XLTEST - Excel spreadsheet quality check

What XLTest can do for you

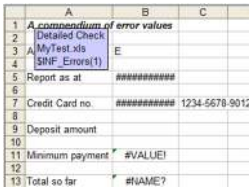
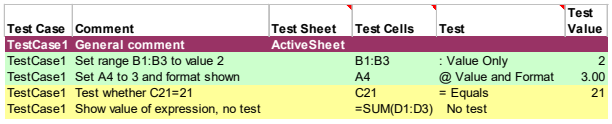
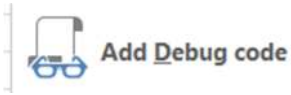
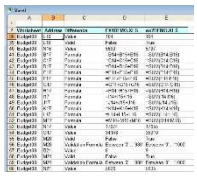
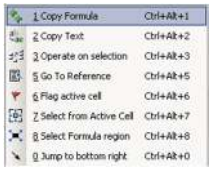
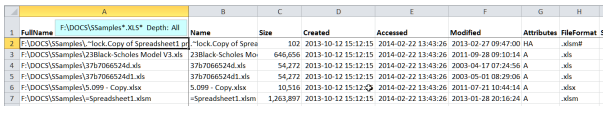
Detailed documentation reveals all the non-obvious content of the spreadsheet. It can reveal hidden rows, columns, and sheets. It helps you get to grips with a large spreadsheet that you have to understand.	
Colour maps give you an easily readable visualization of the structure and content of a spreadsheet. Inconsistent formulas and data stand out for attention.	
Detailed error checking makes it easy to find and fix errors far more quickly than with tedious cell-by-cell inspection.	
Test case maintenance and documentation make it easy to prove regression testing	
Utilities provide more ways to test, such as profiling VBA performance.	
Worksheet and workbook comparisons make it easy to see what has changed between two versions of a spreadsheet file	
Convenient keyboard and menu shortcuts make navigation and operations easier	
Quickly scan folders of Excel files to create an inventory of spreadsheets and their statistics to assist in risk assessment	

Table of Contents

Installation

Unzip the distribution package into a directory of your choice. You may need to unblock the file because Windows suspects files sent by email. To do this:

1. Locate the add-in file XLTest174.xlam in its folder in "Windows Explorer".
2. Right-click on the file and select "Properties" from the menu.
3. Click "Unblock" on the General tab. Click "OK".

If Excel crashes, it may decide to disable an add-in. To re-enable it:

1. Click "File", "Options". In the categories pane, click "Add-ins".
2. In the details pane, locate the add-in in "Disabled Application Add-ins".
3. In the Manage box, click "Disabled Items", and then click "Go".
4. Select the add-in and click "Enable".

You need to enable an Excel Trust option if you wish to analyse VBA content, otherwise (for example it may be blocked by your corporate Group policy), XLTest will be able to analyse spreadsheets but not VBA. To do this, click File, then Options; Trust Center, Trust Center Settings; in the Macro settings section, enable "Trust access to the VBA Project object model".

To install XLTest, in Excel Options click Add-Ins, in the Manage dropdown select Excel Add-ins, click Go, click Browse, open the folder into which you unzipped the package, and select the file XLTest174.xlam.

To uninstall, go to the Add-Ins dialog as above, then deselect "XLTest spreadsheet tester".

The distribution package also contains example files. EX1Demo.xls has some changes to EX2Demo.xls to exercise the workbook comparison feature of XLTEST. In this document, screenshots are from EX1Demo.xls. TriangleFormula.xls is an exercise in the Test Cases feature of XLTest. You may receive a macro security warning on opening the files; if so, enable the macros. If you receive a circular reference warning, click Cancel.

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Recent Version History

Changes up to version 1.74 (September 2021)

1. Start Session dialog changed to show internal workbook information before opening, and to open in manual calculation to prevent recalculation.
2. Start can remove sheet protection from unprotected OpenXML files to simplify processing.
3. Reports legacy BIFF properties in xls files to sheet $FileDoc.
4. Handles Unicode file and folder names.
5. Warns on unusual range name reference starting with "=!".
6. New #Error values (#SPILL! etc) are reported in the detailed inspection.
7. Right-click shortcut to filter where-used listings for Names, Styles, Links.
8. Performance improvements.
9. VBA performance timing at procedure and optionally line level.

Changes in version 1.67 (November 2019)

1. VBA code is commented out before analysis, to avoid interference from event handlers.
2. XML protection is checked before the test workbook is opened.
3. Fix for incomplete VBA module/procedure listing

Changes in version 1.65 (April 2019)

1. Colour by Protection format
2. Cell comparison with character difference in Comparison menu
3. Remove secure Protection from XML
4. Partial recalculation with timing
5. Add VBA debugging and profiling code
6. Ribbon menu shows Calculation and Memory status

Changes in version 1.57 (July 2016)

7. Copy to New Workbook makes a clean copy without excess names and styles
8. Scan Files menu: more output options, List DB Schema command added
9. 64-bit Excel and Excel 2016 compatibility
10. Several usability tweaks: Workbook operations in own menu from Utilities menu, checking for path lengths over 200 characters, two-level progress bar for batch testing, improved Styles Cleaner, stability improvements.

Changes in version 1.56 (Jan. 2016)

11. File open passwords now case sensitive
12. Records both Workbook Open and Worksheet Protect passwords
13. Option to skip checking link status which would cause password prompt

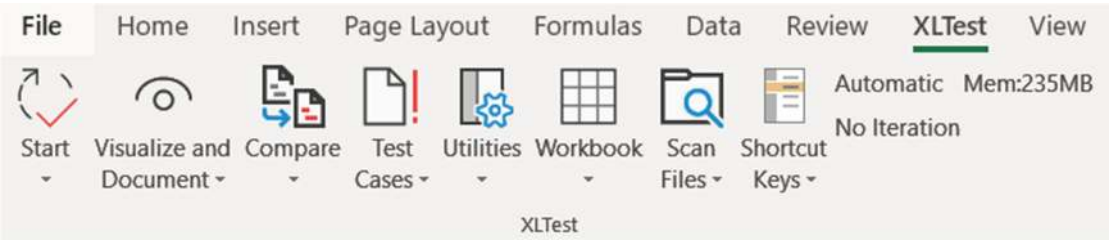
Changes in version 1.55 (Apr. 2015)

1. On startup checks and fixes autonumber seed problems in database
2. Processing limit of 1 million cells made an option
3. ExportActiveProject procedure runnable by user
4. VBA Sort Procedures option
5. Option to list all sheet statistics separately when scanning files
6. Demo / 30-day evaluation version made available
7. Utility option to display current autofilter criteria
8. Numerous usability tweaks, Excel 2013.

(Earlier version changes not listed here)

The XLTest menu and toolbar

The XLTest tab appears after the Review tab of the Ribbon. The colours of the icons may be different depending on the version of Excel you use or your Office theme.



Each button has a shortcut key you can see by pressing the Alt key and then S. To learn how to use the menu, we suggest you work through the XLTest menu items in the following order with the examples shown.

The Start menu has the options

1. Start new test session
2. XLTest options
3. Batch process
4. Help, About XLTest

The 'Visualize and Document' menu has the options

1. Workbook documentation
2. Reset settings, Unhide structure
3. Detailed Inspection
4. Styles and Conditional Formats
5. Formulas List, Colorize
6. Data Validation Formulas
7. Colorize by Protection
8. Data Type and usage
9. Colorize by Precedents
10. Colorize by Dependents
11. Decolorize worksheets
12. Show Watch info
13. Add $TOC, ReadMe, Palette

The 'Compare' menu has the options

1. Compare two cells
2. Compare worksheets
3. Compare workbooks
4. Quick diff report
5. Compare VBA projects

The 'Test Cases' menu has the options

1. New test case workbook
2. Run test cases
3. Tests to Scenarios
4. Scenarios to Tests

The ‘Utilities’ menu has the options

1. Remove secure Protection from XML
2. Toggle R1C1/A1
3. Show active Autofilter
4. Reset Text To Columns settings
5. Reset Excel status
6. Recalc Workbook
7. Recalc Sheets
8. Recalc Selection
9. Recalc Formulas
10. Profile VBA execution

The ‘Workbook’ menu has the options

1. Clear Unused Range
2. Delete all Styles
3. Save Copy As…
4. Copy to new workbook
5. Unprotect active sheet
6. Unprotect workbook and sheets
7. Delete Unused Number Formats
8. Unhide/Delete Names
9. Import all VBComponents
10. Export all VBComponents
11. Export VBProject to text file

The 'Scan Files' menu has the options:

1. List Excel filenames
2. Analyse files in list
3. Run macro on files
4. Manage passwords
5. Set Master password
6. List records for a file
7. SQL Command / Query DB
8. Compact and Repair DB
9. List DB Schema

The ‘Shortcut Keys’ menu has the options:

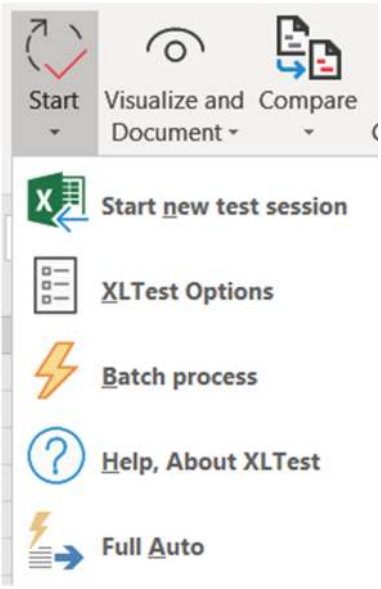
1 Copy Formula
2 Copy Text
3 Copy Address
4 Operate on selection
5 Go To Reference
6 Flag active cell
7 Select from Active cell
8 Select Formula region
9 Selection in Names
0 Jump to bottom right
[Show Precedent formulas
] Show Dependent formulas
V View $DB_ filtered by this
Refresh Right-click menu

The numbers and square brackets in the Shortcut Keys menu are the shortcut keys you can press with Ctrl+Alt. XLTest also adds the Key Shortcuts options to the end of the cell context pop-up menu that appears when you right-click on a cell. If you do not see them, use the menu option ‘Refresh Right-click menu’.

At the end of the XLTest group in the Ribbon is a set of information displays that shows the current recalculation status and memory usage.

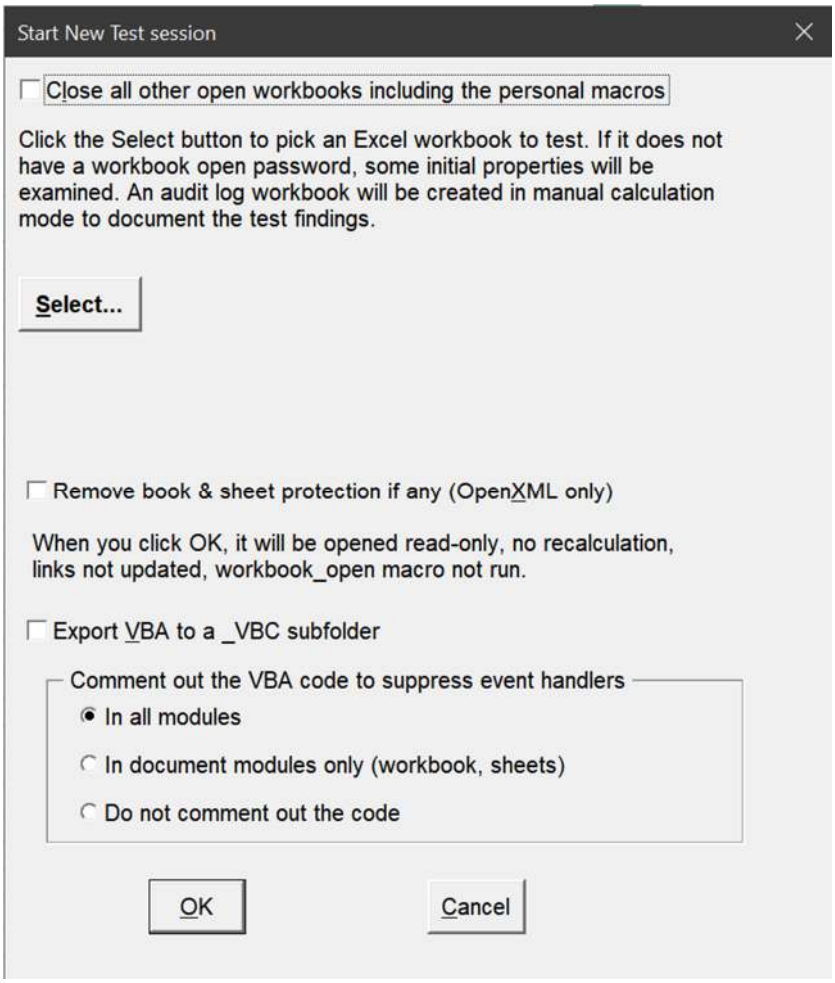
XLTest provides 14 extra user-defined functions that you can use in your spreadsheets. These are listed at the end of this document.

The Start menu



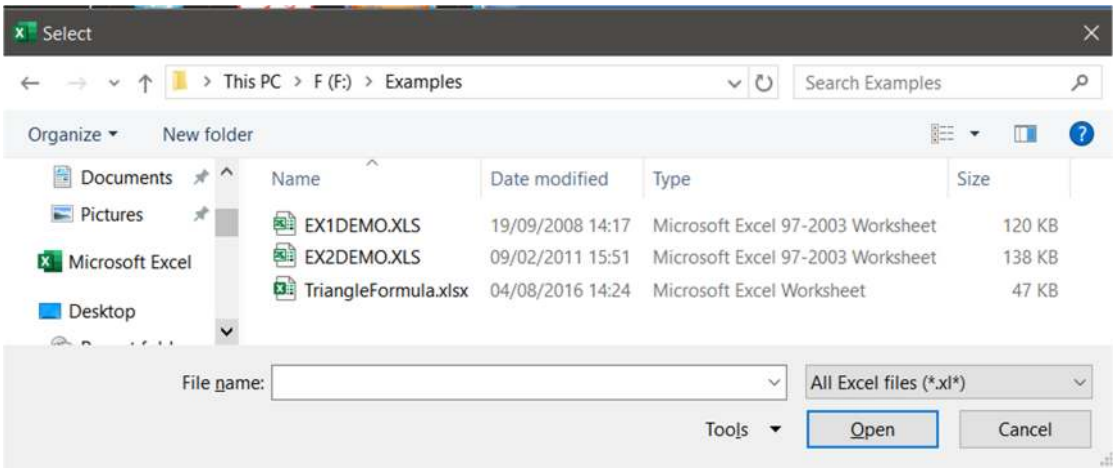
Start > Start new test session

Open workbook for testing, start documentation, create $APP sheet

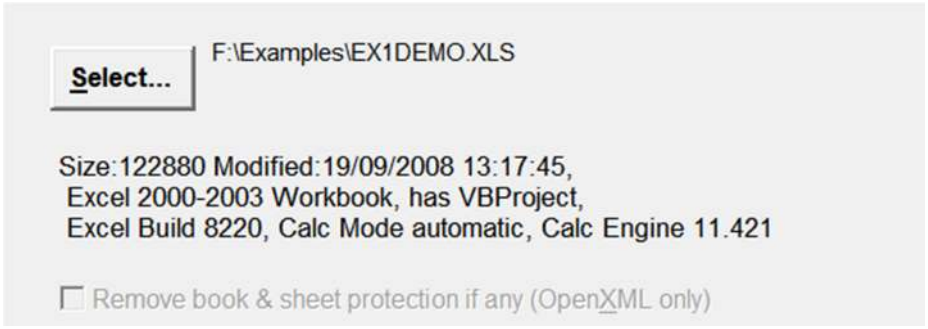


If you check “Close all other…” , XLTest closes all open workbooks including the personal macro workbook (PERSONAL.XLS or .XLSB) which is normally hidden.

When you click “Select”, XLTest prompts you with a File Open dialog:



The dialog will then update to show you any internal information that XLTest has been able to read before opening. This is obtained from the BIFF records of .XLS format files, or the XML of OpenXML files of Excel 2007 and later. It will be recorded in the $FileDoc tab of the XLTEST_LOG workbook (see below). If the workbook is protected, it will not be able to retrieve this information and you will need its password to open it.



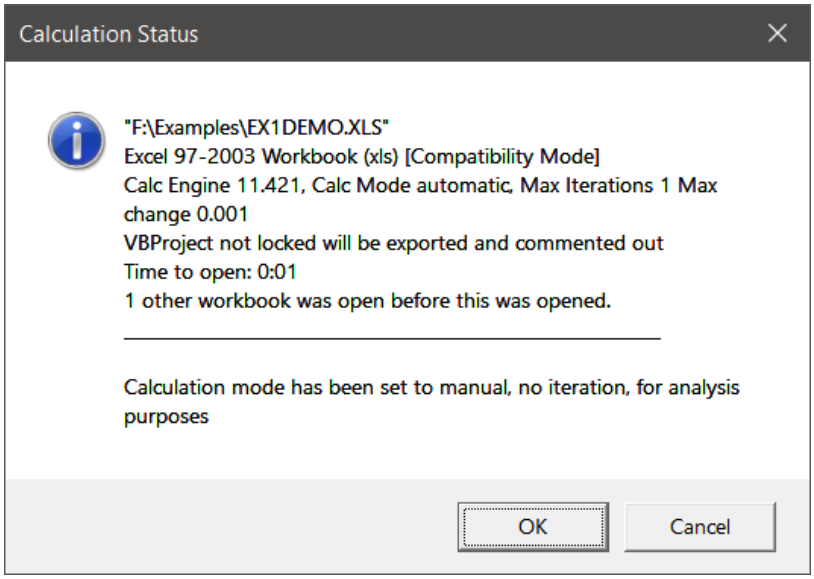
When you click OK, XLTest opens a new workbook named “$XT(1) XLTEST_LOG.xlsx” in manual calculation mode. This will ensure that the workbook under test will not be recalculated automatically when opened, which might change its data.

For OpenXML files, it exports a file "styles.xml", which it uses to check for excessive styles, and to report on Custom Number Formats (see below). If you checked “Remove book and sheet protection”, those attributes are removed from the XML and a backup copy of the workbook is created.

XLTest opens the file you select read-only and with macros disabled. If you checked “Export VBA …”, XLTest will create a folder named after the workbook plus “_VBC” and export the VBProject modules to there.

If you checked the "Comment out…" option and the VBproject is unlocked, it comments out VBA code to disable any event handlers such as Sheet_Change.

It displays a summary message now that this workbook has been opened.

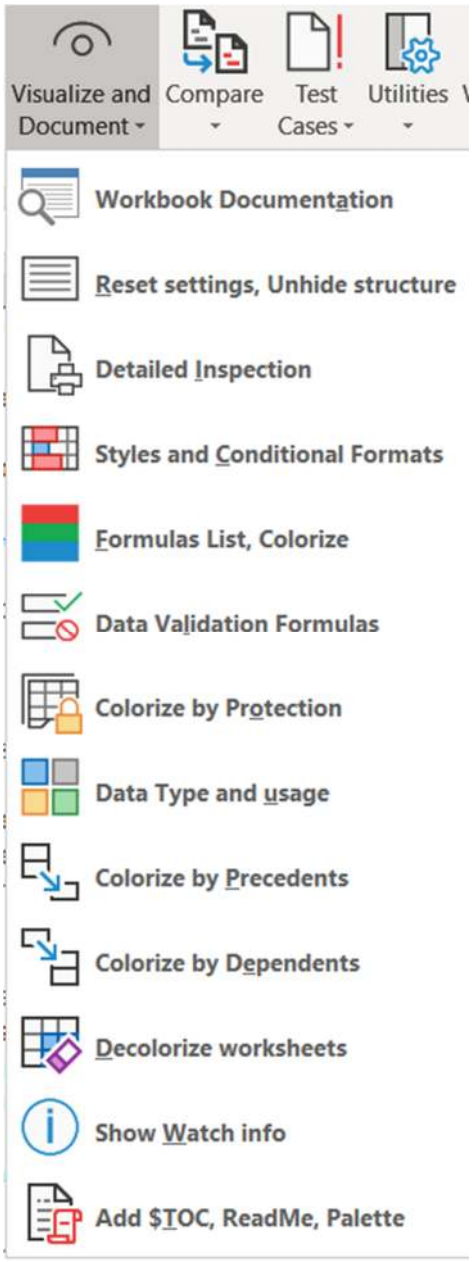


The XLTEST_LOG workbook will contain the various documentation sheets produced during an XLTest session. The sheet named XLTEST_LOG contains a record of each test performed and the time. It also has a sheet $APP showing your current Excel settings, add-ins, and custom menus, so that you can review any Excel options that may need changing. Be sure to switch back to viewing the workbook under test before using more XLTest options.

	A	B	C	D	E
1	**Excel Application Settings**	**05/04/2019 16:09**	**C:\Program Files (x86)\Microsoft Office\Root\Office16**		
2					
3	**Application Setting**	**Value**	**Notes**		
4	Operating System	Version	Windows (32-bit) NT 10.00		
5	Excel Version Number	16	32-bit, Build 11328		
6	Excel User Name	@ExcelAnalytics	Separate from the Windows login user name		
7	Organization Name		Registered organization name		
8	Standard Font	Arial 11			
9	Default File Path		C:\Users\me\AppData\Roaming\Microsoft\Windows\Recent		
10	Open all files in	Startup folder			
11	Custom List Count	8			
12	Default Save Format	51	Excel 12 Workbook (xlsx)		
13	Display Formula Bar	Visible			
14	Display Status Bar	Visible			
15	Display Scroll Bars	Visible			
16	Display comments, indicators	Indicators			
17	Calculation Interrupt Key	Any Key			
18	Calculation method	Manual	May have been set by XLTEST or another workbook opened		
19	Calculation Iterations	Max Iterations: 1, Max change: 0.001	This suppresses warnings about any circular references		
20	Calculate Before Save	Disabled	It is recommended to enable this		
21	Fixed Decimal places	Disabled			
22	Auto Complete	Enabled	This may enter unexpected values if the user is not careful.		
23	Prompt for Workbook properties on save	Disabled			
24	Reference Style	A1			
25	Transition navigation keys	Disabled			
26	Asks to Update Links	Enabled	Whether Excel asks the user to update links whenever a file that contains links is opened		
27	Extend list formats and formulas	Enabled	This may cause formulas to be unexpectedly changed.		
28	Background error checking	Enabled			
29	Auto Recover save interval	Disabled	minutes. It is recommended to enable this		
30					
31					
32	**Add-Ins installed**	**No.**	**Comments**	**FullName**	**Author**
33	Microsoft Power View for Excel	1	{509E7382-B849-49A4-8A3F-BEAB7E7D904C}		
34	Microsoft Power Map for Excel	3	{F39D01F3-69C1-45E1-93B2-7BF0BC6EB63E}		
35	Microsoft Excel Code Compatibility Inspector	4	{00000000-0000-0000-0000-000000000000}		
36	Microsoft Data Streamer for Excel	5	{00000000-0000-0000-0000-000000000000}		
37	Inquire	6	{237428F1-F2C7-4F86-B7ED-ADE148ACF95F}		
38	Microsoft Power Pivot for Excel	7	{A2DBA3BE-42CC-4D0E-95FD-BCAA051BA798}		

The remainder of the Start menu items are described later. Next, we describe the options for creating documentation.

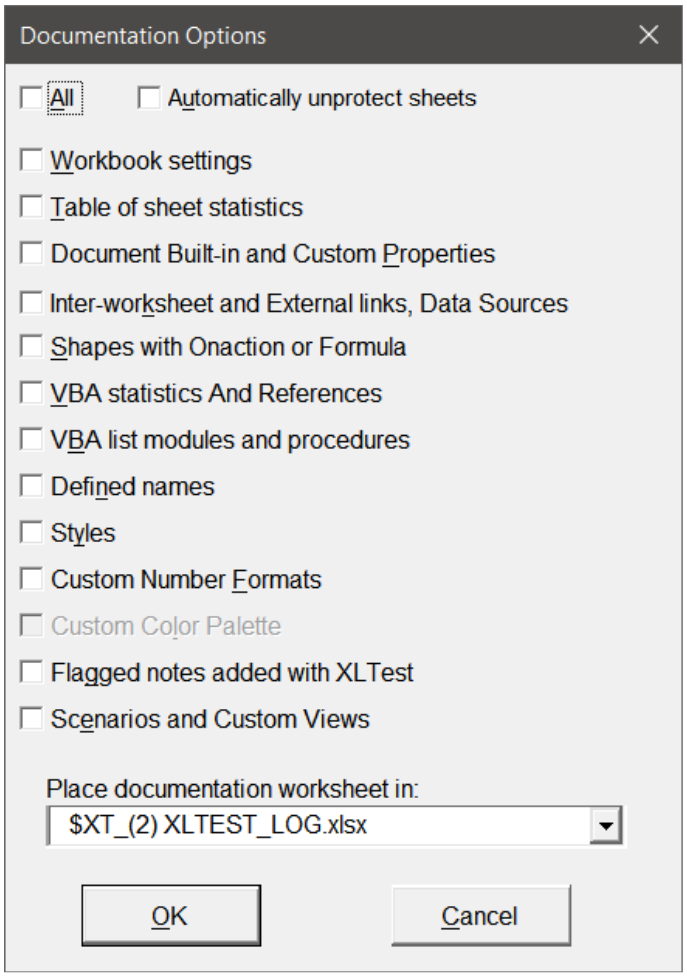
Visualize and Document menu



Workbook Documentation

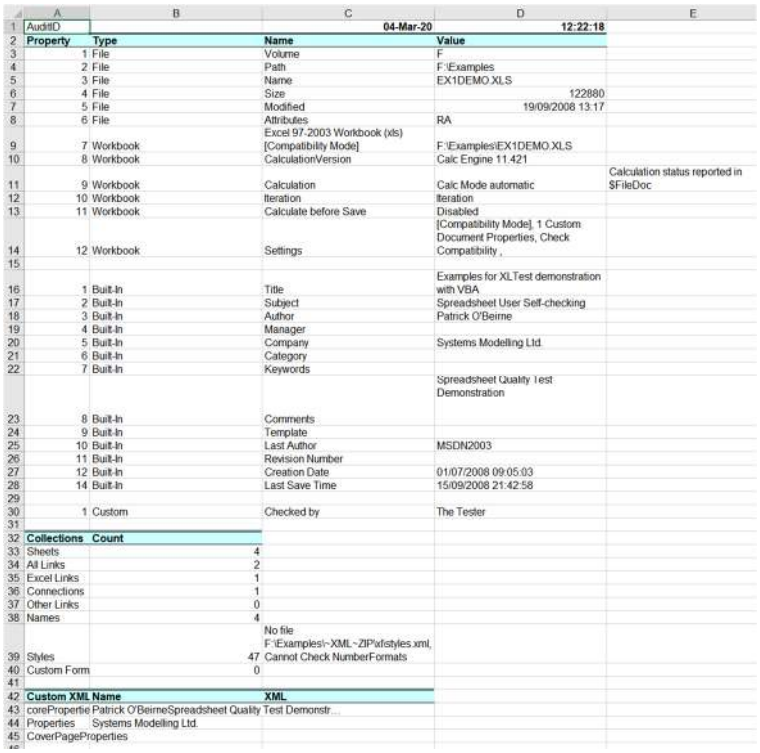
Create $DOC sheet for Workbook documentation

If you have not already done so, use *Start new test session* to open the sample workbook EX1DEMO.XLS read-only. XLTest opens a workbook for testing read-only so that you cannot accidentally overwrite the original. If you save the working file, it must be saved under a different name. You can use *Save Copy As* to save copies under different names, for example after each colouring exercise.



The All checkbox toggles all the selections on or off. If you check 'Automatically unprotect sheets', which only applies to weak protection in Excel before 2007, you will be shown what password worked on them. This does not happen with the Ex1demo example because only a blank password was used.

