

Shadow Macro

v2.0.2

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Overview / Quick Start

You will find a video demonstrating the use of this video on YouTube [here](#).

To create shadow diagrams you must do at least the following Steps:

1. Select the North Direction (F1 on the main menu, then select 2 points as prompted)
2. Select the Location: F2 on the main menu will open a form where you can enter longitude, latitude, time zone and place name. Alternatively select 'Retrieve' from the top menu on the form to re-use previous locations, or to select a location from the SunShader data supplied with DataCAD.
3. Select at least one date (F3 on the main menu allows you to select up to 4 dates)
4. Select at least one time (F4 on the main menu allows you to select up to 4 times)
5. Select entities that you wish to cast shadows of.
F6 on the main menu will display a sub-menu from which you can select entities using the standard entity/group/area/fence options (note that once you have selected at least one entity this way an 'Append' option is available on F7 so that you can build up a selection in multiple steps). As an alternative to selecting this way, you can use the F9 option on this menu to select all suitable entities from 1 or more complete layers. Only configured entity types will be selected (types can be specified using the S5 menu option). By default, selected entities will be highlighted when you are in this menu – you can change this default and other highlight settings using the S7 option on the menu. Select S3 Ignore Voids if your selection includes voids in slabs or polygons that you wish to ignore.
6. Select the surface(s) that you wish to cast shadows onto using the F7 option on the menu. Only polygons can be selected for this purpose, and selection method and options are the same as in step 5 above.
Select S3 Ignore Voids if you wish to ignore voids in the selected polygon.
Select S4 Infinite if you wish selected polygons to be used to define an infinite plane (the shadow will not be clipped to the polygon).
7. Select the Create Shadows option (S3 on the main menu). This will display a form where you can select which dates/times to process (up to 16 combinations may be available depending on how many dates and times you selected at steps 3 & 4 above).
Options for each date/time include
 - specifying the layer for the shadow
 - whether to clear existing entities from that layer
 - whether the layer will be on or off after shadow creation
 - the colour to use for shadow entities
 - the type and fill properties of the entities to be created (3d lines, filled/unfilled polyline)Additionally you can specify whether to have a Shading Report displayed (shows shadows area and percentage of the surface covered for each date/time).

Other options on the main menu include:

- F8, F9 to highlight the entities to cast shadows of, or the entities to cast shadows onto (respectively). The entities will remain highlighted until the screen is refreshed.
- S1 to display a 'Suns-eye view'. A menu will be displayed from which you can choose any of the available date/time combinations. Once a date/time is chosen the appropriate view will be displayed, and you will also have the option to step through adjacent times (in increments specified in minutes, hours, or days) using the F7 Time Steps option on the Suns-eye menu.
- These views can be useful to visualise where shadows will be cast without actually producing a shadow diagram (select to highlight the shadow casting and surface entities to aid with this using the options at s9 – it is suggested to configure highlighting to use different colours for casting and surface entities).
- You can also select to create shadows (for the current suns-eye date/time) using the S8 Create Shadow option.
- S5 Report. This option is only available after you have created shadows. Use it to display a report of shaded areas from the most recent shadow creation.
- S6 Identify. Use this option to display information about a previously created shadow. The location, date and time used to create the shadow will be displayed along with other information.
- S7 2D Shadow. This option will create a 2d shadow diagram from a previously created (3d) shadow. An example of the use of this option would be to add a shadow to an elevation etc.
- S9 Help – displays this document.

Detailed Menu Descriptions

F1 North displays the current north direction in a pointer in the bottom left of the drawing window. Select 2 points to define a new north direction, or select F1 again to enter the north angle from the keyboard.

The indicator in the bottom left corner of the drawing window indicates the current north setting.

F2 Location (Label will change to the place name once a location is selected). Displays the form illustrated at right where you can enter longitude, latitude, time zone, and place name. Alternatively, select 'Retrieve' from the top menu to select a location from the Sunshader data supplied with DataCAD, or to select a previously used location.

