



**Reading barcodes with the Logitech® io2™  
with Bluetooth® digital pen**

Rev. 0.4

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## **1 Disclaimer**

### **1.1 Intellectual property rights**

Applications which include reading, storing and transmitting barcode data (Barcode Solutions) may be subject to the intellectual property rights of third parties. The developer or user of Barcode Solutions is responsible for compliance with any applicable third party intellectual property rights. Neither Logitech nor its licensor Anoto assume any liability with respect to such third party intellectual property rights.

### **1.2 Functionality**

The Logitech io2 digital pens enabling the Anoto Functionality were not designed for barcode reading. This feature has been implemented as an extension to the core functions of the device in order to meet the requirements of certain forms processing use cases. Due to the variety of symbologies, geometries, substrate medium, usage conditions and end-user expectations, it is not possible to predict the results of a particular implementation.

The System Integrator procuring pens is entirely responsible for ensuring that the delivered functionality meets customer expectations and the requirements of each particular deployment conditions.

This document provides indications on the functionality delivered and known constraints, but is not to be understood as an exhaustive description of the specifications required to achieve satisfactory performance.

## 2 Introduction

### 2.1 Purpose

This document provides the necessary information about how to use the barcode feature implemented in the io2 Digital Pen with Bluetooth®, FW version U44.24

For sales enquiries, please contact:

- United States, Canada, Latin America : [infoAMR@logitechio.com](mailto:infoAMR@logitechio.com)
- EMEA : [infoEU@logitechio.com](mailto:infoEU@logitechio.com)
- Other countries: [iosupport@logitech.com](mailto:iosupport@logitech.com)

For technical support: [iosupport@logitech.com](mailto:iosupport@logitech.com)

### 2.2 Scope

This document focuses on the barcode function at different levels :

- Usage model
- System components
- Technical guide

## 3 Usage model

### 3.1 Entering barcode mode

A Barcode pidget is printed on a page. When this pidget is ticked, the pen enters barcode scanning mode and the pen gives feedback “Barcode ON”, indicating that the pen is waiting for the next stroke to be a barcode. The barcode is scanned from left to right or right to left. During scanning of the barcode, the pen gives MMI<sup>1</sup> feedback “Barcode reading”<sup>2</sup>.

If a barcode has been scanned successfully, the pen gives Pen Feedback “Barcode OK”. After this the pen goes back to normal mode which means that it now can be used on patterned pages again. To scan another barcode the Barcode pidget must be ticked again.

If a barcode has not been scanned successfully, the pen gives Pen Feedback “Barcode failed”. After that, the pen goes back to normal mode which means that it now can be used on patterned pages again.

1 kB of the total stroke memory must be available before starting a scan. If there is less than 1 kB memory left when starting to scan a barcode the pen will give Pen feedback “Barcode failed”.

### 3.2 Leaving barcode mode

If in barcode mode, the following events will make the pen leaving the barcode mode:

- The cap is put on
- The pen is docked in the USB cradle
- After successful/unsuccessful barcode scanning
- 2 seconds after pen down without a successful barcode scan
- After 1 second after pen down without starting a barcode scan

### 3.3 Barcode scanning guidelines

The pen will fail to scan the barcode if any of the following conditions are not met (assuming that the barcode is within spec). This means that the pen is more sensitive to pen orientation during barcode scanning than during normal pattern reading. For information about definitions of tilt, skew and rotation see Appendix 1.

- **Scanning speed.** The maximum speed that the pen can detect a barcode is about 25 cm/s. A complete barcode scan must be completed within 2 seconds (see §2.2). A constant velocity is not required during the scan.

- **Tilt, skew and rotation.** The pen must be held with little or no rotation with respect to the lines of the barcode. The pen should not be skewed too more than  $\pm 30$  degrees from the nominal position (see Figure 1). Pen tilt must be between 0 and +45 degrees.

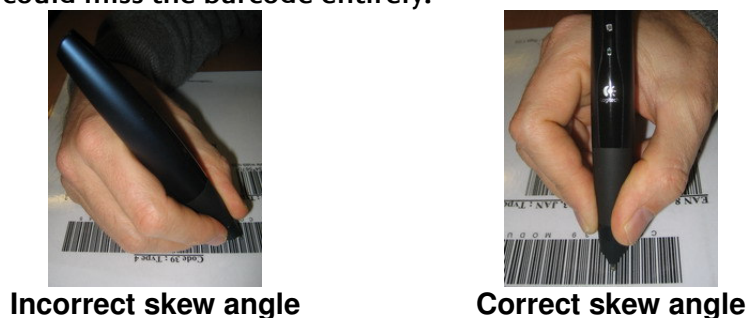
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<sup>1</sup> Man Machine Interface

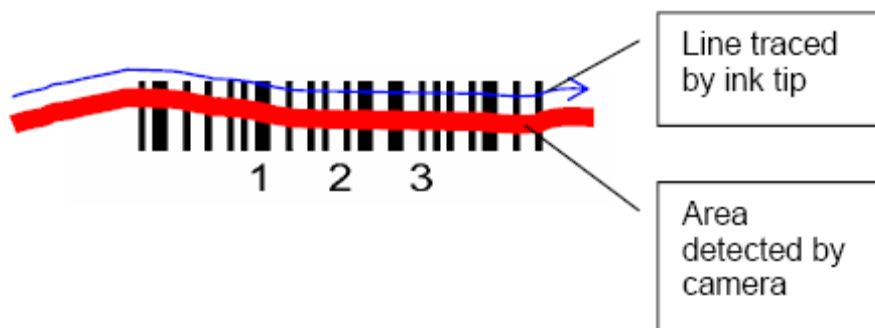
<sup>2</sup> For information on pen feedback in barcode mode, refer to Appendix 2.

Outside of these angles, the risk of barcode reading failure will increase. For a definition of skew and tilt angles, please refer to Appendix 1.

- **Capturing complete barcode.** The pen camera is positioned under the tip and must see the barcode at all times during the scanning. The pen sees the paper approximately 4 mm below the tip if the pen is held as shown in the left photograph in Figure 6 (tilt 30-40 degrees, skew approximately 0 degrees). See Figure 2 for an illustration. This means that if the tip of the pen is in the lower border of a barcode, the camera could miss the barcode entirely.



**Figure 1.** How to hold the pen when scanning a barcode



**Figure 2.** Area detected by camera during a scan

### 3.4 Usage limitations

- The pen must be held in a specific angle when scanning a barcode. See Figure 1.
- The barcode must be scanned with normal hand movement, avoiding extremely high or low speeds.
- The pen cannot detect that it is reading a barcode when decoding coordinates.
- The pen cannot decode Anoto coordinates during a barcode stroke.

## 4 System Components

This section describes the system components involved with barcodes.

### 4.1 Paper

A paper product supporting barcodes must have a Barcode pidget printed on a page. This means that the paper must be based on a paper template containing a Barcode pidget. The barcode to be read can be printed on either the main paper product or on another paper, this is irrelevant to the pen.

### 4.2 Pen

When ticking a barcode pidget, the pen enters barcode scanning mode as described in §3. After a successful scan, the pen stores the barcode in the regular stroke memory to the page address that the pidget is printed on. The barcode is encoded as a special stroke in an area never accessible to the user, meaning it will never interfere with any 'real' strokes.

This also allows the barcode data to be transported to SDKs and other APIs using existing infrastructure, e.g. via a pgc push.

### 4.3 PC download software

For applications requiring USB<sup>3</sup> connectivity on PCs, the Logitech io2 Enterprise or Consumer Software version 4.0 or higher must be used in conjunction with the applicable SDK.