This is an example $Doc sheet in the $XT documentation workbook:



	A	B	C	D	E
1	Audit$D		04-Mar-20	12:22:18	
2	**Property**	**Type**	**Name**	**Value**	
3	1	File	Volume	F	
4	2	File	Path	F:\Examples	
5	3	File	Name	EX1DEMO.XLS	
6	4	File	Size	122880	
7	5	File	Modified	19/09/2008 13:17	
8	6	File	Attributes	RA	
9	7	Workbook	Excel 97-2003 Workbook (xls) [Compatibility Mode]	F:\Examples\EX1DEMO.XLS	
10	8	Workbook	CalculationVersion	Calc Engine 11.421	
11	9	Workbook	Calculation	Calc Mode automatic	Calculation status reported in $FileDoc
12	10	Workbook	Iteration	Iteration	
13	11	Workbook	Calculate before Save	Disabled	
14	12	Workbook	Settings	[Compatibility Mode], 1 Custom Document Properties, Check Compatibility ,	
15					
16	1	Built-In	Title	Examples for XLTest demonstration with VBA	
17	2	Built-In	Subject	Spreadsheet User Self-checking	
18	3	Built-In	Author	Patrick O'Beirne	
19	4	Built-In	Manager		
20	5	Built-In	Company	Systems Modelling Ltd.	
21	6	Built-In	Category		
22	7	Built-In	Keywords	Spreadsheet Quality Test Demonstration	
23	8	Built-In	Comments		
24	9	Built-In	Template		
25	10	Built-In	Last Author	MSDN2003	
26	11	Built-In	Revision Number		
27	12	Built-In	Creation Date	01/07/2008 09:05:03	
28	14	Built-In	Last Save Time	15/09/2008 21:42:58	
29					
30	1	Custom	Checked by	The Tester	
31					
32	**Collections**	**Count**			
33	Sheets	4			
34	All Links	2			
35	Excel Links	1			
36	Connections	1			
37	Other Links	0			
38	Names	4			
39	Styles	47	No file F:\Examples\~XML~ZIP\xl\styles.xml, Cannot Check NumberFormats		
40	Custom Form	0			
41					
42	**Custom XML**	**Name**	**XML**		
43	coreProperties	Patrick O'Beirne	Spreadsheet Quality Test Demonstr...		
44	Properties	Systems Modelling Ltd.			
45	CoverPageProperties				

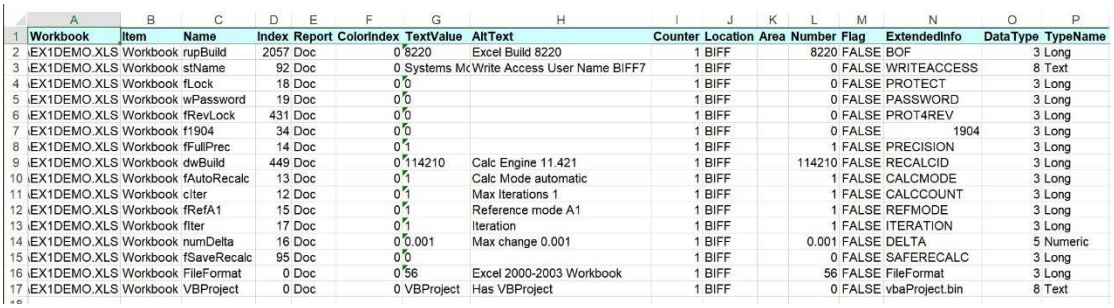
Read the sheets to discover some interesting things about this workbook:

1. $FileDoc: A list of properties obtained from the binary (BIFF) records. For .XLS files only. The file format, Excel build, calc engine build, and others.
2. $Doc: A list of workbook properties, built-in and custom; a summary of functions used in the workbook; a list of any cells flagged using the Flag menu item; and a list of hidden settings reset. In Ex1Demo, calculation iteration was enabled, suppressing alerts about circular references. XLTest turns off iteration.
3. $Sheets: a table gives summary statistical information about the sheets. The columns are Index, Codename, Name, Settings, Protection, First Entry, Last Cell, Last Data Cell, Last Column, Last Row, Cells, NonBlanks, Numerics, Errors, Sum, Min, Max, Comments, Formulas, FormatConditions, CF Cells, DV Cells, Objects, Tables, Query Tables, Hidden Rows, Hidden Columns, PrintArea, Page Header, Page Footer, Window Settings, Found In Formulas, Found In Values.
4. For Ex1Demo, $Sheets reports that Sheet1 ‘Data’ was protected and hidden; Sheet2 ‘Transfer’ is very-hidden, a setting only available from the VBA Project, not from Excel’s Format menu; and Sheet9 ‘Budget08’ has some hidden columns and rows.
5. $WSXref: A cross-tabulation of all sheets against all other sheets to show how the sheets refer to each other by formula links. It also lists everywhere that links are used.
6. $Links: a list of the sources of external links, queries, and data connections.

7. $Names: a list of the defined names along with their range dimensions and values, and any warnings about duplicate names. In a batch process, the column '$DB_ Count' shows you how many uses of that name were found.
8. $Styles: a list of the Styles in use with their properties (font, colour, etc) and whether any are not their default setting. Non-built-in-styles are highlighted in yellow in the 'Builtin' column. If you find that the Normal style has a Date number format, that is a corruption caused by pasting across different workbooks. In a batch process, the column '$DB_ Count' shows you how many uses of that style were found.
9. $Scenarios: A list of the scenarios in the workbook with their settings.
10. $Views: A list of the custom views in the workbook with their settings.
11. $Formats: a list of the custom number formats in the workbook, the number of sheets they are used in, and an example of each. Formats which hide data are highlighted in yellow. This sheet is produced only when there is an OpenXML styles.xml file saved.
12. $VBA: a list of VBProject references, components, procedures, line count statistics, any of the "Find in VBA" strings (see below) that were found, and keyboard shortcuts assigned. These may have been commented out for safety when the file was first opened.

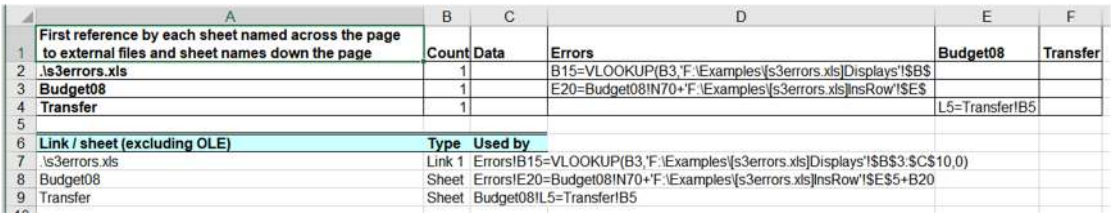
In more detail:

If the workbook was an Excel 2003 or earlier binary .xls file, the $FileDoc sheet lists some properties of interest from the binary records.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Workbook	Item	Name	Index	Report	ColorIndex	TextValue	AltText	Counter	Location	Area	Number	Flag	ExtendedInfo	DataType	TypeName
2	EX1DEMO.XLS	Workbook	rupBuild	2057	Doc	0	8220	Excel Build 8220	1	BIFF		8220	FALSE	BOF	3	Long
3	EX1DEMO.XLS	Workbook	stName	92	Doc	0	Systems Mc	Write Access User Name BIFF7	1	BIFF		0	FALSE	WRITEACCESS	8	Text
4	EX1DEMO.XLS	Workbook	fLock	18	Doc	0	0		1	BIFF		0	FALSE	PROTECT	3	Long
5	EX1DEMO.XLS	Workbook	wPassword	19	Doc	0	0		1	BIFF		0	FALSE	PASSWORD	3	Long
6	EX1DEMO.XLS	Workbook	fRevLock	431	Doc	0	0		1	BIFF		0	FALSE	PROT4REV	3	Long
7	EX1DEMO.XLS	Workbook	f1904	34	Doc	0	0		1	BIFF		0	FALSE	1904	3	Long
8	EX1DEMO.XLS	Workbook	fFullPrec	14	Doc	0	1		1	BIFF		1	FALSE	PRECISION	3	Long
9	EX1DEMO.XLS	Workbook	dwBuild	449	Doc	0	114210	Calc Engine 11.421	1	BIFF		114210	FALSE	RECALCID	3	Long
10	EX1DEMO.XLS	Workbook	fAutoRecalc	13	Doc	0	1	Calc Mode automatic	1	BIFF		1	FALSE	CALCMODE	3	Long
11	EX1DEMO.XLS	Workbook	cIter	12	Doc	0	1	Max Iterations 1	1	BIFF		1	FALSE	CALCCOUNT	3	Long
12	EX1DEMO.XLS	Workbook	fRefA1	15	Doc	0	1	Reference mode A1	1	BIFF		1	FALSE	REFMODE	3	Long
13	EX1DEMO.XLS	Workbook	fIter	17	Doc	0	1	Iteration	1	BIFF		1	FALSE	ITERATION	3	Long
14	EX1DEMO.XLS	Workbook	numDelta	16	Doc	0	0.001	Max change 0.001	1	BIFF		0.001	FALSE	DELTA	5	Numeric
15	EX1DEMO.XLS	Workbook	fSaveRecalc	95	Doc	0	0		1	BIFF		0	FALSE	SAFERECALC	3	Long
16	EX1DEMO.XLS	Workbook	FileFormat	0	Doc	0	56	Excel 2000-2003 Workbook	1	BIFF		56	FALSE	FileFormat	3	Long
17	EX1DEMO.XLS	Workbook	VBProject	0	Doc	0	VBProject	Has VBProject	1	BIFF		0	FALSE	vbaProject.bin	8	Text

The sheet $WSXref can help you see the data flow from sheet to sheet.



	A	B	C	D	E	F
1	First reference by each sheet named across the page to external files and sheet names down the page	Count	Data	Errors	Budget08	Transfer
2	.\s3errors.xls	1		B15=VLOOKUP(B3,'F:\Examples\[s3errors.xls]Displays'!B		
3	Budget08	1		E20=Budget08!N70+'F:\Examples\[s3errors.xls]InsRow'!E		
4	Transfer	1			L5=Transfer!B5	
5						
6	Link / sheet (excluding OLE)	Type	Used by			
7	.\s3errors.xls	Link 1	Errors!B15=VLOOKUP(B3,'F:\Examples\[s3errors.xls]Displays'!$B$3:$C$10,0)			
8	Budget08	Sheet	Errors!E20=Budget08!N70+'F:\Examples\[s3errors.xls]InsRow'!$E$5+B20			
9	Transfer	Sheet	Budget08!L5=Transfer!B5			

The sheet $Sheets lists the sheets and their properties; the XLTest Options dialog (see below) defines strings that are reported in columns “Found in Formulas” and “Found in Values” if any of them are found in the sheet. The defaults supplied are:

In formulas:	#REF! INDIRECT(LOOKUP(MATCH(OFFSET(IF(*IF(*IF(GETPIVOTDATA(
In values:	password confidential error
In VBA:	error password Open .Save Data Source= DDEInitiate .ACCDB .MDB .XLS .TXT .CSV .HTM .XML :\ \\ :// .CommandBars .OnAction Shell URLDownloadToFileA

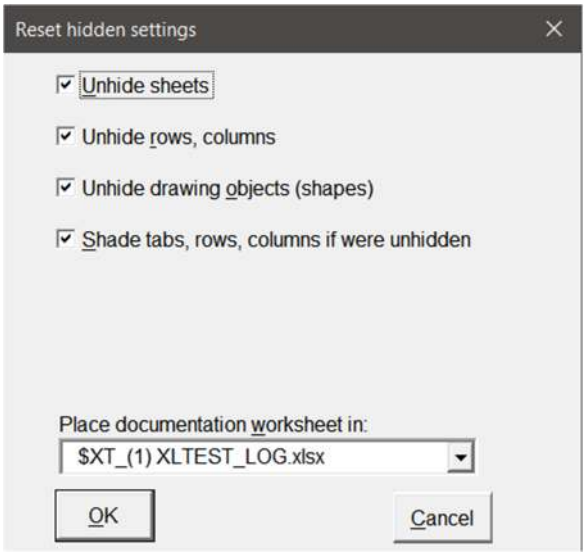
If you wish to select all the cells that match a given string, use the Find command in Excel, click the Find All button, then in the list of cells that appears, press Ctrl+A to select them all, then close the Find dialog.

The sheet $VBA lists the References, the VBProject components (forms, normal modules, code behind sheets, and classes), and flags any which are missing the Option Explicit declaration. If the option “List VBA Modules and procedures” was selected, it also lists the procedure names and declarations. You can tell from these whether the code is unaltered Macro Recorder code with names like “Module1” and “Proc1” or whether they were hand coded.

If any lines of code contain the strings listed in “Find in VBA” above, they are individually listed. These strings were chosen to find lines that may open and get data from external files. You can of course tailor this to add your own special terms such as the names of corporate add-in functions.

Reset Settings, Unhide structure

Reset workbook settings, hidden rows, columns, sheets

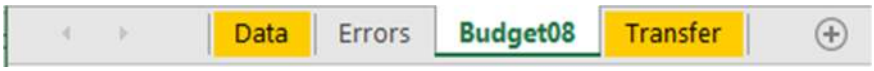


If the views in a workbook have been customised to hide elements such as gridlines and headings, these are reset to normal so as to be able to see them. XLTest reports what has been made visible or what settings have been turned off:

Formula and Status Bar
Comment indicators
Formulas Display turned off
Gridlines, Row & Column Headings
Horizontal and Vertical scrollbar
Sheet tabs
Zero values displayed
Freeze Panes and Window Split removed
Page Break Preview removed
Zoom display reset to 100
Custom colour palette reset to Excel's standard colours

The items revealed are listed at the end of the $DOC sheet if present.

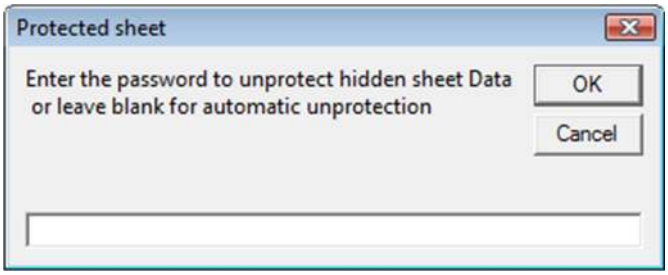
47	Reset	Sheet Name	Unhidden structure
48	1	'Budget08'	1 Window Settings
49	2	'Errors'	1 Window Settings
50	3	'Budget08'	2 Hidden rows
51	4	'Budget08'	1 Narrow rows
52	5	'Budget08'	1 Hidden columns



The tabs of sheets which XLTest unhides are given a gold colour. This is not done in the batch process because all the sheets are unhidden first.

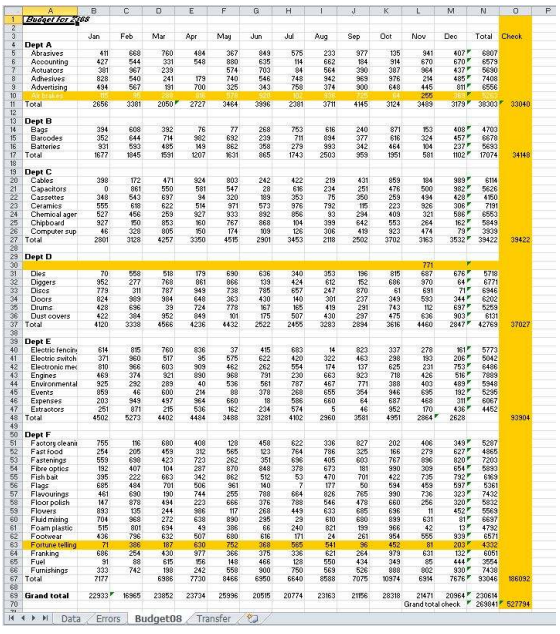
You may wish to only unhide sheets, rows, and columns without also shading them; or you may wish to do neither.

If the sample workbook contains a protected sheet (the Ex1Demo example will not have one if you unprotected it during documentation), you are also asked:



If you don't know what the password is, simply click OK and XLTest will try first a blank and then a sequence of patterns to find the one that will unprotect the sheet. If it fails, the secure protection of Excel 2013 and later may have been used and you did not check "Remove book and sheet protection" when starting the session. The Utilities menu can remove sheet protection from a closed workbook.

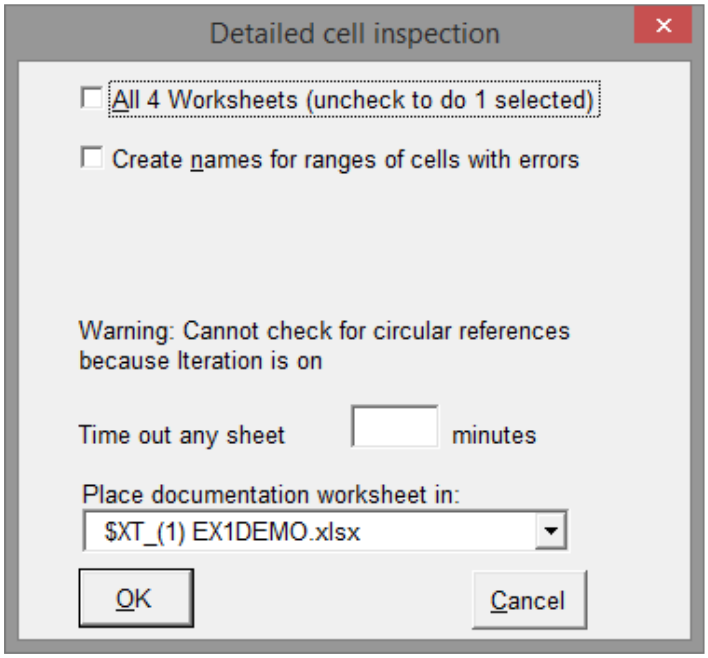
1. Sheet 'Data' had been hidden; XLTest has unhidden it and the sheet tab is coloured gold.
2. Sheet 'Transfer' had been very-hidden; XLTest has unhidden it and the sheet tab is coloured gold.
3. Sheet 'Budget08' had some hidden columns and rows, and some narrow rows or columns that might have been easily missed. When you look at that sheet, you will find they have been coloured gold.



Detailed Inspection

Create sheets of detailed cell inspection

In the example workbook, select the sheet 'Errors' and click the *Detailed Inspection* menu item in the XLTest Visualize menu.



If you check the first option, it will process all the worksheets in the workbook. If you leave it unchecked, it will process only the selected sheets. You can select multiple sheets by Ctrl+click on each tab you want to include in the selection. Or, by selecting one sheet tab, holding down the Shift key, and selecting another tab, you can select a group of sheets at once. This can be a useful way to include a set of sheets that you want to test, or to exclude a sheet containing nothing more of interest than a large table of data. For this exercise, leave the first option unchecked. Because the active sheet is 'Errors', this creates a sheet *Errors* in the $XT_ workbook which summarises the warnings on the sheet. The "Areas" column contains hyperlinks to the cells, or if 'Create names' was checked, to a named range referring to the cells. Each cell across contains the full address of the area and you can use the XLTest shortcut Right-Click+5 to go to that area. If you do not see the numbered XLTest options in the cell context menu, use the Shortcut Keys menu option 'Refresh Right-click menu'.

If Iteration is on, a warning appears that it cannot check for circular references. If you wish to include that check, please first uncheck "Enable iterative calculations" in the Excel Options.

The option to time out the inspection is useful for workbooks that may have large worksheets that you do not wish to analyse completely. Leave it blank for no timeout. The sheet lists the #Error values, the error and warnings checks, some formula statistics, a list of functions used, any circular reference chain, the number formats in use, custom styles, and the comments (cell notes) on that sheet.

Most tests in XLTEST add a text box to the original sheet which hyperlinks to the documentation sheet. This screenshot shows four such links (Info, Numberformats, Conditional Formats, and Formulas), and the screen tip for the first one, $Inf.

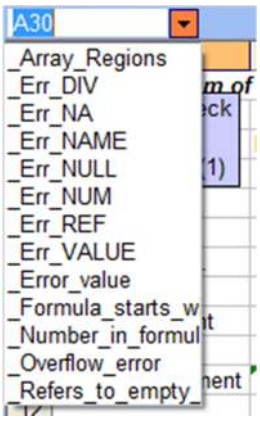
Errors and warning checks

Description of check	***The cell contains…***
Error value	an error value, one of: #DIV/0!, #N/A, #NAME?, #NULL!, #NUM!, #REF!, #VALUE! #SPILL!, #CONNECT!, #BLOCKED!, #UNKNOWN!, #FIELD!, #CALC! Excel 2019 adds #SPILL! and other error values
Text two digit year	a text date with 2 digit years
Number stored as text	a number stored as text
Inconsistent formula	an inconsistent formula for a region
Omits cells in region	a formula omitting a cell for a region
Unlocked formula cell	a formula and is unlocked
Refers to empty cell	a formula referring to empty cells
List validation error	data in the list contains a validation error
Inconsistent list	an inconsistent formula for a list
Fails data validation	a validation error
Overflow error	an overflow error
Number in formula	an embedded (‘hard coded’) numeric constant
NumberFormat hides value	number format obscures real value
Format Font Fill colour	font colour same as cell fill colour
Conditional Format Font	font conditional colour same as cell fill colour
Formula too long	formula exceeds 1024 characters
Formula starts with minus	formula begins =-
Formula with double minus	formula contains --
Numeric text right aligned	numeric text aligned to look like a number
Range_Lookup check params	a lookup function missing the range lookup parameter
Formula #REF but not error	a formula contains #REF but does not return an error

This is followed by other checks: Cells Checked; Not empty; All Formulas; Distinct Formulas; External Link Formulas; Formula Hidden; Formula Unlocked; Max Formula Length; Max Formula Complexity; Total Formula Complexity; Array Formulas; Object formulas; Merged Areas; Number Formats used; Custom Styles used; Circular Reference.

After that, there is a list of Excel functions used, number formats used, cell comments, and hyperlinks.

If you checked "Create names for ranges of cells with errors", range names are created corresponding to the entries in the 'Description of check' column in the table above. This provides a convenient way to select all the cells in a particular class of error.



Not all of these warnings are necessarily real errors. For example, although constant numbers in formulas are not good practice if they represent numbers which might change, the VLOOKUP function will usually have a numeric constant in it which is the number of the column to be returned, eg `=VLOOKUP(A4,TaxTable,7,FALSE)`.

Each of the areas found for each error is listed across the sheet:

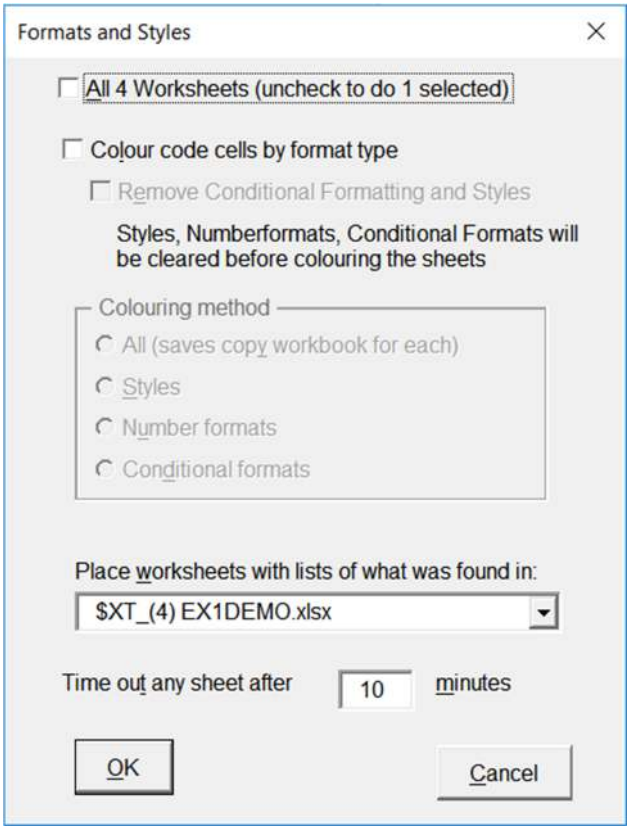
No.	Error Check	Count	Areas	Ranges
1	Error value	10	6	S]Errors!B11 S]Errors!B13 ors!B15:B17 ors!B21:B23 S]Errors!D23 S]Errors!B25
2	Text two digit year			
3	Number stored as text			
4	Inconsistent formula			
5	Omits cells in region			
6	Unlocked formula cell			
7	Refers to empty cell	4	4	S]Errors!B16 S]Errors!B22 S]Errors!D23 S]Errors!B27
8	List validation error			
9	Inconsistent list			
10	Fails data validation			
11	Overflow error	1	1	LS]Errors!B5
12	Number in formula	5	3	S]Errors!B11 ors!B20:B21 ors!C21:D21
13	NumberFormat hides value			
14	Format Font Fill colour			
15	Conditional Format Font			
16	Formula too long			
17	Formula starts with minus	1	1	LS]Errors!B5
18	Formula with double minus			
19	Numeric text right aligned			
20	Range_Lookup check params	3	1	ors!B15:B17
21	Formula #REF but not error			

The sheet name is shown in a lighter colour in order to make the cell address stand out better. The right-click '5 GoTo Reference' shortcut works on these cells even though they are not hyperlinked.

Styles and Conditional Formats

List Colour Formats and Styles

In the Batch Test menu, this is done by the option ‘Colour Styles, Numberformats, Conditional formats from above lists’ which uses the previously derived lists to identify the cells to be coloured.



This enables you to see differences in the otherwise non-obvious formulas behind conditional formatting.

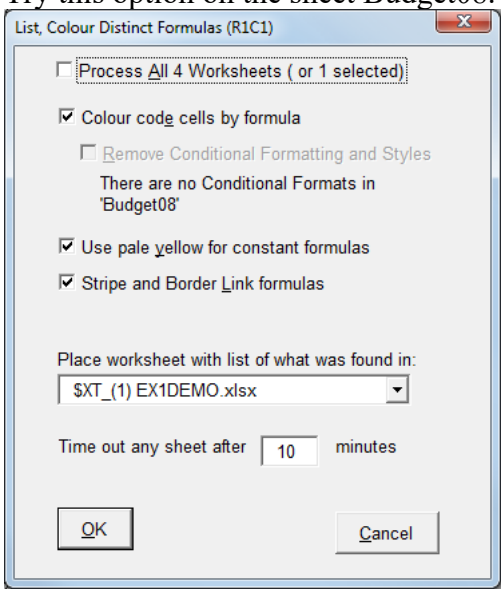
Because Conditional Formats typically have fill colours, there is an option to remove them after creating the sheet that lists them and before adding the XLTest colour scheme which assigns a distinct colour to each conditional format formula.
So, ensure you use this menu option to document the CF colours before you remove them in any other XLTest colouring menu options.

In Batch mode, a copy of the workbook coloured by the Conditional formats is saved in a file "#Cof(1) EX1DEMO.XLS"; otherwise in a sheet in the $XT file.

Formulas List, Colorize

List, Colour cells by distinct formula (R1C1)

Try this option on the sheet Budget08. Select all options except the first and click OK:

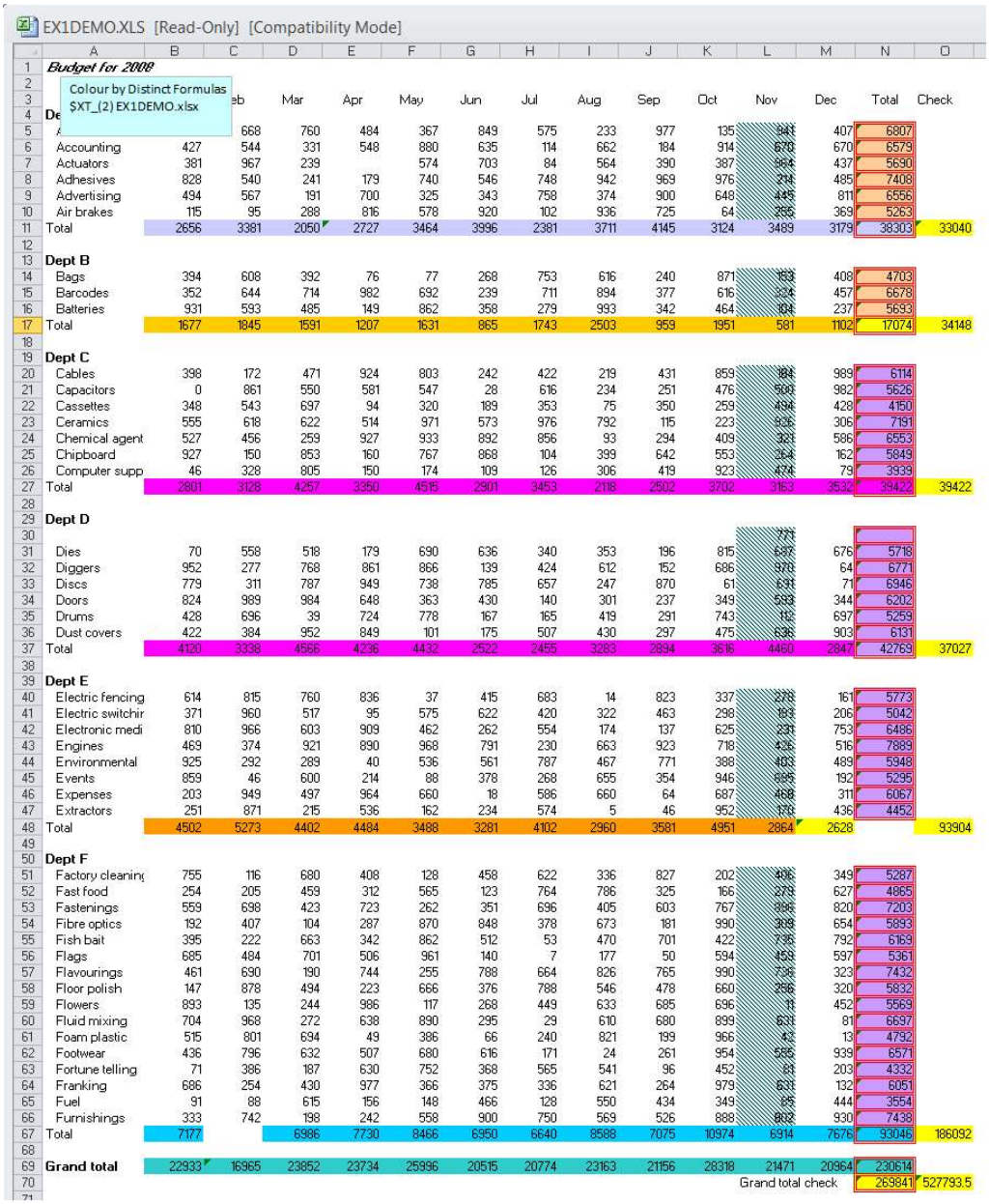


The option for *constant formulas* is for those cases when a sheet has formulas that are simply calculations like =1+2+3 with no cell references. Rather than treating each one as a different formula, this assigns the same pale yellow colour to them all. The *Stripe and Border link formulas* option shades cells with formulas that contain an exclamation mark (which might be an indication of workbook or external links) and puts a black border around cells with external links.

This creates a sheet in the documentation workbook named Budget08 that lists each formula in both R1C1 and A1 style and the areas it was found in. The first column has the colour assigned to it by XLTest. The FormulaA1 column also highlights in yellow some warning comments; for example, formulas with embedded constant numbers. In column G (not shown below) a picture of the worksheet provides an overview.