The screenshot shows a 'Location' dialog box with the following fields and options:

- Retrieve** button
- Latitude**: -33.68108 (with a note: +ve for North, -ve for South)
- Longitude**: 149.86622 (with a note: +ve for East, -ve for West)
- Time Zone**: UTC+10:00 (dropdown menu)
- Place Name**: Oberon
- Latitude/Longitude Entry Format**:
 - ☐ Degrees/Minutes/Seconds
 - ☒ Decimal Degree
- Buttons**: Cancel, OK

F3 Dates displays the Shadow Dates menu where you can add up to 4 dates (F1 – F4) or can clear exiting dates (F6).

When you select to add (or change) a date the Select Date form will be displayed. Use this form to either select a date from the calendar, or use the 4 buttons at the top of the form to select solstice or equinox dates for the current year in the selected location (note that these buttons will be disabled if location has not yet been selected (as location is a parameter in solstice/equinox calculation).

The image shows the 'Shadow Dates' menu on the left with options: F1 Add Date, F2 Add Date, F3 Add Date, F4 Add Date, and F6 Clear. To the right is the 'Select Date' dialog box. It has four date buttons at the top: 20/03/2025, 21/06/2025, 23/09/2025, and 22/12/2025. Below these is a calendar for February 2025. The calendar shows days of the week (Mon to Sun) and dates (1 to 28). The date 19 is highlighted. At the bottom of the calendar, it says 'Today: 27/04/2025'. At the bottom of the dialog box are three buttons: Cancel, Clear, and OK.

F4 Times displays the Shadow Times menu where you can add up to 4 times (F1 – F4), or clear existing times (F6).

When you select to add (or change) a time the Select Time form will be displayed. Select one of the time buttons (for times between 8am and 4pm in hour intervals), or enter the required time into the time field. Use the Clear button to remove the selected time.

The image shows the 'Shadow Times' menu on the left with options: F1 Add Time, F2 Add Time, F3 Add Time, F4 Add Time, and F6 Clear. To the right is the 'Select Time' dialog box. It has six time buttons in a 2x3 grid: 8am, 9am, 10am, 11am, 12 noon, 1pm, 2pm, 3pm, 4pm. Below these is a 'Clear' button and a time field with '12', '00', and 'PM' buttons. At the bottom of the dialog box are two buttons: Cancel and OK.

F6 Casting Entities allows you to specify which entities shadows will be cast of. Entities can be selected using using the standard entity/group/area selection and/or by complete layer(s) using the F9 option (an asterisk on the F9 label indicates at least some whole layer(s) are selected).

If there is no existing selection then the 'F7 Append' button will not be displayed. Once a selection is made you can enable this button to add to the existing selection (if you select 'F9 Whole Layer(s) then a form is displayed to select layers, and and 'Append to existing selection' checkbox on the form has the same purpose as the 'F7 Append' button).

Note that if you select Whole Layers, any entities subsequently added to one of the selected layers will automatically be included as a casting entity. Also note the any mask settings (applied by the 'F5 Mask' option on the menu) do NOT apply to Whole Layer selections.

Please also note the following regarding Locked layers: Shadows CAN be processed for entities on locked layers, but you canNOT select an entity on a locked layer using Entity or Group selection¹ (if you unlock the layer you can select these entities, and the selection will remain when you lock the layer again). You CAN select locked layers when using the Whole Layers option.

Select 'S1 Clear' to clear all existing selections (whether by entity or layer).

Select 'S3 Ignore Voids' to ignore voids for shadows cast of polygon or slab entities. An example of where this may be useful is if casting shadows of walls which contain window or door voids

The image shows the 'Casting Entities' menu. It has options: F1 Entity, F2 Group, F3 Area, F4 Fence, F5 Mask, F6 Layer Search, F7 Append, F9 *Whole Layer(s), S1 Clear, S3 Entity Types, and S7 Hilite Settings.

¹ You can select by Area or Fence. This is a feature of the DataCAD call the macro is using ... it may change in future Dcad versions?

(ignoring voids removes the need to include all the door and window components as casting entities and simplifies processing). Note: Voids are always ignored in Smart Entities regardless of this setting.

The macro cannot process all entity types, and you can further restrict the types of entities that are selected using S3 Entity Types option on the Casting Entities menu. The Entity Types menu is illustrated at right. Basic 3D entities include polygons, slabs and blocks, whilst Curved 3D entities include spheres, domes, cylinders, cones, surfaces of revolution, toruses, and mesh surfaces.

Casting Entities	
F1	Basic 3D Ents
F2	Curved 3D Ents
F3	3D Lines
F4	2D Lines
F5	Polylines
F6	Smart Entities
F7	Symbols

You will not be able to select entities of types which are disabled, and shadows of already selected entities of those type will not be created (however if you re-enable a type then entities of that type which were previously selected will once again be included in shadows (provided you have not cleared their selection – e.g. by selecting other entities without enabling the ‘Append’ option).

The ‘S7 Hilite Settings’ option will display the form illustrated below:

This allows you to specify how casting and surface entities will be highlighted, and whether they will be automatically highlighted whilst you are in the Surface or Casting Entities menus.

It is suggested (but not mandatory) that you choose different colours for the casting entities and surface entities (this is particularly helpful to distinguish them if you use the Sun-Eye View option).

F7 Surface allows you to select polygon entities (only) to define the surface(s) that shadows will be cast onto. The functionality and appearance of this menu is similar to the Casting Entities menu detailed above (without the ‘Entity Types’ option, as only polygons can be selected here). Polygons selected should be planar (i.e. flat, not twisted in any way). You should ideally not have non-planar polygons in your drawing, but if you do select one a warning will be displayed after shadow creation.

By default generated shadows are limited to the area of the selected polygon(s). You can use a polygon to define an infinite plane by enabling the S4 Infinite option on this menu (in which case shadows may extent beyond the area of the selected polygon(s)).

F9 Hilite will display the Hilite menu illustrated at right. Select F6 to hilite the shadow casting entity(s), F7 to hilite the surface entity(s), or S7 to display the Hilite Settings form (see above in the Casting Entities notes).

S9 Keep Hilite is a toggle – if enabled the hilites will remain when you exit the menu (until such time as the screen is refreshed or regenerated). If this option is disabled then hilites will be removed when you exit this menu.

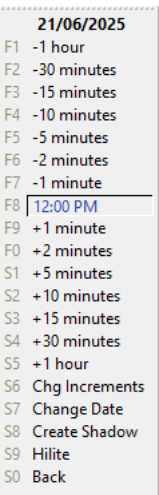


S1 Sun-eye View is only available once a location has been selected. It allows you to set the current view to be from the sun position. If shadow casting and surface entities have been selected then the percentage of the surface that is shaded in the view can be displayed on the message line. An example Suns-eye View menu is shown at right, and includes all combinations of the selected date(s) and time(s). Times that are struck out on the menu are when the sun is too low (either extremely close to or below the horizon). Select the required date/time to adjust the view.



The view will be displayed at the current scale setting, and by default is centred on the extents of the shadow casting entities. You can change the centre to be on the shadow surface from the sub-menu accessed by the S9 Settings/Hilite option of this menu.

Also on the S9 Settings/Hilite sub-menu is an option to calculate the shading percent. Disabling this may speed the display the Suns-Eye views. Regardless of this setting, the percentage will not be shown if surface and casting entities have not been selected.



The S7 Time Steps option will appear once a date/time has been selected, and this allows you to move along the sun's path in increments of minutes, hours, or days for the selected date. A sample menu is illustrated at left. The increments are configurable (using the S6 Chg Increments option).

