

TreeSoft Countersinks

Countersinks was written by Paul Rowntree, based on information and sample source codes provided by Vectric and other 'gadgeteers'. Any flaws in this package were introduced by me. I believe it works well, but no guarantees are given for its use in any application. **Countersinks** works with Aspire 4.0 (or greater) and VCP 7.0 (or greater). **It will not work with previous versions of either program.** Although Rowntree retains copyright, you are free to use the components in any way you wish, including personal and commercial applications. You are not permitted to redistribute the files, nor remove the copyright information that they contain, without written permission.

The current cost of **Countersinks** is \$50.00 CDN. Each copy of **Countersinks** may be associated with a single licensed copy of Vectric's Aspire or VCP.

Values in the provided database are only approximate, and must be verified by the user before use.

Check this site and Vectric.com for updated versions of **Countersinks**.

Change Log

April 24 2013	- Added SafeZWiggle() to start of trajectory
April 17 2013	- Database renamed Countersinks.txt to facilitate editing with Notepad - Registry-recovered profile added to database as db[1] - PilotDepth < 0 cuts through material by that distance - All database entries made to cut through material by 0.5mm, 0.02" - Auto-delete option for identically named toolpaths added - Load and Save selected coordinates to CSV file added
April 15 2013	- Renamed dialog file Countersinks.htm to Countersinks.html
April 14 2013	- First draft written and working

Disclaimer

By downloading, installing and using this program you are accepting full responsibility for any and all consequences. CNC machinery is potentially dangerous, and the user is 100% responsible for ensuring that the output of **Countersinks** is safe to use, and that it will have the desired effects.

As always with CNC equipment, think many times before running code, and doing air cuts is often a good idea with new files. Verify the Z limits of the loaded files before cutting to ensure that you are not going to destroy your table top, spindle, or both.

Work and Play safely.

What is Countersinks ?

Countersinks is a 'gadget' for Vectric's Aspire 4.0 (and higher) and V-Carve Pro 7.0 (and higher) CAD/CAM tools. It builds countersinking toolpaths with programmable parameters; these parameters are stored in a simple editable database file (Countersinks.txt) and they can be adjusted at run time. The positions on the design that will receive the countersink toolpaths are set by the current list of selected vectors, or they can be read in from a CSV file. **Countersinks** will put an identical countersink at the centre of each one. If you would like to support the continued development of **Countersinks**, please consider making a contribution at PaulRowntree.weebly.com

The gadgets work in Aspire and VCP in exactly the same way.

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Unpacking Countersinks

If using a Vectric installer, the files are already in their correct locations and are ready to run. Alternatively, the archive can be opened with Windows, WinZip, Z-zip, or any other standard unzipping program. Extract the files to any directory, then move the individual components in the directories shown below. Aspire or VCP will find the gadgets and show them in the Gadgets menu lists.

Windows Path	Contents
Aspire and VCP User Gadget directories, created during Aspire or VCP installation C:\Users\Public\Public Documents\Vetric Files\Gadgets\Aspire Vx.y\ or C:\Users\Public\Public Documents\Vetric Files\Gadgets\VCarve Pro x.y\	Countersinks.lua Countersinks.txt Countersinks.html If you want, you can create a subdirectory and place these files inside it. This unclutters the Gadgets menu of Aspire and VCP.
Anywhere you want	Countersinks.pdf (this file)

Using Countersinks

The following values describe a Countersink's tool trajectory within Aspire/VCP:

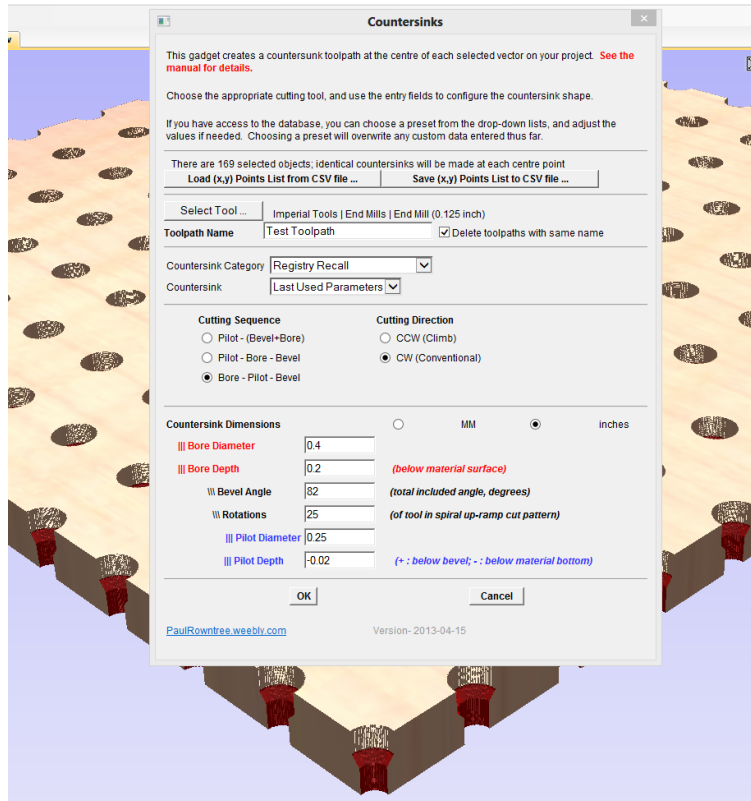
Data Field	Meaning	Values
Bore Diameter	Diameter of topmost cylindrical portion of countersink, above transition	>1/16" >1 mm
Bore Depth	Depth of topmost cylindrical portion of countersink, above transition	0 or more
Angle	Total included angle marking the transition between the upper Bore and the lower Pilot sections	0-180 degrees 180 is flat (no bevel) used for cap screws Imperial screws are ~82° Metric screws are ~90° Aviation screws are ~100°
Rotations	How many times the tool will circle the centre of the countersink as it cuts the beveled transition in a upwards ramp	1-100 15-25 normally gives smooth cuts
Pilot Diameter	Diameter of the portion below the beveled transition	>1/16" >1mm < Bore Diameter
Pilot Depth	Depth of the lower portion, If POSITIVE : measured from the bottom of the beveled transition If NEGATIVE : distance that pilot hole will extend below material bottom	Any value

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- 1) After installing the files, restart Aspire or VCP, and verify that it has found the Countersinks.lua file by checking the Menu>Gadgets listing.
- 2) Before running the gadget, create a project and create one or more circular vectors on the 2D presentation.
- 3) Select all of the circles, **but do not group them**.
- 4) Run the **Countersinks** gadget, which will present a dialog box similar to the one shown below.
- 5) The text bar just below the explanatory text should identify the number of vectors that you selected. **Ignore the two buttons (Load ... , Save ...) below this message for now.**
- 6) Choose a tool from the standard Vectric Tool database. **Countersinks** will accept end-mills, ball-nosed bits, and radiused end-mills, but all calculations assume an end-mill. Ball-nosed bits give slightly smoother beveled sections, but do not get the bevel-bore transition exactly correct.
- 7) Enter an appropriate name for the toolpath. If the associated checkbox is checked, all existing toolpaths with exactly the same name (case-sensitive) will be deleted before creating the replacement. This makes iterative designing of the toolpaths very rapid.
- 8) Ignore the two DropDown selectors for the moment. Enter appropriate values for the dimensions of the countersinks you want in the six numerical entry fields, and select the appropriate units (millimeters or inches) and cut direction (Climb or Conventional). **Remember that negative values of the Pilot Depth (e.g. -0.02) correspond to cutting all way through the material, and this much further into the spoilboard (in the case below, 0.02" below the material bottom).**
Countersinks will not limit the cutting depth to the material thickness, except in planning the final bore.
- 9) The cutting sequence is controlled by the three "Radio Buttons". For most purposes use the last one (Bore – Pilot – Bevel) as it imposes the least load on the cutting tool. For light cuts or strong machines you may want to try the other options, which may be a bit faster.
- 10) Verify the settings. Repeat step (10) as many times as necessary.
- 11) Press "Ok" to accept or "Cancel" to reject the settings. If you accept them, the program will generate the toolpaths and add them to the toolpath list so you can preview the results.
- 12) If you pressed "Ok", the last set of parameters will be saved for the next use of **Countersinks**.