	A	B	C	D	E	F
1	Distinct Form	Formula R1C1 in 'Budget08'	Formula A1	Count	Areas	Ranges
2	1	=Transfer!RC[-10]	L5=Transfer!B5	47	6	[EX1DEMO.XLS]Budget08!L5:L10 [EX1DEM
3	2	=SUM(RC[-13]:RC[-1])	N5=SUM(A5:M5)	9	2	[EX1DEMO.XLS]Budget08!N5:N10 [EX1DEM
4	3	=SUM(R[-6]C:R[-1]C)	B11=SUM(B5:B10)	13	1	[EX1DEMO.XLS]Budget08!B11:N11
5	4	=SUM(R[-6]C[-13]:R[-2]C[-2])	O11=SUM(B5:M9)	1	1	[EX1DEMO.XLS]Budget08!O11
6	5	=R[-3]C+R[-2]C+R[-1]C	B17=B14+B15+B16	12	1	[EX1DEMO.XLS]Budget08!B17:M17
7	6	=SUM(R[-3]C:R[-1]C)	N17=SUM(N14:N16)	1	1	[EX1DEMO.XLS]Budget08!N17
8	7	=SUM(R[-3]C[-13]:R[-1]C[-1])	O17=SUM(B14:N16)	1	1	[EX1DEMO.XLS]Budget08!O17
9	8	=SUM(RC[-12]:RC[-1])	N20=SUM(B20:M20)	39	4	[EX1DEMO.XLS]Budget08!N20:N26 [EX1DEM
10	9	=SUM(R[-7]C:R[-1]C)	B27=SUM(B20:B26)	25	2	[EX1DEMO.XLS]Budget08!B27:N27 [EX1DEM
11	10	=SUM(R[-7]C[-13]:R[-1]C[-2])	O27=SUM(B20:M26)	1	1	[EX1DEMO.XLS]Budget08!O27
12	11	=SUM(R[-6]C[-13]:R[-1]C[-2])	O37=SUM(B31:M36)	1	1	[EX1DEMO.XLS]Budget08!O37
13	12	=SUM(R[-8]C:R[-1]C)	B48=SUM(B40:B47)	11	1	[EX1DEMO.XLS]Budget08!B48:L48
14	13	=SUM(R[-8]C:R[-2]C)	M48=SUM(M40:M46)	1	1	[EX1DEMO.XLS]Budget08!M48
15	14	=SUM(R[-8]C[-13]:R[-1]C[-1])	O48=SUM(B40:N47)	1	1	[EX1DEMO.XLS]Budget08!O48
16	15	=SUM(R[-16]C:R[-1]C)	B67=SUM(B51:B66)	12	2	[EX1DEMO.XLS]Budget08!B67 [EX1DEM
17	16	=SUM(R[-16]C[-13]:R[-1]C[-1])	O67=SUM(B51:N66)	1	1	[EX1DEMO.XLS]Budget08!O67
18	17	=R[-58]C+R[-52]C+R[-42]C+R[-32]C+R[-21]C+R[-2]C	B69=B11+B17+B27+B37+B48+B67	13	1	[EX1DEMO.XLS]Budget08!B69:N69
19	18	=SUM(R[-1]C[-12]:R[-1]C[-1])	N70=SUM(B69:M69)	1	1	[EX1DEMO.XLS]Budget08!N70
20	19	=SUM(R[-67]C[-13]:R[-3]C[-1])/2	O70=SUM(B3:N67)/2	1	1	[EX1DEMO.XLS]Budget08!O70

The shade of colour used is not significant, except that unique formulas (those that occur only once on the sheet) are coloured in pure yellow. The colours paint the areas of the sheet with the same underlying formula, as you can see in the next picture of the Budget08 sheet after colouring:



It is relatively easy to spot discrepancies in expected patterns this way, for example in N17, M48, N48 and C67. The unlocked formulas are given red borders.

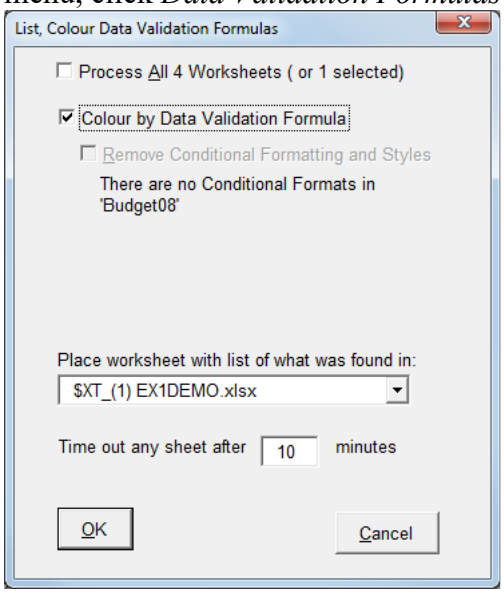
Each colouring menu item (Formulas, Validation, etc.) puts its own colour scheme on the sheet, replacing any previous colour scheme. You might wish to print or save a copy of the workbook at each colouring stage if you wish to keep a record of the colouring. This is done automatically by the Batch processing menu.

It is recommended to use the menu item *Styles and Conditional Formats* first to document conditional formats before you decide to remove them.

Data Validation Formulas

List, Colour Data Validation Formulas

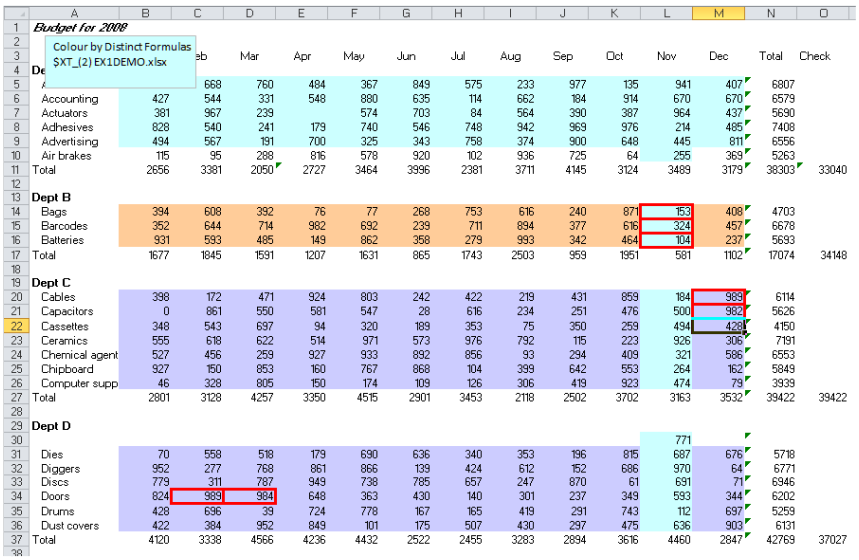
This lists Data Validation formulas and optionally gives cells with the same DV formula the same colour. Use the menu item first to document conditional formats before you remove them. Select the tab Budget08. In the Visualize and Document menu, click *Data Validation Formulas*



A sheet lists the formulas and the colours assigned to them.

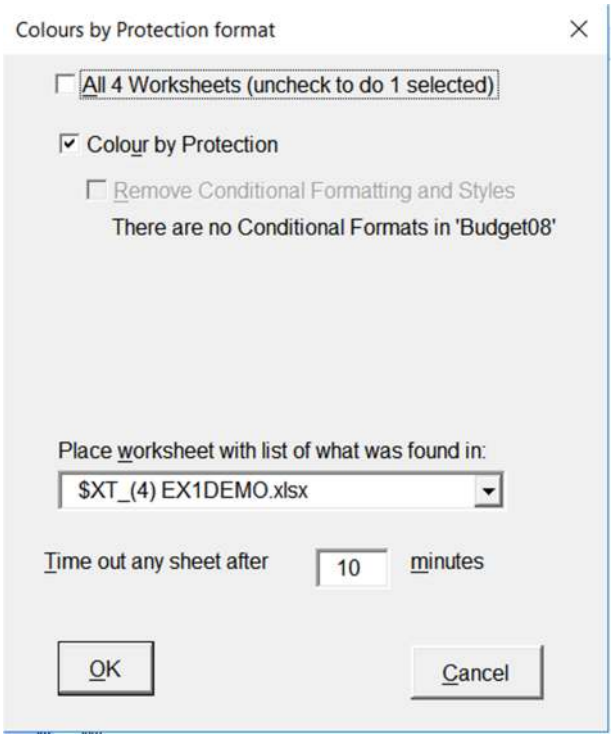
	A	B	C	D	E	
1	Data Validatic	in 'Budget08'	Formula A1	Count	Areas	Ranges
2	1	Stop Decimal > 0	Stop Decimal > 0	102	7	B5:M9,L10,L14:L16,L2
3	2	Stop Decimal Between 0 .. 1000	Stop Decimal Between 0 .. 1000	33	2	B14:K16,M14:M16
4	3	Stop Decimal Between 0 .. 980	Stop Decimal Between 0 .. 980	407	8	B20:K26,M20:M26,B3

The sheet Budget08 is now coloured and the discrepancies are obvious. Cells where data validation has failed are outlined in red.



Colorize by Protection

List, colour by Protection and Hidden format



This is intended as a visual check on the appropriate pattern of protection being applied to input cells (which should be unlocked) and calculation cells (which should be locked). The Locked and Hidden attributes of the Format Cells dialog Protection tab only take effect when the sheet is protected.

It applies the following colour scheme to the cells:

Type \ Protection	Lock,Unhid	Unlock,Unhid	Lock,Hid	Unlock,Hid
Empty	Pale Blue	Turquoise	Light Turquoise	Sky Blue
Constant	Tan	Yellow	Pale yellow	Light Orange
Formula	Lime	Bright Green	Light Green	Sea Green

And lists the ranges in the documentation workbook:

	A	B	C	D	E	
1	**Protection**	**in 'Budget08'**	**Formula A1**	**Count**	**Areas**	**Ranges**
2	1	Locked ,Unhidden Constant		591	26	A1,B3:M3,O3,E
3	2	Locked ,Unhidden Empty		252	27	B1:M1,A2:M2,C 6,A28:M28,B29 68,O68:O69,A7
4	3	Unlocked,Unhidden Empty		15	8	N1:N2,N4,N12
5	4	Unlocked,Unhidden Constant		1	1	N3
6	5	Locked ,Unhidden Formula		137	21	L5:L10,B11:M1 ,B48:M48,O48,
7	6	Unlocked,Unhidden Formula		54	7	N5:N11,N14:N

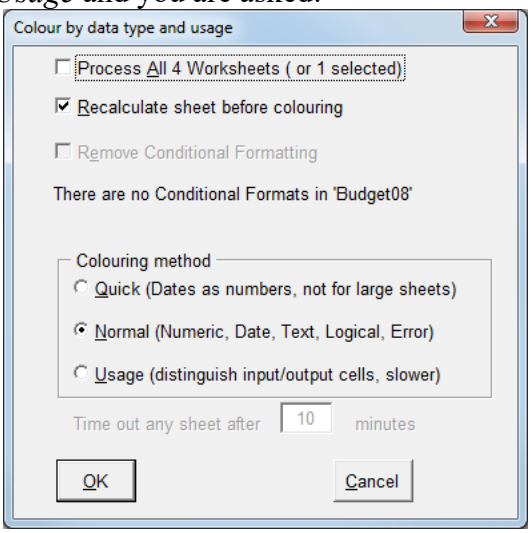
Data Type and Usage

Colours cells by Data Type, Input, or Output

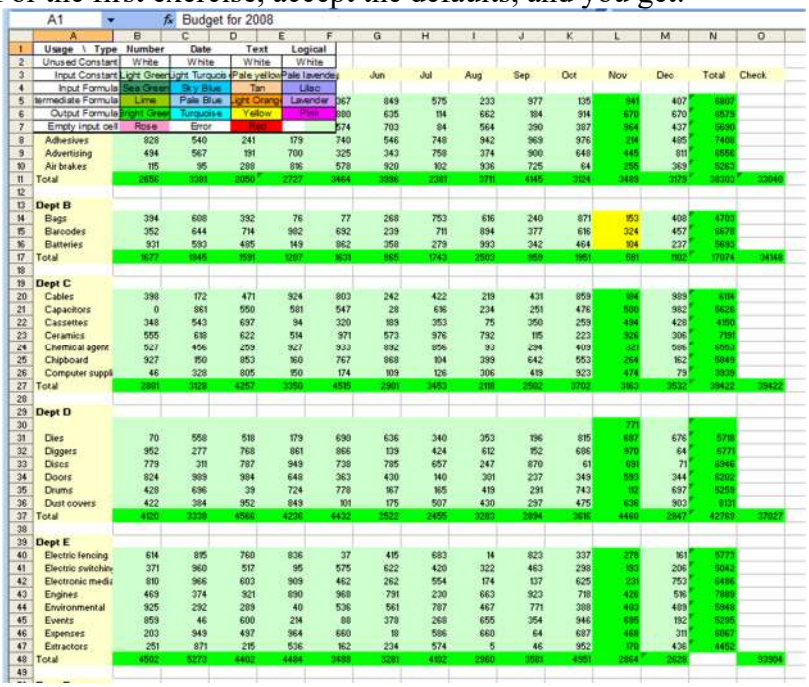
You can choose a simple scheme for text, numbers, dates, or logical values, or a more detailed scheme that distinguishes input values, intermediate and final calculations.

There is no need to manually remove any colouring from previous testing, it will be automatically removed. If you wish, you can use the menu item Decolorize Worksheets and check "Remove cell interior colours and patterns". You can use the menu item *Styles and Conditional Formats* first to document conditional formats before you decide to remove them.

Select the tab Budget08. In the Visualize and Document menu, click *Data Type and Usage* and you are asked:



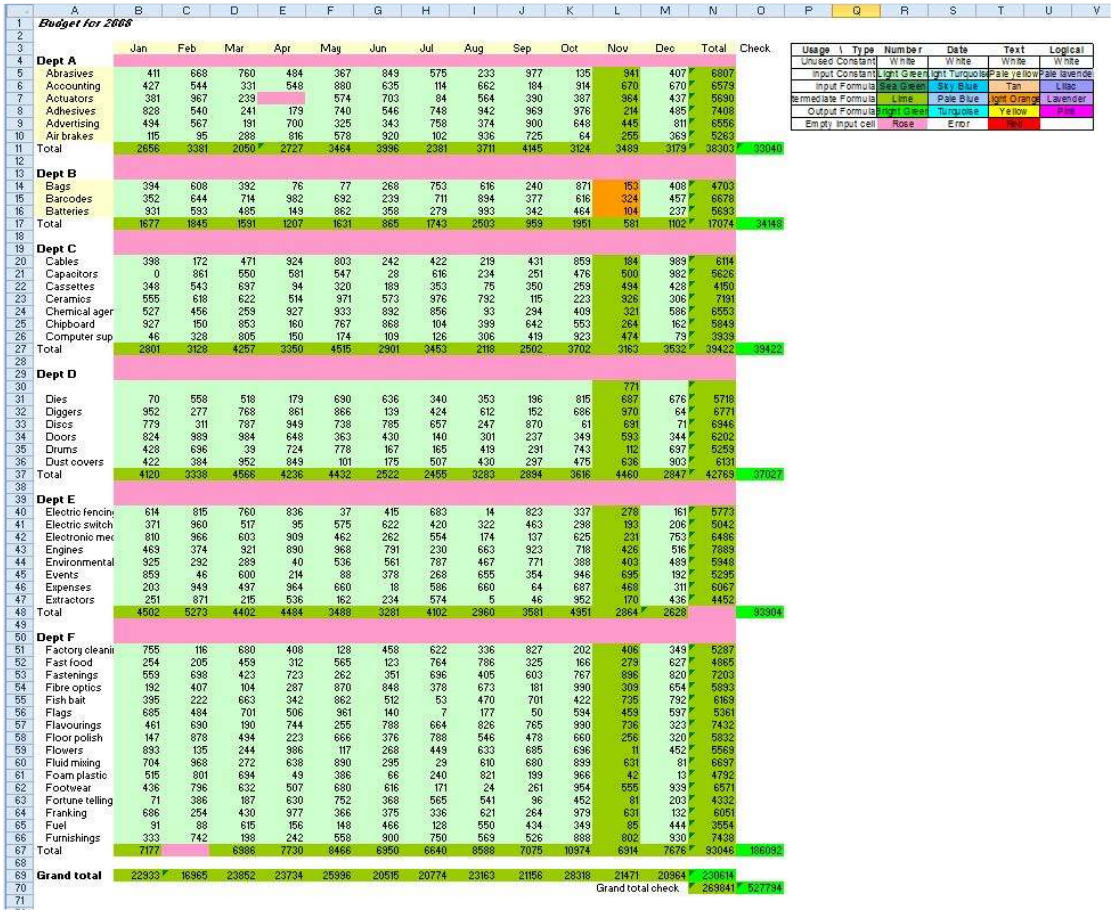
For the first exercise, accept the defaults, and you get:



The colour key is included on the page as a picture which you can move around as you wish.

As expected, the labels are text, most cells in the table are numbers, and the edges of the table have numeric formulas. When you move the colour key out of the way, you can see that cell E7 is empty (as are N48 & C67 when you scroll down); and L14:L16 contain text values. The formula in L17 treats these as numbers but the SUM formulas in N14:N16 ignore them.

For the second exercise, select Colour Data Type and Usage, select the Usage colouring method, and click OK. This is a slower process. Move the colour key to the right-hand side so that you can see the whole sheet:



Budget for 2666	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Check
Dept A														
Abrasives	411	668	760	484	367	849	575	233	977	135	941	407	6807	
Accounting	427	544	331	548	880	635	114	662	184	914	670	670	6579	
Actuators	381	967	239		574	703	84	564	390	387	964	437	5690	
Adhesives	828	540	241	179	740	546	748	942	969	976	214	485	7408	
Advertising	494	567	191	700	325	343	758	374	900	648	445	811	6556	
Air brakes	115	95	288	816	578	920	102	936	725	64	255	369	5263	
Total	2656	3381	2050	2727	3464	3996	2381	3711	4145	3124	3489	3179	38303	33040
Dept B														
Bags	394	608	392	76	77	268	753	616	240	871	153	408	4703	
Barcodes	352	644	714	982	692	239	711	894	377	616	324	457	6678	
Batteries	931	593	485	149	862	358	279	993	342	464	104	237	5693	
Total	1677	1845	1591	1207	1631	865	1743	2503	959	1951	581	1102	17074	34148
Dept C														
Cables	398	172	471	924	803	242	422	219	431	859	184	989	6114	
Capacitors	0	861	550	581	547	28	616	234	251	476	500	982	5626	
Cassettes	348	543	697	94	320	189	353	75	350	259	494	428	4150	
Ceramics	555	618	622	514	971	573	976	792	115	223	926	306	7191	
Chemical ager	527	456	259	927	933	892	856	93	294	409	321	586	6553	
Chipboard	927	150	853	160	767	868	104	399	642	553	264	162	5949	
Computer sup	46	328	805	150	174	109	126	306	419	923	474	79	3939	
Total	2801	3128	4257	3350	4515	2901	3453	2118	2502	3702	3163	3532	39422	39422
Dept D														
											771			
Dies	70	558	518	179	690	636	340	353	196	815	687	676	5718	
Diggers	952	277	768	861	866	139	424	612	152	686	970	64	6771	
Discs	779	311	797	949	738	705	657	247	870	61	691	71	6946	
Doors	824	989	984	648	363	430	140	301	237	349	593	344	6202	
Drums	428	696	39	724	778	167	165	419	291	743	112	697	5259	
Dust covers	422	384	952	849	101	175	507	430	297	475	636	903	6131	
Total	4120	3338	4566	4236	4432	2522	2455	3283	2894	3616	4460	2847	42769	37027
Dept E														
Electric fencin	614	815	760	836	37	415	683	14	823	337	278	161	5773	
Electric switch	371	960	517	95	575	622	420	322	463	298	193	206	5042	
Electronic mec	810	966	603	909	462	262	554	174	137	625	231	753	6486	
Engines	469	374	921	890	968	791	230	663	923	718	426	516	7889	
Environmental	925	292	289	40	536	561	787	467	771	388	403	489	5948	
Events	859	46	600	214	88	378	268	655	354	946	695	192	5295	
Expenses	203	949	497	964	660	18	586	660	64	687	468	311	6067	
Extractors	251	871	215	536	162	234	574	5	46	952	170	436	4452	
Total	4502	5273	4402	4484	3488	3281	4102	2960	3581	4951	2864	2628		33904
Dept F														
Factory cleani	755	116	680	408	128	458	622	336	827	202	406	349	5287	
Fast food	254	205	459	312	565	123	764	796	325	166	279	627	4885	
Fastenings	559	698	423	723	262	351	696	405	603	767	896	820	7203	
Fibre optics	192	407	104	287	870	848	378	673	181	990	309	654	5893	
Fish bait	395	222	663	342	862	512	53	470	701	422	735	792	6169	
Flags	685	484	701	506	961	140	7	177	50	594	459	597	5361	
Flavourings	461	690	190	744	255	788	664	826	765	990	736	323	7432	
Floor polish	147	878	494	223	666	376	788	546	478	660	256	320	5832	
Flowers	893	135	244	986	117	268	449	633	685	696	11	452	5569	
Fluid mixing	704	968	272	638	890	295	29	610	680	899	631	81	6697	
Foam plastic	515	801	694	49	386	66	240	821	199	966	42	13	4792	
Footwear	436	796	632	507	680	616	171	24	261	954	555	939	6571	
Fortune telling	71	386	187	630	752	368	565	541	96	452	81	203	4332	
Franking	686	254	430	977	366	375	336	621	264	979	631	132	6051	
Fuel	91	88	615	156	148	466	128	550	434	349	85	444	3554	
Furnishings	333	742	198	242	558	900	750	569	526	888	802	930	7438	
Total	7177		6986	7730	8466	6950	6640	8588	7075	10974	6914	7676	93046	186092
Grand total	22933	16965	23852	23734	25996	20515	20774	23163	21156	28318	21471	20964	230514	
											Grand total check		269841	527794

Usage \ Type	Number	Date	Text	Logical
Unused Constant	White	White	White	White
Input Constant	Light Green	Light Turquoise	Pale yellow	Pale lavende
Input Formula	Sea Green	Sky Blue	Tan	Lilac
Intermediate Formula	Lime	Pale Blue	Light Orange	Lavender
Output Formula	Bright Green	Turquoise	Yellow	Pink
Empty Input cell	Rose	Error	Red	

Now you can see that E7 is empty and used in a formula; some labels are unused labels and some are included in the SUM formulas.

This is the colour key:

Usage \ Type	Number	Date	Text	Logical
Unused Constant	White	White	White	White
Input Constant	Light Green	Light Turquoise	Pale yellow	Pale lavender
Input Formula	Sea Green	Sky Blue	Tan	Lilac
Intermediate Formula	Lime	Pale Blue	Light Orange	Lavender
Output Formula	Bright Green	Turquoise	Yellow	Pink
Empty input cell	Rose	Error	Red	

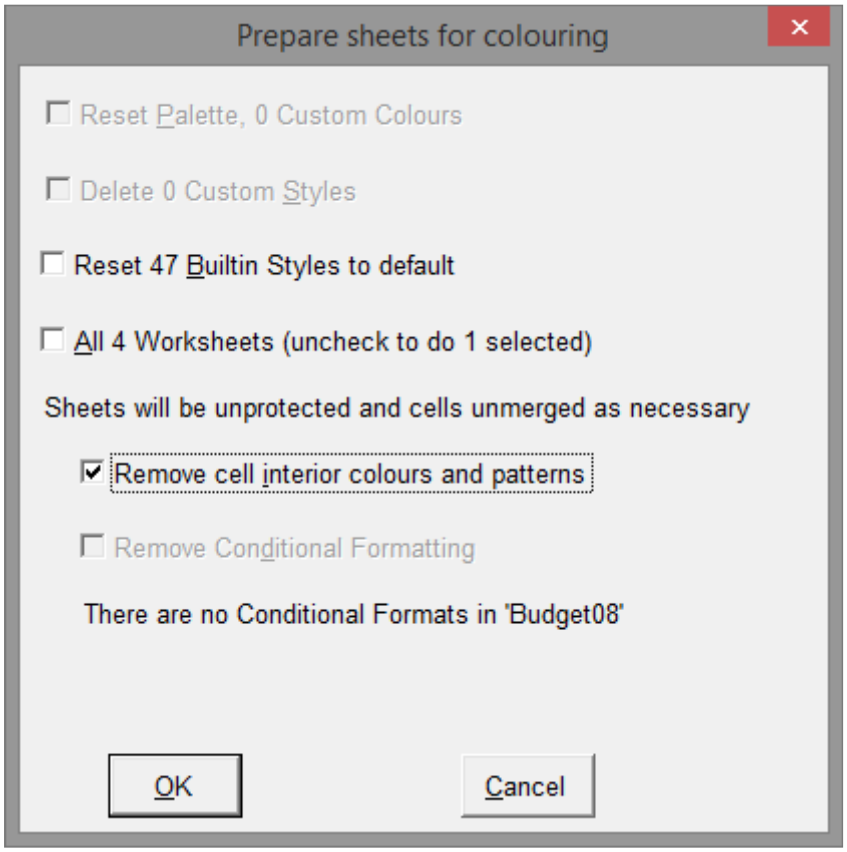
This is what the usage terms mean:

Unused Constant	A constant that has no dependents, eg a label. White is also used for formulas with no dependents *and* no precedents such as =NOW() or a constant =1+2+3
Input Constant	A constant that has dependents.
Input Formula	A formula that has dependents but no precedents; for example =NOW() that is referred to by another formula.
Intermediate Formula	A formula that has both precedents and dependents; it is in the middle of a chain of calculation.
Output Formula	A formula that has precedents but no dependents; it is the final calculation result.
Empty input cell	A blank cell that has dependents.

Colouring by usage can be extremely slow on large sheets – it may take hours to do a sheet with 10,000 cells. The $DOC sheet gives some rough timing estimates at the end of the sheet statistics, but these underestimate the time for large sheets.

Decolorize worksheets

Remove cell colours from worksheets



This option is also used to delete excessive Custom Styles.
In Excel 2007 and later, XLTest cannot determine the unused Styles because it would take too long.

This resets all cells on the active sheet or all worksheets to the default (clear) background. Try it on the Budget08 sheet you have just coloured. Check the box to "Remove cell interior colours and patterns".

It will ask you if you wish to clear colours set by Conditional Formatting, if any are detected. Use the menu item *Styles and Conditional Formats* first to document conditional formats before you remove them.

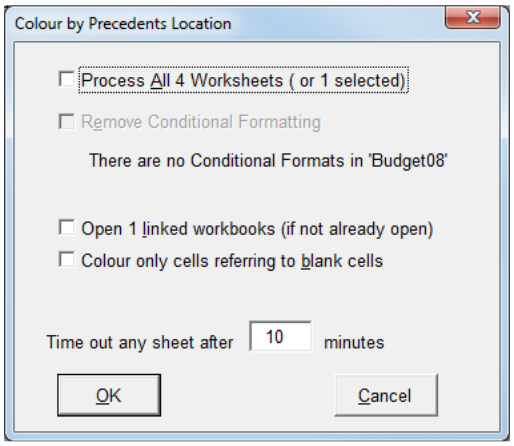
Colorize by Precedents

Colour by Precedents location

This can be extremely slow on very large sheets. To be accurate, precedent sheets should be visible, so you should run this after doing "Reset Settings, Unhide structure".

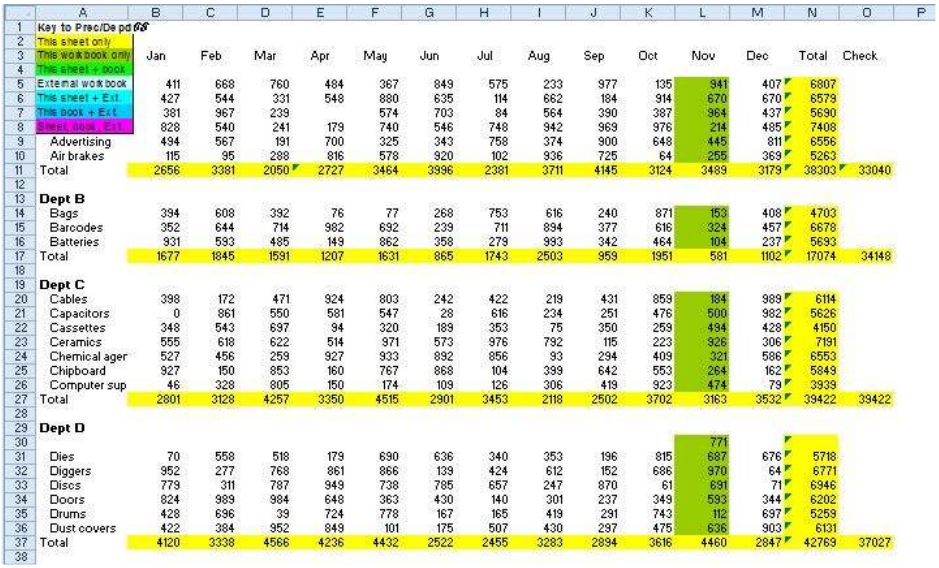
The option *Open..linked* will automatically open any external linked files so that precedents to them can be counted. If this is not checked, any formula with an exclamation mark will be counted as one precedent link. If you are working on the EX1DEMO.xls sample file, do not check this as a source is intentionally missing.

The option *Colour only cells referring to blank cells* is useful when you wish to identify only formulas where some precedent values may be missing. To see it the other way around – ie to identify blank cells being referred to by a formula, use the menu to colorize by Data Type and Usage and empty input cells are shown in pink.



Applying this to the Budget08 sheet, you get the sheet coloured and a colour key picture is copied to the sheet which you can move around:

Key to Prec/Depd
This sheet only
This workbook only
This sheet + book
External workbook
This sheet + Ext.
This book + Ext.
Sheet, book, Ext.



