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Penmap

# Getting Started

# A Users Guide

By Strata Software

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# Introduction

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## How to use this Guide

This Guide is intended to show a user the basics of using Penmap, and is definitely the best place to start learning about the system. Penmap is a very configurable system, different user groups use completely different functions for very diverse applications. This makes providing documentation for users somewhat difficult, the Penmap Technical Reference Manual contains documentation of all aspects of Penmap, but this can be a bit daunting. So the intention of this manual is to provide an easy to use guide to answer most users questions as they begin to use Penmap.

The Users Guide will take you through the following basic steps

**Installing Penmap** – How to Install Penmap.

**Basic Concepts** - (Tips and Tricks) - This will document concepts and conditions that will apply throughout Penmap regardless of application.

**First Time Use** – This covers some of the basics of data collection.

**Using the Penmap Organiser** - Here you can find specific training workbooks and examples from users in your application area.

The later two sections of this guide will refer to example data sets on the Penmap CD ROM. Please make sure that you have it available.

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# Overview - What is Penmap?

## A field editing System

Penmap is a sophisticated field editing system that runs on a portable pen based computer. Data that used to be collected in text only loggers and plotted back at the office may now be viewed onscreen, instantly, using Penmap.

Viewing data as collected is only part of the advantage of Penmap. For the first time users are able to take existing data set out to site with them in a digital format. This existing data can then be edited along with new data being added. This greatly reduces errors and time spent is greatly reduced.

## Penmap's unique across the board functionality

Generally speaking, Penmap users are most concerned with Surveying, CAD and GIS. The Penmap System provides a common structure that each discipline can access with different but overlapping purpose.

All these users are collecting or processing graphics detail. Surveyors are involved with the storage and reprocessing of observations. CAD specialists are concerned with the editing of graphics detail and GIS users with the attributes of the graphics items represented on the survey. When all three groups share interest in the same site it makes sense that they can source the same material, reducing expensive development time and margin of error.

Penmap services the requirements of Surveying, CAD and GIS curricula by means of it's unique data structure. Consisting of Nodes, Graphics and Attributes, this sophisticated mechanism locks Graphics and their Attributes together onto a network of surveyed data points called Nodes.

Nodes, Graphics and their Attributes are interdependent, but may be edited individually or as a group by a powerful suite of utilities. Editing a node affects other nodes that have been generated with reference to it, and that editing effects the graphics and attributes attached to that edited node. Similarly, editing of a graphics item can change the nodes associated with that item, as in Adjust Item, Explode or Copy. Edition of the item affects the attributes it owns, such as the layer on which it appears or the text and symbols applied to it.

This combination of data collection and handling produces a field editing system, more powerful than any individual Surveying, CAD or GIS System, and of unparalleled multiple functionality.

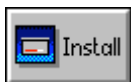


# Installing Penmap

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## Installing Penmap

To install Penmap place the Penmap CDROM into your computer. This should automatically start the Penmap Organiser. If it does not then from the Start menu in Windows95/98/NT/2000 select RUN and run DEMOORG.EXE on the CDROM.



When the Organiser is running there will be a button marked Install on the lower left-hand side of the Organiser. Select this button and Penmap will install onto the hard disk.

During Installation the user will be prompted for the installation directory. It is recommended that this is always the C:\PENMAP3 directory.

After installing Penmap the software Key must be installed.

**Please See Installing the Software Key**

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## Installing Penmap on a computer without a CDROM drive

Many Pen computers do not have CD ROM drives although most can use external CD ROMs. If your Pen computer cannot directly use a CD ROM then you have a choice of installation methods.

- A. There is a set of files which can be used to make a floppy disk based installation set. These can be found on the Penmap CD in the directory called "Penmap3/Floppy".
- B. The alternative method is to use Windows Direct Cable Connection to establish a link between the Pen computer and a desktop computer. The file "Penmap3\Setup.exe" should then be copied from the CD ROM to the Pen computer. Once this file has been moved to the Pen computer, it can be run to install Penmap.

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## Installing the Software Key

Penmap contains a copy protection system. With every copy of Penmap there is a Key disk included. This disk contains the software keys necessary to run the program.



To install a Key. The KeyMover software must be used. This was installed with Penmap and is selectable by pressing the appropriate button in the Penmap group.

If you have installed Penmap onto a computer that does not have a floppy drive then you will also need to install Penmap onto another computer which does have a floppy drive. The key can then be moved from the second computer to the Pen computer.

For instructions on using the Key Manager refer to the Key Manager documentation on the Penmap CD. This can be accessed via the Demonstration Library Organiser in the same way that this file was accessed.



# Tips, Tricks, and words of wisdom

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This section contains all of the most essential background information for using Penmap. The areas described tend to be the ones where previous users have needed assistance. Please read all of this section first.

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## Starting Penmap

Penmap must be installed properly on any computer before it can be started, this includes installing a software key from a key disk. If Penmap or the key has not been installed please read the following sections **Installing Penmap** and **Installing the software key** before finishing this section.

Switch the computer on.

**Select** 'Penmap for Windows' from the Penmap for Windows Applications Group. If there is no group or Penmap is not installed please see the following sections

See Installing Penmap

See Installing the Software Key

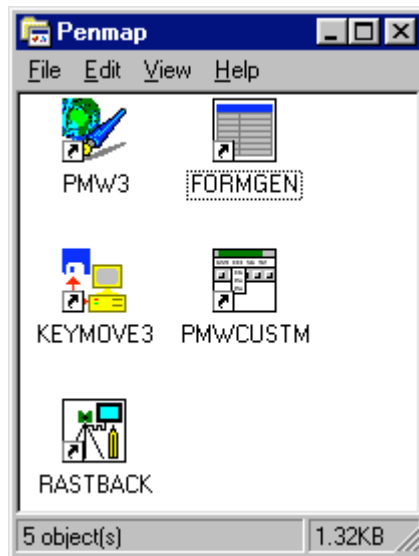


Fig: The Applications Group

The Penmap Title page will appear. This will be swiftly followed by the User Information box, into which will be stored the user's name, address, reference number, Penmap issue date and software version number.