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This is a preview of 169 identical $\frac{1}{4}$ " countersinks arranged in a grid pattern, and the parameters used to create the countersink.



Using CSV Files to Position Countersinks

Possible scenarios:

- You want to coordinate the positions of holes between projects. You could export the circular vectors via dxf or eps files; unfortunately, in some cases Aspire/VCarve Pro will shift them on the project workspace during importation, losing the alignment between projects.
- A list of positions for holes/countersinks is available as a list of (x,y) pairs (e.g., for a circuit board), and you don't really want to create all of these vectors by hand.

The two push-buttons below the text bar that identifies how many vectors were selected (the buttons you ignored at step 5) allow you to load up (x,y) coordinates from a CSV file, or to save the selected coordinates to a CSV file for later use. The file "ManyPoints.csv" that is included in the **Countersinks** package gives the coordinates of the 169 locations on the grid image shown above. If you load this file from the **Countersinks** gadget, the loaded coordinates will be used, and the selected vectors will be ignored. These coordinates are absolute and do not change when loaded; the holes will stay where you put them, even if the different projects have different origins or material sizes (but they must have the same unit base). Countersinks will be created in the order that the (x,y) pairs are found in the CSV file.

Here are the first few lines from ManyPoints.csv

```
; Selected object centres written to CSV file by Countersinks gadget
```

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```
;
-6, -6
-5, -6
-4, -6
```

No 2D vectors are made when you load these points, and so if you re-run the gadget to modify to countersink shape, you will have to reload the CSV file as well.

Using the Database

The text file Countersinks.txt in the gadget directory holds the parameters that you can use for your countersinks. **The information in the provided database file is approximate, and must be verified/adapted prior to use.** You can edit this file with Notepad, keeping a backup copy in case the file becomes unusable. The structure of the file is described in the text header.

