TEC-IT Barcode Software

Barcode Overview

Version 7.0

Reference

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3 Introduction

3.1 Scope of this Document

This document describes barcode symbologies supported by TEC-IT software in a non-product-specific way. Please use this document as add-on or in-depth reference when dealing with barcode related questions in the following TEC-IT products:

► **TBarCode OCX**	A Microsoft® ActiveX® compliant barcode control
► **TBarCode .NET**	A .NET barcode library
► **TBarCode Library**	Barcode DLL for Microsoft® Windows® (and UNIX®)
► **Barcode Studio**	A stand-alone barcode designer for Microsoft® Windows®
► **TBarCode/X**	Barcode generators (SDK) for Linux® and UNIX®
► **TFORMer Designer**	Full-featured label and report design
► **TFORMer Runtime**	Label and reporting engine for various operating systems
► **TFORMer Server**	Industrial output management
► **TBarCode/Embedded**	Barcode-enabled print and spool appliance
► **TBarCode/SAPwin**	Barcode DLL for SAP® R/3®
► **TBarCode/Direct**	Smart PostScript® compatible bar-coding for SAP® R/3®

3.2 Barcode Types

The reason for the many different types of barcodes is that barcodes are used in many different operational areas. Thus it is possible to select the most suitable barcode type to meet the requirements of a particular industry.

3.2.1.1 Linear 1D Barcodes

Figure 1: Linear Barcode Sample

Linear barcodes are known under names like Code 39, Code 128, UPC, EAN, 2of5...

Linear barcodes encode the information in one way (=one dimension), so they are also called one-dimensional bar codes (1D). The information is stored in the relationship of the widths of the bars (spaces) to each other.

In most of these symbologies the height of the bars is not relevant, except for some height-modulated Postal Codes (e.g. Australian Post 4-State or USPS OneCode).

3.2.1.2 2D Barcodes (Stacked)

Figure 2: 2D-Stacked Barcode Sample

Two-dimensional barcodes are known under names like PDF417, or Codablock F.

Such stacked or multi-row barcodes store information in two dimensions. Several stacked linear barcodes are used to encode the information.

3.2.1.3 2D Barcodes (Matrix Codes)

Figure 3: 2D Barcode Sample

Two-dimensional barcodes like MaxiCode, Data Matrix or QR-Code encode information in two dimensions. Compared to stacked symbologies the information is not stored by using different bar (space) widths. Instead the position of black (or white) dots is relevant.

3.2.1.4 Composite Codes

Figure 4: Composite Barcode Sample

Composite codes like RSS-14 Composite Symbology are combining linear with 2D (stacked) symbologies. The advantage of such codes is that the linear code component encodes the most important information. The 2D component is used for additional data. This separation ensures better migration (e.g. with respect to scanning hardware) between linear and 2D technology.

3.3 Barcode Glossary

As follows you will find a short explanation about technical terms which are used in the barcode technology.

Bar	A bar is represented by the dark or black elements in a barcode.	
Space	The white or lighter elements in a barcode are called spaces.	
Barcode density	The density of the barcode refers to how much space is required for the needed characters (characters per Inch or centimeter)	
Element	Represents both a bar and a space.	
Module	A module is the smallest element of a barcode. The width of the single bars and spaces is a (mostly integer) multiples of the basic width of the module.	
Module width	The width of the barcode's smallest element in millimeter, in inches or in so-called mils (one mil = 1/1000 millimeter). The module width is usually abbreviated with the letter X	
X Dimension	The width of the barcode's smallest element (see Module width).	
Quiet-zone	An area free of any printing or marks that precedes the start character of a barcode and follows the stop character. The required minimal size of the quiet-zone depends on the barcode type. As a rule, the quiet-zone should be ten times the dimension of the module width or at least 1/4 inch (6.5 mm).	
Human Readable Text	This term refers to the entire encoded information of a barcode shown in readable form. It is usually printed below the code. For 2D codes no human readable text is used.	
Discrete Codes	Each character begins and ends with a bar. The spacing between characters is not part of the code.	
Continuous Code	The spaces between the characters are also part of the code. An example of a continuous code is the Code 2/5 Interleaved.	
Start and Stop Characters	Distinct characters used at the beginning and end of each barcode symbol that provide the scanner with start and stop reading instructions as well as scanning direction.	
Self-checking Code	Self-checking code uses the same pattern for each character. For example, this can be five elements where two of these elements are wide and three are narrow. Any deviation from this pattern would result in an error.	
Check-Digit	One or more characters included within the barcode which are used to perform a mathematical check to ensure the accuracy of the scanned data. Check-digits are mandatory with certain codes or are even built into the symbology (as for Code-128)	
Bearer Bars	These are bars printed above and below the symbol. The bearer bars are eliminating partial reads (as drawn in the example on the right). Sometimes the complete symbol is surrounded by bearer bars (e.g. ITF-14).	
Substitution Error	Due to reading errors a character is replaced by another during scanning. Substitution errors can be excluded by adding a check-digit.	
Synchronizing Bars	These bars are synchronizing the barcode reader. E.g. UPC-A and EAN-13 have synchronizing bars at the beginning, in the middle and at the end of the symbol.	
No-Read	A failure to decode, resulting in no output.	
Misread	The data output of a reader/decoder does not agree with the data encoded in the barcode field. This yields to substitution errors.	

Table 1: Barcode Glossary

4 Important Barcode Parameters

In this chapter you will find an explanation about the most important barcode parameters.

4.1 Barcode Symbology

The symbology determines the format and the capabilities of the barcode. Check out chapter 6 for a list of supported barcode symbologies. It depends on your application which symbology you should use. For help, deciding the right symbology, you can contact TEC-IT Support.

4.2 Module Width

4.2.1 Introduction

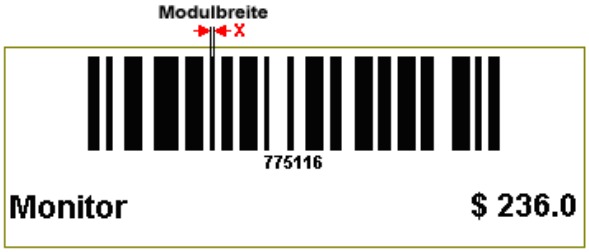


Figure 5: Module Width

The module width (or X dimension) is the width of the smallest bar (or space) in the barcode. The minimal module width depends on the used symbology. In most specifications the recommended module width is at least 0.19 mms.

The default setting in TEC-IT software adapts the module width according to the bounding rectangle of the bar code. The module width is computed automatically by dividing the width of the object by the number of required modules. This depends on the number of data characters to be encoded. The module width decreases as the data content increases.

When adjusting the module width to a fixed value, the resulting bar code can be wider than the bounding rectangle. To avoid clipping, ensure if the entire barcode can be displayed with the maximum data content and widen the barcode object if needed.

4.2.2 Optimize the Module Width

Printing tolerances can lead to problems when decoding a barcode. A remedy for this problem is to optimize the module width with respect to available printing resolutions.

Assume you want to print a barcode with a resolution of 300 dpi then one pixel equals 0,003333 inch (or 0,08466 mm) in such a case. To avoid raster errors, you should select a module width that is an integer multiple of the pixel width (e.g. for 300 dpi a multiple of 0,08466 mm).

- 200 dpi: 2 modules á one pixel (0.127 mm) = 0.254 mm
- 202 dpi: 2 modules á one pixel (0.1257 mm) = 0.251 mm
- 300 dpi: 3 modules á one pixel (0.08467 mm) = 0,254 mm
- 600 dpi: 5 modules á one pixel (0.04233 mm) = 0,212 mm
- For printer solutions over 300 dpi normally the optimizing of the module width isn't necessary.

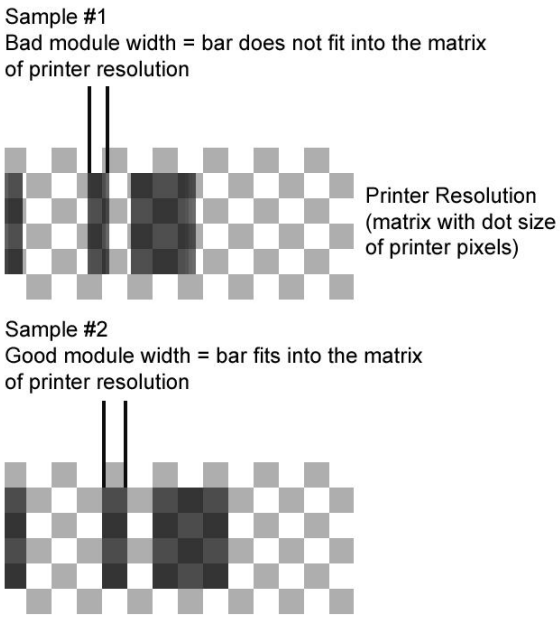


Figure 6: Raster Optimization

4.3 Quiet-zone

A quiet-zone (an area free of any printing or marks) should be maintained directly before and after the barcode symbol. The quiet-zone helps the scanner to determine the barcode correctly.

As a rule, the quiet-zone should be ten times the dimension of the module width or at least 1/4 inch (6.5 mm); the exact value depends on the barcode-symbology.

Figure 7: Quiet-zone

4.4 Print-Ratio and Ratio-Format

The print-ratio (the bar/width ratio) is the width relationship of all elements of a barcode – with respect to the smallest element. TEC-IT Software allows fine-tuning of the print-ratio by supporting three parameters:

- Print-ratio
  The read/write property *Ratio* is used to adjust the print-ratio. The value of this property has to comply with the ratio-format.
- Format of ratio
  The read-only property *RatioHint* shows the format (syntax) of the print-ratio setting. It is intended as a hint for the programmer or user.
- Default print-ratio
  The read-only property *RatioDefault* contains the default print-ratio for the selected barcode symbology. It most cases the default ratio is the best choice for printing the bar code.

Figure 8: Print-ratio

Example:

The picture above shows a barcode with 4 different bar widths and 4 different space widths. Because TEC-IT software maintains the print-ratio of bars and spaces separately, the ratio format is composed as follows:1B:2B:3B:4B:1S:2S:3S:4S.

The first four values (1B:2B:3B:4B) refer to the 4 different widths of the Bars, the second four values (1S:2S:3S:4S) refer to the 4 different widths of the Spaces. The numbers in the ratio hint (e.g. 1B stands for the smallest bar, 2B for the bar with the next larger width and so on) are only used to denote the order – they have no meaning with respect to the ratio itself.

Now set a new print-ratio value. This string must be formatted according to the ratio format, but without the letters: A value of “1:3:5:7.3:1:3:5:7.3” for the *Ratio* indicates that the width of the widest bar (4B) is 7.3 times the width of the smallest bar (7.3:1).

Ratio-Format Specifier	Description
nB	The ratio of bar-width n with respect to the width of the smallest bar (bar-width 1)
nS	The ratio of space-width n with respect to space-width 1 (smallest space)
1T	This is specific to the symbology “Plessey Bidirectional”. It denotes the ratio of the width of the terminator bar 1 to bar-width 1
nC	This is specific to the symbology “Pharmacode”. It denotes the ratio of the width of color-bar n to the width of the smallest bar

Table 2: Print-ratio Adjustment

4.5 Format

Format acts like a ”mask” for formatting the barcode data prior to encoding it. Placeholders in the format string can be mixed with constant data characters to build a final data string. With this feature it’s possible to:

- Select subsets in Code 128, EAN 128 and UCC 128 (even within the code!)

- Insert control characters into the barcode
- Select the required start/stop character for CODABAR
- Change the position of the check-digit
- Set the MaxiCode values “date”, “preamble”, “service class”, “postal code” and “country code” directly in the barcode data (with special escape sequences).

Placeholder character	Description
#	Stands for the next data character of the input data (property *Text*)
&	Stands for all remaining data characters in the input data (property *Text*)
^	Stands for the next check-digit (use only if check-digits will be computed!) ▪ TBarCode 6 (or earlier) computes the check-digit for all characters in the input data. ▪ TBarCode 7 (or later) only uses input data left of the check-digit placeholder for check-digit computation (see examples below!).
A	Switch to Subset A (used in: Code 128, EAN 128, UCC 128) Start- or stop character A (only in: CODABAR)
B	Switch to Subset B (used in: Code 128, EAN 128, UCC 128) Start- or stop character B (only in: CODABAR)
C	Switch to Subset C (used in: Code 128, EAN 128, UCC 128) Start- or stop character C (only in: CODABAR)
D	Start- or stop character D (only in: CODABAR)
S	Only for MaxiCode: enables setting the values of Date, Preamble, Service Class, Postal- and Country-Code directly in the barcode data (only in conjunction with escape sequences).
J	Only for Japanese Postal codes: the Address B data field can be automatically compressed, i.e. Japanese characters are converted into ASCII characters by a defined rule.

Table 3: Format Placeholders

4.5.1 Format Examples

Input data	Barcode type	Format string	Data used for encoding	Notes
123	Irrelevant		123	
123	Irrelevant	5&	5123	
123	Irrelevant	&6	1236	
123	Irrelevant	q#w#e#	q1w2e3	
123	Irrelevant	#q&	1q23	
123	Irrelevant	&^	123c	
123	Irrelevant	^&	c123	This format string may be used for TBarCode 6 (or earlier). – TBarCode 7 always returns 0 in this case.
12345	Irrelevant	####^#	1234c5	When using Modulo 10 for check-digit calculation, c will be ▪ Mod-10 (12345) = 5 for TBarCode 6 (or earlier). ▪ Mod-10 (1234) = 0 for TBarCode 7 (or later).
Hello	Code 128	A&	Hello	
Hello	Code 128	A##B&	Hello	
Hello4711	Code 128	A##B&	Hello4711	
Hello4711	Code 128	A##B###C&	Hello4711	
1234567890	EAN-128	#####^#####	12345**7**67890	7 is the check-digit computed when using Modulo 10. The check-digit computation uses only the digits 12345 (67890 are ignored because this data comes after the ^)

Table 4: Format Examples

red	characters	represented in subset A
gray	characters	represented in subset B
green	characters	represented in subset C
c		represents the place of the check-digit

4.6 Escape Sequences (Encoding Binary Data)

If you want to use non-printable or special characters in a barcode, you have to use escape sequences. An escape sequence always start with a backslash ('\') followed by the sequence itself.