**The Logitech io2 Consumer and Enterprise Softwares DO NOT expose barcode data.** The only supported method to extract barcode data is by using a suitable SDK from Anoto. See §5.4 for more information.

### 4.4 SDK

The SDKs are used to retrieve the barcode data from pages. §5.4 indicates which SDK versions support this functionality.

### 4.5 Application

An application with barcode support must be developed using a SDK as described in the previous section.

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<sup>3</sup> The new Logitech io2 with Bluetooth pen firmware featuring barcode reading also supports USB connectivity with PCs.

## 5 Technical Guide

### 5.1 Symbolologies, supported barcode types

The following barcode types or symbolologies are supported by the pen:

#### 5.1.1 Code 128



Modern dense 4-width code, used extensively worldwide. Codes 100 characters with multiple character sets and special function codes. Variable length, mandatory check character.

#### 5.1.2 Codabar



Line traced by ink tip Area detected by camera

Used in libraries and blood banks. Variable length, 16 characters, 2 width with optional check character.

#### 5.1.3 Code39



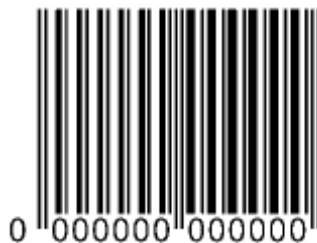
Used in U.S. Government and military applications, 43 alphanumeric characters. Variable length, 2-width with optional check character.

#### 5.1.4 Interleaved 2/5, with or without check digit



Used in logistics and warehouses. It is a variable-length, 2-width scheme with optional check digit. Encodes 2 decimal digits in each symbol.

#### 5.1.5 EAN13 (JAN13, UPC-A), EAN8 (JAN8)



This is the product code found on most retail products. It is a superset of the American UPC. In Japan it is known as JAN. It is a fixed-width (8 or 13 numbers), 4-width bar code scheme with special guide bars and check digits.

These types span a wide range of applications and industries. A good site for reference is <http://www.barcodeisland.com/symbolgy.phtml> (sic)

## 5.2 Recommended Barcode sizes

The main parameter is the **barcode module**. The module controls the nominal width of a narrow bar or space. In multiple-width symbologies, like EAN, UPC and Code 128, the bars and spaces are 1,2,3 or 4 times the module width. In two-width symbologies, like Codabar, Code39 and Interleaved 2/5, the bars and spaces are 1 or  $x$  times the module width, where  $x$  typically can vary between 2 and 3.

Having a very small module width will make the barcode hard to resolve. About 0.15 mm is the minimum bar/space width. Too large module will make the barcode big and bulky. The pen will also have problems calculating the pen tip speed when the bars and spaces are very wide, which will lead to failure.

To avoid failure the barcode height should be at least 15 mm. This equals the pattern marginal of 7 mm when the pen tip is held in the middle of the barcode during a scan. We also do recognize that in some applications, the barcode type and module will be dictated by compatibility with legacy readers.

The longest acceptable barcode is 200 mm.

The widest bar or space acceptable is about 1.6 mm. This gives the following approximate minimum and maximum module sizes for different symbologies, printed with default properties. This is not to say that bigger modules will not work, but the barcode capturing performance will be degraded.

Symbology	Minimum module	Maximum module
Code 128	0.20 mm	0.40 mm
Codabar	0.20 mm	0.64 mm
Code 39	0.20 mm	0.72 mm
Interleaved 2-of-5	0.20 mm	0.72 mm
EAN/UPC/JAN	0.20 mm	0.40 mm



## 5.3 Paper, printing and ink

The pen needs good contrast between bar and spaces to ensure acceptable accuracy. This is true for all barcode scanners, but the biggest difference here is that a pen will look in the near infrared part of the spectrum (~850 nm), whereas a normal barcode scanner will use red light (~600 nm). This means that some inks and substrates used

for traditional barcodes will not work. It is not possible to make an absolute prediction whether a legacy barcode will be read by the pen or not just by looking at it, but the following may be used as a rule of thumb:

- Black ink on white paper will work
- Blue ink is unlikely to work
- White ink on metal (like on some soda cans) will not work.

