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USER'S GUIDE

PC ARCPLOT™

Graphic query, display, and cartographic output™

ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE, INC.

How to use this guide

This guide serves as the basic learning and reference guide for PC ARCPLOT, the cartographic toolkit for all your PC ARC/INFO® needs. This guide has several sections:

- Sections I and II present basic information about PC ARCPLOT. If you are new to PC ARCPLOT, you should read these sections first to get to know the product's capabilities and limitations.

- Section III presents important information about using PC ARCPLOT to create maps.

- Section IV contains the command references presenting detailed descriptions of each command. Once you start using ARCPLOT, the command references are where you will look to find out how to use individual commands.

- Section V contains detailed descriptions of the symbol types used in PC ARCPLOT, and the programs and procedures used to modify the default symbol characteristics to create your own customized symbols.

Before you start

Before you start using this guide, you should know what coverages are and how they are stored. If you are not yet acquainted with the ARC/INFO data model, you should read the *PC ARC/INFO User's Guide.* This introduces you to PC ARC/INFO and how it is used to store geographic information.

Audience

This guide is intended for two levels of audience:

- If you are a new PC ARCPLOT user who needs to know how to use PC ARCPLOT, what steps are involved in creating a map, and what operations one can perform with PC ARCPLOT, you should

pay particular attention to PC ARCPLOT's capabilities presented in the 'Introduction to PC ARCPLOT', the basic concepts and information discussed in the section 'Getting started', and the information presented in Section III, the 'PC ARCPLOT user reference'. In addition, you should receive training for PC ARCPLOT – either via the PC ARC/INFO Training Videos or an ARC/INFO Training Class (the intent of this guide is to supplement, not replace, your training). We assume that you are familiar with the procedures contained in the PC ARC/INFO STARTER KIT which allow you to create coverages and their feature attribute tables.

Organization

This guide is divided into five sections that include nine chapters and five appendices. Each of these sections discusses major aspects of using PC ARCPLOT.

Introduction to PC ARCPLOT

Section I contains a description of PC ARCPLOT, a discussion of this guide and limitations of PC ARCPLOT.

Getting started

Section II presents basic concepts which will help you in understanding map design and creation. This section also contains a sample PC ARCPLOT session and a list of PC ARCPLOT commands by function. This section is primarily intended for new users.

PC ARCPLOT User's Reference

Section III serves both as an introduction to PC ARCPLOT and as a detailed user guide. It is subdivided into nine chapters and an introductory section which contains important information on using PC ARCPLOT, including how to start and stop PC ARCPLOT and how to get help.

Chapter 1, 'Displaying maps', summarizes all of the options available for storing and displaying maps you have created in PC ARCPLOT, as well as important design considerations relating to map display.

Chapters 2 through 7 discuss, in detail, the operations involved in creating a map and the commands available to perform them. Topics include map positioning and scaling; specifying symbols; selecting, drawing and labeling features; adding titles, key legends, neatlines and other map components.

Chapter 8, 'Putting maps to work - query and update with PC ARCPLOT', describes the interactive query and update capabilities of PC ARCPLOT.

Chapter 9, 'Interactive map composition', discusses the commands available to interactively create and preview maps on the monitor screen prior to sending them to a printer or plotter.

PC ARCPLOT command reference

Section IV provides a detailed description of each command including syntax, argument descriptions, usage notes and examples.

Building symbols for use with PC ARCPLOT

Section V describes, in detail, the characteristics of the various symbols used in PC ARCPLOT, and shows you how to use the LINEEDIT and FONTEDIT symbol generation programs. It is intended primarily for experienced users who wish to build their own symbol libraries.

Appendices

Five appendices are included in the guide:

A - Description of the Green Valley sample data set
B - Useful conversion constants
C - Differences between PC ARCPLOT 3.3 and PC ARCPLOT 3.4D Plus
D - Default symbols
E - What to do if a problem occurs

Typographic conventions

In this guide, there are many examples showing how to use commands. In these examples, what the computer displays before and after commands are entered is shown in `plain` text. The commands themselves and any additional responses typed in by the user are shown in **BOLD**, uppercase text:

```
[Arcplot] RESELECT ZONES ARCS ZONES_ID = 2
ZONES arcs: 2 of 35 selected
```

(press ENTER) is used to denote a carriage return. Note that all commands and responses typed interactively in ARC/INFO are followed by a carriage return; but for simplicity, these carriage returns are not shown with **(press ENTER)** in examples. When a **(press ENTER)** is shown by itself in an example, it means that a carriage return is the only keystroke given.

Command usages

Most ARC/INFO commands are given with one or more arguments. These commands have a command usage which describes the correct way to give the arguments. Here are some examples of command usages:

LABELS [cover] {IDS / IDSONLY / NOIDS}

POINTMARKERS [cover] [item / symbol] {lookup_table}
{SYMBOL / ANGLE / SCALE / ALL}

MAPEXTENT {feature_class} [cover...cover]
MAPEXTENT [xmin ymin xmax ymax / *]
MAPEXTENT [IMAGE]

The command usages have the following conventions:

[ ] Square brackets enclose a required argument. Required arguments have to be given with the command. For example, to use the LABELS command shown above, you have to give the name of a coverage.

{ } Braces enclose an optional argument. For example, to use the POINTMARKERS command above, you may give a {lookup_table} value, but you don't have to. If you don't give the optional argument, ARCPLOT will, in most cases, apply a default for that argument. The command references in this guide describe the default that applies to each optional argument in a command usage.

cover	An argument shown in lowercase is an argument name that you substitute with an actual name or value. For example, for the [cover] argument in the LABELS command shown above, you would give the name of the coverage which contains the label points to be drawn in ARCPLOT.
IDS	An argument shown in uppercase is a keyword. Keyword arguments are typed in as they are shown in the usage. Note that PC ARC/INFO accepts commands and arguments in lowercase or uppercase, so you don't have to type keyword arguments in uppercase. *Note: ARC/INFO coverages must not be named the same as any of the keywords used in ARCPLOT commands.*
/	A forward slash separates mutually exclusive arguments. Only one of the arguments in the list of options separated by / can be given. For example, the {IDS / IDSONLY / NOIDS} argument in the LABELS command means that you can choose one of the options. Only one can be used when the LABELS command is given. For most commands, the first option in the list is the default.
cover...cover	Three dots between two argument names indicate that you can give one or more names or values for that argument. For example, the [cover...cover] argument in the MAPEXTENT command shown above means that you can give the names of one or more coverages.
*	An asterisk argument is typed in as an asterisk. The * argument specifies interactive coordinate entry or some other form of interactive command dialog.
MAPEXTENT MAPEXTENT MAPEXTENT	The command name itself is sometimes repeated in the command usage. This indicates that there is more than one way of giving the command in those cases where trying to show all the possible arguments in one usage line would be confusing. When the command name is repeated in the usage, each line of arguments preceded by the command name represents an alternate usage. In those cases where a command has more arguments than will fit on one usage line, the arguments are continued on the next line, but the

command name itself only appears once. For example, the POINTMARKERS command is given with four arguments, only two of which are required.

Some additional rules about command usage

1) Arguments must be entered in the order in which they are shown in the command usage.

2) Each argument must be separated by one or more blank spaces or a single comma. The single comma can be typed with or without blank spaces before or after. For example, the following are all acceptable ways of giving the MAPEXTENT command with the [xmin ymin xmax ymax] option:

```
[Arcplot] MAPEXTENT 21 34 2891 76211
[Arcplot] MAPEXTENT 21,34,2891,76211
[Arcplot] MAPEXTENT 21, 34, 2891, 76211
```

3) Each command and its arguments are entered on one line (i.e., enter the entire command line before pressing ENTER). Use the vertical bar '|' continuation character to continue a command string longer than 80 characters on the next line. The '|' can be inserted anywhere in the command string. If you type '|' and then press ENTER, the prompt (:) will appear on the next line and you can continue typing the command string.

For example,

```
[Arcplot] RESELECT PARCELS POLYS TAX <= 99 AND TAX > 12 OR LANDUSE
= 'INDUSTRIAL'
```

4) In PC ARC/INFO, the # character can be used to 'skip' over optional arguments in the command line when assigning explicit values to subsequent arguments is necessary. A default value will be substituted for the # character. The # character cannot be used to skip optional arguments in PC ARCPLOT. For example, to set your display for eight (8) lines of dialog area, you would have to specify:

```
[Arcplot] DISPLAY 4 1 8
```

You must explicitly specify your choice for the second argument {option}. If an optional keyword argument precedes a required

argument, you can simply skip the optional argument. Optional arguments at the end of the command line can be skipped by leaving them blank. For example, one usage for MAPEXTENT is MAPEXTENT {feature_class} [cover...cover]. You can skip {feature_class} by simply entering:

```
[Arcplot] MAPEXTENT [cover]
```

5) Concatenated items. In situations where an item is required as an argument in a command line, concatenated items may be used, if appropriate. Item concatenation is achieved by using the following syntax whenever an item specification would be required as a command argument.

```
ITEM1+ITEM2
```

This syntax convention indicates that ITEM1 and ITEM2, and any item between ITEM1 and ITEM2, should be used as if it were a single CHARACTER item. The concatenation is temporary and only in effect during the command with which it was invoked. Blank characters in CHARACTER item types are valid characters and would have to be accounted for during item comparison and query operations.

6) Item ranges. Some commands provide an option to specify multiple items on a command line. In these situations, PC ARC/INFO provides a shorthand convention for specifying multiple items on the command line.

```
ITEM1:ITEM2
```

This syntax convention indicates that ITEM1 and ITEM2, and all items between ITEM1 and ITEM2, will be used as if they were individually listed on the command line.

7) PC ARCPLOT is not case sensitive (i.e., you can type commands and arguments in either upper or lowercase).

Abbreviating commands

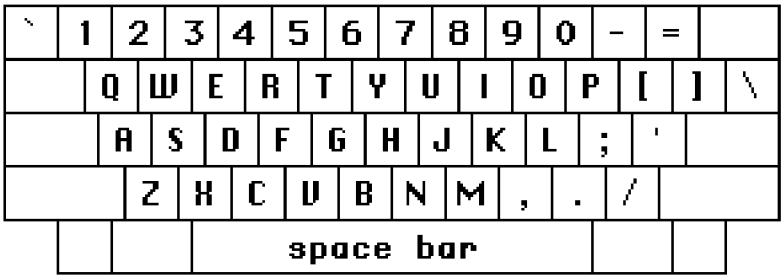
Although the examples in this manual always show commands typed in full, you can use abbreviations for most PC ARCPLOT

commands. Commands are abbreviated by typing just the first letters of the command name. How many letters you have to type depends on how many other commands start with the same letters. PC ARCPLOT will indicate if you give an abbreviation which is ambiguous.

For example, typing KEY as a command is ambiguous because there are six commands that start with these letters, where KEYPOS is an acceptable abbreviation for KEYPOSITION because no other commands start with these letters.

Alphanumeric keys

Many commands in PC ARCPLOT require coordinate input. Some of them require that certain keys be entered along with the coordinate location of the cursor. Many times, the key used to enter the coordinate location does not matter as long as it is an alphanumeric key. An alphanumeric key is one that returns an ordinary text character. The following figure demonstrates some of the valid alphanumeric keys:



Introduction to PC ARCPLOT

Welcome to PC ARCPLOT, the cartographic toolkit for all your PC ARC/INFO mapping needs. With PC ARCPLOT you can display maps on color graphics monitors and create high quality cartographic plots. You can also put your computer graphics into action with PC ARCPLOT's interactive query functions.

What is PC ARCPLOT

PC ARCPLOT provides full cartographic output capabilities for PC ARC/INFO, from simple screen displays to high quality cartographic plots for reports and presentations. It provides facilities for interactively creating and previewing maps on the monitor screen, sending maps to a printer or pen plotter, and for using maps as graphic windows to your database for interactive query and update of attribute information. PC ARCPLOT includes facilities for creating your own cartographic symbols and a macro language to create customized user applications.

PC ARCPLOT includes commands for scaling and positioning maps; specifying symbols; selecting, drawing and labeling coverage features; adding titles, legends, neatlines, scale bars, and North arrows; querying the database; and for composing plots interactively on the monitor screen. Described below are some of the features of the PC ARCPLOT product.

Product features

PC ARCPLOT lets you display maps on the PC monitor screen and create high quality cartographic products. Using PC ARCPLOT's map composer, you can create maps by positioning and scaling map components such as scale bars, North arrows, key legends and neatlines. When you have designed the map you want on your screen, you can save it or send it to your plotter or graphic printer.

PC ARCPLOT comes with an extensive symbol library, plus facilities for customizing your own cartographic symbols, including

a font editor and an interactive line symbol editor. Features from any number of coverages can be selected for display and drawn with different symbols according to their attributes.

PC ARCPLOT's interactive query functions put maps to work as graphic windows into your attribute database. You can use the cursor to select any coverage feature displayed on the screen, and that feature's attributes will immediately be retrieved and listed; or you can ask to see only those features which match specified criteria. For example, you can show all parcels whose zoning characteristics are inconsistent with the current land use plan map.

PC ARC/INFO features its own macro programming language, called SML (Simple Macro Language). With SML, you can customize the PC ARCPLOT user interface by creating easy-to-use menus for specific applications. You can also automate the cartographic production process by creating maps using SML files.

Graphic peripherals

PC ARCPLOT supports a wide range of color graphic display adapters and monitors, as well as a variety of pen plotters and graphic printers. To take full advantage of PC ARCPLOT's graphic capabilities, you will probably want to install at least a medium resolution graphics adapter (such as an IBM EGA) for screen display. In addition, you will want an output device such as a pen plotter or color graphics printer to create hardcopy maps. Section III, the chapter 'Displaying maps', contains a discussion of issues to consider when determining the best display device to use for graphic output.

Section II Getting started

Designing a map

Map design means resolving a number of technical and graphic issues regarding your map, such as at what scale the map will be drawn, and which colors and symbols you will use. If you consider these issues before starting PC ARCPLOT, you will ensure that your final map is informational and easy to read. This section discusses the design issues which contribute to the creation of a successful map.

What is a map?

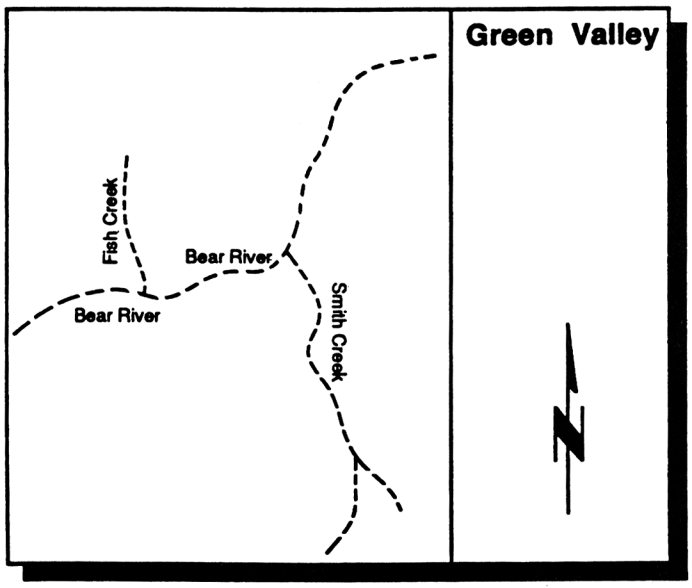
A map is a graphic representation of geographic features or other spatial phenomena which occur in the environment. A successful map conveys several types of information about the portion of the environment that is represented on the map. Locational information describes the location on the Earth's surface of particular geographic features as well as the spatial relationships between various features (for example, the shortest path from the fire station to the library). A map also contains information describing the attributes of the various geographic features represented (for example, what the feature is, its name, and perhaps some quantitative information such as its area or length). Finally, a map contains information which describes the map as a whole and aids in interpretation of the map (for example, the title, orientation, and scale of the map).

The purpose of a map is to convey information about a particular location on the Earth's surface. There are both technical and artistic facets of a map which combine to fulfill this purpose. The technical facet of a map consists of the information about the features being displayed, such as the coordinate location and attributes of the feature, as well as the scale and resolution or accuracy of the map. Scale and resolution play an important role in the display of maps and are discussed later in this section and in Section III, the chapters 'Displaying maps' and 'Positioning and scaling maps'.

The artistic or graphic facet of a map involves map design. The intent of map design is to use graphic display to convey the technical information in a manner which is appealing to the eye and easily understood. The graphic tools available to the map designer to accomplish this are symbols and labels. Symbols consist of points, lines and shades, while labels are composed of text strings. Section III of this guide discusses how to manipulate symbols and labels to produce a successful map design.

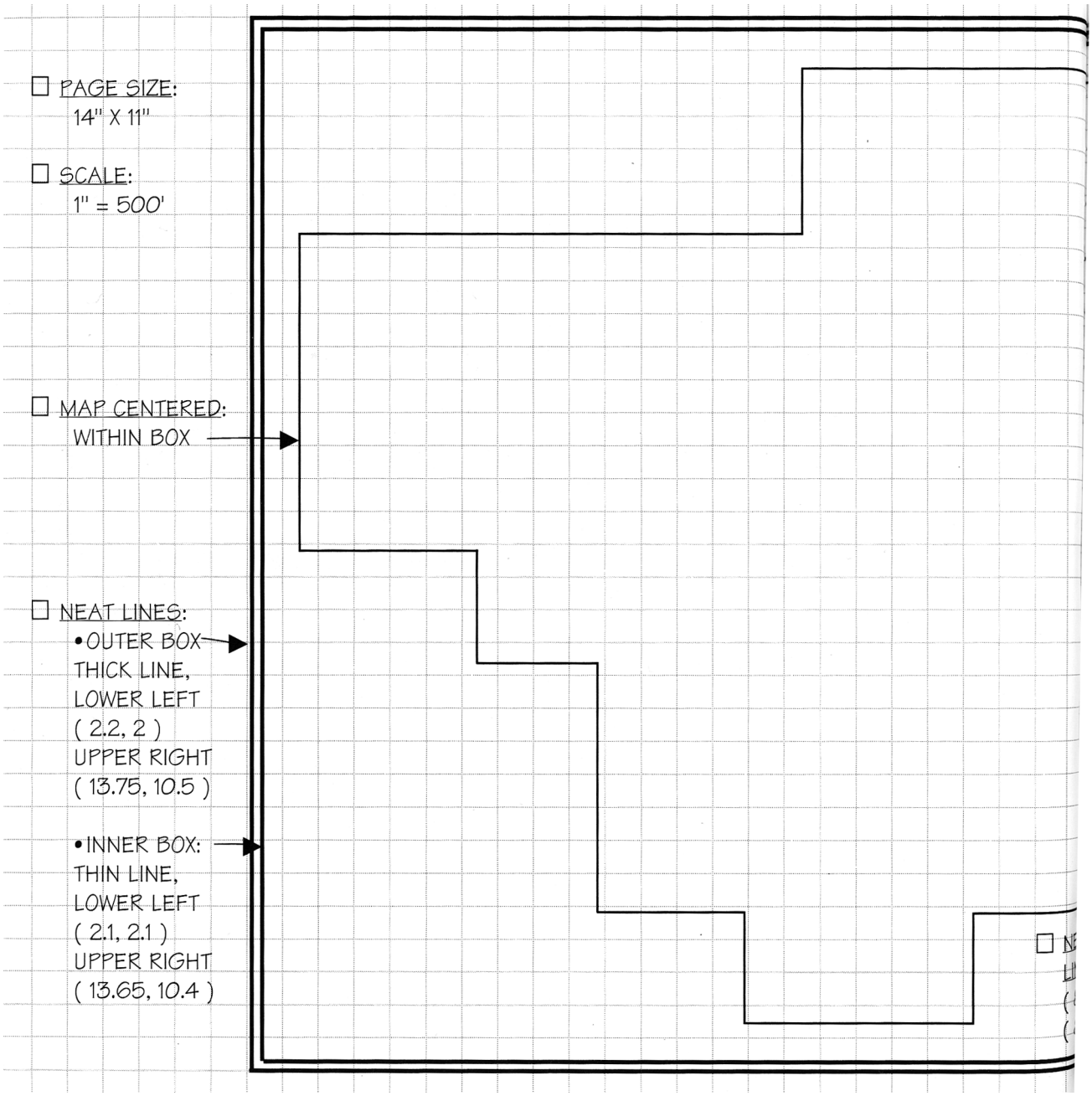
The information conveyed by a map is represented graphically as map components. Locational information is represented by points – for features such as wells or spot elevations; lines – for features such as streams or pipelines; and areas – for features such as lakes or county boundaries. Descriptive information about geographic features is presented as annotation or symbols while interpretive information about the map as a whole is presented in the form of scale bars, North arrows, key legends and titles. For example, streams can be shown using blue lines and labeled with their names, well locations can be drawn using a special marker symbol such as  , and so on.

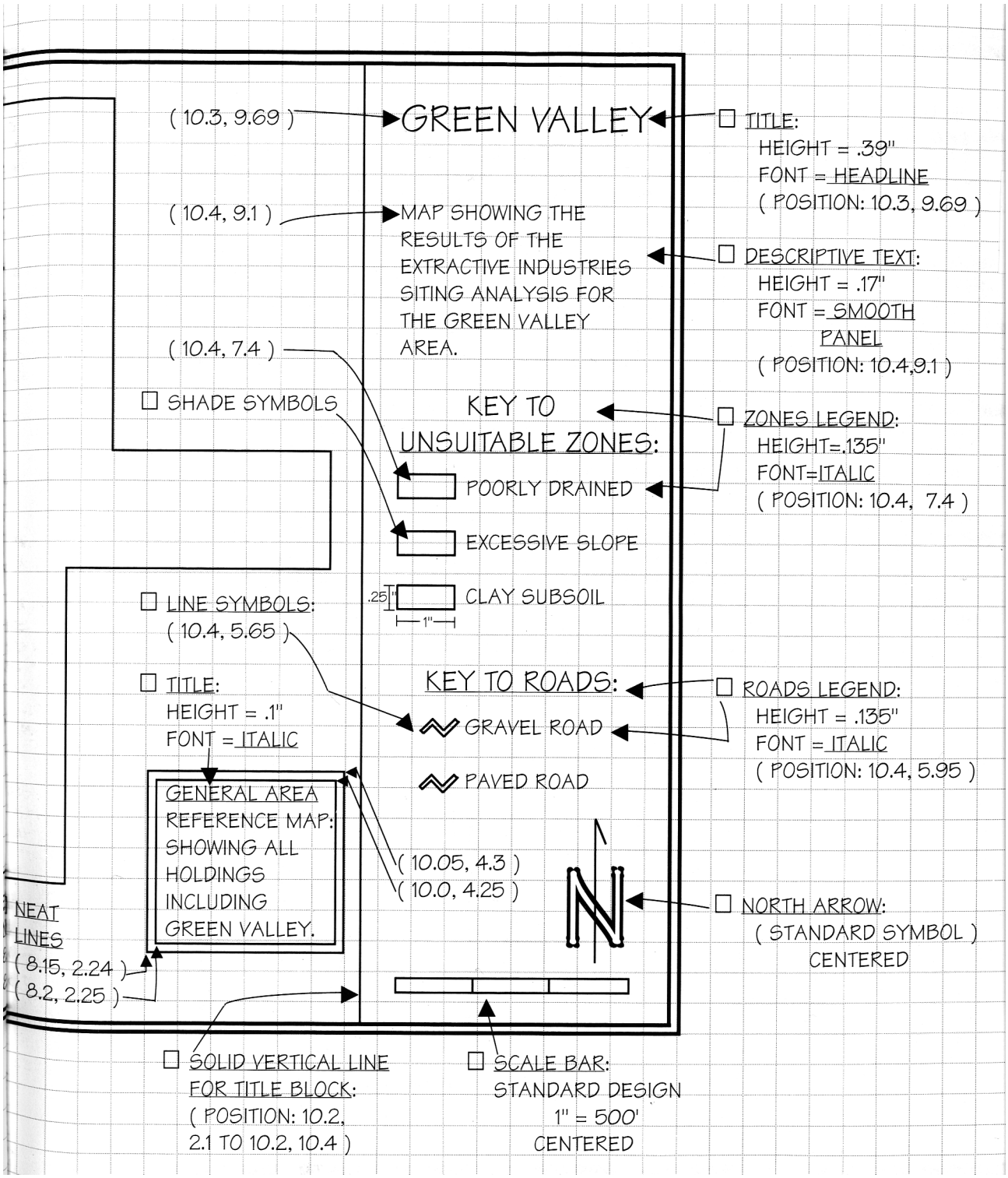
In this example, the streams are represented by a dashed line symbol, the names of the streams by labels, the North arrow by line and shade symbols, and the title by a label.



Map layout

There are a number of considerations which go into the creation of a successful map. These include the layout of the map components in relation to each other, the characteristics of the symbols and labels used, and the size and scale of the entire map. If you lay out your map ahead of time on paper, using ARCPLOT to create your final map will be easy. The next two pages show some of the graphic specifications you should resolve before starting ARCPLOT.


☐ PAGE SIZE:
14" X 11"
☐ SCALE:
1" = 500'
☐ MAP CENTERED:
WITHIN BOX
☐ NEAT LINES:
•OUTER BOX
THICK LINE,
LOWER LEFT
(2.2, 2)
UPPER RIGHT
(13.75, 10.5)
•INNER BOX:
THIN LINE,
LOWER LEFT
(2.1, 2.1)
UPPER RIGHT
(13.65, 10.4)


(10.3, 9.69)
GREEN VALLEY
TITLE:
HEIGHT = .39"
FONT = HEADLINE
(POSITION: 10.3, 9.69)
(10.4, 9.1)
MAP SHOWING THE RESULTS OF THE EXTRACTIVE INDUSTRIES SITING ANALYSIS FOR THE GREEN VALLEY AREA.
DESCRIPTIVE TEXT:
HEIGHT = .17"
FONT = SMOOTH PANEL
(POSITION: 10.4,9.1)
(10.4, 7.4)
SHADE SYMBOLS
KEY TO UNSUITABLE ZONES:
ZONES LEGEND:
HEIGHT=.135"
FONT=ITALIC
(POSITION: 10.4, 7.4)
POORLY DRAINED
EXCESSIVE SLOPE
.25"
1"
CLAY SUBSOIL
LINE SYMBOLS:
(10.4, 5.65)
TITLE:
HEIGHT = .1"
FONT = ITALIC
KEY TO ROADS:
ROADS LEGEND:
HEIGHT = .135"
FONT = ITALIC
(POSITION: 10.4, 5.95)
GRAVEL ROAD
PAVED ROAD
GENERAL AREA REFERENCE MAP: SHOWING ALL HOLDINGS INCLUDING GREEN VALLEY.
(10.05, 4.3)
(10.0, 4.25)
N
NORTH ARROW:
(STANDARD SYMBOL)
CENTERED
NEAT LINES
(8.15, 2.24)
(8.2, 2.25)
SOLID VERTICAL LINE FOR TITLE BLOCK:
(POSITION: 10.2, 2.1 TO 10.2, 10.4)
SCALE BAR:
STANDARD DESIGN
1" = 500'
CENTERED

Scale, resolution and classification

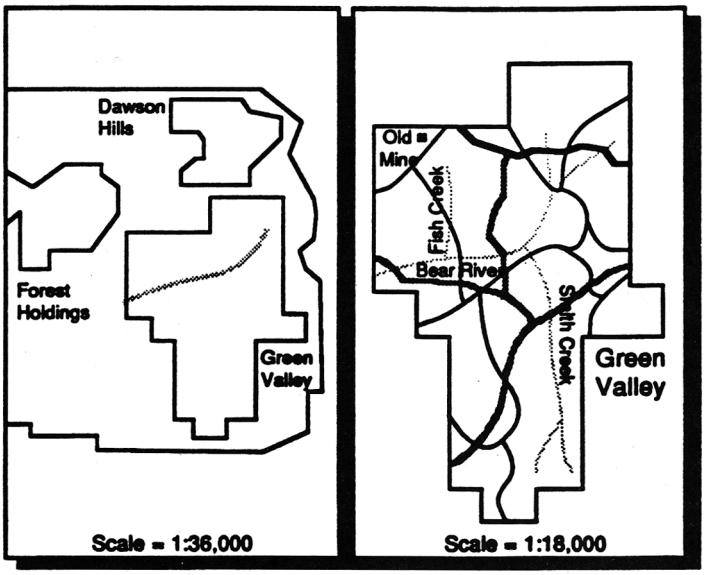
In addition to graphic considerations, there are technical factors which determine the amount and detail of information that a map can display and still be easily understood. These include scale, resolution, and classification. In most cases, there is a trade-off between the amount of information that can be communicated and the complexity of that information.

Map scale

Map scale is the extent of reduction required to display a portion of the Earth's surface on a map. It is expressed as a ratio of distance on the map page to distance on the ground.

The appropriate scale at which to display your map depends on the information you are trying to convey. Larger scale maps show features in greater detail but cover less area. Thus, important spatial relationships may not be shown. Smaller scale maps show a larger area, but the information is displayed in less detail, which may reduce the usefulness of the map for certain applications.

In this example, the same map is displayed in two different scales. The map on the left is displayed at a small scale, while the one on the right shows a portion of the same map drawn at a larger scale. More detailed information can be displayed in the large scale map.



A common solution to showing both detail and overall spatial relationships is to include an inset within your map. For a small scale map you would include a reference map showing the location of the area displayed, while a large scale map might contain a detailed inset of a portion of the map.

Map resolution

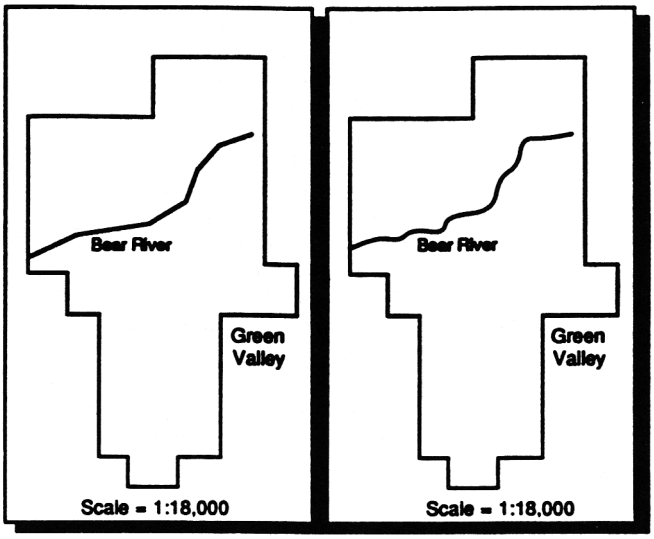
The resolution of a map determines how accurately both the location and shape of geographic features are represented. Unlike map scale, resolution is determined at the time a map is created on paper or digitized and cannot be changed in the display process. However, it is important to be aware of the implications of resolution for map display.

The scale from which a map was digitized affects the resolution of that map. In a large scale map, the location of the features more closely match the actual real-world coordinates of the feature because the extent of reduction from ground to map coordinates is less. And spatial relationships between features are more closely preserved. Also, since more detail can be shown, less smoothing of features occurs. Thus, feature shape will more accurately reflect the true shape of features represented.

Small-scale maps tend to be more generalized resulting in more variation in both location and shape of the geographic features from real-world coordinates.

It is important to remember that displaying a small-scale map, or a portion of such a map, at a larger size by changing its scale will not increase its resolution. In this example, compare two maps originally created from different scales and redrawn at the same scale. The map on the left was originally created from a smaller scale and appears much more generalized.

The map on the left was originally digitized from a 1:36,000 scale map, while the map on the right was digitized originally from a 1:6,000 scale map. Both are drawn here at 1:18,000 scale.



Similarly, displaying a map on a high resolution graphic output device such as a high quality pen plotter will not increase the resolution of the map. However, displaying a map with high resolution on a low or medium resolution device, such as the PC monitor's screen, will tend to decrease the accuracy with which geographic features are represented. The chapter 'Displaying maps', Section III of this guide, contains a discussion of resolution as it applies to graphic output devices.

Classification

As with map scale and resolution, classification also determines the quality of information displayed on your map, and thus how successful your map is in communicating.

Classification consists of grouping features into categories for display purposes. Using fewer categories simplifies the map graphic but at the same time reduces the level of detail of information displayed.

The appropriate classification scheme for your map depends on the purpose of the map. For instance, is it necessary to distinguish five classes of roads (Interstate, US Highway, State Highway, County Road and local road) each with its own line symbol? Or, is it sufficient to display them all using one symbol indicating merely the presence of a road? Displaying five symbols rather than one may require more information than can be easily understood by the map user.

It is important to remember that each additional class may make graphic display of spatial relationships more complex, and less readily understood. Grouping features by attribute to reduce the number of classes can be easily accomplished in PC ARC/INFO by performing logic on the feature attributes in your database. The chapter 'Selecting coverage features for drawing', in Section III of this guide, contains information on selecting features for display.

Creating a map with PC ARCPLOT

We want you to start making maps with PC ARCPLOT as soon as possible. This section gets you started by introducing the PC ARCPLOT commands and showing what you can do with the program. Don't worry if you don't understand how everything works all at once. It is all described in detail in later sections.

To start PC ARCPLOT, type **ARC ARCPLOT** at the DOS prompt, like this:

```
(C:\)ARC ARCPLOT
```

(In all our examples, what you type is shown in **BOLD** text, and the computer's prompts and responses are shown in plain text.) If you are already in the ARC system, just type **ARCPLOT** at the ARC prompt, like this:

```
(C:\)[ARC]ARCPLOT
```

As PC ARCPLOT starts, you will see a version number and a copyright statement. Then, as soon as you see the PC ARCPLOT prompt, which is ([Arcplot]), you can begin typing PC ARCPLOT commands.

How to make a map with pcARCPLOT

Drawing and labelling coverage features

■ *You can draw features from any number of existing ARC/INFO coverages on the same map. Features can be drawn with the same graphic symbol, or can be drawn with different symbols according to their attributes.*

Points

■ *Use these commands:*
POINTS
POINTMARKERS

Labelled points

■ *Use this command:*
POINTTEXT

Arcs

■ *Use these commands:*
ARCS
ARCLINES

Labelled arcs

■ *Use this command:*
ARCTEXT

Polygon outlines

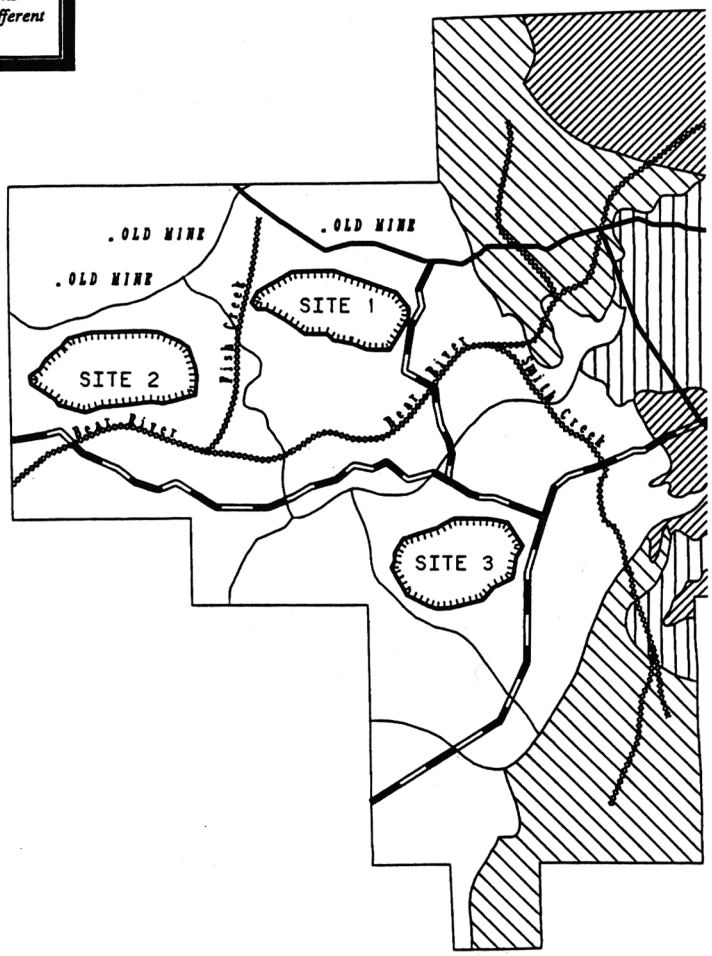
■ *Use this command:*
POLYS

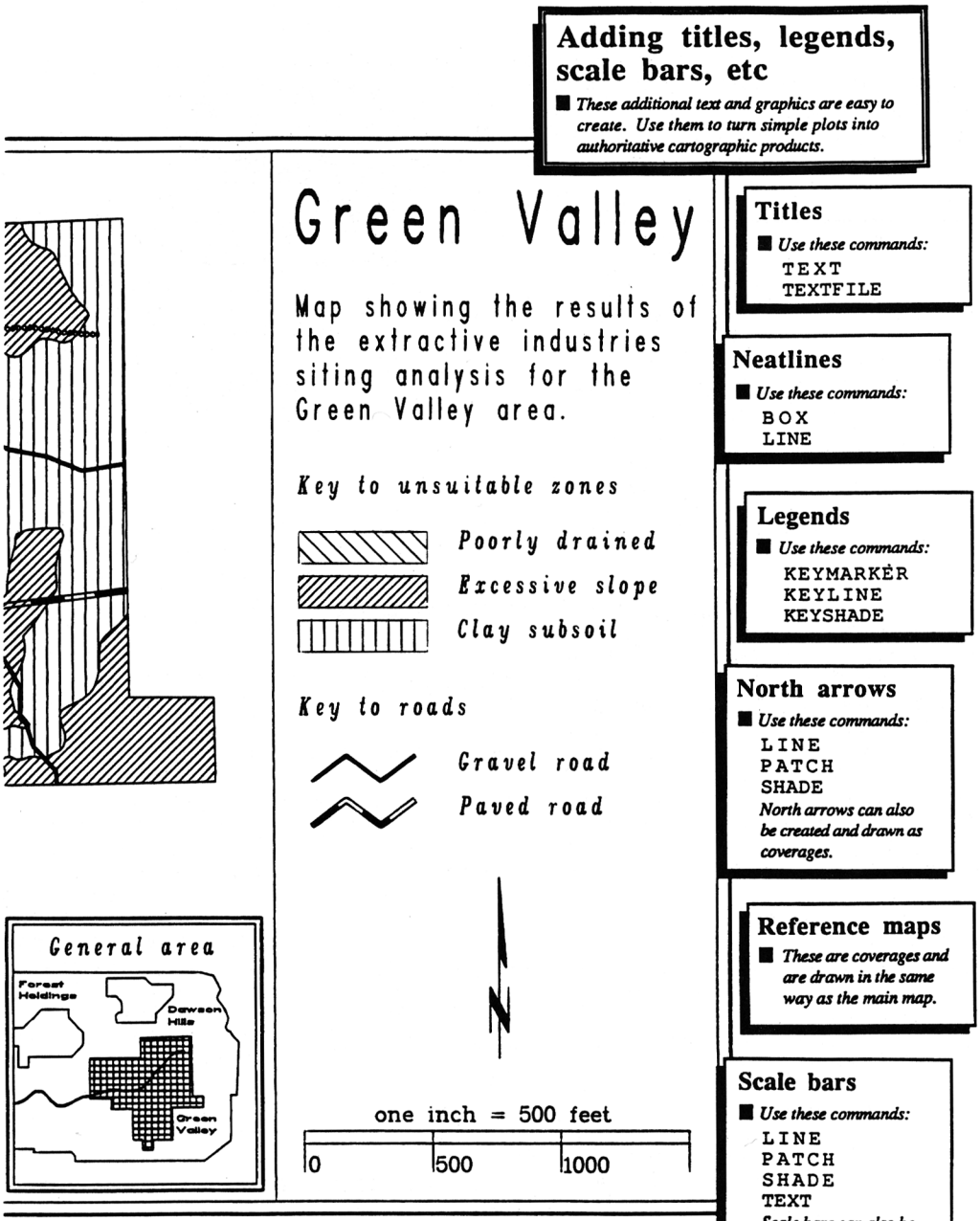
Labelled polygons

■ *Use these commands:*
POLYGONTEXT
LABELTEXT

Shaded polygons

■ *Use this command:*
POLYGONSHADES





Adding titles, legends, scale bars, etc

- *These additional text and graphics are easy to create. Use them to turn simple plots into authoritative cartographic products.*

Titles

- *Use these commands:*
  - TEXT
  - TEXTFILE

Neatlines

- *Use these commands:*
  - BOX
  - LINE

Legends

- *Use these commands:*
  - KEYMARKER
  - KEYLINE
  - KEYSHADE

North arrows

- *Use these commands:*
  - LINE
  - PATCH
  - SHADE

North arrows can also be created and drawn as coverages.

Reference maps

- *These are coverages and are drawn in the same way as the main map.*

Scale bars

- *Use these commands:*
  - LINE
  - PATCH
  - SHADE
  - TEXT

Scale bars can also be created and drawn as coverages.

neatlines. Each BOX is defined by giving the x,y coordinates of two of its corners. The LINE is defined by giving the x,y coordinates of its endpoints. Coordinates are given in inches. ARCS draws the arcs from the STREAMS coverage with the current line symbol, which here has been set to line symbol number 52.

```
BOX 2.1 2.1 13.80 10.4

LINE 10.2 2.1 10.2 10.4
LINESYMBOL 52

ARCS STREAMS
```

TEXTSYMBOL selects symbol number 32 from the ready-to-use set of 100 text symbols. This text symbol becomes the current text symbol. TEXTSIZE specifies a new height (in inches) for the current text symbol. Using the current text symbol, ARCTEXT labels the arcs in the STREAMS coverage with text strings supplied from an item called NAME in its arc attribute table. The LINE option in ARCTEXT specifies that the text labels will be splined along the arcs.

```
TEXTSYMBOL 32

TEXTSIZE 0.08

ARCTEXT STREAMS NAME LINE
```

ARCLINES draws the arcs from the ROADS coverage. Instead of using the current line symbol, it assigns different line symbols to different arcs. Symbols are assigned to arcs according to their values for an item named CLASS in the arc attribute table. ROADS.LUT is a lookup table that specifies which line symbol is to be used for each value or range of values in CLASS.

```
ARCLINES ROADS CLASS ROADS.LUT
```

MARKERSYMBOL selects symbol number 17 from the default set of 100 marker symbols to be the current marker symbol. MARKERSIZE is given to change the height of the current marker symbol by giving a new height in inches. Marker symbols are used to represent point features. POINTS draws the points in the MINES coverage and POINTTEXT labels them using the NAME item from the point attribute table to supply text. Any

```
MARKERSYMBOL 17

MARKERSIZE 0.04

POINTS MINES

TEXTCOLOR 1
```

attribute item, whatever its data type definition, can be used to supply text for labeling. The current text symbol is set to TEXTCOLOR 1 and TEXTFONT 6 which is a serif, italic font.

```
TEXTFONT 6

POINTTEXT MINES NAME
```

So far, line symbols have been selected from the default set of lines. But you can also customize your own sets of line symbols and save them as files called lineset files. The LINESET command specifies that an existing customized lineset file called SITES.LIN is to be used. The default lineset file is called PLOTTER.LIN. LINESYMBOL selects symbol number 1 from this lineset file. POLYS uses this symbol to draw the outlines of the polygons in the SITES coverage. POLYGONTEXT labels these polygons with text labels taken from the attribute item called NUMBER. POLYGONTEXT automatically finds the best position inside each polygon in which to fit the text labels.

```
LINESET SITES.LIN

LINESYMBOL 1

POLYS SITES

TEXTSYMBOL 1

POLYGONTEXT SITES NUMBER
```

LINESET specifies that the default lineset file will be used instead of the customized lineset file specified in the previous LINESET command. POLYGONSHADES normally shades all the polygons from a specified coverage. But here we only want to shade some of the polygons. So before giving POLYGONSHADES, the RESELECT command is used to select a set of polygons from this coverage according to one of their attributes. POLYGONSHADES will now only shade those polygons found in this selected set. The POLYS command is given after POLYGONSHADES to draw the outlines of all the polygons. The outlines are drawn using line symbol number 1 from the PLOTTER.LIN lineset file.

```
LINESET PLOTTER.LIN

RESELECT ZONES POLYS TYPE >= 20

POLYGONSHADES ZONES TYPE ENV.LUT

POLYS ZONES
```

MOVE indicates where the title specified with the TEXT command will be drawn on the map. MOVE specifies the x,y coordinates, in inches, of the point on the map where the lower-left corner of the first letter in the TEXT will be drawn. The

```
MOVE 10.3 9.69

TEXTFONT 1
```

current text symbol is set to TEXTFONT 1 which is a thick stemmed font commonly used for titles.

```
TEXTSPACING 1.1

TEXTSIZE 0.39

TEXT 'Green Valley'
```

MOVE is given here again to position the text that will be drawn with the TEXTFILE command. TEXTFILE draws an ASCII text file on the map. The text file can have any number of lines of text. The text file is drawn using the current text symbol and is positioned so that the lower-left corner of the first letter in the first line of the file is located at the point specified in MOVE. Text files are created prior to the PC ARCPLOT session using any system text editor.

```
MOVE 10.4 9.1

TEXTFONT 2

TEXTSIZE 0.17

TEXTFILE TITLE2
```

We have seen how commands like MOVE, MAPLIMITS and BOX specify where things are placed on the map by giving x,y coordinates in inches. When you make plots that have many different components, it may be useful to sketch the basic layout of the map on graph paper before starting PC ARCPLOT. Then you can use a ruler to measure the x,y coordinates for use in these commands.

```
MOVE 10.4 7.7

TEXTFONT 10

TEXTSIZE 0.135

TEXT 'Key to unsuitable zones'
```

PC ARCPLOT key legends show symbol samples drawn in boxes along with descriptive text about what these symbols represent. KEYPOSITION specifies where the legend will be drawn on the map. The top-left corner of the first key box will be located at the given point. KEYSEPARATION sets the distances (in inches) between the key boxes and the text, and between the different boxes. KEYBOX specifies the width and height of the key boxes. Finally, the KEYSHADE command is used to draw the shade symbol key legend by naming an existing key file. Key files are ASCII text files that contain the symbol numbers used on the map and associated descriptive text. The text is drawn using the current text symbol.

```
KEYPOSITION 10.4 7.4

KEYSEPARATION 0.25 0.10

KEYBOX 1.0 0.25

KEYSHADE ZONES.KEY
```

*Commands like MOVE and BOX position things on the map by giving x,y coordinates. When using these commands to draw a map on the monitor screen, you can use the screen cursor instead of giving x,y coordinates to indicate positions. Typing * after the command specifies that you will use the screen cursor. So the command BOX * will let you draw a box on the screen using the screen cursor to indicate its corner points. MAPEXTENT and MAPLIMITS also have * options. The interactive * options only work in screen graphics mode (DISPLAY is set to 4) and cannot be used when you are making a plot file (DISPLAY is set to 1039) or when you are plotting to a VDI/CGI device (DISPLAY is set to 1 or 2).*

```
MOVE 8.45 4.03

TEXT 'General area'

BOX 8.15 2.24 10.05 4.3

LINESYMBOL 1

BOX 8.20 2.29 10 4.25
```

These commands draw the scale bar which was created before the PC ARCPLOT session as a coverage stored in inches. MAPEXTENT is set to the extent of the TICS in the SCALEBAR coverage. This is to ensure that the annotation fits inside the MAPEXTENT and is not clipped. Setting MAPSCALE to 1 specifies that the scale bar coverage will not be scaled, so it will be drawn at the same size at which it was digitized.

```
MAPEXTENT TICS SCALEBAR

MAPLIMITS 10.0 2.15 13.9 3.15

MAPSCALE 1

ARCS SCALEBAR

ANNOTEXT SCALEBAR
```

The North arrow is drawn in the same way as the scale bar because it was also created as a coverage. The North arrow could have been drawn using commands like LINE and PATCH, but storing it as a coverage means you can position it anywhere on the map simply by using the MAPLIMITS command. It also means that you can store the North arrow permanently and use it on any number of maps. Like the scale bar, the North arrow is drawn at the center of the MAPLIMITS area because the MAPPOSITION specification given previously is still in effect. QUIT is always the last command in a PC ARCPLOT session.

```
MAPEXTENT NORTHARR

MAPLIMITS 10.85 2.9 12.85 5.0

ARCS NORTHARR

POLYGONSHADES NORTHARR 1

QUIT
```

Chapter 1 Displaying maps

Displaying maps

1 The purpose of PC ARCPLOT is to create maps for presentation and analysis. This chapter describes the various options available to you to display your maps. You can display maps on the PC monitor's screen or send them to a plotter or printer. You can also store maps as system files and redisplay them without having to recreate the entire map. Before creating your map, however, you should consider how your choice of map display will affect your map design.

Design considerations for map display

There are three different types of graphic output devices capable of supporting map display through PC ARCPLOT: PC graphic monitors, pen plotters and graphics printers. The output quality and characteristics of each of these device types varies widely across the range of available options. This diversity will influence the way you design your maps for the various devices you currently have

installed as part of your PC ARC/INFO® workstation. Factors such as display resolution, map size and scale, and the range of symbols and colors available for a particular device define the suitability of the various devices for specific applications.

Resolution

When designing a map, the resolution of the output device is an important consideration. For instance, the PC monitor screen may be relatively limited in its size and ability to display detailed graphics. Thus, excessive detailed descriptive information such as titles, key legends and labels tend to make the map appear cluttered, and reduce the quality of the information displayed. Maps which are created for screen display should be simplified as much as possible and should utilize solid lines, simple shading patterns and minimal descriptive text. The complexity of information displayed may also be affected by hardware limitations. For example, polygons containing more than 10,000 points cannot be shaded using the hardware shadeset COLOR.SHD.

Printers and plotters, on the other hand, have the ability to display detailed graphics due to their fine resolution and larger size. Maps displayed on plotters or printers can contain complex descriptive information without reducing the quality of the map.

Map size and scale

Map size and scale are also important considerations in your map design. PC ARCPLOT allows you to determine the size of your map by setting a specific scale or by setting the size of the map and letting the scale default to allow the map to be drawn inside the limits you specified. In addition, PC ARCPLOT includes commands that allow you to specify where on the map page graphics and coverage features will be drawn.

It is important to remember, when choosing the appropriate output device, that the maximum dimensions of the surface area for a map display are limited to the dimensions supported by the graphic output device.

The chapter 'Positioning and scaling maps' in this section and the chapter 'PC ARCPLOT command reference' in Section IV, contain

more information on the commands used to specify the size and scale of your map.

Colors and symbols

The display device you are using also determines which colors and symbols are available for creating your map. The following table shows color display capabilities for some commonly used output devices. Note that your graphic printer or pen plotter may not support the same range of colors that are available on your graphics card and monitor display. Also, plotter colors depend on which pens you have loaded in your particular plotter.

	Device			
Color	EGA/VGA	CGA	4-Pen Plotter	B/W Graphic Printer
0	Background	Background	Background	Background
1	White	White	Black	Black
2	Red	Magenta	Red	
3	Green	Cyan	Green	
4	Blue		Blue	
5	Yellow			
6	Cyan			
7	Magenta			
8	Dark Grey			
9	Light Grey			
10	Light Red			
11	Light Green			
12	Light Blue			
13	Light Yellow			
14	Light Cyan			
15	Light Magenta			

PC ARCPLOT allows you to display up to 16 different colors at any one time, in your map, if your graphics card and monitor support this capability. If you want to display the available colors on the monitor screen, use the COLORINDEX command. Type:

```
[Arcplot] COLORINDEX *
```

and use the screen cursor to indicate the lower-left and upper-right corners of a box on the screen. A color index will be drawn inside this box showing the colors. The COLOR command lets you customize this palette of screen colors by specifying a percentage color mixture for a particular color number using either the red/green/blue (RGB) or the cyan/magenta/yellow (CMY) color mixing system. For example,

```
[Arcplot] COLOR RGB 14 10 30 10
```

redefines color number 14 to be a 10% red, 30% green and 10% blue, which specifies a dark green.

Note: Screen color redefinitions made with the COLOR command only last for the duration of the current PC ARCPLOT session.

When you are sending graphics to a plotter or printer, the range of colors available to you is determined by the range provided by the output device and how the device has been configured. Most pen plotters use 4 to 8 pens. If your device is a four-pen plotter, specifying color number 2 in a PC ARCPLOT command like LINECOLOR will access pen number 2 on the plotter, but the actual color this produces on the plot depends on the color of the pen that has been inserted in that pen location.

If you specify a color which is unavailable on your plotter, another pen will be used. How the unavailable colors are specified depends on the plotter you are using. In most cases, unavailable colors are specified either as black or as the color of the highest available pen color.

It is a good idea to sequence your plotter pens so that they match the sequence of screen colors. Screen colors 1 through 4 are white, red, green and blue when you use the EGA card, so organize your four

plotter pens in the same way (substituting a black pen in pen location number 1 for what appears white on the screen). In this way, when you preview a plot file on the monitor screen before finally sending it to a plotter, it will appear on-screen in approximately the same colors as the final plot. This makes it easier to check that everything has been specified correctly in the plot file.
To ensure that only available colors are used in your map if its final destination is a pen plotter, PC ARCPLOT includes a set of symbolsets which use only four colors (black, red, green and blue). An alternative symbolset included in PC ARCPLOT uses all 16 available colors while a third uses only one color (black) for creating maps on a black and white graphics printer or mono/graphics monitor. The chapter titled 'Specifying symbols' in this section contains more information on specifying symbolsets.

Displaying graphics

So far, we have discussed graphic design considerations, such as map size and scale, and the use of colors. The rest of this chapter describes the various methods of displaying graphics on specific output devices such as graphics monitors, pen plotters and graphics printers. You can display maps as they are created or store them to be displayed when they are needed. Options for creating and displaying stored maps are discussed at the end of this chapter.

How to display graphics on the PC monitor screen

The DISPLAY command is normally the first command you use in a PC ARCPLOT session because it specifies where your graphics will be displayed. Typing:

```
[Arcplot] DISPLAY 4
```

puts the PC monitor into screen graphics mode. The monitor screen will clear, and the PC ARCPLOT prompt will reappear at the top of the screen in the command dialog area. This area is where you will enter commands. The DIALOGCOLOR command lets you specify the color of the text and bar in the dialog area. By default, the command dialog area is 4 lines long. The rest of the screen beneath the command dialog area is used to display graphics. Once you are in screen graphics mode, anything you draw appears directly on the screen. DIALOGCLEAR will clear all text from the dialog area, while CLEAR will clear all text and graphics from the screen.

If you want the command dialog area at the top of the display to be longer or shorter than 4 lines, you can specify this using the DISPLAY command. Typing:

```
[Arcplot] DISPLAY 4 1 8
```

specifies that the command dialog area will be 8 lines long. When you increase the length of the command dialog area, it reduces the size of the available graphic display area on the screen. The number 1 given in this example is the default value for an argument which can be used to specify dual screen and dual page display mode options. For details on these options, see the DISPLAY command reference in Section IV.

If your graphic card supports more than one graphic page, there are alternatives to using one screen with dialog at the top and graphics below. One of these options is to set two virtual screens – one for text and one for graphics. Typing:

```
[Arcplot] DISPLAY 4 3
```

will initiate this mode. All prompts and messages will appear on the text screen, and all graphics will appear on the graphic screen. Using the ESCAPE key will toggle between the two screens. See the DISPLAY command reference in Section IV for more details on this option.

The PENSPEED command allows you to reduce the speed at which your CGI-driven plotter draws graphics. This may be important when using a smooth material such as MYLAR® or special types of ink with your plotter. See the command reference in Section IV for more information on PENSPEED.

Storing maps

An alternative to sending maps directly to an output device is storing them as system files. Storing maps in PC ARCPLOT allows you to display them quickly without having to issue all of the commands you use to create the map. There are two ways to store maps in PC ARCPLOT – as ESRI plot files and as map compositions.

The ESRI Plot System

The ESRI plot file system allows you to store a map as a plot file which can then be sent to a graphic output device. The PC ARC/INFO Arc processor and PC ARCPLOT both contain several commands for displaying plot files. These commands are discussed below.

Setting DISPLAY to 1039 specifies that PC ARCPLOT graphics will be written to an ESRI plot file. When DISPLAY is set to 1039, you are immediately prompted to name the plot file that will be created:

```
: DISPLAY 1039
Enter Plot filename: STATEMAP.PLT
```

The plot file name you give should have the extension .PLT. If you omit this extension, PC ARCPLOT automatically adds it to the end of your specified plot file name. Once you have specified the plot file, you can give any PC ARCPLOT commands to create the map. The plot file is closed when you QUIT PC ARCPLOT or when you give the DISPLAY command again with any setting. Nothing is drawn on the graphics screen when DISPLAY is set to 1039. The default output dimensions of maps created as plot files is 108 inches wide by 34 inches long. It can also be displayed on the PC monitor screen.

How to display ESRI plot files

To draw an ESRI plot file on a CGI-driven plotter or graphics printer, use the DRAW command in the PC ARC/INFO STARTER KIT. The DRAW command is implemented as a utility command.

To draw an ESRI plot file on a CalComp, Hewlett–Packard or Bruning Zeta plotter, use the PLOT command in the PC ARC/INFO STARTER KIT. The PLOT command is implemented as a utility command. See the PC ARC/INFO on-line help for a description of the CalComp-compatible plotters supported by the PLOT command.

Plot files can be displayed on the graphics monitor using the DRAW command in the PC ARC/INFO Arc processor. This is useful, for example, to preview plots before sending them to a plotter for final hardcopy, or to display graphics on screen so that they can be

photographed for slides. If you are in PC ARCPLOT, use the PLOT command to display a plot file on the monitor screen.

Map compositions

Maps can also be stored as map compositions. Map compositions are created interactively on your PC's monitor screen and can be stored at anytime during a PC ARCPLOT session. A map composition is actually a subdirectory containing a set of ESRI Plot System files. The advantage of storing maps as map compositions is that they can be redisplayed quickly on the screen and interactively edited. The chapter titled 'Using interactive map composition' in this section discusses how to create and edit map compositions.

How to display map compositions

Map compositions and individual map elements can be displayed using the PC ARCPLOT PLOT command subsequent to setting the display device. For example, typing:

```
[Arcplot] DISPLAY 4
[Arcplot] PLOT GREEN.MAP
```

will display the map composition GREEN.MAP on the PC monitor screen, while typing:

```
[Arcplot] DISPLAY 1
[Arcplot] PLOT GREEN.MAP
```

will display GREEN.MAP on a CGI-driven plotter, and typing:

```
[Arcplot] DISPLAY 2
[Arcplot] PLOT GREEN.MAP
```

will display GREEN.MAP on a CGI-driven printer. Note that with most graphics printers, no graphic output will appear until you QUIT PC ARCPLOT or until you give the DISPLAY command again with any option.

If you created a map composition at a specific PAGESIZE, you will have to specify that same PAGESIZE each time you plot that map composition within ARCPLOT.

To send a map composition to a CalComp, Hewlett–Packard or Bruning Zeta plotter, use the PLOT command included with the PC ARC/INFO Arc processor.

Note the differences between the PLOT command included with the PC ARC/INFO Arc processor and the PC ARCPLOT PLOT command:

ARC PLOT	• invoked from command or at the [ARC] prompt • sends an ESRI plot file or a map composition to a CalComp, Hewlett–Packard, or Bruning Zeta plotter.
PC ARCPLOT PLOT	• invoked from PC ARCPLOT (at the : prompt) • displays an ESRI plot file or a map composition on the PC monitor's screen, or sends it to a CGI-driven plotter or printer

Chapter 2 Positioning and scaling maps

Positioning and scaling maps

2 ARCPLOT lets you specify all the vital statistics of maps, such as what area the map represents, output size, map scale, angle of rotation and where maps are positioned on your monitor screen or plot. If you don't specify map scale or output dimensions, ARCPLOT will simply draw a map as large as will neatly fit on your graphics screen or plot paper. Usually though, you will want to specify scale and position in order to create specific cartographic products.

Map positioning and scaling is also known as map-to-page transformation because it controls how the coverage coordinates are

transformed into a graphic on the display page of your output device (screen or plot). Coverages are not maps, but they contain the unscaled coordinates that PC ARCPLOT uses to draw maps.

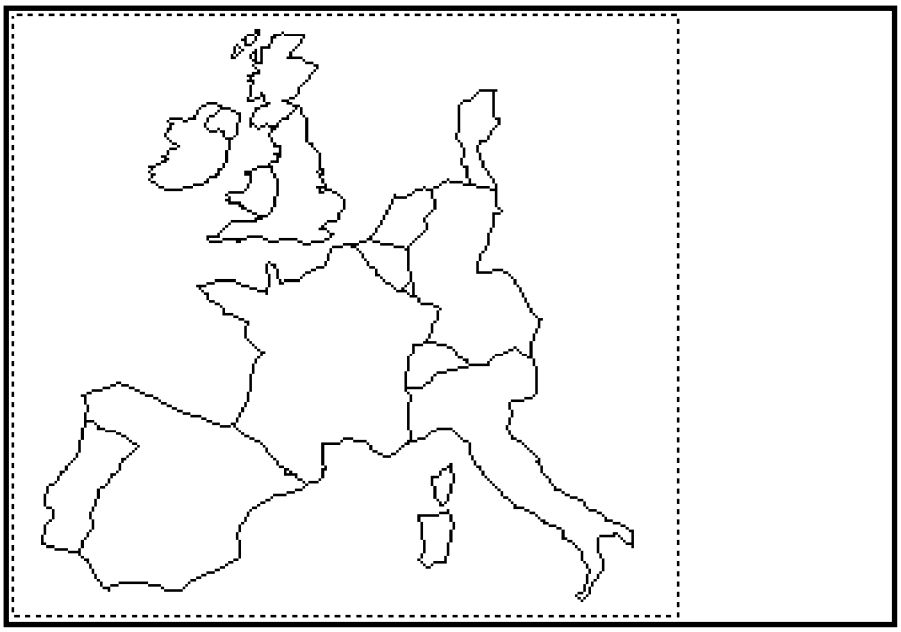
How to specify which geographic area will be covered in a map

Use the MAPEXTENT command to specify the geographic area that will be represented on your map. MAPEXTENT is the only command described in this chapter that you have to give in every PC ARCPLOT session. There is no default MAPEXTENT.

MAPEXTENT can be thought of as a window that defines which coverage area will be accessible to PC ARCPLOT from the total area covered by your database of coverages. Coverage features that fall outside this MAPEXTENT window will not be drawn, and those that fall partly outside will be clipped around the edge of the window.

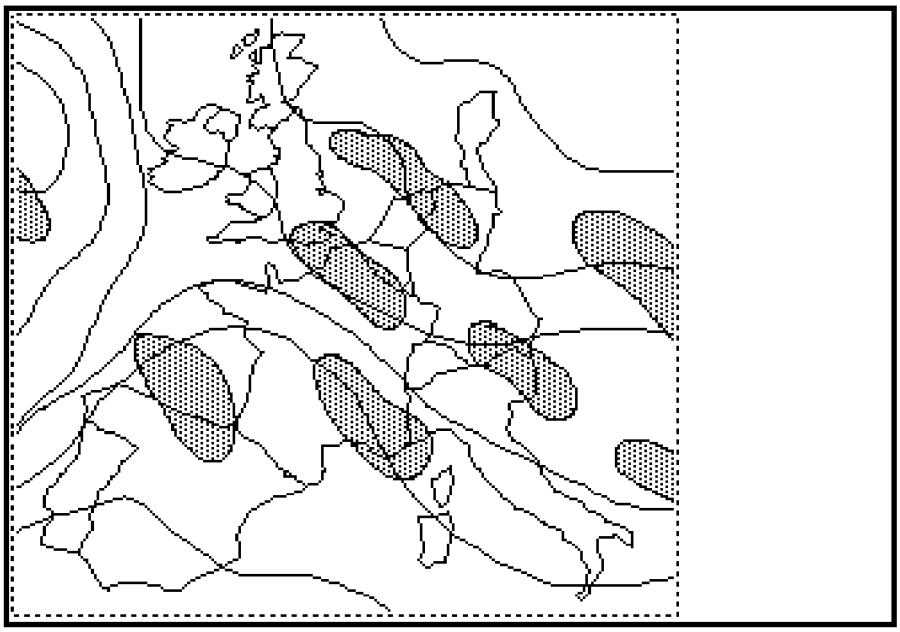
The simplest way to specify MAPEXTENT is to name a coverage. The coverage's boundary file, known as the BND file, is used to obtain the MAPEXTENT window. In the example below, the MAPEXTENT was set by giving the name of the coverage:

```
[Arcplot] MAPEXTENT EUROPE
[Arcplot] ARCS EUROPE
```



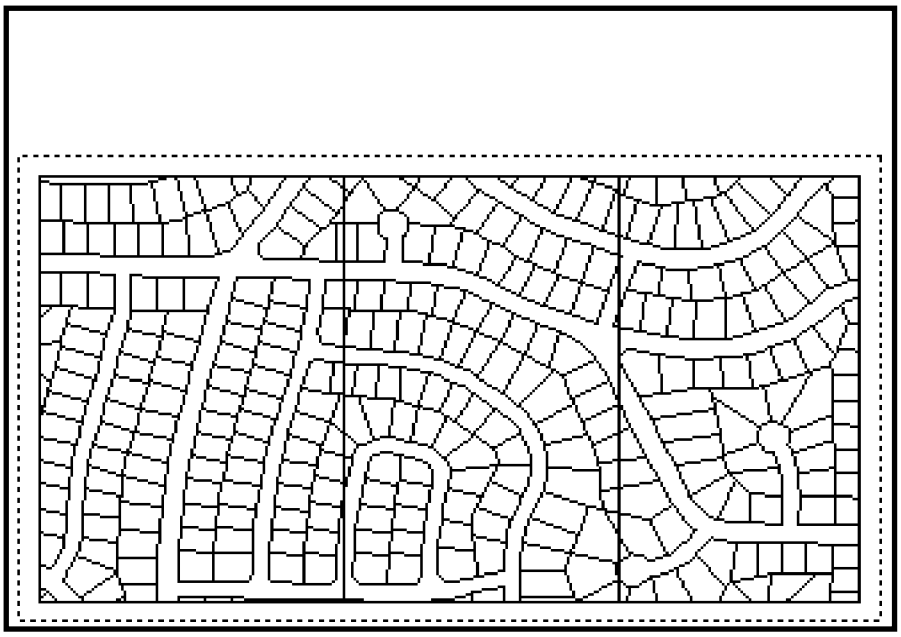
Even though only one coverage was named to set the MAPEXTENT, features can be drawn from any coverages that cover all or part of the same area. So, when you have a number of coverages that store different features for the same geographic area, you only need to name one of these coverages in MAPEXTENT to be able to draw features from any of them.
In the following example, the MAPEXTENT is set to EUROPE. Features from coverages CONTOURS and ZONES are drawn and are clipped where they fall outside the MAPEXTENT:

```
[Arcplot] MAPEXTENT EUROPE
[Arcplot] ARCS EUROPE
[Arcplot] ARCS CONTOURS
[Arcplot] ARCS ZONES
[Arcplot] POLYGONSHADES ZONES 56
```



When you want to draw a map that includes several neighboring coverages, you can name more than one coverage to set the MAPEXTENT window. In the following example, the MAPEXTENT window is set large enough to encompass the area represented by three coverages ZONE4, ZONE5 and ZONE6:

```
[Arcplot] MAPEXTENT ZONE4 ZONE5 ZONE6
[Arcplot] ARCS ZONE4
[Arcplot] ARCS ZONE5
[Arcplot] ARCS ZONE6
```



When you name several coverages to set the MAPEXTENT, the coverages do not have to be adjacent to each other. The MAPEXTENT is set large enough to encompass the coverages wherever they are located in relation to each other.

MAPEXTENT normally reads the BND boundary file of the named coverage(s) to obtain the coordinate window that will be accessible in the map. However, you can name a coverage feature class in the MAPEXTENT command if you want the window to be limited to the area covered by a particular set of coverage features. For example,

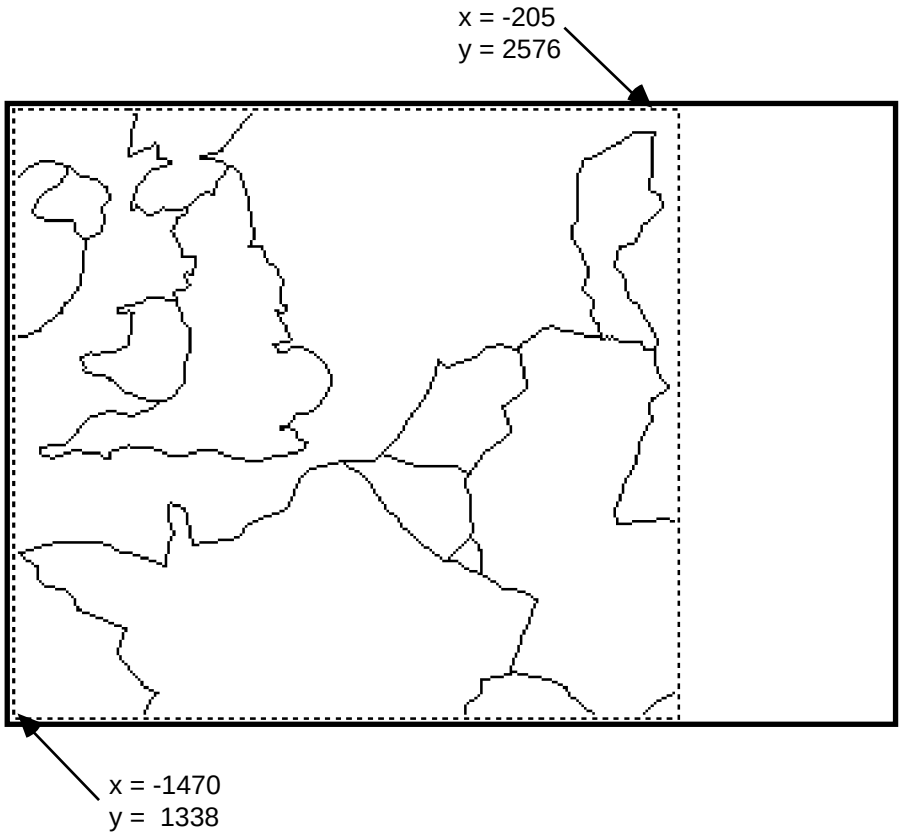
```
[Arcplot] MAPEXTENT POLYS STREETS
```

will set the MAPEXTENT window to the extent of the polygon features in a coverage called STREETS.

If you want to make a map of a particular part of a coverage, you can give the coordinates of the lower-left and upper-right corners of the desired window directly in the MAPEXTENT command. The coordinates are given in the same units in which your coverage

coordinate data is stored. (These units are called MAPUNITS.) In the following example, the MAPEXTENT is set to be the coverage area with a lower-left corner at coordinate point -1470, 1338 and an upper-right corner at coordinate point -205, 2576:

```
[Arcplot] MAPEXTENT -1470 1338 -205 2576
[Arcplot] ARCS EUROPE
```

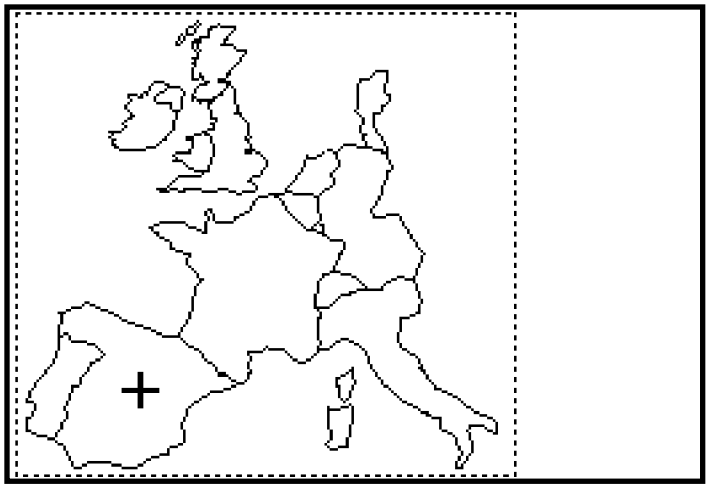


You can also set the MAPEXTENT interactively from an existing map display on the graphics screen. Typing:

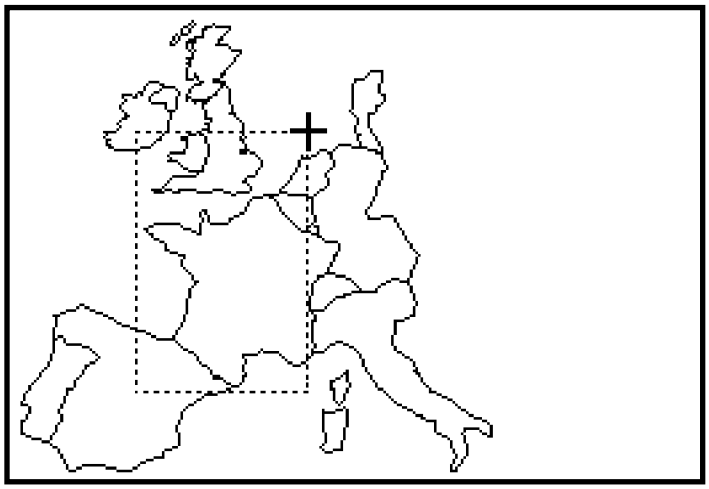
```
[Arcplot] MAPEXTENT *
```

lets you indicate two corners of the desired window with the screen cursor. Specifying MAPEXTENT interactively and then redrawing the coverage features is the best way to zoom in on a particular area. MAPEXTENT with the * option demands that you have already set MAPEXTENT using one of the other methods in order to draw the initial map display on the screen. Here is how to set MAPEXTENT with the screen cursor:

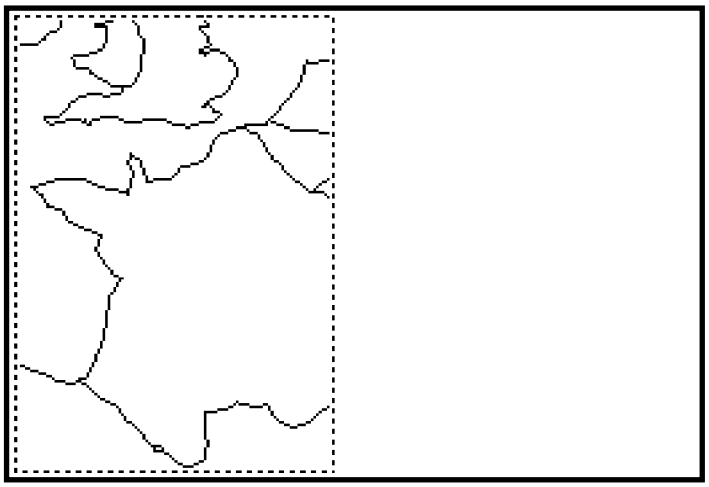
*Before you can set MAPEXTENT interactively, it must have already been set using one of the other methods. In this example, MAPEXTENT has already been set to EUROPE and the arcs from this coverage have been drawn. Now give the MAPEXTENT command with the * option. Next, position the screen cursor at one corner of your desired map extent window and press any alphanumeric key.*



Finally, position the screen cursor at the second corner of your desired map extent window and press any alphanumeric key.



The MAPEXTENT is set to the window you have just defined. For example, if we now give the CLEAR command to clear the screen, and then draw the arcs from the EUROPE coverage, only those arcs falling inside this MAPEXTENT window will be drawn.

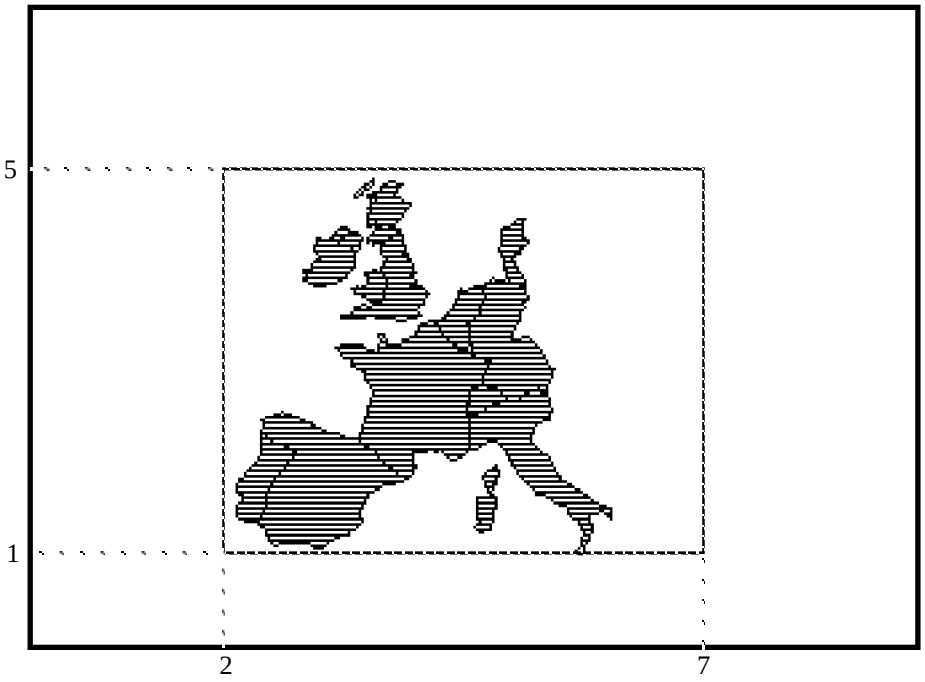


How to make a map of a certain size

The MAPLIMITS command specifies the area on your plot or graphics screen where coverage features can be drawn. If you don't specify a scale for your map, PC ARCPLOT will simply draw the coverage features large enough to fit neatly inside your specified MAPLIMITS area. In this case, MAPLIMITS also controls how large coverage features can be drawn.

In the following example, the MAPLIMITS command is used to specify that the coverage features on the map will be drawn inside an area no larger than 5 inches wide by 4 inches high. The coordinates of the lower-left and upper-right corners of the desired MAPLIMITS area are given in inches:

```
[Arcplot] MAPLIMITS 2 1 7 5
[Arcplot] MAPEXTENT EUROPE
[Arcplot] ARCS EUROPE
[Arcplot] POLYGONSHADES EUROPE 10
```



In the example above, no MAPSCALE was specified, so the coverage features from the specified MAPEXTENT area were automatically drawn large enough to fill the specified MAPLIMITS area on the device display page. If you do not specify MAPLIMITS, PC ARCPLOT will automatically make the MAPLIMITS equal to the whole available display page (the plot paper or the graphics screen). When you draw coverage features they will thus be drawn large enough to fill the display page. So you do not need to give the MAPLIMITS command if you simply want the map to be drawn as large as possible.

Note that the coordinates used to specify MAPLIMITS are given in inches. These are inches on the display page of the device you are using. The coordinate origin for the display page is the lower-left corner of the plot paper or graphics screen. Coordinates that specify location on the device display page are in PAGEUNITS. PAGEUNITS applies only to the device display page and is not related to the MAPUNITS, such as feet or meters, in which your

coverage coordinate data is stored. For example, you can't specify MAPEXTENT in PAGEUNITS.

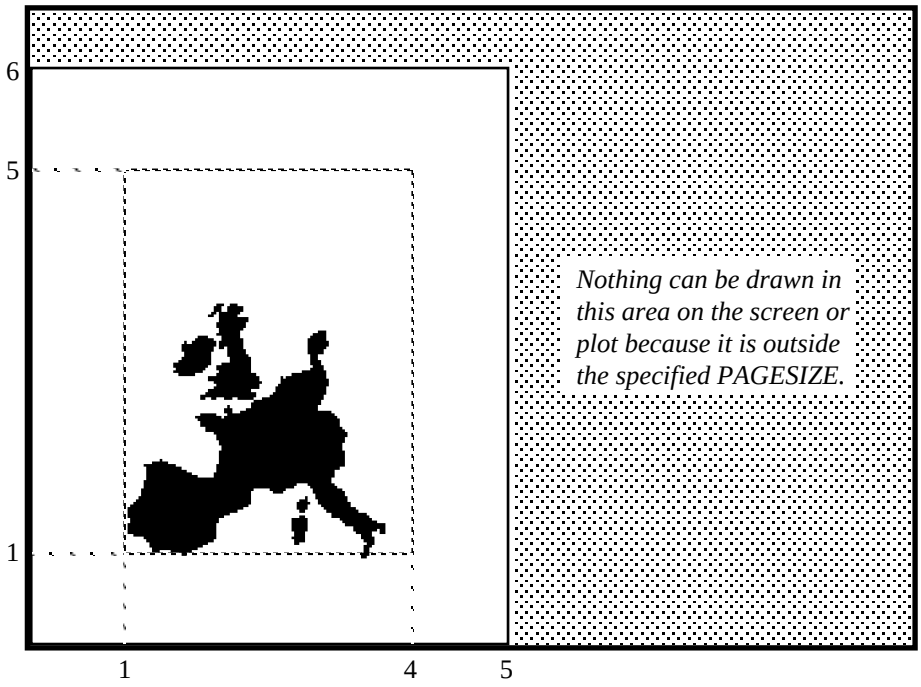
MAPLIMITS only affects where coverage features are drawn on your map and has no effect on cartographic additions like titles and legends drawn with commands like TEXT, LINE, DRAW, etc. These additional graphics can still be drawn anywhere on the available display page.

Use the PAGESIZE command when you want to ensure that no graphics are drawn outside of a specified area on the device display page. PAGESIZE is used to change the size of the graphics page. The graphics page is that part of your device display page where graphics can be drawn. PAGESIZE controls the size of the entire PC ARCPLOT graphic because nothing can be drawn outside the specified graphics page.

In the following example, PAGESIZE is used to specify a map no larger than 5 inches wide by 6 inches high so that it can fit into a small report. In addition, the map has to have a border of about one inch in which titles could be drawn, so the MAPLIMITS command was given to specify an area in the center of the graphics page:

```
[Arcplot] PAGESIZE 5 6
[Arcplot] MAPLIMITS 1 1 4 5
[Arcplot] MAPEXTENT EUROPE
[Arcplot] POLYGONSHADES EUROPE 1
```

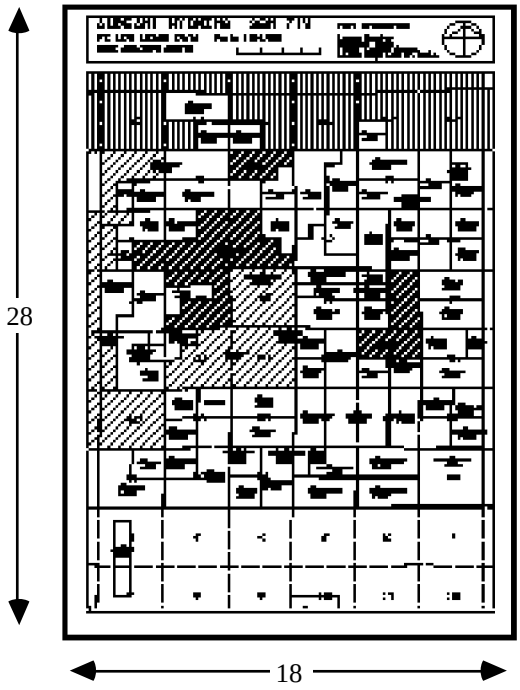
PAGESIZE sets the width and height of the graphics page in inches (PAGEUNITS). The MAPLIMITS command specifies which part of the graphics page specified in PAGESIZE will be used to show coverage features. In this example, the MAPLIMITS specification leaves a one-inch border between the edge of the MAPLIMITS area and the edge of the graphics page for titles. The graphics page you specify with PAGESIZE is always located at the lower-left corner of the actual display page supplied by your device:



When you don't give the PAGESIZE command, the PAGESIZE defaults to the device display page, that is, the available screen or plot area on your output device. When DISPLAY is set to 1039, the PAGESIZE defaults to 107.9 inches wide by 34.8 inches high. When the monitor screen is being used for graphic display (DISPLAY is set to 4), the PAGESIZE defaults to the area of the screen below the command dialog area (about 9.6 inches wide by 5.6 high when the command dialog area is four lines long). The MAPINFO command can be used to determine the exact dimensions of the PAGESIZE.

What if you want to design a large map on your graphics screen? Very often, the size of the map you want to make will exceed the size of your graphics screen. In this case, you should give the PAGESIZE command before you do any drawing. Whenever the PAGESIZE you specify is larger than the available display page on the graphics screen, everything you draw will be scaled down to fit onto the screen. In this way, you can design a large map on the small screen (and of course, when you plot out the final map, the hardcopy will be at the correct large format).

