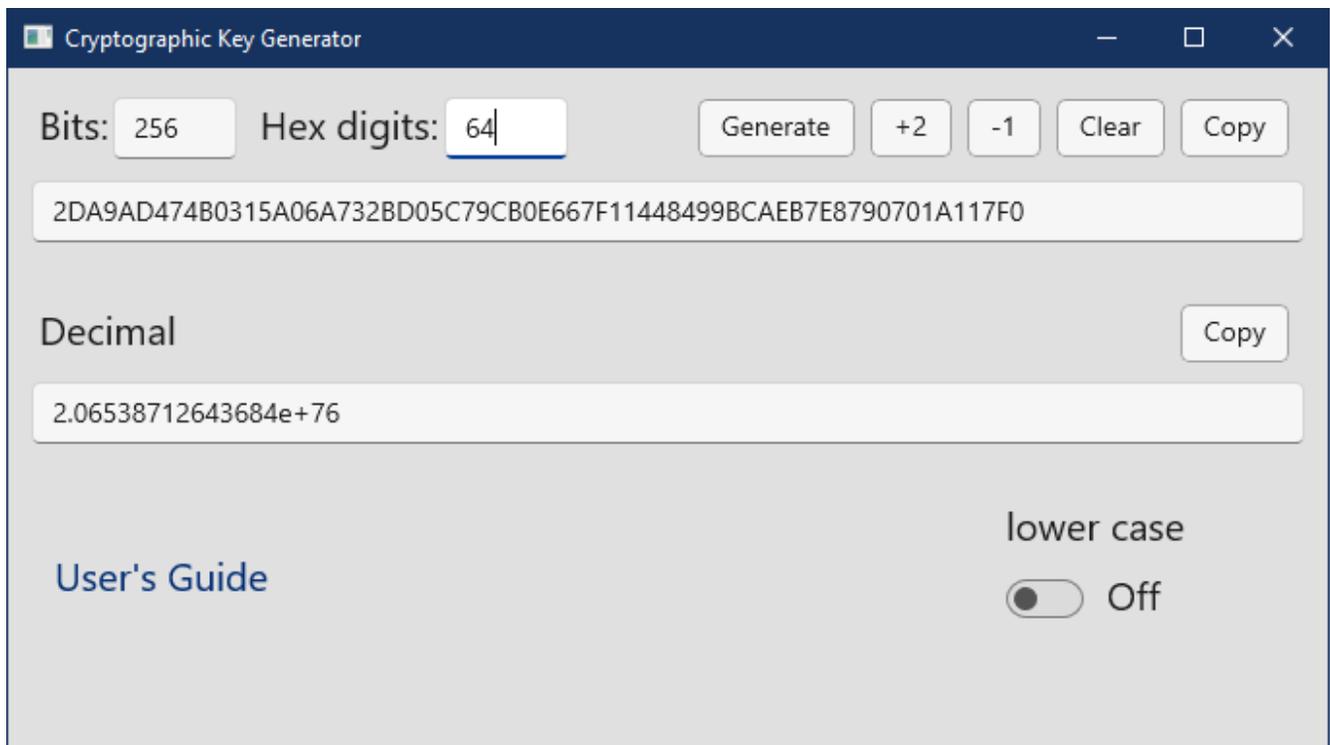# Cryptographic Key Generator
User's Guide

The first time CKG is run, its window appears in the default size determined by Windows. Dragging the right and bottom borders, the user can resize the window to any convenient size, and CKG will retain that position and size in subsequent sessions.

Operation of CKG is straightforward. Enter the number of bits or of hex digits desired, click **Generate**, and a strong cryptographic key is generated and appears in hexadecimal format in the text box below the top line of controls. One hex digit represents 4 bits, therefore the number of bits should always be a multiple of 4. For example, a 256-bit encryption key is specified by entering 256 in the Bits box, or by entering 64 in the Hex digits box. After that, a new key of that length is generated each time the **Generate** button is clicked. If the two numbers do not match in a 4:1 ratio, the last value entered

determines the value of the other. An unusual number of bits, such as 19, is automatically rounded down to the nearest multiple of 4, in this case 16, when **Generate** is clicked.

