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Support Services



This section provides instructions on support services available from NuMega Technologies, Inc.

In order to save your time and provide you with the best possible support, we would like you to do a few things before you contact us. These simple steps will get you the fastest answer to your questions.

- Have you read the manual? Did you look under the table of contents and the index? Did you re-check the manual?
- Have you used the search feature of the help system?
- Have your serial number ready. It was on the registration card stuck on the inside cover of the manual.
- Have your version number ready. Use the **Help...About** dialog from any window to see the version number.



By Phone

Technical support is available from 9:00am to 5:00pm, Monday through Friday, EST. The technical support phone number is **(603) 889-2386**. Have version number, customer number and product serial number ready.



By Fax

You can fax your questions to **(603) 889-1135** 24 hours a day. Don't forget to include version and registration numbers. Provide as much detail as possible in your fax.



By E-Mail We also provide tech support via electronic mail. Send e-mail to internet **info@numega.com**. Don't forget to include version and registration numbers. Include any code examples as a file attachment to the email. You can also visit our web site at **http://www.numega.com**.

Step-By-Step Guide



This section provides step-by-step help on using NuMega VB/Metric.

The process of using NuMega VB/Metric is quite easy. See the [Quick Start](#) or follow these directions:

- 1) Load a project using the **File...Open Project** dialog.
- 2) Choose the files you want to process from the [Project Window](#) file list.
- 3) Set options using the [Options](#) dialog.
- 3) Press **F5** to start the process.
- 4) To stop or interrupt the process, press **Shift+F5**.



You can run the [Wizard](#) at any time by choosing the Wizard help menu option.

Technical Reference



This section provides a technical discussion on how NuMega VB/Metric operates.

NuMega VB/Metric examines Visual Basic source code and develops statistical quality control metrics. NuMega VB/Metric reports on:

- McCabe [cyclomatic complexity](#)
- Function Points
- McCabe understanding level
- McCabe Bad fix probability
- Myers [extended cyclomatic complexity](#)
- Myers understanding level
- Myers Bad fix probability
- [Halstead](#) program length
- Halstead program vocabulary
- Halstead program volume
- Halstead program level
- Halstead intelligence content
- Halstead language level
- Halstead programming effort
- Halstead programming time (in hours)
- Total code lines, blank code lines, comment lines and percent comments
- NuMega (Halstead derived) GUI metrics

Once the code file is examined, you can print the results.

Quick-Start



This section is a quick start on using NuMega VB/Metric

To get running right away with NuMega VB/Metric, use the [Wizard](#). In general the process is to load a project, choose options, and then process it. See the [Step-By-Step](#) directions for fastest results.

quick start

4000

Tip Of the Day

The **Tip Of the Day** feature shows pointers maximizing your usage of this NuMega VB/Metric.

- You can disable tips by clearing the **Show Tips At Startup** option. You can see tips from most Help menus.
- Choose **OK** when done viewing tips.
- You can cycle through the tips one at a time by choosing the **Next Tip** button.
- The **More Tips** button shows this help file, which lists all tips.



Tip Of the Day

Following is a list of all tips.

- You can skip running the Wizard each time you start VB/Metric by clearing the 'Show At Startup' box on the Wizard screen.
- You can skip seeing Tip of the Day each time you start VB/Metric by clearing the 'Show At Startup' box on the Tip of the Day screen.
- You can start by pressing F5?
- You can stop by pressing Shift+F5?
- You can get context sensitive help almost anywhere by pressing F1?
- You can determine version and other important information from the System Information option of the Help...About menu?
- You can setup the printer by using the Print menu, and then choosing Setup.
- You can change the page orientation from the Print Setup menu.
- You can change the font used for printing by choosing the File...Print Setup menu, and then choosing the Font button.
- You can exit the Tip Of The Day dialog by pressing Escape!
- Double-clicking on the running man in the Wizard dialog shows our fearless leaders name.

NuMega VB/Metric Wizard - Tab 1

This tab is where you choose the project to process.



