RefTreeAnalyser

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Welcome to the Excel Formula Reference Auditing Utility.

This tool enables you to track down what dependents and precedents any cell in your worksheet have, going as far as 5 levels deep.
It is also capable of finding circular reference chains in your workbook.

Both options come with a handy reporting option which helps you audit your spreadsheet models.

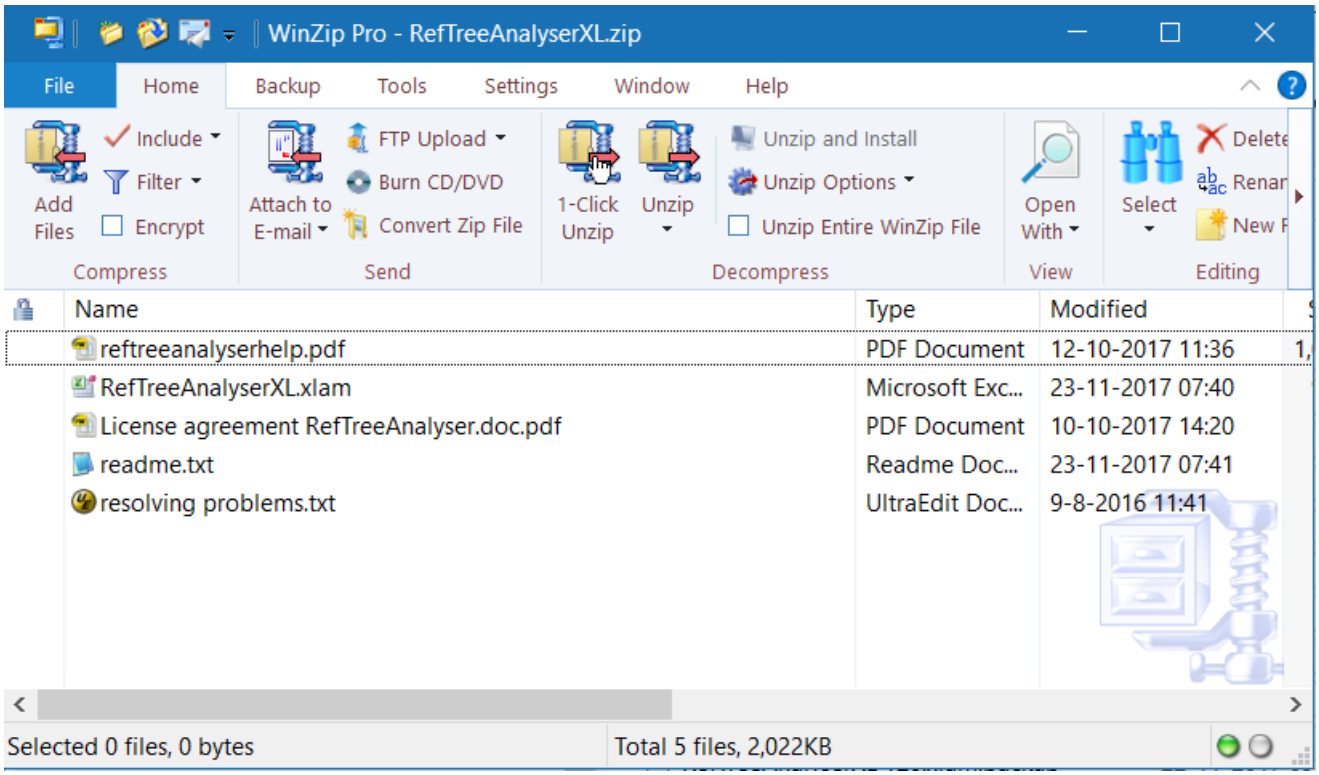
This help file contains these topics:

Installing RefTreeAnalyser

Installing RefTreeAnalyser requires these simple steps:

1. Open Downloaded Zip file

Open the zip file which you have downloaded from my website:



2. Copy files

Copy all files from the zip file to any folder you like on your system:

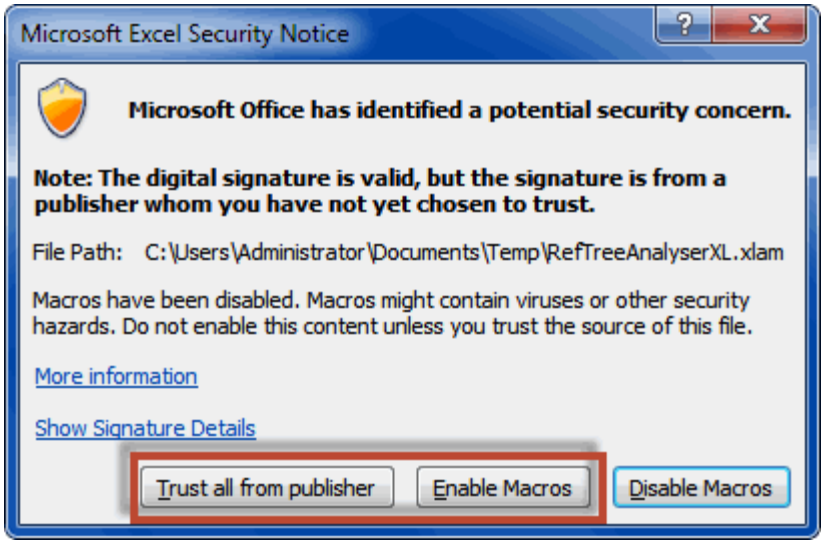
3. Open add-in file

Simply double-click on the excel file you just copied from the zip file.

- Excel 2007-2013 users use the file called RefTreeAnalyser.xlam from the file called RefTreeAnalyserXL.zip
- Excel 2003 users should open the file RefTreeAnalyser.xla from the file called RefTreeAnalyserXL2003.zip

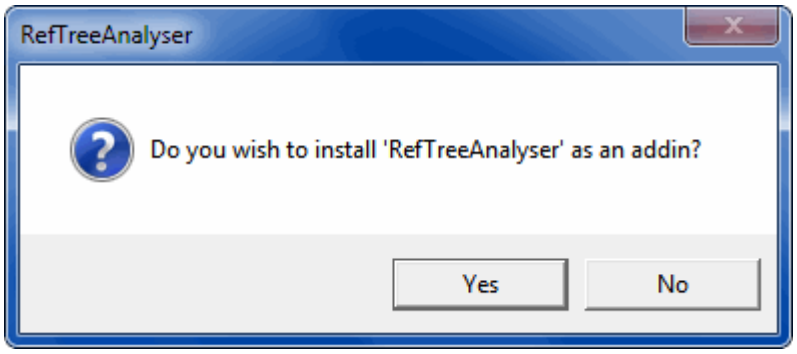
4. Enable macros:

You can either click Enable, or "Trust All from Publisher". The latter will ensure any future add-ins you download from my website will have their macros enabled by default.



5. Install as Add-in

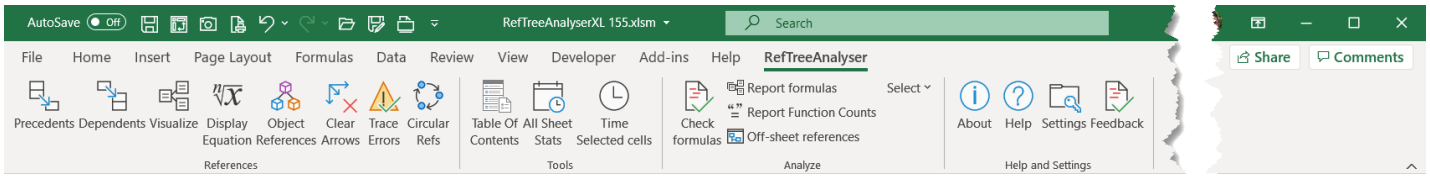
After enabling macros, RefTreeAnalyser will ask you whether or not you wish to install it as an add-in:



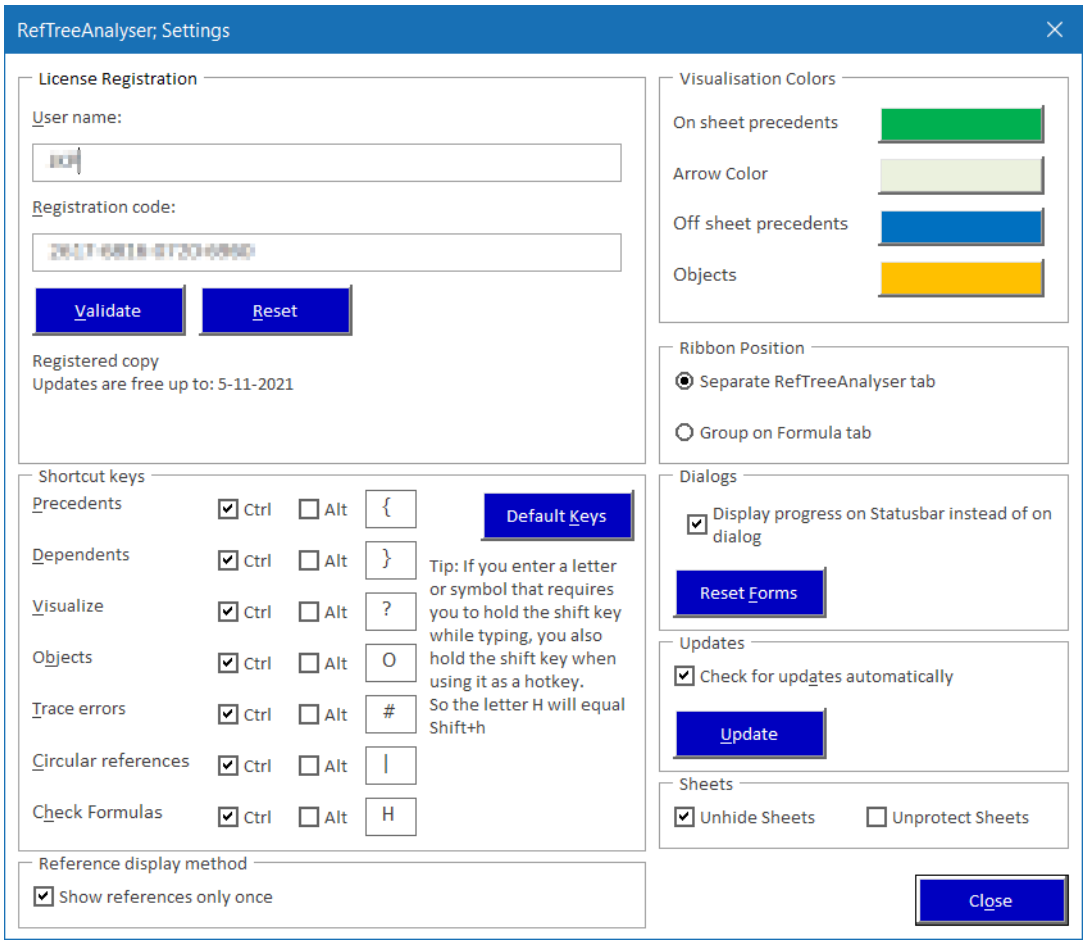
Click yes to have the add-in available every time you start Excel.

