International Securities Identification Number (ISIN)

An International Securities Identification Number (ISIN) uniquely identifies a security. An ISIN consists of three parts: Generally, **a two letter country code**, a **nine character alpha-numeric national security identifier**, and **a single check digit**. The nine-digit security identifier is the National Securities Identifying Number, or NSIN, assigned by governing bodies in each country, known as the national numbering agency (NNA). In North America the NNA is the CUSIP organization, meaning that CUSIPs can easily be converted into ISINs by adding the US or CA country code to the beginning of the existing CUSIP code and adding an additional check digit at the end. In the United Kingdom and Ireland the NNA is the London Stock Exchange and the NSIN is the SEDOL, converted in a similar fashion after padding the SEDOL number out with leading zeros. Most other countries use similar conversions, but if no country NNA exists then regional NNAs are used instead.

To calculate the ISIN check digit, first convert any letters to numbers by adding their ordinal position in the alphabet to 9, (so as an example, A = 10 and M = 22). Starting with the right most digit (that is not the check digit – remember we are trying to calculate the check digit so theoretically we don't know it yet), every other digit is multiplied by two. The resulting string of digits (numbers greater than 9 becoming two separate digits) are added up. Subtract this sum from the smallest number ending with zero that is greater than or equal to it (same as finding the remainder after dividing it by 10) this gives the check digit which is also known as the ten's complement of the sum modulo 10. That is, the resulting sum, including the check-digit, is a multiple of 10.

Examples

Apple Inc. ISIN= US037833100-5, Notice it has the country code "US" on the front, 9 digits in the middle and a check digit = 5. Here's how you determine how the check digit is calculated...

1. Convert any letters to numbers: U = 30, S = 28. So the ISIN (**WITHOUT the CHECK DIGIT**) changes from US037833100 to -> 3028037833100.
2. Collect all numbers in an "odd" position (this means the 1st, 3rd, 5th, etc…) in one group and all the numbers in an "even" position in another group.

   Thus, we have 3028037833100 = (3, 2, 0, 7, 3, 1, 0), (0, 8, 3, 8, 3, 0) = "odds", "evens"

3. Find the group above that contains the LAST DIGIT from the original (non-check digit) number (in this case it would be the "odds" since it has "0" in it. Multiply all the numbers in this group by 2 to get: 2*(3, 2, 0, 7, 3, 1, 0) = (6, 4, 0, 14, 6, 2, 0)
4. Add up the **individual digits** (so 14 = 1 + 4) from BOTH groups to get: (6 + 4 + 0 + (1 + 4) + 6 + 2 + 0) + (0 + 8 + 3 + 8 + 3 + 0) = 45
5. Divide by 10 and keep track of the remainder – so we have 45/10 = 4 with remainder = 5
6. Subtract the remainder from 10, so we have: 10 - 5 = 5
7. The above is your Check digit UNLESS it = 0, then your check digit is 10. In the case of Apple, Inc. the check digit is 5 as listed above in it's ISIN.

Example 2

TREASURY CORP VICTORIA 5 3/4% 2005-2016 (A Bond issue) has ISIN = AU0000XVGZA3

1. Convert any letters to numbers: A = 10, G = 16, U = 30, V = 31, X = 33, Z = 35. AU0000XVGZA -> 103000003331163510.
2. Collect odd and even characters: 103000003331163510 = (1, 3, 0, 0, 3, 3, 1, 3, 1), (0, 0, 0, 0, 3, 1, 6, 5, 0)
3. Multiply the group containing the rightmost character (which is the SECOND group) by 2: (0, 0, 0, 0, 6, 2, 12, 10, 0)
4. Add up the individual digits:
   (1 + 3 + 0 + 0 + 3 + 3 + 1 + 3 + 1) + (0 + 0 + 0 + 0 + 6 + 2 + (1 + 2) + (1 + 0) + 0) = 27
5. Divide by 10 and keep track of the remainder, we have 27/10 = 7
6. Subtract from 10 to get: 10 - 7 = 3
7. Since 3 doesn't = 0, we have our answer, the check digit is valid and is "3" as listed above.

EAN-13 Bar Code (from http://www.barcodeisland.com/ean13.phtml)

To calculate the check digit use all digits except c heck digit and use a 1,3,1,3,1,3,1,3,1,3,1,3 weighting sum. Add up the numbers from the multiplication and divide by 10 and take note of your remainder. (as was done above with ISIN) Calculate 10 minus the remainder and you have the check digit.

The table below shows the **coding system for EAN bar codes**. Remember that 0 represents light and 1 represents dark.

