



9.1 Basic Structure of GS1 Bar Codes using GS1 Application Identifiers

All GS1 bar code symbologies that use GS1 Application Identifiers have particular symbol characters to indicate that the data is encoded according to the GS1 Application Identifier rules. For example the GS1-128 Symbology uses the Function 1 Symbol Character (FNC1) in the position following the Start Character. This double start pattern is reserved for GS1 System applications worldwide. This makes it possible to distinguish GS1-128 Bar Codes from extraneous non-GS1 bar codes.

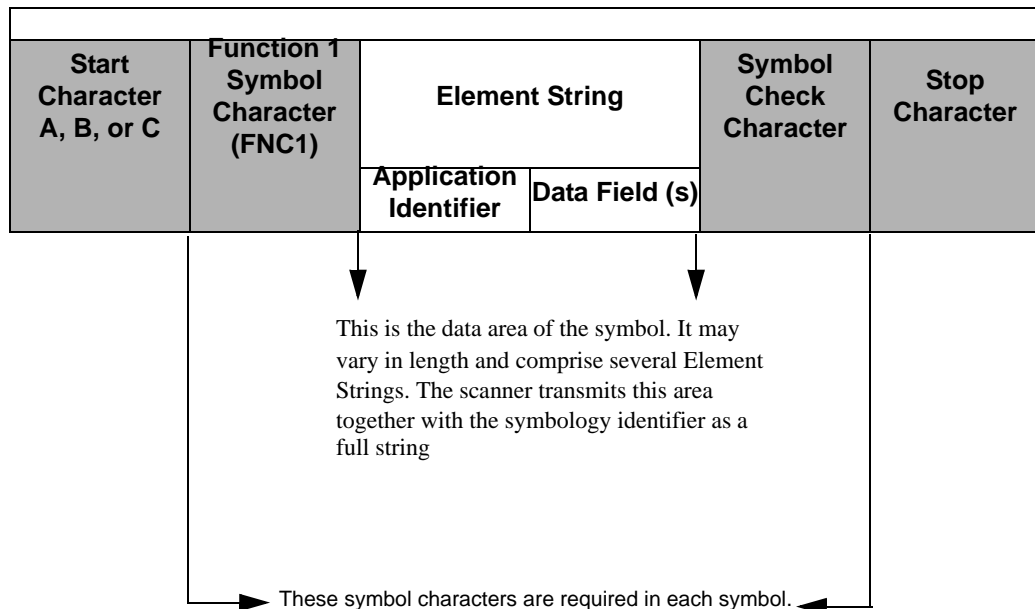


Figure 40 - Example GS1-128 Bar Code Structure

All GS1 bar code symbologies that use GS1 Application Identifiers allow several Element Strings to be encoded in one bar code, a process called concatenation. Concatenation is advantageous because it means that the symbology elements are only needed once, and the space required for the symbol is smaller than when separate bar codes are used to encode each Element String. It also improves scanning accuracy, allowing for single scanning rather than multiple scanning. The various Element Strings can be transmitted from the bar code reader as a single full string.

The various Element Strings, which are transmitted from concatenated bar codes, have to be analysed and processed. To simplify this procedure and reduce the symbol size, the lengths of some Element Strings are pre-defined (see Figure 41). Element Strings that are not contained in Figure 41 and that do not appear at the end of the symbol (encoded immediately before the Symbol Check Character) must be delimited to separate them from the Element String that follows. The delimiter shall be a Function 1 Symbol Character in GS1-128 Symbology, GS1 DataBar Expanded Versions and GS1 Composite Symbology and should be a Function 1 Symbol Character in GS1 DataMatrix Symbology and GS1 QR Code Symbology.



Figure 41 contains all Application Identifiers that have a predefined length and, therefore, do not require a Function 1 Symbol Character (FNC1) separator.

First Two Digits of the Application Identifier	Number of Characters (Application Identifier and Data Field)	First Two Digits of the Application Identifier	Number of Characters (Application Identifier and Data Field)
00	20	17	8
01	16	(18)	8
02	16	(19)	8
(03)	16	20	4
(04)	18	31	10
11	8	32	10
12	8	33	10
13	8	34	10
(14)	8	35	10
15	8	36	10
(16)	8	41	16

Figure 41 - Element Strings with Pre-Defined Length Using Application Identifiers

Note: Figure 41 is limited to the listed numbers and will remain unchanged. Those numbers in parentheses are not yet assigned. Application Identifiers starting with two digits that are not included in Figure 41 have a variable length even if the definition of the Application Identifier specifies a fixed length data field.