Settings

The settings screen is available from the ribbon (almost on the far right):



Clicking that entry opens this dialog:



Registration

RefTreeanalyser does not require you to purchase a license to function. The demo version has some restrictions, but most of the functions work.
However, if you want to be able to use the full functionality of the tool, you can purchase a license key from my website:

www.jkp-ads.com/reftreeanalyser.asp

After receiving your license key, please choose the "Settings" button in the RefTreeAnalyser group on the Formulas tab of the ribbon. In the window that appears, paste the license code that you received and enter your name in the appropriate boxes.

After entering your name and code, press the Validate button (make sure you are connected to the internet). After the registration code has been successfully validated your add-in will be fully functional.

Purchasing a license entitles you to one year of free updates.

Automatic updates

Check the box to have RefTreeAnalyser check for updates once a week.
If you prefer to check for updates manually, uncheck this box and press the Update button to manually check whether any updates are available.

Note that the button will only work as long as your license for free updates has not expired.

Shortcut keys

You can change the hotkeys RefTreeAnalyser uses to access its core functionality.
Note that only control key combinations are supported. If you want to use control+shift to access a certain key, make sure you hold down the shift key when you type the character you want to use.

For example, the default hotkey to start the Precedents search is control+shift+[.
Since shift+[is actually the { character, simply type the { character in that box.

User interface

Location of tool on ribbon

You can change where the RefTreeAnalyser displays itself on the Excel Ribbon UI:

- As a separate tab on the ribbon
- On the Formulas tab as a separate group

Form positions

By default, RefTreeAnalyser remembers the position of the dialogs. But if you work on a two-monitor setup mostly and sometimes on a single monitor setup, the dialogs may appear off-screen. Click this button to reset the form positions.

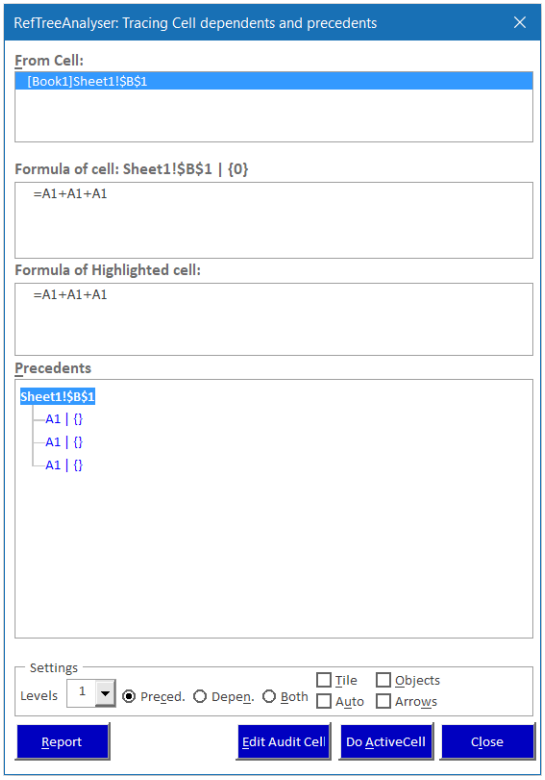
Visualization colors

Use this option to change the colors of the arrows drawn on sheet

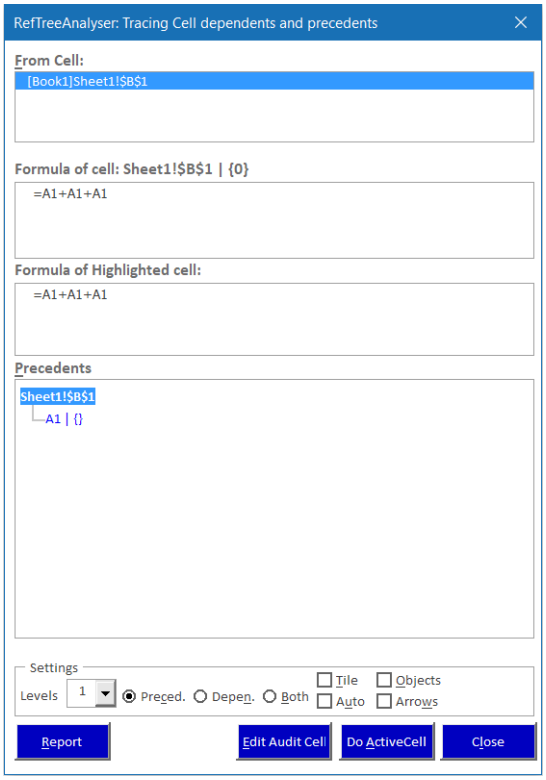
Reference display method

Show references only once

By default, this feature is turned off. If you have a formula in which a reference appears more than once, such as =A1+A1+A1, RefTreeAnalyser will show each A1 as a separate entry in the tree:



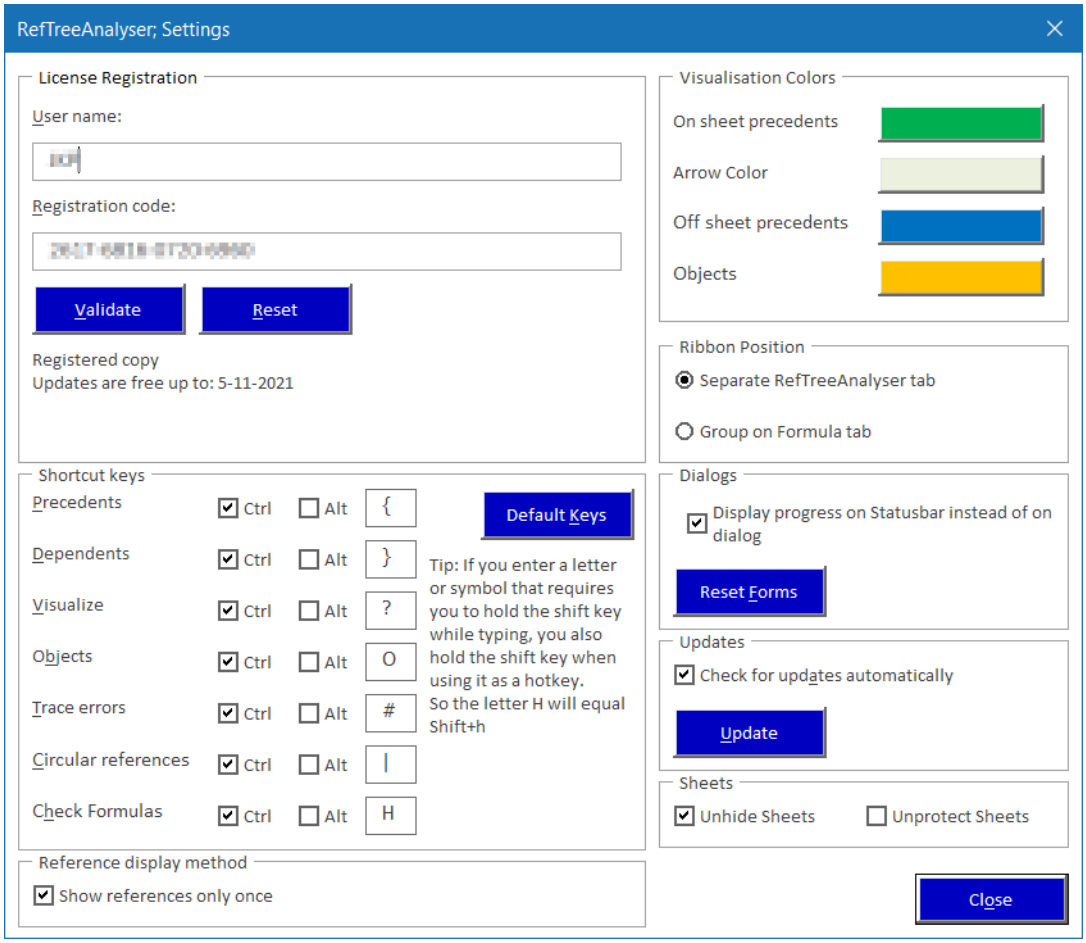
If you check this box, RefTreeAnalyser will show each unique reference only once:



Automatic updates

RefTreeAnalyser will check for updates automatically once a week (but only if you start Excel and if your update license has not expired yet).

You can manually check for updates too, just open the registration form and click the Update button:



You can turn off automatic update checks by unchecking "Check for updates"

Please note that a license entitles you to one year of free updates (the settings screen displays your expiration date). After that period, you will no longer receive updates.

Starting the tool

To start the tool, you can use these options:

Hotkeys

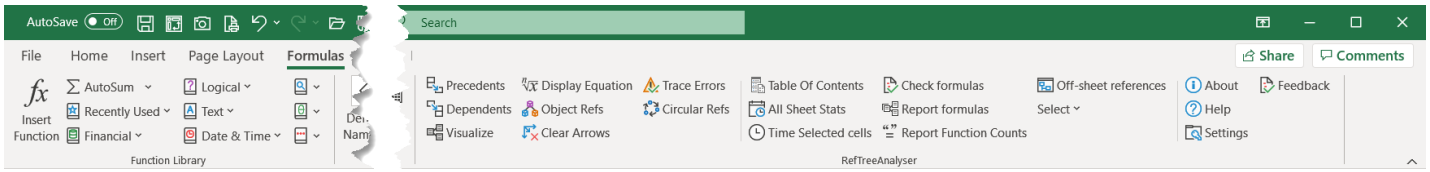
The tool has these hotkeys:

- Control+shift+[: Find precedents (or both if that has been selected). If the active cell is within a pivottable the tool will jump to the pivot tables source range.
- Control+shift+] : Find dependents (or both if that has been selected).
- Control+shift+| : Find Circular references.
- Control+shift+# : Trace errors.
- Control+shift+? : Visualize the precedents of the active cell on-sheet.
- Control+shift+O : Shows the Object references window.
- Control+shift+H : Shows the Check Formulas window.

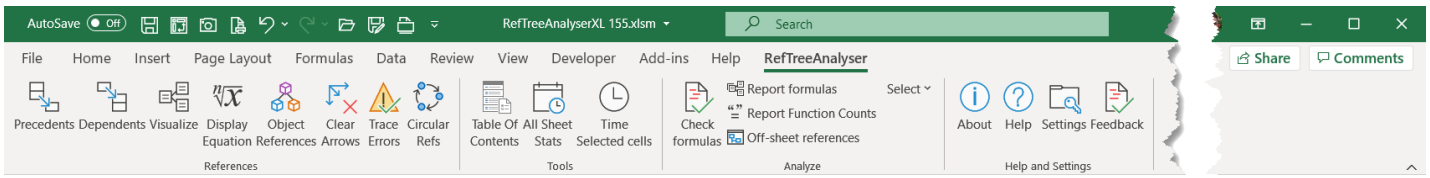
These hotkeys can also be used to return to the analyser's dialog after one has clicked in Excel.