When either the Bits box or the Hex digits box has the input focus, pressing the Enter key has the same effect as clicking **Generate**. When neither of those boxes has the input focus, pressing the Enter key has the same effect as clicking the last button that was clicked. After a key has been generated, a new key of the same length is generated each time the Enter key is pressed.

A key of any length can be generated, up to a limit of 16,384 bits, represented by 4096 hex digits. The text box will expand vertically to accommodate such a large key, which could take more than 30 seconds to generate.

An alternative method of input is to add 8 bits (2 hex digits) to the key with each click of the mouse on the **+2** button.

The **-1** button deletes 1 hex digit (4 bits) from the end of the key.

The **Clear** button returns CKG to its initial state, ready for input.

When a key has been generated, the **Copy** button copies the key as hexadecimal text to the Windows clipboard. From there, it can be pasted into any application that requires a cryptographic key, or into a text file and saved to disk.

Upper case is the default format of hex digits, but they can be displayed or converted to lower case by toggling the **lower case** switch On. Toggling the switch Off converts digits back to upper case. The setting of that switch is saved for future sessions.

The Decimal text box displays the string of hex digits as a decimal number, in case a random number is needed for another purpose besides a cryptographic key. For a given number of hexadecimal digits, the highest value v a decimal number can have is

$v = 16^n - 1$

where n is the number of hexadecimal digits, and the range of the random decimal number is 0 through v. The upper limit to the exact value a decimal number can be displayed is 18,446,744,073,709,551,615, the highest possible value that can be stored in a 64-bit unsigned integer. Above that limit, display of the decimal number is in scientific or exponential notation, in which the number of significant digits is 15, and the exponent indicates magnitude. The **Copy** button to the right copies the decimal number to the clipboard as text.

The Algorithm used to generate the sequence of bits that comprise a cryptographic key depends on the CPU on which CKG is running. Intel 5th-generation Core i3, Core i5, Core i7, Core Ultra, Xeon processors, and later generations, have Intel® Secure Key Technology, in which the Enhanced Non-deterministic Random Number Generator meets the RBG3 construction requirements defined in NIST SP 800-90C. That random number generator derives entropy from quantum fluctuations of thermal noise within the CPU, and CKG uses that generator when running on a CPU that has it. AMD Ryzen 1000 and subsequent generations feature equivalent technology, which CKG also uses. When such technology is available, CKG displays the message "Using Intel® Secure Key Technology" in the hexadecimal text box when launched. Confirmation as to whether or not that technology is present can be obtained by right-clicking the **Copy** button to the right and above the Decimal text box.

When the Intel Enhanced Non-deterministic Random Number Generator, or its AMD equivalent, is not available, CKG uses its own algorithm that generates cryptographically secure, true random sequences of bits. To do that, CKG derives entropy from computer hardware, using time-variant sampling and distributive techniques.

Test results

The National Institute of Standards and Technology in the United States has developed and maintains *A Statistical Test Suite for Random and Pseudorandom Number Generators for Cryptographic Applications,* outlined in Special Publication 800-22. It is a software package that consists of 15 tests that take as input a sequence of binary bits and evaluate it for randomness.