- You have to activate the decoding of escape sequences in the bar code properties – per default the translation of escape sequences is turned off.
- With activated escape sequences you must use "\\" in the input data to encode a single backslash „\" in the barcode.

Escape sequence	Description	Valid for Barcode Symbology
\a	Bell (alert)	All
\b	Backspace	
\f	Form feed	
\n	New Line	
\r	Carriage Return	
\t	Horizontal Tab	
\v	Vertical Tab	
**	The backslash \ itself	
\0ooo	ASCII-character in octal notation: ooo … octal digits (0..7)	
\ddd	ASCII-character in decimal notation: ddd … decimal digits (0..9)	
\xhh	For encoding bytes or ASCII-characters in hexadecimal notation *hh* … hexadecimal digits (0..F)	
\Crrggbb	Color selection	See Pharmacode
\F	FNC1 (Function Number Character 1) used as field separator	EAN-128, UCC-128, Codablock-F MicroPDF417: a special FNC1 codeword is inserted when using emulation mode for EAN-128 or Code-128 Data Matrix: a special FNC1 codeword is inserted
\F	Inserts a Gs (Group Separator) or ASCII 1DHex. Don't encode the \x1d directly!	PDF417, MaxiCode and in QR-Code QR.Code: When using format UCC/EAN a Gs is inserted in Byte Mode, a % is inserted in alphanumeric mode.
\E	ECI (**E**xtended **C**haracter **I**nterpretation). Used for defining the character set (code page) for the encoded data – contact us to get further information.	MaxiCode, Data Matrix and QR-Code, PDF417, MicroPDF417
\EB, \EE	Special ECI identifiers for nesting ECIs. *\EB* (**E**CI **B**egin) opens a nesting level, *\EE* (**E**CI **E**nd) closes it.	QR-Code
\G	GLI (**G**lobal **L**anguage **I**dentifier), similar to ECI (see *\E*).	PDF417
\210	FNC1	Code128, EAN-128, UCC128, Codablock-F
\211	FNC2	Code128, EAN-128, UCC128, Codablock-F
\212	FNC3	Code128, EAN-128, UCC128, Codablock-F
\213	FNC4	Code128, EAN-128, UCC128, Codablock-F
\x11	DC1	Code93, Code93Ext

\x12	DC2	Code93, Code93Ext
\x13	DC3	Code93, Code93Ext
\x14	DC4	Code93, Code93Ext
\x1e	Rs (Record Separator), ASCII 1EHex	PDF417, QR-Code, DataMatrix, MaxiCode (Mode 3,4 SCM)
\x1d	Gs (Group Separator), ASCII 1DHex	PDF417, QR-Code, DataMatrix, MaxiCode (Mode 3,4 SCM)
\x04	Eot (End of Transmission), ASCII 04Hex	PDF417, QR-Code, DataMatrix, MaxiCode (Mode 3,4 SCM)

Table 5: Implemented Escape Sequences

4.7 Check-Digits

The method for the check-digit(s) calculation depends on the respective barcode type. In order to make TEC-IT products as user-friendly as possible, a standard method for each barcode type is supplied (where applicable).

► Per default the input can take place with and without a check-digit. In the latter case the check-digit is calculated automatically and added to the barcode data.

Example (EAN13): If you enter 12 digits (= utilizable data), the 13th digit (= the check-digit) is computed and added automatically. If you enter 13 digits, the check-digit is replaced by your data and isn't calculated.

Check-digit enumeration	Enumeration value	Check-digit calculation methods
eCDNone	0	No check-digit will be computed
eCDStandard	1	Standard check-digit of the selected barcode type is used
eCDMod10	2	Modulo 10 (usually used with Interleaved 2of5)
eCDMod43	3	Modulo 43 (suggested for Code39 and Logmars, consist of 1 digit)
eCD2Mod47	4	Modulo 47 (2 digits)
eCDDPLeit	5	Method for DP Leitcode
eCDDPIdent	6	Method for DP Identcode
eCD1Code11	7	Method for Code11 (1 digit)
eCD2Code11	8	Method for Code11 (2 digits)
eCDPostnet	9	Method for USPS Postnet
eCDMSI1	10	Method for MSI (1 digit)
eCDMSI2	11	Method for MSI (2 digits)
eCDPlessey	12	Method for Plessey
eCDEAN8	13	Method for EAN 8
eCDEAN13	14	Method for EAN 13
eCDUPCA	15	Method for UPC A
eCDUPCE	16	Method for UPC E
eCDEAN128	17	EAN 128 internal method (Modulo 103)
eCDCode128	18	Code 128 internal method (Modulo 103)
eCDRM4SCC	19	Method for Royal Mail 4 State
eCDPZN	20	Mod-11 Method for PZN
eCDMod11W7	21	Mod-11 (Weighting = 7)
eCDEAN14	22	Method for EAN 14
eCDMod10Kor	23	Method for Korean Postal Authority - Modulo 10
eCDMod10Pla	24	Method for Planet - Modulo 10

eCDMod10ItlPst25	25	Method for Italian Postal 2/5 (Modulo 10 based)
eCDMod36	26	Modulo 36 (ISO/IES 7064) for DPD Barcode

Table 6: Check-Digit Methods and Enumerators

5 Application Identifiers (AI)

5.1 Introduction

Some barcode symbologies (e.g. EAN-128) use Application Identifiers (AI's) in order to provide information about the structure of the encoded data. Application Identifiers are mostly used in industry-specific barcode symbologies.

An Application Identifier (AI) is a prefix (built from 2 to 4 characters) used to identify the meaning and the format of the data that follows. AI's have been defined by EAN/UCC for identification, traceability data, dates, quantity, measurements, locations, and many other types of information.

The data presented can be alphanumeric or numeric and with fixed or variable data lengths. The symbology character FNC1 is used as field separator in connection with variable length data fields.

- Use FNC1 only with variable length data fields
- Don't use FNC1 after the last data field.
- Don't use FNC1 if the maximal field length is used

Depending on the bar code symbology (e.g. with EAN-128) you are able to concatenate multiple AI's and encode more data fields into one symbol. If an AI is of variable length type and you don't use the maximum number of characters for this AI, you have to separate the next data field with FNC1. FNC1 is specified in the barcode data with the escape sequence "\F" (see section 4.6).

- For encoding the FNC1 you have to activate *Translate Escape Sequences*.
- Do not encode the brackets which are usually used to denote an Application Identifier. TEC-IT software generates the brackets automatically for the human readable text.

Please use the link below to get a list of all available AI's: http://www.ean.co.at/html/2_4_1AI.pdf

5.2 Examples

5.2.1 Batch Number

A batch number is encoded with AI 10. The format of AI 10 is "n2 + an..20". This means the AI has two digits (10) followed by variable length data with maximum 20 characters.

Description	Value
Data (Text property)	10 + Production Number = 1012345678
Human readable text	(10)12345678
Encoded data	1012345678

5.2.2 Multiple AI's within one Barcode

Two data fields should be encoded in one barcode. Following fields are used:

Description	Value
Batch number AI (10) – format	n2 + an..20
Item number AI (01) – format	n14
Data (Text property)	10+Batch Number+\F+01+Item Number = 1012345678\F0112345678901234
Human readable text	(10)12345678(01)12345678901234
Encoded data	1012345678*FNC1*0112345678901234

► The field separator FNC1 (encoded by the sequence „\F“) has to be used because the batch number is a variable length data field and has only 8 characters (and not the maximum of 20 characters).

5.2.3 EAN-128 with embedded Check-Digit

Sometimes it is required to calculate a check digit only for a partial content of a bar code. A good example is the AI 01 (GTIN) in combination with other data fields within an EAN-128 symbol.

Description	Value
AI for GTIN	01
AI for Date	11
GTIN without check digit	1234567890123
Production Date	060606

In our example, the GTIN contains no check digit (e.g. when created based on the EAN-13 number). The check digit has to be generated only for the first 13 digits of the supplied data and not for the full data content.

Since **TBarCode Version 7+** you can use the format property to solve this problem:

Description	Value
Format property:	01#############^11######
Input Data (Text property):	1234567890123060606
Check-Digit Method:	EAN-14 (Mod-10)
Calculated Check Digit:	CD = Mod-10 of (1234567890123) = 1
Result:	01 + 1234567890123 + CD + 11 + 060606
Data used for encoding:	01123456789012311060606

5.3 RSS Expanded / RSS Expanded Stacked

The mentioned symbologies use an internal data compression algorithm for specific Application Identifiers. Compression means that the bar code can encode more data or can be made smaller. This optimization takes effect automatically if the AIs are applied in the following predefined order.

5.3.1 AI’s with a Fixed Length

5.3.1.1 AI(01) and Weight

AI (01) must begin with an indicator digit of 9 for variable units

Combinations	Description	Max. Weight
AI (01) + AI (3103)	Weight in kg with 3 decimal places (n,nnn kg)	32,767
AI (01) + AI (3202)	Weight in pound with 2 decimal places (n,nn lbs)	999,99
AI (01) + AI (3203)	Weight in pound with 3 decimal places (n,nnn lbs)	22,767

Table 7: Fixed length AI’s in RSS Expanded / Expanded Stacked Codes

5.3.1.2 AI(01), Weight and Date

Two or three data elements will be used for the barcode:

Combinations	Description	Addition
AI (01)	Must start with 9 for variable units	

+ AI (310n) or AI (320n)	For declaration of the Weight	n = 0..9
+ AI (11), AI (13), AI (15), AI (17)	For the Date	

Table 8: AI's in RSS Expanded / Expanded Stacked Codes

If the date is not required this order of AI's still leads to a better barcode representation.

5.3.2 AI's with Variable Lengths

5.3.2.1 AI (01) and Price

Combinations	Description	Addition
AI (01)	Must start with 9 for variable units	
+ AI (392x)	For the price	x = 0..3
or + AI (393x)	For the price in the ISO currency format	x = 0..3

Table 9: Variable length AI's in RSS Expanded / Expanded Stacked Codes

5.3.2.2 AI (01)

► If AI(01) is needed in the barcode, please ensure it is the first AI encoded (for optimal data representation).

5.4 EAN.UCC Composite Symbology

The Composite Symbology was designed to hold primary data (like the GTIN or Shipping Container Code) in the linear symbol and additional data in the 2D Composite Component. For specific AI combinations in the 2D add-on symbol it is possible to perform a data compression (as shown below). This leads to a higher data density (= smaller bar code or more encode able characters).

5.4.1 Compressed Sequences of AIs

The following AI-sequences can be compressed for higher data efficiency:

Combinations	Description
AI (11) + AI (10)	Date and Lot-Number
AI (17) + AI (10)	Expiration Date und Lot-Number

Table 10: AI's in Composite Codes

5.4.2 AI (90)

AI (90) and the following data (which starts with an upper-case letter or a digit) may be used for encoding of FACT IDs. Compression takes place only if AI(90) is the first data element of the sequence.

6 Barcode Symbologies

This chapter describes all supported barcode types. For each barcode the following values are specified:

- Symbology Number
  This number is used in some TEC-IT products to specify the barcode symbology. Developers are usually specifying the barcode type via an enumeration which is documented in the respective developer documentation.
- Valid characters
  Lists the available characters or character sets which can be encoded with the symbology.
- Quiet-zone
  This is the recommended quiet-zone for the barcode symbology in question. Please note that the quiet-zone often depends on your individual application.
- Module-width
  The recommended minimal module width of the barcode. This value may be adapted to your special requirements.
- Standard print-ratio
  This setting describes the print-ratio used by TEC-IT software if no custom ratios are adjusted. For most applications you can use this default value.
- Ratio-format
  This value serves as a hint for specifying user-defined print-ratios.
- Default check-digit
  Describes which check-digit method is used by default for the barcode symbology in question. For 2D codes check-digits are not applicable, these codes are using an error correction scheme.
- Possible check-digits
  Provides information whether additional or user-defined check-digits methods may be adjusted
- Size
  Describes the requirements with respect to the symbol size (if available)

6.1 1D (Linear) Symbologies

6.1.1 Australian Post Customer

Symbology number:	63
Valid characters:	“0”..”9”, 8 digits
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Size:	see Notes

This barcode is used by the Australian Post for marking shipments. Special code variants are available for redirections, replies and so on. The barcode height is between 4.2mm and 5.8mm. The module width should be adjusted to 0.47 mms. Usual no readable text is displayed. The length will depend on the use of additional bars (code variants Customer 2 and Customer 3).

6.1.2 Australian Post Customer 2

Symbology number:	64
Valid characters:	“0”..”9”, “A”..”Z”, “a”..”z”, Space, “#”
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	see Australian Post Customer

This is the same barcode as the Australian Post Standard Customer, but with additional 5 characters for customer specific data. The first 8 characters must be digits.

6.1.3 Australian Post Customer 3

Symbology number:	65
Valid characters:	“0”..”9”, “A”..”Z”, “a”..”z”, Space, “#”
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	see Australian Post Customer

This is the same barcode as the Australian Post Standard Customer, but with additional 10 characters for customer specific data. The first 8 characters must be digits.

