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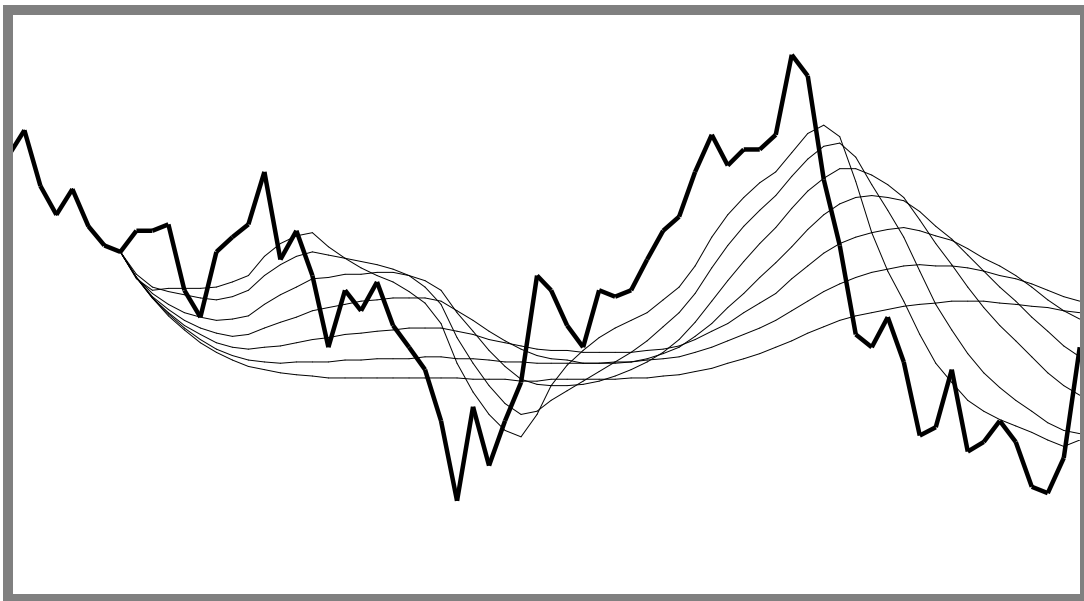
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# VEL

Zero-Lag Velocity DLL module  
for Windows<sup>®</sup> Application Developers



## USER'S GUIDE

### Requirements

- Windows 98, 2000, NT4, XP
- Application software that can access DLL functions

# Installing the 32 bit DLL module

1. Execute the Installer, JRS\_DLL.EXE. It will analyze your computer and give you a computer identification number. Write it down.
2. Get your access PASSWORD from Jurik Research Software. You can do so by calling 323-258-4860 (USA), faxing 323-258-0598 (USA), e-mailing support@nfsmith.net, or writing Jurik Research Software at 686 South Arroyo Parkway, Suite 237, Pasadena, California 91105. Be sure to give your full name, mailing address and computer identification number. You will then be given a password.
3. Rerun the installer JRS\_DLL.EXE, this time entering the password when asked. Also enter **all the Jurik Research modules that you currently are licensed to run**. It will copy the latest version of these modules to any directory you specify.

You may now code your software to access the DLL as described on the following pages. First, read the important notices below.

## !! IMPORTANT !!

### ABOUT PASSWORDS

And what to do when they become invalid

If you upgrade to a new computer, or significantly upgrade your existing computer (such as flash a new BIOS), you should reinstall VEL and all other Jurik tools that are licensed for your computer. The installer will let you know if your current password is no longer valid. Also, if you want to run VEL on additional computers, you will need additional passwords. For new or replacement passwords, call 323-258-4860

### ABOUT DATA VALIDITY

And what to do when VEL encounters an error

When VEL encounters a problem, (e.g. the password used during installation has become invalid), VEL will continue to run but the data produced will not be valid. To let you know this is the case, VEL will return an appropriate error code, but it will NOT post any warning message on your monitor. Therefore ...

Do not assume VEL results are correct. You must validate VEL's output by CHECKING THE RETURN ERROR CODE immediately after each call to VEL.

# Why Use VEL ?

*To obtain lag-free smoothing of the standard momentum indicator !*

## Brief Description

VEL (Zero-Lag Velocity) is a super smooth version of the technical indicator "momentum" with the special feature that the smoothing process has added no additional lag to the original momentum indicator. The chart on this manual's front cover illustrates a curve by VEL superimposed over the standard (and noisy) momentum. Less lag means better timing and a smoother curve has less noise that causes false signals. All in all, VEL provides the perfect momentum oscillator.