Penmap User Information	
Name:	A N Ulmer
Address:	123 Any Street Bradford North Yorkshire UK
Serial Number	PMW UK 0000
Supplier	Survey Geoda Inc
Telephone	123 45678
Implementation	Full System
Issue Date	27/2/94 0:00:00
Version	1.00

Fig: The User Information Box

**Select** OK to move on. The Penmap Window appears. If a message appears concerning a missing Key, Then the software protection Key is missing. Please Install the Key using the Key mover and the key disk.

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# The Penmap Application Suite

The Penmap installation process will not only install Penmap but also several other supporting modules. The following is a list of the modules and a brief description.

## Penmap



This is the main Penmap module.

## Rastback



The Rastback program takes in Raster background maps and images and rectifies them for use in Penmap. For example if a map is scanned then it must be rotated so that it is exactly on the correct axis, and then it must be scaled with the correct coordinates so that it appears in the correct position in Penmap. These functions are performed by Rastback.

## The Form Generator



The Form Generator (Formgen) allows the user to design and modify a GIS database. Databases can be created, fields added, picklists assigned, etc. These databases can then be attached to buttons with the Customiser.

## The Customiser



The Customiser modifies many settings within Penmap. Items can be removed from the main menu, the button bar can be changed, default symbol libraries and Layer lists added. The complete look and feel of the system can be changed with the Customiser

## The Key Mover



This utility moves the Penmap software key from one disk to another.

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## Entering Data with a Pen

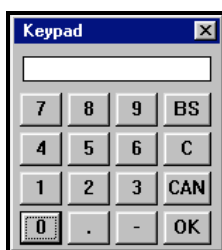
Entering data with a pen is very similar to entering data with a mouse. In fact touching the pen to the screen is identical to placing the mouse on that point and pressing the left mouse button. This allows the user to operate menus, buttons, pulldown lists, etc, with either a mouse or a pen. Penmap takes this one step further by allowing the entry of numbers and text with the pen or mouse.

An Edit Box is any field on a dialog box where data can be entered by keyboard. There are two types of edit box, one for numeric data and one for all alphanumeric data. When the pen is touched to an edit box for at least one second a keyboard will appear for alphanumeric data or a number pad will appear for numeric data.

Once either of these are on the screen the user can then enter data by tapping the pen on the keys of this on screen keyboard or keypad.

### On Screen Keypad

The On Screen Keypad is very easy to use. Numbers can be entered then when the OK button is pressed the Keypad will disappear and the number entered will appear in the original edit box touched with the pen.



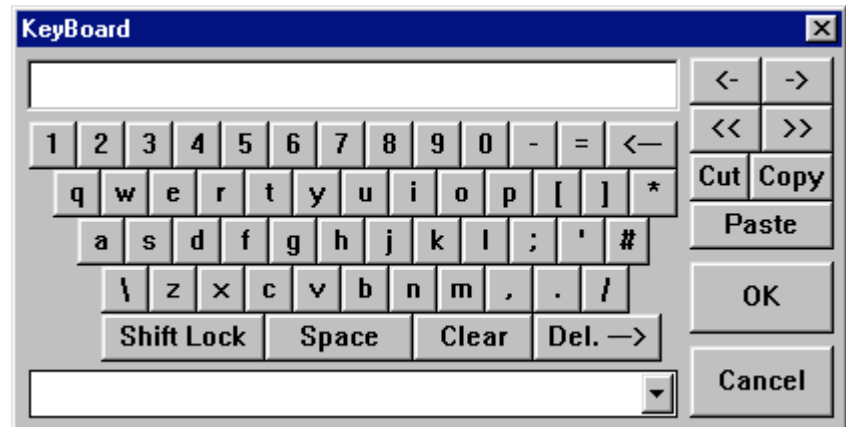
**BS** will backspace 1 character if a mistake is made

**C** will Clear the entire number entered and the user can begin again.

**CAN** will Cancel the entire procedure and no entry will appear in the edit box.

## On Screen Keyboard

The On screen Keyboard operates in effectively the same manner as the keypad but it has a few additional features.



The pull down scroll bar at the bottom of the keyboard will contain the last 20 items that have been entered. Because some things are repetitive this is very useful. Imagine you are entering addresses into a database. You enter 15 Smith Street with the keyboard. Now you move up the street and the next house is 21 Smith Street. Now you may select the last entry and only change the 15 to 21. This is done by positioning the cursor by using the move cursor keys in the upper right hand corner of the keyboard or touching the pen to the end on 15 an pressing the backspace key twice, then typing 21.

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## Basic Layout

The default Penmap window will appear across the entire screen with a Status Bar at the bottom of the screen. The black grid points appearing on the site are at ten survey unit intervals. The grey boundary box visible in the window represents the data extents of a site that is one hundred by one hundred survey units.

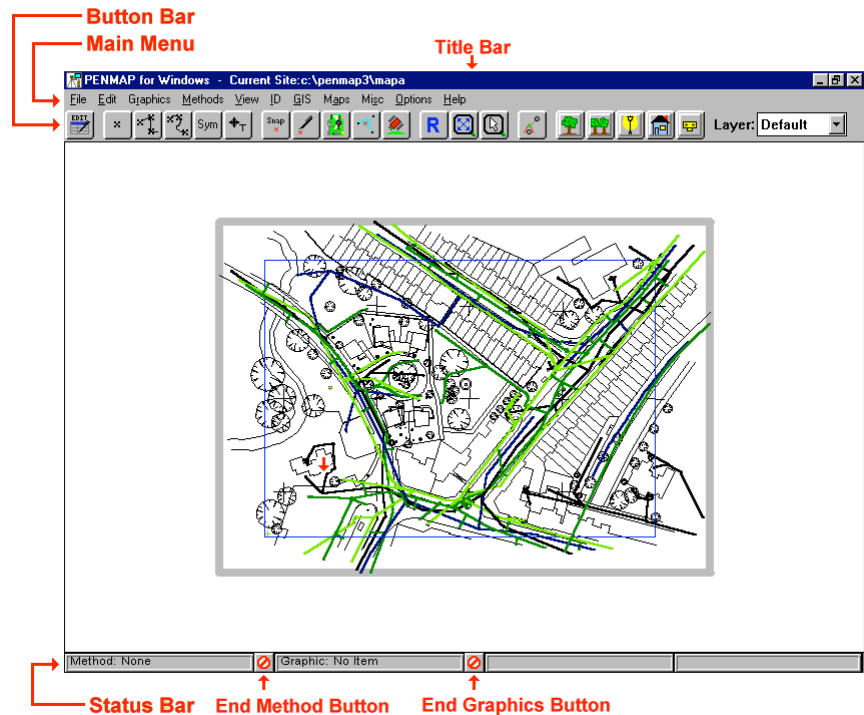


Fig: The Default Penmap Window and Status Bar

The first line below the Window identity displays the list of Main Menu options available.