Ribbon of Excel 2007 and up

The tool integrates with Excel's ribbon and can be found either on the Formulas tab (on the far right):



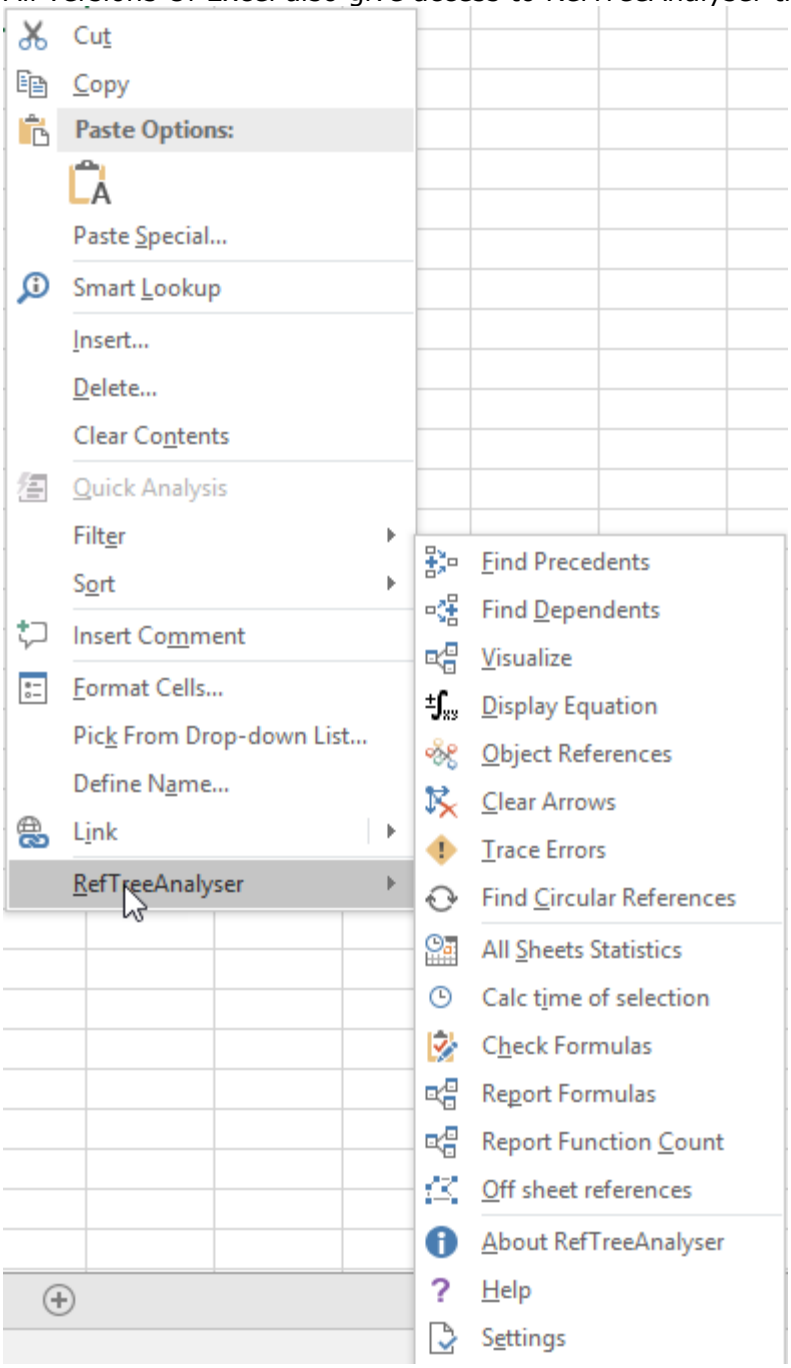
or in its own tab:



You can toggle the position of the UI using the Settings button.

Right click menu of RefTreeAnalyser

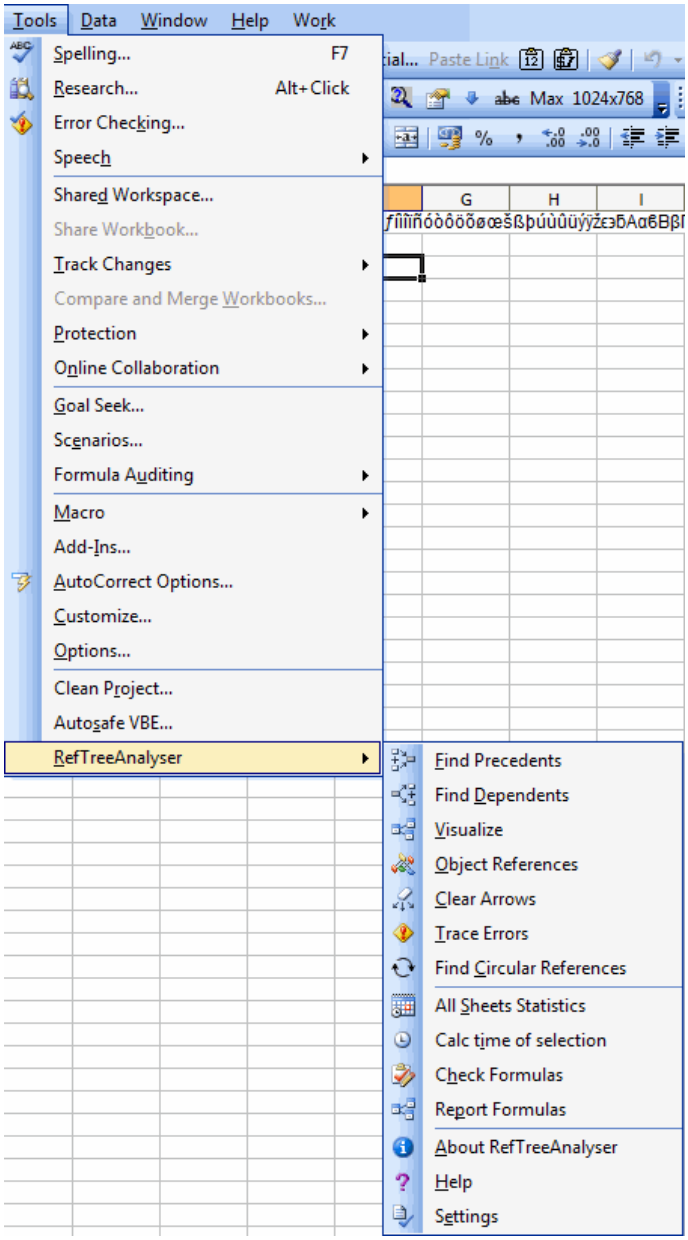
All versions Of Excel also give access to RefTreeAnalyser through their right-click menu:



Excel 2000 to 2003 user interface

The tool can be started using its entry in Excel's Tools menu (see screenshot below)

Menu of RefTreeAnalyser



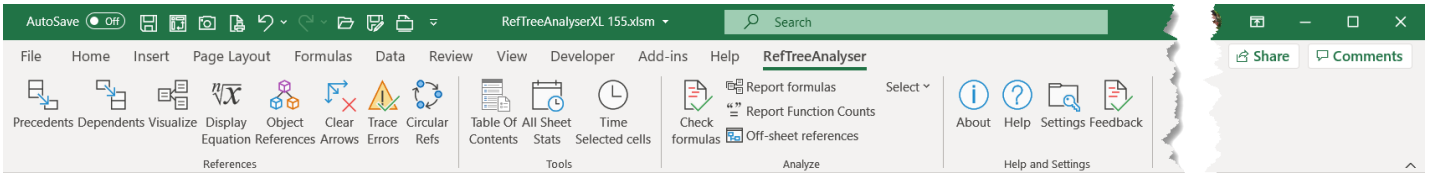
or by pressing one of the buttons on the toolbar:

Toolbar of RefTreeAnalyser

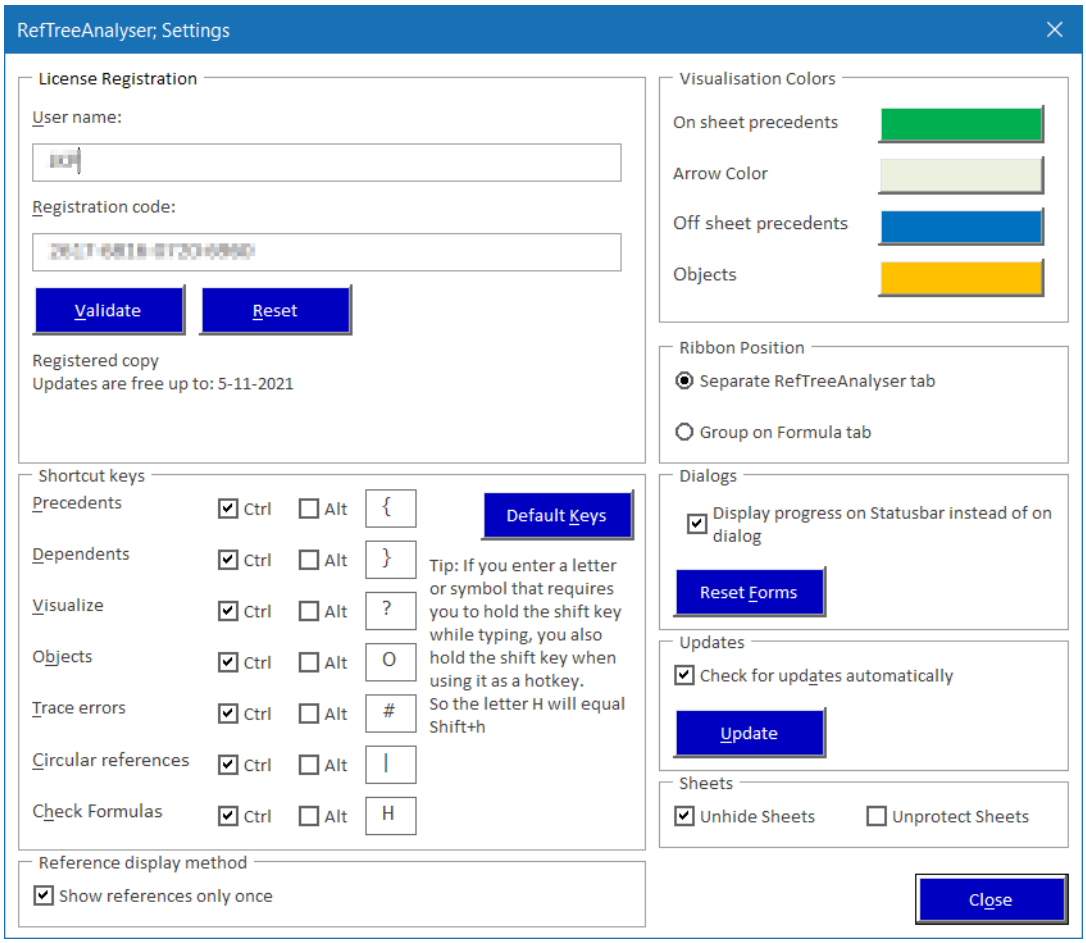
Hot Keys

RefTreeanalyser was designed to be easy to use with a keyboard. Its core functionality is accessible by keyboard shortcuts.

You can change the hotkeys from the Settings screen, which is available from the ribbon (almost the last button on the right):



Clicking that entry opens this dialog:



You can change the hotkeys RefTreeAnalyser uses to access its core functionality.
Check a box if you want to combine a key with the control key.
If you want to use control+shift to access a certain key, make sure you hold down the shift key when you type the character you want to use.

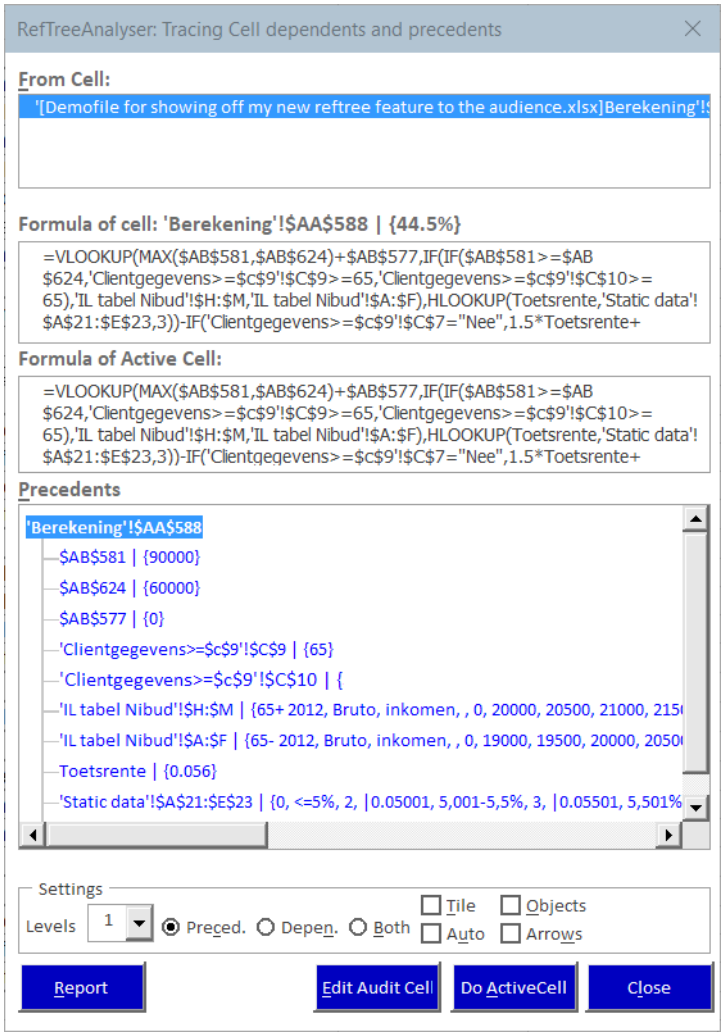
For example, the default hotkey to start the Precedents search is control+shift+[.
Since shift+[is actually the { character, simply type the { character in that box.

Leave a box empty if you do not want to use a hotkey for that option.

Working with the References window

Main Window

After clicking Find Precedents, Find Dependents or Trace Errors, the main window opens:



Note that if the active cell is within a pivottable the tool will jump to the pivot tables source range.

Description of the window elements

From Cell list box

This list keeps track of what cells have been analyzed. Click any entry in this list to redo the analysis.

Formula of Cell Edit box

This box shows the formula of the analyzed cell. You can change the formula by editing in this box. Confirm your changes by hitting the TAB key.

Formula of Highlighted Cell

This box shows the formula (or value) of the cell (or range name) that is currently highlighted in the tree view.

Precedents/Dependents Tree views

These two areas of the screen show you the reference structure. To navigate the tree, you can use the arrow keys:

- Down/Up arrow: selects each visible element one-by-one
- Right Arrow: If an element has child elements (indicated by a small plus-sign to its left) the element is expanded to show the children and the first child is selected.
- Left Arrow: If an element is a child element, the tree collapses to hide this element and the focus moves to the parent.

Other shortcut keys and mouse actions:

- 1, 2, 3: Collapse or expand the tree to that level
- Double-click a node: if the node points to a range, the top-left cell of that range will be analyzed
- Single-click a node: go to the cell reference

If an element in the tree is selected, the tool will update its screen and will try to activate the corresponding range in your file.

Note that the Precedents tree elements are normally blue, and the dependents items are green. If an item is colored red it indicates that there is at least one cell in that range which contains an error value. Objects are indicated in black font.

Levels dropdown

Use the levels dropdown to change how deep into the reference tree the tool must search.
The licensed version has 5 levels, the demo version is limited to 1 level.
When in Error tracing mode this dropdown is disabled. Object references are always traced to a maximum of 1 level.

Option buttons

Use the option buttons to change what references need to be analyzed by the tool.
When in Error tracing mode these options are disabled

Tile check box

If you check this box, the RefTreeAnalyser will be tiled next to Excel's main window.

Auto check box

Check this box if you want the Precedents/Dependents list to automatically update as you click on cells.

Objects check box

Check this box to include references to/from any objects in the precedents and dependents list, such as validation or conditional formatting formulas, list box source ranges, list box linked cells and etcetera. This box is unchecked by default because searching all possible objects may take a considerable amount of time for large and/or complex workbooks.

Arrows check box

If you check this box, the RefTreeAnalyser will show the precedents and/or dependents arrows of the active cell.

Report Button

Creates a report in Excel on the current analysis results. Unavailable in the demo version.

Edit Audit Cell Button

Takes you to the audited cell and puts Excel into Edit mode.

Do Active Cell Button

Redoes the analysis starting from the currently selected cell.

Close Button

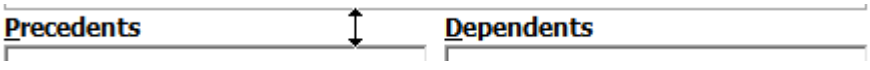
Closes the tool. The active cell is retained.
Note that hitting Escape will also take you back to excel, but with the audited cell activated.

Stop Button

During lengthy analyses, the tool will show a progress screen with a Stop button. Click this button to abort the analysis. Note that it may take some time before the tool responds to that click.

Splitter bars

There are splitter bars between the various screen elements, which is indicated by a change in mouse pointer:



Drag with the mouse to change the size of the screen elements.

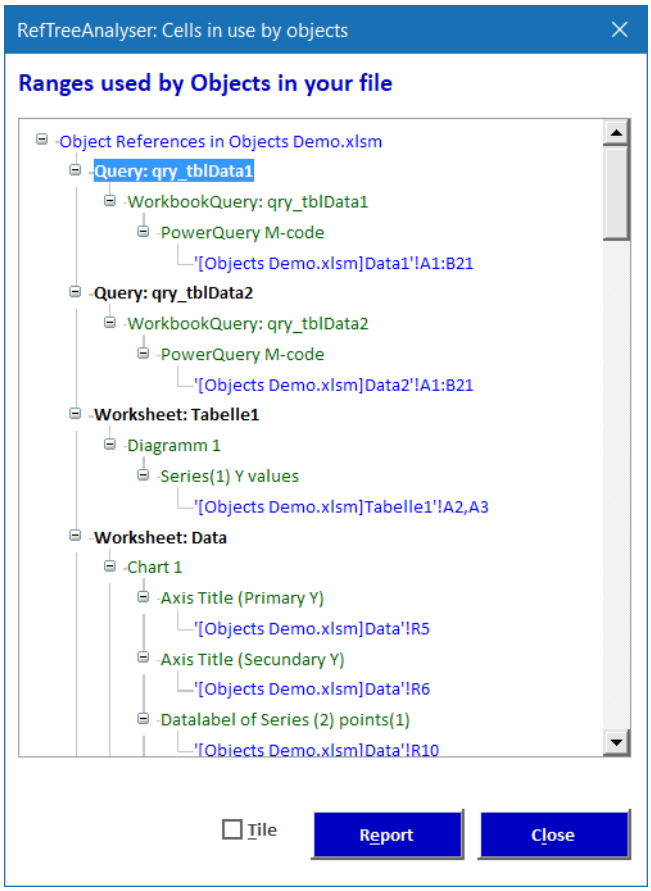
Working with the Object References Window

With this feature you can analyze all objects for cell dependencies.

RefTreeAnalyser searches these objects for cell references:

- Charts (SERIES formula, objects pointing to worksheet cells)
- Form and ActiveX objects (LinkedCell, ListSource)
- Drawing objects (Camera tool)
- Pivot tables (Source range)
- Validation formulas
- Conditional Formatting formulas

Clicking an object in the window will select the object (or it's source reference):



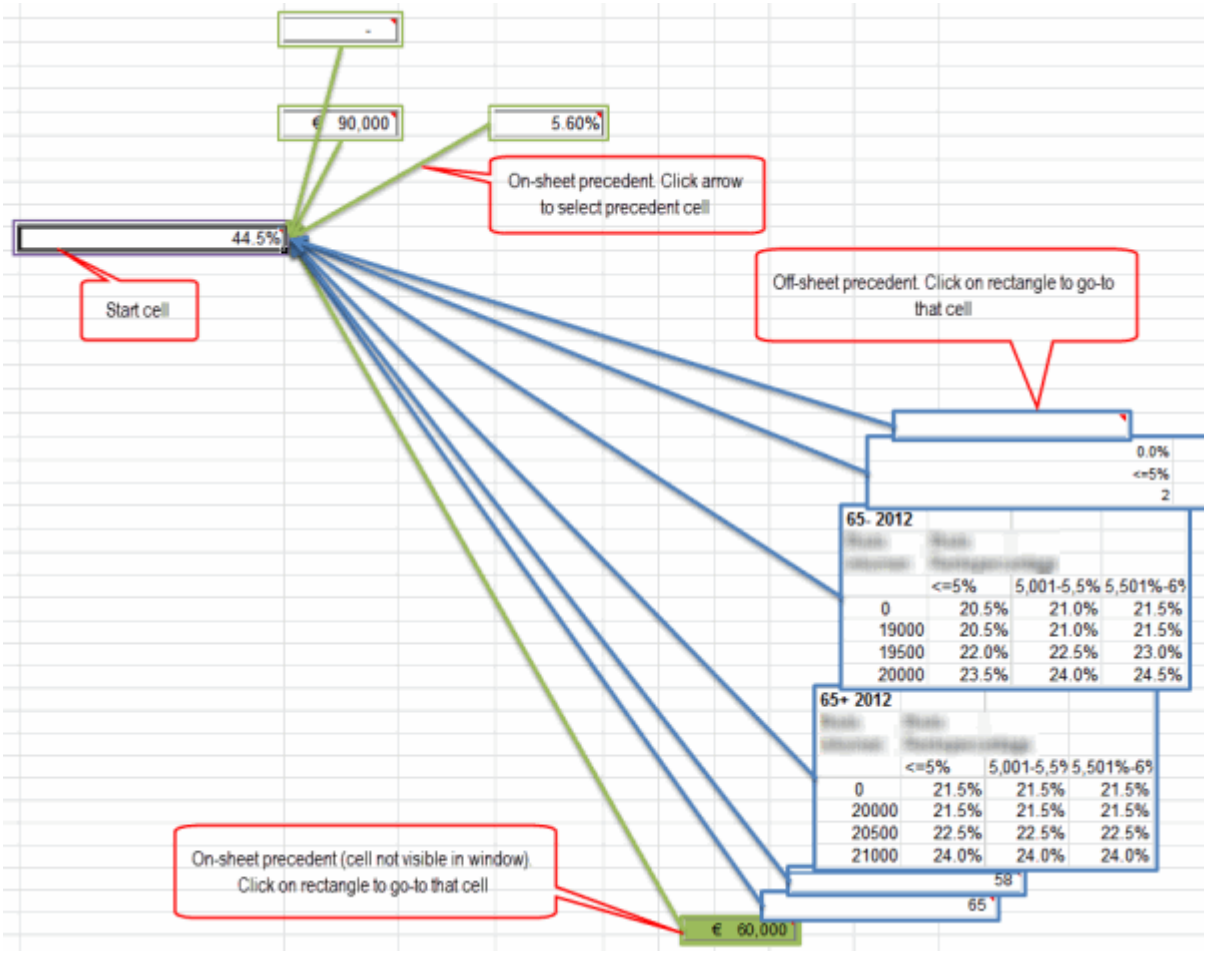
Should the tool encounter any errors during the analysis, then the red error bar (shown in the screen above) will become visible. Click on the error bar to read the error messages.