## Background

One of the simplest ways to play the market is to buy when prices are rising and sell otherwise. If the trends are long enough, this strategy does very well. The momentum indicator (ie. today's price minus that of N bars ago) is an effective indication of market direction. As N increases, more evidence is considered and the indicator becomes more accurate. However, the estimate's delay of  $N/2$  bars also increases, delaying trades by a few critical bars, possibly making them too late to be profitable. It is the classic tradeoff: **accuracy versus timing**. You cannot have both.... or can you?

*You can with a new momentum oscillator from Jurik Research. By using sophisticated matrix algebra, it improves both accuracy and timing.*

To see how, refer to the chart below. The first graph is the H-L-C daily price bars of D-Mark futures, from 8/92 to 12/92. The second graph (line A) is the ordinary 7-day momentum oscillator.  $N=7$  is fast enough to capture the cyclic motion and not too fast to be extra jittery. Strategies using jittery indicators may place trades too often (and pay too much commission) as the indicator rises and falls almost every bar.

The classic method for reducing jitter is to use a M-bar wide moving average of the indicator. Note how often the plain oscillator (line A) crosses the zero-threshold line in the right-half of the graph and how the 6-bar averaged version (line B) is smoother and crosses the zero-line much less frequently.

This improvement comes with a penalty. Note the tops and bottoms of line B lags behind those of line A by  $(6/2 = 3)$  bars, on average. There is also a corresponding lag at all locations where line B crosses the zero-threshold line. As you may have already experienced in your own trading, in these short cycles, being 3 bars late may be the difference between having a profit or a loss. The story is the same with long cycles and large values of M and N.

Line C was produced by our momentum oscillator, called "**JRC Velocity**" (VEL). This truly amazing indicator has the best of both worlds, smooth lines and no lag! Line C's tops, bottoms and zero-crossings all coincide with those of line A. We refer to this amazing feat as ZERO-LAG FILTERING, once thought by the financial community as a feat impossible to achieve!

VEL has one input parameter: DEPTH. Depth controls how many bars are simultaneously examined by our proprietary momentum (velocity) formula. Depth size is analogous to the window size of a classical momentum oscillator.

