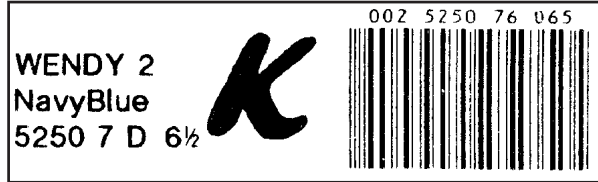


8 ITF Symbols

ITF (Interleaved Two of Five) symbols are used in the UK on such things as containers and library cards. They can be distinguished from the usual bar codes often used on products as ITF symbols do *not* have extended bars at the start, middle and end of the code.



The symbol is made up of *light* (white) and *dark* (black) parallel bars, of two widths *wide* and *narrow*.

The wide bars are three times the width of the narrow bars.

Any number to be represented by an ITF symbol must have an *even* number of digits.

The first four bars of an ITF symbol form the *start guard* – a narrow dark bar followed by a narrow light bar, then a narrow dark bar and a narrow light bar. At the end of the symbol, the final three bars form the *stop guard*: they are wide dark, narrow light and lastly, narrow dark.



Activity 1

Each digit has a code made up of exactly TWO '1's and THREE '0's. For example, the digit '0' has the code

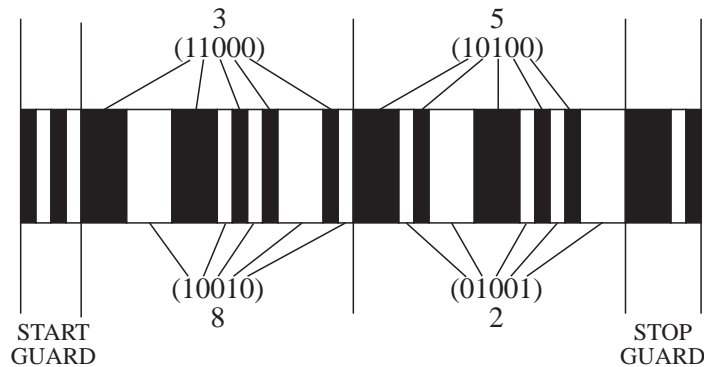
0 0 1 1 0

List all possible codes that could be used.

The codes for each of the 10 digits are given in Appendix 1.

In the design of the code, '1' means *wide* and '0' means *narrow*.

The example below shows the ITF symbol for the number 3852. The first two digits, **3** and **8**, are paired together – **3** is denoted by the dark bars and **8** by the light bars, arranged alternately.



Note the START and STOP GUARDS framing the number.



Example

Decode the following ITF code.



(Remember that there is a START and STOP GUARD on each code.)



Solution

Reading the thicknesses that follow the start guard gives

0 0 1 0 1 0 0 1 0 1 | 1 0 0 1 0 0 1 1 0 0

Taking the digits alternately, we have

0 1 1 0 0 } first half
0 0 0 1 1 }

1 0 0 1 0 } second half
0 1 0 1 0 }

This gives the number, from Appendix 1,

6 7 8 9



Exercise 1

Decode this ITF code.



In a similar way, we can put numbers into ITF code.



Example

Design the ITF symbol code for 4347.



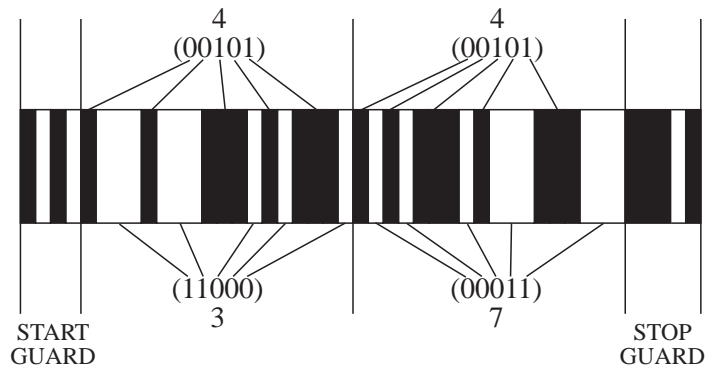
Solution

We take the numbers in pairs. First, using Appendix 1, for 43 we have

$$\left. \begin{array}{l} 4 \rightarrow 00101 \\ 3 \rightarrow 11000 \end{array} \right\} 0101100010 \quad (\text{alternately})$$

$$\left. \begin{array}{l} 4 \rightarrow 00101 \\ 7 \rightarrow 00011 \end{array} \right\} 0000100110$$

Hence, combining these with start and stop guards, we get



Exercise 2

Put into ITF symbol code the number 441035.

(You might find it helpful to use the grid in Appendix 2.)



Activity 2

What advantages/disadvantages does this type of bar code have in comparison with the EAN system described in Unit 3 ?

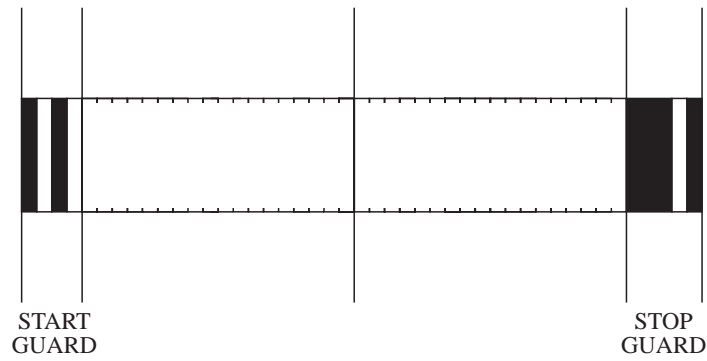
Appendix 1

Codes for ITF symbols

Value of Digit	Wide (1) and Narrow (0) Bars
0	00110
1	10001
2	01001
3	11000
4	00101
5	10100
6	01100
7	00011
8	10010
9	01010

Appendix 2

GRID for 4-digit numbers



GRID for 6-digit numbers