[Step-By-Step Instructions](#)

[Technical Reference](#)

Choose File List

Choose a file from the drop-down list to process. To select a new file, choose the [Browse](#) button, which will call the open file dialog.

wiz_choose_file

11038

Finish Button

Choose this button to start the processing using the information entered into the Wizard.

wiz_finish

11039

Help Button

Choose this button to show help on using the Wizard.

wiz_help

11040

Last Button

Choose this button to move to the previous or last step in the Wizard process.

Wiz_last

11041

Next Button

Choose this button to move to the next step in the Wizard process.

wiz_next

11042

Product Splash

This is the product name.

wiz_our_developer

11043

Show At Startup Option

When this checkbox is set (has an X in it) then the Wizard is automatically shown when the program starts. When the checkbox is cleared, the Wizard is not automatically started.



You can always run the Wizard by choosing the **Wizard** help menu dialog from most program windows.

wiz_show_at_startup

11044

Wizard - Tab1

Click this here to move to [Tab1](#).

wiz_tab1

11045

Wizard - Tab2

Click here to move to [Tab2](#).

wiz_tab2

11046

Wizard - Tab3

Click here to move to [Tab3](#).

wiz_tab3

11047

NuMega VB/Metric Wizard - Tab 2

This tab is where you choose files of the the project to process.



[Step-By-Step Instructions](#)

[Technical Reference](#)

Choose Files To Analyze

Choose the files in the list you want to analyze.

wiz_select_files

11037

NuMega VB/Metric Wizard - Tab 3

This tab is where you choose how to process selected files.



[Step-By-Step Instructions](#)

[Technical Reference](#)

Query Load Project

You need to choose a Visual Basic project to review before NuMega VB/Metric can review it. There is no project specified under Tab 1 of the Wizard. Move to Tab 1 and choose a project.

- Choose **Yes** to load a project file now.
- Choose **No** to go back to the Wizard.

WizMsg1

3003

Query Exit Wizard

You chose not to load a project. Do you want to exit the Wizard at this time?

- Choose **Yes** quit the Wizard now.
- Choose **No** to go back to the Wizard.

WizMsg2

3004

Open File

You need to choose a file to open.

- Choose **Ok** after choosing the file you want to load.
- Choose **Cancel** to end this dialog without choosing a file.
- Choose **Help** to see this help.
- Choose **Network** to navigate to network drives.

opfn
5000

Confirm Process Project

You have opened a project. Would you like to review this project now?

- Choose **Yes** to start the project review now.
- Choose **No** to return to the Project level view of the project.

StartNow

6000

Results Display

This window shows the results of the processing.

Results Display

11036

Print Button

This button will call the print dialog to print the contents of the window.

Print
11035

Results Window

This dialog lets you view the project under review.

You can choose to view the code line-by-line as it is formatted by using the Options, [General](#) tab, or let the process run in a batch mode. In the line-by-line mode or batch mode, you still get a chance to accept or reject changes.

You can print the display to the printer by choosing the **File...Print** dialog.



[Options](#)
[Menus](#)

Options

This window is where you set options for VB/Metric.

Preferences

11010

OK Button

This button closes the options dialog. Note that changes made to options are effective immediately (even while processing is running).

Tab_OK

11034

Options, General Tab

This Tab lets you set general program options.

View Results As Process Runs

Set this option print a status messages to the display window as the process runs. Clear this options for fastest performance.

Show Tool Tips

Set this option to have tool tips displayed when the mouse is held over a toolbar button for 2 seconds or more; clear to show no tool tips.

Show Status Bar

Set this option to display the status bar; clear to hide status bar.

Help Button

This button displays help on the tab or tab-item with focus.

OK Button

This button closes the dialog.



Any changes you make to options take effect immediately, and not when the dialog is closed.

Options, Tune Algorithms Tab

This Tab lets you set parameters which control the quality control algorithms.

Stroud Constant

The Stroud constant is the highest number of individual moments per second of which humans can perceive. We cannot notice anything faster. This ranges from 5 to 20 moments per second. Halstead uses 18 in his book, "*Elements of Software Science*". The Stroud constant is used in the calculation of Programming Time.

Backfired Function Point Constant

Function points are estimated using what is known as "backfiring." It has been determined that it takes an average of 128 C statements to code one function point. There is no known metric for Visual Basic code, so the default used, 128, is for C code.