The second line displays the Button Bar and the layer(s) on which the Currently selected function appear(s).

The third line shown at the bottom of the Window is the Status Bar, which confirms the identity of the currently used functions, and provides prompts for the next action to be taken.

The Button and Status Bars and the Main Menu may be selected for display or not, depending on user preference and application.

## The Title Bar

The title bar is the top row on the screen and it usually displays the site name and directory. It also can be used to display help in the form of a written description of each button. This is accessed by placing the mouse on a button for at least one second but not actually pressing any of the mouse buttons. This is an aid incase an icons meaning is forgotten.

The Title bar can also display GPS coordinates and instrument measurements. In some configurations of Penmap the Title Bar can be removed completely thus allowing more space or viewing data.

## The Button Bar

The Button Bar consists of two sections, the first being a range of *hot* buttons giving access to favourite menu functions. And the second being a selection of favourite macro functions are represented and accessed by a single button press.

The method and graphics menu buttons on the Standard Button Bar are radiobuttons; only one button may be selected (and its functions accessed) at one time. Selection of a new radiobutton automatically deselects the previous selection. The remaining buttons on the default standard button bar are all push buttons, as are the other buttons available for inclusion on the standard button bar.

## The User Buttons

The User button display at the right hand side of the button bar. The buttons shown display a symbol, simply and clearly indicating the identity of the functions accessed by that button. .

All user buttons are push buttons, so unlike those radiobuttons on the Standard Button Bar they do not remain depressed when selected.


Selection of a User pushbutton automatically checks **all** of the functions included in that macro on the menu function list.

## The Status Bar

This always appears in a line format along the base of the Penmap Window unless it has been turned off by unchecking the option.

### **The first segment - *Method***


This records the type of surveying method chosen to collect nodes currently in use on the survey and prompts the stages in the method. The

'End' button  is a convenient way of ending the type of method in use without returning to the method menu.

Selection of a method from either the Main Menu Bar or from either of the button bars is automatically confirmed in this segment.

When a menu option not involving a method is in use, the message recorded is *None*.

### **The second segment - *Graphics***

This records the type of graphics item currently under construction on the survey. The 'End' button  is a convenient way of stopping creation of this type of item without returning to the graphics menu.

Selection of a graphics item from either the Main Menu Bar or from either of the button bars is automatically confirmed in this segment.

When a menu option not involving graphics items is in use, the message recorded is *None*.

### **The third segment - *Menu / sub menu***

This records the identity of the Main Menu currently in use and the sub menu, where appropriate.

The menu (and sub menu) identities are confirmed here, whether selected from the Main Menu Bar or from either of the buttons bars.

### **The fourth part - *Message prompt***

This prompts the user regarding the next step in editing and collecting data.

## **The Data Extents box**

The grey boundary box on the Penmap Window represents the perimeter of the survey. The box is defined by two coordinates, which are the diagonal Southwest and Northeast corners of a rectangle and are called the Data Extents. The default settings for the data extents are so large that they will probably never have to be reset, however if the user have a site with a large number of data items then redoing the data extents can greatly increase the speed of the redrawing the data.

Although the tiling mesh is not visible unless the 'Show Tiling' option has been selected from the Data Extents Menu, the data extents box also acts as a perimeter to the tiling system.

## The Grid

The black dots visible within the data extents box are set at ten survey unit intervals. There are smaller, paler dots at one survey unit intervals visible when a zoom function is performed. The survey units represent either the metric (meters) or imperial (feet) measurement system in use on the survey. Data entered in or collected **must** always be measured in the same survey units for consistency.

The grid acts purely as a guide to laying down nodes and graphics items unless the Gridlock radio button is selected on the Display Configuration dialog box. This facility is mainly used in the creation of symbols.

## The Main Menu Bar

This is located across the top of the Penmap Window. Each menu option has its own pull down menu which can be accessed by pen or mouse.

### The File Menu

This pull down menu groups together operations which effect whole files. These include opening and saving files, importing, exporting and printing files.

### The Edit Menu

This pull down menu groups together editing functions that are performed on nodes and graphics objects.

### The Graphics Menu

This pull down menu groups together the graphics item options available with the Penmap software.

### The Method Menu

This pull down menu groups together the surveying method options that can be used to generate nodes on a survey with the Penmap software.

### The View Menu

This pull down menu groups together operations that affect how the data are viewed in the Penmap Window. It includes Redraw, Zoom In and Zoom Out, Window and Pan.

### The ID Menu

This pull down menu identifies survey data in the Penmap Window, such as coordinates of nodes, length of lines, contour levels, the radius of a circle and azimuth angles.

### **The GIS Menu**

This pull down menu enables a library of databases of additional information regarding the survey to be collected and edited. The Form Generator is accessed prior to using the GIS Menu in order to define a Form File, which specifies the GIS databases to be loaded into Penmap.

### **The Maps Menu**

This pull down menu deals with both Raster and Vector background maps.

### **The Misc Menu**

This pull down menu groups together access to the Status Bar, the Layer Bar and the Symbol Bar. It also groups together many diverse options, such as text attributes and fonts, graphics point styles and line styles, freezing and thawing specific data, which contribute to the general look and feel of the survey data. Instrument setup for additional equipment, which connects directly into Penmap, is also included.

### **The Help Menu**

This menu enables the user to access information about other pull down menu options. The Penmap help system now contains the full technical reference manual and notes on instrumentation as on-line help accessible from the help menu.

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## **Basic Penmap Structure and Functionality**

Penmap has a unique data structure that was designed to allow the collection of Surveying, CAD, and GIS data. Based on our experience these three areas cannot be separated and must work together in any field data collection solution. For example if a user needs to collect Polygons of forestry data, the boundaries of the polygons must be surveyed (probably with instrumentation) and then the Polygons usually get edited with CAD like functionality before they are turned into GIS (attributed) polygons.

It is helpful when using Penmap to be aware of the basic structure of the software. When using Penmap the user will continually be manipulating four basic data structures. Methods, Graphics, Layers, and GIS data. No

matter what application Penmap is being used for most of these will be used.

## Method (or Node) structure

Methods are means of collecting positional data. GPS is a method of getting positions via satellite, so is using a tape measure to record a position by two distances to known positions, and even drawing on the screen with a pen or mouse is a method.

When a method creates a position this is called a Node. A node must exist for any position to be on the screen. These nodes have no layer or attribute information but they do "remember" how they were created. This information on how positions were created is absolutely necessary for collecting surveying information and any project where quality control is important.

### Note

Nodes do not contain layer information and should not be confused with Points, which do contain layer information.

## Graphics Structure

The Graphics structure contains all of the Graphics items. Points, Lines, Polylines, Curves, Symbols are all Graphics items. One way to look at this is that the Graphics items are the CAD elements in Penmap.

Graphics elements cannot exist without nodes. For example the only way for a graphics line to exist on the screen is for it to run between two nodes.

## Layer Structure

The Layer structure allows graphics objects to be sorted into different layers. For example a graphic line might be in Layer Fence, or it might be in Layer Road.

## GIS Structure

GIS data consists of Databases attached to graphics items. For example a tree database would be attached to a tree symbol. Or a Polygon datatype would be attached to the graphics elements, which define the polygon.

When creating data on the Penmap screen all three of these areas can be occurring simultaneously. However when editing existing data the user is presented with the choice of editing one of the three levels of information. For Example if the user selects EDIT he is then presented with the option of Editing Nodes, Graphics, or GIS data. If he erases a node then all lines attached to that node will also be erased, and the lines will be removed from the GIS databases. If a Graphics line is erased the nodes will remain and can be used by other graphics items.

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## Pen Computers Vs Desktop

Penmap was originally designed as a portable data collection and editing application that would run on Pen computers in the field. As functionality has increased users have started to use Penmap as both an office and a field system. Having the same system used in both places brings many potential benefits, however there are a few areas that need to be mentioned.

Penmap is a windows application not a Pen Windows application. Pen Windows is a version of windows that comes preinstalled on many pen computers, and facilitates using a pen instead of a mouse. Penmap will operate under Pen Windows perfectly but it is best if some of the pen functionality is turned off. This is because Penmap has been designed to run on either a windows or PenWindows machine and contains its own pen functions.

To ensure that there is no conflict with Microsoft Pen Tools, make sure that the start up group does not contain the Microsoft Pen Tools icon. If it does then either remove it from the Start Up group or delete it.

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## Selecting Items

No matter what Penmap is being used for data items will have to be selected from the screen with the Pen or Mouse. The same process applies whether the user is selecting a line to edit, a node to determine a coordinate, selecting a GIS database, or many other hundreds of possibilities.

Let's say a point is to be selected on the screen. Penmap will prompt the user on the status bar to select the point. If there is only one item within a specified search distance (measured in dots on the screen or Pixels) then that item is selected. The search distance is specified in MISC - Miscellaneous Options:

In many cases there will be several items within that search distance. Under this case Penmap is unsure which one to select. When this happens the selector dialog box appears.

In the following example we will be electing a node for a resection computation.

The message prompt on the Status Bar reads (For example):

**Get base node for XXXXXXXX**

**Select** base node A on the survey. If there is only one node within the search distance then that node will be selected and the user will be returned to the dialog. However if there are more than one nodes within the search distance then one node flashes and the Selector dialog box appears in the Penmap Window:



Fig: The Resection Selector dialog box

There were three items found within the search distance. When the above dialog was displayed the first of the three was highlighted by flashing.

- Either -

**Select** Select to confirm this flashing node is the node required.

-or-

**Select** Another to choose a different node within a tight grouping of nodes and then **Select** Select as above

- or -

**Select** Cancel to choose a node in another area altogether. Then **Select** Select or **Select** Another as above

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# Data Extents

Penmap is unusual in that it has been designed to contain very large data sets; sometimes these sets can contain many millions of data items. In order to deal with this large amount of data Penmap will break the data into invisible tiles. These tiles will greatly speed redrawing and regeneration times because usually when a user has a large site he or she is only viewing one section of that site. When this happens Penmap will only redraw those tiles that are necessary for the current screen view.

Imagine that your “site” is an entire city, but you are only interested in the data from one street. Why should you wait for Penmap to sort through all of the data when the tiling system will automatically bring you the data from that street in a fraction of the time?

## The Data Extents Box

The Data Extents box displays the current data extents around the current site.

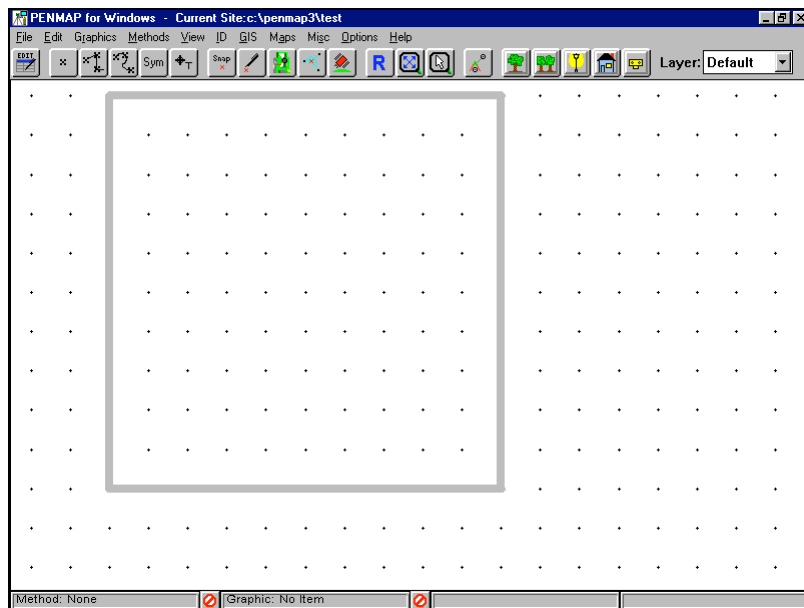


Fig. The grey box in the above screen represents the current data extents box.

## Setting Data Extents

When Penmap automatically tiles data it likes to know what the extents of the data so that the tiles can be set up efficiently. When starting a new site Penmap will automatically set the data extents to such a large area that any data collected should be inside it.

When a great deal of data has been collected and the redraw speed starts to decrease. The user may set the number of Tiles in the Miscellaneous Options dialog box in the MISC pull down menu. This will increase the

number of tiles from the default setting of one to something larger. Once this is set then the user can adjust data extents to Min Max values, which is in the Data extents section of the MISC menu. This will reset the data extents using the new number of tiles.







# Using Penmap for the first time

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## Overview

This section will discuss some of the basic points of using Penmap on its own and in conjunction with survey equipment. The intent is to discuss the basics of use and not to go into fine detail; this is done in the Penmap Technical Reference Manual.

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## Collecting Data in Penmap

Regardless of the type of data being collected there are three areas that have to be watched at all times.

1. How are we collecting data?
2. What are we collecting?
3. And what layer or GIS item is it going to be in?

The **How are we collecting it** is the survey method. This can be drawing on the screen(Free Node) , using a Total Station, or any one of 18 others.

The **What are we collecting** is the Graphics items, is it a line, a curve, a circle, etc.

The **Layer** is what gives the Graphics items their definition, i.e. the line could be part of a fence or a building. The Layer defines whether it is one or the other because the line can be in layer Fence or Building.

While data is being collected these three areas, Method, Graphics, and Layer will be changing frequently. For example the user might be collecting the edge of a road, starting off with a Graphics Line but then switching to a Curve as the road curves. Or surveying buildings with a Total Station and then switching methods to a tape measure (bilateration) to gain access to a difficult corner.

## Methods

There are over 20 survey methods in Penmap; a survey method is defined as any technique for locating a position. These methods can all be used interchangeably but they are rarely all used by the same surveyor or on the same site. Leaving the instrument methods, like Total Station and GPS, aside until a following chapter lets look at several of the most common methods. These Methods can either be selected from the Main Menu or from the Button bar depending upon which buttons are configured.

### Snap

This snaps the new graphic item being collected onto an existing node. It does not actually create a new node just uses the existing one.



### Free Node

The Free Node method will allow the position to be entered by touching the Pen or Mouse onto the screen. After selecting Free Node touching the screen will cause graphics to be drawn.



### Bilateration

Bilateration means using a tape measure to calculate a new position by measuring to two existing positions. First the user must guess where the position is on the plan by touching the screen. Then touch the pen to the first position to measure to and enter the distance. This is then repeated for the second distance.

### Sketch

This option allows sketching onto the screen.



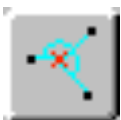
### Total Station

This allows data to be collected with a Total Station



### Resection

This involves measuring a position by angles and distances to other positions with a Total Station.





## GPS

This allows data collection with a GPS system.

## Graphics

Graphics items are the lines, curves, etc. that are being collected. The current graphic item can be selected from either the main menu or from the button bar.

The most commonly used Graphics are the following

### Points



A Graphic point should not be confused with a node. A node is a position and is not a graphic item, whereas a point is a graphic item and is assigned to a layer.

### Line

Each line segment runs from one node to the next. Each Line collected has a start and stop. This is different from a Polyline.

### Polyline



A Polyline is a continuous stream of line segments. Between the start and end nodes a polyline can have many nodes that it passes through, going around corners etc.

### Curve



This draws a curve. The curve will display as a dashed line until the curve is ended by either touching the Stop graphics button at the bottom of the screen or selecting a new graphics item.

### Text

Text can be placed on the plan just like any other graphic item. When placed the user will be presented with a dialog to enter the text and the possibility to scale and rotate the text.

### Symbol



This will place a symbol. The symbol must be selected first from either a button or the Symbol Bar (MISC – SYMBOL BAR)



## Permanent Station

Total Stations can be setup on any type of point but traditionally a Permanent Station (Also called a control point) is used to mark the position where and instrument is going to be used. After placement the user will be requested to enter a name for the station which will be displayed next to the position.

## Layer Information

While collecting data it is helpful to remember that all items being collected are going into the current layer. The current layer is either visible in the Layer Bar or it is visible on the Main menu.



Currently Selected Layer ↑

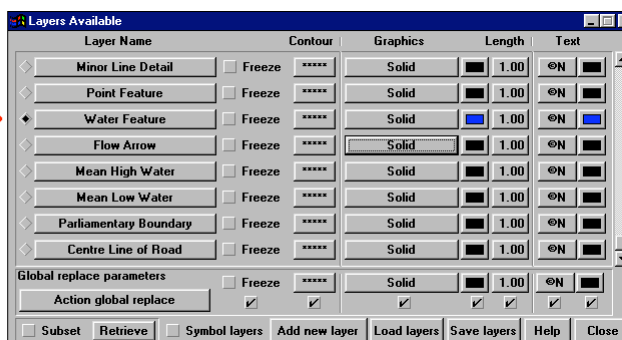
On the Button bar the current Layer can be selected from a pull-down list. This list is not present on all button bar configurations and the name Layer is frequently shortened to just "L" to save space.

## Layer Bar



The Layer Bar can be selected from the Misc submenu on the main menu or from the button bar. .

Currently Selected Layer →



The Layers Bar displays all of the current layers and they're various colours and parameters. The currently selected layer is the layer that all new graphics items are going into. For example in the above settings all new Polylines collected would go into the layer Water Feature.

## Display and Configuration Options

The other major area of interest to a new Penmap user concerns manipulating the display. The Following are the most critical areas to be familiar with.

### Zoom Functions

These functions are under View on the main menu or on the button bar. These will move or change the view on the screen. The most common are the following

#### Pan



To Pan your view on the screen select the Pan option and then touch the screen on one position. Holding the pen on the screen drag the pen to another position and then remove the pen. This will shift the map by the distance between the two points. Do Not remove the pen from the screen between the two points, it must be dragged between them.

#### Zoom In



When Zoom in is selected the user must touch the screen at the position where the user wants to magnify. The position touched will become the centre of the new view. Zoom In is available at X2,X5,X10 levels of magnification.

#### Zoom Out



Zoom out will increase the amount of map available on the screen by a factor of X2,X5, or X10

#### Window



Zoom Window will zoom in to a user selected window. When selected the user can place the Pen on the screen on one corner of the desired window and then drag the pen to the opposite corner. When the pen is removed the window will appear on the screen. The shape of the window will always be the proportion of the screen.

## Display Configuration

This is available under the Options on the main menu or on the Button bar. This is where Node display and the Grid can be turned on or off, which is needed relatively often.