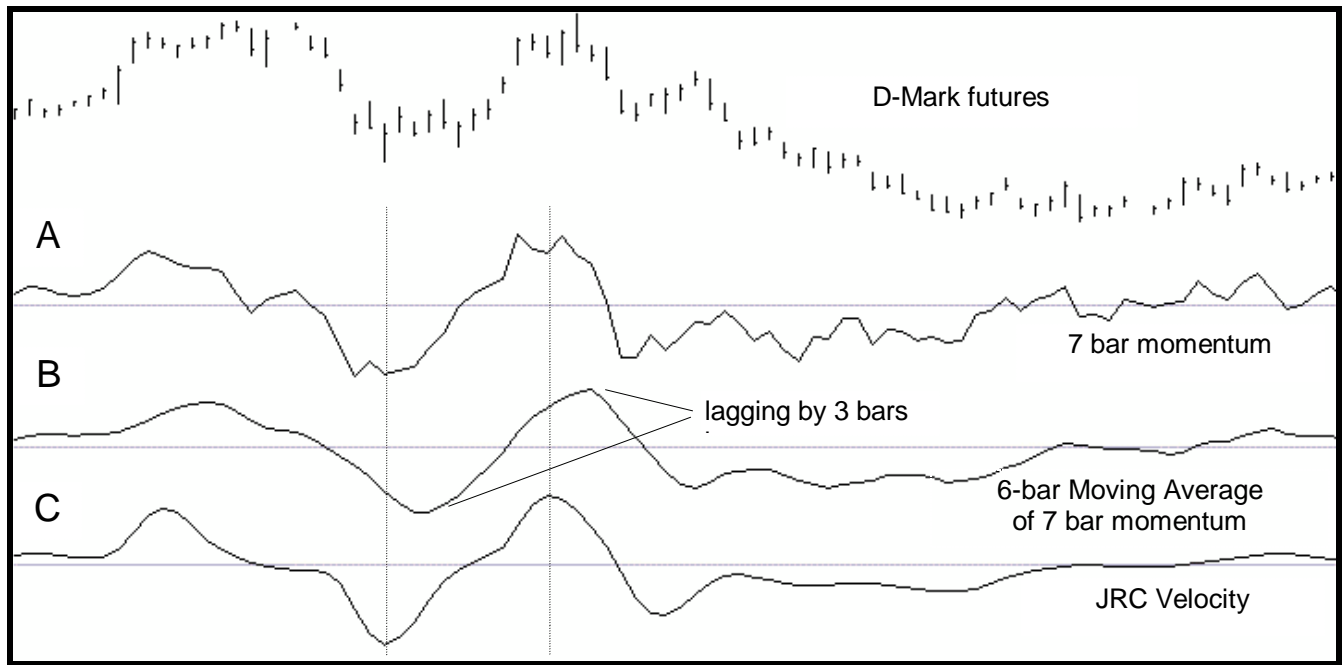


FIGURE 1

In the chart above, line A is a 7-bar momentum of the time series shown by the high-low-close bars. Line B is the result of smoothing line A using a 6 bar moving average. Line C is a smoothed momentum obtained by using VEL.

# Coding Applications

The DLL file contains two versions of **VEL**.

The **BATCH MODE** version accepts an entire array of input data and returns results into another array of equal size. This method requires the user provide the DLL function with pointers to two arrays. This version is ideal when an entire array is available for processing with only one call to VEL.

The **REAL TIME** version accepts one input value and returns one value as a result. VEL is called for each successive value in some arbitrary time series. This approach is ideal for processing real time data, whereby the user wants an instant VEL update as each new data value arrives.

The following pages cover the following applications of VEL:

- C code example for batch mode
  - C code example for real time
  - Visual Basic example for batch mode
  - Visual Basic example for real time
- 

## Dynamic Linking

### Load Time Dynamic Linking (Microsoft Compilers)

For load-time dynamic linking, you must use the LIB file JRS\_32.LIB, located at C:\JRS\_DLL\LIB (or on whichever drive you specified during installation). With load-time dynamic linking, the Jurik DLL is loaded into memory when the user's EXE is loaded.

### Load Time Dynamic Linking (non-Microsoft Compilers)

The LIB file we provide will only work with the MS Visual C/C++ compiler. For C/C++ users with non-Microsoft compilers, you will probably not be able to use the LIB file we have provided for Load Time Dynamic Linking with our DLL functions. You have two choices. 1) Consult your compilers' documentation to determine how to construct a LIB file from a DLL. For instance, Borland's compiler includes the IMPLIB.EXE utility to accomplish this. 2) Use run-time dynamic linking (described below). A LIB file is not required for this method.

### Run Time Dynamic Linking

You may prefer to use run-time dynamic linking instead of load-time. For example, users of Microsoft Visual C may wish to prevent the Jurik DLL from automatically loading along with the user's EXE. With run-time, the DLL is loaded only when the user's EXE specifically calls for it to be loaded with the LoadLibrary function. Another reason for preferring run-time is that the user has a non-Microsoft compiler, and therefore, cannot use the LIB file provided.

For new C/C++ users, we provide sample C files which demonstrate how to accomplish run-time dynamic linking. The sample files are located in the folder C:\JRS\_DLL\RUNTIME (or on whichever drive you specified during installation).

## C Programming the 32 bit VEL DLL for batch mode

The file **JRS\_32.DLL** contains the function "VEL". In your C code, you should declare VEL as externally defined and, if using MS VC++, use the `_declspec(dllimport)` keywords. The function is exported as a C function, so if you are using C++, you should insert "C" (with the quotes) between the words "extern" and "\_declspec". Also, you should link with JRS\_32.LIB, which we provide.

```
extern _declspec(dllimport) int WINAPI VEL( double *pdSeries, double
    *pdOutput, DWORD dwDepth, DWORD dwSize );
```

### PARAMETERS

**pdSeries**      A pointer to an array of doubles that contain your input time series data for VEL.  
**pdOutput**     A pointer to an array of doubles that VEL will write its results to.  
**dwDepth**      A 32 bit unsigned integer that specifies the moving window size of VEL.  
**dwSize**        A 32 bit unsigned integer equal to the number of doubles in the input data array.

### NOTES

The input and output arrays must be the same size, as specified by the calling parameter **dwSize**.

**dwSize** must be no less than `max ( 32 , dwDepth )`.

**dwDepth** may range from 1 to 500. Typical values range from 5 – 20.

The first `N = min ( 30 , dwDepth )` elements of VEL's output will be zero.