This assumes moderately complex code. From Capers Jones book, "*Applied Software Measurement*", "In essence, it takes fewer statements to implement one function point for simple applications than it does for complex ones. This concept is also true in reverse: When function points are backfired, highly complex code will contain fewer function points than the same volume of simple code. This concept is counterintuitive, but it appears to be empirically correct."

Options, Report Tab

This tab controls which reports are run.

McCabe

McCabe cyclomatic complexity is a measure of the number of unique paths through the code, which has been found to correlate with code errors. Cyclomatic complexity works out to be the number of decision points in a function plus one.

Myers

Extended cyclomatic complexity, which considers complex Boolean conditionals at any branch point in the code. The same information as McCabe is displayed, but based on the additional data Myers algorithms develops.

Halstead

Halstead metrics uses the amount of unique and total operators and their operands to develop metrics. This is different from McCabe and Myers which are concerned only with operators.

The metrics developed using Halstead provide more specific objective data than Myer or McCabe. You can use Halstead data as a relative gauge for measuring code productivity, development, man-hours and maintainability.

Code Line Metrics

These are statistics about the number of type of code lines. VB/Metric considers a line to be a blank line if it contains only whitespace characters; a code line if it contains at least one non-whitespace character; and a comment line if it starts with ' or REM.

NuMega GUI

There are no general purpose Visual Basic form/control/menu standard metrics that we know of. So we developed these metrics for forms to examine menus, controls and user interface complexity. They are based on Halstead algorithms; but replace operators and operands with controls and menus. These are non-standard and specific to NuMega Technologies, Inc. However, as a relative measure between programs when using VB/Metric, they provide empirically standard data.

Open Project

This item calls the file open dialog to opens a new project.

Project Open

11031

Start

This item starts processing the selected files.

Go Button

11030

Help

This item displays help on the currently highlighted topic (the same as pressing **F1**).

Help Button

11029

Wizard

This item stops processing, closes any open windows and then calls the [Wizard](#).

Wizard Button

11028

Options

This item calls the [Options](#) dialog.

Preferences Button

11027

Halt

This item halts processing, but does not close the window. This button is the same as pressing **Shift+F5**.

Halt Button

11026

Project File List

This window contains all the files in the project. You can choose one or more files using the mouse. You can also use the **Edit** menu options to choose classes of files, for example, all form or all classes.

Project File List

11019

File Status

This area shows project file information for reference.

File Status

11020

Close Project

This item closes all open windows, stops processing (if running) and then closes the open project.

Close Window

11025

Project Window

This windows shows you the project files for the loaded project, and a toolbar to control options.

From this window your set [options](#), start and stop reviews or load new projects for review.

- To start a review, load a project and then press **F5**.
- To Stop a running review, press **Shift+F5**.



[Menus](#)

Project

5400

Query Show Help

You are exiting the Wizard without letting the Wizard begin processing. You can see help on using NuMega VB/Metric right now if you want to.

- To see help on using NuMega VB/Metric then press **Yes** now.
- To skip seeing help, press **No**.

Show Help

11022

Query Start Now

You just loaded a project. You can start the processing of this project right now if you want to. This dialog is only shown for the first project loaded. After that, it is assumed you are not processing an entire project, but rather are working with individual files of the project.

- To start processing now, press **Yes**.
- To skip processing right now, press **No**.

Query Start Now

11021

Project Window Menus

These are the Project Window menus.



Project Window

Project Window Menus

11071

Results Window Menus

These are the Result Window menus.



Format Result Window

Format Result Menus

11048

Choose Code

This item will select all code files in the [file list](#) for processing. Code files have a .bas or .cls extension.

Choose Code

11077

Choose Class

This item will select all Class files in the [file list](#) for processing. Class files have a .cls extension.

Choose Class

11076

Choose Forms

This item will select all Form files in the [file list](#) for processing. Form files have a .frm extension.

Choose Forms

11078

Choose All

This item will select all files in the [file list](#) for processing. This includes all files with .bas, .cls and .frm extensions.

Choose All

11075

Choose No Files

This item will de-select all files in the [file list](#).

Choose None

11080

Choose Modules

This item will select all basic code files in the [file list](#) for processing. Basic code modules have a .bas extension.

Choose Modules

11079

Invert Selection

This item will invert the selection state of the selected files.