A test version of CKG, running on a 3rd generation Intel Core i5 CPU that does *not* have the Enhanced Non-deterministic Random Number Generator of Intel® Secure Key Technology, was used to write ten sequences of 1,048,576 bits to a binary file. That file was read as input by the NIST suite of tests, and CKG passed 188 of 188 tests, an expected result for a high-quality true random number generator. Below is a copy of the Final Analysis Report generated by the test software.

```
------------------------------------------------------------------------------
RESULTS FOR THE UNIFORMITY OF P-VALUES AND THE PROPORTION OF PASSING SEQUENCES
------------------------------------------------------------------------------
   generator is <test18.bin>
------------------------------------------------------------------------------
 C1  C2  C3  C4  C5  C6  C7  C8  C9 C10   P-VALUE  PROPORTION  STATISTICAL TEST
------------------------------------------------------------------------------
  1   2   0   1   1   0   0   3   2   0  0.350485    10/10     Frequency
  0   0   3   0   1   3   1   1   0   1  0.213309    10/10     BlockFrequency
  1   2   1   1   2   0   0   1   0   2  0.739918    10/10     CumulativeSums
  1   2   1   2   1   0   0   0   0   3  0.350485    10/10     CumulativeSums
  2   1   1   0   0   0   1   1   3   1  0.534146     9/10     Runs
  0   2   1   1   1   0   2   1   1   1  0.911413    10/10     LongestRun
  1   1   0   1   1   0   2   1   1   2  0.911413    10/10     Rank
  0   1   1   0   1   3   0   0   2   2  0.350485    10/10     FFT
  1   0   2   0   1   2   1   2   0   1  0.739918    10/10     NonOverlappingTemplate
  1   0   0   2   0   1   2   1   1   2  0.739918    10/10     NonOverlappingTemplate
  0   0   0   2   0   1   2   2   1   2  0.534146    10/10     NonOverlappingTemplate
  2   1   1   0   0   1   1   0   2   2  0.739918    10/10     NonOverlappingTemplate
  1   0   0   1   3   0   1   1   2   1  0.534146    10/10     NonOverlappingTemplate
  1   0   1   0   1   3   0   1   3   0  0.213309     9/10     NonOverlappingTemplate
  2   0   2   2   2   0   1   0   0   1  0.534146    10/10     NonOverlappingTemplate
  0   1   1   1   1   0   2   3   0   1  0.534146    10/10     NonOverlappingTemplate
  2   0   1   2   1   1   0   0   0   3  0.350485    10/10     NonOverlappingTemplate
  2   1   0   0   1   2   1   1   1   1  0.911413    10/10     NonOverlappingTemplate
  1   1   0   0   1   2   0   2   2   1  0.739918    10/10     NonOverlappingTemplate
  1   1   2   0   1   1   0   1   1   2  0.911413    10/10     NonOverlappingTemplate
  3   1   1   2   0   1   0   1   0   1  0.534146    10/10     NonOverlappingTemplate
  0   1   0   0   0   1   1   2   0   5  0.008879    10/10     NonOverlappingTemplate
  2   0   1   2   0   1   1   1   2   0  0.739918    10/10     NonOverlappingTemplate
  1   0   1   1   3   0   2   1   0   1  0.534146     9/10     NonOverlappingTemplate
  1   1   1   1   2   2   0   1   0   1  0.911413    10/10     NonOverlappingTemplate
  2   0   1   1   1   2   1   1   0   1  0.911413    10/10     NonOverlappingTemplate
  2   0   2   0   1   1   1   1   2   0  0.739918    10/10     NonOverlappingTemplate
```

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0	0	2	0	0	1	2	2	2	1	0.534146	10/10	NonOverlappingTemplate
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0	1	1	2	1	1	1	0	1	2	0.911413	10/10	Universal
1	0	2	0	1	1	1	1	3	0	0.534146	10/10	ApproximateEntropy

```
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    0    1    0    0    1    0    1    0    2    0    ----      5/5     RandomExcursions
    0    1    1    0    1    0    0    1    0    1    ----      5/5     RandomExcursions
    1    0    0    0    2    0    0    1    0    1    ----      5/5     RandomExcursions
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    2    1    0    0    2    3    1    1    0    0   0.350485   10/10    Serial
    1    0    0    3    0    0    1    1    2    2   0.350485   10/10    LinearComplexity


- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
The minimum pass rate for each statistical test with the exception of the
random excursion (variant) test is approximately = 8 for a
sample size = 10 binary sequences.

The minimum pass rate for the random excursion (variant) test
is approximately = 4 for a sample size = 5 binary sequences.

For further guidelines construct a probability table using the MAPLE program
provided in the addendum section of the documentation.
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

For comparison, below is the Final Analysis Report for ten sequences of 1,048,576 bits generated by CKG running on a 5th generation Intel Core i7 CPU that *does* have the Enhanced Non-deterministic Random Number Generator of Intel® Secure Key Technology.

```
------------------------------------------------------------------------------
RESULTS FOR THE UNIFORMITY OF P-VALUES AND THE PROPORTION OF PASSING SEQUENCES
------------------------------------------------------------------------------
   generator is <test19.bin>
------------------------------------------------------------------------------
 C1  C2  C3  C4  C5  C6  C7  C8  C9 C10   P-VALUE  PROPORTION  STATISTICAL TEST
------------------------------------------------------------------------------
    0    2    1    2    1    0    0    0    2    2   0.534146   10/10     Frequency
    0    0    1    2    2    1    1    1    2    0   0.739918   10/10     BlockFrequency
    0    2    2    1    0    1    1    0    2    1   0.739918   10/10     CumulativeSums
    0    2    2    0    0    0    2    2    0    2   0.350485   10/10     CumulativeSums
    0    2    2    1    0    1    0    0    1    3   0.350485   10/10     Runs
    3    0    0    2    2    1    1    1    0    0   0.350485   10/10     LongestRun
    2    1    2    1    0    1    0    0    2    1   0.739918   10/10     Rank
```

1	1	1	0	2	1	2	0	1	1	0.911413	10/10	FFT
3	0	0	1	0	1	2	2	0	1	0.350485	10/10	NonOverlappingTemplate
0	2	1	1	2	3	1	0	0	0	0.350485	10/10	NonOverlappingTemplate
1	0	1	0	2	1	1	2	1	1	0.911413	10/10	NonOverlappingTemplate
1	1	1	1	2	3	1	0	0	0	0.534146	10/10	NonOverlappingTemplate
0	5	0	2	0	1	0	1	0	1	0.008879	10/10	NonOverlappingTemplate
1	1	0	1	1	2	0	1	0	3	0.534146	10/10	NonOverlappingTemplate
0	2	1	2	0	2	1	0	1	1	0.739918	10/10	NonOverlappingTemplate
1	0	1	1	2	0	2	1	1	1	0.911413	10/10	NonOverlappingTemplate
0	1	0	2	2	3	0	1	0	1	0.350485	10/10	NonOverlappingTemplate
1	2	0	1	0	1	1	2	2	0	0.739918	10/10	NonOverlappingTemplate
2	2	0	1	1	1	1	0	1	1	0.911413	10/10	NonOverlappingTemplate
1	1	1	3	0	0	0	1	2	1	0.534146	10/10	NonOverlappingTemplate
1	0	2	1	0	3	1	0	2	0	0.350485	10/10	NonOverlappingTemplate
4	0	0	1	0	0	3	0	1	1	0.035174	10/10	NonOverlappingTemplate
0	0	1	1	3	1	1	0	0	3	0.213309	10/10	NonOverlappingTemplate
0	4	0	0	2	0	1	2	0	1	0.066882	10/10	NonOverlappingTemplate
2	1	1	1	0	1	1	0	1	2	0.911413	10/10	NonOverlappingTemplate
1	1	1	0	2	2	1	0	2	0	0.739918	10/10	NonOverlappingTemplate
0	2	3	1	1	0	1	0	2	0	0.350485	10/10	NonOverlappingTemplate
2	2	0	1	1	2	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
3	2	2	1	0	0	2	0	0	0	0.213309	10/10	NonOverlappingTemplate
2	0	2	2	1	0	2	0	0	1	0.534146	10/10	NonOverlappingTemplate
1	1	2	0	1	1	0	2	1	1	0.911413	9/10	NonOverlappingTemplate
1	1	2	2	0	2	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
1	2	1	0	0	1	1	0	1	3	0.534146	10/10	NonOverlappingTemplate
2	1	1	1	2	1	0	1	1	0	0.911413	10/10	NonOverlappingTemplate
0	4	0	1	1	0	0	2	0	2	0.066882	10/10	NonOverlappingTemplate
0	2	1	1	0	2	1	3	0	0	0.350485	10/10	NonOverlappingTemplate
1	0	1	0	0	0	1	3	3	1	0.213309	10/10	NonOverlappingTemplate
2	4	0	1	1	1	0	0	0	1	0.122325	10/10	NonOverlappingTemplate
1	1	2	0	1	2	1	1	1	0	0.911413	10/10	NonOverlappingTemplate
0	0	1	2	0	3	1	1	0	2	0.350485	10/10	NonOverlappingTemplate
0	1	1	0	1	2	4	1	0	0	0.122325	10/10	NonOverlappingTemplate
0	0	0	0	3	0	0	2	2	3	0.066882	10/10	NonOverlappingTemplate
0	3	2	0	0	2	0	1	1	1	0.350485	10/10	NonOverlappingTemplate
1	0	1	1	2	3	0	1	0	1	0.534146	10/10	NonOverlappingTemplate
0	1	0	1	0	2	3	0	2	1	0.350485	10/10	NonOverlappingTemplate
3	0	0	1	2	0	1	0	2	1	0.350485	10/10	NonOverlappingTemplate
2	0	2	3	1	0	1	1	0	0	0.350485	9/10	NonOverlappingTemplate
1	2	0	4	1	0	1	1	0	0	0.122325	9/10	NonOverlappingTemplate
0	2	1	1	2	2	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
0	2	2	2	1	1	1	0	0	1	0.739918	10/10	NonOverlappingTemplate
0	0	2	1	0	2	1	1	2	1	0.739918	10/10	NonOverlappingTemplate
2	2	0	2	0	0	0	0	4	0	0.035174	10/10	NonOverlappingTemplate
3	1	0	1	1	1	2	0	1	0	0.534146	10/10	NonOverlappingTemplate
2	0	2	0	3	0	0	2	1	0	0.213309	9/10	NonOverlappingTemplate
0	0	0	2	2	0	1	0	3	2	0.213309	10/10	NonOverlappingTemplate
0	0	1	0	2	1	2	2	0	2	0.534146	10/10	NonOverlappingTemplate
0	1	1	0	2	0	2	2	2	0	0.534146	10/10	NonOverlappingTemplate
0	1	0	1	1	0	1	3	2	1	0.534146	10/10	NonOverlappingTemplate
3	1	0	0	0	2	1	1	1	1	0.534146	10/10	NonOverlappingTemplate
1	0	2	1	0	1	1	0	2	2	0.739918	10/10	NonOverlappingTemplate
2	2	2	0	2	0	1	0	0	1	0.534146	10/10	NonOverlappingTemplate
3	1	1	0	1	2	2	0	0	0	0.350485	10/10	NonOverlappingTemplate
0	0	1	1	0	1	4	1	1	1	0.213309	10/10	NonOverlappingTemplate
0	0	1	2	3	0	1	2	0	1	0.350485	10/10	NonOverlappingTemplate
0	1	0	1	0	1	2	4	1	0	0.122325	10/10	NonOverlappingTemplate
0	1	1	1	1	0	2	2	1	1	0.911413	10/10	NonOverlappingTemplate
1	0	2	0	2	0	1	2	0	2	0.534146	10/10	NonOverlappingTemplate
0	2	3	1	2	0	1	0	1	0	0.350485	10/10	NonOverlappingTemplate
1	2	0	0	1	1	2	1	1	1	0.911413	10/10	NonOverlappingTemplate
1	1	1	1	1	2	0	1	1	1	0.991468	10/10	NonOverlappingTemplate
1	0	1	0	3	0	1	0	2	2	0.350485	10/10	NonOverlappingTemplate
0	3	0	2	1	1	2	0	0	1	0.350485	10/10	NonOverlappingTemplate
2	0	1	1	0	3	0	0	1	2	0.350485	10/10	NonOverlappingTemplate

0	1	0	3	0	3	2	0	0	1	0.122325	10/10	NonOverlappingTemplate
1	0	0	1	3	0	3	1	0	1	0.213309	10/10	NonOverlappingTemplate
1	0	0	3	2	0	3	1	0	0	0.122325	10/10	NonOverlappingTemplate
1	0	2	1	1	1	2	1	0	1	0.911413	10/10	NonOverlappingTemplate
1	2	2	1	0	1	1	1	0	1	0.911413	10/10	NonOverlappingTemplate
1	2	0	2	0	1	1	1	2	0	0.739918	10/10	NonOverlappingTemplate
1	0	1	0	2	0	1	2	2	1	0.739918	10/10	NonOverlappingTemplate
0	1	0	0	1	1	0	1	4	2	0.122325	10/10	NonOverlappingTemplate
2	1	0	2	1	1	2	0	0	1	0.739918	10/10	NonOverlappingTemplate
3	0	0	1	0	1	2	2	0	1	0.350485	10/10	NonOverlappingTemplate
1	1	1	4	1	0	1	0	1	0	0.213309	10/10	NonOverlappingTemplate
1	1	1	1	3	0	1	0	1	1	0.739918	9/10	NonOverlappingTemplate
1	0	0	1	2	1	1	1	2	1	0.911413	9/10	NonOverlappingTemplate
1	1	1	2	0	2	1	0	0	2	0.739918	10/10	NonOverlappingTemplate
1	2	0	2	0	3	0	0	0	2	0.213309	10/10	NonOverlappingTemplate
2	1	1	3	1	1	0	1	0	0	0.534146	10/10	NonOverlappingTemplate
2	1	2	2	0	1	0	0	1	1	0.739918	10/10	NonOverlappingTemplate
1	4	0	1	0	2	1	1	0	0	0.122325	10/10	NonOverlappingTemplate
1	2	0	1	1	1	0	2	2	0	0.739918	10/10	NonOverlappingTemplate
0	1	1	2	0	1	2	0	1	2	0.739918	10/10	NonOverlappingTemplate
0	2	3	0	0	1	1	2	0	1	0.350485	10/10	NonOverlappingTemplate
1	1	2	1	2	1	1	1	0	0	0.911413	10/10	NonOverlappingTemplate
0	1	3	0	1	1	0	0	3	1	0.213309	10/10	NonOverlappingTemplate
1	1	2	0	0	3	0	0	2	1	0.350485	9/10	NonOverlappingTemplate
2	1	2	0	1	2	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
2	1	2	0	0	2	1	1	0	1	0.739918	9/10	NonOverlappingTemplate
2	1	2	2	0	0	1	1	1	0	0.739918	10/10	NonOverlappingTemplate
1	0	2	1	1	1	0	1	3	0	0.534146	10/10	NonOverlappingTemplate