6.1.4 Australian Post Redirection

Symbology number:	68
Valid characters:	“0”..”9”, 8 digits
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	see Australian Post Customer

6.1.5 Australian Post Reply Paid

Symbology number:	66
Valid characters:	“0”..”9”, 8 digits
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	see Australian Post Customer

6.1.6 Australian Post Routing

Symbology number:	67
Valid characters:	“0”..”9”, 8 digits
Quiet-zone:	left/right: 6 mm, top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	see Australian Post Customer

6.1.7 Bookland

The Bookland barcode encodes the ISBN number in EAN-13 format followed by a 5 digit supplemental code. The barcode data always consists of the digits ‘978’ (the EAN article identifier), followed by a 9 digit number and one check-digit. You can use the EAN-13 with 5 digits add-on for encoding. The 5 digit add-on bar code is used to encode the book price. For more information refer to 6.1.44

6.1.8 Codabar (Rationalized Version)

Symbology number:	18
Valid characters:	“0”..”9”, “-“, “$”, “:”, “/”, ”.”, ”+”, “A”, “B”, “C”, “D”
Quiet-zone:	left/right: 10X
Module width:	X = 0.19 mm
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	User supplied (e.g. Modulo 16)
Symbol size:	+/- 0.066mm Module width Deviation

This code was invented 1972 by Monarch Marking Systems for retail purposes. 1977 the American Blood Commission defined Codabar 2 as standard symbology for blood banks (=ABC Codabar).

The characters “A”, “B”, “C”, “D” are useable as start or stop characters only. The barcode uses 2 element-widths and 4 different start/stop-characters (A, B, C, D). These start/stop characters can be utilized for additional information – e.g. "B1234B". The print-ratio should be in the following range: 1:2 -1:3 (Pr >= 2,25:1). Since the symbology is “self-checking” there is no established check sum method.

The symbology is also known as Code 2 of 7, NW-7, ABC Codabar, USD-4, Monarch, Code-27, Ames code or Rationalized Codabar.

The “rationalized version” uses 2 different element widths in spite of the original symbology, which used 18 different element widths (Standard Codabar).

- Use the format property to determine the Start and Stop characters (see 9.3).
- FedEx is using a special variant of the Codabar barcode. The format of the encoded number is as follows: XXXX-XXXX-XXXY with a 4-digit ID at the end. The first 12 digits contain the tracking number. The barcode starts with „C“ (start-character) and ends with „D“ (stop-character).

6.1.9 Code 2 of 5 Standard (Code 2 of 5 Matrix)

Symbology number:	2
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X>= 0.19 mm
Standard print-ratio:	1:3:4.5:1:3
Ratio-format:	1B:2B:3B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 10 (eCDMod10)
Symbol size:	--

This is a self-checking code. It is used for industrial applications, article numbering, photo development, ticketing.

6.1.10 Code 2 of 5 Data Logic

Symbology number:	6
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	--
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 10 (eCDMod10)
Symbol size:	--

This symbology is proprietary variant of Code 2 of 5 Standard.

6.1.11 Code 2 of 5 IATA

Symbology number:	4
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X>= 0.19 mm
Standard print-ratio:	1:3:1
Ratio-format:	1B:2B:1S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 10 (eCDMod10)
Symbol size:	--

This is a self-checking code. Start/stop-characters are identical to Code 2 of 5 Industry. It supports distance reading (> 1m) and can be printed with very simple printing techniques.

It is used for baggage handling in air-transport applications (International Air Transport Agency = IATA).

6.1.12 Code 2 of 5 Industrial

Symbology number:	7
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X>= 0.19 mm
Standard print-ratio:	1:3:1
Ratio-format:	1B:2B:1S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 10 (eCDMod10)
Symbol size:	--

6.1.13 Code 2 of 5 Interleaved

Symbology number:	3
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X>= 0.19 mm
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 10 (eCDMod10)
Symbol size:	--

Code 2 of 5 Interleaved is in wide-spread use (article-numbering, industrial applications).

This self-checking code offers high data capacity due to encoding pairs of numbers (the first digit is encoded in the bars, the second in the spaces). Thus, this symbology can encode only an even number of digits. If the number of digits is odd a leading zero will be inserted automatically.

6.1.14 Code 2 of 7

This symbology is identical with Codabar 2 Widths and is also known as NW-7 or USD-4. See 6.1.8

6.1.15 Code 11

Symbology number:	1
Valid characters:	“0”..”9”, “-“
Quiet-zone:	left/right: 10X
Module width:	X= 0.191 mm
Standard print-ratio:	1:2.24:3.48:1:2.24
Ratio-format:	1B:2B:3B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	1 check-digit (eCD1Code11) - or 2 check-digits (eCD2Code11)
Symbol size:	--

This symbology is mainly used in telecommunications for marking equipment and components. It was invented in 1977 by INTERMEC. It is similar to Code 2 of 5 Matrix. The symbology is not self-checking therefore 2 check-digits are recommended. Code 11 is a high-density code, but requires also a high-density output device (mainly because of the print-ratio utilized).

6.1.16 Code 39

Symbology number:	8
Valid characters:	“0”..”9”, “A”..”Z”, “-“, “.”, Space, “*”, “$”, “/”, “+”, “%”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 43 (eCDMod43), Modulo 11 Weight 7 (eCDMod11W7)
Symbol size:	H>=15% of L (H>=6.3 mm!) H: Height of the barcode without human readable text L: width of the barcode

Code 39 is in heavy use in industry, organizations and commerce. It was developed 1974 by INTERMEC and got standardized by ANSI MH 10.8 M-1983 and MIL-STD-1189.

► The start- and stop characters “*” (asterisk) are created automatically and must not be included in the input data. They are not displayed in the human readable text.

Code 39 is a self-checking code. Code concatenation is possible (if the first encoded character is a space subsequent barcodes are concatenated by the scanner). Distance-reading is possible (> 1m).

6.1.17 Code 39 Extended

Symbology number:	9
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 43 (eCDMod43), Modulo 11 Weight 7 (eCDMod11W7)
Symbol size:	H>=15% of L (H>=6.3 mm!) H: Height of the barcode without human readable text L: width of the barcode

Code 39 Extended is rarely used because Code 128 offers much better compression. Code 39 Extended uses the same symbology as Code 39 but encodes also lower-case letters and special characters („+A“ results in a lower case „a“ when scanned). Scanner must be configured correctly for decoding Code39 Extended.

► The start- and stop characters “*” (asterisk) are created automatically and must not be included in the input data. They are not displayed in the human readable text.

6.1.18 Code 93

Symbology number:	25
Valid characters:	“0”..”9”, “A”..”Z”, “-“, “.”, Space, “$”, “/”, “+”, “%”
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 47 (eCD2Mod47)
Symbol size:	--

Code 93 was invented 1982 by INTERMEC to achieve better information densities (compared to Code 39). Code concatenation is possible (if the first encoded character is a space subsequent barcodes are concatenated by the scanner).

6.1.19 Code 93 Extended

Symbology number:	62
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 47 (eCD2Mod47)
Symbol size:	--

Based upon Code 93 but encodes the complete ASCII character set. One of the four available control characters is used to shift into the ASCII-character table.

6.1.20 Code 128

Symbology number:	20
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDCode128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	--

Code 128 is heavily used in all areas. It is a modern high-density symbology and was invented 1981 by Computer Identics.

TEC-IT software analyzes input data and chooses the best suitable barcode representation with the highest data density. This is done by so-called “subset switching”. 3 different internal characters (=subsets) sets are used:

- Code128A = Upper Case + Non-Printable Characters (ASCII 0-31)
- Code128B = Upper / Lower Case + All Printable Characters
- Code128C = Numeric with doubled density

Code128 uses a built-in check-digit (Modulo 103). This check-digit is part of the code and cannot be omitted. It is never printed in the human readable text. Scanners are checking it when reading a code but do not deliver the check-digit to connected systems.

In conjunction with the symbology character "FNC1" this code is also known as UCC-128 / EAN-128 bar code – see 6.1.38

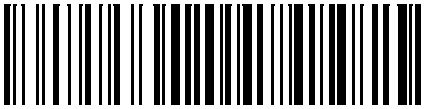
6.1.21 Code 128 Subset A

Symbology number:	59
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDCode128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	--

This is a variant of Code128 which uses character set (subset) A. It is suitable for encoding upper case characters + ASCII control sequences. It switches to other Code128 subsets when required.

6.1.22 Code 128 Subset B

Symbology number:	60
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDCode128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	--



This is a variant of Code128 which uses character set (subset) B. It is suitable for encoding lower & upper case letters. It switches to other Code128 subsets when required.

6.1.23 Code 128 Subset C

Symbology number:	61
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDCode128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	--

This is a variant of Code128 which uses character set (subset) C. It is suitable for encoding digits. It switches to other Code128 subsets when required.

6.1.24 Code 25

Uniform Symbology Specification ITF 2-5. Identical to Code 2 of 5 Interleaved. Another alias is USS ITF 2-5.

6.1.25 Deutsche Post Identcode

Symbology number:	22
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	--
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	Automatic (symbology specific). DP Identcode (eCDDPIdent)
Symbol size:	--

This symbology is used by Deutsche Post. The code is basically a Code 2 of 5 interleaved enhanced with a special check-digit calculation.

6.1.26 Deutsche Post Leitcode

Symbology number:	21
Valid characters:	“0”..”9”, 13 digits + 1 check-digit
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	--
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	Automatic (symbology specific). DP Leitcode (eCDDPLeit)
Symbol size:	--

This symbology is used by Deutsche Post. The code is basically a Code 2 of 5 Interleaved enhanced with a special check-digit calculation. It is used for encoding the ZIP-Code, Street and number of the shipment.

6.1.27 DOD Logmars

Department of Defense Logmars. Same as Logmars (see below).

6.1.28 DUN-14

The DUN-14 (Distribution Unit Number) is not a barcode type. It's a numbering system for shipping containers. The DUN-14 uses the ITF-14 or the EAN-14 barcode symbols. Modern installations always use the EAN-14 to encode the DUN-14.

The DUN-14 encodes the following data:

- The first digit represents the number of units in the container: 1=6 units, 2=10 units, 3=12 units, 4=20 units, 5=24 units. (The digits 6,7 and 8 are standing for other numbers of units.)
- The next 12 digits are representing the product number. In general this is the EAN-13 number without check-digit.
- The last digit is the check-digit.

6.1.29 DUNS

This is not a barcode standard. DUNS is a nine-digit number assigned and maintained by Dun and Bradstreet to identify unique business establishments. DUNS numbers are assigned worldwide and include US, Canadian, and international organizations.

6.1.30 EAN-8

Symbology number:	10
Valid characters:	“0”..”9”, 7 digits + 1 check-digit
Quiet-zone:	left/right: 7X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-8 (eCDEAN8)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This symbology is reserved for the European Article Numbering (EAN). EAN 8 is used for marking small articles with restricted space. It encodes a unique article number. This number is maintained by EAN and encodes manufacturer and product.

The check-digit is calculated automatically if not specified in the input data (that is when only 7 digits are used for creating the code).

6.1.31 EAN-8 with 2 Digits Add-On

Symbology number:	11
Valid characters:	“0”..”9”, 9 digits + 1 check-digit
Quiet-zone:	left: 7-10X, right: 5X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-8 (eCDEAN8)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This symbology extends EAN-8 with 2 add-on digits which are mainly used for encoding the price or the weight. The check-digit will be calculated automatically if it not specified in the input data (e.g. 9031101712).

This symbology is also used for bar-coding paperbacks or newspapers. In this case a 2(3) digits country code and a 4(5) article code are encoded.

6.1.32 EAN-8 with 5 Digits Add-On

Symbology number:	12
Valid characters:	“0”..”9”, 12 digits + 1 check-digit
Quiet-zone:	left: 7-10X, right: 5X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-8 (eCDEAN8)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This symbology extends EAN-8 with 5 add-on digits which are mainly used for encoding the price or the weight. The check-digit will be calculated automatically if it not specified in the input data (e.g. 0725272**72077**).

6.1.33 EAN-13

Symbology number:	13
Valid characters:	“0”..”9”, 12 digits + 1 check-digit
Quiet-zone:	left: 11X, right: 7X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-13 (eCDEAN13)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This code is reserved for the European Article Numbering (EAN) system. EAN 13 is used for identifying articles or products uniquely. Encoded are a 2-digit country code, 5-digits manufacturer code and a 5 digits products code. JAN and IAN are identical to EAN-13.

The check-digit is calculated automatically if it not specified in the input data (that is when only 12 digits are used for creating the code).

6.1.34 EAN-13 with 2 Digits Add-On

Symbology number:	14
Valid characters:	“0”..”9”, 14 digits + 1 check-digit
Quiet-zone:	left: 7-10X, right: 5X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-13 (eCDEAN13)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This symbology extends EAN-13 with 2 add-on digits (see also EAN-8 with 2 Digits Add-On). The check-digit will be calculated automatically if it not specified in the input data (e.g. 978020137968612).

6.1.35 EAN-13 with 5 Digits Add-On

Symbology number:	15
Valid characters:	“0”..”9”, 17 digits + 1 check-digit
Quiet-zone:	left: 7-10X, right: 5X
Module width:	X=0.33mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-13 (eCDEAN13)
Possible check-digits:	User supplied
Symbol size:	Standardized symbol sizes. See EAN.

This symbology extends EAN-13 with 5 add-on digits (see also EAN-8 with 5 Digits Add-On). The check-digit will be calculated automatically if it not specified in the input data (e.g. 978020137968612345).