Turn highlighting on/off for the Shadow Casting or Surface entities by selecting S9 Settings/Hilite and then selecting the appropriate option from the Hilite/Cntr Menu.

Select S7 to select a different date from the Time Steps menu.

Select S8 to display the form below and create shadows for the currently selected date/time.

dh 21/6, noon Shadows

Default Lyr Names

Layer

Shad Jun21 12noon

Dflt

☐ Clear Layer

Colour

Lt Red

Pick

Outline Type

No Outline

Fill Opacity

30 %

Cancel

OK (Create Shadow)

The options on this form have the same function as the equivalent options on form displayed when you select F3 to create shadows from the main menu (see below)

S3 Create Shadows displays the form shown below.

dh Process Shadows

Defaults

☒ Set All

☒ Dflt ☐ ☒ White Pick Lines 0 %

Date/Time	Layer	Clear Lyr	Lyr On	Shadow Colour	Outline Type	Fill Opacity
<input checked="" type="checkbox"/> 20/03/2025 9am	Shad Mar20 9am <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	No Outline <input type="text"/>	20 %
<input checked="" type="checkbox"/> 20/03/2025 12noon	Shad Mar20 12noon <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Lt Green <input type="text"/> Pick	PolyLine <input type="text"/>	20 %
<input checked="" type="checkbox"/> 20/03/2025 3pm	Shad Mar20 3pm <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	Lines <input type="text"/>	
<input checked="" type="checkbox"/> 21/06/2025 9am	Shad Jun21 9am <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Green <input type="text"/> Pick	PolyLine <input type="text"/>	30 %
<input checked="" type="checkbox"/> 21/06/2025 12noon	Shad Jun21 12noon <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Color_240 <input type="text"/> Pick	No Outline <input type="text"/>	30 %
<input checked="" type="checkbox"/> 21/06/2025 3pm	Shad Jun21 3pm <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	PolyLine <input type="text"/>	20 %
<input checked="" type="checkbox"/> 22/12/2025 9am	Shad Dec22 9am <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	Lines <input type="text"/>	
<input checked="" type="checkbox"/> 22/12/2025 12noon	Shad Dec22 12noon <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	PolyLine <input type="text"/>	20 %
<input checked="" type="checkbox"/> 22/12/2025 3pm	Shad Dec22 3pm <input type="text"/> Dflt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	White <input type="text"/> Pick	Lines <input type="text"/>	

☐ Show shading report

Cancel OK (Start Processing)

Use the fields at the top of the form to set the same value in all rows, otherwise select/enter the required values for each individual row. The columns are explained below:

Date/Time: All combinations of the Date(s) and Time(s) that you have selected will be displayed with a checkbox for each. You can control whether they are all initially selected or unselected by selecting (or unselecting) the 'All DatesTimes Selected' option on the Defaults menu at the top of the form. Select the date/times that you wish to create shadows for.

Layer: If you have previously generated shadows for a particular date time then the previously used layer name will be defaulted here, otherwise a default will be assigned based on the rules you specify using the 'Default Lyr Names' option on the Defaults menu at the top of the form. Use the drop-down list to select an existing layer (note that locked layers are not displayed in this list – if you manually type the name of an existing locked layer then the shadow will be created on a new layer of the same name (not recommended)). Click the 'Dflt' button to revert to a default value (as specified using the 'DefaultLyrNames' menu option).

Clear Lyr: Select this checkbox if you wish existing entities to be deleted from the layer prior to creating the new shadow. If you select to do this then a dialog will display during the shadow creation process. The dialog has 3 options – 'Do Nothing', 'Clear Shadow Entities ONLY', or 'Clear ALL entities'. The dialog appears only once (whichever option you choose will apply to all layers you have selected to clear).

Lyr On: Uncheck this box if you do not wish the layer specified for the shadow to be ON once the shadow generation is completed.

Shadow Colour: The colour selected here (either from the drop-down list or using the 'Pick' button) will be used both for the shadow outline and fill (if specified).