	Left-side code		Right-side code
Digit	**Odd Parity**	**Even Parity**	
0	0001101	0100111	1110010
1	0011001	0110011	1100110
2	0010011	0011011	1101100
3	0111101	0100001	1000010
4	0100011	0011101	1011100
5	0110001	0111001	1001110
6	0101111	0000101	1010000
7	0111011	0010001	1000100
8	0110111	0001001	1001000
9	0001011	0010111	1110100

Odd or Even "Parity" of the first 6 digits (including the first) is determined by the first digit of the EAN bar code using the following table:

First Digit	Digit Parity (ordered from left to right)					
	1	**2**	**3**	**4**	**5**	**6**
0	Odd	Odd	Odd	Odd	Odd	Odd
1	Odd	Odd	Even	Odd	Even	Even
2	Odd	Odd	Even	Even	Odd	Even
3	Odd	Odd	Even	Even	Even	Odd
4	Odd	Even	Odd	Odd	Even	Even
5	Odd	Even	Even	Odd	Odd	Even
6	Odd	Even	Even	Even	Odd	Odd
7	Odd	Even	Odd	Even	Odd	Even
8	Odd	Even	Odd	Even	Even	Odd
9	Odd	Even	Even	Odd	Even	Odd

An EAN-13 bar code has the following physical structure:

- Left-hand guard bars, or start sentinel, encoded as **101**.
- The second character of the number system code, encoded as described below.
- The five characters of the manufacturer code, encoded as described below.
- Center guard pattern, encoded as **01010**.
- The five characters of the product code, encoded as right-hand characters, described below.
- Check digit, encoded as a right-hand character, described below.
- Right-hand guard bars, or end sentinel, encoded as **101**.

The characters that are encoded to the left of the center guard pattern are considered the "left hand side" of the symbol whereas all characters encoded to the right of the center guard pattern are considered the "right hand side" of the symbol.

ENCODING EXAMPLE

This example will encode the EAN-13 bar code which represents the value "**7501031311309**". This is number system "75", manufacturer code "01031", product code "31130" (the check digit is "9", but we're going to calculate that in this example). This is the bar code from a 12-ounce can of Pepsi in the country of Mexico.

First, we calculate the check digit: Summing the weighted sums we arive at 7 + 15 + 0 + 3 + 0 + 9 + 1 + 9 + 1 + 3 + 3 + 0 = 51. We must add 9 to make 51 evenly divisible by 10 (51 + 9 = 60), therefore the check digit is 9. This matches the trailing "9" that we observed in the bar code, so we calculated it correctly.

Next, we observe that the first digit of the number system code (the left-most digit in the bar code) is the digit "7". Consulting the parity encoding table for the digit "7", we find that the parity for the second number system digit and the manufacturer code should follow the pattern "Odd/Even/Odd/Even/Odd/Even." That means the second number system digit will be encoded from the "left-hand odd" parity table, the first digit of the manufacturer code will be encoded with "left-hand even" parity, etc. We can now start encoding our bar code with the following steps, or sections. The bar code is then constructed by simply concatenating all the strings together.

1. LEFT GUARD BARS (always the same): **101**.
2. SECOND NUMBER SYSTEM DIGIT [5]: Encoded with left-hand odd parity, **0110001**.
3. 1st MANUFACTURER DIGIT [0]: Encoding with left-hand even parity, **0100111**.
4. 2nd MANUFACTURER DIGIT [1]: Encoded with left-hand odd parity, **0011001**.
5. 3rd MANUFACTURER DIGIT [0]: Encoded with left-hand even parity, **0100111**.
6. 4th MANUFACTURER DIGIT [3]: Encoded with left-hand odd parity, **0111101**.
7. 5th MANUFACTURER DIGIT [1]: Encoded with left-hand even parity, **0110011**.
8. CENTAR GUARD BARS (always the same): **01010**.
9. 1st PRODUCT CODE DIGIT [3]: Encoded as right-hand character, **1000010**.
10. 2nd PRODUCT CODE DIGIT [1]: Encoded as right-hand character, **1100110**.
11. 3rd PRODUCT CODE DIGIT [1]: Encoded as right-hand character, **1100110**.
12. 4th PRODUCT CODE DIGIT [3]: Encoded as right-hand character, **1000010**.
13. 5th PRODUCT CODE DIGIT [0]: Encoded as right-hand character, **1110010**.
14. CHECK DIGIT [9]: Encoded as right-hand character, **1110100**.
15. RIGHT GUARD BARS (always the same): **101**.

Remember, a "1" represents a bar and a "0" represents a space. Thus if we convert this string of numbers to their graphical representation we end up with the following bar code:

In order to see more clearly the construction of the bar code, the following graphic shows the exact same bar code but each character, or section, of the bar code is indicated by alternating colors. Above the bar code, in each colored section, is a number from 1 to 15, which corresponds to each of the "steps," or sections, described above. You may easily compare the 1-0 sequence of each step to the graphical representation below: