

# Using AutoCAD on the PWF

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## 1 Introduction

This document contains some very short notes about using AutoCAD as installed on PCARCH05 in the Department of Archaeology's MCS PWF cluster. If you wish to contribute additional information and top tips please email the author. You can always obtain the latest version of this document from:

<http://www.arch.cam.ac.uk/comp/docs/>

## 2 AutoCAD

The installed version of AutoCAD is AutoCAD Map v3 which is AutoCAD release 14 with added spatial (or GIS) functionality. It can be started by doing Start ▸ PWF Programs and Information ▸ Graphics and Presentation ▸ AutoCAD Map

Please note that AutoCAD can be made to do things by choosing tools or tasks from the menus, or issuing commands on the AutoCAD commandline. This document will use the command line wherever possible because the menus may change between versions of AutoCAD. In addition, clones of AutoCAD will look and feel different, but often implement the same commands.

## 3 Personal Profile (acad14.cfg)

AutoCAD takes its basic configuration from a file acad14.cfg. Each user has their own version of this file in:

F:\appscfg.pwf\autocad\acad14.cfg

If this file becomes corrupted AutoCAD will fail to start, or start then crash horribly. The file can become corrupted because you have chosen inappropriate options in Tools ▸ Preferences or just because it is one of those things that happen. Deleting the configuration files:

F:\appscfg.pwf\autocad\acad14.cfg

and (if present):

F:\appscfg.pwf\autocad\acad14.bak

will resolve this problem.

## 4 Using the Digitiser

### 4.1 Configuring the digitiser

Details of the digitiser are specified in:

F:\appscfg.pwf\autocad\acad14.cfg

and it is therefore necessary to configure the digitiser before you can use it. You need only do this once, although if you are forced to delete your `acad14.cfg` file you will need to repeat the process.

1. Start AutoCAD by choosing **Start** ▸ **PWF Programs and Information** ▸ **Graphics and Presentation** ▸ **AutoCAD Map**.
2. When the startup process has completed, choose **Tools** ▸ **Preferences**.
3. Select the **Pointer** tab of the dialogue box that appears.
4. Set the **Pointer Type** to **Wintab Compatible Digitizer ADI 4.2 - by Autodesk, Inc.**
5. Click the **Set Current** button.
6. Then click **OK**.

You are now ready to use the digitiser. You will see that it has its own mouse-type thingy, called a puck, which should be in a holder in the top right corner of the tablet. The green light on the puck means that the digitiser is basically behaving itself: the red light means that the puck is over a sensitive part of the tablet and is transmitting data to the computer.

The puck has a lot of buttons: sixteen at the last count. The one labelled '0' acts like a left mouse button and is what you are required to click in the examples below.

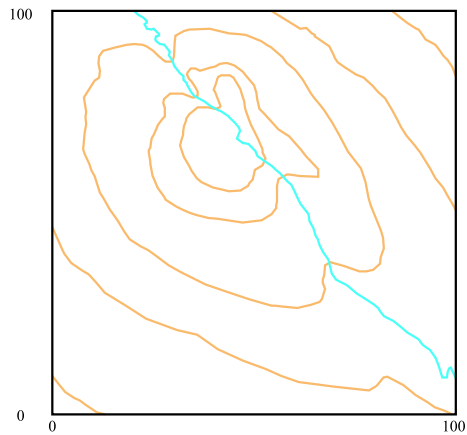


Figure 1: An imaginary map extract.

## 4.2 Calibrating the digitiser

Secure on the digitiser the plan, map, or illustration you want to digitise. Use good quality masking tape and ensure that the plan is neither stretched too taut, not crumpled or in any way distorted. Please do not use tape or other fixatives that are liable to leave an 'orrible sticky mess all over my digitising tablet. Identify the reference or control points you intend to use, and make a note of their co-ordinates.

Let us briefly imagine that, for reasons that temporarily escape me, we wish to digitise the imaginary map extract shown in Figure 1. Secure it on the digitiser and start AutoCAD. In the examples that follow, AutoCAD's prompts and reports are shown like this: user input is shown **like this**. At the command line type:

```

Command: tablet
Option (ON/OFF/CAL/CFG): cal
Digitize point #1:
Enter coordinates for point #1: 0,0
Digitize point #2:
Enter coordinates for point #2: 100,0
Digitize point #3 (or press ENTER to end):
Enter coordinates for point #3: 100,100
Digitize point #4 (or press ENTER to end):
Enter coordinates for point #4: 0,100
Digitize point #5 (or press ENTER to end):
Phase 2
4 calibration points
Transformation type:      Orthogonal    Affine        Projective
-----
Outcome of fit:          Success      Success      Exact
RMS Error:               0.1377      0.0142
Standard deviation:     0.0116      0.0000
Largest residual:       0.1504      0.0142
At point:                 2           3
Second-largest residual: 0.1504      0.0142
At point:                 1           4
Select transformation type...

```

The kind of transformation type you choose depends on what you are trying to digitise.

The following excerpts from the Online Help will help you to decide which kind of transform you require:

### **Orthogonal**

Specifies translation, uniform scaling, and rotation with two calibration points. Use Orthogonal for dimensionally accurate paper drawings and paper drawings in which the portion to be digitized is long and narrow, with most points confined to single lines.

### **Affine**

Specifies arbitrary linear transformation in two dimensions consisting of translation, independent X- and Y-scaling, rotation, and skewing with three calibration points. Use Affine when horizontal dimensions in a paper drawing are stretched with respect to vertical dimensions,<sup>1</sup> and lines that are supposed to be parallel actually are parallel. The RMS (root mean square) error reported after calibration measures how close AutoCAD has come to making a perfect fit. Affine should be used if the RMS is small.

### **Projective**

Specifies a transformation equivalent to a perspective projection of one plane in space onto another plane with four calibration points. A projective transformation provides a limited form of what cartographers call rubber sheeting, in which different portions of the tablet surface are stretched by varying amounts. Straight lines map into straight lines. Parallel lines do not necessarily stay parallel. Projective transformation corrects parallel lines that appear to converge.

You only need to type the first letter of the transformation you choose, for example:

```
Orthogonal/Affine/Projective/<Repeat table>: p  
Command:
```

Once you have chosen a transformation type the digitiser is calibrated and you can begin tracing lines or points from it. Before doing so it is worth crudely checking your calibration by tracing something recognisable, in this case the box formed by the points used to calibrate the tablet. We will use a polyline to do this. Enter the command `pline` which means 'start drawing a polyline':

```
Command: pline  
From point:
```

Use the digitising puck to click on each of the four corners of the map:

---

<sup>1</sup>If the map or plan you are digitising has been photocopied you need at least an Affine transformation, if not a projective transformation.

```
Current line-width is 0.0000
Arc/Close/Halfwidth/Length/Undo/Width/<Endpoint of line>:
Arc/Close/Halfwidth/Length/Undo/Width/<Endpoint of line>:
Arc/Close/Halfwidth/Length/Undo/Width/<Endpoint of line>:
```

Use the `c` command to close the polyline and create a square:

```
Arc/Close/Halfwidth/Length/Undo/Width/<Endpoint of line>: c
Command:
```

Zoom to the extents of the drawing so that you can see what you have drawn:

```
Command: z
ZOOM All/Center/Dynamic/Extents/Previous/Scale(X/XP)/Window/<Realtime>: e
Command:
```

Purely for reference, below is a transformation table that resulted from my specifying a wrong co-ordinate during the calibration process. You can see that the RMS Error is extremely large compared to that above. Trying to digitise the outline of the mapsheet resulted in a bizarre shape rather than the square I was expecting, so I was able to identify my error.

4 calibration points	Orthogonal	Affine	Projective
Transformation type:			
-----	-----	-----	-----
Outcome of fit:	Success	Success	Exact
RMS Error:	49.9652	35.3553	
Standard deviation:	30.0272	0.0290	
Largest residual:	70.7105	35.3839	
At point:	2	3	
Second-largest residual:	70.7105	35.3839	
At point:	3	2	
Select transformation type...			

Please note that the above is an extremely simple case to get you started. You should read the [AutoCAD Online Help](#) and examine the GIS literature for coverage of digitising issues.

## 5 Learning AutoCAD

You can find online tutorials at:

<http://www.csanet.org/inftech/tutorial.html>

and

<http://www.cadtutor.net/>

However if you google for "AutoCAD tutorial" you will find many more.

## **6 Availability**

If you require a copy of AutoCAD for installation and use on your own computer the following options are available to you. Note that the Department cannot help you: these pointers are for your information only.

### **6.1 Educational Licence**

You may be eligible to purchase a discounted version of AutoCAD. This will cost approximately £300 (compared to a full retail price in excess of £3000) and may only be used whilst you are a student. You will need to contact SSI Limited:

`http://www.ssi.co.uk`

There are almost certainly other suppliers: this is one I happen to know about.

### **6.2 Clones**

You can obtain a free clone of AutoCAD called IntelliCAD: the functionality and commands are very similar to those of AutoCAD and it reads and writes R14 DWG files. You can download it from:

`http://www.cadopia.com/register.asp`

Please note the terms of the licence.