0	4	1	1	0	1	0	2	1	0	0.122325	10/10	NonOverlappingTemplate
0	1	2	1	2	0	0	3	1	0	0.350485	10/10	NonOverlappingTemplate
0	1	1	1	1	1	1	2	1	1	0.991468	10/10	NonOverlappingTemplate
3	0	1	1	1	2	0	1	1	0	0.534146	10/10	NonOverlappingTemplate
0	1	1	1	0	1	1	1	2	2	0.911413	10/10	NonOverlappingTemplate
2	2	2	0	0	0	2	0	0	2	0.350485	10/10	NonOverlappingTemplate
1	0	1	2	1	0	0	1	2	2	0.739918	10/10	NonOverlappingTemplate
0	2	2	1	0	0	2	0	1	2	0.534146	10/10	NonOverlappingTemplate
1	1	0	1	2	4	0	0	0	1	0.122325	10/10	NonOverlappingTemplate
1	0	2	0	2	0	1	2	1	1	0.739918	10/10	NonOverlappingTemplate
1	0	2	1	2	2	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
3	1	1	0	1	0	0	2	2	0	0.350485	9/10	NonOverlappingTemplate
2	0	1	1	1	2	2	1	0	0	0.739918	10/10	NonOverlappingTemplate
3	1	0	2	0	1	0	0	1	2	0.350485	10/10	NonOverlappingTemplate
3	2	1	0	1	1	2	0	0	0	0.350485	9/10	NonOverlappingTemplate
1	0	1	2	0	1	1	1	2	1	0.911413	9/10	NonOverlappingTemplate
0	0	4	2	1	0	0	1	0	2	0.066882	10/10	NonOverlappingTemplate
0	0	3	1	0	1	2	2	1	0	0.350485	10/10	NonOverlappingTemplate
2	1	0	0	1	1	0	1	3	1	0.534146	10/10	NonOverlappingTemplate
1	3	1	1	0	0	3	0	1	0	0.213309	10/10	NonOverlappingTemplate
0	2	1	2	1	0	1	1	0	2	0.739918	10/10	NonOverlappingTemplate
1	0	0	2	0	3	1	1	0	2	0.350485	10/10	NonOverlappingTemplate
1	1	1	1	3	1	1	0	1	0	0.739918	10/10	NonOverlappingTemplate
1	2	0	0	2	0	1	2	1	1	0.739918	10/10	NonOverlappingTemplate
1	2	1	1	0	0	1	1	2	1	0.911413	10/10	NonOverlappingTemplate
1	0	1	1	1	1	1	1	2	1	0.991468	10/10	NonOverlappingTemplate
3	3	0	0	0	1	0	2	1	0	0.122325	10/10	NonOverlappingTemplate
1	1	2	0	1	0	0	0	3	2	0.350485	10/10	NonOverlappingTemplate
0	1	2	2	1	0	1	0	1	2	0.739918	10/10	NonOverlappingTemplate
1	3	2	1	0	1	0	2	0	0	0.350485	10/10	NonOverlappingTemplate
1	2	2	1	0	1	0	1	1	1	0.911413	10/10	NonOverlappingTemplate
3	3	0	1	1	0	0	1	1	0	0.213309	9/10	NonOverlappingTemplate
1	2	0	3	0	0	0	0	3	1	0.122325	10/10	NonOverlappingTemplate
1	0	1	0	1	2	2	1	1	1	0.911413	9/10	NonOverlappingTemplate
1	0	0	1	1	1	1	1	3	1	0.739918	10/10	NonOverlappingTemplate
2	0	0	1	0	1	1	0	2	3	0.350485	10/10	NonOverlappingTemplate
2	0	2	0	3	1	0	0	2	0	0.213309	10/10	NonOverlappingTemplate
1	1	0	0	1	1	2	4	0	0	0.122325	10/10	NonOverlappingTemplate