The best place for a new user to start is to open a new site in Penmap (File – New) and try drawing (Method – Free Node) all of the different Graphics on the screen.

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## Collecting Data with a Total Station

### Preparing for use

A Total Station effectively measures offsets from one position to another. It does this by measuring the Horizontal and Vertical angle from the instrument position to the target along with the distance. So before any data can be collected the position of the instrument must be entered. This position must be on the Penmap screen before surveying can begin.

Usually when a surveyor is using Penmap there is a map or plan on the screen and the instrument is set up on a point on the plan. If there is not a plan then the surveyor is starting with a clean sheet, this requires some coordinates to be entered first.

Selecting **Graphics – Permanent Station** will collect a station position for the instrument. Then selecting **Method – Enter Data** will allow the user to enter the coordinates of at least one station.

The station coordinates entered can be  $X = 1000$ ,  $Y = 1000$  or any value. This requirement of having at least one coordinate on the screen before using a Total Station cannot be circumvented.

## Setting Up on a known position

A known position is defined as any position that is represented on the Penmap screen. This position could have been entered with the keypad or read in from a file. Placing a total station on a known position is done by using the instrument setup dialog. (Misc – Instrument – Setup)

ID	Type	Hz Ang	Sl_Dist	dx	dy
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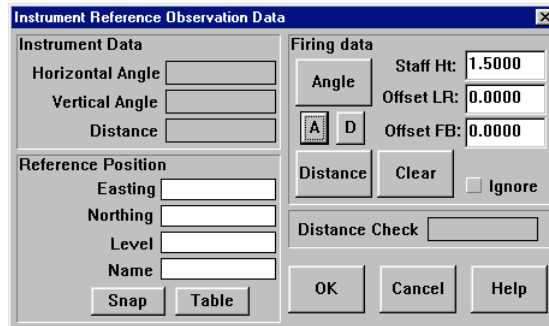
The Theodolite Position is the position of the instrument. Pressing the SNAP button and then touching the pen to the node that is the instrument position will automatically place that nodes coordinates into the Easting, Northing and Level boxes. The instrument position will then be entered.

The instrument type and communications port are also entered on this dialog along with the height of the instrument and prism.

*Some Instruments do have digital compasses that measure the orientation to magnetic north. These do not necessarily need a backsight.*

Once the instrument position has been entered the user will then need to enter a backsight. All instruments are measuring a horizontal angle but what is that horizontal angle being measured from? When an instrument is placed on a tripod Zero degrees on the instrument can be in any direction, so the user must make a measurement to another known position to calculate the orientation of the instrument.

The Backsight measurement is made by pressing the Add Obs button to add a backsight measurement. Once this is done then the Instrument Reference Dialog appears.



This dialog allows the user to select the position of the Reference node and to make a measurement to it. The Reference position is selected by pressing the Snap button and then touching the node with the pen. The measurement to the selected position is made by pointing the instrument at the node and pressing either the Angle button, which will do a set of angle measurements with no distance, or the Distance button with will do the angles AND the distance. A measurement of either type must be made along with the selecting of the reference position before the OK button is pressed.

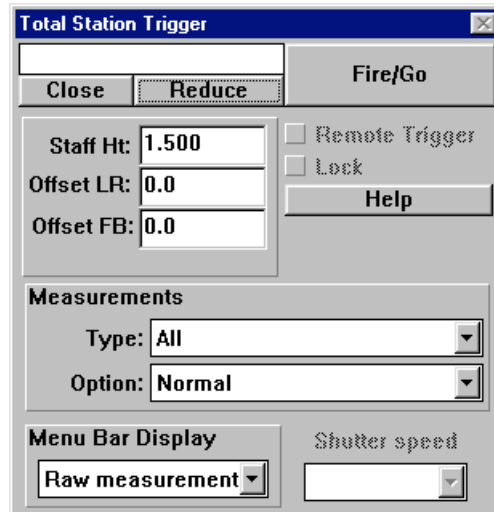
Once the reference observation has been made the user will be back to the Instrument Setup dialog and the dialog can be exited using the Close button. More than one Reference object can be used to setup an instrument but one is the minimum.

## Collecting Data with a Total Station

Once the instrument has been setup data can be collected using the Total Station Method. (Method – Total Station) When this method the Total Station dialog will appear on the screen.



Pressing the Fire/Go button will fire the instrument and download the data. There is also an expanded version of the dialog which can be accessed by pressing the expand button. The expanded dialog contains additional features such as setting the staff height, measurement type etc. Measurement Type is usually set to All and Option is usually set to Normal.



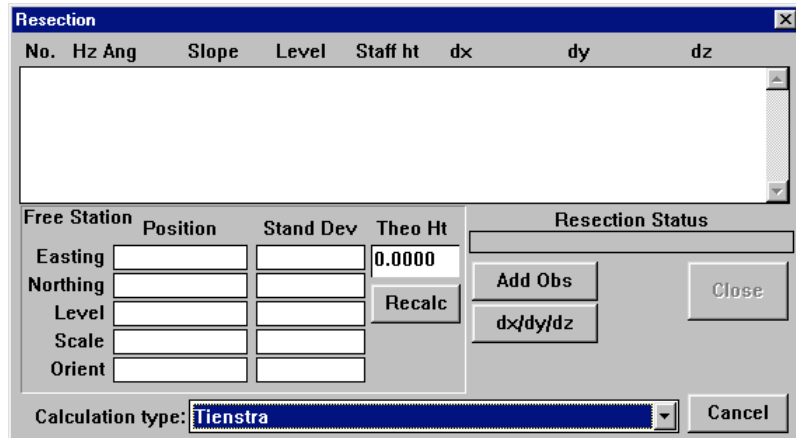
Pressing the Fire/Go button will collect the data and place the currently selected graphic on the survey. For example if polyline is the selected graphic then the user will point the instrument at positions on the polyline and press the Fire/Go button.

## Resection (or Free Stationing)

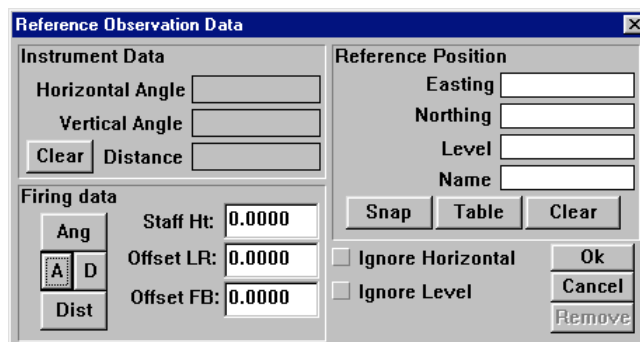
The previous section describes setting up on a known position but frequently users do not know the position where they need to setup their instrument. So they are going to set the instrument on an unknown position and then setup the instrument by observing several known positions.