6.1.36 EAN-14

Symbology number:	72
Valid characters:	ASCII-characters between 0..127, 13 digits + 1 check-digit
Quiet-zone:	see UCC/EAN-128, ITF-14
Module width:	see UCC/EAN-128, ITF-14
Standard print-ratio:	see UCC/EAN-128, ITF-14
Ratio-format:	see UCC/EAN-128, ITF-14
Default check-digit:	EAN-14 (eCDEAN14)
Possible check-digits:	User supplied
Symbol size:	see UCC/EAN-128, ITF-14

EAN-14 is used to encode the GTIN (Global Trade Item Number) for numbering trade items. Within the EAN/UCC system (or GS1) you can use 2 symbologies for encoding the GTIN:

- UCC/EAN-128 (or GS1-128)
- ITF-14.

EAN-14 uses EAN-128 with Application identifier (AI) 01. The AI is prefixed automatically; it must not be part of the input data. The check-digit is calculated automatically if not specified in the input data (that is when only 13 digits are used).

6.1.37 EAN-18

Same as SSCC-18 (see 6.1.64).

6.1.38 EAN-128

Symbology number:	16
Valid characters:	ASCII-characters between 0..127
Quiet-zone:	left/right: 10X but min. ¼ in
Module width:	see Code128
Standard print-ratio:	see Code128
Ratio-format:	see Code128
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDEAN128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	see Code 128

EAN-128 is based upon Code-128 but with the FNC1 function character at 2nd position (after the start character). This allows scanners and data processing software to differentiate EAN-128 from other symbologies.

► The FNC1 at 2nd position is inserted automatically by TEC-IT software. The symbology internal check-digit (Modulo 103) is also computed automatically.

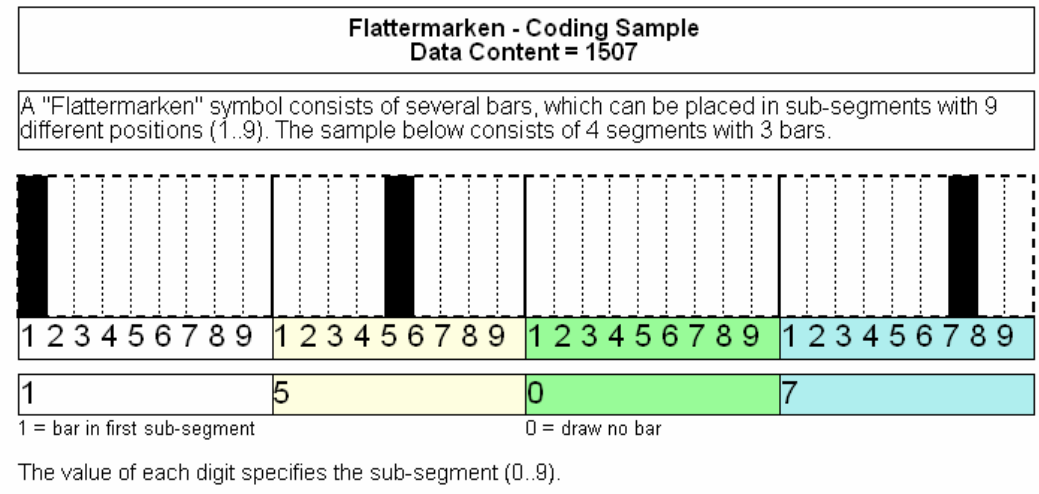
EAN-128 is in wide spread use (retail, logistics, food and beverage, …). Beside the article-number EAN-128 encodes also quantities, weights, prices, dates, … in a structured way. This is supported by the use of so-called Application Identifiers (AI's) – see chapter 5. Within the EAN/UCC system these Application Identifiers (AI's) are used to prefix the encoded data.

The EAN-128 is the same as the UCC-128. Therefore this code will also be referenced as UCC/EAN-128.

6.1.39 Flattermarken

Symbology number:	28
Valid characters:	"0"..."9"
Quiet-zone:	Application dependent
Module width:	2-3 mm
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	None (eCDNone)
Symbol size:	Symbol height between 5 and 10mm

This is a special "barcode" used for recognizing the correct sequence of pages in print-shops.



6.1.40 GS1-128

The GS1-128 is simply another name for the existing EAN-128 (or UCC-128) bar code. The EAN and UCC standardization organizations founded GS1 in order to globalize (and harmonize) their different standards. See 6.1.38

6.1.41 GTIN

GTIN stands for Global Trade Item Number and is not a barcode symbology.

A GTIN is used for the unique identification of trade items worldwide within the EAN.UCC system. The GTIN may be encoded in UCC-12, EAN-8, EAN-13, EAN-14 (ITF-14 and UCC/EAN-128) symbologies.

6.1.42 HIBC

HIBC is an abbreviation for Health Industry Bar Code. The HIBC is a numbering system – and not a specific barcode symbology. It is used for product identification codes as well as for worldwide identification of shipping units.

The primary code contains the manufacturer id, the article number, the package number and a check-digit. The secondary code contains the serial number, the expiration date and the units per package.

The following symbologies are commonly used for encoding: Code 39, Code 128, Codablock F. For more information, please refer to http://www.hibcc.org.

6.1.43 I-2/5

Short for Code 2 of 5 Interleaved. It is also known as Code 25.

6.1.44 ISBN Code

Symbology number:	69
Valid characters:	“0”..”9”, 17 digits + 1 check-digit
Quiet-zone:	See EAN13 + 5
Module width:	See EAN13 + 5
Standard print-ratio:	See EAN13 + 5
Ratio-format:	See EAN13 + 5
Default check-digit:	EAN-13 (eCDEAN13)
Possible check-digits:	User supplied
Symbol size:	See EAN13 + 5

ISBN is the abbreviation of International Standard Book Number. It uses the symbology EAN-13 with 5 Digits Add-On. The add-on is used for additional pricing information. For more information, please refer to http://www.isbn.org.

The EAN-13 barcode for a book is generated from the ISBN number assigned to it. When encoding ISBN in an EAN-13 barcode, the ISBN number is preceded by the number 978 and the ISBN check-digit is not used (the rightmost digit of the ISBN). When the ISBN number is encoded in the EAN-13 barcode in this way it is often called Bookland. A 5 digit add-on barcode is optional and can contain the price of the book.

- When entering the number for the data content, avoid to enter the last number of the ISBN!
- In order to generate the correct check digit, do not enter 978 + 10 digits, enter 978 + 9 digits!

6.1.44.1 Example

You got the ISBN Number 1-56592-843-1 and a value for the second small barcode (as for the price) of 90000.

Therefore encode the following data: 97815659284390000 (omit the last number (1) of the ISBN!). Instead of the omitted 1 a new check-digit is created (5). This is because the EAN-13 symbology uses another check-digit calculation method as ISBN.

- The check-digit of the EAN-13 barcode must be used - so never encode a total of 18 digits - only 3 + 9 + 5 = 17.

Instead of the ISBN barcode you can also choose the EAN-13 symbology to print an ISBN compatible barcode without the 5 digit add on.

6.1.44.2 ISBN Additional Data

The smaller barcode which is on the right side of the ISBN code is a 5-digit additional code and can be used for additional information (e.g. like pricing).

Example:

Price	Encoded
$10.95	51095
$3.00	50300
$99.99 +	59999

Table 11: ISBN Sample

The preceding digit ”5” (therefore also called EAN-5) marks the price encoded in US Dollar. Bookstores recommend EAN-5. If there is no price, the value 90000 will be encoded instead (EAN-9). This value is used when no additional information is available.

- For scanner in US bookstores ISBN EAN codes are not readable without the 5 digit additional code (which is called EAN-5 or EAN-9, depending on the first number encoded in the add-on).

First Digit	Description
5	$ US
6	$ Canada
4	$ New Zealand
3	$ Australia
0 & 1	British pounds

Table 12: ISBN Encoding – Country and Currency

Values	Description
59999	Price for $100 and more
90000-98999	For internal purposes (BISG recommend 90000 if no price is given)
99000-99999	Reserved for the industry market
99990-99999	Reserved for Nat’l Ass’n College Stores (NACS)
99990	NACS used books
99991	NACS copies

Table 13: ISBN Encoding – Price Samples

6.1.45 ISBT-128

This is the International Standard for the transfer of information associated with tissue transplantation and Blood Transfusion. It provides a globally unique donation numbering system, internationally standardized product definitions, and standard data structures for bar-coding and electronic data interchange.

It uses (but is not limited to) Code128B. For more information, please refer to http://iccbba.org.

6.1.46 ISSN

ISSN stands for International Standard Serial Number. The ISSN is the standardized international code, which identifies any serial publication independently of its country of origin, its language or alphabet, or its frequency, medium, etc.

The ISSN can be encoded by using the EAN-13 symbology. In this case the ISSN is preceded by the digits 977. The ISSN check-digit (the last of the 8 digits) must be omitted! A two digit price code, almost always "00", is added to the end. Finally the EAN-13 check-digit (calculated automatically by TEC-IT software) is added.

For more information, please refer to http://www.issn.org.

6.1.47 ITF-14

ITF-14 encodes the GTIN-14, this is a 14-digit number used to identify trade items at various packaging levels (also referred as GTIN).

ITF-14 is based on the Code 2 of 5 Interleaved symbology. It encodes 14 digits (13 usable digits + 1 modulo 10 check-digit). The check digit method complies to the EAN-14 method.

ITF-14 uses “Bearer Bars”, these are horizontal or surrounding bars, to prevent misreads. The vertical bearer bars must have at least 10 modules distance to the bar code (this is why you have to adjust a minimum of 12 for the quiet zone to see a vertical bearer bar in TEC-IT Software).

6.1.48 Japanese Postal Code

Symbology number:	76
Valid characters:	“0”..”9”, “A”..”Z”, “-“, 7 digits (ZIP code) + additional data
Quiet-zone:	left/right/top/bottom: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	--

This code is used by the Japanese Postal system. You can encode 7 digits followed by block and street number (uppercase alphanumeric). The special compaction mode of Japanese characters can be enabled on demand (*Format* parameter “J”) – see below.

This barcode symbology supports two methods to provide the barcode data (with and without data–extraction from the Japanese Address B Field).

6.1.48.1 Direct Encoding Mode

Description	Value
Format Property	“” (default=empty)
Postal code	2730102 (no hyphen ‘-‘)
Address B	3-20-5B604

Barcode text	Postal code + Address B (no space between)
Barcode text	2730102 3-20-5B604
Encoded data in the symbol	27301023-20-5B604

6.1.48.2 Japanese Extraction Mode

Description	Value
Format Property	”J” (=Japanese)
Postal code	273-0102 (can contain ‘-‘)
Address B	東３丁目－２０－５　郵便・A&bコーポB604号
Barcode text	Postal code + Address B
Barcode text	273-0102　東３丁目－２０－５　郵便・A&bコーポB604号
Encoded data in the symbol	27301023-20-5B604 (after internal compression)

- In **TBarCode DLL** you provide the data with the „Japanese SHIFT JIS“ (MultiByte) character set (Codepage 932) using the *BCSetText(..)* function.
- In **TBarCode OCX** you set *InterpretInputAs* = Japanese Shift JIS.

6.1.48.3 Standard Dimensions

To draw the barcode according to the specification please follow these steps:

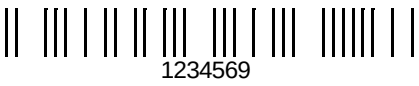
- Set the module-width to 0.6mm (DLL-function: *BCSetModWidth* (pBC, "600"))
- Set the height of the „Bounding Rectangle“ in the draw function to 3.6 mm
- Switch off the display of the human readable text

6.1.49 JAN

JAN is the abbreviation for Japanese Article Number. This code uses EAN-13 symbology. The first two digits have to be either 45 or 49 for identifying Japan.

6.1.50 Korean Postal Authority

Symbology number:	77
Valid characters:	“0”..”9”, 6 digits + 1 check-digit
Check-digit method:	Check-digit included in the code
Quiet-zone:	10X (not exactly specified)
Module width:	--
Standard print-ratio:	1:3:4
Ratio-format:	1B:1S:2S
Default check-digit:	Automatic (symbology specific). Modulo10 (eCDMod10Kor)
Symbol size:	--



This code is used by the Korean Postal system. Encoded are a 6-digit ZIP and 1 check-digit.

6.1.50.1 Example

Description	Value
Post number	305-600
Barcode Text property	305600 (no hyphen, 6 digits)
Encoded data in the symbol	0065036
	The check-digit (7th digit marked red) will be calculated automatically. 

Parameters: width = 70, height = 4 mm, module width = 0.417 mm

> ► Hint: Will be scanned from right to left, so the data is encoded in the reverse order. The check-digit will be added at the right side, so it is the first digit read by a scanner.

6.1.51 LOGMARS

Symbology number:	50
Valid characters:	“0”..”9”, “A”..”Z”, “+“, “-”, “*”, “/”, ”.”, ”$”, Space
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X>=0.19 mm
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Possible check-digits:	Modulo 43 (eCDMod43), Modulo 11 Weight 7 (eCDMod11W7)
Symbol size:	H>=15% of L (H>=6.3 mm!) H: Height of barcode-symbol without human readable text L: Width of barcode

This is a special variant of Code 39 used by the U.S. Department of Defense. This standard defines acceptable ranges for a number of variables, include density, ratio, bar height, and size of the human-readable interpretation line. The modulo 43 check-digit, optional for Code 39, is defined and recommended in the specification.

6.1.52 MSI

Symbology number:	47
Valid characters:	“0”..”9”
Quiet-zone:	left/right: 12X
Module width:	--
Standard print-ratio:	1:2:1:2
Ratio-format:	1B:2B:1S:2S
Default check-digit:	MSI 1 digit (eCDMSI1)
Possible check-digits:	User supplied and MSI 2 digit (eCDMSI2)
Symbol size:	14 digits incl. check-digits

The MSI-Code is a variant of the Plessey-Code. MSI uses various check digit calculation methods - TEC-IT implemented the 2 most common used (please contact TEC-IT if you need a different one).