Visualize Precedents

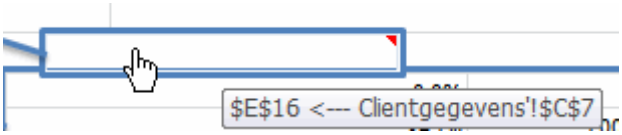
Apart from using the References screen, RefTreeAnalyser also enables you to visualize the precedents of a cell on-sheet.

To enable this feature, simply click the "Visualize" button on the ribbon, or press control+shift+? (or the shortcut-key you have set-up yourself).

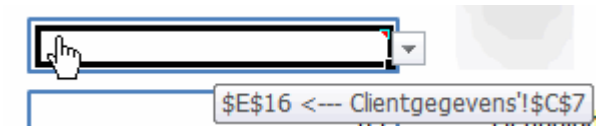
This is done by drawing rectangles around the current cell (purple) and around each cell on the same sheet that is a precedent to the current cell (green). Precedents that are off-sheet are represented by a blue arrow and a small picture of the range in question. See the screenshot below:



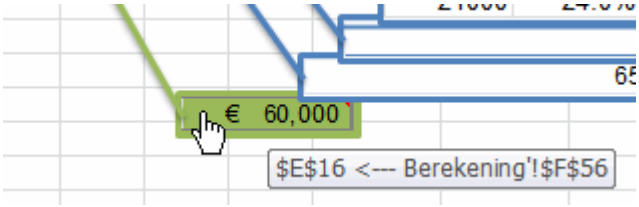
Click on a screenshot to take you to the relevant worksheet:



Click on the precedent area (indicated by a blue box around it) to take you back:



If a cell is on the same sheet, but out of view, a screenshot of that cell is shown with a green fill. Clicking on the screenshot will take you to that cell:



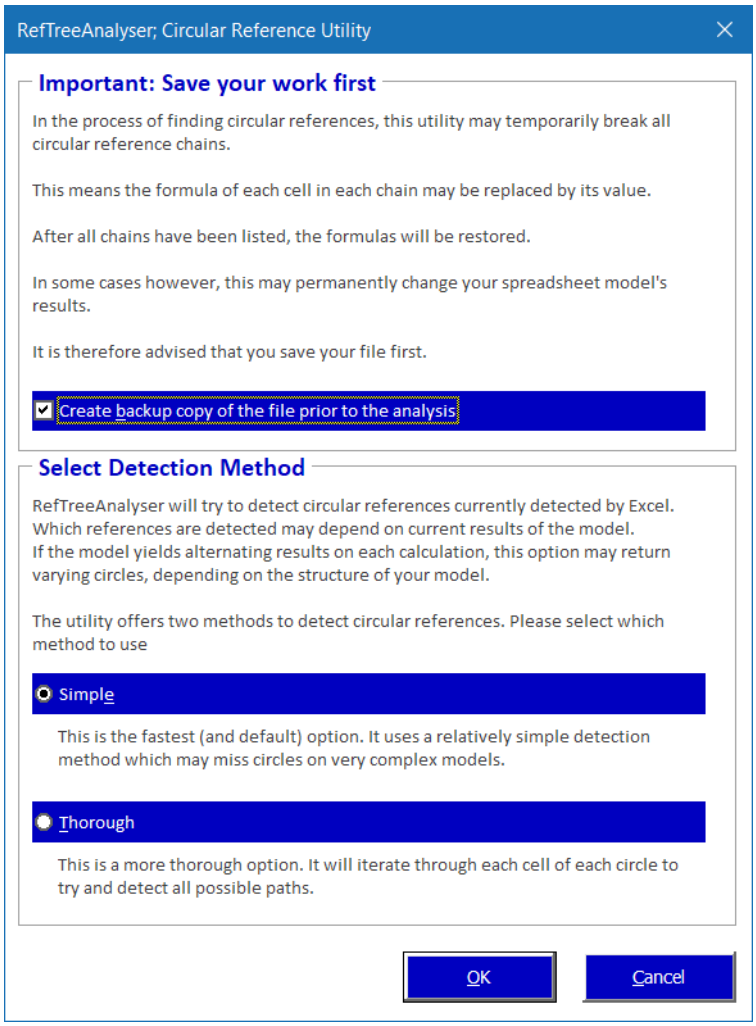
Warning

The tool creates drawing objects on your worksheet which are named similar to "jkpRTA 12318718". Pressing the remove arrows button will remove all shapes from your worksheet which have a name that begins with jkpRTA.

Working with the Circular Reference Window

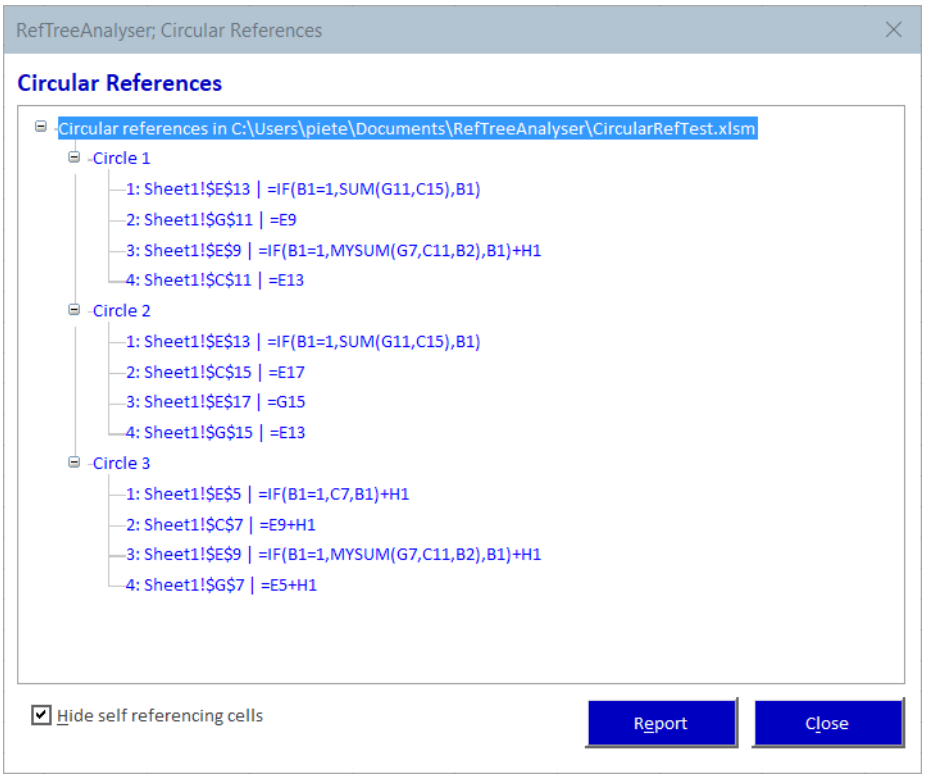
Main window

After clicking the Find Circular References button or menu entry, the tool first shows a window to advise you to save a backup copy of your file:



If you want the tool to save a backup copy of your workbook, make sure you check the box.
In addition, the tool offeres an (experimental) Thorough mode which will parse all formulas to decide where the circular references are. This method is experimental and may take a very long time to complete. Even then, it may produce incomplete results.

After clicking OK, the tool analyses your file for circular references and then opens the Find Circular References window:



The demo version of the tool will show a maximum of 2 cells for each circle it has found.

Description of the window elements

Circular References Tree view

The circular references detected by the tool are shown in a tree view, where each circle has its own node. Each circle node contains the cell ranges that form the circular reference. To navigate the tree, you can use the arrow keys:

- Down/Up arrow: selects each visible element one-by-one
- Right Arrow: If an element has child elements (indicated by a small plus-sign to its left) the element is expanded to show the children and the first child is selected.
- Left Arrow: If an element is a child element, the tree collapses to hide this element and the focus moves to the parent.

If an element in the tree is selected, the tool will update its screen and will try to activate the corresponding range in your file.

Hide self referencing cells checkbox

This box is checked by default and prevents the tool from reporting formulas that refer to themselves, e.g. if you have this formula in cell A1:
=IF(B1="",A1,B1) cell A1 will be omitted from the list when the checkbox is checked.

Report Button

Creates a report in Excel on the current analysis results. Unavailable in the demo version.

Close Button

Closes the tool. The active cell is retained.

Remarks on The Circular Reference Tool

Limitations

Which circular references the tool will find may depend on the current values in your cells. For example, Excel is smart enough to detect whether the True or False portion of the IF function is currently valid. If the test clause of the IF function evaluates to TRUE, only the TRUE part of the IF function counts as a reference, the FALSE part is completely ignored.

Multiple workbooks

As soon as two or maybe more workbooks are open in Excel, finding Circular references may be skewed. This is why the tool will issue a warning to close all workbooks except the one to be examined. If multiple workbooks together form the circular reference, the tool will work as expected. The heading in the tree view will show the name of workbook which was active when the tool was started.

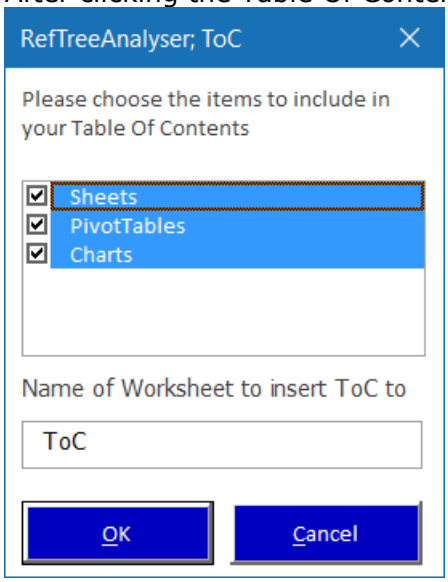
Tracing errors

In the error tracing mode, RefTreeAnalyser will keeping tracing down the precedents tree, until it either finds a cell which has no precedents, or it finds a cell which has no error value.