Outline Type: Select one of the three options:

'Lines' will create an outline of the shadow using 3D Line entities. There is no fill option for this choice. The macro will try to eliminate internal shadow lines (e.g. if the shadow extends across more than 1 surface polygon then in most cases no line will be shown on the boundary between the 2 surfaces).

'Polyline' will create an outline using polylines. In some cases multiple polylines will be produced (with abutting edges hidden). You can select a fill option of between 0 and 100 percent. Polyline edges at the boundary of surface polygons will always be visible.

'No Outline' will create a filled polyline with no outline visible. You can select a fill option of between 1 and 100 percent.

Fill Opacity: This field specifies the opacity of fill that will be applied to polyline shadows (the field is not visible if you choose 'Lines' as the outline type). Select 0% if you do not want the polyline to be filled.

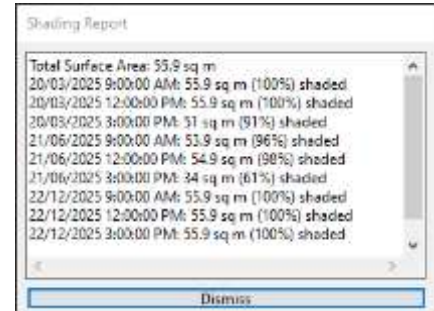
If the 'Show shading report' checkbox is checked a report will be automatically displayed once the shadow entities are created. This report will show the shaded area (in sq meters for metric scales, or sq feet otherwise)² as well as the percentage of the surface that is shaded³ (as shown in the example at right). Note that if the S4 Infinite option is selected on the surface menu then the surface



FatherBrown_S07E06 The Dance of Death.avi

area shown

will be of the (non-infinite) polygon and the shaded percentage may be greater than 100%.



The options on the Defaults menu are shown at left. The Default Lyr Names option allows you to configure how the macro constructs default layer names.

The Custom Format option displays the form shown below. It allows you to specify a format string that provides great flexibility.



The format string is composed of characters that represent values to be inserted into the layer name (the common characters are listed on the form – you will need to scroll down to see them all)⁴.

You can also include hard text inside quotes

as part of the format string.

The All Dates/Times Selected option is a toggle ... if enabled then all the date/time checkboxes will be checked when the Process Shadows form is displayed (if not enabled then none of these checkboxes will be checked when the form is displayed).

The OK (Start Processing) button does what it says (and will create shadows for all the selected dates/times). Note that selecting DataCAD's undo (Ctrl/Z) after creating the shadows will remove all the created shadows. If you changed settings (such as layer names, colours or outline types) then selecting undo a second time will revert the saved settings to the previous values (i.e. the settings changes are not undone with the first undo, but are undone if you select undo again).

² By default square meters will be shown to the nearest 0.1 square meter and square feet are shown to the nearest square foot (see notes on [Advanced Configuration](#))

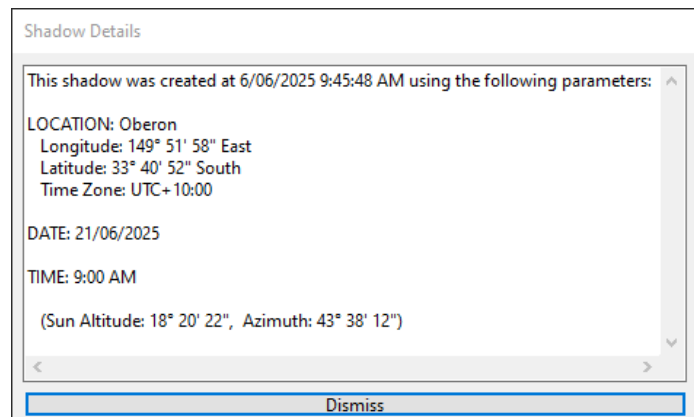
³ Percentages are shown to the nearest 1 percent.