Paper should preferably be white to ensure good contrast. No Anoto pattern should be printed behind or on top of the barcode. The background to the barcode should be blank.

A range of inkjet and laser printers (color and monochrome) were tested to print barcodes and found to be suitable.

Printing **gain** is the phenomenon where ink deposited on a substrate will “bleed” onto the surrounding white area. This effect will be more or less prominent depending on printing technology, paper type and ink type. The most obvious effect of high gain is that narrow spaces will be hard to resolve. Low gain will make narrow bars hard to resolve. See examples below.



Sometimes barcode printing software and/or hardware have provisions for compensating for this effect (device compensation).

## 5.4 Tools compatibility and availability

The table below shows the compatibility of different tools and applications to support the barcode mode.

Tool / Application	Compatible Revision	Availability
Anoto Network SDK – COM	2.3 and higher	Contact Anoto Support
Anoto Network SDK - Java	2.3 and higher	Contact Anoto Support
Anoto Components SDK	3.2 and higher	Feb 1 <sup>st</sup> 2006
Anoto FDT	2.1 and higher	Feb 1 <sup>st</sup> 2006
Logitech io2 Consumer SW	4.0 and higher <sup>4,5</sup>	Feb 1 <sup>st</sup> 2006
Logitech io2 Enterprise SW	4.0 and higher <sup>4,5</sup>	April 1 <sup>st</sup> 2006
Logitech io2 Firmware updater	4.2 and higher	Feb 1 <sup>st</sup> 2006

For more details on Anoto tools, please contact Anoto.

<sup>4</sup> **The Logitech io2 Consumer and Enterprise Softwares DO NOT expose barcode data as such.** The only supported method to extract barcode data is by using a suitable SDK from Anoto.

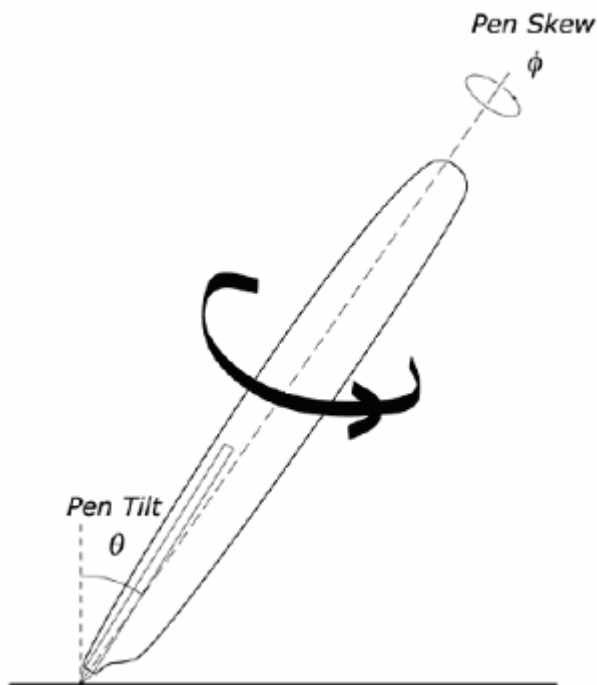
<sup>5</sup> Will be available on a restricted basis until April 2006 to system integrators signing up to the Barcode Early Adopter program, please contact your Logitech sales representative for more information.

## 6 Appendix 1: Pen orientation relative to the paper

The following parameters, as illustrated in Figure 3, uniquely define the orientation of the pen relative to the paper:

- Pen tilt,  $\theta$ , is the angle between the normal of the paper and the refill axis.
- Pen skew,  $\phi$ , is pen rotation around the refill axis.  $\phi$  is zero where the pen symmetry plane is perpendicular to the paper for  $\theta > 0$

A negative tilt – with skew  $\phi$  corresponds to a positive tilt with skew  $\phi-180^\circ$ .