6.1.53 NVE-18 (Nummer der Versandeinheit)

Symbology number:	75
Valid characters:	“0”..”9”
Check-digit method:	Modulo10
Default check-digit:	Modulo10
Quiet-zone:	left/right: 10X, min. ¼ inch
Module width:	X >= 0.19 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 10 (eCDMod10) and Modulo 103 (eCDEAN128)
Symbol size:	--

NVE stands for “Nummer der Versandeinheit” (a German term for tracking number). This code uses an EAN-128 symbology with a prefixed Application Identifier (AI) 00. The AI “00” is inserted automatically and must not be included in the input data. It is similar to SSCC-18.

6.1.54 NW-7

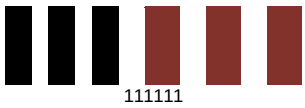
This symbology is identical with Codabar 2 Widths and is also known as Code 2 of 7.

The Japanese version of the Codabar 2 Widths barcode is called NW7. Another name for this symbology is Code 2 of 7. Please see 6.1.8

The following symbols can be encoded in NW7: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, -, $, /, ., +

6.1.55 Pharmacode One-Track

Symbology number:	51
Valid characters:	“0”..”9” or binary
Quiet-zone:	left/right: 6 mm
Module width:	2-3 mm
Standard print-ratio:	1:3:2:4:2:3
Ratio-format:	1B:2B:1C:2C:1S:2S
Default check-digit:	None (eCDNone)
Symbol size:	5-10 mm height



This code was invented by Laetus®. It I used in pharmaceutical areas. Pharmacode supports colored bars. The data for the bars/spaces is encoded directly in the property *Text*:

- “0” is used for a narrow bar (the width of these bars are enlarged after a color change, according to ratio 1C)
- “1” is used for a wide bar (the width of these bars are enlarged after a color change, according to ratio 2C)
- “b” is used for a narrow bar
- “c” is used for a wide bar

When using colored bars, the color is specified by the escape sequence \Crrggbb (RGB hex). The barcode *Format* must be set to *D* and *EscapeSequences* must be activated.

The data for the barcode in the example above is as follows (the color escape sequence is not displayed in the human readable text): 111\C2a3282111

6.1.56 Pharmacode Two-Track

Symbology number:	53
Valid characters:	numeric [0..9] and generic;
Quiet-zone:	left/right: 6 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	None (eCDNone)
Symbol size:	see Notes

This code was invented and specified by Laetus®. Pharmacode assigns numeric values to the bars. It is used for medicine packing in pharmaceutically area; for small labels. Usually Pharmacode is printed without a human readable text.

The dimensions are:

- 2-track bar width: 1 mm
- space bars: 1 mm
- bar height above/below: 4-6 mm
- height of the long bar: 8-12 mm

It offers a high printing tolerance and is readable very fast (200 readings per second).

6.1.57 Pharma Zentralnummer (PZN)

Symbology number:	52
Valid characters:	“0”..”9”, 6 digits + 1 check-digit
Quiet-zone:	see Code 39
Module width:	see Code 39
Standard print-ratio:	see Code 39
Ratio-format:	see Code 39
Default check-digit:	PZN check-digit (eCDPZN)
Possible check-digits:	User supplied
Symbol size:	see Code 39

PZN uses Code 39 as the base symbology. It uses a special check-digit and the human readable text always contains the prefix “PZN-“ (which is not encoded in the barcode data).

6.1.58 Planet 12

Symbology number:	82
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	left/right: 1/25 inch top/bottom: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Modulo 10 Planet (eCDMod10Pla)
Possible check-digits:	User supplied
Symbol size:	11 digits + 1 check-digit

This code was developed for the United States Postal Services. It is a 3-of-5 variant of the Postnet barcode.

6.1.59 Planet 14

Symbology number:	83
Valid characters:	“0”..”9”, 13 digits + 1 check-digit
Quiet-zone:	left/right: 1/25 inch top/bottom: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Modulo 10 Planet (eCDMod10Pla)
Possible check-digits:	User supplied
Symbol size:	13 digits + 1 check-digit

This code was developed for the United States Postal Services. It is a 3-of-5 variant of the Postnet barcode.

6.1.60 Plessey Code

Symbology number:	46
Valid characters:	numeric [0..9] A, B, C, D, E, F
Quiet-zone:	left/right: 12X
Module width:	--
Standard print-ratio:	1:2:1:2
Ratio-format:	1B:2B:1S:2S
Default check-digit:	Plessey (eCDPlessey)
Possible check-digits:	User supplied
Symbol size:	--

Plessey code is in use primarily in libraries. It is a pulse-width modulated code and was developed by Plessey Company Limited in UK. The basic encoding principle in Plessey Code was used by MSE Data Corporation to construct its MSI barcode.

The check digit is calculated with a polynomial CRC algorithm and is always part of the symbology.

6.1.61 Rational Codabar

Is the same as Codabar – see 6.1.8.

6.1.62 Royal Mail 4 State (RM4SCC)

Symbology number:	70
Valid characters:	“0”..”9”, “A”..”Z”
Quiet-zone:	left/right: 2 mm
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Possible check-digits:	User supplied
Symbol size:	max. 9 digits without check-digits

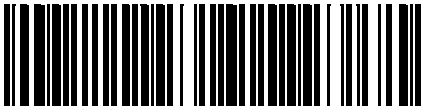
This code is a height modulated code using 4 different vertical bars. It is used in mass-mailing applications (Cleanmail, Mailsort) of the Royal Mail, United Kingdom and Singapore (also called SinPost barcode). Encoded are ZIPs.

6.1.63 SCC-14

Shipping Container Code – see DUN-14.

6.1.64 SSCC-18

Symbology number:	48
Valid characters:	“0”..”9”, 17 digits + 1 check-digit
Quiet-zone:	see EAN 128, sometimes ¼ inch
Module width:	see EAN 128
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific). Modulo 10 (eCDMod10) and Modulo 103 (eCDEAN128)
Symbol size:	see EAN 128



Used to encode the Serial Shipping Container Code. It is used for the unique identification of trade items world-wide. SSCC-18 is based on the EAN-128 symbology with Application Identifier (AI) 00. The check-digit is encoded automatically if 17 digits are used for the input data.

The structure of the SSCC-18 is as follows:

- The first two digits represent the Application Identifier (AI). The AI is always ‘00’.
- The next digit is the Packaging Identifier.
- The Packaging Identifier is followed by the ILN (the International Location Number) of the manufacturer (7 digits).
- The next 9 digits represent the Carton Serial Number.
- The last digits is the check-digit.

6.1.65 Singapore Post

The Singapore Post 4 State Customer Code is the same as the RM4SCC.

6.1.66 Telepen Alpha

Symbology number:	32
Valid characters:	ASCII characters between 0..127
Quiet-zone:	n/a
Standard print-ratio:	1:3:1:3
Ratio-format:	1B:2B:1S:2S
Default check-digit:	None (eCDNone)
Symbol size:	--

Telepen Alpha is the alphanumeric variant of Telepen.

6.1.67 UCC-128

See UCC/EAN-128.

6.1.68 UCC / EAN-128

Symbology number:	33
Valid characters:	ASCII characters between 0..127
Quiet-zone:	left/right: 10X, min ¼ inch
Module width:	see Code128
Standard print-ratio:	see Code128
Ratio-format:	see Code128
Default check-digit:	Automatic (symbology specific). Modulo 103 (eCDEAN128)
Possible check-digits:	Modulo 10, EAN-14
Symbol size:	max width 165 mm

EAN-128 is based upon the Code-128 symbology. To identify an EAN-128 symbology the FNC1 symbology character is placed on the first position of the barcode. This is done automatically by TEC-IT Software.

Data is encoded with Application Identifiers (AI). UCC/EAN-128 is used for marking transport-units in supply chains.

6.1.69 UPC 12 Digits

Symbology number:	17
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	see UPC-A
Module width:	see UPC-A
Standard print-ratio:	see UPC-A
Ratio-format:	see UPC-A
Default check-digit:	UPC-A (eCDUPCA)
Possible check-digits:	User supplied
Symbol size:	see UPC-A

The symbologies UPC-A and UPC-12 are identical. The check-digit is calculated automatically if not specified in the input data (that is when only 11 digits are used for creating the code).

6.1.70 UPC Version A

Symbology number:	34
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	9X
Module width:	0,33 mm
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	UPC-A (eCDUPCA)
Possible check-digits:	User supplied
Symbol size:	H=26.26mm; B=37.29mm; variable size

UPC A is used for article bar-coding. It is used in the United States for marking of products in retail applications (similar to EAN). The article number is maintained by UCC and identifies manufacturer and product uniquely. The code (11 digits + 1 check-digit) is built from one system-digit, 5 digits manufacturer code and 5 digits product code. The check-digit is calculated automatically if not specified in the input data (that is when only 11 digits are used for creating the code).

6.1.71 UPC Version A, 2 Digits Add-On

Symbology number:	35
Valid characters:	“0”..”9”, 13 digits + 1 check-digit
Quiet-zone:	left: 9-12X, right: 5X
Module width:	see UPC-A
Standard print-ratio:	see UPC-A
Ratio-format:	see UPC-A
Default check-digit:	UPC-A (eCDUPCA)
Possible check-digits:	User supplied
Symbol size:	see UPC-A

Identical to UPC-A but with 2 add-on digits. The check-digit will be calculated automatically if it is not specified in the input data (e.g. 725272720707**1**2), The check-digit is not displayed in the human readable text.

6.1.72 UPC Version A, 5 Digits Add-On

Symbology number:	36
Valid characters:	“0”..”9”, 16 digits + 1 check-digit
Quiet-zone:	left: 9-12X, right: 5X
Module width:	see UPC-A
Standard print-ratio:	see UPC-A
Ratio-format:	see UPC-A
Default check-digit:	UPC-A (eCDUPCA)
Possible check-digits:	User supplied
Symbol size:	see UPC-A

Identical to UPC-A but with 2 add-on digits. The check-digit will be calculated automatically if it is not specified in the input data (e.g. 725272720707**1**2345), The check-digit is not displayed in the human readable text.

6.1.73 UPC Version E

Symbology number:	37
Valid characters:	“0”..”9”, 7 digits + 1 check-digit
Quiet-zone:	left: 9X, right: 7X
Module width:	--
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	UPC-E (eCDUPCE)
Possible check-digits:	User supplied
Symbol size:	--

UPC-E is used for product marking and article bar-coding. The code must begin with “0” or “1”. The check-digit is computed automatically if it is not specified in the input data (that is when only 7 digits are used for creating the code).

6.1.74 UPC Version E, 2 Digits Add-On

Symbology number:	38
Valid digits:	“0”..”9”, 9 digits + 1 check-digit
Quiet-zone:	left: 9-12X, right: 5X
Module width:	see UPC-E
Default check-digit:	see UPC-E
Ratio-format:	see UPC-E
Check-digit method:	UPC-E (eCDUPCE)
Possible check-digits:	User supplied
Symbol size:	--

This code is identical to UPC Version E, but with 2 add-on digits. The check-digit will be calculated automatically if not specified in the input data (e.g. 0123456512). The check-digit is not displayed in the human readable text.

6.1.75 UPC Version E, 5 Digits Add-On

Symbology number:	39
Valid digits:	“0”..”9”, 12 digits + 1 check-digit
Quiet-zone:	left: 9-12X, right: 5X
Module width:	see UPC-E
Standard print-ratio:	see UPC-E
Ratio-format:	see UPC-E
Default check-digit:	UPC-E (eCDUPCE)
Possible check-digits:	User supplied
Symbol size:	--

This code is identical to UPC Version E, but with 2 add-on digits. The check-digit will be calculated automatically if not specified in the input data (e.g. 0123456512345). The check-digit is not displayed in the human readable text.

6.1.76 UPC SCS (Shipping Container Symbols)

Shipping Container Symbol. ITF-14 is based on Code 2of 5 interleaved as barcode symbology, but is rendered with bearer bars.

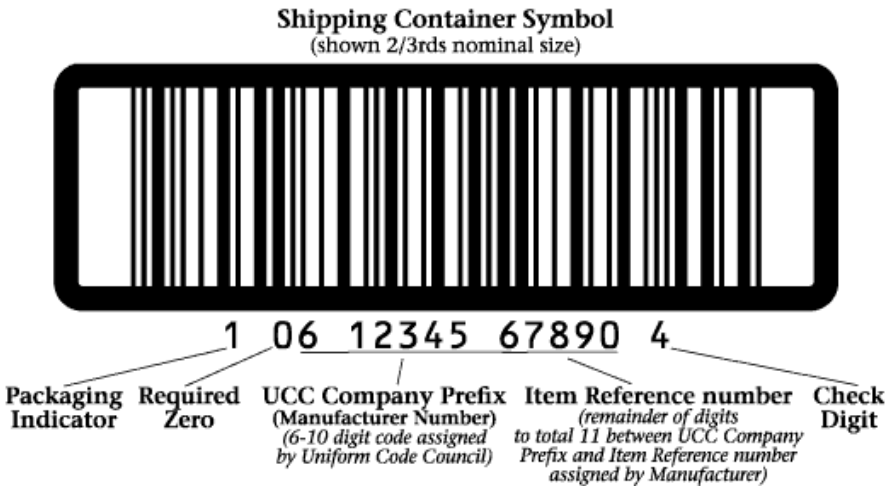


Figure 9: UPC Shipping Container Symbol (SCS)

The UPC Shipping Container Symbol (SCS) is very similar in structure to the Universal Product Code (UPC). Both employ a unique UCC company prefix (assigned by the Uniform Code Council) and a 1 to 5-digit item number (assigned by the manufacturer, depending on the number of digits in the UCC company prefix). Each employs a check-digit at the end of the code.