Key to Prec/De pd 66														
This sheet only														
This work book only	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Check
This sheet + book														
External work book	411	668	760	484	367	849	575	233	977	135	941	407	6807	
This sheet + Ext.	427	544	331	548	880	635	114	662	184	914	670	670	6579	
This book + Ext.	381	967	239		574	703	84	564	390	387	964	437	5690	
Sheet, book, Ext.	828	540	241	179	740	546	748	942	969	976	214	485	7408	
Advertising	494	567	191	700	325	343	758	374	900	648	445	811	6556	
Air brakes	115	95	288	816	578	920	102	936	725	64	255	369	5263	
Total	2656	3381	2050	2727	3464	3996	2381	3711	4145	3124	3489	3179	38303	33040
Dept B														
Bags	394	608	392	76	77	268	753	616	240	871	153	408	4703	
Barcodes	352	644	714	982	692	239	711	894	377	616	324	457	6678	
Batteries	931	593	485	149	862	358	279	993	342	464	104	237	5693	
Total	1677	1845	1591	1207	1631	865	1743	2503	959	1951	581	1102	17074	34148
Dept C														
Cables	398	172	471	924	803	242	422	219	431	859	184	989	6114	
Capacitors	0	861	550	581	547	28	616	234	251	476	500	982	5626	
Cassettes	348	543	697	94	320	189	353	75	350	259	494	428	4150	
Ceramics	555	618	622	514	971	573	976	792	115	223	326	306	7191	
Chemical ager	527	456	259	927	933	892	856	93	294	409	321	586	6553	
Chipboard	927	150	853	160	767	868	104	399	642	553	264	162	5849	
Computer sup	46	328	805	150	174	109	126	306	419	923	474	79	3939	
Total	2801	3128	4257	3350	4515	2901	3453	2118	2502	3702	3163	3532	39422	39422
Dept D														
											771			
Dies	70	558	518	179	690	636	340	353	196	815	687	676	5718	
Diggers	952	277	768	861	866	139	424	612	152	686	970	64	6771	
Discs	779	311	787	949	738	785	657	247	870	61	691	71	6946	
Doors	824	989	984	648	363	430	140	301	237	349	593	344	6202	
Drums	428	696	39	724	778	167	165	419	291	743	112	697	5259	
Dust covers	422	384	952	849	101	175	507	430	297	475	636	903	6131	
Total	4120	3338	4566	4236	4432	2522	2455	3283	2894	3616	4460	2847	42769	37027

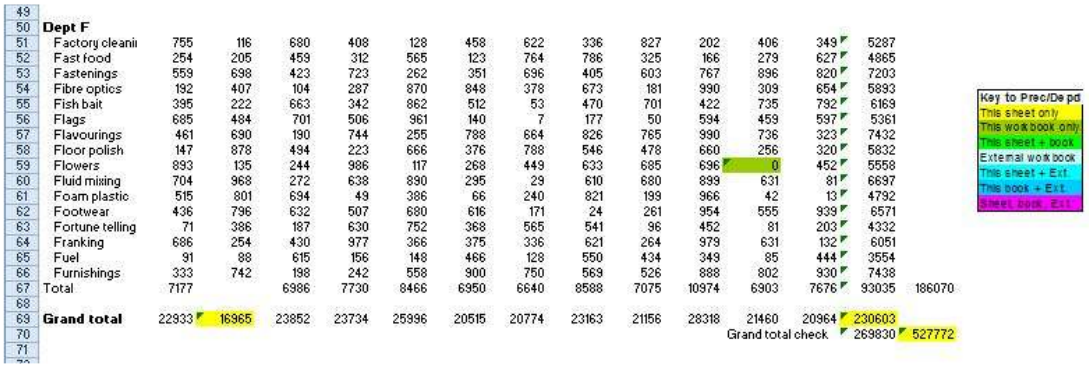
The green fill in column L means that it has precedents from another sheet.

To identify blank cells being referred to by formulas

To prepare an example for the next test, go to the sheet ‘Transfer’ and delete the contents of cell B59.

Now go to sheet Budget08, click “Colorize by Precedents”, and select the option “Colour only cells referring to blank cells”.

The cells on this sheet which refer to blanks on this sheet are highlighted in yellow and those which refer to blanks on the linked sheet ‘Transfer’ are highlighted in green.



Dept F														
Factory cleanii	755	116	680	408	128	458	622	336	827	202	406	349	5287	
Fast food	254	205	459	312	565	123	764	786	325	166	279	627	4865	
Fastenings	559	698	423	723	262	351	696	405	603	767	896	820	7203	
Fibre optics	192	407	104	287	870	848	378	673	181	990	309	654	5893	
Fish bait	395	222	663	342	862	512	53	470	701	422	735	792	6169	
Flags	685	484	701	506	961	140	7	177	50	594	459	597	5361	
Flavourings	461	690	190	744	255	788	684	826	765	990	736	323	7432	
Floor polish	147	878	494	223	666	376	788	546	478	660	256	320	5832	
Flowers	893	135	244	986	117	268	449	633	685	696	0	452	5558	
Fluid mixing	704	968	272	638	890	295	29	610	680	899	631	81	6697	
Foam plastic	515	801	694	49	386	66	240	821	199	966	42	13	4792	
Footwear	436	796	632	507	680	616	171	24	261	954	555	939	6571	
Fortune telling	71	386	187	630	752	368	565	541	96	452	81	203	4332	
Franking	686	254	430	977	366	375	336	621	264	979	631	132	6051	
Fuel	91	88	615	156	148	466	128	550	434	349	85	444	3554	
Furnishings	333	742	198	242	558	900	750	569	526	888	802	930	7438	
Total	7177		6986	7730	8466	6950	6640	8588	7075	10974	6903	7676	93035	186070
Grand total	22933	16965	23852	23734	25996	20515	20774	23163	21156	28318	21460	20964	230603	
											Grand total check		269830	527772

Key to Prec/De pd
This sheet only
This work book only
This sheet + book
External work book
This sheet + Ext.
This book + Ext.
Sheet, book, Ext.

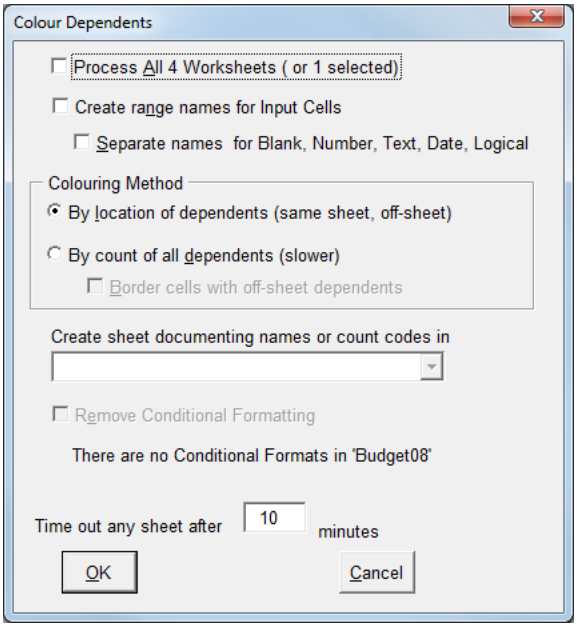
You can use the menu item *Styles and Conditional Formats* first to document conditional formats before you remove them.

Colorize by Dependents

Colour by Dependents location or count

This can be extremely slow on very large sheets. To be accurate, dependent sheets should be visible, so you should run this after doing "Reset Settings, Unhide structure".
This colours the cells according to either the location of the dependents, or the count of dependents at all levels. The options to create range names provide an easy way to select all the inputs on a sheet by range name. A further option creates range names for each data type – Blank, Number, Date, Text, Logical.

Try this on the sheet Budget08.



First try selecting the option "By location", which shows that most of the cells (coloured yellow) are referred to only on the current sheet, the exception being the total (coloured green) in N70 which is referred to by the formula in E20 on the Errors sheet.

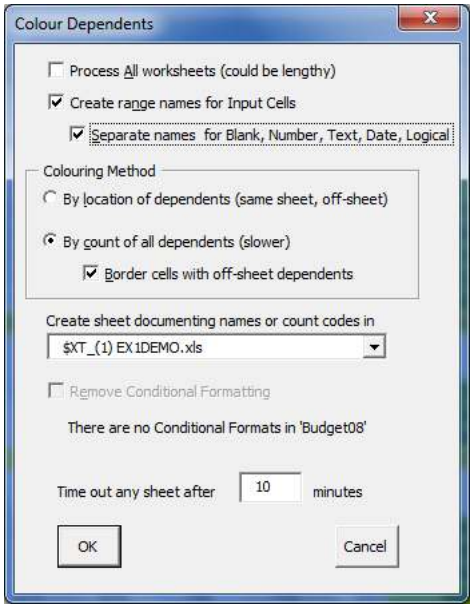
Key to Prec/Depd
This sheet only
This workbook only
This sheet + book
External workbook
This sheet + Ext.
This book + Ext.
Sheet, book, Ext.

954	555	939	6571	
452	81	203	4332	
979	631	132	6051	
349	85	444	3554	
888	802	930	7438	
10974	6914	7676	93046	186092
28318	21471	20964	230614	
	Grand total check		269841	527793.5

If you checked "Create range names" and "Separate names", see the documentation sheet which shows the range names created:

Type	Range Name	Count	Areas	Ranges
	AllInputs	859	30	A1:O4,A5:K
0	BlankInputs	267	27	B1:O1,A2:C
5	NumericInputs	516	15	B5:K6,F7:K
8	TextInputs	76	10	A1,B3:O3,A

Then try again, check the option “By count” and check “Border cells”. If you check “Remove Conditional Formatting” it will show that there are none on Budget08. For other sheets, you can use the menu item *Styles and Conditional Formats* first to document conditional formats before you remove them.



You get a colour key sheet like this:

	A	B	C	D	E	F
1	No.	Dependents in 'Budget08'	External	Count		
2	1	1		185	11	B3:N4,A5:A10,B12:N13,A14:A16,B18:N19,B28:N2
3	2	4		523	8	B5:M9,B14:M16,B20:M26,B31:M36,B40:M46,B47 :L47,B51:B66,D51:M66
4	3	2		87	9	N5:N10,B11:N11,B17:N17,N20:N26,B27:N27,N37 ,N40:N47,B48:N48,B67:N67
5	4	3		72	7	B10:M10,N14:N16,B30:M30,B37:M37,M47,C51:C 66,N51:N66

And the Budget08 sheet now shows the differing usage of the data:

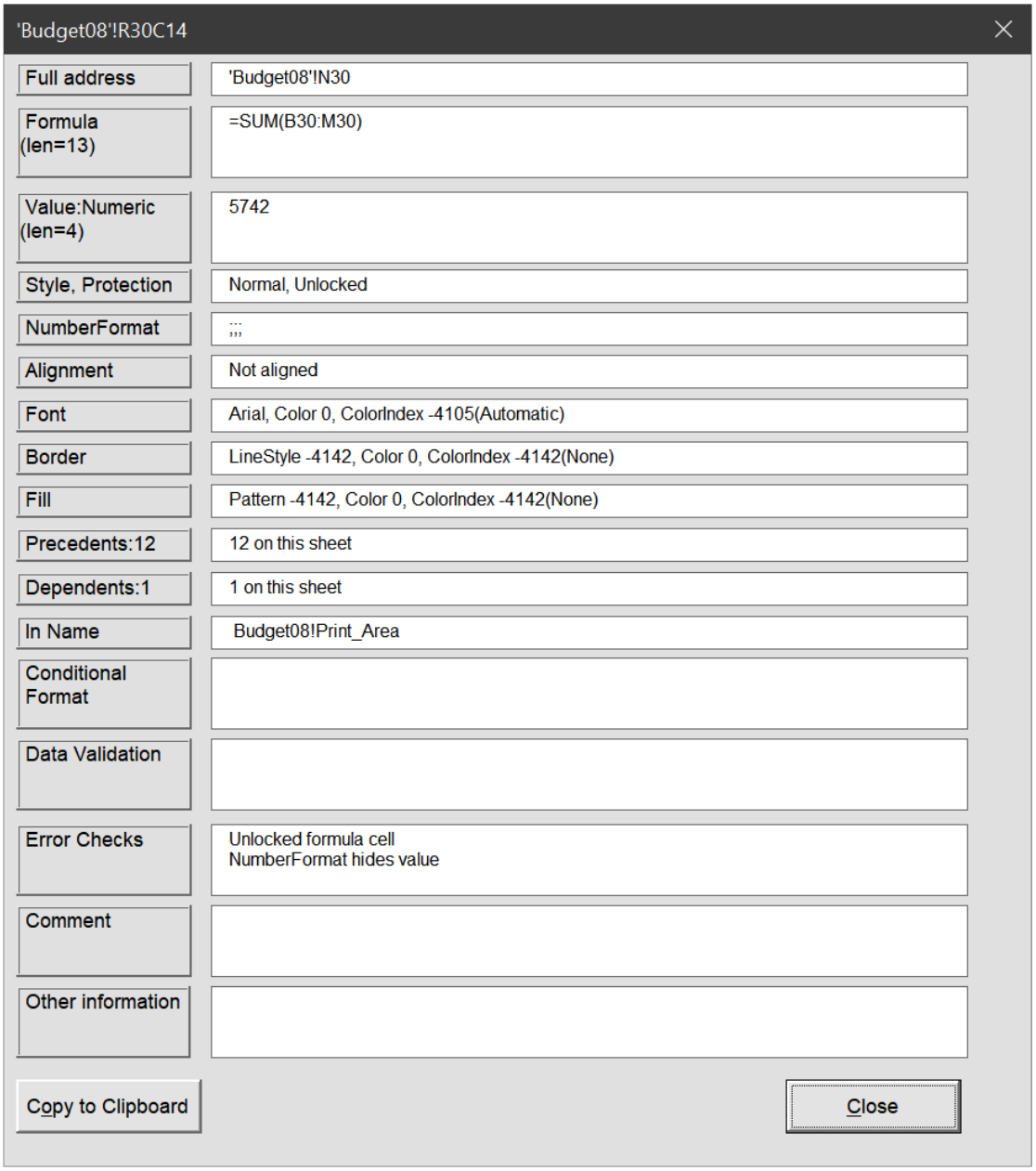
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	*Budget for 2008*														
2															
3		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Check
4	**Dept A**														
5	Abrasives	411	668	760	484	367	849	575	233	977	135	941	407	6807	
6	Accounting	427	544	331	548	880	635	114	662	184	914	670	670	6579	
7	Actuators	381	967	239		574	703	84	564	390	387	964	437	5690	
8	Adhesives	828	540	241	179	740	546	748	942	969	976	214	485	7408	
9	Advertising	494	567	191	700	325	343	758	374	900	648	445	811	6556	
10	Air brakes	115	95	288	816	578	920	102	936	725	64	255	369	5263	
11	Total	2656	3381	2050	2727	3464	3996	2381	3711	4145	3124	3489	3179	38303	33040
12															
13	**Dept B**														
14	Bags	394	608	392	76	77	268	753	616	240	871	153	408	4703	
15	Barcodes	352	644	714	982	692	239	711	894	377	616	324	457	6678	
16	Batteries	931	593	485	149	862	358	279	993	342	464	104	237	5693	
17	Total	1677	1845	1591	1207	1631	865	1743	2503	959	1951	581	1102	17074	34148
18															
19	**Dept C**														
20	Cables	398	172	471	924	803	242	422	219	431	859	184	989	6114	
21	Capacitors	0	861	550	581	547	28	616	234	251	476	500	982	5626	
22	Cassettes	348	543	697	94	320	189	353	75	350	259	494	428	4150	
23	Ceramics	555	618	622	514	971	573	976	792	115	223	926	306	7191	
24	Chemical agent	527	456	259	927	933	892	856	93	294	409	321	586	6553	
25	Chipboard	927	150	853	160	767	868	104	399	642	553	264	162	5849	
26	Computer supp	46	328	805	150	174	109	126	306	419	923	474	79	3939	
27	Total	2801	3128	4257	3350	4515	2901	3453	2118	2502	3702	3163	3532	39422	39422
28															
29	**Dept D**														
30												771			
31	Dies	70	558	518	179	690	636	340	353	196	815	687	676	5718	
32	Diggers	952	277	768	861	866	139	424	612	152	686	970	64	6771	
33	Discs	779	311	787	949	738	785	657	247	870	61	691	71	6946	
34	Doors	824	989	984	648	363	430	140	301	237	349	593	344	6202	
35	Drums	428	696	39	724	778	167	165	419	291	743	112	697	5259	
36	Dust covers	422	384	952	849	101	175	507	430	297	475	636	903	6131	
37	Total	4120	3338	4566	4236	4432	2522	2455	3283	2894	3616	4460	2847	42769	37027
38															
39	**Dept E**														
40	Electric fencing	614	815	760	836	37	415	683	14	823	337	278	161	5773	
41	Electric switchir	371	960	517	95	575	622	420	322	463	298	193	206	5042	
42	Electronic medi	810	966	603	909	462	262	554	174	137	625	231	753	6486	
43	Engines	469	374	921	890	968	791	230	663	923	718	426	516	7889	
44	Environmental	925	292	289	40	536	561	787	467	771	388	403	489	5948	
45	Events	859	46	600	214	88	378	268	655	354	946	695	192	5295	
46	Expenses	203	949	497	964	660	18	586	660	64	687	468	311	6067	
47	Extractors	251	871	215	536	162	234	574	5	46	952	170	436	4452	
48	Total	4502	5273	4402	4484	3488	3281	4102	2960	3581	4951	2864	2628		93904
49															
50	**Dept F**														
51	Factory cleanin	755	116	680	408	128	458	622	336	827	202	406	349	5287	
52	Fast food	254	205	459	312	565	123	764	786	325	166	279	627	4865	
53	Fastenings	559	698	423	723	262	351	696	405	603	767	896	820	7203	
54	Fibre optics	192	407	104	287	870	848	378	673	181	990	309	654	5893	
55	Fish bait	395	222	663	342	862	512	53	470	701	422	735	792	6169	
56	Flags	685	484	701	506	961	140	7	177	50	594	459	597	5361	
57	Flavourings	461	690	190	744	255	788	664	826	765	990	736	323	7432	
58	Floor polish	147	878	494	223	666	376	788	546	478	660	256	320	5832	
59	Flowers	893	135	244	986	117	268	449	633	685	696	0	452	5569	
60	Fluid mixing	704	968	272	638	890	295	29	610	680	899	631	81	6697	
61	Foam plastic	515	801	694	49	386	66	240	821	199	966	42	13	4792	
62	Footwear	436	796	632	507	680	616	171	24	261	954	555	939	6571	
63	Fortune telling	71	386	187	630	752	368	565	541	96	452	81	203	4332	
64	Franking	686	254	430	977	366	375	336	621	264	979	631	132	6051	
65	Fuel	91	88	615	156	148	466	128	550	434	349	85	444	3554	
66	Furnishings	333	742	198	242	558	900	750	569	526	888	802	930	7438	
67	Total	7177		6986	7730	8466	6950	6640	8588	7075	10974	6914	7676	93046	186092
68															
69	**Grand total**	22933	16965	23852	23734	25996	20515	20774	23163	21156	28318	21471	20964	230614	
70												Grand total check		269841	527793.5

Note that the rose-coloured cells have 3 dependents but the tan-coloured ones 4, so you can see which cells are being omitted from some formulas. For example M47 is coloured rose because M48 only sums rows 40:46 whereas the other formulas in row 48 sum 40:47. C51:C66 are coloured rose because there is no SUM formula in C67.

Show Watch info

Show or hide Watch info on selection

This keeps a dialog open that updates as you select cells.

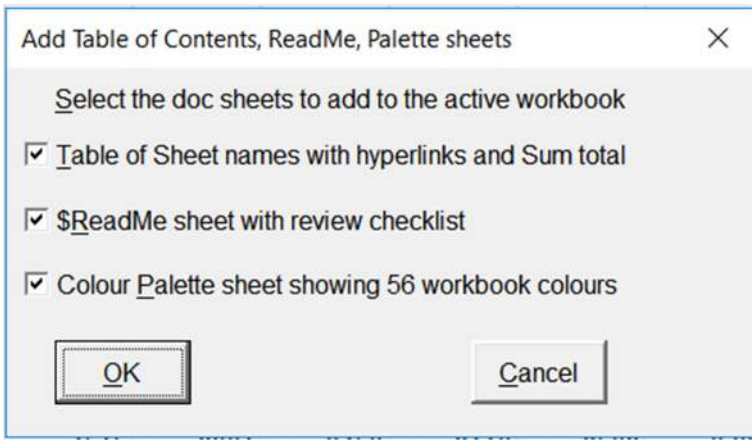


It gives you a convenient summary of the cell without having to use many Excel menus to find all the settings that apply to it.

The button ‘Copy to Clipboard’ copies the text shown in the dialog to the clipboard so you can paste it into any audit record document that you are working on.

Add $TOC, Readme, Palette

Add Table of Contents, Readme, and Palette sheets

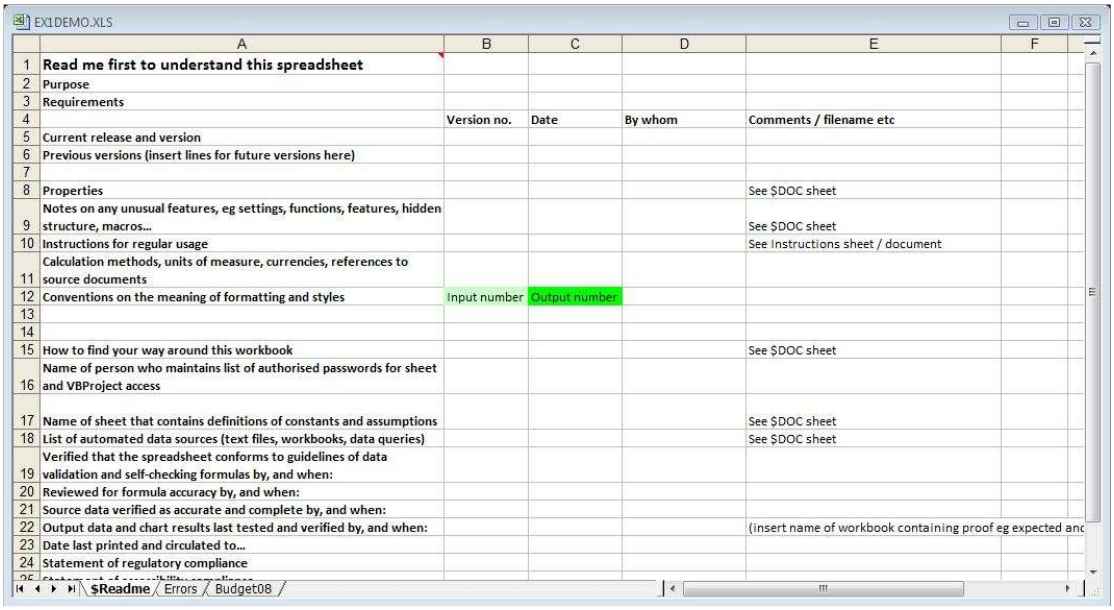


The $TOC Table of Contents lists sheets and a hash total of their cells. This total may be useful in quickly seeing if reference sheets have changed between versions.

	A	B	C	D	E	F	G	H
1	**Sheet**	**Type**	**Sheet Tab Name**	**Visibility**	**Contents**	**Sum Total**	**Rows**	**Columns**
2	1	Worksheet	Data	Visible	Client	8097426.755	73	15
3	2	Worksheet	Errors	Visible	A compendium of error values	#VALUE!	30	5
4	3	Worksheet	$Readme	Visible	Read me first to understand this spreadsheet	0	25	5
5	4	Worksheet	Budget08	Visible	Budget for 2008	2777309.5	70	15
6	5	Worksheet	Transfer	Very Hidden	November 2008	63832	69	2
7	6	Worksheet	$Palette	Visible	Palette	971439460	59	12
8	7	Worksheet	$TOC	Visible				

If the workbook already has sheets named '$TOC', '$Palette', or '$Readme', they will not be overwritten; another sheet will be added with a (1) suffix.

The '$Readme' sheet can help you remember the things to check before distribution, and to record the checking activities.

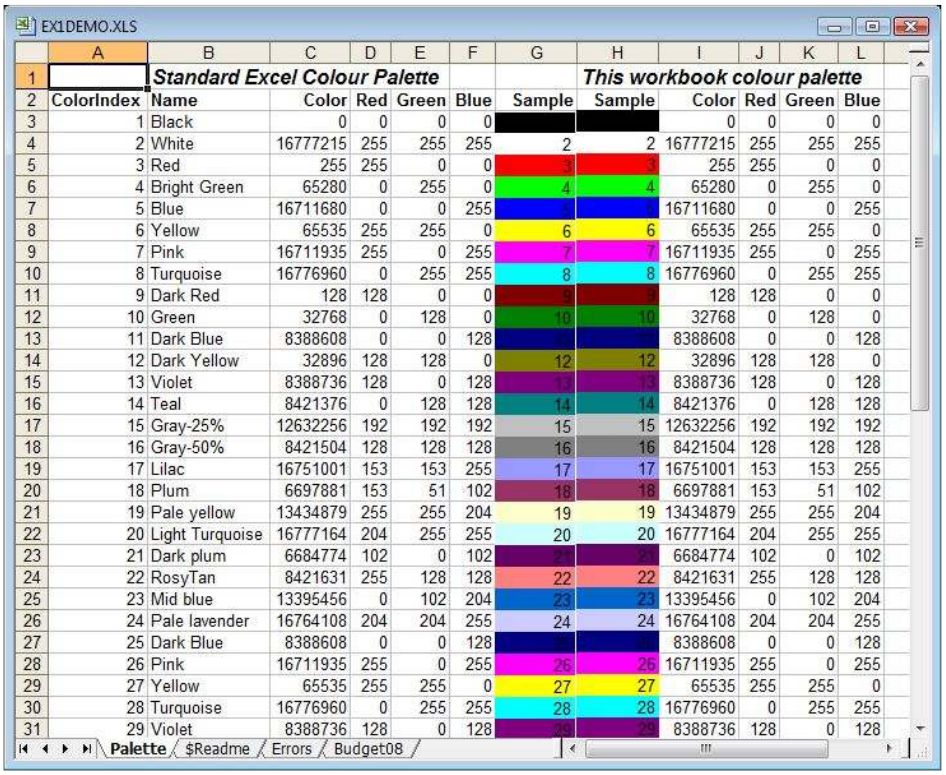


EX1DEMO.XLS

	A	B	C	D	E	F
1	**Read me first to understand this spreadsheet**					
2	Purpose					
3	Requirements					
4		Version no.	Date	By whom	Comments / filename etc	
5	Current release and version					
6	Previous versions (insert lines for future versions here)					
7						
8	Properties				See $DOC sheet	
9	Notes on any unusual features, eg settings, functions, features, hidden structure, macros...				See $DOC sheet	
10	Instructions for regular usage				See Instructions sheet / document	
11	Calculation methods, units of measure, currencies, references to source documents					
12	Conventions on the meaning of formatting and styles	Input number	Output number			
13						
14						
15	How to find your way around this workbook				See $DOC sheet	
16	Name of person who maintains list of authorised passwords for sheet and VBProject access					
17	Name of sheet that contains definitions of constants and assumptions				See $DOC sheet	
18	List of automated data sources (text files, workbooks, data queries)				See $DOC sheet	
19	Verified that the spreadsheet conforms to guidelines of data validation and self-checking formulas by, and when:					
20	Reviewed for formula accuracy by, and when:					
21	Source data verified as accurate and complete by, and when:					
22	Output data and chart results last tested and verified by, and when:				(insert name of workbook containing proof eg expected anc	
23	Date last printed and circulated to...					
24	Statement of regulatory compliance					

$Readme / Errors / Budget08

The 'Palette' sheet tells you whether a workbook has a non-standard colour palette, which would change the colouring schemes that XLTest creates. To reset the palette to the Excel default set of 56 (of course, do this on a copy of the workbook for testing) on the Tools menu, click Options, click the Color tab and then click Reset.



EX1DEMO.XLS

	A	B	C	D	E	F	G	H	I	J	K	L
1		*Standard Excel Colour Palette*						*This workbook colour palette*				
2	ColorIndex	Name	Color	Red	Green	Blue	Sample	Sample	Color	Red	Green	Blue
3	1	Black	0	0	0	0			0	0	0	0
4	2	White	16777215	255	255	255	2	2	16777215	255	255	255
5	3	Red	255	255	0	0	3	3	255	255	0	0
6	4	Bright Green	65280	0	255	0	4	4	65280	0	255	0
7	5	Blue	16711680	0	0	255	5	5	16711680	0	0	255
8	6	Yellow	65535	255	255	0	6	6	65535	255	255	0
9	7	Pink	16711935	255	0	255	7	7	16711935	255	0	255
10	8	Turquoise	16776960	0	255	255	8	8	16776960	0	255	255
11	9	Dark Red	128	128	0	0	9	9	128	128	0	0
12	10	Green	32768	0	128	0	10	10	32768	0	128	0
13	11	Dark Blue	8388608	0	0	128	11	11	8388608	0	0	128
14	12	Dark Yellow	32896	128	128	0	12	12	32896	128	128	0
15	13	Violet	8388736	128	0	128	13	13	8388736	128	0	128
16	14	Teal	8421376	0	128	128	14	14	8421376	0	128	128
17	15	Gray-25%	12632256	192	192	192	15	15	12632256	192	192	192
18	16	Gray-50%	8421504	128	128	128	16	16	8421504	128	128	128
19	17	Lilac	16751001	153	153	255	17	17	16751001	153	153	255
20	18	Plum	6697881	153	51	102	18	18	6697881	153	51	102
21	19	Pale yellow	13434879	255	255	204	19	19	13434879	255	255	204
22	20	Light Turquoise	16777164	204	255	255	20	20	16777164	204	255	255
23	21	Dark plum	6684774	102	0	102	21	21	6684774	102	0	102
24	22	RosyTan	8421631	255	128	128	22	22	8421631	255	128	128
25	23	Mid blue	13395456	0	102	204	23	23	13395456	0	102	204
26	24	Pale lavender	16764108	204	204	255	24	24	16764108	204	204	255
27	25	Dark Blue	8388608	0	0	128	25	25	8388608	0	0	128
28	26	Pink	16711935	255	0	255	26	26	16711935	255	0	255
29	27	Yellow	65535	255	255	0	27	27	65535	255	255	0
30	28	Turquoise	16776960	0	255	255	28	28	16776960	0	255	255
31	29	Violet	8388736	128	0	128	29	29	8388736	128	0	128

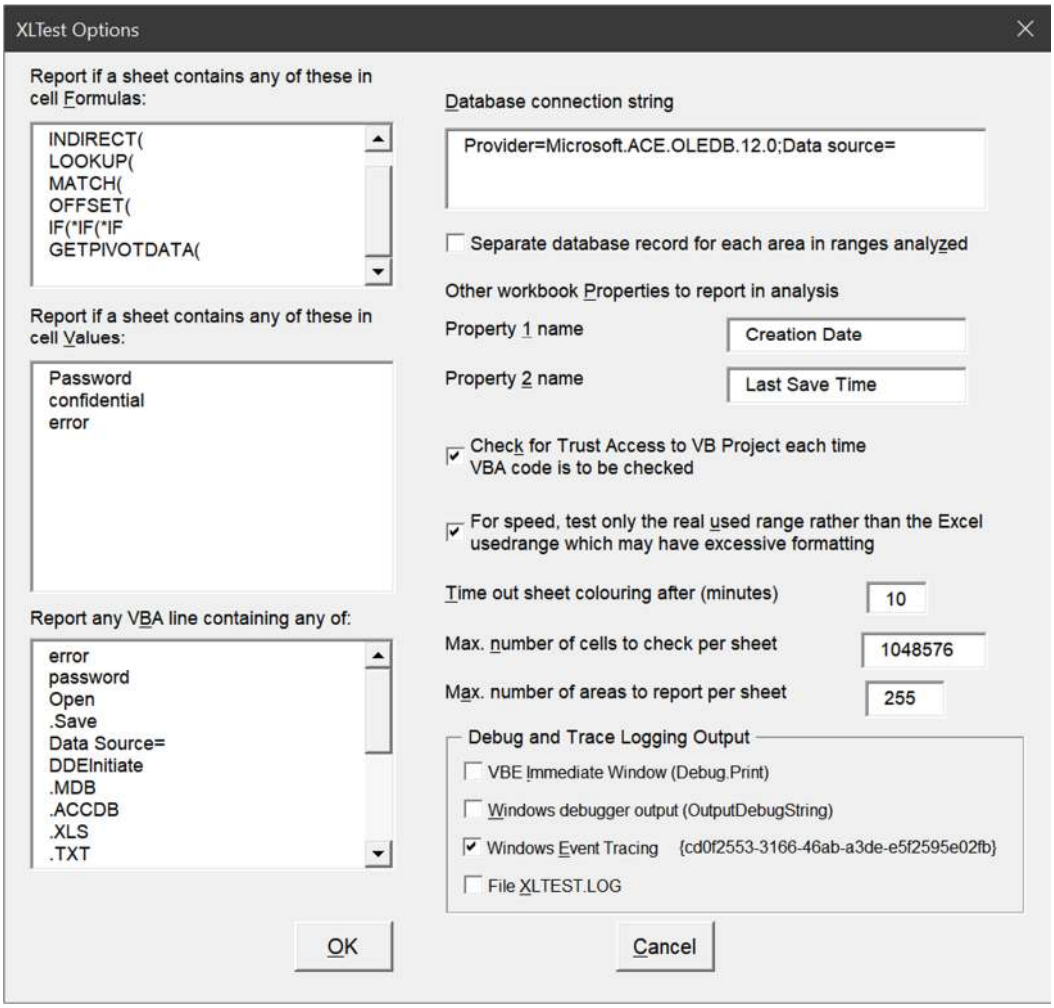
Palette / $Readme / Errors / Budget08

Start > XLTest Options

Options saved for use in XLTest sessions

The first two boxes list the strings that will be reported in the *Detailed Inspection* menu option if any are found in formulas.

The "speed" option restricts XLTest tests to up to the last row and column with data, rather than Excel's used range which may be the entire sheet excessively formatted. You can turn off the option to "Check for Trust Access" if your group policy does not allow it.



The Database connection string is used to specify where analysis results are to be saved to a database. The default is to save to an MS Access file XLTESTDB.ACCDB in the same folder as the XLTest add-in.

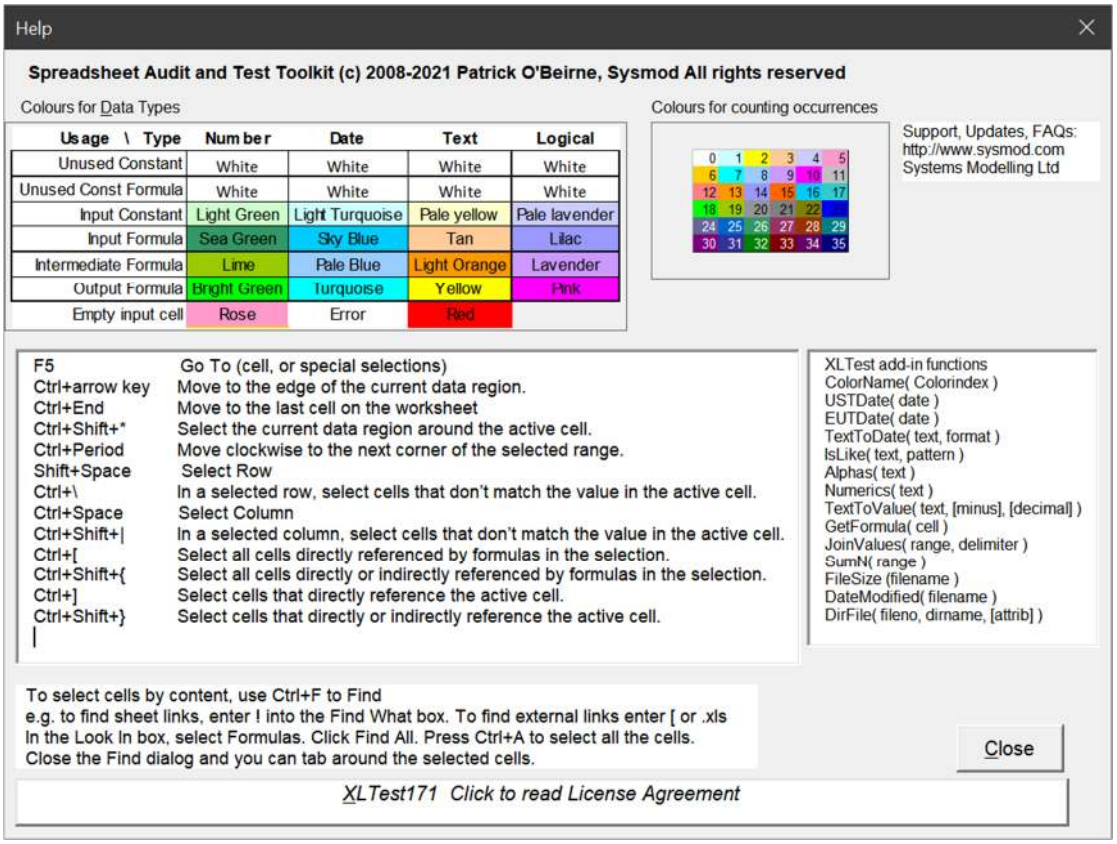
The two workbook properties (reported in the Scan Files analysis) give the date and time data stored by Excel internally in the workbook, rather than the filesystem date which may be changed when the file is copied to another device.

You can choose where to output XLTest debug messages and VBA profiler event trace output.

Start > Help / About XLTest

Help on colours and keyboard shortcuts

This displays the form shown below. It is non-modal so you can move it around and keep it in view while you work.

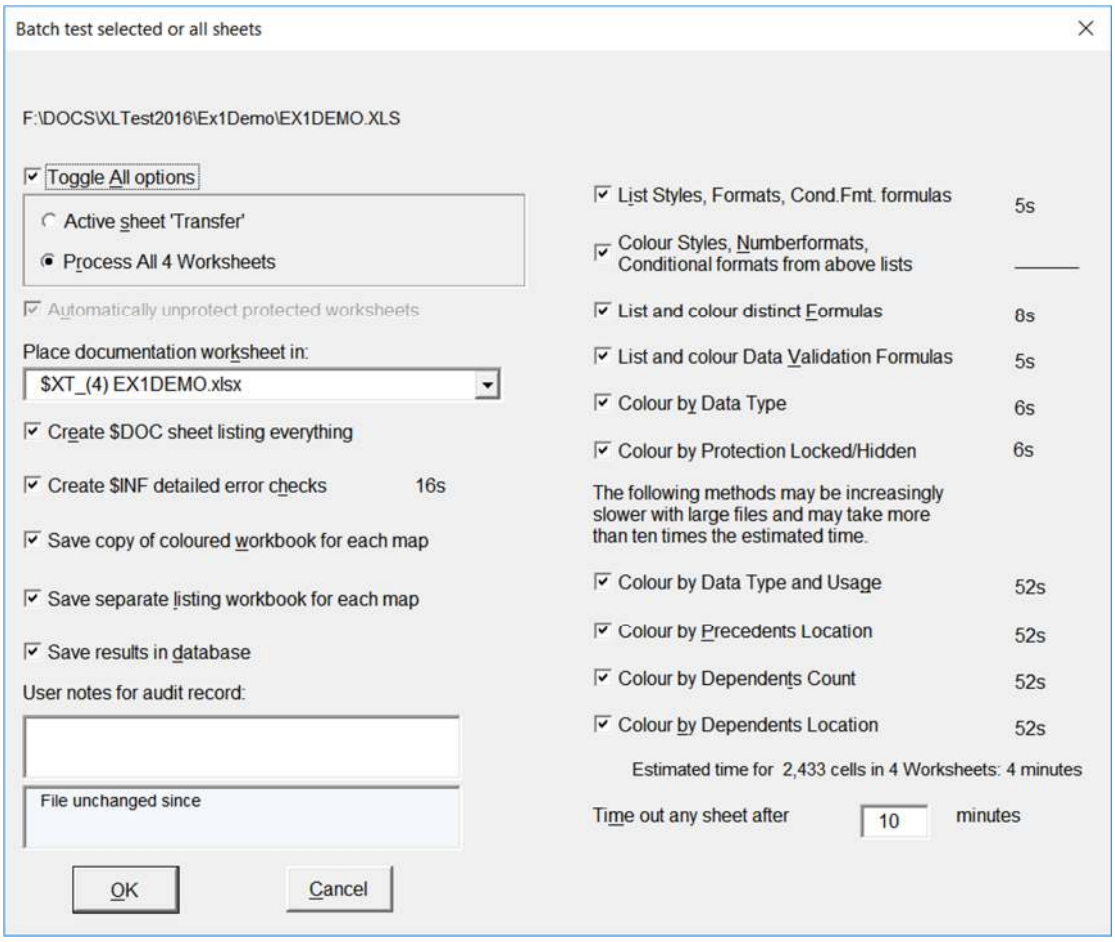


The box on the right shows the functions in XLTest that are available for you to use in your own formulas, as long as the XLTest add-in is installed.

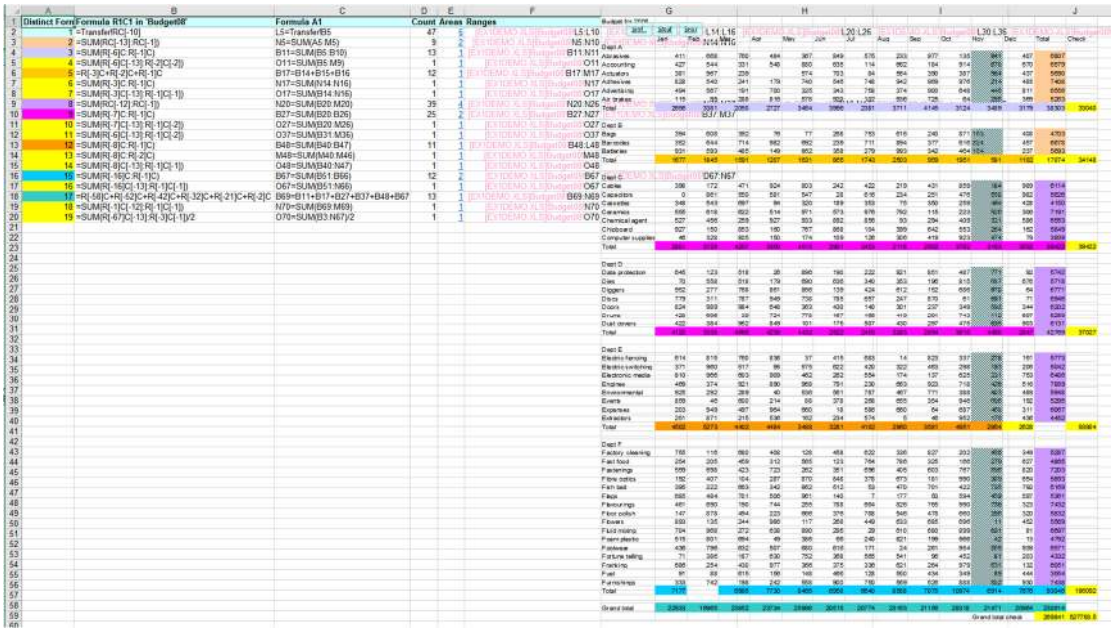
You can access the right-click shortcuts using the keyboard; the key looks like this:

Click the text box at the bottom to read the license agreement. It is also at the end of this document.

Start > Batch process



This runs all the tests in sequence on all the sheets in the current workbook. Each option shows a rough estimate in seconds or minutes of how long it will take. It saves some effort running each XLTest menu option in turn but cannot save you the effort of actually reading the results! It saves a copy of the workbook under test for each colour map with a name created from the test and the file name, e.g. for the “Formulas List” option it creates “#For EX1DEMO.XLS” for the coloured workbook and “$For EX1DEMO.XLS” for the colour code sheets. It also offers the option of copying a picture of each coloured sheet into its documentation sheet as shown here:



It may not be possible to process large workbooks automatically as Excel may run out of memory. The last four tests can be extremely slow on large sheets. Therefore a timeout is applied to each sheet to keep the batch time within reasonable limits.

Workbooks are saved for each type of sheet produced:

Listing	Worksheets	Colour-coded copy workbook
Documentation	$XT	
Formulas	$For	#For
Data Validation	$Val	#Val
Data Type	$Typ	#Typ
Data Type & Usage	$Use	#Use
Styles, Formats	$Sty	#Sty
Protection Formats	$Prf	#Prf
Precedents Location	$PrL	#PrL
Dependents Location	$DpL	#DpL
Dependents Count	$DpC	#DpC

Because the folders for the saved copies are created in the same directory as the workbook, you need to have create permission in that directory – in other words, don't try this when the workbooks are on a CD or protected network location.

Test Cases menu

Introduction to Test Cases

XLTest can execute a set of test cases on a target workbook and stores the result of each test. You can use this for regression testing to verify that a new version performs the same as before, except of course for what you expect to have changed.

New Test Case Workbook

Create test case template

This creates a new workbook with a worksheet ready formatted with a test case skeleton for you to complete.

Test Case	Comment	Test Sheet	Test Cells	Test	Test Value
TestCase1	General comment	ActiveSheet			
TestCase1	Set range B1:B3 to value 2		B1:B3	: Value Only	2
TestCase1	Set A4 to 3 and format shown		A4	@ Value and Format	3.00
TestCase1	Test whether C21=21		C21	= Equals	21
TestCase1	Show value of expression, no test		=SUM(D1:D3)	No test	

Before change	Test Result	Type test	Format test	Value test	Errors

Test cases can contain multiple inputs and output checks.

Meaning of the TestCases sheet columns and entries

Test Case	Name of test case
Comment	Any text comment on the test
Test Sheet	If blank, defaults to last used active sheet
Test Cells	The address of the cell, range, or range name to be input or tested
Test	The Test operation to be performed. Must be one of the following (only the first character is used) Blank or space the value of Test Cells is shown in Test Result but not checked against Test Value, which should also be left blank. **:** The Test Value is input into the Test Cells; the Test Result is expected to be the same as the input **@** The Test Value and Format are copied into the Test Cells; the Test Result is expected to be the same **+, -, *, /** The Test value is added, subtracted, multiplied, or divided into the Test Cells **=** The internal value of Test Cells is tested for exact equality with the Test Value **~** The display value of Test Cells is tested for equality with the Test Value display **<, >,#**, Comparison is Less than, Greater than, Not equal to.
Test Value	The value that you want compared to the Test Result; usually the expected result.
Before Change	For input Test Cells, this shows the value in the cell(s) before the Test Value was input
Test Result	The value of the Test Cells after the Test Value is input
Type test	A check that the data type of Test Value and Test Result are the same
Format test	A check that the cell format of Test Value and Test Result are the same
Value test	A check that the value of Test Value and Test Result are the same
Errors	Any errors found during test - for example data validation rules broken.

Run Test Cases

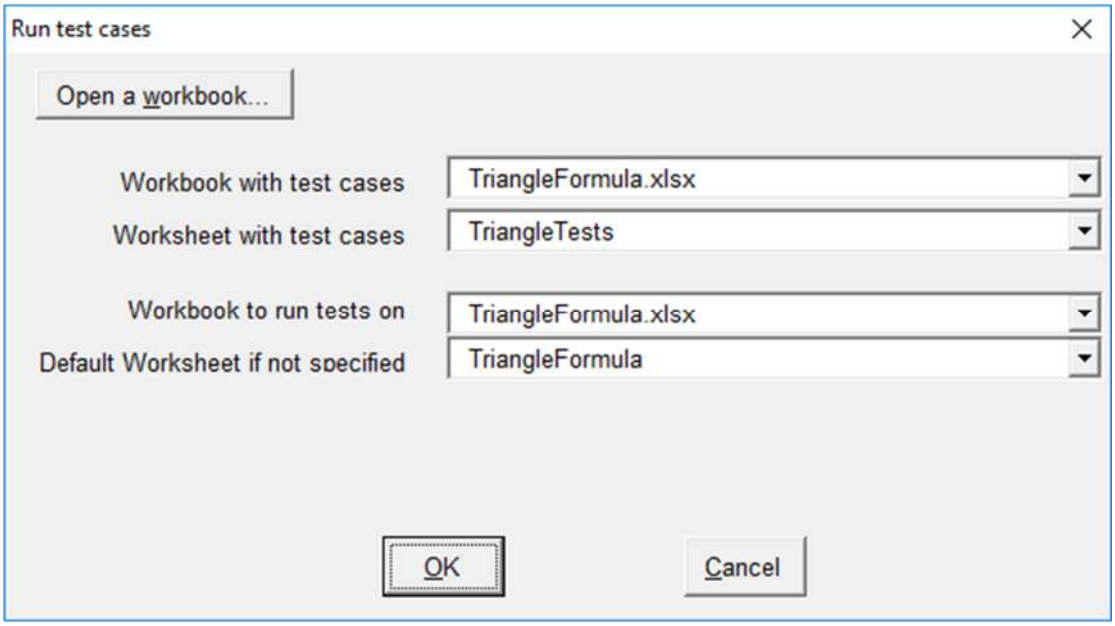
Apply test inputs and test results

This executes all the tests specified in the test worksheet.

XLTest first records the current value of the input cell in the Before Change cell. Then it inputs the Test value into the Test cells, which can be a single cell address, a range of cells or a range name. It records the actual content of the input cell in the Test Value cell. Then it reports whether the type, format, and value of the result cell are the same as specified in the Test Value cell.

As an exercise, open the demonstration TriangleFormula workbook supplied. This is a classical exercise in software testing: to test whether a function is returning the correct name for a type of triangle.

On the TriangleFormula sheet enter different values for the lengths of the three sides and decide whether you think the formula is correct. Then run the test cases contained in the TriangleTests worksheet and examine the results to see if there are some other conditions you could have tested. There are 99 test cases in this worksheet!



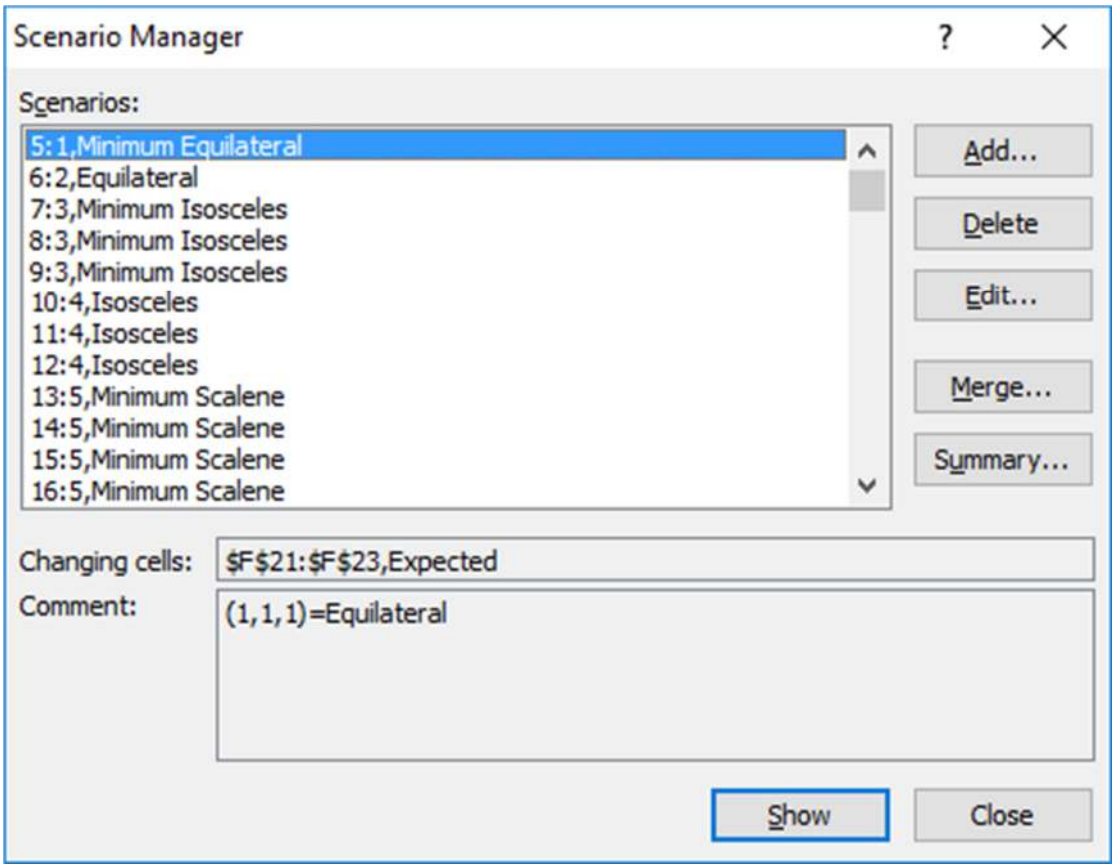
Tests to Scenarios

Convert XLTest cases worksheet to Scenarios
If you wish for any reason to create Excel Scenarios from XLTest cases, use this option.

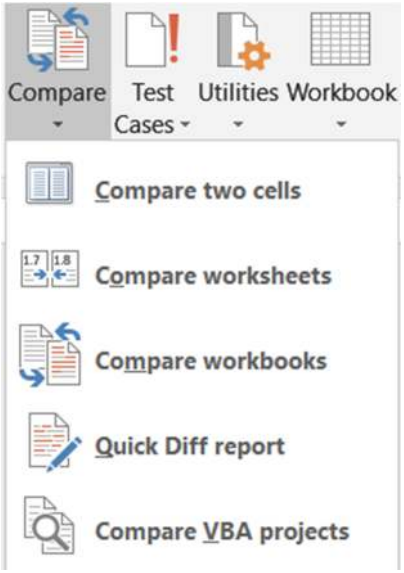
Scenarios to Tests

Convert Excel Scenarios to XLTest case worksheet
If you have a worksheet which has Excel Scenarios stored on it, use this option to convert them to XLTest test cases. The TriangleFormula sheet has 99 scenarios.

In the TriangleFormula workbook, activate the sheet 'TriangleFormula' and review the scenarios there (Data tab, What-If Analysis, Scenario Manager):



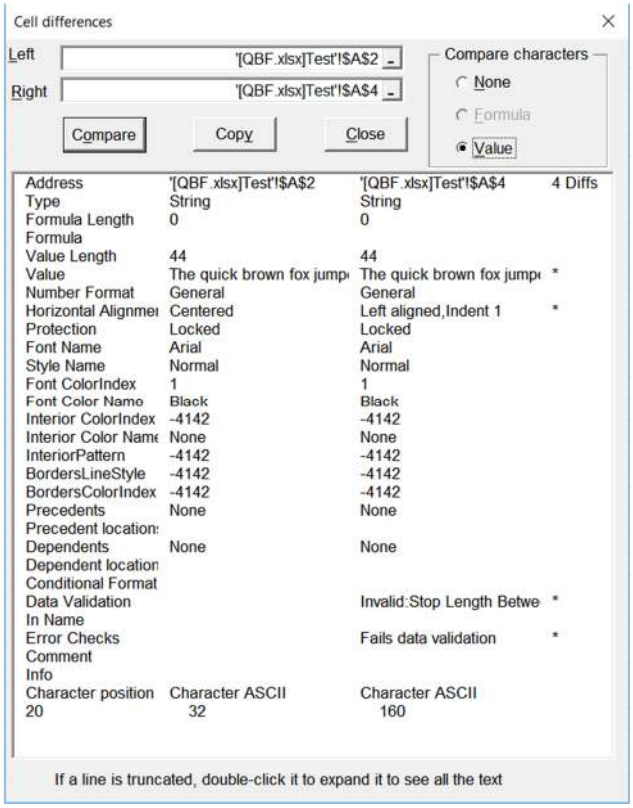
Compare Menu



Compare two Cells

Compare two cells in detail

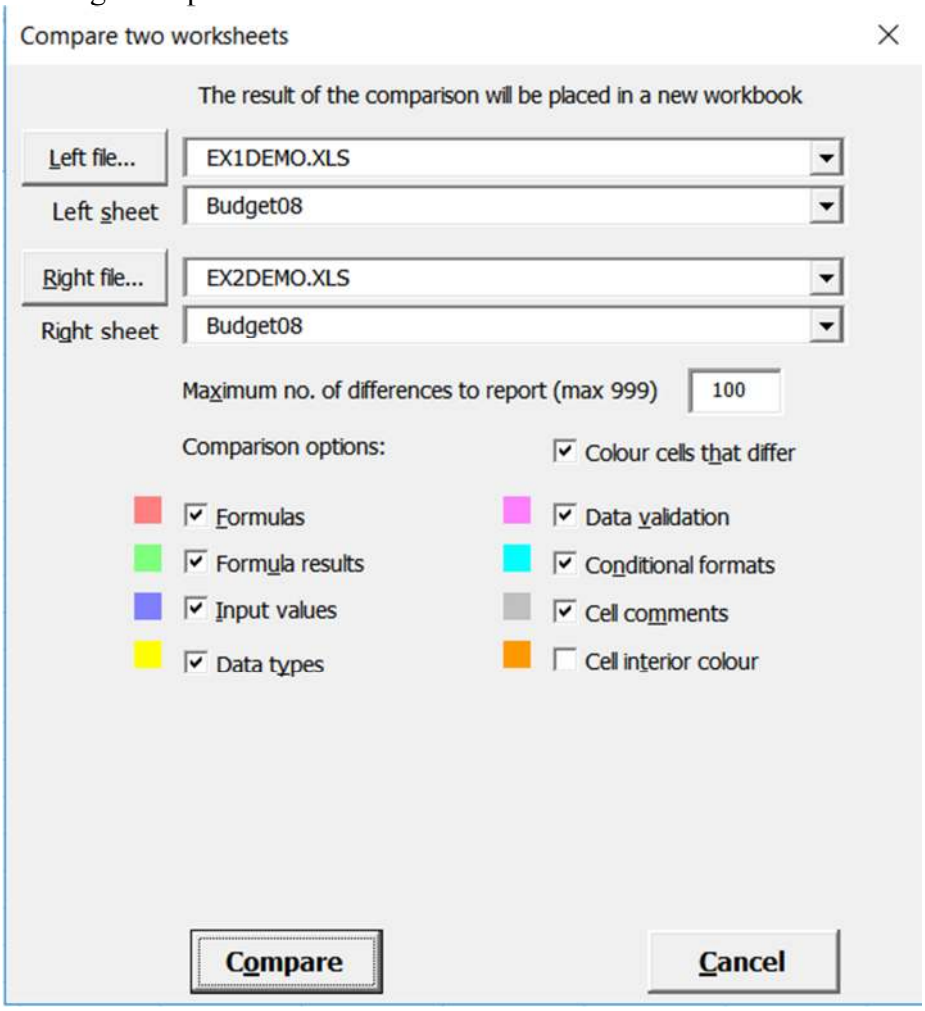
Click the dropdown of the Left and Right boxes to select the cells to compare. This lists the cell properties and, if a 'Compare characters' option is selected, each character of the cell contents. The rightmost column has an asterisk where there is a difference. This helps locate formatting or spelling differences.