### RETURN VALUES

The VEL function returns an integer to indicate success or an error as follows:

0	NO ERROR
-1	PASSWORD / INSTALLATION ERROR
11001	POINTER TO INPUT DATA LOCATION IS NULL
11002	POINTER TO OUTPUT DATA LOCATION IS NULL
11003	NOT ENOUGH DATA ROWS; MUST BE AT LEAST 32
11004	OUT OF MEMORY CONDITION
11005	DEPTH IS GREATER THAN DATA ROWS
11006	DEPTH VALUE NOT BETWEEN 1 AND 500

## C PROGRAMMING EXAMPLE for batch mode

```
dwSize = 2500;
dwDepth = 10;

pdSeries = (double *) GlobalAllocPtr( GHND, (DWORD) sizeof(double) * dwSize);
pdOutput = (double *) GlobalAllocPtr( GHND, (DWORD) sizeof(double) * dwSize);

/* At this location, check that memory was actually allocated, and put your time
   series data into the input array. */

error_code = VEL(pdSeries, pdOutput, dwDepth, dwSize);
```

## C Programming the 32 bit VEL DLL for real time

The file **JRS\_32.DLL** contains the function **VELRT**. In your C code, you should declare VELRT as externally defined and, if using MS VC++, use the `_declspec(dllimport)` keywords. The function is exported as a C function, so if you are using C++, you should insert "C" (with the quotes) between the words "extern" and "\_declspec". Also, you should link with JRS\_32.LIB, which we provide.

```
extern _declspec(dllimport) int WINAPI VELRT( double dSeries, DWORD
dwDepth, double *pdOutput, int iDestroy, int *piSeriesID );
```

### PARAMETERS

- dSeries:** a double precision floating point number equal to the input data value.
- dwDepth:** a 32 bit unsigned integer that specifies the moving window size of VEL.
- pdOutput:** a pointer to the memory location of a double which contains the result from VEL
- iDestroy:** a 32 bit signed integer, with a value = 0 or 1. When value = 1, the RAM in the DLL used for a particular VEL time series is released. The desired time series is designated by piSeriesID. (see next parameter) This event does not release the memory containing the output of VEL. Control of that memory is the user's responsibility.
- piSeriesID:** a pointer to the memory location of a 32 bit signed integer (iSeriesID). When processing the first element of any new time series, set iSeriesID = 0. VEL will store a unique identification number of the series into that integer (iSeriesID) pointed to by pointer piSeriesID.

### NOTES

**dwDepth** may be any integer, from 1 to 500. Typical values range from 5 – 20.

The first  $N = \min(30, \text{dwDepth})$  elements of VEL's output will be zero. The value of **dwDepth** is obtained by VEL on the first call to it (i.e. when iSeriesID = 0 )

### RETURN VALUES

The VEL function returns an integer, which will indicate success or an error:

0	NO ERROR
-1	PASSWORD / INSTALLATION ERROR
11002	POINTER TO OUTPUT DATA LOCATION IS NULL
11004	OUT OF MEMORY CONDITION
11006	DEPTH VALUE NOT BETWEEN 1 AND 500
11007	POINTER TO SERIES IDENTIFICATION VARIABLE WAS NULL
11008	CANNOT DEALLOCATE DLL RAM WHEN SERIESID = 0



## C PROGRAMMING EXAMPLE for real-time mode

```
// declare variables
double *pdData, *pdOutput ;
int     iDestroy, iSeriesID, *piSeriesID, iErr, i ;
DWORD   dwDepth ;

// get address of variable iSeriesID
piSeriesID = &iSeriesID ;

// assume you want this VEL parameter value
dwDepth = 10 ;

// allocate RAM for input and output. Assume array size is 100
pdData   = (double *) GlobalAllocPtr(GHND, (DWORD) sizeof(double) * 100) ;
pdOutput = (double *) GlobalAllocPtr(GHND, (DWORD) sizeof(double) * 100) ;

// fill pdData array with double precision numbers from disk
// file or other source. (code not shown)

// clear deallocation flag and initialize series identification to 0.
iDestroy = iSeriesID = 0 ;

// loop through data, calling VEL on each element, and store results
for(i=0;i<100;i++)
{
    iErr = VELRT( *(pdData+i), dwDepth, (pdOutput+i), iDestroy, piSeriesID) ;
    if(iErr != 0)
        YourErrorHandlerFunc() ;
}

// done processing. Deallocate DLL RAM, and check for any errors.
// When deallocating, it is OK to replace the output pointer with 0.

iDestroy = 1 ;
iErr = VELRT( 0,0,0, iDestroy, piSeriesID) ;
if(iErr != 0)
    YourErrorHandlerFunc() ;

// do something with data and deallocate RAM at pdData and pdOutput
```