The first step is to setup the instrument on the desired unknown position, making sure that from that position several known positions are visible. These known positions should be visible as nodes on the Penmap screen before starting the resection.

When the Method is set to resection (Methods – Resection) the resection dialog will appear.



This dialog is similar in some ways to the Instrument Setup procedure in that the user must make multiple measurements to reference positions. This is done by pressing the Add Obs button, which will bring up the Reference Observation Data Dialog.



This dialog allows the user to select the node to be measured to; this is usually done by pressing the SNAP button then touching the pen to the node on the screen.

The measurements to that node are done by pointing the instrument at the node then pressing either the Ang button, which will measure the angles from the instrument to the node (but not the distance). Alternatively pressing the Dist button will collect the angles and the distance to the node.

## Robotic Control

If the Total Station being used is a Robotic Total Station then there are several additional functions that might be of use. With a Robotic total station the user with Penmap is at the Prism, and all of the instrument functionality is available through a radio link. The Instrument will track the user's prism as it moves about but frequently it will lose the prism. When this happens the user can select the Instrument Control option under Misc and this will bring the Instrument Control dialog onto the screen. Touching the screen will cause the instrument to turn and point

to that position on the ground and look for the prism. The dialog also has vertical controls for the vertical angle.

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## Collecting Data with GPS

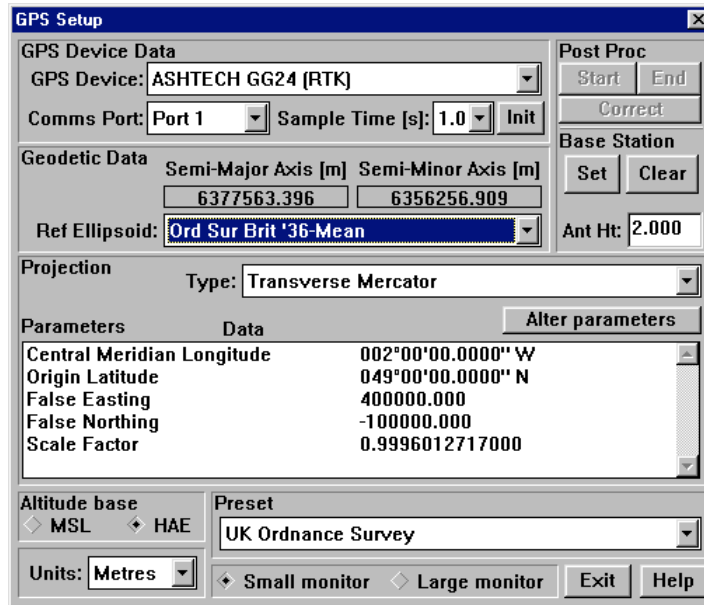
### Preparing for Use

Differential GPS works by having two GPS receivers, a base station and a rover. The base station sits on a known position and broadcasts correction information (via digital radio) to the rover receiver. These corrections allow the surveyor using the rover to achieve very accurate results.

In many ways using GPS is similar to using a Total Station, the Total station measures offsets from the Instrument to the prism, and the GPS is effectively doing the same thing from the Base GPS to the Rover.

The major difference between the two is that the Total Station can work on any coordinate system, but the GPS must work in a system that can be transformed into WGS84 coordinates. This sounds more complicated than it is

The simplest way of setting up the GPS is to go into GPS setup (Misc – GPS – Setup) and this will bring up the GPS setup dialog.



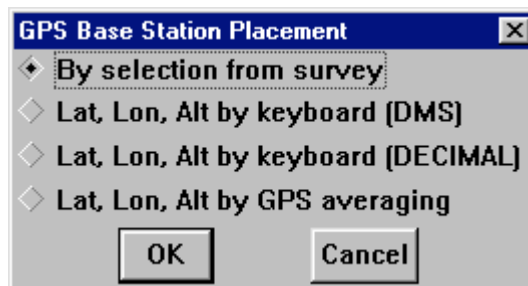
The most important field to select on this dialog is the Pre-set pull-down at the bottom of the screen. This contains a list of many countries and their transformations for using GPS. Select from this list your country or state, if it is not on the list then consult the Penmap Technical Reference manual for more information about how to set up your own transformation parameters and coordinate system.

While you have the dialog open please check that your GPS device and Comm port are correct for the equipment that you are using.

## Setting Up a base station

The setting up of a base station is also done from the GPS setup dialog. After the correct pre-set and GPS type have been entered the Set Base Station option button can be selected. Make sure that the Base station is connected and operational before selection.

This will bring up the GPS Base Station Placement Dialog.



There are four possible options for placing a base station. If there is a survey already on the screen and it is in the coordinate system that the GPS has been set to. For example if working in England and the GPS preset is UK Ordnance Survey then the survey should be in Ordnance Survey Coordinates. Then select **By Selection from survey** and then press OK. The user will then be prompted to touch the screen at the position for the base station. Penmap will snap onto the nearest coordinate and set up the base station for that position.

Another means is to enter the position in Latitude and Longitude by either degrees minutes and seconds, or decimal degrees.

The last method is to position the base station by averaging its position from GPS readings. This is the least accurate but is an easy way to learn and probably the best place to start. Selecting **Lat, Lon, Alt by GPS averaging** will then bring a menu on the screen that will show the averaged readings. Pressing the Fix Now button on that dialog will load the base station with the averaged position and start the base station running.

After a base station has been positioned Penmap should be immediately disconnected from the base station. This is because some GPS receivers will stop operating as a base if the user tries to collect data with the base.