Invert Selection

11074

Perferences Menu

This item will call the [options](#) dialog, where you can edit/set/view current program paramaters.

Perferences Menu

11073

About Menu

This menu item will display the application **About Box**, where you can see version information, important copyright and trademark notices and customer support information.



[Support](#)

About

11063

Search For Help Menu

This menu item will display a search dialog box to search the help systems keywords.

Search For Help

11062

Help Contents Menu

This menu item displays the help contents, or first page of the applications help system.

Help Contents Menu

11061

Wizard Menu

This menu item will stop processing (if running), close all open windows, display the Wizard dialog.



Wizard

Wizard

11060

Tip Of The Day Menu

This menu item will show the Tips Of The Day dialog.



Tips Of The Day

Tip Of The Day Menu

11059

Help On Help Menu

This menu item will show help on accessing and using Windows help systems.

Help On Help

11058

Help With This Window Menu

This menu item will display help on the control with focus on the currently active form. If there is no active control or the control has no help, then it will display the help on the active window or dialog. If there is no active window, then it displays the contents of the applications help file. You will always get some help with this option.

Help With This Window

11057

Tile Vertical Menu

This menu option arranges all open window.

Tile Vertical

11056

Tile Horizontal Menu

This menu option arranges all open windows.

Tile Horizontal

11055

Arrange Icons Menu

This menu item will arrange all iconic windows so that they are visible on thier parent.

Arrange Icons

11069

Cascade Menu

This menu option arranges all open windows on atop the other.

Cascade

11054

Break Menu

This menu item will halt processing.

Break
11068

Start Menu

This menu item will begin processing, using the current options and file selection.



Options

Start
11052

Break Menu

This menu item interrupts processing but does not close the window.

Break Menu

11051

File Close Menu

This menu option closes the window.

File Close Menu

11053

File Print Menu

This menu item will print the contents of the window.

File Print Menu

11049

File Exit Menu

This menu item will terminate the program.

File Exit Menu
11050

This dialog lets you print.

You can choose:

- **OK** to print.
- **Setup** to set the page orientation (landscape or portrait) and choose the printer to use.
- **Cancel** to exit without saving any changes to the print setup.



Also see the [Print Setup](#) dialog.

This dialog lets you set or view printing options, and choose a printer to use.

You can choose:

- **OK** to accept the printer as defined.
- **Cancel** to exit without saving any changes to the print setup.
- **Font** to set the font to use when printing.



Also see the [Print](#) dialog.

File Not Found

The file you tried to open could not be opened for some reason.

- Check network connections and try again.
- Long filenames are not supported under Windows 3.x.

Choose Print Item

You chose the **OK** button, but you did not select anything to print.



[Print Dialog](#)

[Print Setup Dialog](#)

Choose Print Item

11085

No Printers Defined

There are no printers defined on this system. You need to define a printer and then try to print.

No Printers Defined

11086

Query Confirm Process

You are about to process a project file, and you are now prompted to backup the project before any changes are made to it.

You can choose:

- **Yes** to backup the project and proceed.
- **No** to skip backing up the project, and then proceed.
- **Cancel** to cancel the processing.

Query Cancel Process

The escape key was pressed while processing was underway. You are now prompted to cancel or continue the processing.

You can choose:

- **Yes** to save stop processing now.
- **No** to resume processing.

Query Cancel Format

12007

Wizard - Browse

Choose this button to select a project file to process.

wiz_browse

13006

Wizard - Options

Choose this button to set program options for this formatting session.

wiz_options

13007

Processing Interrupted

The processing of the selected file(s) has been interrupted; either from a menu action that requires processing to stop, or from pressing the escape key. To re-start processing press F5.

Processing Interrupted
13008

McCabe

McCab'e Cyclomatic Complexity Index

McCabe's cyclomatic complexity index is a measure of the number of decision points in a code block (like a procedure). A decision point is a measure of the number of unique paths through the code, which has been found to correlate with code errors. McCabe's cyclomatic complexity metric works out to be the number of decision points in a code block, plus one. VB/Metric considers the following list of Visual Basic keywords as decision points: -, +, /, \, *, ^, **mod, xor, and, or, not, >, <, =, <=, >=, <>, if, Else, elseif, Do, Loop, While, Switch, select, IIf, Case, for, &**

Usage

The metrics developed using McCabe provides objective data to use as a relative guage for measuring code complexity productivity, development, man-hours and maintainability.