9.2 Concatenation

9.2.1 Pre-Defined Length Element Strings

Concatenated Element Strings constructed from Application Identifiers with a pre-defined length do not require a Separator Character. Each Element String is immediately followed by either the next Application Identifier or the Symbol Check Character and Stop Character.

For example, concatenation of net weight (4.00 kilograms) with the associated Global Trade Item Number (GTIN) 95012345678903 does not require the use of a Separator Character.

(01) has a pre-defined Element String length of 16 digits.

(31) has a pre-defined Element String length of 10 digits.



Figure 42 - Data Encoded in two GS1-128 Symbols



Figure 43 - Data Encoded in one Concatenated GS1-128 Symbol



9.2.2 Variable Length Data Strings

Concatenating Element Strings of variable length, including all Application Identifiers that do not start with two characters contained in Figure 41 involves the use of a Separator Character. The Separator Character used is the Function 1 Symbol Character (FNC1). It is placed immediately after the last symbol character of a variable length data string and is followed by the Application Identifier of the next Element String. If the Element String is the last to be encoded, it is followed by the Symbol Check and Stop Characters and not the FNC1 Separator Character.

For example, concatenation of price per unit of measure (365 currency units) and batch number (123456) requires the use of a Separator Character immediately after the price per unit of measure.

Figure A1.2 – 1 Data Encoded in two GS1-128 symbols

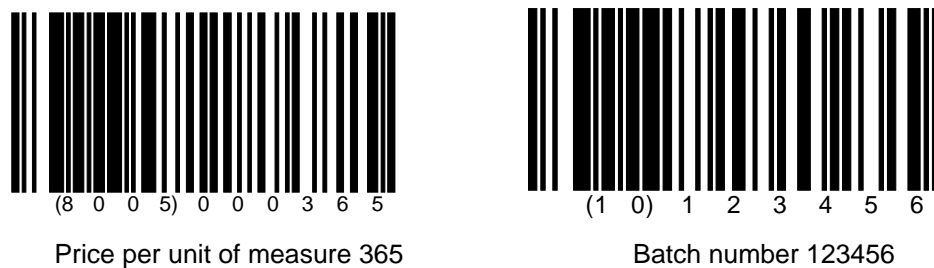


Figure 44 - Data Encoded in two GS1-128 Symbols



Figure 45 - Data Encoded in one Concatenated GS1-128 Symbol

Note: The FNC1 is not shown in Human Readable Interpretation.

9.2.3 Other considerations when using Concatenation

Concatenation is an effective means for presenting multiple Element Strings in a single bar code and should be used to conserve label space and optimise scanning operations when permitted by the application guideline (e.g., concatenation shall not be used with the GS1-128 bar code containing the SSCC on cartons or outer-cases).

When concatenating a mixture of pre-defined and other Element Strings, the pre-defined Element Strings should appear before the variable length Element Strings.



The FNC1 Separator Character appears in the decoded data string as <GS> (ASCII character 29, 7-bit character set ISO/IEC 646). An FNC1 is not required at the end of the last Element String represented in a GS1 Symbology using GS1 Application Identifiers. The processing routine allows for a FNC1 entered by error after an Element String contained in Figure 41.



(01)90614141000015(3202)000150

Figure 46 - Example of GS1 DataBar Expanded Stacked Bar Code that uses Concatenation

Concatenation may not be desirable in all circumstances (e.g., GS1 Logistic Labels are often constructed using multiple rows of bar code), in such cases the bar code containing the additional attribute data encoded using GS1 Application Identifiers should be printed in close proximity to the bar code containing the GS1 Identification Key.