Compare worksheets

Compare two worksheets

You use this to find any differences in the cells, formulas, validation, and comments in two similar worksheets. As an exercise, we shall compare the Budget08 worksheet in EX1Demo.xls with the same named sheet in EX2Demo.xls. You could open them first in Excel, but we recommend using the dialog buttons which open a workbook read-only and without executing any Workbook_ Open macros. Use 'Left file…' to open EX1Demo.xls and 'Right file…' to open EX2Demo.xls. Then in the Compare menu of XLTest, click Compare Worksheets, check the options are as shown, and click Compare. XLTest creates a new workbook named like "$WSC(1) Book1.xlsx" with a sheet named "Worksheet Comparison", and you should save that before clicking 'Compare'.



If there are more differences than the number specified in the Maximum Differences box (100), XLTest will pause and ask you if you want to stop the comparison. Click No, as in this case there are 102 differences.

Cell values are compared both by value and by visible display text. It shows the differences in both R1C1 and A1 reference style.

	A	B	C	D	E	F	G	H
1	Sheet	Address	Difference	R1/Value EX1DEMO.XLS	R1/Value EX2DEMO.XLS		A1/Text EX1DEMO.XLS	A1/Text EX2DEMO.XLS
43	'Budget08'	N14	Value	4703	4856		4703	4856
44	'Budget08'	L15	Formula	=Transfer!RC[-10]	324		=Transfer!B15	324
45	'Budget08'	L15	Value	324	324		324	324
46	'Budget08'	L15	Validation result	False	True		False	True
47	'Budget08'	L15	Validation Formula	> 0	Between 0 .. 1000		> 0	Between 0 .. 1000
48	'Budget08'	N15	Value	6678	7002		6678	7002
49	'Budget08'	L16	Formula	=Transfer!RC[-10]	104		=Transfer!B16	104
50	'Budget08'	L16	Value	104	104		104	104
51	'Budget08'	L16	Validation result	False	True		False	True
52	'Budget08'	L16	Validation Formula	> 0	Between 0 .. 1000		> 0	Between 0 .. 1000
53	'Budget08'	N16	Value	5693	5797		5693	5797
54	'Budget08'	B17	Formula	=R[-3]C+R[-2]C+R[-1]C	=SUM(R[-3]C:R[-1]C)		=B14+B15+B16	=SUM(B14:B16)
55	'Budget08'	C17	Formula	=R[-3]C+R[-2]C+R[-1]C	=SUM(R[-3]C:R[-1]C)		=C14+C15+C16	=SUM(C14:C16)
56	'Budget08'	D17	Formula	=R[-3]C+R[-2]C+R[-1]C	=SUM(R[-3]C:R[-1]C)		=D14+D15+D16	=SUM(D14:D16)
57	'Budget08'	E17	Formula	=R[-3]C+R[-2]C+R[-1]C	=SUM(R[-3]C:R[-1]C)		=E14+E15+E16	=SUM(E14:E16)
58	'Budget08'	F17	Formula	=R[-3]C+R[-2]C+R[-1]C	=SUM(R[-3]C:R[-1]C)		=F14+F15+F16	=SUM(F14:F16)

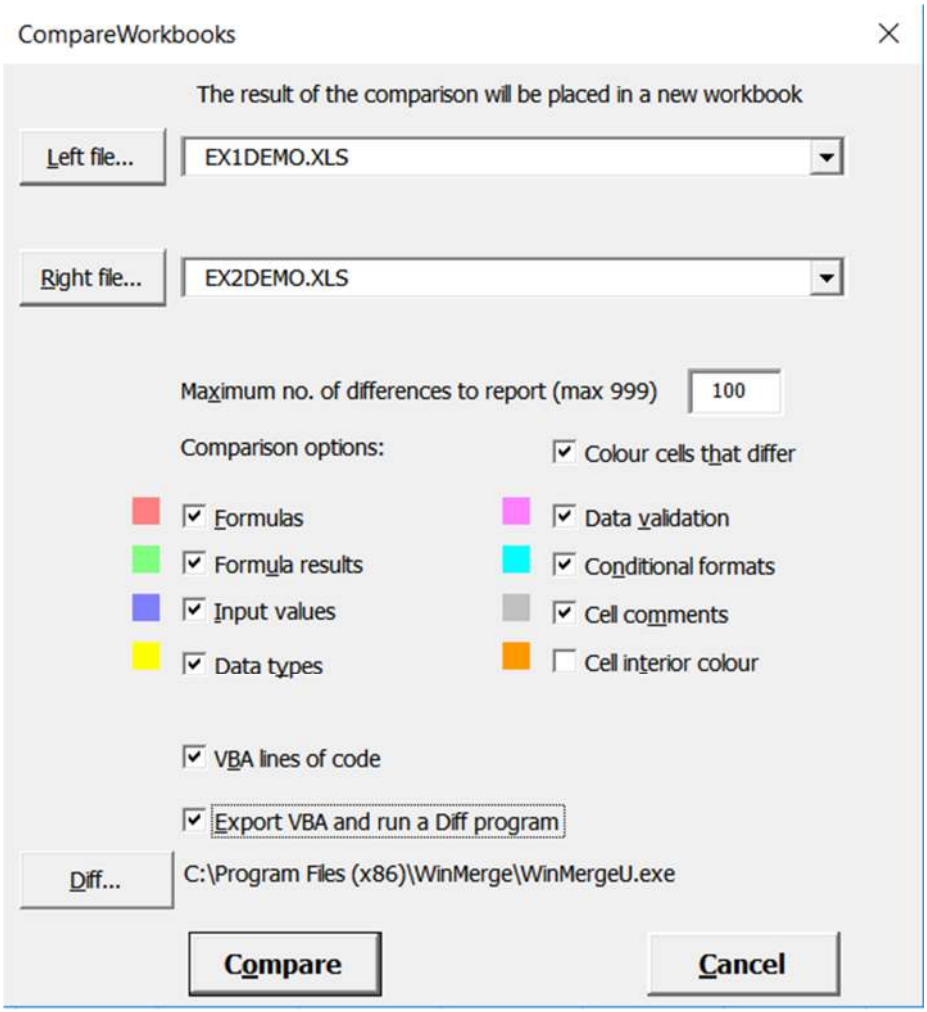
If the option was taken to colour the worksheets, the cells that are different are colour coded in the original workbooks as follows:

EX2DEMO.XLS [Read-Only] [Compatibility Mode]

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Budget fo	2008													
2															
3		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Check
4	Dept A														
5	Abrasive	411	668	760	484	367	849	575	233	977	135	941	407	6807	
6	Account	427	544	331	548	880	635	114	662	184	914	670	670	6579	
7	Actuator	381	967	239	500	574	703	84	564	390	387	964	437	6190	
8	Adhesive	828	540	241	179	740	546	748	942	969	976	214	485	7408	
9	Advertisi	494	567	191	700	325	343	758	374	900	648	445	811	6556	
10												255			
11	Total	2541	3286	1762	2411	2886	3076	2279	2775	3420	3060	3234	2810	33540	33540
12															
13	Dept B														
14	Bags	394	608	392	76	77	268	753	616	240	871	153	408	4856	
15	Barcode	352	644	714	982	692	239	711	894	377	616	324	457	7002	
16	Batteries	931	593	485	149	862	358	279	993	342	464	104	237	5797	
17	Total	1677	1845	1591	1207	1631	865	1743	2503	959	1951	581	1102	17655	35310
18															
19	Dept C														
20	Cables	398	172	471	924	803	242	422	219	431	859	184	989	6114	
21	Capacito	9	861	550	581	547	28	616	234	251	476	500	982	5635	
22	Cassette	348	543	697	94	320	189	353	75	350	259	494	428	4150	
23	Ceramic	555	618	622	514	971	573	976	792	115	223	926	306	7191	
24	Chemica	527	456	259	927	933	892	856	93	294	409	321	586	6553	
25	Chipboar	927	150	853	160	767	868	104	399	642	553	264	162	5849	
26	Compute	46	328	805	150	174	109	126	306	419	923	474	79	3939	
27	Total	2810	3128	4257	3350	4515	2901	3453	2118	2502	3702	3163	3532	39431	39431
28															

Compare workbooks

Compare two workbooks (same named sheets)

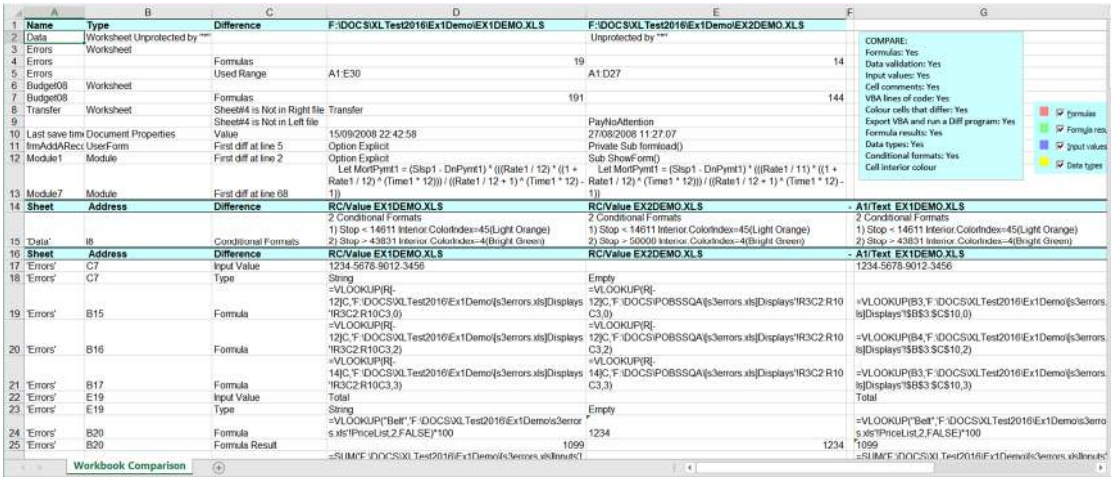


This compares all the worksheets in the two workbooks selected. When you select this menu item, it first creates a report workbook (eg XLTEST_LOG.xlsx) with a sheet "Workbook Comparison" which you should save.

As an exercise, compare the files EX1Demo.xls and EX2Demo.xls. Do not use an Ex1Demo.xls file left open from previous exercises as it has been altered. Start with no workbook open. Use ‘Left file…’to open EX1Demo.xls and ‘Right file…’to open EX2Demo.xls. These buttons open a file read-only and without executing any Workbook_Open macros, which is recommended. If prompted for a password to unprotect a sheet, just click Ok for it to be done automatically.

XLTest also allows you to compare all the VBA code modules by exporting them to two directories created from the workbook name plus “_VBC” and then running a Diff utility, if you have one installed. Our recommended Diff utility is WinMerge, which is free. Use the [Diff…] button to select your preferred diff utility.
Because the folders for the source code are created in the same directory as the workbook, you need to have create permission in that directory – in other words, don’t try this when the workbooks are on a CD or protected network location.

Sample workbook comparison output:



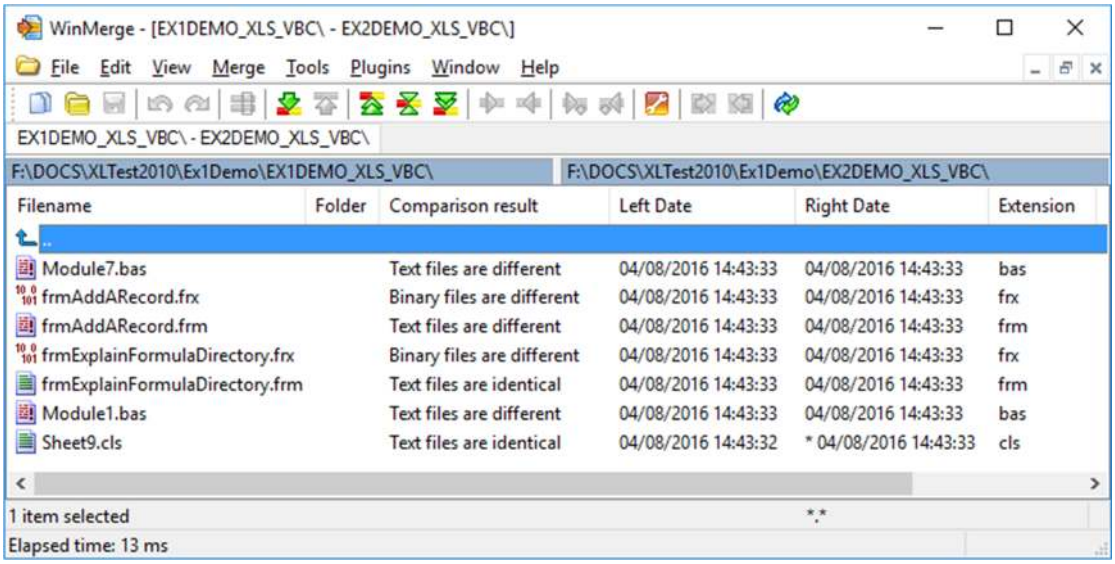
	A	B	C	D	E	F	G
1	**Name**	**Type**	**Difference**	**F:\DOCS\XLTest2016\Ex1Demo\EX1DEMO.XLS**	**F:\DOCS\XLTest2016\Ex1Demo\EX2DEMO.XLS**		
2	Data	Worksheet Unprotected by ""			Unprotected by ""		
3	Errors	Worksheet					
4	Errors		Formulas	19	14		
5	Errors		Used Range	A1:E30	A1:D27		
6	Budget08	Worksheet					
7	Budget08		Formulas	191	144		
8	Transfer	Worksheet	Sheet#4 is Not in Right file	Transfer			
9			Sheet#4 is Not in Left file		PayNoAttention		
10	Last save time	Document Properties	Value	15/09/2008 22:42:58	27/08/2008 11:27:07		
11	frmAddARecc	UserForm	First diff at line 5	Option Explicit	Private Sub formload()		
12	Module1	Module	First diff at line 2	Option Explicit	Sub ShowForm()		
13	Module7	Module	First diff at line 68	Let MortPymt1 = (Slsp1 - DnPymt1) * (((Rate1 / 12) * ((1 + Rate1 / 12) ^ (Time1 * 12))) / ((Rate1 / 12 + 1) ^ (Time1 * 12) - 1))	Let MortPymt1 = (Slsp1 - DnPymt1) * (((Rate1 / 11) * ((1 + Rate1 / 12) ^ (Time1 * 12))) / ((Rate1 / 12 + 1) ^ (Time1 * 12) - 1))		
14	**Sheet**	**Address**	**Difference**	**RC/Value EX1DEMO.XLS**	**RC/Value EX2DEMO.XLS**		**- A1/Text EX1DEMO.XLS**
				2 Conditional Formats 1) Stop < 14611 Interior.ColorIndex=45(Light Orange) 2) Stop > 43831 Interior.ColorIndex=-4(Bright Green)	2 Conditional Formats 1) Stop < 14611 Interior.ColorIndex=45(Light Orange) 2) Stop > 50000 Interior.ColorIndex=-4(Bright Green)		2 Conditional Formats 1) Stop < 14611 Interior.ColorIndex=45(Light Orange) 2) Stop > 43831 Interior.ColorIndex=-4(Bright Green)
15	'Data'	I8	Conditional Formats				
16	**Sheet**	**Address**	**Difference**	**RC/Value EX1DEMO.XLS**	**RC/Value EX2DEMO.XLS**		**- A1/Text EX1DEMO.XLS**
17	'Errors'	C7	Input Value	1234-5678-9012-3456			1234-5678-9012-3456
18	'Errors'	C7	Type	String	Empty		
19	'Errors'	B15	Formula	=VLOOKUP(R[-12]C,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!R3C2:R10C3,0)	=VLOOKUP(R[-12]C,'F:\DOCS\POBSSQA\[s3errors.xls]Displays'!R3C2:R10C3,0)		=VLOOKUP(B3,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!$B$3:$C$10,0)
20	'Errors'	B16	Formula	=VLOOKUP(R[-12]C,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!R3C2:R10C3,2)	=VLOOKUP(R[-12]C,'F:\DOCS\POBSSQA\[s3errors.xls]Displays'!R3C2:R10C3,2)		=VLOOKUP(B4,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!$B$3:$C$10,2)
21	'Errors'	B17	Formula	=VLOOKUP(R[-14]C,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!R3C2:R10C3,3)	=VLOOKUP(R[-14]C,'F:\DOCS\POBSSQA\[s3errors.xls]Displays'!R3C2:R10C3,3)		=VLOOKUP(B3,'F:\DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Displays'!$B$3:$C$10,3)
22	'Errors'	E19	Input Value	Total			Total
23	'Errors'	E19	Type	String	Empty		
24	'Errors'	B20	Formula	=VLOOKUP("Belt",'F:\DOCS\XLTest2016\Ex1Demo\s3errors.xls'!PriceList,2,FALSE)*100	1234		=VLOOKUP("Belt",'F:\DOCS\XLTest2016\Ex1Demo\s3errors.xls'!PriceList,2,FALSE)*100
25	'Errors'	B20	Formula Result	1099	1234		1099
				=SUMCE.[DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Inputs'!			=SUMCE.[DOCS\XLTest2016\Ex1Demo\[s3errors.xls]Inputs'

Workbook Comparison

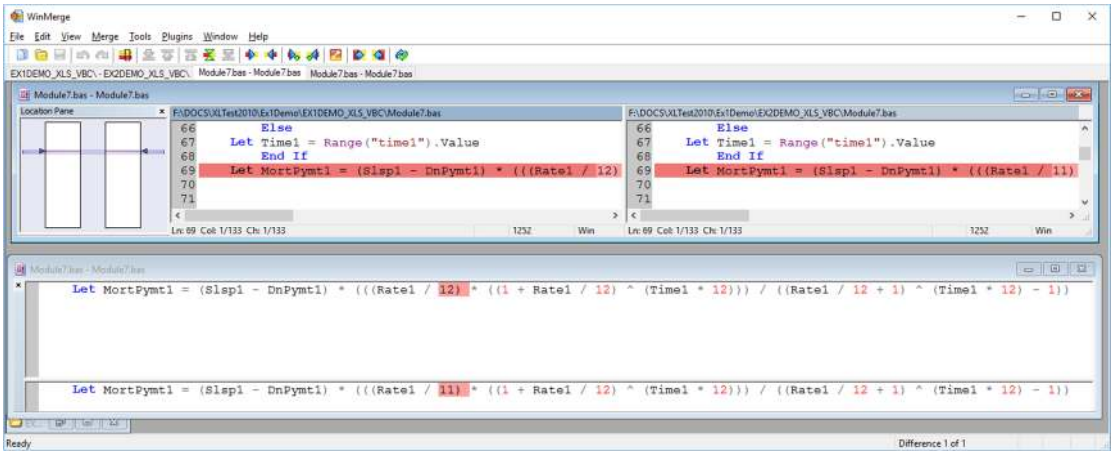
COMPARE:
Formulas: Yes
Data validation: Yes
Input values: Yes
Cell comments: Yes
VBA lines of code: Yes
Colour cells that differ: Yes
Export VBA and run a Diff program: Yes
Formula results: Yes
Data types: Yes
Conditional formats: Yes
Cell interior colour

Formulas
Formula res
Input values
Data types

Winmerge screen shot:



Double click on Module7.bas to see the code difference highlighted:



Comparison Functions callable from your code

You can call the XLTest macros from your own VBA code. This can help you create regression test suites to automatically compare versions of workbooks. The syntax is:

```
CompareWorkbooks(LeftWorkbook, RightWorkbook,
ComparisonOutputWorksheet, MaximumDifferences,
ColorDiffs, CompareFormulas, CompareResults, CompareValues,
CompareTypes,  CompareValidations, CompareConditionalFormats,
CompareComments,  CompareVBACode)
```

The function returns the number of differences found as a Double.
LeftWorkbook and RightWorkbook can be either Workbook objects, or strings containing the name of an open workbook, or strings containing the full path and file name of a workbook to be opened. If ComparisonOutputWorksheet is Nothing, XLTest creates a new worksheet.
All arguments after the first three are optional. The default value for MaximumDifferences is 100, for the remainder is TRUE. The order of arguments is the same as the Comparison dialog.

Example

Debug.Print Application.Run("XLTest174.xlam!CompareWorkbooks", "C:\docs\Book1.xlsx", "C:\docs\Book2.xlsx").

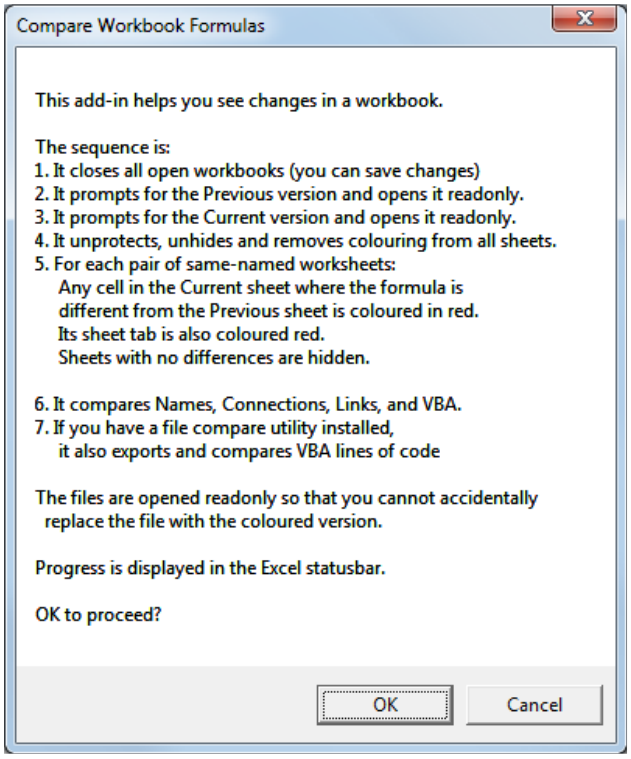
Similarly, there is a function to compare two worksheets:

```
CompareWorksheets(LeftWorksheet, RightWorksheet,
ComparisonOutputWorksheet, MaximumDifferences, ColorDiffs,
CompareFormulas, CompareResults, CompareValues, CompareTypes,
CompareValidations, CompareConditionalFormats,
CompareComments)
```

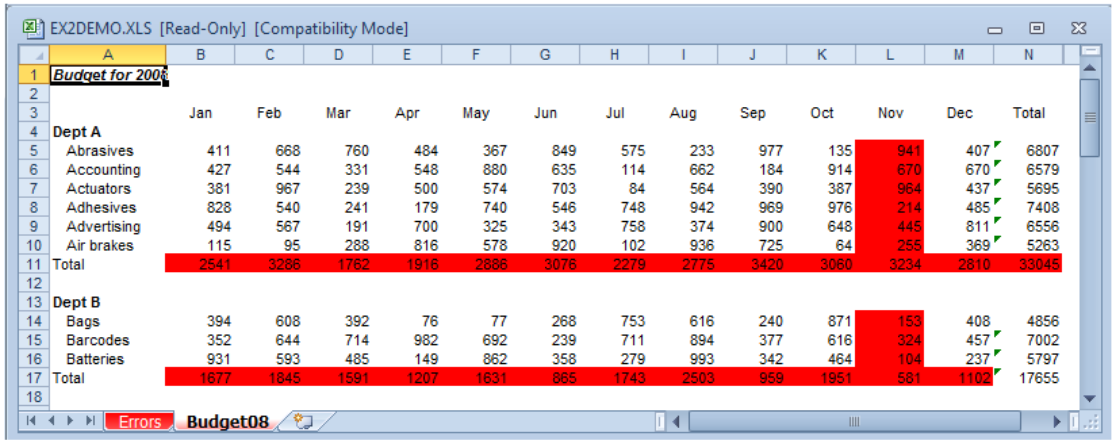
The function returns the number of differences found as a Double.

Quick Diff report

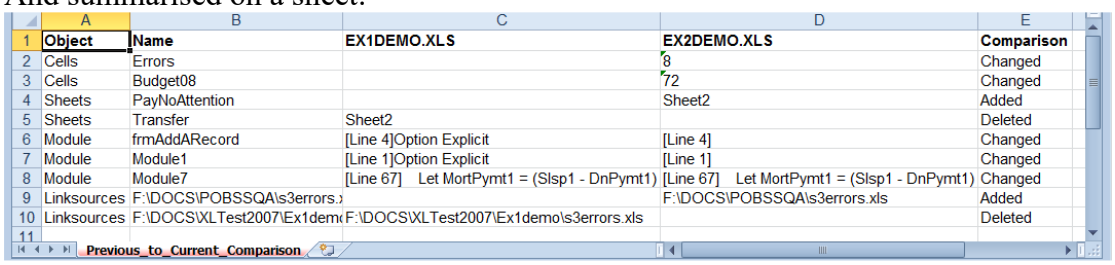
This is a fast comparison that takes a simple approach which may be suitable for quick comparisons between versions of a workbook. For this reason, it refers to the first file opened as the Previous version, and the second file as the Current version.



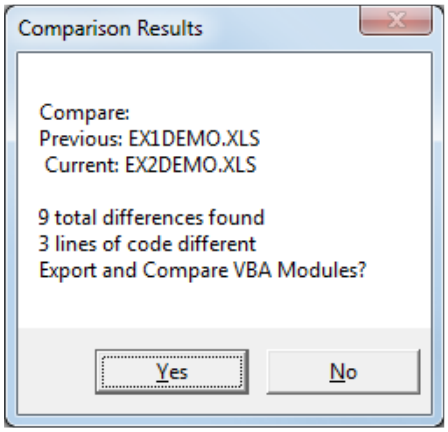
The differences are coloured in red in the Current version.



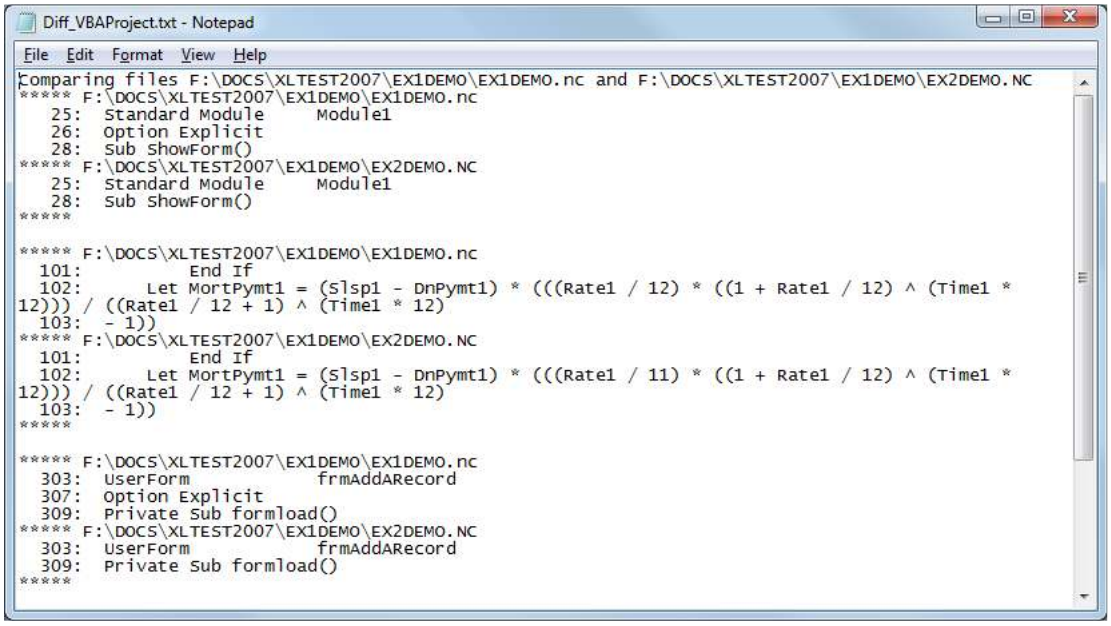
And summarised on a sheet:



At the end you are asked if you want to compare the VBA modules:



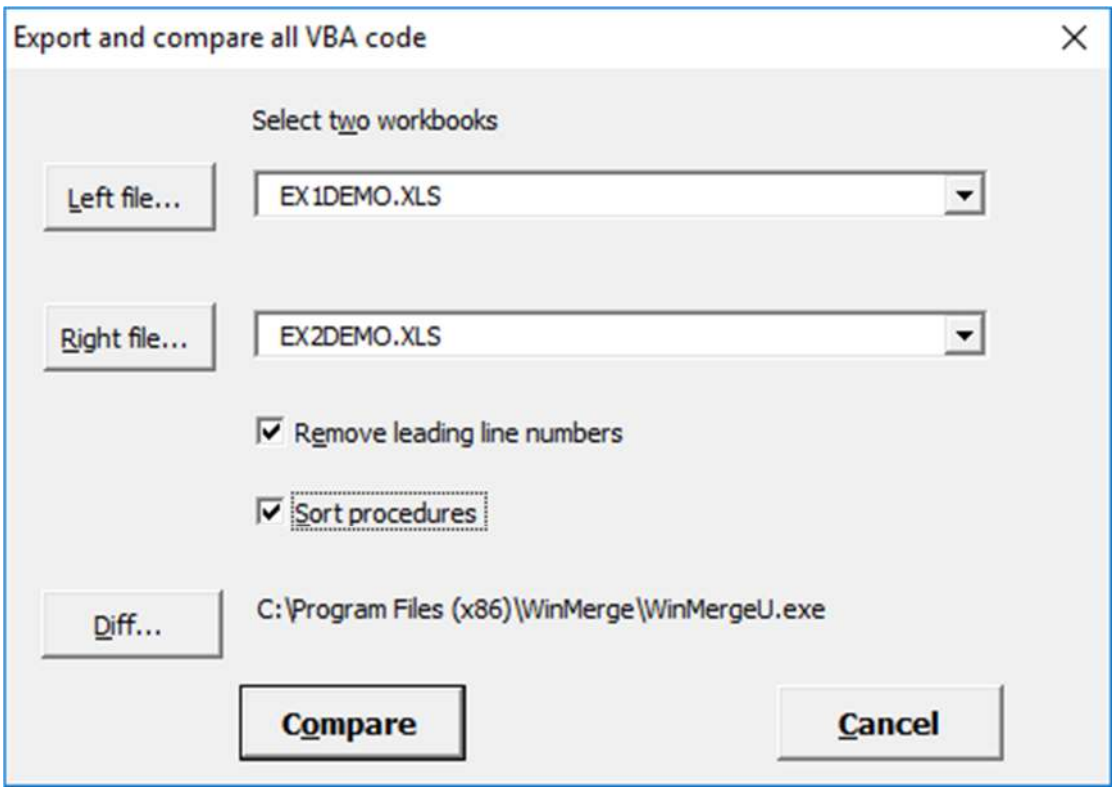
This outputs all the VBA code to one file for each workbook called eg Ex1Demo.nc and those two files are then compared. XLTest will use WinMerge if it finds it in the standard Program Files folder, otherwise it will use the DOS FC.EXE program which produces this kind of output in a file Diff_VBProject.txt :



Compare VBA

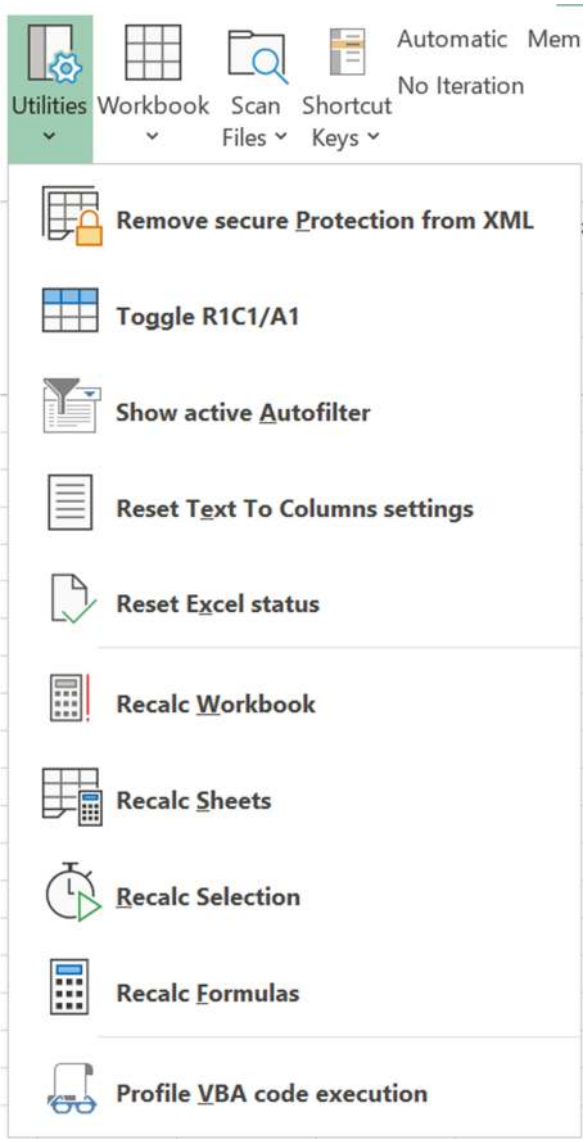
This exports the two VBProjects to text files, one single text file per project, with the procedures sorted alphabetically, and runs Winmerge to compare them, as above. When you select this menu command it creates a temporary workbook to record the names of the files being compared.