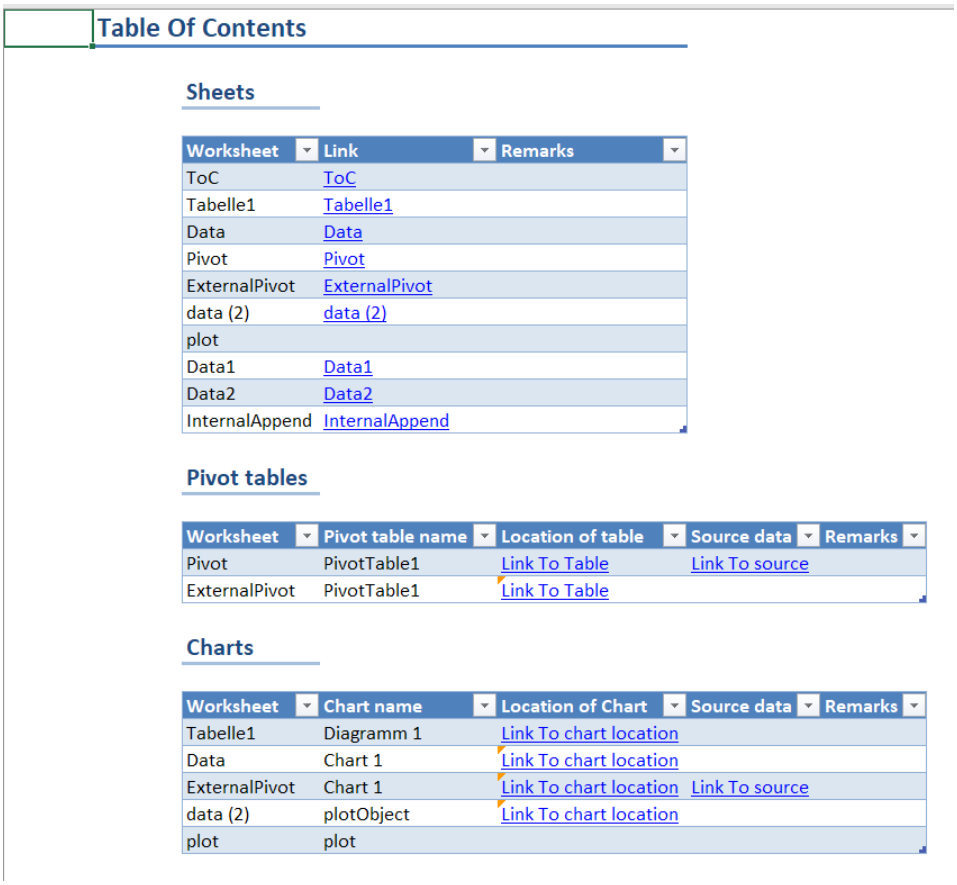
This way, you can trace which cell(s) are the root cause of an error.

Table Of Contents

After clicking the Table Of Contents button you get asked which elements you want included in your ToC:



Note that the list only includes items actually in your active workbook, if you have a workbook with no pivot tables open, that entry will not be in this list.
The tool then generates a sheet like this one:



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Sheets

Worksheet	Link	Remarks
ToC	ToC	
Tabelle1	Tabelle1	
Data	Data	
Pivot	Pivot	
ExternalPivot	ExternalPivot	
data (2)	data (2)	
plot		
Data1	Data1	
Data2	Data2	
InternalAppend	InternalAppend	

Pivot tables

Worksheet	Pivot table name	Location of table	Source data	Remarks
Pivot	PivotTable1	Link To Table	Link To source	
ExternalPivot	PivotTable1	Link To Table		

Charts

Worksheet	Chart name	Location of Chart	Source data	Remarks
Tabelle1	Diagramm 1	Link To chart location		
Data	Chart 1	Link To chart location		
ExternalPivot	Chart 1	Link To chart location	Link To source	
data (2)	plotObject	Link To chart location		
plot	plot			

Please note that this table of content is static, to update it just click that same button again. The tool will try to keep any remarks entered into in the Remarks column with the same entry. This will fail if you have renamed an entry in the meantime.

All sheets statistics

The tool enables you to gather statistics about the worksheets in the active workbook.
Pressing the associated button on the ribbon will generate a worksheet like this:

A	B	C	D	E	F	G	H
Full calc time	0.010742672						
Dirty calc time	0.001454465						
Worksheet	used range	Conditional formatting	Data validation	Formula cells	Empty cells	Constants	Calc time
SheetStats 03.04.2013 14.12.09	$A$1:$H$4			0	18	14	0.000213195
Sheet1	$A$1			0	0	0	0.000184177
Sheet2	$A$1			0	0	0	0.000189507
Sheet3	$A$1			0	0	0	0.000185954

Please note that the calculation times may be affected by other files you have open in Excel. For accurate results, make sure the file you want to analyze is the only file open in Excel.

Check Formula's

By pressing this button (default shortcut key: control+shift+H) you can have RefTreeanalyser analyze the formula's in your selection.

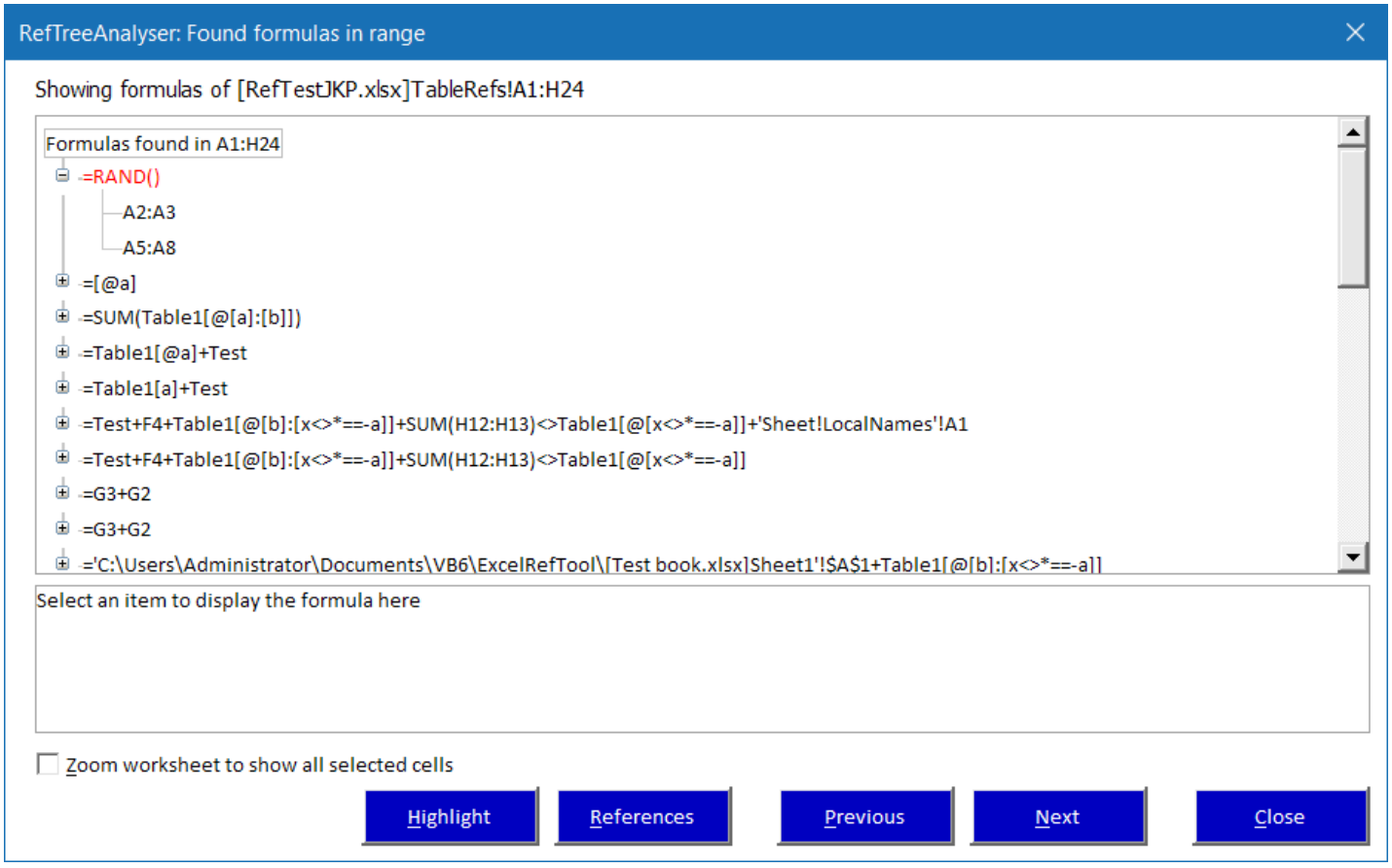
This is useful if you want to check whether a range of cells contains any formula's which differ from the adjacent cells.

The tool will generate a list of all unique formulas in the selected cells.

If you have just one cell selected, then the tool will analyze the entire column.

Here, Unique is defined as those cells who have a formula which cannot be achieved by copying another cell.

The unique sets of formula's are then shown in this dialog:

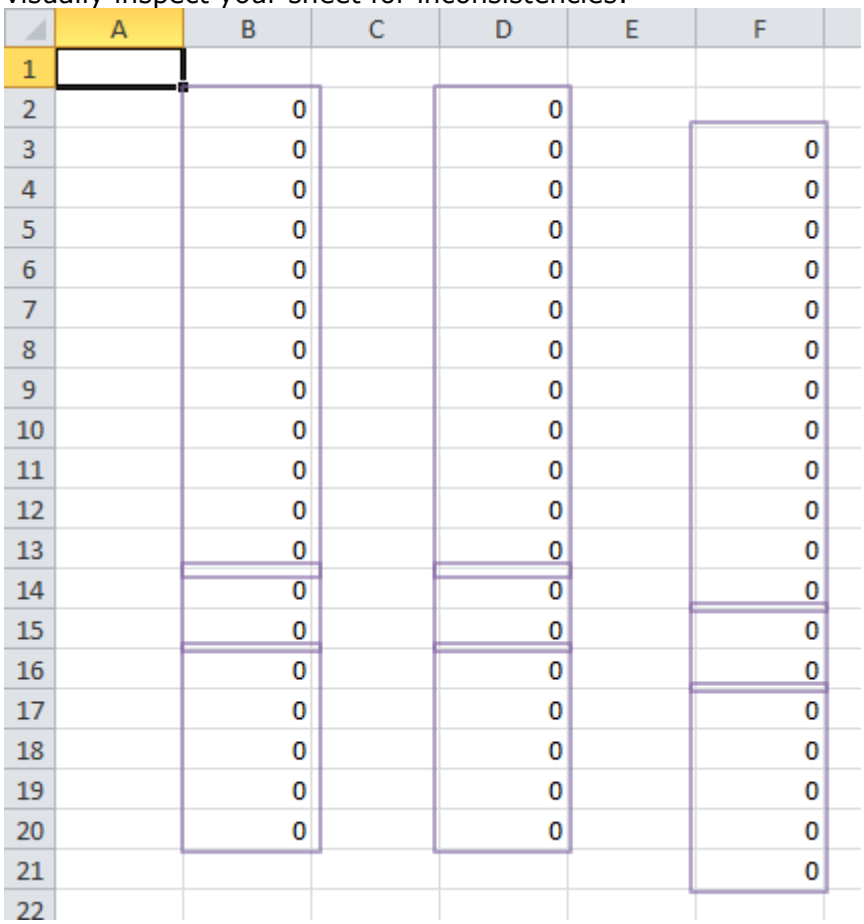


Use the previous and next buttons or click on the list to select the cells which share the same formula. You can of course also use the arrow keys when the list box is the active control of the form.