The SCS also has a packaging indicator field preceding the UCC company prefix. Its symbology is called Interleaved 2 of 5 (I-2/5) and uses a series of wide and narrow bands and spaces to represent digits and is surrounded on two or four sides by a frame called a bearer.

The packaging indicator (historically called an assortment indicator) can be any single digit (except 8 which is reserved for future use):

Packaging Indicator	Description
0	Is always used when the UPC code on the case and on the individual items inside the case are different or when both a UPC Version A symbol and a UPC Shipping Container Symbol (I-2/5) must appear on the same carton (for products where the shipping container also acts as the package for the consumer product).
1	Is used traditionally when the UPC code on the case and on the individual items inside the case are the same.
1-7	Can be used to signify a range of packaging levels
8	Reserved for future use
9	Is used only to signify a variable content shipment. The 9 indicates to the scanner that a mandatory variable content add-on symbol follows the primary symbol.

Table 14: Shipping Container Symbol Packaging Indicator

6.1.77 USD-4

This symbology is identical with Codabar 2 Widths and is also known as Code 2 of 7 and as NW-7.

6.1.78 USPS OneCode 4-State Customer Barcode

Symbology number:	85
Valid characters:	“0”..”9”, 20 digits + 0, 5, 9, or 11-digit ZIP Code.
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Symbol size:	Up to 31 digits

This symbology is also known as

- OneCode 4CB
- USPS 4CB
- 4-CB
- 4-State Customer Barcode
- USPS OneCode Solution Barcode.

Encoded are:

- Barcode ID (1st digit: 0-9; 2nd digit: 0-4)
- Special services (range: 000-999)
- Customer ID (range: 000000-999999)
- Sequence number (range: 000000000-999999999)
- Delivery point ZIP code (0, 5, 9, or 11-digit ZIP code)

6.1.79 USPS Postnet 5

Symbology number:	40
Valid characters:	“0”..”9”, 5 digits + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Symbol size:	5 digits, 1 check-digit

This code is used by the United States Postal Services for mass-mailing applications. Encoded are a 5 digit ZIP-code. The check-digit is calculated automatically. It cannot be specified in the input data.

The bar code height should be adjusted to 3.2 mms; the module width to 0.423 mms; usually no plain text is displayed.

The newer USPS OneCode 4-State Customer Barcode additionally includes a 20 digits tracking code.

6.1.80 USPS Postnet 6

Symbology number:	41
Valid characters:	“0”..”9”, 5 digits + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Possible check-digits:	User supplied
Symbol size:	5 digits, 1 check-digit

Same as Postnet 5, but the check digit can be specified freely (the 6th digit). To be used only if the (correctly calculated) check digit is already part of the input data.

6.1.81 USPS Postnet 9

Symbology number:	42
Valid characters:	“0”..”9”, 9 + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Symbol size:	9 digits, 1 check-digit

This code is used by the United States Postal Services for mass-mailing applications. Encoded are a 5 digit ZIP-code and 4 additional digits. The check-digit is computed automatically, it cannot be specified in the input data.

The bar code height should be adjusted to 3.2 mms; the module width to 0.423 mms; usually no plain text is displayed.

The newer USPS OneCode 4-State Customer Barcode additionally includes a 20 digits tracking code.

6.1.82 USPS Postnet 10

Symbology number:	43
Valid characters:	“0”..”9”, 9 digits + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Possible check-digits:	User supplied
Symbol size:	9 digits, 1 check-digit

Same as Postnet 9, but the check digit can be specified freely (the 10th digit). To be used only if the (correctly calculated) check digit is already part of the input data.

6.1.83 USPS Postnet 11

Symbology number:	44
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Symbol size:	11 digits, 1 check-digit

This code is used by the United States Postal Services for mass-mailing applications. Encoded are a 5 digit ZIP-code and 4 to 9 additional digits. The check-digit is calculated automatically. It cannot be specified in the input data.

The bar code height should be adjusted to 3.2 mms; the module width to 0.423 mms; usually no plain text is displayed.

The newer USPS OneCode 4-State Customer Barcode additionally includes a 20 digits tracking code.

6.1.84 USPS Postnet 12

Symbology number:	45
Valid characters:	“0”..”9”, 11 digits + 1 check-digit
Quiet-zone:	vertical: 1/25 inch horizontal: 1/8 inch
Module width:	--
Standard print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	POSTNET (eCDPostNet)
Possible check-digits:	User supplied
Symbol size:	1 digits, 1 check-digit

Same as Postnet 11, but the check digit can be specified freely (the 12th digit). To be used only if the (correctly calculated) check digit is already part of the input data.

6.1.85 USS ITF 2-5

Uniform Symbology Specification ITF 2-5. Identical to Code 2 of 5 Interleaved. Another alias is Code 25.

6.1.86 USS Code 128

Uniform Symbology Specification Code 128. It is identical to Code 128.

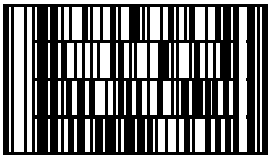
6.1.87 USS Code 39

Uniform Symbology Specification Code 39. It is identical to Code 39.

6.2 2D Symbologies

6.2.1 Codablock F

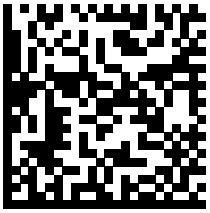
Symbology number:	74
Valid characters:	ASCII 0-127 + ISO 8859-1
Quiet-zone:	left/right/ top/bottom: 10X
Module-width:	X>=0.19mm
Print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	Automatic (symbology specific).
Size:	2 - 44 rows; 4 - 62 characters per row



Codablock F is de facto a “stacked” Code128 symbology. It is based upon Code 128 - each row is a single Code 128 symbol extended with row indicator information and additional check-digits. The UCC/EAN format indicator is supported.

6.2.2 Data Matrix

Symbology number:	71
Valid characters:	Alphanumeric (ASCII 0.. 255) and/or bytes
Quiet-zone:	left/right/ top/bottom: 1X
Module-width:	--
Print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Size:	.001 till 14.0 square inch



Data Matrix is used for encoding large amounts of data and is also ideal for marking small objects. The symbol size adjusts automatically depending on the amount of input data.

It was developed for the Space Shuttle Program, enhanced by the NASA and the Symbology Research Center.

It is the de-facto standard symbology in the following areas:

- Automotive
- Aviation (SPEC2000)
- Pharmaceutical areas

TEC-IT’s Data Matrix implementation complies to

- ECC200
- ANSI/AIM BC11

- ISO/IEC 16022
- Department of Defense UID, MIL-STD-130L
- and all other specifications that require ECC200.

The input data is always analyzed and the appropriate encoding mode is chosen automatically. Mode switching is done as required to produce the most efficient encoding. Supported encoding modes are

- BASE256
- C40
- TEXT
- ASCII.

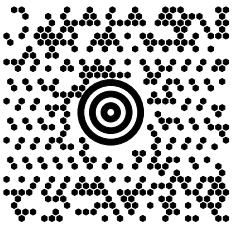
Maximum data capacity for binary data is equal to 1556 bytes using a Matrix of 144x144 dots. With a dot size of 0.35 mm minimum, you get a symbol size of 50.4 * 50.4 mm.

- The maximum data capacity for a matrix of 120x120 dots = 1048 Bytes.
- The maximum data capacity for a matrix of 96x96 dots = 694 Bytes.

In practice, with a hand-held scanner, you can scan sizes up to 96x96 dots without problems. Symbol sizes of 120x120 dots are ok if you are using (very) good scanners. However – TEC-IT recommends splitting up the 1 KB input data into 2 or more symbols.

6.2.3 MaxiCode

Symbology number:	57
Valid characters:	Alphanumeric (ASCII 0.. 255) and/or bytes
Default Mode:	Mode-4 (standard symbol)
Quiet-zone:	left/right/ top/bottom: 1X
Module-width:	--
Print-ratio:	n/a
Ratio-format:	n/a
Default check-digit:	Automatic (symbology specific).
Size:	Fix: 1.11 x 1.054 inch



MaxiCode is in use (and was invented) by UPS®.

MaxiCode represents data by drawing hexagonal items, which are arranged around a circular center (a so called "Bull's Eye"). Different encoding modes for including postal information (SCM) can be adjusted: UPS Modes are Mode 2 (US Carrier) and Mode 3 (Intern. Carrier).

The printing size is usually set to a fixed value. If you want to change the size of the symbol, adjust a custom module width (default is 0.870 mm).

6.2.3.1 MaxiCode & UPS®

The internal data structure is regulated by different "modes". The mode "Structured Carrier Message" (SCM) was defined by the parcel transport service UPS®. If you want to use MaxiCode for UPS, please use these SCM modes. For standard purposes, data can be encoded with two different error correction levels (SEC = Standard Error Correction and EEC = Enhanced E.C.).

With Structured Append you can divide larger quantities of data into several MaxiCode symbols – they are joined by the scanner when being read. The maximum data capacity of one symbol is 93 characters. By using the UPS MaxiCode compression software you can extend this value to about 100 characters. The actual quantity of the utilizable data depends on the selected mode, how often special characters are used, whether numeric sequences are used (which can be compressed) and the level of error correction.

Setting Parameters by Properties of TEC-IT Software

> ► Note: If you want to use MaxiCode for UPS, please use mode 2 or 3 (SCM) depending on your postal code. UPS MaxiCode compression works only for these SCM modes.

If you want to set the properties in your program code (e.g. Visual Basic, VBA,…) the names of the used ActiveX properties are enclosed in parenthesis. Here we are demonstrating the settings by using the property pages of **TBarCode**.

First set the mode (Property *MaxiCode.Mode*) to *2* (numeric postal code) if you want to encode a numeric Postcode (USA) – or *3* if you want to use letters in the Postcode (e.g. “D12345” for German PLZ).

- Then check "Use preamble" (property *MaxiCode.Preamble*) and enter the date into the field preamble date (property *MaxiCode.Date*, refer to “Message Header / Transportation Data” in the UPS® manual)
- Then enter Service Class (property *MaxiCode.ServiceClass*), Country Code (property *MaxiCode.CountryCode*) and Postal Code (property *MaxiCode.PostalCode*) into the according text boxes. (refer to Postal Code, Country Code, Class of Service in the UPS® manual)

- All other UPS® fields must be entered in 'Encoded data' (property *Text*) separated by Gs. At the end of the text Rs and Eot must be added.

Example: the text could look like this:

```
1Z12345677GsUSPNGs123556Gs089GsGs1/1\Gs0GsYGsGsSALT LAKE CITYGsUTRsEot
```

- Then replace all control characters (Gs, Rs, Eot) with their hexadecimal encoding (\xnn).(Gs with \x1d, Rs with \x1e, Eot with \0x04). Please refer to Escape Sequences for an overview of available escape sequences.

The text should now look like:

```
1Z12345677\x1dUSPN\x1d123556\x1d089\x1d\x1d1/1\x1d10\x1dY\x1d\x1dSALT LAKE
CITY\x1dUT\x1e\x04
```

- This corresponds to the UPS® Data fields: → Tracking Number, SCAC, UPS Account Number, Julian Day of Collection, place holder for Shipment ID Number, Package n/x, Package Weight, Address Validation, Place Holder for Ship To Street Address, Ship To City, Ship To State, End Of Transmission.
- At last check *Translate escape sequences* (property *EscapeSequences*). This is necessary to translate the hexadecimal codes internally into the special characters “Rs”, “Gs” and “Eot”.

Setting SCM Parameters in the Barcode Data itself

The parameters for SCM (Structured Carrier Message - used for UPS®) can be set directly in the barcode data. This allows complete control of all necessary parameters when using SCM from within an application where the property pages are not available.

The values for the properties postal code, country code, service class, preamble and date are extracted from the barcode data (*Text* property). If this data values are encoded in the text string the values of the belonging properties are overdriven.

The *Format* property of **TBarCode** must be set to "S" (switches extracting of SCM Data to “on”). And the property *EscapeSequences* must be switched on.

The *Text* property should contain the whole text according to UPS standard including preamble, date, postal code, country code and service class. Special characters and separators must be replaced by escape sequences Rs, Gs, Eot (also refer to Escape Sequences):

Example 1

A typical international data string would appear as follows:

[)>Rs01Gs96841706672Gs840Gs066Gs1Z12345677GsUPSNGs123556Gs089GsGs1/1Gs10GsYGsGsSALT LAKE CITYGsUTRsEot

Most of the information is easily identified and can be separated into its component data elements as shown below:

[)>Rs	Message Header
01Gs96	Transportation Data Format Header
841706672 Gs	Postal Code
840 Gs	Country Code
066 Gs	Class of Service
1Z12345677 Gs	Tracking Number
UPSNGs	SCAC
123556 Gs	UPS Account Number
089 Gs	Julian Day Of Collection
Gs	Place holder for Shipment ID Number
1/1 Gs	Package n/x
10Gs	Package Weight
YGs	Address Validation
Gs	Place holder for Ship To Street Address
SALT LAKE CITY Gs	Ship To City
UTRs	Ship To State
Eot	End of Transmission

There are additional characters contained in the data string

- **[)>Rs** is the message header
- **Gs** is used to separate field in a message
- **Rs** is used to separate format types
- **Eot** is the end of transmission character

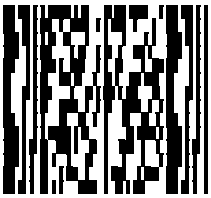
Notice that in example 1, the Shipment ID Number and Ship to Street Address are blank data elements that are separated with a Gs.

