Adhesive: High Strength Acrylic
Symbology: Code 39
Barcode density: 9.4cpi

Note: Lamination probably not required.

If you wish to ask specific questions about the use of this system, then Gary Chapple at the *National Herbarium of New South Wales, Sydney* who may be able to provide further infomation.

Select Another Example To Contents

Example 3:

Label specifications:

Size 1 5/8" x 5/8"
Printing Process Photocomposition
Lamination 1 mil Clear Mylar
Polyester Adhesive Archival quality Acrylic
Symbology Code 39

If you wish to ask specific questions about the use of this system, then *The New York Botanical Garden* (bthiers@nybg.org) may be able to provide further infomation.

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Useful Internet Sites on BarCodes

There are many useful Internet sites about barcoding. The BarCodes - How to Get Started website is a good place to start searching for information. Other useful Barcode Websites are provided at this site.

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