⁴ For a full list of formatting characters search the web for 'delphi datetime format strings' (an example result would be [this page](#) which contains a complete table of formatting characters at the bottom of the page).

S4 Layers displays the standard DataCAD Layers menu. Use this to switch layers on/off etc. without leaving the macro.

S5 Report displays a report of the shaded areas from the most recent shadow creation. The report can be displayed regardless of whether the 'Show Shading Report' checkbox is checked at the time of creating the shadows (see above). This option does not display when the macro is first started (it only becomes available once you have created some shadows in the current session of the macro).

S6 Identify allows you to select a previously created shadow and display information about it as shown in the example at right.



S7 2D Shadow is used to create a 2D shadow diagram from a shadow previously created by the macro. The shadows created by this macro are 3D entities, so use this function to create shadows to show on a 2D drawing.

The 2D shadow diagram will be created using 2D lines and/or horizontal polylines. Optionally, horizontal polygons can be created instead of polylines by selecting the **S6 To Polygons** option on the 2D Shadow menu (polyLines will still be created for any shadows with more than 256 vertices).

The macro can create a 2D diagram from any parallel view, but typically you would use it from an elevation view to create a diagram to be used on an elevation drawing.

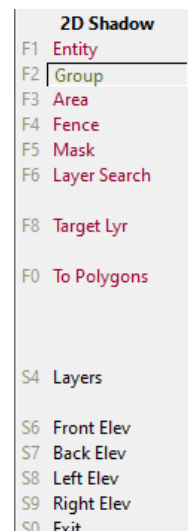
The first step to use this is to set the current view to the desired angle (e.g. use the elevation buttons on DataCAD's Projection Pad, or use the S6..S9 buttons on the macro's menu).

You can also set the Target Layer (where the 2D entities will be created) at this stage. This will make the macro switch to the nominated layer for placing the 2D shadow diagram (but you can change layer at that stage if desired using either the Drop-down Layer List, Tab key or Layer Manager).

Having set the view to the desired viewing angle, select the shadow entities to create the 2D diagram from (note that as some shadows are created using multiple entities, it is recommended to select by group, area, or fence).

Once the entities are selected you will be prompted to select a reference point to drag the shadow by (like the way you select a point when using DataCAD's move/drag functionality).

Having selected the drag reference point, the view will be changed to an ortho (plan) projection. If you nominated a target layer the current layer changed to that layer. The 2D diagram will be created and you can drag it to the desired location (or press S0 to cancel the whole operation). Note that you can change layers here (using the tab key or Lyr Manager), but whichever layer you



end up creating the diagram on will be saved as the default target layer for the next time you use this functionality in this drawing.

Once you have placed the 2D diagram the macro will return to the '2D Shadow' menu and a 'F9 Prev View/Layers' option will be available. Select this option to revert to the view and layer on/off settings that existed before you placed the 2D diagram.

Advanced Configuration

Removing Previous Locations

Previous Locations are displayed in the Retrieve/Previous Locations menu on the macro's Location screen. If you wish to remove items from this menu you can do so by editing the Shadow.ini file located in your DataCAD Macros folder (use a text editor such as Notepad, and it is a good idea to save a copy before editing the file).

Search the Shadow.ini file for the following Text: '[Place='. You will find an entry for each of the saved locations that appears on the Previous Locations menu. For each location you wish to remove delete the line starting '[Place=' together with the following 3 lines (these 3 lines will specify the Timezone, Latitude and Longitude). Save the file and the deleted locations will be removed from the menu.

Report Precision

By default reported areas will be to the nearest sq ft (for imperial scales) and to the nearest 0.1 sq m (for metric scales). Percentages are shown to the nearest 1% by default. You can increase the precision by adding an entry to the Shadow.ini file as shown below:

```
[Report]  
DecPlaces=2
```

Valid values for DecPlaces are 0,1, and 2. For metric scales the actual decimal places for areas will be 1 more than the specified value. Note that due to the conversions between floating point values and integer values and vice versa in the shadow processing, absolute accuracy cannot be guaranteed (in one test scenario the percentage displayed as 99.9% even though I knew it should be 100%) which is the reason the default is zero decimal places (1 decimal place for metric areas). Note that this entry applies to the values on the Report only (percentages displayed in messages with Suns-Eye Views will always be to the nearest 1%).