The class of service and shipper number fields in the 1Z number have been omitted in the MaxiCode tracking number field to avoid duplication within the symbol.

Figure 10: MaxiCode UPS Encoding

6.2.4 MicroPDF417

Symbology number:	84
Valid characters:	Alphanumeric and/or bytes
Quiet-zone:	left/right: 1X
Module-width:	--
Print-ratio:	1:2:3:4:5:6:1:2:3:4:5:6
Ratio-format:	1B:2B:3B:4B:5B:6B:1S:2S:3S:4S:5S:6S
Default check-digit:	Automatic (symbology specific).
Size:	--



TBarCode/X control sequence

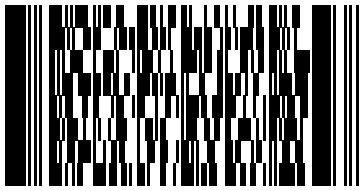
For V1.x:	*$_tbcs b84 dThis is a MicroPDF417$_tbce*
For V2.x:	*$_tbcs -b84 –d"This is a MicroPDF417"$_tbce*

This stacked 2D symbology is used to encode large quantities of data.

The input data is always analyzed and the appropriate encoding mode is chosen automatically. Mode switching is done as required to produce the most efficient encoding.

6.2.5 PDF417

Symbology number:	55
Valid characters:	Alphanumeric (ASCII 0.. 255) and/or bytes
Quiet-zone:	left/right: 2X
Module-width:	--
Print-ratio:	1:2:3:4:5:6:7:8:1:2:3:4:5:6
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B: 1S:2S:3S:4S:5S:6S
Default check-digit:	Automatic (symbology specific).
Size:	X >= 0.19 mm



This (stacked) 2D symbology is used to encode large quantities of data. It is the de-facto 2D standard symbology in the automotive industry.

The symbol is divided into rows and columns. TEC-IT software adjusts the size automatically depending on the amount of input data. A data-density of up to 900 characters per square inch is possible.

The input data is always analyzed and the appropriate encoding mode is chosen automatically. Mode switching is done as required to produce the most efficient encoding.

6.2.5.1 The Maximum Data Capacity of PDF417

The PDF417 specification defines the following limits (maximal data characters without error correction – *PDF417.ECLevel* = 0):

Numerical data only:	2710 digits
Bytes:	1108 (also used for control characters to switch to lowercase letters)
Text characters:	1850 (only uppercase letters used [A..Z])

If you mix the character types the maximum data capacity cannot be predicted exactly (due to internal compression and character set switching - this is by design).

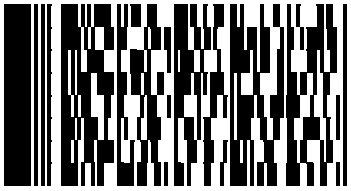
If you use a combination of digits and text (lower & uppercase letters) the maximum data capacity would be about 1100 to 1200 characters - but this can vary due to your input data. If you want to encode large data amounts we recommend using only capital letters or multiple symbols (structured append).

6.2.5.2 How to optimize PDF417 for FAX?

Adjust the resolution of the generated barcode to 200 dpi (FAX devices are usually using 200 dpi). Follow the instructions in chapter 7. Make sure the row-height of the PDF417 is at least 3 times the module width.

6.2.6 PDF417 Truncated

Symbology number:	56
Valid characters:	Alphanumeric (ASCII 0.. 255) and/or bytes
Quiet-zone:	left/right: 2X
Module-width:	--
Print-ratio:	1:2:3:4:5:6:7:8:1:2:3:4:5:6
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B: 1S:2S:3S:4S:5S:6S
Default check-digit:	Automatic (symbology specific).
Size:	--

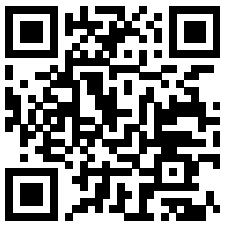


This (stacked) 2D symbology is used to encode large quantities of data.

The symbol is divided into rows and columns. TEC-IT software adjusts the size automatically depending on the amount of input data. A data-density of up to 900 characters per square inch is possible.

6.2.7 QR-Code

Symbology number:	58
Valid characters:	Alphanumeric and/or bytes, Kanji character set
Quiet-zone:	left/right/ top/bottom: 4X
Module-width:	--
Print-ratio:	1:1
Ratio-format:	1B:1S
Default check-digit:	Automatic (symbology specific).
Size:	--



This 2D symbology is used to encode large quantities of data and was developed for fast readability (QR = Quick Response Code) by Denso. The symbol size adjusts automatically depending on input data. Special industry formats are supported.

6.2.7.1 Kanji and Chinese Compaction

This symbology supports the compaction of Kanji characters and (in newer specifications) also the compaction of Chinese characters. The compaction of Kanji or Chinese characters can be activated in TEC-IT software – when used, it must be ensured that the input data complies with the Shift JIS X 02 (Japanese) or the GB 2312 (Simplified Chinese) character set.

6.2.7.2 QR–Code Capacity

Maximum data capacity for binary data is 2953 bytes using a matrix of 177x177 dots. As an example the symbol-version 22 (104x104 dots) can encode appr. 1 KB of data using a low error correction level. The resulting symbol size is about = 37x37 mm when a dot-size of 0.35 mm is used.

The input data is always analyzed and the appropriate encoding mode is chosen automatically. Mode switching is done as required to produce the most efficient encoding.

6.2.7.3 QR–Code Creation Speed

QR-Code is a quite complex symbology and may take a lot of CPU-time when encoding a very large amount of data. You could speed up the encoding process by

- Set the QR-Code mask pattern to a constant value. Changing this setting could affect readability.

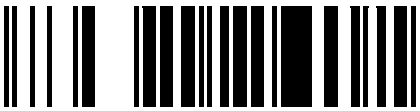
- Set the symbol size to a constant value (property *"QRCode.Version"*) if the symbol should have always the same size.
- Set the error correction level to "low" (*"QRCode.ECLevel"*). Changing this setting could affect readability.
- Minimize computing steps: set the configuration properties of **TBarCode** only one time at startup of your program, and do only change the text property for each barcode.

6.3 RSS - Reduced Space Symbologies

The sample control sequences refer to the following TEC-IT products only: **TBarCode/X** and **TBarCode Embedded** (SEH ISD 300).

6.3.1 RSS-14

Symbology number (:	29
Valid characters:	"0"..."9"
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Symbol size:	13 digits, 1 check-digit, AI 01 is encoded automatically

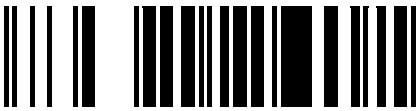


RSS-14 is used to encode the GTIN (Global Trade Item Number) with Application identifier (AI) "01". The GTIN consists of a packaging indicator (0..9) followed by a 12 digit number (taken from the EAN-13 article number system) followed by a check-digit. The check-digit on the 14th position is computed automatically if not provided in the input data.

The height of the symbol should be at least 33X to support omni-directional scanning (X…module width). TEC-IT software prefixes the barcode data with the AI "01" automatically - do not provide the AI 01 with your input data.

6.3.2 RSS-14 Truncated

Symbology number:	78
Valid characters:	"0"..."9"
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Symbol size:	13 digits, 1 check-digit, AI 01 is encoded automatically



This symbology is similar to RSS-14 but the height should be at least 13X. Omni-directional scanning may not be possible.

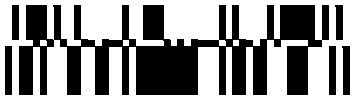
6.3.3 RSS Limited

Symbology number:	30
Valid characters:	“0”..”9”
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Symbol size:	13 digits, 1 check-digit

This symbology is similar to RSS-14 but is smaller in size and limited to a packaging indicator (first digit) 0 or 1.

6.3.4 RSS-14 Stacked

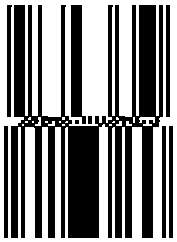
Symbology number:	79
Valid characters:	“0”..”9”, 13 digits + 1 check-digit
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Size:	--



This symbology is similar to RSS-14 but is split into 2 rows to make the symbol smaller. It is used for pharmaceutical packaging. Omni-directional scanning is not possible.

6.3.5 RSS-14 Stacked Omni directional

Symbology number:	80
Valid characters:	“0”..”9”, 13 digits + 1 check-digit
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Size:	--



This symbology is similar to RSS-14 Stacked and supports omni-directional scanning.

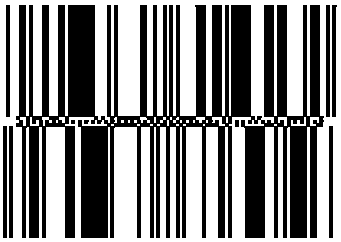
6.3.6 RSS Expanded

Symbology number:	31
Valid characters:	“A”..”Z”, “a”..”z”, “0”..”9” + ISO 646 character set
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	None (eCDNone).
Possible check-digits:	Modulo 10 (eCDMod10). EAN-14 (eCDEAN14)
Size:	Numeric: 74 digits Alphanumeric: 41 characters

This is a variable length symbology. It encodes up to 74 numeric or 41 alphabetic characters. Data should be encoded with Application Identifiers (AIs). Omni-directional scanning is possible.

6.3.7 RSS Expanded Stacked

Symbology number:	81
Valid characters:	“A”..”Z”, “a”..”z”, “0”..”9” + ISO 646 char set
Quiet-zone:	none required (1X recommended)
Module width:	--
Print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	None (eCDNone).
Possible check-digits:	Modulo 10 (eCDMod10). EAN-14 (eCDEAN14)
Size:	--



This is the stacked version of RSS Expanded. The number of data segments per row can vary between 4 and 22. The default number of data segments is 4.

6.4 EAN.UCC Composite Symbologies

6.4.1 Data input

- Please note: For all Composite Symbologies the vertical bar “|” character is used to separate the data of the linear symbol and the 2D composite component.
- Example: 1234567890123|TEC-IT

6.4.2 Data capacity of EAN.UCC Composite Symbols

6.4.2.1 Linear component

EAN-128:	up to 48 digits
EAN/UPC:	8, 12 or 13 digits
RSS Expanded:	up to 74 digits
Other RSS	16 digits (2 digits AI01 + 14 digits GTIN)

6.4.2.2 2D component

CC-A	up to 56 digits
CC-B	up to 338 digits
CC-C	up to 2361 digits

The maximum data capacity of the 2D component depends on the number of data columns, which also depends on the type of the linear component.

For instance, RSS-14 Stacked allows a 2D component with 2-data columns (CC-A or CC-B). In this case the maximum capacity of a CC-A would be 52 digits with special AI combination at the beginning of the data (AI 11/17 + 10), otherwise the capacity would be 48 digits.

With the other variants having 4 data columns (RSS Expanded, RSS-14...) the maximum data capacity is a little bit higher = 56 digits.

6.4.3 RSS-14 Composite Symbology

Symbology number:	29
Valid characters RSS-14:	“0”..”9”, 13 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Encoded data:	1234567890123|TEC-IT

This is a RSS-14 barcode with an attached 2D component (CC-A or CC-B). The leading Application Identifier (AI) 01 (for the GTIN) is prefixed automatically by TEC-IT software and must not occur in the input data. The 2D component can encode additional information like lot number, quantity, expiration date …

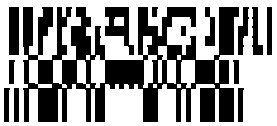
6.4.4 RSS-14 Truncated Composite Symbology

Symbology number:	78
Valid characters RSS-14:	“0”..”9”, 13 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Encoded data:	1234567890123|TEC-IT

This is a RSS-14 Truncated barcode with an attached 2D component (CC-A or CC-B).

6.4.5 RSS-14 Stacked Composite Symbology

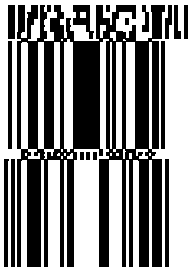
Symbology number:	79
Valid characters RSS-14:	“0”..”9”, 13 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Encoded data:	1234567890123|TEC-IT



This is a RSS-14 Stacked barcode with an attached 2D component (CC-A or CC-B).

6.4.6 RSS-14 Stacked Omni directional Composite Symbology

Symbology number:	80
Valid characters RSS-14:	“0”..”9”, 13 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Encoded data:	1234567890123|TEC-IT



This is a RSS-14 Stacked Omni directional barcode with an attached 2D component (CC-A or CC-B).

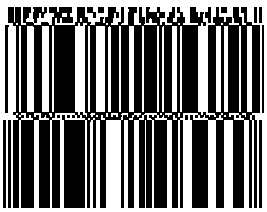
6.4.7 RSS Expanded Composite Symbology

Symbology number:	31
Valid characters RSS Exp.:	ASCII characters between 0..127
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	None (eCDNone).
Possible check-digits:	Modulo 10 (eCDMod10). EAN-14 (eCDEAN14)
Encoded data:	1234567890123|TEC-IT

This is a RSS Expanded barcode with an attached 2D component (CC-A or CC-B).

6.4.8 RSS Expanded Stacked Composite Symbology

Symbology number:	81
Valid characters RSS ES:	ASCII characters between 0..127
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	None (eCDNone).
Possible check-digits:	Modulo 10 (eCDMod10). EAN-14 (eCDEAN14)
Encoded data:	ABCabc123+|TEC-IT



This is a RSS Expanded Stacked barcode with an attached 2D component (CC-A or CC-B).