Any formula that is found in more than one contiguous area is highlighted in red and that node of the tree is expanded to show the individual areas of the range containing the formula.

Use the "References" button to analyze the selected cell's precedents/dependents.

The "Highlight" button draws rectangles around all areas shown in the dialog, thus making it easier to visually inspect your sheet for inconsistencies:



	A	B	C	D	E	F
1						
2		0		0		
3		0		0		0
4		0		0		0
5		0		0		0
6		0		0		0
7		0		0		0
8		0		0		0
9		0		0		0
10		0		0		0
11		0		0		0
12		0		0		0
13		0		0		0
14		0		0		0
15		0		0		0
16		0		0		0
17		0		0		0
18		0		0		0
19		0		0		0
20		0		0		0
21						0
22						

As you can see, cells B14:B15, D14:D15 and E15:E16 seem to have a different formula than expected.

Formula report

The Formula Report button generates a worksheet with all unique formulas in your workbook. A unique formula is a formula that has not been duplicated anywhere in the worksheet by means of a copy/paste operation.

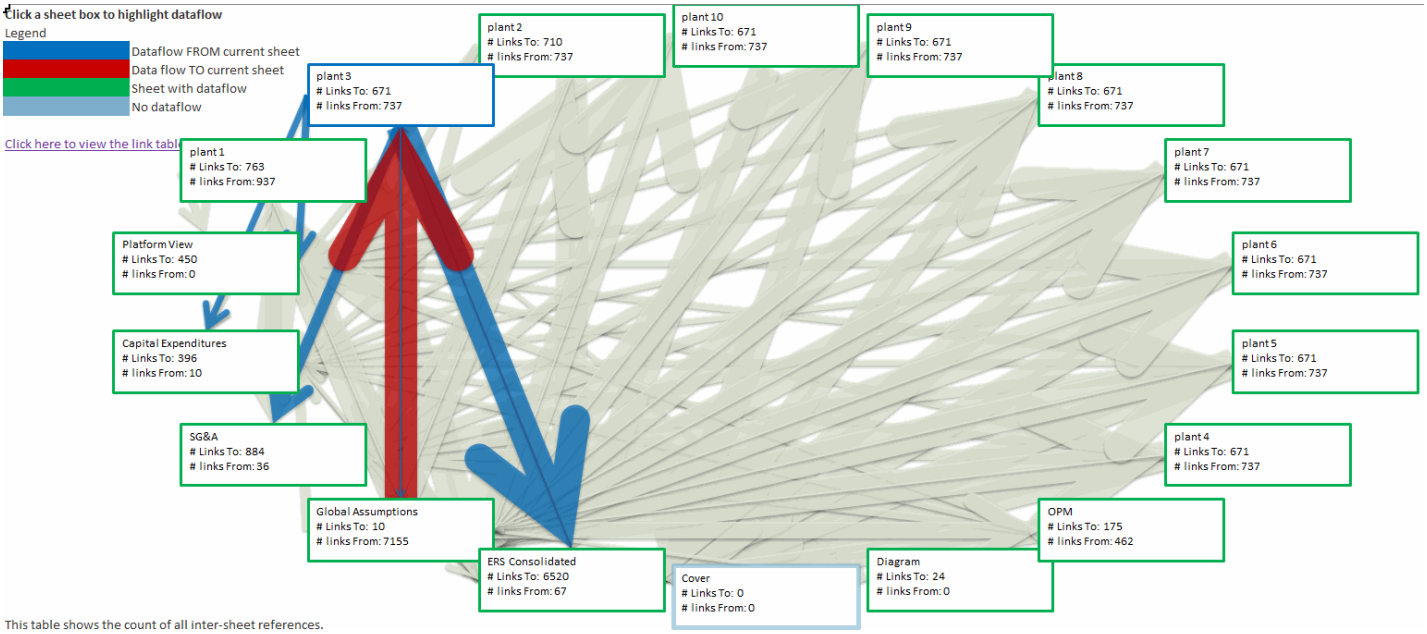
Report Function Counts

The Report Function Count option generates a list of how many times all built-in Excel functions are used within your current Excel file. The list is sorted in descending order of the times a function has been found.

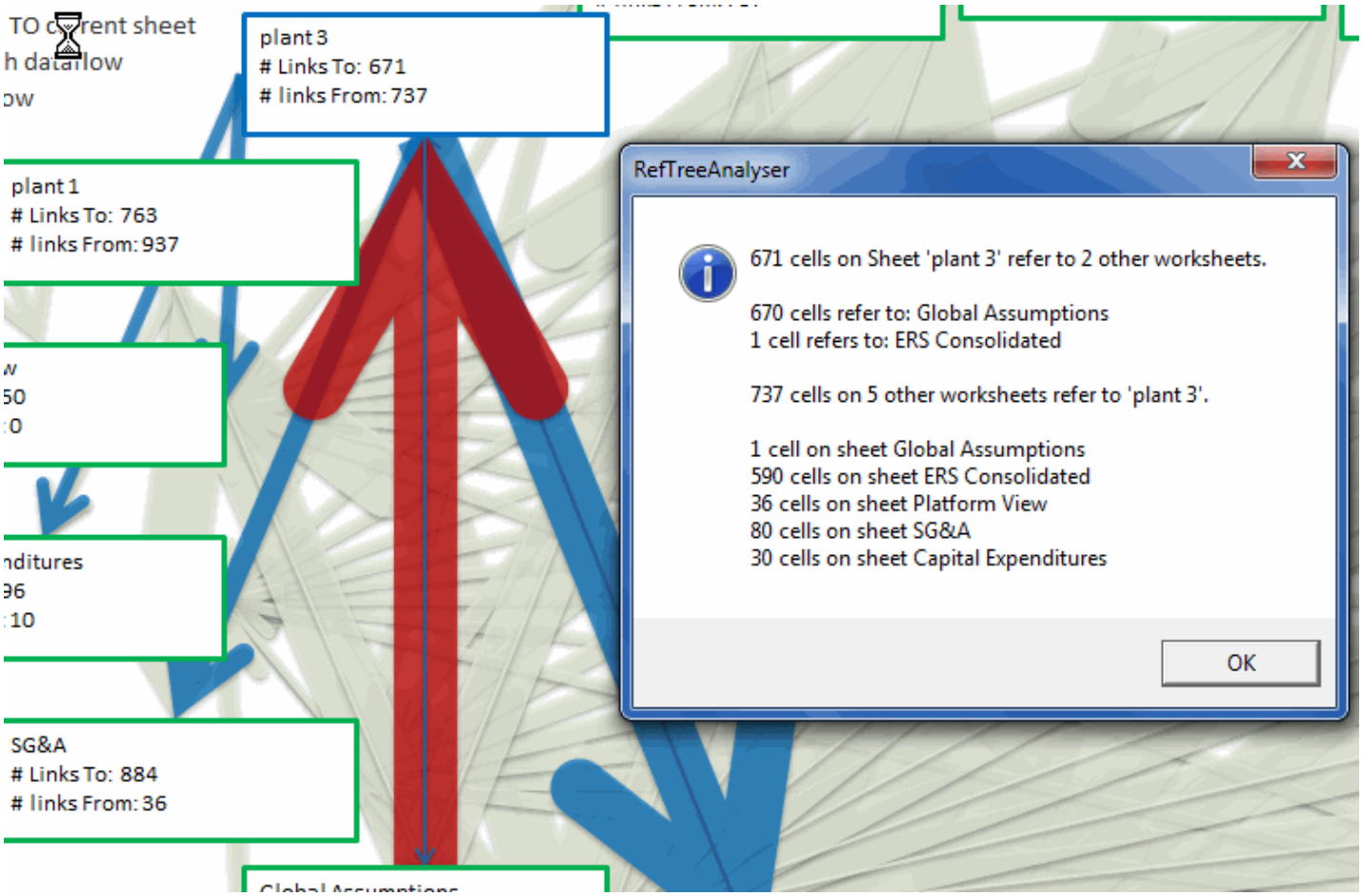
Off-sheet references

RefTreeAnalyser offers a report displaying the relations between your worksheets. This report simply counts the number of cells on worksheet A pointing to worksheet B. After gathering those counts the

worksheets are drawn on a report sheet with arrows indicating which sheets get data from which other sheets:



Each worksheet box can be clicked on to display to which other sheets it links and vice versa:



Also, underneath the visualization a table with all counts is included:

This table shows the count of all inter-sheet references.
In the columns you see the number of cells pointing to other worksheets
In the rows, you see the number of cells in another worksheet pointing to this worksheet

Changed\Affected	Cover	Global Assumptions	ERS Consolidated	Platform View	SG&A	plar
Cover		0	0	0	0	0
Global Assumptions	0		83	0	3	76
ERS Consolidated	0	0		45	1	1
Platform View	0	0	0		0	0
SG&A	0	0	36	0		0
plant 1	0	1	734	36	120	
plant 2	0	1	590	36	80	0
plant 3	0	1	590	36	80	0
plant 4	0	1	590	36	80	0
plant 5	0	1	590	36	80	0
plant 6	0	1	590	36	80	0
plant 7	0	1	590	36	80	0
plant 8	0	1	590	36	80	0
plant 9	0	1	590	36	80	0
plant 10	0	1	590	36	80	0
OPM	0	0	347	45	40	0
Capital Expenditures	0	0	10	0	0	0
Diagram	0	0	0	0	0	0

Workbook and worksheet protection and visibility

In order for RefTreeAnalyser to work properly, your workbooks and worksheets must be visible and unprotected.

Every time you launch the tool to detect precedents or dependents, it will:

- Unhide all worksheets.
- Try to unprotect all workbooks and worksheets (prompting for the password if needed).

And as soon as you close the dialog the tool will:

- Hide all worksheets that were hidden
- Protect all worksheets and workbooks that were protected (using the original password)

Display Equation

Formulas can be quite complex and RefTreeAnalyser has another feature that may help to figure out how your formula works.
It will try to display your current formula as a mathematical equation.