Standard

There are no industry standards for Visual Basic at this time, that we are aware of. The industry standard cyclomatic complexity threshold, using the McCabe definition for paths through the code, is 10. Only code blocks with complexities greater than 10 should be of concern.

Reference

McCabe, T., "A Complexity Measure," *IEEE Transactions on Software Engineering*, vol. SE-12(4), December 1976, pp. 308-320.

Understanding

Capers Jones says in his book, "**Applied Software Measurement**" "Empirical studies reveal that programs with cyclomatic complexities of less than 5 are generally considered simple and easy to understand. Cyclomatic complexities of 10 or less are considered not too difficult. When the cyclomatic complexity is more than 20, the complexity is perceived as high. When the McCabe number exceeds 50, the software for practical purposes becomes untestable."

Reference

Jones, C., *Applied Software Measurement*, McGraw-Hill, New York, NY, 1991, 493 pages.

Bad Fix Probability

Capers Jones in his book, "**Applied Software Measurement**" describes how cyclomatic complexity is related to maintainability -- "The phrase 'bad fix' refers to an error accidentally inserted into a program or system while trying to fix a previous error." As shown in the table, as cyclomatic complexity approaches 100, any fix is more likely than not to introduce another error.

Cyclomatic Complexity	Probability of Bad Fix
less than 10	5
20-30	20
greater than 50	40
approaching 100	60

Reference

Jones, C., *Applied Software Measurement*, McGraw-Hill, New York, NY, 1991, 493 pages.

Myer

Myers' Extended Complexity

Glenford Myers defined an extension to [McCabe's cyclomatic complexity](#) metric. This extension is referred to as "extended complexity". In addition to counting the same decision points as McCabe, extended complexity counts compound decisions or conditionals at any branch point in the code. In Visual Basic these are , these are constructed with logical operators such as And, Or, Not and Xor.

Usage

The metrics developed using McCabe provides objective data to use as a relative guage for measuring code complexity productivity, development, man-hours and maintainability.

Standard

There are no industry standards for Visual Basic at this time, that we are aware of. An industry standard extended cyclomatic complexity threshold, using Myers' definition for paths through the code, is 15. Only code blocks with extended complexities greater than 15 should be of concern.

Reference

Myers, G., "An Extension to the Cyclomatic Measure of Program Complexity," *SIGPLAN Notices*, 12(10), October 1977, pp. 61-64.

Halstead

Halstead Language Level Metrics

Halstead's program length, program vocabulary, program volume, program level, programming effort, intelligence content, programming time (in hours), and language level refer to mathematical analysis of the number and type of operators and operands contained within the source code under review.

Usage

The metrics developed using Halstead provide more specific objective data than Myer or McCabe. You can use Halstead data as a relative gauge for measuring code productivity, development, man-hours and maintainability.

VB/Metric uses [McCabe](#) complexity and [Myers'](#) extended complexity keywords for the operators, and the arguments used in the code as the operands. The equations used to calculate the Halstead metrics follow. Given:

unique operators n_1
unique operands n_2
total operators N_1
total operands N_2
Stroud number $S = 18 \text{ moments / second}$
seconds factor $f = 60 * 60 = 3600$

Program Length $N = N_1 + N_2$
Program Vocabulary $n = n_1 + n_2$
Program Volume $V = N * \log_2(n)$
Program Level* $L = (2 / n_1) * (n_2 / N_2)$
Programming Effort $E = V / L$
Programming Time* $T = E / (S * f)$
Intelligence Content $I = L^{\wedge} * V$
Language Level $*l = 1 * 1 * V$

* These factors are mean approximate or estimated measures of an observed parameter.

Stroud

The Stroud number is the highest number of "moments" per second of which humans can perceive. We cannot notice anything faster. This ranges from 5 to 20 moments per second. Halstead uses 18 in his book, *Elements of Software Science*; however, it is not known why this value was chosen. VB/Metric uses a Stroud number of 18 for its calculations. You can specify another value from the Options menu, Tune Algorithms tab.