# Visual Basic example of VEL in batch mode

## INTRODUCTION

In your Jurik Research DLL installation directory (eg., C:\JRS\_DLL) the workbook VEL\_DLL.XLS contains a programming example using Excel's VBA to call function **VEL**. The workbook includes a worksheet where you can run the macro **VEL\_Test** to run **VEL** in batch mode.

In this example, run the VBA macro called "**VEL\_Test**". The macro gets the data in column 1 and sends it to the VEL batch mode function in the DLL. The output array produced by VEL is then written back onto column 3 of the worksheet.

## VBA MACRO DESCRIPTION

The macro VEL\_TEST calls the function VEL, which is declared as shown below. Note that the input and output arrays ( dInData and dOutData ) are called by reference using "ByRef". This enables the calling statement to send to VEL a pointer to the first element of each data array.

```
Declare Function VEL Lib "JRS_32.dll" ( _  
    ByRef dInData As Double, _  
    ByRef dOutData As Double, _  
    ByVal depth As Long, _  
    ByVal length As Long)
```

The VBA subroutine **VEL\_Test** is shown on the next page. This code will read data from column 1 of the active worksheet, call the DLL function VEL, and output its results back to the worksheet.

Note that the code calls a local subroutine "Error\_handler". If an error condition exists, the subroutine posts a message on the screen (because VEL itself does not) and then halts the program.

```

Sub VEL_test()

    Dim k As Long                'iteration variable
    Dim iSize As Long            'size of data array
    Dim iResult As Long          'returned error code
    Dim dInputData() As Double   'input array
    Dim dOutputData() As Double  'output array
    Dim iDepth As Long           'VEL window size (smoothness)
    Dim calctype As Long         'for preserving current Excel calc mode

    'disable automatic calculation
    Application.Calculation = xlManual

    iSize = 100                 ' length of input array
    iDepth = 10                  ' VEL window size (smoothness)

    ReDim dInputData(1 To iSize)
    ReDim dOutputData(1 To iSize)

    ' Read Data from spreadsheet into array
    ' Input data is in column 1

    For k = 1 To iSize
        dInputData(k) = Cells(k + 1, 1)
    Next k

    '--- VEL return error codes ---
    '      0          no error
    '     -1          password / installation error
    '    11001        pointer to input data location IS NULL
    '    11002        pointer to output DATA location IS NULL
    '    11003        not enough data rows; must be at least 32
    '    11004        Out of memory condition
    '    11005        Depth is greater than data rows
    '    11006        Depth value not between 1 and 500

    'Call VEL. Note that only the first elements of both data arrays are referenced.

    iResult = VEL(dInputData(1), dOutputData(1), iDepth, iSize)
    If (iResult <> 0) Then
        Call Error_handler(iResult, calctype)
    Else
        ' Show results in column 3 on spreadsheet
        For k = 1 To iSize
            Cells(1 + k, 3).FormulaR1C1 = dOutputData(k)
        Next k
    End If

    ' Enable automatic calculation
    Application.Calculation = calctype
End Sub

```

---

```

' The following subroutine is a simple way to handle run-time errors that may occur
' It is good practice to handle each error type mentioned in the user manual.

Private Sub Error_handler(ByVal error_code As Long, ByVal calctype As Long)
    Dim result As Long
    result = MsgBox("Error number " & Str(error_code) & " was returned by VEL.", ,
"VEL Error")
    Application.Calculation = calctype
    End ' this END command will halt execution of the VBA code.
End Sub

```

# Visual Basic example of VEL in real time mode

## INTRODUCTION

In your Jurik Research DLL installation directory (eg., C:\JRS\_DLL) the workbook VEL\_DLL.XLS contains a programming example using Excel's VBA to call function **VELRT**. The workbook includes a worksheet where you can run the macro **VELRT\_Test** to run **VELRT** in real-time mode.

In this example, run the VBA macro called "**VELRT\_Test**". The macro reads one element at a time from column 1, sequentially feeding each one through the real time version of VEL and places the results sequentially into column 4.