Example: Suppose you have this formula in your cell:

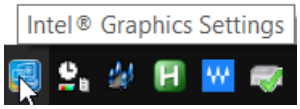
=MAX(ROUNDUP(($X$585-($X$584-$AB$577*$AA$588))/$AA$588/$X$576,0),0)

Pressing "Display Equation" yields this picture:

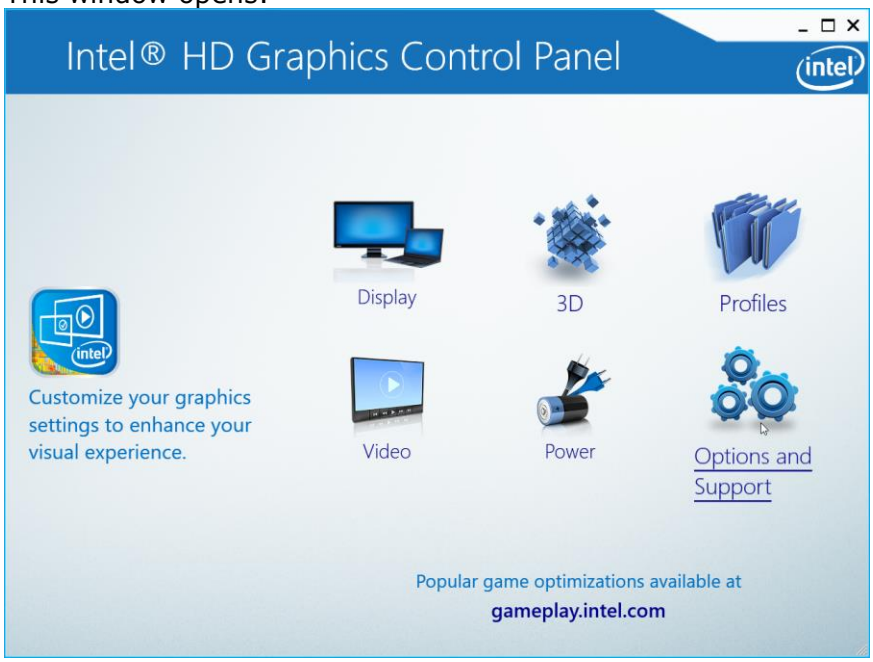
$$AB573 = MAX\left(ROUNDUP\left(\frac{X585-(X584-AB577*AA588)}{\frac{AA588}{X576,0}}\right),0\right)$$

Performance issues

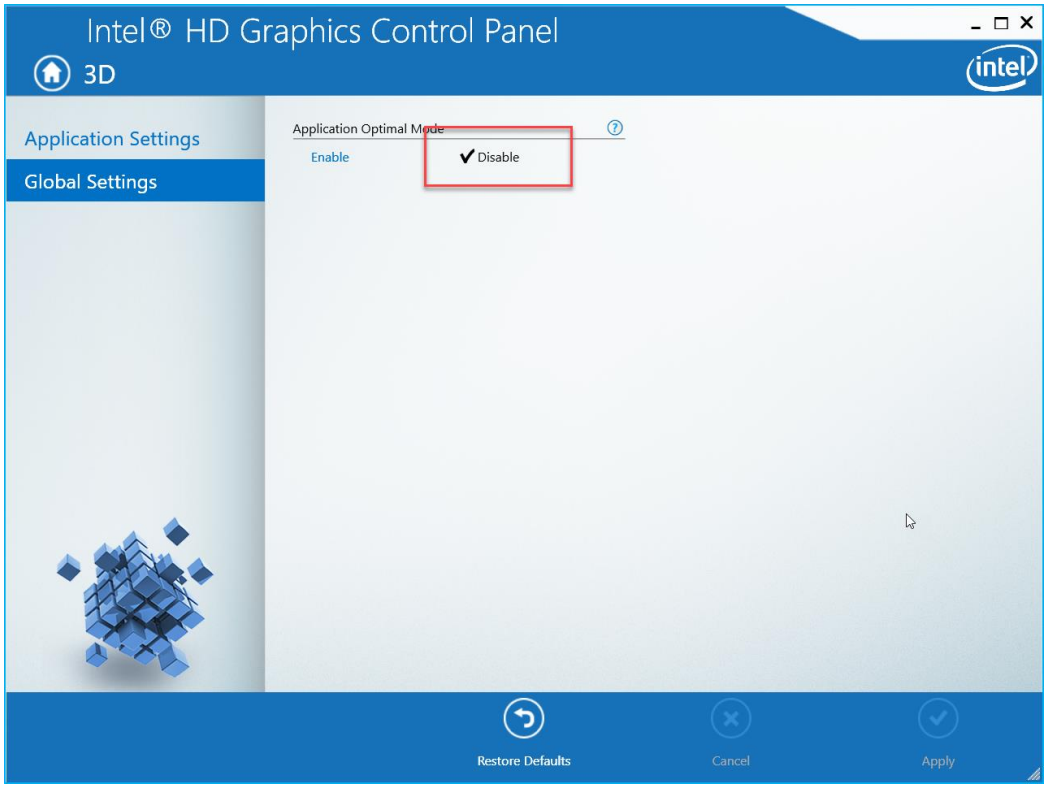
Some people report issues with RefTreeAnalyser' s performance in Excel 2013 and 2016. It seems these issues may be caused by display driver settings. On my system I experienced the same issues and was able to resolve it by changing a setting. Open the Intel Graphics settings app by double-clicking on it in the system tray:



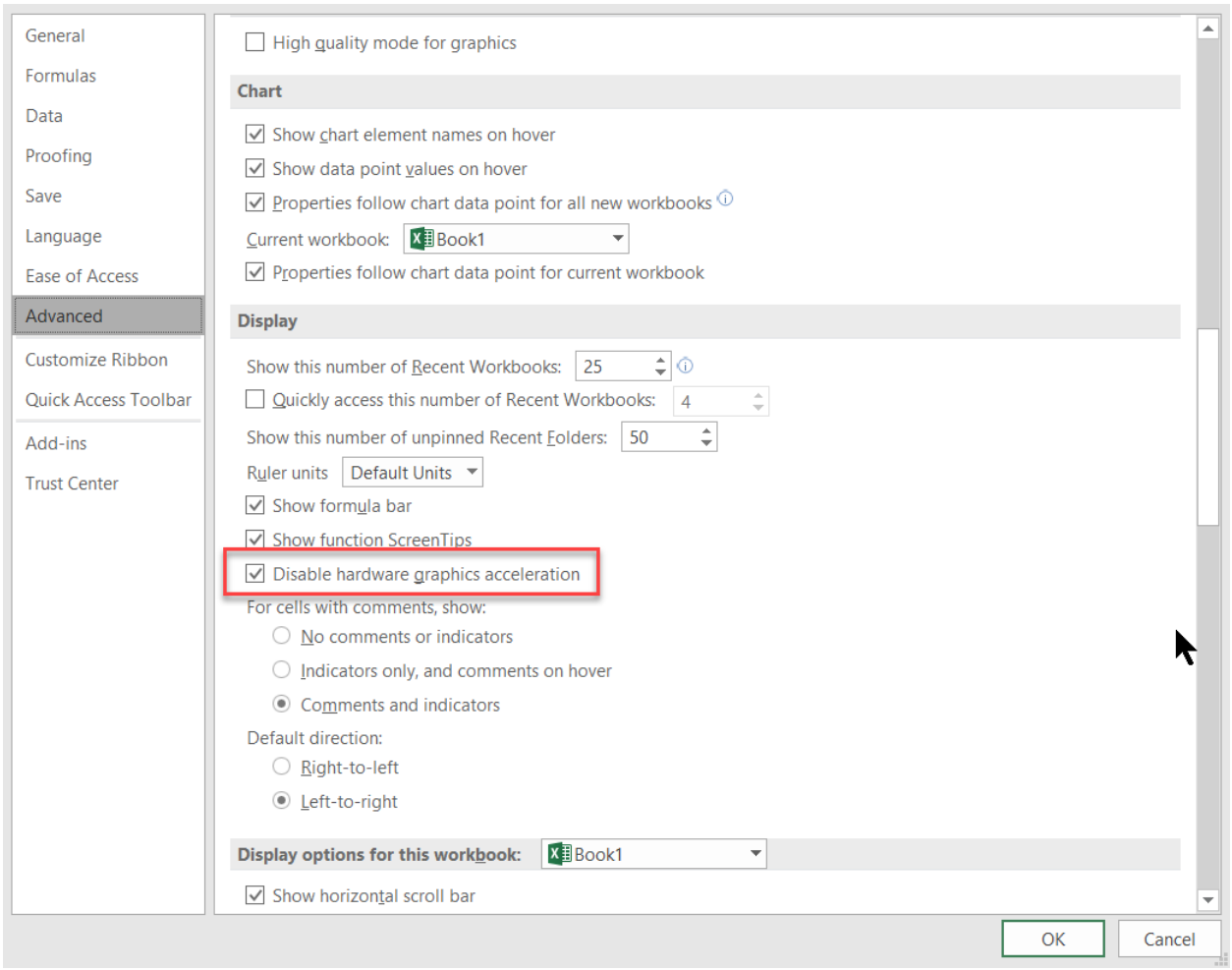
This window opens:



Click the 3D icon
Click "Global Settings"
Disable "Application Optimal Mode":

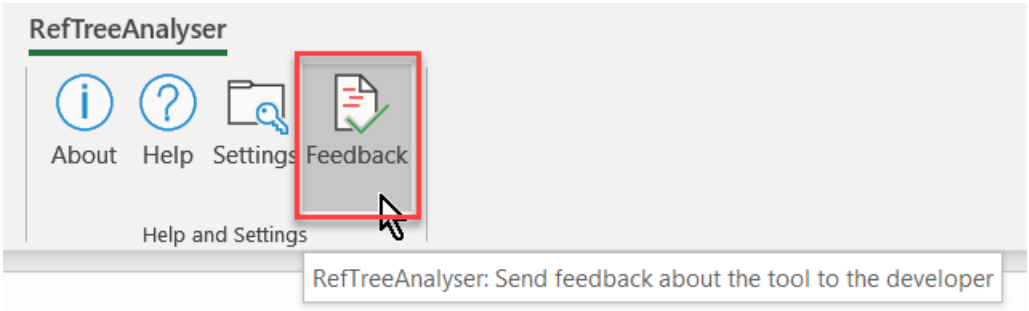


If you have a different display app, try changing settings similar to this one. Another option is to turn off hardware graphics acceleration in Excel's settings:



Feedback

If there is anything you would like to share with the developer of RefTreeAnalyser, please do not hesitate to press the Feedback button:



The button will take you to an on-line feedback form.

About JKP Application Development Services

The RefTreeAnalyser was brought to you by JKP Application Development Services.

We specialize in creating custom solutions based on your specifications.

Our main expertise lies with developing solutions using Microsoft Excel and Excel VBA, but creating applications using the other Office programs is also possible.

Contact us for more information on consulting and software development services.

Visit our website for more (free) utilities and add ins.