```
  1   0   0   1   2   0   2   1   2   1   0.739918   10/10      NonOverlappingTemplate
  0   0   0   4   2   1   2   0   0   1   0.066882   10/10      NonOverlappingTemplate
  1   0   3   2   0   1   2   1   0   0   0.350485   10/10      NonOverlappingTemplate
  2   1   1   0   0   2   0   1   2   1   0.739918   10/10      NonOverlappingTemplate
  1   2   0   1   1   0   1   1   1   2   0.911413   10/10      NonOverlappingTemplate
  1   1   1   0   2   2   2   0   1   0   0.739918   10/10      NonOverlappingTemplate
  2   1   0   0   1   1   0   4   1   0   0.122325   10/10      NonOverlappingTemplate
  1   1   2   1   0   1   1   2   1   0   0.911413   10/10      NonOverlappingTemplate
  2   1   1   2   0   0   1   2   1   0   0.739918   10/10      NonOverlappingTemplate
  0   1   1   1   0   1   1   1   2   2   0.911413   10/10      NonOverlappingTemplate
  0   0   4   0   2   1   0   0   0   3   0.017912   10/10      NonOverlappingTemplate
  1   0   1   0   3   0   1   1   1   2   0.534146   10/10      NonOverlappingTemplate
  0   1   2   0   0   5   1   1   0   0   0.008879   10/10      NonOverlappingTemplate
  2   0   1   3   1   0   0   3   0   0   0.122325   10/10      NonOverlappingTemplate
  1   0   0   2   2   0   1   2   0   2   0.534146   10/10      NonOverlappingTemplate
  2   1   1   1   2   1   1   1   0   0   0.911413    9/10      NonOverlappingTemplate
  2   1   0   2   1   1   2   0   0   1   0.739918   10/10      NonOverlappingTemplate
  1   1   1   2   0   1   1   0   1   2   0.911413   10/10      OverlappingTemplate
  1   0   3   1   1   1   0   1   1   1   0.739918   10/10      Universal
  0   1   1   1   3   1   0   2   0   1   0.534146   10/10      ApproximateEntropy
  1   0   1   1   1   1   0   1   1   0    ----       7/7       RandomExcursions
  2   0   2   1   0   1   0   0   1   0    ----       7/7       RandomExcursions
  2   1   2   1   0   0   0   0   1   0    ----       6/7       RandomExcursions
  2   1   1   1   1   1   0   0   0   0    ----       6/7       RandomExcursions
  1   1   1   0   1   2   0   0   0   1    ----       7/7       RandomExcursions
  2   2   0   0   0   0   2   1   0   0    ----       7/7       RandomExcursions
  0   1   2   1   0   1   1   0   0   1    ----       7/7       RandomExcursions
  0   1   1   2   0   1   0   1   0   1    ----       7/7       RandomExcursions
  1   0   0   2   0   0   0   0   3   1    ----       7/7       RandomExcursionsVariant
  1   1   0   1   0   0   1   0   2   1    ----       7/7       RandomExcursionsVariant
  0   1   1   0   0   1   1   1   1   1    ----       7/7       RandomExcursionsVariant
  0   1   0   0   0   1   1   1   2   1    ----       7/7       RandomExcursionsVariant
  1   0   0   0   1   1   0   1   1   2    ----       7/7       RandomExcursionsVariant
  1   1   0   0   0   1   3   0   1   0    ----       7/7       RandomExcursionsVariant
  2   0   1   1   0   0   2   1   0   0    ----       7/7       RandomExcursionsVariant
  2   0   1   1   1   0   0   0   0   2    ----       7/7       RandomExcursionsVariant
  2   0   0   2   0   1   0   1   0   1    ----       7/7       RandomExcursionsVariant
  0   2   1   0   1   0   1   0   1   1    ----       7/7       RandomExcursionsVariant
  1   0   1   0   1   0   0   1   0   3    ----       7/7       RandomExcursionsVariant
  1   0   0   0   1   1   0   0   1   3    ----       7/7       RandomExcursionsVariant
  0   1   0   1   1   0   2   1   1   0    ----       7/7       RandomExcursionsVariant
  0   1   1   0   1   1   2   1   0   0    ----       7/7       RandomExcursionsVariant
  0   0   2   2   0   0   2   1   0   0    ----       7/7       RandomExcursionsVariant
  0   0   1   0   2   1   1   0   1   1    ----       7/7       RandomExcursionsVariant
  0   1   0   0   1   1   1   2   1   0    ----       7/7       RandomExcursionsVariant
  1   0   1   0   1   0   2   0   0   2    ----       7/7       RandomExcursionsVariant
  1   2   0   1   1   1   1   0   0   3   0.534146   10/10      Serial
  1   2   1   0   0   0   1   1   0   4   0.122325    9/10      Serial
  2   1   1   1   1   0   1   0   1   2   0.911413   10/10      LinearComplexity
```

- -
The minimum pass rate for each statistical test with the exception of the
random excursion (variant) test is approximately = 8 for a
sample size = 10 binary sequences.

The minimum pass rate for the random excursion (variant) test
is approximately = 6 for a sample size = 7 binary sequences.

For further guidelines construct a probability table using the MAPLE program
provided in the addendum section of the documentation.
- -

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