If the code has been line numbered and one version renumbered differently, it may be useful to remove the leading line numbers to permit comparing just the code changes.



For an example of WinMerge output, see the Compare Workbooks menu item above.

Utilities Menu



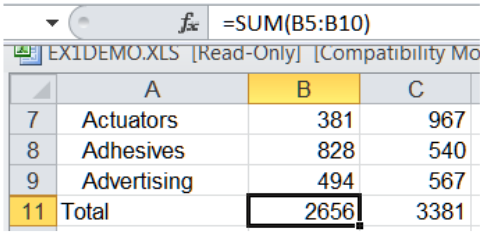
Remove secure protection from XML

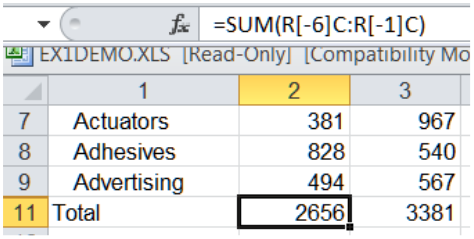
Remove workbook and worksheet protection

This strips out the workbook and worksheet passwords from the XML content of a workbook. It works on a closed file, not one open in Excel. It must be an OpenXML workbook such as .XLSX or .XLSM. It does not bypass the file open password, only the structure protection passwords. It replaces the original file so be sure you have a backup of the original in case any error happens.

Toggle R1C1 / A1

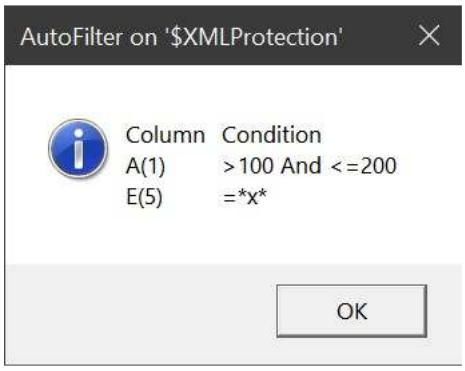
This toggles the display style of Excel between the normal A1 style where the column headings are letters to the numeric style where the columns are numbered and the cell references are in Row number & Column number style, where R1C1 is the same as A1. It is a slightly shorter action than the Excel menu File > Options > Formulas > R1C1 Reference Style.





Show active Autofilter

If the active sheet has an Autofilter, this shows the criteria in a simple message box. This may not work if there are many criteria applied.



Reset Text to Columns settings

Reset Excel's Text to Columns parsing

When you convert Text to Columns, Excel remembers the settings and applies them to the next Paste operation. That can result in the pasted text being split up in a way that you do not want. This option resets the settings to the default.

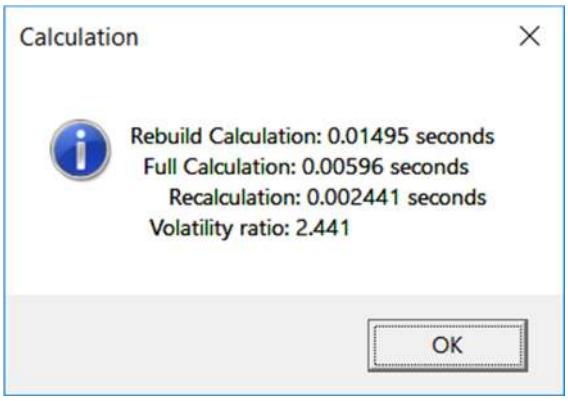
Reset Excel status

If XLTest is interrupted by an error, it may leave Excel in a manual calculation state and with some message on the status bar. This resets it to the default state.

Recalculate Workbook / Sheets / Selection / Formulas

These menu items recalculate the workbook selectively and report the timings. It is based on public domain code from Charles Williams on the Microsoft web site.

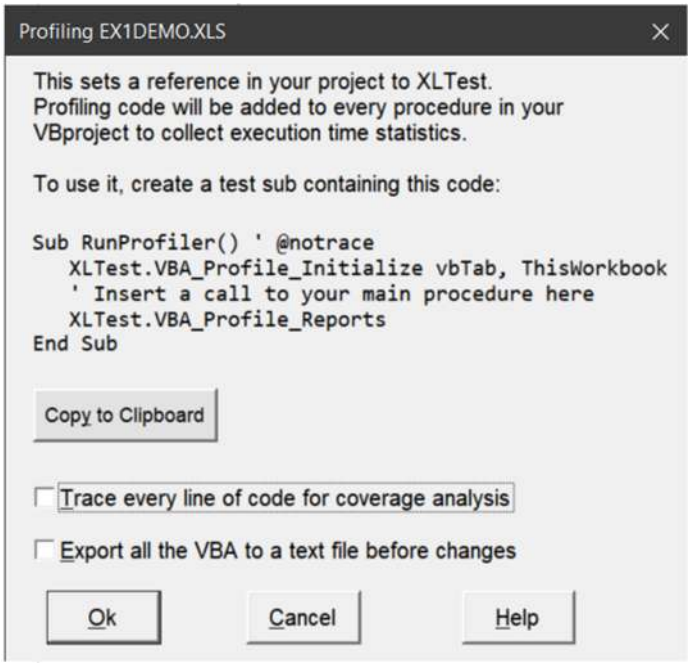
https://docs.microsoft.com/en-us/office/vba/excel/concepts/excel-performance/excel-improving-calcuation-performance



Profile VBA code execution

Add tracing calls to profile VBA performance

This collects timing data on procedure calls, to produce profile statistics reports. It adds a one-line call to each procedure; and optionally to every line of code. It adds a reference to XLTest to collect the statistics on the calls.



Click the Help button to learn more.

You can opt to export all the VBA to a text file before making the changes. This is just for your record, it is not used in this process. The tab-delimited text file is named from your workbook name suffixed with _VBA_BEFORE.TXT

It adds a line like the following to every procedure in the project, unless its declaration line contains a comment '@notrace

```
Dim P_ As Object: Set P_ = XLTest.New_Profiler():
P_.Start 12345, "modulename", "procname"
```

When the procedure exits and the variable P_ goes out of scope, the profiler adds one to the number of calls of this procedure and the length of time it took to run. The resolution of the timer is about a microsecond (1 µs).

If you checked code coverage in the form, it inserts a call at the beginning of every executable line like this:

```
 P_.O 12345&:
```

In the examples above 12345 is a unique line number in the project, corresponding to lines in the coverage file.

Finally you need to manually edit your code to insert a test sub to initialize the profiler, call the starting procedure, and then produce reports:

```
Sub RunProfiler() ' @notrace
   XLTest.VBA_Profile_Initialize vbTab, ThisWorkbook
   ' Insert a call to your main procedure here
   XLTest.VBA_Profile_Reports
End Sub
```

If the first parameter of VBA_Profile_Initialize is a delimiter such as a tab character (vbTab) or a comma (","), then every P_.Start sends the parameters to the debug logging output, separated by that character. The log output is set in XLTest Options, usually as either OutputDebugString (c. 20 µs) or Event Tracing events (c. 1 µs each) You can watch and capture that output using DebugView from SysInternals or TraceSpy from Simon Mourier. I use TraceSpy because it is faster than DbgView and did not miss any output in fast tests. To be sure that TraceSpy can keep up with the output, do not use Auto-Scroll.To have no data sent to the debug output, specify "" for the delimiter.

The profiling report is a tab-delimited file named after your workbook plus "_VBA_PROFILE.TXT". It gives the procedure name, number of times it was called, and the total time in seconds spent in that procedure, both including and excluding the time for the procedures it calls. For example:

Module.Proc	Count	Inclusive time	Exclusive time	Average time	Index
usercode.Main	1	7.9249538	1.5243795	1.5243795	1
usercode.subrecurse	3	0.7719876	0.4008644	0.133621467	2
usercode.sub2	2	4.0001536	7.64E-04	3.82E-04	3
usercode.sub3	6	5.9989464	5.9989464	0.9998244	4

The report columns are:

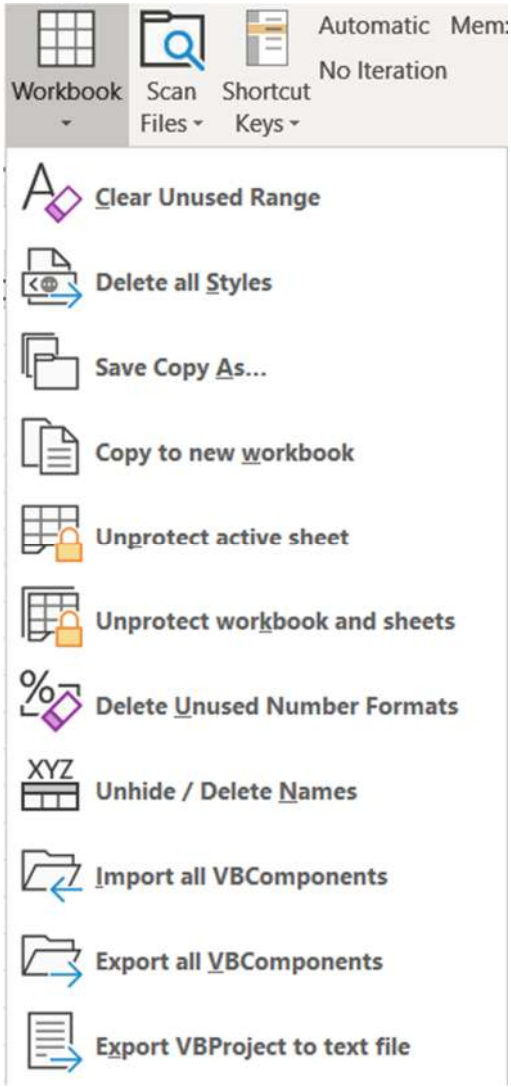
A Module.Proc Module name and procedure name
B Count Number of times the procedure was called
C Inclusive time Execution time of this procedure and all those it calls
D Exclusive time Execution time within this procedure only
E Average time The average run time of the procedure, the exclusive time divided by the count of calls
F Index A sequence number

If you also selected code coverage analysis, a workbook is created with one sheet containing the contents of the _VBA_COVERAGE.TXT file with an extra column added to show the number of times a line of code was executed and the execution time of each line in microseconds.

If you lose the original workbook, you can remove the profiling code by doing a Search, use Pattern matching, and Replace All with nothing for these Find What strings:

```
Dim P_ *
P_O *&:
```

Workbook Menu



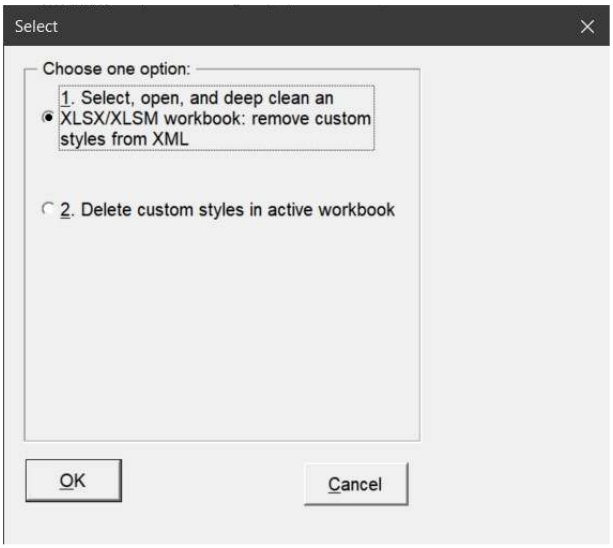
Clear Unused Range

Reset Excel's used range

Excessive formatting can cause a worksheet to have a larger used range (as shown by Ctrl+End in Excel) than the range occupied by data. This option clears cells to the right of and below the data range. When you then save the workbook that should reset the Excel used range.

Delete All Styles

Remove excessive styles



Styles often become duplicated when copying from one workbook to another, leading to possibly thousands of unwanted styles; that reduces workbook stability.

The first option is a deep cleaning method that deletes the non-builtin styles from the styles.xml component of xlsx or xlsm files. Excel may warn of unreadable content when you open the file after this. Because this carries the risk of corrupting the workbook, it creates a backup file.

The second option is used only when the workbook is already open; it may fail to remove styles with corrupted names.

Save Copy As…

Save a copy of the workbook

This saves a copy of the active workbook under another name, without changing the name of the workbook in memory. It is useful in keeping copies of a file for documentation purposes while still keeping the current file name which might be linked to from XLTest documentation sheets.

Copy to new workbook

Copy all sheets to a new workbook

This creates a cleaner copy of the open workbook by copying all the sheets and VBA to a new workbook. It usually results in a smaller file with no excess range names or styles. If you get a “Compatibility Checker” warning with Excel 2003 files, you can turn it off by unchecking the box “Check compatibility when saving this workbook”. If it contains external links, you may be prompted to update values; you can cancel that dialog if the source file is missing. Excel copies only the values of What-If Data Tables, not the {TABLE()} array formula.

Unprotect active sheet

Remove active sheet protection

This can be used to remove the sheet protection set by the Excel command “Protect Worksheet” when you do not know the password. It should unprotect the sheet in a minute or two.

The password found is shown. It is not the real password, merely one that happens to match Excel’s encoding of the original:

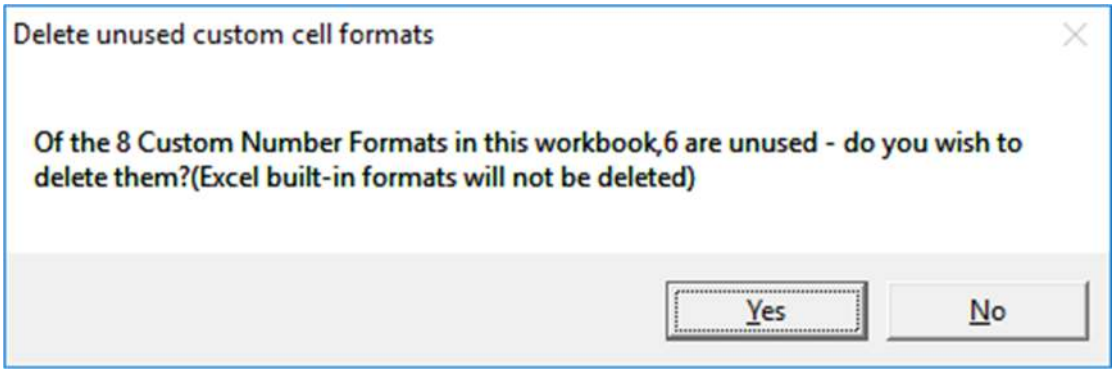
Unprotect workbook and sheets

Remove workbook structure protection

This is similar to “Unprotect sheet” but removes the workbook structure protection set by the Excel command “Protect Workbook”

Delete Unused Number Formats

Delete custom formats not used on any sheet, from active workbook
This helps you tidy up a workbook with too many formats. It exports the formats from the workbook XML, identifies the custom formats, searches for them being in use in any sheet, and deletes any formats not found to be in use.



Unhide / Delete Names

This allows you to see names normally hidden from Excel's name manager, and to delete names that contain #REF in their formula.

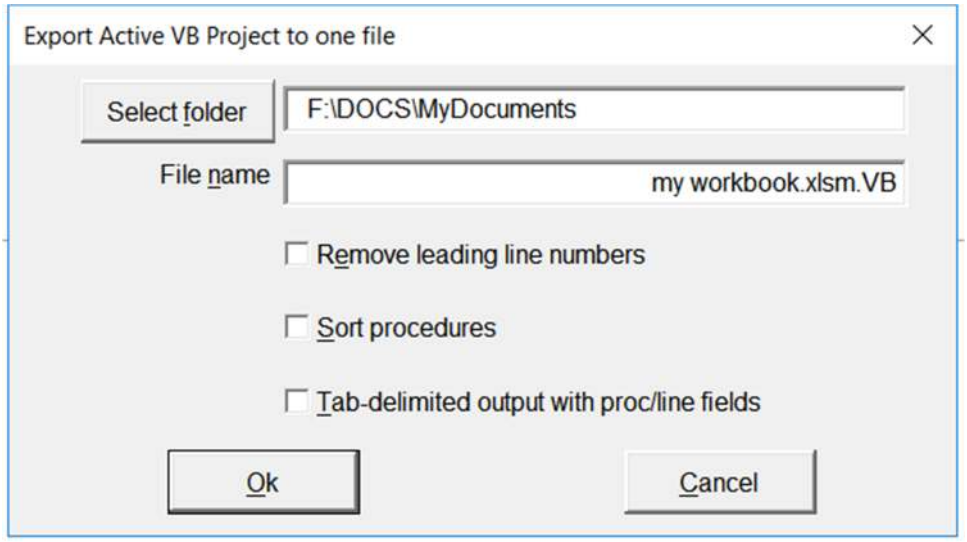
Import all VB Components

You are asked to select a folder to import all VB Components from.
Select one, and all the .bas (module), .cls (class), and .frm (form) files in the folder are imported into the current workbook's VB project, replacing any of the same name already there.

Export all VB Components

You are asked to select a folder to export all VB Components to.
Select one or click "New Folder" in the dialog to create one, and all the modules, classes, and forms in the current workbook's VB project are saved there.

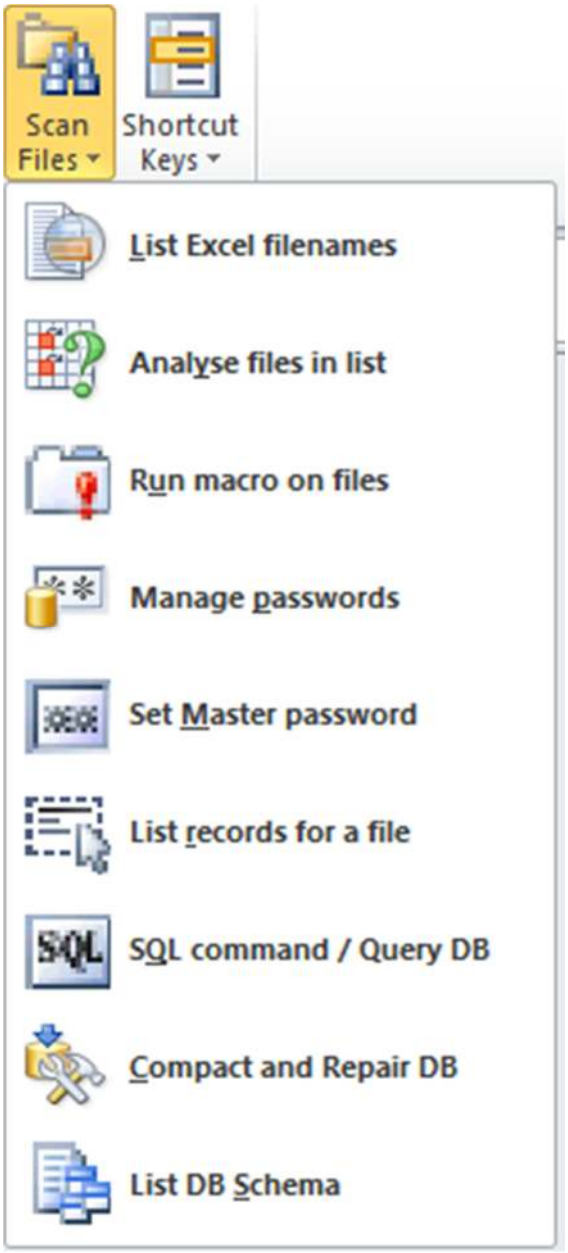
Export VBProject to text file



This creates one text file containing all the VBA code from your project. It is the same as that used in the Compare VBA routine. The Tab-delimited output is used in the VBA Profiling feature.

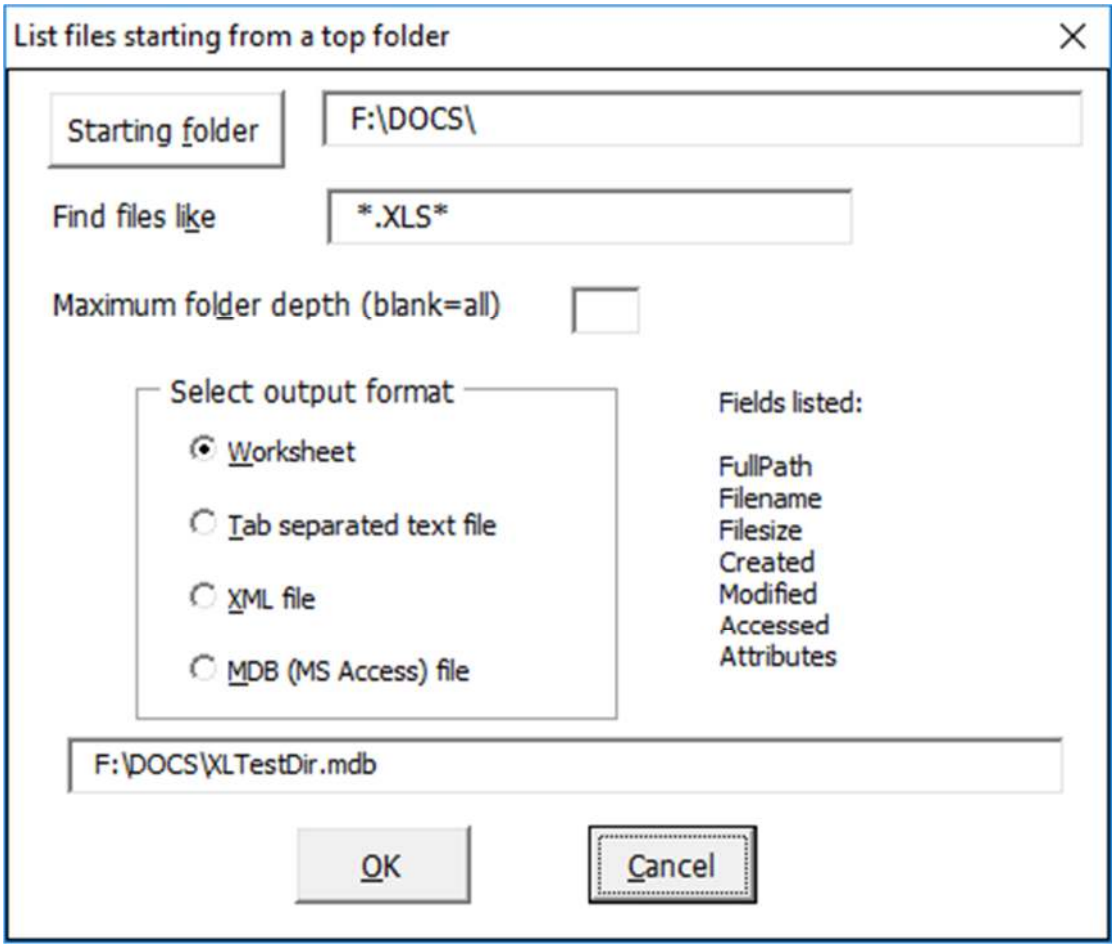
Scan Files menu

List and process folders of Excel spreadsheets



List Excel filenames

List Excel files to a new worksheet



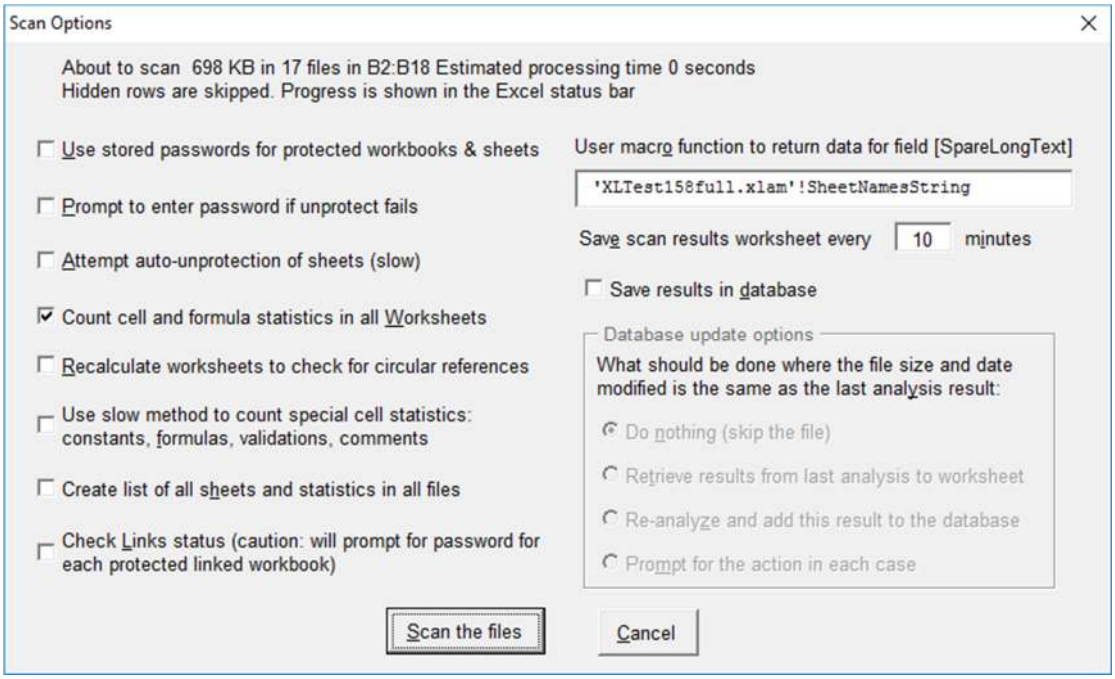
This creates the specified output file with a list of the files found whose extension matches the pattern. The filename shown for worksheet output is in fact an Access MDB file used as a temporary storage before the final output is sent to a sheet. The MDB-only output is recommended if there are more than a million files to be found, because of the 1048576 row limit in Excel.

Sheet4

	A	B	C	D	E	F	G	H
1	Directory	FileName	Size	Created	Accessed	Modified	Attributes	ID
2	F:\DOCS\XLTest2010\Ex1Demo\	#Cof(1) EX1DEMO.XLS	159,744	2016-08-01 19:05:39	2016-08-01 19:05:39	2016-08-01 19:05:40	A	1
3	F:\DOCS\XLTest2010\Ex1Demo\	#Cof(2) EX1DEMO.XLS	163,840	2016-08-02 12:01:21	2016-08-02 12:01:21	2016-08-02 12:01:23	A	2
4	F:\DOCS\XLTest2010\Ex1Demo\	#DpC(1) EX1DEMO.XLS	147,456	2015-11-10 14:41:00	2015-11-10 14:41:00	2015-11-10 14:41:02	A	3
5	F:\DOCS\XLTest2010\Ex1Demo\	#DpC(2) EX1DEMO.XLS	207,360	2016-08-01 19:06:17	2016-08-01 19:06:17	2016-08-01 19:06:18	A	4
6	F:\DOCS\XLTest2010\Ex1Demo\	#DpL(1) EX1DEMO.XLS	136,704	2015-11-10 14:40:53	2015-11-10 14:40:53	2015-11-10 14:40:54	A	5
7	F:\DOCS\XLTest2010\Ex1Demo\	#DpL(2) EX1DEMO.XLS	191,680	2016-08-01 19:06:08	2016-08-01 19:06:08	2016-08-01 19:06:10	A	6

Analyse files in list

Analyse selected range of Excel file names



The option to "Use stored passwords" is available when the "Manage Passwords" button has been used to save Workbook Open passwords in an encrypted file to help automatic processing.

The "Save results in database" option is available when the database exists and is configured using the connection string in XLTest Options.

If you check “Use slow method to count special cell statistics" that gives extra information at the cost of more time.

As well as populating the "XLScan" sheet with statistics, this also creates a "ScanLinks" sheet listing the external links in the files. This can be used to show what interdependencies exist among the workbooks.

The macro function box is a way to specifies extra processing for each file. The example "SheetNamesString" returns a list of sheet names delimited by slash characters. You can specify your own macro that you wish to run on each file. Be aware that if that macro throws an untrapped error, processing may halt at that point.

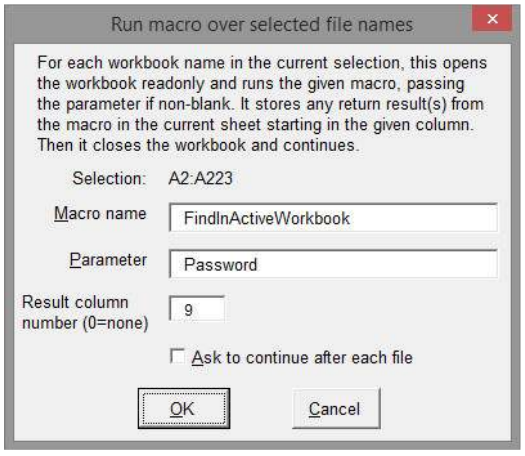
XLScan columns			ScanLinks columns
FullName	PropertyName1	nValidations	LinkNo
Name	PropertyValue1	nDVCells	WBFullName
Size	PropertyName2	nFormatConditions	WBDrive
Created	PropertyValue2	nCFCells	WBShareName
Accessed	FirstEntry	nComments	WBDirectory
Modified	Found_In_VBA	nConstants	WBName
Attributes	nExcelLinks	nConstantErrors	WBModified
FileFormat	LinkSources	nNumbers	ObjectType
ScanMsg	nAllLinks	nFormulas	ObjectName
ScanTime	nTotLinkFormulas	nFormulaErrors	ObjectSubType
Options	CalcVersion	nDistinctFormulas	LinkLocation
AuditDate	nWBSet	nUsedCells	LinkSource
Updated	WBSettings	nObjects	LinkFullName
Deleted	nNames	MaxCol	LinkDrive
UserID	nSheets	MaxRow	LinkShareName
UserNotes	nWorksheets	nArrayFormulas	LinkDirectory
Drive	nModules	MaxLenFormula	LinkName
ShareName	nForms	MaxComplexity	LinkRelativePath
Directory	nClasses	nTotComplexity	LinkFileExists
Author	nLines	Scoring	LinkModified
Last_Author	nWSSet	SpareText	LinkInf
Last_Print_Date	WSSettings	SpareLongText	
Title	Found_In_Formulas	ID	
Company	Found_In_Values	nStyles	

Table of columns in the results sheets

Run macro on files

Run a macro on each of the workbooks in a column of file names

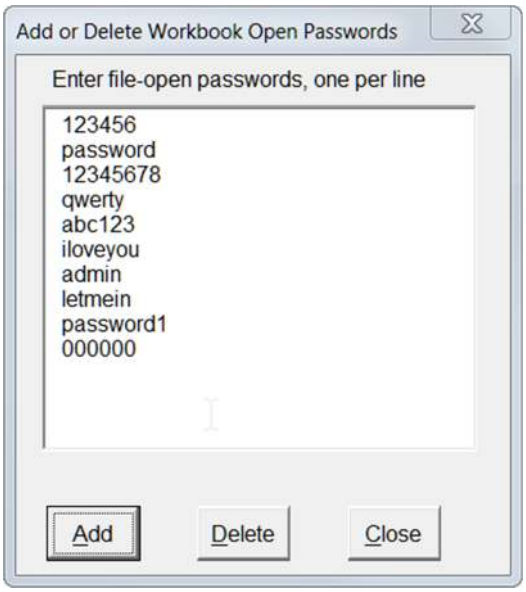
To specify your own macro, prefix it with the workbook name, eg
`Personal.xls!MyMacro`



Manage passwords

Manage workbook open passwords

This maintains a list of passwords that will be tried in succession to open workbooks which have password protection. There is no association of any specific workbook to a given password. You cannot view existing passwords, only add to them or delete specified ones. By the way the examples shown in the picture are from lists of the top ten worst passwords! Passwords to unprotect worksheets are stored unencrypted in a file XLTestPasswords.tsv. These text files are saved in the same folder as the add-in.



Set Master Password

Set Master Password, initialise password file

The first time this option is taken, it creates a file "XLTestPasswords.txt" in the same folder as the XLTest add-in. Its contents are encrypted. On subsequent times that you take this option, you can change the password:

List records for a file

Prompt for a filename and list its database records

In the Select File dialog, select the file. If there are any records in the database for it, they are listed on a new worksheet. The Audit sheet lists the summary information from when Scan Files was run.

SQL Command / Query DB

Issue a SQL command to the database

In the dialog, enter any SQL command to report on the audit results. For example:

```
SELECT fullname FROM audit WHERE name LIKE 'ex1demo%'
```

The database schema is shown below. The Audit table contains the summary information. The Results table contains one record for each test performed. There is no predefined report in XLTest for this information. Apart from using the SQL command to query it, you could also design reports in Access if you wish.

For example, to query for all the workbooks that link to an add-in named 'inventory.xla', you could use:

```
SELECT *
FROM Results INNER JOIN Audit ON Results.Auditid = Audit.ID
WHERE (((Results.Item)='Link') AND ((Results.TextValue) Like
'*inventory.xla'));
```

List DB schema

List the schema of a Jet/Access file

You are prompted to select an MDB or ACCDB file. This creates a list of tables and fields in that database.

The SQL type is that used in the ADO driver. The DataTypeEnum is defined at https://msdn.microsoft.com/en-us/library/ms675318(v=vs.85).aspx

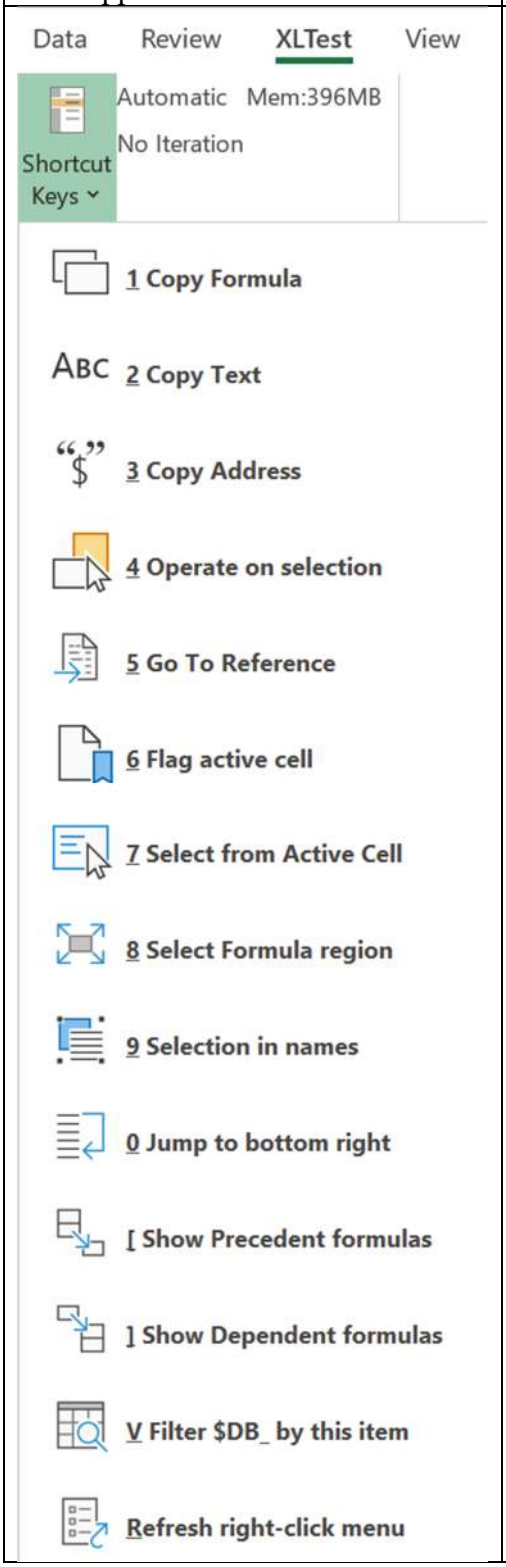
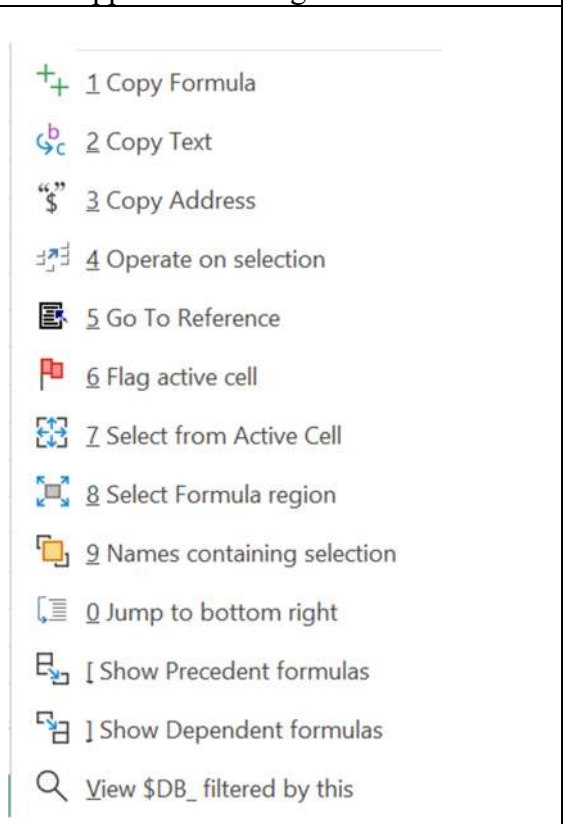
The Column Flags are documented under `DBCOLUMNFLAGS` at https://msdn.microsoft.com/en-us/library/ms716934(v=vs.85).aspx

Schema of XLTest database

Table	Column	Access Type	Position	SQL Type	Column Flags	Size	Nullable
Audit	FullName	Text	1	130	106	255	TRUE
Audit	Name	Text	2	130	106	255	TRUE
Audit	Size	Double	3	5	122		TRUE
Audit	Created	Date	4	7	122		TRUE
Audit	Accessed	Date	5	7	122		TRUE
Audit	Modified	Date	6	7	122		TRUE
Audit	Attributes	Text	7	130	106	255	TRUE
Audit	FileFormat	Text	8	130	106	255	TRUE
Audit	ScanMsg	Text	9	130	106	255	TRUE
Audit	ScanTime	Double	10	5	122		TRUE
Audit	Options	Text	11	130	106	255	TRUE
Audit	AuditDate	Date	12	7	122		TRUE
Audit	Updated	Date	13	7	122		TRUE
Audit	Deleted	Date	14	7	122		TRUE
Audit	UserID	Text	15	130	106	255	TRUE
Audit	UserNotes	Text	16	130	106	255	TRUE
Audit	Drive	Text	17	130	106	255	TRUE
Audit	ShareName	Text	18	130	106	255	TRUE
Audit	Directory	Text	19	130	106	255	TRUE
Audit	Author	Text	20	130	106	255	TRUE
Audit	Last_Author	Text	21	130	106	255	TRUE
Audit	Last_Print_Date	Text	22	130	106	255	TRUE
Audit	Title	Text	23	130	106	255	TRUE
Audit	Company	Text	24	130	106	255	TRUE
Audit	PropertyName1	Text	25	130	106	255	TRUE
Audit	PropertyValue1	Text	26	130	106	255	TRUE
Audit	PropertyName2	Text	27	130	106	255	TRUE
Audit	PropertyValue2	Text	28	130	106	255	TRUE
Audit	FirstEntry	Text	29	130	106	255	TRUE
Audit	Found_In_VBA	Memo	30	130	234	0	TRUE
Audit	nExcelLinks	Integer	31	3	122		TRUE
Audit	LinkSources	Memo	32	130	234	0	TRUE
Audit	nAllLinks	Integer	33	3	122		TRUE
Audit	nTotLinkFormulas	Double	34	5	122		TRUE
Audit	CalcVersion	Double	35	5	122		TRUE
Audit	nWBSet	Integer	36	3	122		TRUE
Audit	WBSettings	Memo	37	130	234	0	TRUE
Audit	nNames	Integer	38	3	122		TRUE
Audit	nSheets	Integer	39	3	122		TRUE
Audit	nWorksheets	Integer	40	3	122		TRUE
Audit	nModules	Integer	41	3	122		TRUE
Audit	nForms	Integer	42	3	122		TRUE
Audit	nClasses	Integer	43	3	122		TRUE
Audit	nLines	Integer	44	3	122		TRUE
Audit	nWSSet	Integer	45	3	122		TRUE
Audit	WSSettings	Memo	46	130	234	0	TRUE

Audit	Found_In_Formulas	Memo	47	130	234	0	TRUE
Audit	Found_In_Values	Memo	48	130	234	0	TRUE
Audit	nValidations	Double	49	5	122		TRUE
Audit	nDVCells	Double	50	5	122		TRUE
Audit	nFormatConditions	Double	51	5	122		TRUE
Audit	nCFCells	Double	52	5	122		TRUE
Audit	nComments	Double	53	5	122		TRUE
Audit	nConstants	Double	54	5	122		TRUE
Audit	nConstantErrors	Double	55	5	122		TRUE
Audit	nNumbers	Double	56	5	122		TRUE
Audit	nFormulas	Double	57	5	122		TRUE
Audit	nFormulaErrors	Double	58	5	122		TRUE
Audit	nDistinctFormulas	Double	59	5	122		TRUE
Audit	nUsedCells	Double	60	5	122		TRUE
Audit	nObjects	Double	61	5	122		TRUE
Audit	MaxCol	Integer	62	3	122		TRUE
Audit	MaxRow	Integer	63	3	122		TRUE
Audit	nArrayFormulas	Double	64	5	122		TRUE
Audit	MaxLenFormula	Integer	65	3	122		TRUE
Audit	MaxComplexity	Integer	66	3	122		TRUE
Audit	nTotComplexity	Double	67	5	122		TRUE
Audit	Scoring	Integer	68	3	122		TRUE
Audit	SpareText	Text	69	130	106	255	TRUE
Audit	SpareLongText	Memo	70	130	234	0	TRUE
Audit	ID	Integer	71	3	90		FALSE
Audit	nStyles	Integer	72	3	122		TRUE
Results	AuditID	Integer	1	3	122		TRUE
Results	Item	Text	2	130	106	255	TRUE
Results	Name	Text	3	130	106	255	TRUE
Results	ItemIndex	Text	4	130	106	255	TRUE
Results	TextValue	Memo	5	130	234	0	TRUE
Results	AltText	Memo	6	130	234	0	TRUE
Results	DataType	Integer	7	3	122		TRUE
Results	Number	Double	8	5	122		TRUE
Results	Counter	Integer	9	3	122		TRUE
Results	Location	Memo	10	130	234	0	TRUE
Results	Flag	Text	11	130	106	1	TRUE
Results	ExtendedInfo	Memo	12	130	234	0	TRUE
Results	Report	Text	13	130	106	4	TRUE
Results	ColorIndex	Integer	14	3	122		TRUE
Results	Timestamp	Date	15	7	122		TRUE
Results	ID	Integer	16	3	90		FALSE

Shortcuts Keys menu

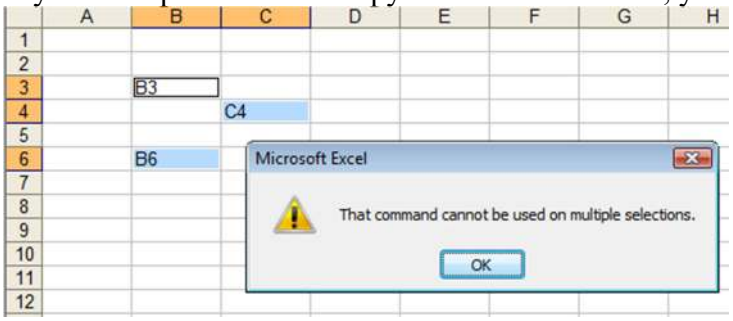
As it appears in the Ribbon menu	As it appears with a right-click on a cell
	

Copy Formula
Copy formula in current display style (A1 or R1C1) from active cell to Windows clipboard.

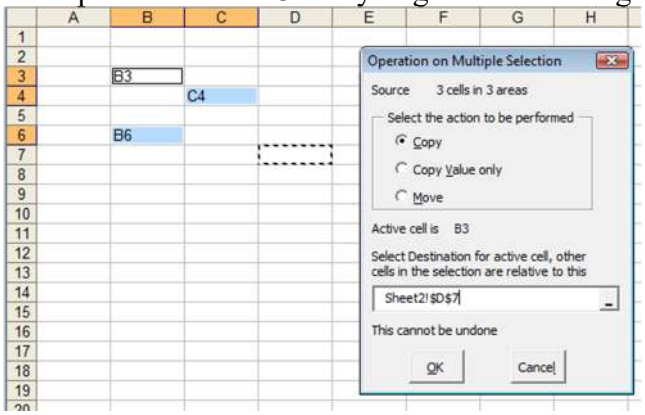
Copy Text
Copy text from active cell to clipboard.
This can be used to copy values into other applications without the line terminator that Ctrl+C adds.

Copy Address
You can select how much detail in the address to copy:

Operate on selection
This provides options to copy or move multiple selections, which Excel does not do. If you attempt in Excel to copy the selection shown, you receive an error message:



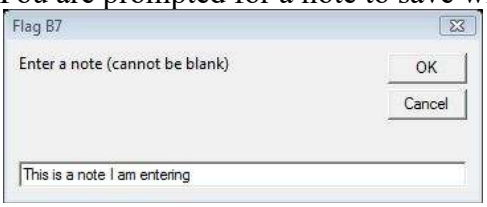
Example: select B3, C4, B6 and press Tab to make the first cell (B3) the active cell. Then press Ctrl+Alt+3 and you get the following dialog:



Click in the Destination box and then click on D7, then click OK. Now the multiple selection is copied, starting with B3 being copied to D7, and the rest relative to that.

Go To Reference
Go to the address in the cell
This selects the range referred to by the hyperlink or address in the active cell.

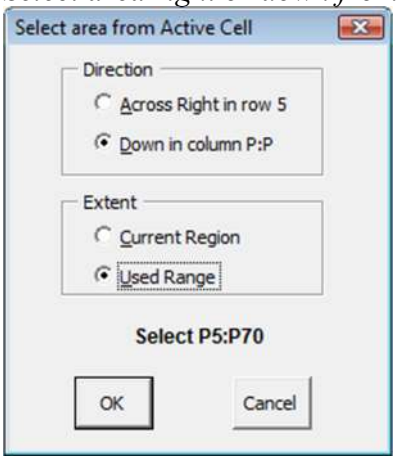
Flag active cell
This places a flag on the cell for a table of contents
You are prompted for a note to save with the flag:



The flag appears on the left of the cell:

The flagged cell locations and notes are listed by the WB/WS documentation menu item.

Select from Active Cell
Select area right or down from active cell



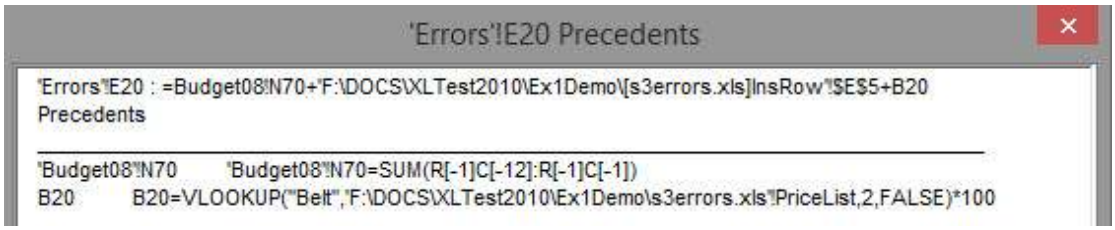
This can select the current row, or column, of the current region of the cell (the area bounded by blank rows and columns) or of the entire used range of the sheet starting at the active cell. When this is selected, you might wish to format the cells, or copy the active cell's formula (fill right is Ctrl+R, fill down is Ctrl+D).

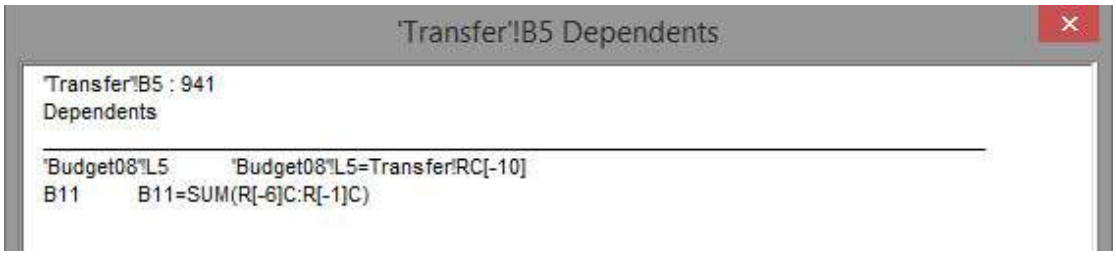
Select Formula Region
This selects the cells with the same formula (in relative R1C1 terms) in the current region. It helps you to check that the formula is copied to the correct region.

Names Containing Selection
This shows you which defined names refer to a range that includes the current selection.

Jump to Bottom Right
Goes to the intersection of the last row and the last column with any data.

Show Precedent Formulas
Show Dependent Formulas
These display a dialog showing the address of the active cell, the first 300 characters (up to approximately 4 lines) of its formula, and a list of the unique formulas in the precedent or dependent ranges. They can be useful for tracking the logic of calculations.





View $DB_ filtered by this item
For the sheets $Names and $Styles, this filters the $DB_ sheet to show only the detailed results, the references to the item in the active row of the sheet. This helps you see where Names and Styles are used.

For $Links, it filters the $WSXref sheet list "Used by".

User defined Functions

XLTest provides these functions for use in your spreadsheets.

Function	Description	Example
ColorName(Colorindex)	Return color name from index	=ColorName(1)
USTDate(date)	Convert text mm/dd/yyyy or mm-dd-yyyy to a date	=USTDate("12/1/2008")
EUTDate(date)	Convert text dd/mm/yyyy or dd-mm-yyyy to a date	=EUTDate("12/1/2008")
TextToDate(text, format)	Convert text to date specifying order and delimiter	=TextToDate("08-02-09","mdy-")
IsLike(text, pattern)	True if text matches Pattern regular expression	=IsLike("abc@def.ghi","*@*.???")
Alphas(text)	Returns alphabetic characters in text	=Alphas(B5)
Numerics(text)	Returns numeric characters in text	=Numerics(K5)
TextToValue(text, [minus], [decimal])	Converts text to number, optional negative and decimal symbols	=TexttoValue("12.3-")
GetFormula(cell, refstyle)	Returns formula of a cell. Default 1=A1, else R1C1	=GetFormula(K9,1)
JoinValues(range, delimiter)	Concatenates range to a delimited text string	=JoinValues(G2:G15,",")
SumN(range)	Sums non-formula cell values excluding dates, text, errors	=SumN(A1:K10)
FileSize (filename)	Returns size of a file given its name	=FileSize("test103.csv")
DateModified(filename)	Returns modified date of a file given its name	=DateModified("somefile.xlsx")
DirFile(fileno, filespec)	Returns the file name in the given position in a folder. Wildcards allowed.	=DirFile(1,".\Version*.xlsx") =DirFile(2,"C:\dir*.*")

Book: 'Spreadsheet Check and Control' cross-reference

47 key practices to detect and prevent errors
Patrick O'Beirne, 2005, ISBN 190540400X
Systems Publishing, Tara Hill, Gorey, Co. Wexford, Ireland

CATEGORY: 1 Design		
Skill set: 1.1 Specification		
1.1.1	Define spreadsheet specifications.	Use $ReadMe sheet $DOC sheet lists file properties
1.1.2	Use cell comments and descriptions to list sources and assumptions.	Use $ReadMe sheet $DOC sheet lists table of contents
1.1.3	Be explicit about conventions, methods, functions, formats, and policies.	Use $ReadMe sheet $APP sheet lists application settings
Skill set: 1.2 Security		
1.2.1	Make regular secure backups of spreadsheet and related files.	Use Save Copy As
1.2.2	Maintain separately saved versions of spreadsheets in development.	Use Save Copy As
1.2.3	Understand the security limitations of password protection.	XLTest can bypass worksheet protection passwords
1.2.4	Use passwords of at least 8 mixed case, non-alphanumeric characters.	$DOC sheet lists passwords
CATEGORY: 2 Input		
Skill set: 2.1 Set-up		
2.1.1	Simplify long formulas and use named ranges.	$DOC sheet lists defined names
2.1.2	Isolate constants into their own cells.	$INF sheet lists cells with embedded constants
2.1.3	Identify units of measure and conversion calculations.	Use $ReadMe sheet
2.1.4	Understand the "precision as displayed" setting.	$DOC sheet lists settings
2.1.5	Understand and use manual, automatic calculation.	$DOC sheet lists settings
CATEGORY: 3 Calculation		
Skill set: 3.1 Fundamentals		
3.1.1	Understand the order of precedence of mathematical operators.	n/a
3.1.2	Remove circular references.	$DOC sheet lists circ refs
3.1.3	Identify array (matrix) formulas.	$INF sheet lists arrays
Skill set: 3.2 Error Identification		
3.2.1	Identify missing input values.	Colorize Data Types & Usage to show blank input cells in pink
3.2.2	Identify cells with missing dependents.	Colorize Data Types & Usage to show final formulas, visual check
3.2.3	Use information functions: ISERROR, ISNA.	Inspect sheet to list error values
3.2.4	Suppress display of #DIV/0! values.	Inspect sheet to list error values
Skill set: 3.3 Error Correction		
3.3.1	Correct relative, absolute and mixed cell references.	Colorize Formulas to discover inconsistent patterns

3.3.2	Identify and correct error values indicated by # signs.	Inspect sheet to list error values
3.3.3	Correct inconsistencies in a pattern of formulas.	Colorize Formulas to discover inconsistent patterns
3.3.4	Correct mistakes in totals caused by inserting, deleting rows and columns.	Colorize Dependents to discover cells omitted from total formulas
3.3.5	Correct grand totals that double-count subtotals.	Colorize Dependents to discover cells double-counted in formulas
3.3.6	Correct mismatched cross-check totals.	Colorize Formulas to discover inconsistent patterns
3.3.7	Correct mistakes created by incorrect use of automatic sum feature.	Colorize Dependents to discover cells omitted from total formulas
3.3.8	Replace linking by cell address with linking by range name between files.	$DOC sheet lists links
3.3.9	Recognise link references and understand problems caused by changes in linked files.	$DOC sheet lists links
3.3.10	Modify a lookup function to return an exact, approximate value.	n/a
3.3.11	Sort a list that is used for an approximate match in a lookup function.	n/a
CATEGORY: 4 Outputs		
Skill set: 4.1 Appropriate Display		
4.1.1	Reveal data hidden by formatting.	Inspect sheet to reveal same font & fill colours. Use Colour by Formats to check for consistency.
4.1.2	Understand difference between format decimals and ROUND.	n/a
4.1.3	Correct cell content of incompatible data type such as numbers entered as text.	Colorize Data Types to discover inconsistent patterns of input data
4.1.4	Correct a cell range incorrectly sorted by one column.	n/a
4.1.5	Correct database range in a worksheet to get correct query output.	n/a
4.1.6	Correct database criteria.	n/a
Skill set: 4.2 Charts		
4.2.1	Modify chart layout so that all data series are clearly visible.	n/a
4.2.2	Modify the scale of chart axes to clarify chart output.	n/a
4.2.3	Modify chart type to clearly express the meaning of data.	n/a
CATEGORY: 5 Review		
Skill set: 5.1 Testing		
5.1.1	Create and run test cases covering all logic paths.	Use Test Cases features, or Excel Scenarios
5.1.2	Verify outputs by using a different calculation method.	n/a
5.1.3	Unhide formulas, rows, columns, worksheets.	$DOC sheet lists hidden rows, columns, and worksheets

5.1.4	Show all formulas in a worksheet.	Ctrl+` toggle
5.1.5	Inspect all formulas in a worksheet.	Inspect sheet button
Skill set: 5.2 Data Integrity		
5.2.1	Use IF function to test if cell contents are within defined parameters.	n/a
5.2.2	Use conditional formatting to highlight specific data attributes.	Colorize Conditional Formatting to discover irregular patterns
5.2.3	Set data validation criteria.	Colorize Data Validation to discover irregular patterns
Appendix A: Microsoft Excel error checking		$INF sheet lists cells failing Excel error checks
Appendix B: MS Excel Keyboard Shortcuts		Help key lists common shortcuts
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