```
; This is the database file for Countersinks.lua
; Should be named Countersinks.txt, in same directory as Countersinks.lua
; Table of bolt and countersink information
; information culled from several sources ... check values before using!
;
; all values must be separated by commas, lines with semicolons are ignored
; these are the dimensions of the holes, not the fasteners.
;
;       There should be no blank lines in this file.  Use ; to start a comment
;
; col 1 : Name of fastener/countersink profile
; col 2 : millimeters = 1, inches=0
; col 3 : bore hole diameter
; col 4 : bore hole depth
; col 5 : countersink included angle (degrees) 180 degrees is flat bottomed for cap screws
; col 6 : rotations of tool to make ramped conic section
; col 7 : pilot hole diameter
; col 8 : pilot hole depth : if negative, the hole will go through the material by that amount
;
; col 9 : 1,2,3 for CuttingSequence (optional : default is 3 )
; col 10: 1,2 for CuttingDirection (optional : default = 2 for CW )
;
; Locked version of Countersinks only uses first 5 database entries
; Unlocked version of Countersinks uses entire database.
; Invest ($50.00) at PaulRowntree.weebly.com to have full database access
;
"Favourites"
"1/4 inch Cap", 0,0.5,0.4,180, 15, 0.250, -0.02
"1/4 inch CS", 0,0.5,0.1,82, 15, 0.250, -0.02
"#6 UNF/C CS", 0,0.4,0.4,82, 15, 0.140, -0.02
"#8 UNF/C CS", 0,0.4,0.4,82, 15, 0.165, -0.02
"#10 UNF/C CS", 0,0.4,0.4,82, 15, 0.190, -0.02
;
"Metric Capscrews"
"M3 Cap", 1, 5.25, 3.0, 180, 15, 3.0, -0.5
"M4 Cap", 1, 7.25, 4.0, 180, 15, 4.0, -0.5
"M5 Cap", 1, 8.75, 5.0, 180, 15, 5.0, -0.5
"M6 Cap", 1, 10.25, 6.0, 180, 15, 6.0, -0.5
"M8 Cap", 1, 13.25, 8.0, 180, 15, 8.0, -0.5
"M10 Cap", 1, 16.25, 10.0, 180, 15, 10.0, -0.5
;
"Metric Countersunk Screws"
"M3 CS", 1, 6.75, 1.9, 90, 15, 3.0, -0.5
"M4 CS", 1, 9.0, 2.5, 90, 15, 4.0, -0.5
```

The lines with only one piece of information start "Categories' in the database (e.g., "Favourites", "Metric Capscrews", "Metric Countersunk Screws"), and can be used to collect similar types or similar

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functions for your projects. You can use any Category names you wish, and you can have as many Categories as you need. Names and Categories are case-sensitive.

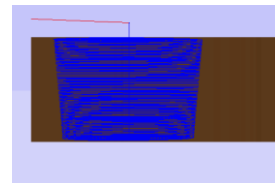
Each of the other lines describes a countersink shape, with a more-or-less useful name. You can have as many countersinks in the file as you wish. You can repeat the same name if you want, but this would be confusing.

There are two selector controls on the **Countersink** front panel that you ignored at step 8 above. The top one lists all countersink Categories that were found in the database. The lower control lists all countersink parameter sets in the database. Selecting a Category moves the first countersink entry of that group to become visible in the listing field. Selecting a new countersink name in the lower box makes that entry active. In the full (unrestricted) use of **Countersinks**, the parameters that define that countersink are loaded into the six working fields below when you select a new countersink shape.

The parameters used to create the toolpath are always those shown in the edit fields, regardless of the names and categories that may be visible in the DropDown lists.

Tips for Using Countersinks

- 1) **Countersinks** will not make a toolpath with a tool that is too large for selected profiles.
- 2) The units associated with the shapes, tools and jobs can be freely mixed; use millimeter or inch unit systems as you see fit.
- 3) **Countersinks'** toolpaths cannot be edited after construction; fortunately they can be easily recreated with new parameters.
- 4) Setting a small negative value as the Pilot Depth (-0.02", -0.5mm) will make the hole pass through the entire thickness of the material. This is probably what you want in most cases. It is possible that the thickness of material exceeds your cutter length when making small-bore countersinks; use a small Pilot Depth in **Countersinks** (Pilot Depth being positive now) to serve as a drill guide, then finish the job with a twist drill.
- 5) If speed is very important, try using cutting Sequence=1 [Pilot-(Bevel+Bore)]; it uses the side of the cutting tool to cut the bore out while doing the spiral ramp for the bevel section.
- 6) **Countersinks** can cut inside taper shapes, such as mounting a rigid ShopVac hose section to a dust shoe. Set the Bore/Pilot diameters to the top and insertion-depth diameters, Bore Depth=0, Pilot Depth= -.01 (to just go through material). A large number of rotations will make a smoother inner surface. **Countersinks** will **not** limit the depth of cut to the material thickness, so do your math carefully for the bevel angle and Pilot Diameter, and pay attention to the Vec tric previews.



If you use **Countersinks** to produce something interesting, please consider posting photos on the Vec tric forums. If you have any questions, I am frequently on the Vec tric and CNCZone forums as PaulRowntree, or you can reach me via the PaulRowntree.weebly.com website.

Specialized toolpath models can be prepared upon request.

Cheers!

PR