Standard

There are no industry standards for Visual Basic at this time, that we are aware of. There are no standards for Halstead language metrics that we are aware of.

Reference

Halstead, M., *Elements of Software Science*, Elsevier North Holland, New York 1977.

NuMega GUI

NuMega (Halstead Derived) GUI Complexity

There are no Graphical User Interface complexity models we could find. So, we created the NuMega GUI metrics. These are based on [Halstead](#) metrics; however, our algorithms replace operators with controls and menu items. We are not sure this is mathematically pure; but the results seem consistent.

Usage

The metrics developed using NuMega GUI provide more specific objective data than Myer or McCabe. You can use it as a relative gauge for measuring complexity, code productivity, development, man-hours and maintainability.

Standard

There are no industry standards for Visual Basic at this time, that we are aware of. There are no standards for GUI metrics that we are aware of.

Function Points

Function Points

Function points represent an analysis of the entire program; inputs, outputs, cross-function communication, complexity etc. Normal function point analysis requires a certified analyst with proper training. The results are industry standard measures of complexity, maintainability, cost (time, development, maintenance) and resources. VB/Metric implements a software algorithm to estimate function points. Function points are estimated using what is known as "backfiring." It has been determined that it takes an average of 128 C statements to code one function point. There is no known equivalent for Visual Basic, so this value of is used 128 instead. You can adjust this value from the [Options](#) Tab, Tune Algorithms entry.

This 128 value assumes moderately complex code. From Capers Jones book, *Applied Software Measurement*, "In essence, it takes fewer statements to implement one function point for simple applications than it does for complex ones. This concept is also true in reverse: When function points are backfired, highly complex code will contain fewer function points than the same volume of simple code. This concept is counterintuitive, but it appears to be empirically correct."

So, for example, if the code you are measuring contains a lot of functions that have a high [cyclomatic complexity index](#), such as 38, the backfired function points that VB/Metric generates will be higher than the actual function points.

Adjusted Function Points

In the SPR's 1985 backfire method, described in Capers' book, the initial backfired function points can be adjusted up or down based on the combined logic, data, and problem complexities. These are subjective metrics and use a different scale than that of cyclomatic complexity. It has not been established how one would use cyclomatic complexity to adjust backfired function points for a more accurate estimate. However, VB/Metric uses an algorithm based on Table 2.16 in *Applied Software Measurement*, to adjust the initial function point metric. The algorithm divides the initial function point metric by a value from a table which uses cyclomatic complexity as its index. This adjusting function is non-standard at this time.

Reference

Jones, C., *Applied Software Measurement*, McGraw-Hill, New York, NY, 1991, 493 pages.

Exporting Data

Introduction

NuMega VB/Metric can export the contents of the display window to a comma delimited text file. This text file is in the standard CSV (Comma Delimited Text) format. The first row contains the field names, the subsequent rows contain the field data. Fields are separated by commas. The export capability has been thoroughly tested using Microsoft Excel. Any program conforming to CSV file formats should have no problem reading the export file.

Fields

Only the following fields are exported:

Module, Procedure, Complexity, Understanding, Bad fix, Extended, Understanding, Bad fix, Length, Vocabulary, Volume, Level, Intelligence, Lang. Level, Effort, Time, Total Lines, Code Lines, Blank, Comment and % Comments.

Due to the nature of CSV in requiring that all fields be static and each record always contain the same number fields, all the above fields are always exported; regardless of whether or not you chose that report. For empty fields, a blank value is inserted in the CSV file.

The module level summary is exported with the **Procedure** field set to "module summary". The following are not exported:

Function Points, NuMega GUI Metrics and Procedure Summary.

To Export

To export you must first load a project. Then start processing the project. You can then stop the processing and load a saved .met file (saved metrics file) or allow the project to complete processing. When complete or loaded, choose File...Export from the display window screen.

NuMega Answer Wizard

The NuMega Answer Wizard is used in many new NuMega products. It provides a more user friendly means to access help. Type in your question in plain english; or choose a previous help topic from the drop down. Press enter or choose search.

If the Answer Wizard cannot match your request or you simply want to search help directly just press F1 anywhere. Choosing the Help Options tab of the Answer Wizard will let you access the most common help functions.