## VBA MACRO DESCRIPTION

The function VELRT is declared as shown below. Note that the output and series identification variables ( dOutput and iSeriesID) are called by reference using "ByRef". The user initializes the series identification variable (iSeriesID) to zero and during the first call to VELRT, the function will replace zero with an integer that uniquely identifies the time series. This way, when you have multiple time series running in parallel, the series identification numbers will tell VELRT to which time series the new data point is to be assigned.

```
Declare Function VELRT Lib "JRS_32.dll" ( _  
    ByVal dSeries As Double, _  
    ByVal iDepth As Long, _  
    ByRef dVELout As Double, _  
    ByVal iDestroy As Long, _  
    ByRef iSeriesID As Long) As Long
```

The VBA subroutine **VELRT\_Test** is shown on the next page. This code reads data from column 1 of the active worksheet, one element at a time, each time calling the DLL function VELRT, and outputting the result back to the worksheet.

Note that the code calls a local subroutine "Error\_handler". If an error condition exists, the subroutine posts a message on the screen (because VEL itself does not) and then halts the program.

Also note that if you have several separate data time series that you want VEL to process simultaneously in real time, **each time series must be given its own series identification variable**. In this example, only one time series will be filtered, therefore only one series identification variable needs to be declared.

```

Sub VELRT_test()

    Dim k As Long           'iteration variable
    Dim iDepth As Long      'VEL window size (smoothness)
    Dim dVELout As Double   'VEL output
    Dim iResult As Long     'returned error code
    Dim iDestroy As Long    'deallocate DLL RAM switch
    Dim iSeriesID As Long   'Input series ID code
    Dim calctype As Long    'for preserving current Excel calc mode

    '--- VELRT return error codes ---
    '    0          no error
    '   -1          password / installation error
    ' 11002         pointer to output DATA location IS NULL
    ' 11004         Out of memory condition
    ' 11006         Depth value not between 1 and 500
    ' 11007         pointer to SERIES IDentification variable WAS NULL
    ' 11008         Cannot deallocate DLL RAM when SeriesID=0

    iSize = 100           ' length of input array
    iDepth = 10           ' VEL window size
    iSeriesID = 0         ' MUST initialize series identification to zero
    iDestroy = 0          ' MUST clear "deallocate DLL RAM" flag

    'disable automatic calculation
    calctype = Application.Calculation
    Application.Calculation = xlManual

    For k = 1 To iSize
        iResult = VELRT(Cells(k + 1, 1), iDepth, dVELout, iDestroy, iSeriesID)
        If (iResult <> 0) Then
            ' Post Error Message and HALT
            Call Error_handler(iResult, calctype)
        Else
            Cells(1 + k, 4).FormulaR1C1 = dVELout
        End If
    Next k

    'deallocate DLL RAM. Check for errors.
    'iSeriesID should contain a non-zero identification value

    iDestroy = 1
    iResult = VELRT(0, 0, 0, iDestroy, iSeriesID)
    If (iResult <> 0) Then
        ' Post Error Message and HALT
        Call Error_handler(iResult, calctype)
    End If

    're-enable automatic calculation
    Application.Calculation = calctype

End Sub

```

---

```

' The following subroutine is a simple way to handle run-time errors that may occur
' It's good practice to handle each error type mentioned in the user manual.

Private Sub Error_handler(ByVal error_code As Long, ByVal calctype As Long)
    Dim result As Long
    result = MsgBox("Error number " & Str(error_code) &
        " was returned by VEL.", , "VEL Error")
    Application.Calculation = calctype
    End ' this END command will halt execution of the VBA code.
End Sub

```

## IF YOU FIND A BUG . . . YOU WIN

If you discover a legitimate bug in any of our preprocessing tools, please let us know! We will try to verify it on the spot. If you are the first to report it to us, you will receive the following two coupons redeemable toward your acquisition of any of our preprocessing tools:

- a \$50 discount coupon
- a free upgrade coupon

You may collect as many coupons as you can.

You may apply more than one discount coupon toward the purchase of your next tool.

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2. We do not perform cost-benefit analysis when it comes to litigation. We prosecute all offenders.
3. We register portions of our software with the U.S. Copyright office, entitling us to demand the offender compensate Jurik Research for all legal costs, which is typically over \$10,000 per lawsuit.
- 4. We offer up to \$5000 reward for information leading to the prosecution of any offender(s).**

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