9.3 Processing of Data from a GS1 Symbology using GS1 Application Identifiers

Figure on page 76 is a flowchart of the basic logic required for processing of data that includes GS1 Application Identifiers. This system logic holds true for any GS1 Symbology using GS1 Application Identifiers. The Symbology Identifiers listed in Figure are:

JC1 = GS1-128

Je0 = GS1 DataBar

Je1 = GS1 Composite Symbols

Je2 = GS1 Composite Symbols

Jd2 = GS1 DataMatrix

JQ3 = GS1 QR Code



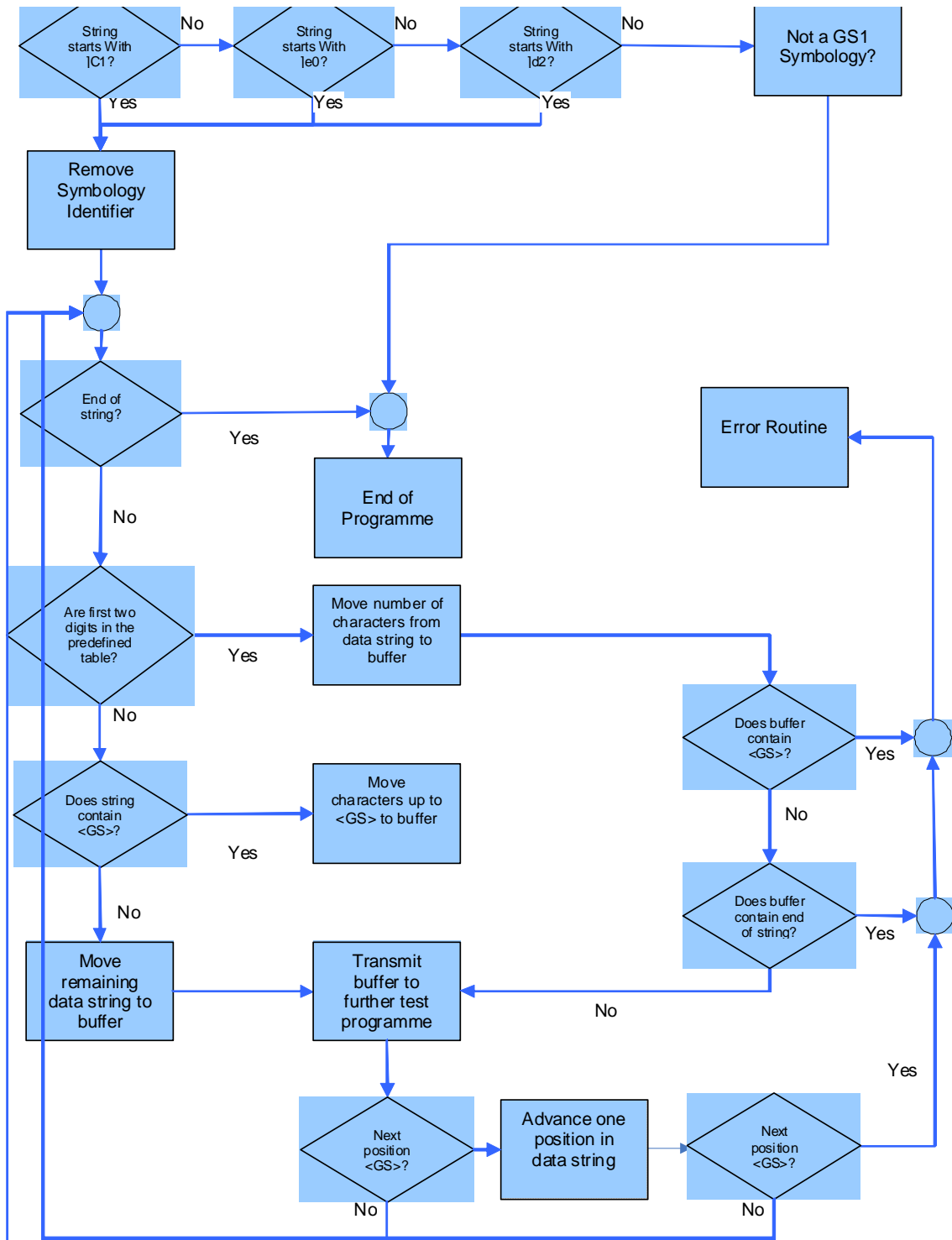


Figure 47 - Decoding Software Flowchart