Epsilon

Floating point numbers are often not absolutely accurate in computer programs (e.g. the double type used by DataCAD and in dmx macros only has about 15 digits of precision). For this reason when comparing these numbers for equality it is common to allow some tolerance (or a very small difference, often referred to as an epsilon value).

In several places in the shadow macro a default epsilon value of 0.001 is used (equal to $1/32000''$)⁵. This value is used to compare points for equality, and also to test for colinear points (i.e. given 3 sequential points on a polygon, if the middle point is within the epsilon distance from a straight line between the other 2 points, then that point is a candidate for removal – there is a bit of other testing around the point removal, but this epsilon test plays an important part).

I have found an epsilon value of 0.001 satisfactory in all my testing, and do not recommend that you change it. However, should you feel it necessary to change this value you may edit the following line in the Shadow.ini file that the macro creates in your macro directory:

```
Epsilon=0.001
```

Note that the value defined here will apply to the macro in all drawings (it is not stored as part of the drawing data). Also note that if you enter a value less than 0.000000000001 then the macro will revert back to the default value of 0.001.

⁵ DataCAD stores distances in units of $1/32''$ (e.g a distance of 1 foot would be 384 in DataCAD units). All references to an epsilon value are in these units.

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Whilst I do accept contributions toward the cost of developing and distributing my software, such contributions are entirely at your discretion and in no way constitute a payment for the software.

You may distribute this software to others provided that you distribute the complete unaltered zip file provided by me at the dhsoftware.com.au web site, and that you do so free of charge. This includes not charging for any other software, service or product that you associate with this software in such a way as to imply that a purchase is required in order to obtain this software (without limitation, examples of unacceptable charges would be charging for distribution media or for any accompanying software that is on the same media or contained in the same download or distribution file). If you wish to make any charge at all you need to obtain specific permission from me.

Whilst it is free (or because of this), I would like and expect that if you can think of any improvements or spot any bugs (or even spelling or formatting errors in the documentation) that you would let me know. Your feedback will help with future development of the macro.

The solar calculations in this macro make an allowance for atmospheric refraction, but due to variations in atmospheric composition, temperature, pressure and conditions, and uncertainty inherent in the algorithms used, observed values may vary from the calculations. You should not rely on results from this macro for litigation purposes.

Source Code

The source code for this macro is publicly available⁶. You may modify and compile the source code for your own use, but any product derived from my source code may not be distributed to others for profit without explicit permission from me. If you feel that a change is warranted I would prefer that you contacted me (I may be able to make the change and include it in a future release, or if you have made a change and are prepared to share it then I may consider including your change in a future release with your permission).

The source code includes files from the [Clipper2 library by Angus Johnson](#) (contained in the 'Clipper' folder in the repository). The Clipper2 library is open source freeware copyright 2010-2025 by Angus and use of these files is subject to the [Boost Software License - Version 1.0 - August 17th, 2003](#)

⁶ Source code is in my [Bitbucket Workspace](#) (you will need the new-shadow and common repositories in addition to the DataCAD supplied include files from version 23.00.03.01 or later)

Contribute

I develop this software primarily as a hobby to keep my brain active during my senior years. I do not rely on any income from these efforts, nonetheless if you feel that the software is of value to you then a contribution towards my development and distribution costs would be appreciated and may encourage me to continue to develop further DataCAD macros.

There is no requirement for you to contribute, but should you wish to do so contributions may be made at dhsoftware.com.au/contribute.htm.

Australian users can also send a contribution directly to my bank account using a PayID of `contribute@dhsoftware.com.au`