**Figure 3.** Parameters used to define the orientation of the pen relative to the paper

## 7 Appendix 2: Pen Feedbacks for Barcode Mode

Pen state	Memory Indicator			Vibrating System	Description
	Color	Intensity	Blink		
Barcode ON	Yellow	High	Pulse	N/A	Indicates that the pen is in barcode mode
Barcode reading	Yellow	High	Solid	N/A	Indicates that the pen is reading a barcode Timeout 2 seconds after scanning start Timeout 1 second if scanning has not start
Barcode OK	Green	High	Solid for 2 seconds	Triple Click	Shows when barcode reading succeeded, then goes in Standby mode.
Barcode failed	Red	High	Two pulses then solid for 2 seconds	1 second On	Barcode reading failed. After the two pulses, the red light is solid to finish the timeout, and then goes to Standby mode.

For more details on the pen user interface, please refer to the user manual included in the Logitech io2 with Bluetooth Business Kit, available for download at [www.logitechio.com/catalog](http://www.logitechio.com/catalog).

## 8 Appendix 3: Frequently asked questions

- **Can the Logitech io2 USB pen read barcodes as well ?** No. Barcode reading is only available with the Bluetooth pen. There are no plans to implement this feature in the Logitech io2 USB pen.
- **Can barcode data be sent via USB and Bluetooth ?** Yes. Barcode data can either be transferred to a Windows PC via USB or to a Bluetooth device as PGC files.
- **Can barcode reading be used with Network Based Open Services ?** No, this communication protocol is not supported by the FW 44.24.
- **Can several barcodes be read in sequence ?** Yes, a page can include several barcodes, read in sequence. The barcode pidget must be tapped before each individual barcode is read.
- **Is barcode data page-specific ?** Yes. Barcode data is stored in the pen as virtual strokes belonging to the page address of the barcode pidget.
- **How do I get access to the barcode pidget ?** The barcode pidget will be provided as part of the Anoto FDT v2.1.
- **Can I downgrade a Logitech io2 Bluetooth digital pen from FW 44.24 to 44.05 ?** Yes, by using the previous version (4.1.711.1) of the Digital Pen Firmware Updater, currently available on [www.logitechio.com/catalog](http://www.logitechio.com/catalog) as part of the “Logitech io2 with Bluetooth Business Kit”
- **Can I use the Bluetooth Digital Pen Configuration Utility with FW 44.24 ?** No, this configuration utility software is only suitable for use with FW 44.05. To configure a pen with FW 44.24 or above, Logitech io2 Software version 4.0.843.1 or above must be used.
- **Is the Logitech io2 Software 4.0 compatible with both Logitech pen models ?** Yes, this software version is compatible with both the Logitech io2 and Logitech io2 Bluetooth digital pens.
- **Why is there a new firmware for the Logitech io2 (USB) digital pen ?** FW 38.16 updates the list of supported templates and corrects miscellaneous bugs, including:
  - clearing of stylo settings strokes from the memory after download,
  - a bug correction in the handling of template updates,
  - other minor corrections in the Man Machine Interface.

## 9 Appendix 4: feature and compatibility summary table

	Logitech io2 with Bluetooth	Logitech io2 (USB)
PGC push via Bluetooth	FW 44.05 and above	N/A
NBOS via Bluetooth	FW 44.05 only	N/A
NBOS via USB	N/A	Yes
USB download	FW 44.24 and above	Yes
Coordinates streaming	FW 44.24 and above	N/A
Barcode reading	FW 44.24 and above	N/A
Latest Consumer PC SW available	4.0.843.1	4.0.843.1
Latest Enterprise PC SW available	N/A (April 1 <sup>st</sup> 2006)	3.3.631
Latest Firmware available	44.24	38.16