6.4.9 RSS Limited Composite Symbology

Symbology number:	30
Valid characters RSS Lim.:	“0”..”9”, 13 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:5:6:7:8:9:1:2:3:4:5:6:7:8:9
Ratio-format:	1B:2B:3B:4B:5B:6B:7B:8B:9B: 1S:2S:3S:4S:5S:6S:7S:8S:9S
Default check-digit:	EAN 14 (eCDEAN14)
Possible check-digits:	User supplied
Encoded data:	1234567890123|TEC-IT

This is a RSS Limited barcode with an attached 2D component (CC-A or CC-B).

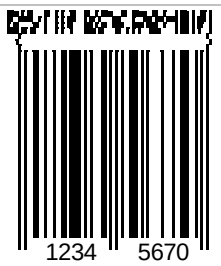
6.4.10 UCC/EAN-128 Composite Symbology

Symbology number:	16
Valid characters EAN 128:	ASCII-characters between 0..127
Valid characters CC-A/B/C:	ISO 646 character set, up to 2361 characters
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B1S:2S:3S:4S
Default check-digit:	None (eCDNone).
Possible check-digits:	Modulo 10 (eCDMod10). EAN-14 (eCDEAN14)
Encoded data:	1234567890|TEC-IT

This is a EAN-128 barcode with an attached 2D component (CC-A, CC-B or CC-C).

6.4.11 EAN-8 Composite Symbology

Symbology number:	10
Valid characters EAN 8:	“0”..”9”, 7 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-8 (eCDEAN8)
Possible check-digits:	User supplied
Encoded data:	1234567|TEC-IT



This is a EAN-8 barcode with an attached 2D component (CC-A or CC-B).

6.4.12 EAN-13 Composite Symbology

Symbology number:	13
Valid characters EAN 13:	“0”..”9”, 12 digits + 1 check-digit
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters
Standard print-ratio:	1:2:3:4:1:2:3:4
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S
Default check-digit:	EAN-13 (eCDEAN13)
Possible check-digits:	User supplied
Encoded data:	123456789012|TEC-IT

This is a EAN-13 barcode with an attached 2D component (CC-A or CC-B).

6.4.13 UPC-A Composite Symbology

Symbology number:	34	
Valid characters UPC-A:	“0”..”9”, 11 digits + 1 check-digit	
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters	
Standard print-ratio:	1:2:3:4:1:2:3:4	
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S	
Default check-digit:	UPC-A (eCDUPCA)	
Possible check-digits:	User supplied	
Encoded data:	12345678901|TEC-IT	

This is a UPC-A barcode with an attached 2D component (CC-A or CC-B).

6.4.14 UPC-E Composite Symbology

Symbology number:	37	
Valid characters UPC-A:	“0”..”9”, 7 digits + 1 check-digit	
Valid characters CC-A/B:	ISO 646 character set, up to 338 characters	
Standard print-ratio:	1:2:3:4:1:2:3:4	
Ratio-format:	1B:2B:3B:4B:1S:2S:3S:4S	
Default check-digit:	UPC-E (eCDUPCE)	
Possible check-digits:	User supplied	
Encoded data:	1234567|TEC-IT	

This is a UPC-E barcode with an attached 2D component (CC-A or CC-B).

7 Resolution and Readability

7.1 General

TEC-IT software computes barcode sizes and module widths automatically whenever possible. This automatic mode may reach its limits whenever one or more of the following conditions are met:

- Low output device resolution
- Very large data density
- Meeting industry standards (with pre-defined barcode parameters like the module width)
- Creating readable (decodable) barcode images like bitmaps – especially when used in browser based applications

7.2 Barcode Bitmaps

The barcode must be converted from its internal resolution (high) to a graphic pixel resolution (low). During this process it can happen that the module width varies due to rounding errors or that barcode modules are truncated if the resolution is too small.

7.2.1 Best Practice

The following methods are suitable to minimize graphical errors when reproducing the barcode through a bitmap:

- Enlarge the image resolution – use significantly higher values for *XSize* and *YSize*. This should avoid readability and scanning problems in most cases.
- Especially when using Code128 or other codes with high optical density you have to choose an essential higher resolution.
- Don't use any compression reducing the picture quality.
- Use multiple barcode symbols for higher data contents – try to reduce the optical density of the single code symbols.
- Use the property *OptResolution* to adapt the module width to the pixel resolution.

7.2.2 Optimization Methods

7.2.2.1 Optimize Resolution (Method 1)

Activate the property *OptResolution* (set it to "true"). This ensures that a barcode module is always rendered with an integer number of device pixels.

7.2.2.2 Use a Fixed Module Width (Method 2)

Use a *ModuleWidth* which matches the width of a device pixel (or an integer multiple of the pixel width). In screen resolution (96dpi) 1 pixel would be 0,2646 mm large. With a *ModuleWidth* of 265 the module width is adjusted to approximately 1 pixel (in 1/1000 mm).

If possible at least 2 pixels should be used for representing a single module (*ModuleWidth* = 529).

7.2.2.3 Optimize the Width of the Barcode Image (Method 3)

Ensure that the width of the barcode image (*SaveImage* parameter *XSize* [pixels]) equals the number of barcode modules (property *CountModules*). With such a setting it is achieved that the module width becomes exactly 1 pixel wide. In such a case many problems fall away:

- no matrix effects
- no rounding errors
- no module width variations

This procedure works for web applications (*ConvertToStream* method) as well as for storing image files (*SaveImage* method).

If you need wider barcodes, then select an integer multiple of *CountModules* for the width of the barcode image. This procedure guarantees optimal readability for all barcodes with integer based print-ratios.

7.2.2.4 Optimizing the HTML (Method 4)

In order to increase printing resolution you can produce the barcode with twice or triple resolution as used in the browser window. Within the HTML-code at client side it would look like

```
<img src="/images/barcode.jpg" width="250" height="60">
```

However, the barcode is produced with twice resolution like: *XSize*=500 pixels and *YSize*=120 pixels (using *SaveImage* or *ConvertToStream*). Use a larger font size (property *font*) to make the text look normal. To avoid big file sizes you could double only the horizontal but not the vertical resolution. To avoid distorted fonts switch the font in the barcode off and print the text separately using HTML.

7.2.3 Printing Resolution in Web-Applications

By default the browser renders all images assuming a resolution of 96 dpi (this is the screen resolution). So the smallest bar displayed in the browser can only be 1 screen pixel wide: 1 pixel is equal to 1/96 dpi which is 0.0104 inch (≅ 10 mils).

Without a specific width in the HTML image tag the module width can be 10 mils (1 pixel) or an integer multiple of 10 mils.

For printing other module widths (e.g. 15 mils) we need to generate a barcode image in optimal quality and scale the image using the HTML image tag.

7.2.3.1 Step 1 – Create the Image

Adapt the horizontal resolution of the barcode image to the number of barcode modules:

```
CntModules = tbc.CountModules        ' the number of modules in the barcode
BitmapWidth = 3 * CntModules         ' one module will be 3 pixels in the generated image
ImgByteArray = ConvertToStream (eIMBmp, BitmapWidth, 100 ...)
```

7.2.3.2 Step 2 – Scale the Image

Now we achieve our desired module width by scaling the generated image. In this example we use a required module width of 15 mils and a screen resolution of 96 dpi (which equals to 10 mils per pixel):

```
ImgTagWidth = (CntModules) * 15/10

' Image width in pixels = (Number of Modules in the Barcode) * ModuleWidth in Pixels
' ModuleWidth in Pixels = (Required Module Width) / (Width of one Pixel)

<img src="<%="Barcode.asp?" & URLPARAM%>" width="<%=ImgTagWidth%>" height="50">
```

7.2.4 2D and Composite Barcodes as Images

To get a precise image you have to adjust the size of the image in pixels according to the required horizontal and vertical size of the barcode. By using the properties 2DXCols (number of columns in modules) and 2DXRows (number of “rows” in modules) the size of the image can be optimized:

```
TBarCode71.Text = "Somedata"
TBarCode71.BarCode = TBarCode7Lib.eBC_MicroPDF417
nScale = 5                                  ' 5 pixels per module
nXSize = TBarCode71.Get2DXCols * nScale
nYSize = TBarCode71.Get2DXRows * nScale
TBarCode71.SaveImage "D:/Temp/SomeFile.bmp", TBarCode7Lib.eIMBmp, nXSize, nYSize, 72, 72
```

8 Image Parameters

8.1 Image Types

Applying the methods *SaveImage* and *ConvertToStream* to the object, the barcode can be converted to a bitmap or vector format. The following image types with the corresponding compression options (parameter *nQuality*) are available. Please keep in mind that unreadable barcodes may be produced when creating a bitmap with low resolution (see 7.2.2).

8.1.1 Image Formats

Image Format	Enumeration (def. value)	Note
BMP	eIMBmp (0)	
EMF	eIMEmf (1)	not supported by *ConvertToStream* methods
EPS (Bitmap)	eIMEps (2)	not supported by *ConvertToStream* methods
GIF	eIMGif (3)	supported since **TBarCode 7**
JPG	eIMJpg (4)	
PCX	eIMPcx (5)	not supported by *ConvertToStream* methods
PNG	eIMPng (6)	
TIF	eIMTif (7)	
EPS (Vector)	eIMPsVector (8)	not supported by *ConvertToStream* methods

Table 15: Supported Image Types

8.1.2 Compression Modes

Image format	Compression / nQuality	Remark
BMP	0..1, 0 = uncompressed, 1 = compressed	
EMF	No compression is used	
EPS	Bitmap EPS: unused Vector EPS: adjust font substitution.	With vector EPS files you can choose between using Windows fonts (0) and using PostScript compatible fonts (1).
JPG	0..100, 0=highest compression, worst quality, 100 =lowest compression, best quality	Value of 100 suggested, especially for high data density
PCX	Not used	In *ConvertToStream* and *ConvertToStreamEx* not supported
PNG	PNGALLFILTERS (0) -> use best filter for each row (highest compression) PNGINTERLACE (1) -> Interlace filter PNGNOFILTER (2) -> no filter will be used (fastest runtime) PNGSUBFILTER (4) -> Difference filter with adjacent pixel PNGUPFILTER (6) -> Difference filter with pixel from the previous row PNGAVGFILTER (8) -> Average filter PNGPAETHFILTER (10) -> Paeth filter	To save an image in compressed mode and additional as interlaced file, you have to make a bit wise or operation with the defined constants (or simple adding the numbers). Example: to save a file with maximum compression and interlaced, the quality parameter is calculated as follows: PNGALLFILTERS | PNGINTERLACE
TIF	0.. No compression 1.. LZW* 2.. PackBits compression 3.. Group 3 1D compression 4.. Group 4 2D compression 5.. CCITT Group 3 compression	* LZW is supported with TBarCode 7 and higher

Table 16: Supported Image Compression Modes

9 Frequently Asked Questions

9.1 How to add the Leading and Trailing '*' for Code 39?

No action is required. The asterisks '*' are added automatically to the barcode.

9.2 How to add the Check-Digit to Code 39?

Simply select Modulo 43 (or another method) as check-digit Method. The automatically computed check-digit is appended at the end of the barcode.

9.3 How to add the Leading and Trailing 'A' (or B, C, D) for CODABAR?

Enter A&A in the format string (property *"Format"* – see section 4.5).

9.4 How to use a Specific Subset in Code 128?

Use the corresponding barcode types Code128A, 128B or 128C. The whole code will then be generated in the corresponding subset. If this is not possible with the current data, the software will change subsets as required. If you want to change the subset within the barcode enter A or B or C in the *"Format"* (see section 4.5).

9.5 How to use the Compressed Mode of Code 128?

Use the barcode type Code128 and make sure *"Format"* is empty.

9.6 How to generate a PDF417 symbol with an Aspect Ratio of 3:2?

In order to generate a PDF417 which utilizes the standard aspect ratio of 3:2 there are two possible methods:

9.6.1 Set a Row:Col Ratio of 11:1

```
Set Cols = 2
Set Rows = Cols * 11
```

9.6.2 Maintain a constant Ratio of Row Height / Module Width

Set a row height: module width ratio of 3:1 (default) by setting the module width to 500 (0.5 mm constant value) and PDF417 row height to 1500 (1.5 mm).

9.7 How to set a Specific Module Width?

You can adjust the module width (or X Dimension) by setting the property *ModuleWidth* to the desired value.

Per default the barcode adapts automatically to the object width (= to the dimension of the bounding rectangle). After adjusting module width the resulting barcode width depends on the amount of the encoded data characters and no longer on the width of the bounding rectangle.

- Keep in mind to choose a suitable size of the bounding rectangle to ensure that the barcode is not clipped.
- The dimension of the bounding rectangle must be wide enough to hold the largest data content possible. Use the property *MustFit* to check whether a barcode does not fit into the bounding rectangle.
- The “SizeMode” property (available in TBarCode V7) must be set to Custom Module Width if you want your settings to take effect.

10 Document History

13-10-06, Version 7.0	TBarCode Version 7, Revised by GuenterK, HaraldS
08-31-06, Version 6.0	USPS OneCode, StephanG
07-28-06, Version 6.0	Updated Related Symbologies, StephanG
03-24-06, Version 6.0	Product list updated, Sample Control Sequences added for TBarCode/X 2.0. MartinG
02-27-06, Version 6.0	Product list updated, Sample Control Sequences added for TBarCode/X 2.0. MartinG
09-30-05, Version 6.0	Revised, GuenterK
11-10-05, Version 6.0	Revised, GuenterK – Custom Drawing Functions
12-20-04, Version 6.0	Revised, New layout, GuenterK

11 Appendix

11.1 Index of Figures

11.2 Index of Tables

12 Contact and Support Information

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