## Collecting Data

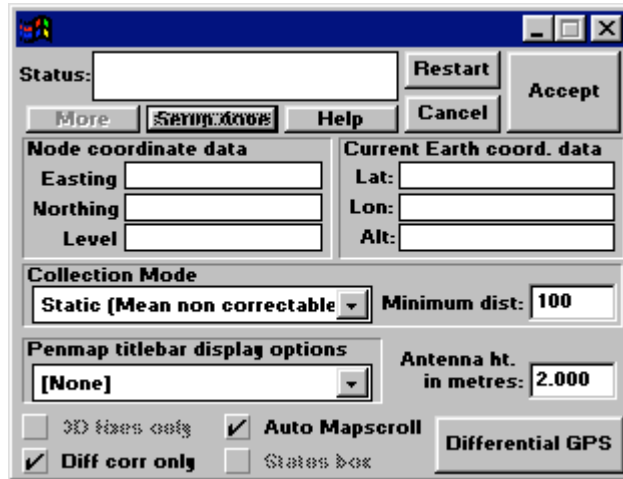


Collecting positions via GPS is done with the GPS method, which can be accessed, from either the Methods pull down menu on the button bar or from the GPS Method Button.

Selecting the GPS method will bring the GPS data collection dialog onto the screen.



The above dialog is the shortened default variant of the dialog; this contains all of the data most commonly needed to collect GPS data. Pressing the Setup button expands the dialog to show the full set of options.



This dialog controls the collection of GPS data. There are several forms of the dialog, which show different data, these forms are selectable in the GPS setup dialog.

### Collection Mode

The Collection Modes are the different means of collecting GPS data.

**Static (Mean non-correctable)** is the default setting, this means that many data readings will be averaged together to get a position. Averaging is started everytime restart is selected and a point is recorded when Accept is pressed.

**Static (Last reading only)** This means that the last GPS reading is recorded whenever the accept button is pressed.

**Minimum Distance** means that data is recorded whenever the user has moved a minimum distance from the last recorded data point. For example If the user is recording a road and the minimum distance value is 4 meters then a data point will be recorded every four meters as the user walks down the road. The Minimum Distance value can be set by entering the number in the minimum distance field.

The most important information is the Status box; this displays the current messages from the GPS receiver. The two key messages are **GPS Fix available** and **GPS Differential Fix available**. If it says GPS fix available and not GPS Differential Fix available then the system is not working in differential mode. There are several possible causes of why you might not get a differential fix

- Sometimes the receiver can take up to 10 minutes to synchronise with the base station so give it sufficient time.
- The base station might not be setup correctly. Check the digital radios to see if they are broadcasting. Most radios have an indicator to show that they are broadcasting or receiving.
- You must have at least 4 satellites visible and in some cases 5 are necessary. Is the base station near any buildings or anything else that might block the signals?
- Check all cables and connections

Once a GPS differential fix is available you are ready to collect data. Pressing the Accept button will collect the current position. Change the Graphics item to draw polylines, curves, etc.



# Using the Penmap Organiser

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## About Organiser

The Organiser is designed to assist in both learning to use Penmap and also as an aid in configuring Penmap to suit your needs. This was done by collecting examples from users and assembled them into a series of examples and tutorials.

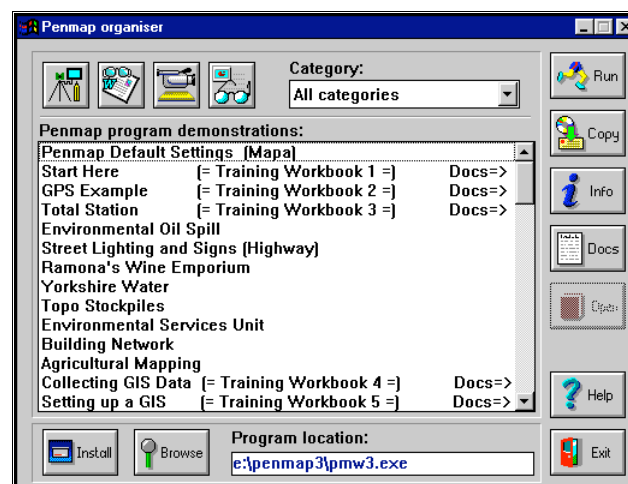
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## Running the Organiser

This section contains all of the information necessary to run the organiser.

The Organiser can be started by either placing the CDROM into the computer. This should start the system automatically. If it does not start this way then it can be done manually by running the program DEMOORG.EXE on the root directory of the CD.

When the Organiser starts the user will be presented with the following dialog



At the bottom of the dialog there are the buttons for installing Penmap onto the hard disk and for Browsing to look for Penmap on the hard disk. The Program Location: box will show the location of Penmap on the system. If it is blank then either Penmap needs to be installed or it has been installed in a directory other than Penmap3. If it is in another directory then Browse must be used to find it.

The Four Buttons at the Top of the screen concern which type of example we will be working with. They are Examples, Literature, Movies, and PowerPoint slides.

## User Examples and Tutorials



To Look at examples from other users and for training exercises press the Examples button.

This will display a description of all examples in the main window of the organiser. When an example is selected by highlighting one in the main window the user may then select a button on the right. These perform the following functions.

**Run** - Copies the example to the Penmap directory, and starts Penmap

**Copy** - Copies the example to the Penmap directory, but does not start Penmap

**INFO** - Contains a short description of what the example is and describes things to look for.

**Docs** - This section contains detailed Documentation relating to the example. Not all examples include detailed documentation, but all of the ones that say they are training exercises do. Pressing the DOCS button will automatically bring the documentation onto the screen using WordViewer and then the documentation can be printed from WordViewer.

## Penmap Articles and Literature



Pressing the Literature button will bring onto the screen all of Penmap's literature.

All of the Literature will then display in the Main Window. After highlighting a piece of literature of interest, the following button may be selected on the Right.

**Open** - This will open the literature in the WordViewer for reading or printing.

## Penmap Movies



Pressing the Movies button will bring up a list of on screen movies that you can play.

After Highlighting a Movie selecting the RUN button will start the viewer and display the film.

## Penmap PowerPoint Slide Shows



Pressing the PowerPoint button will place a list of Powerpoint slideshows onto the main Organiser Window.

After selecting the slideshow from the main window. Selecting the Run button will display the show.

## Selecting Categories

The Penmap organiser contains over 75 different examples of Penmap in use. Instead of having to sort through the entire list and find the ones relevant for any specific application the organiser Categories pull down list box can assist in that area.

The Categories Listbox contains different types of application. For example the Listbox might contain Forestry as a category. If this is selected then all examples relevant to forestry will display in the main window and the others will be ignored.



# Glossary of Terms