For example, below is a petroleum lease map we created with PC ARCPLOT. It is 18 inches wide and 28 inches high:

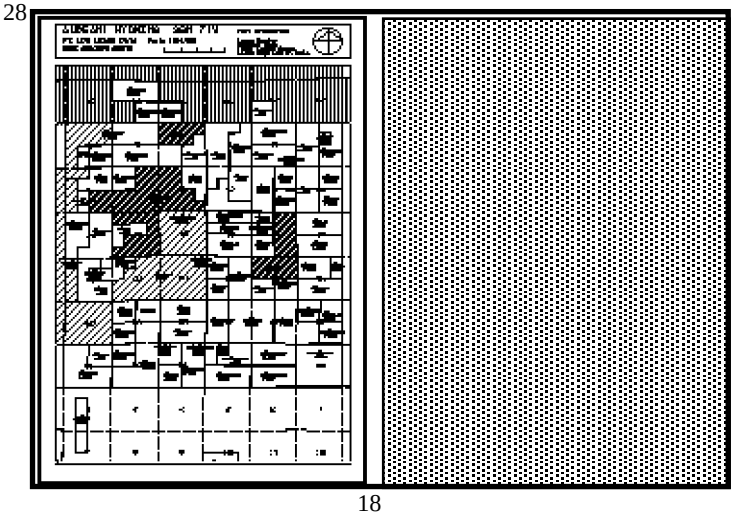


In order to design this map interactively on the graphics screen, the PAGESIZE command was given at the beginning of the PC ARCPLOT session:

```
[Arcplot] PAGESIZE 18 28
```

The area shown here is the available display page on a graphics monitor screen. The display page is approximately 9 inches wide by 6 inches high. If you don't give the PAGESIZE command, the PAGESIZE will default to the size of the available display page, here, 9 by 6 inches.

Even though the actual size of this display page is 9 by 6, you can specify a larger PAGESIZE. Whenever your specified PAGESIZE is larger than the screen, everything you draw will be scaled down to fit onto the screen. Here, the PAGESIZE was specified as 18 by 28. This enabled us to create the entire 18 by 28 inch lease map on the screen.



How to position maps inside the MAPLIMITS

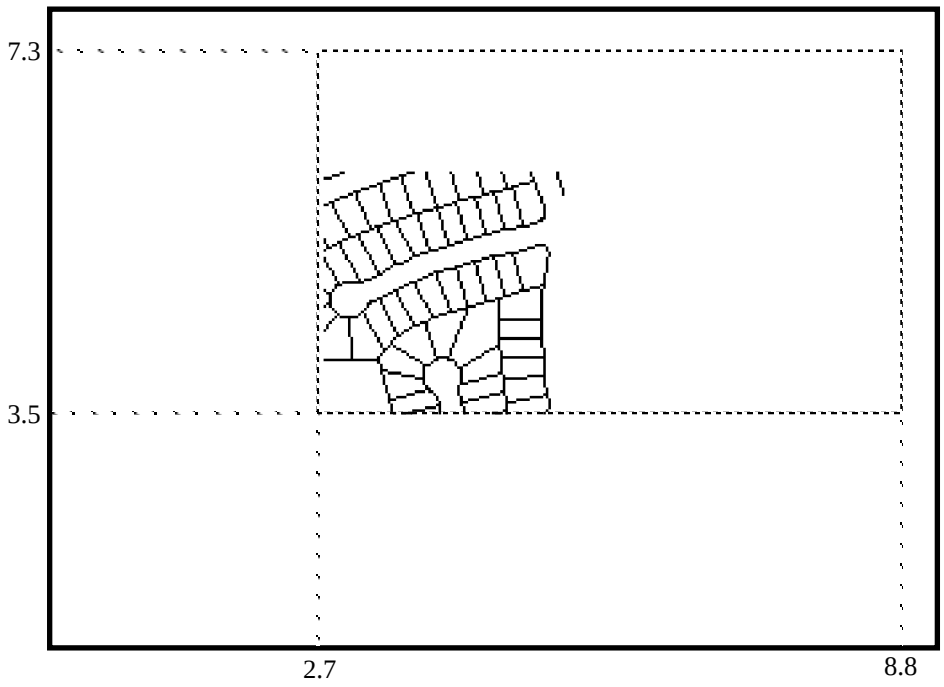
When coverage features are drawn inside the area specified in MAPLIMITS, they are automatically positioned so that the lower-left corner of the area defined in MAPEXTENT is placed at the lower-left corner of the MAPLIMITS.

This lower-left positioning is the default in PC ARCPLOT. So, in the same way, if no MAPLIMITS have been specified, coverage features are automatically positioned so that the lower-left corner of

the MAPEXTENT is placed at the lower-left corner of the device display page or graphics page specified in PAGESIZE.

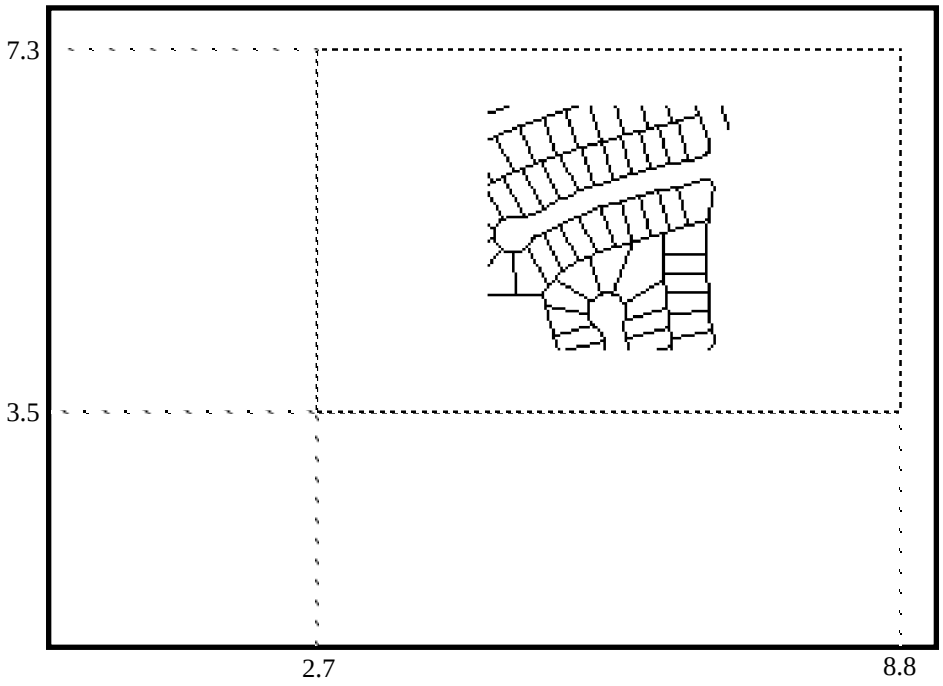
In the following example, the coverage features from the MAPEXTENT do not fill the specified MAPLIMITS area because a MAPSCALE was specified too. When a MAPSCALE is specified, the coverage features from the MAPEXTENT are drawn at the specified output scale which, in this example, results in the coverage features being drawn smaller than the available MAPLIMITS. The coverage features are automatically positioned at the lower-left corner of the MAPLIMITS:

```
[Arcplot] MAPEXTENT ZONE5
[Arcplot] MAPLIMITS 2.7 3.5 8.8 7.3
[Arcplot] MAPUNITS METERS
[Arcplot] MAPSCALE 2000
[Arcplot] ARCS ZONE5
```

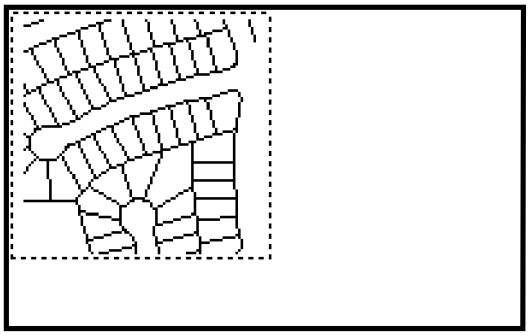


If you don't want coverage features to be positioned to the lower-left of the MAPLIMITS or graphics page, you can use the MAPPOSITION command. MAPPOSITION lets you specify where the MAPEXTENT area is positioned inside the MAPLIMITS or graphics page. In the MAPPOSITION command, you specify two points: the first from the MAPEXTENT area, the second from the MAPLIMITS area or graphics page. When coverage features are drawn, the first point is positioned on the second point to position the map. In the following example, the MAPPOSITION command is given with the two keywords CEN CEN. This ensures that the center of the specified MAPEXTENT will be positioned at the center of the specified MAPLIMITS area:

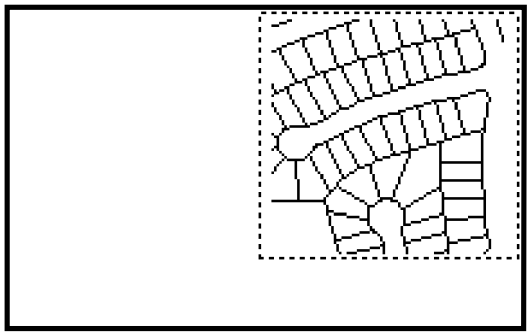
```
[Arcplot] MAPEXTENT ZONE5
[Arcplot] MAPPOSITION CEN CEN
[Arcplot] MAPLIMITS 2.7 3.5 8.8 7.3
[Arcplot] MAPUNITS METERS
[Arcplot] MAPSCALE 2000
[Arcplot] ARCS ZONE5
```



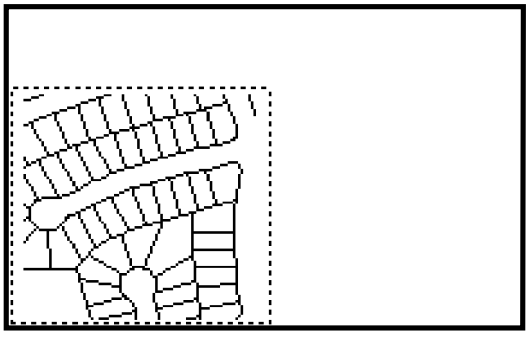
In the following MAPPOSITION examples, no MAPLIMITS has been specified. So in the first example, the MAPPOSITION is set with the keywords UL UL, which specifies that the upper-left corner of the MAPEXTENT will be positioned at the upper-left corner of the graphics page.



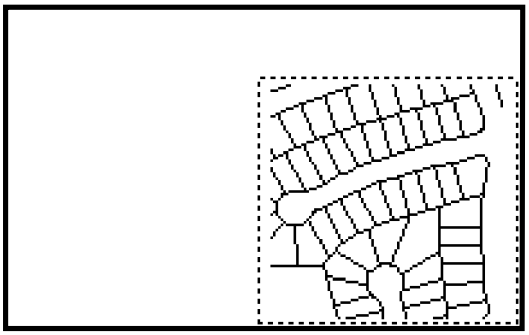
MAPPOSITION UL UL



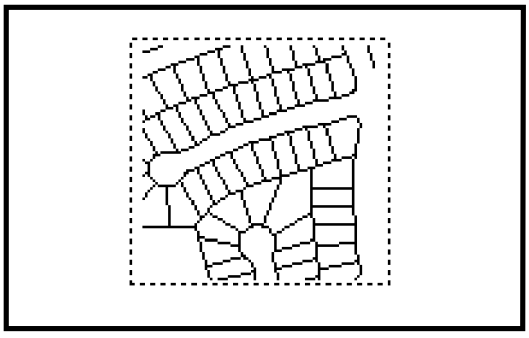
MAPPOSITION UR UR



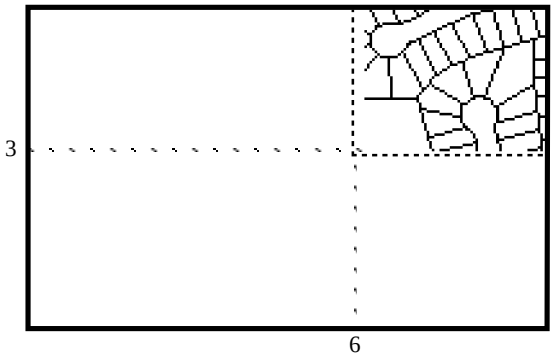
MAPPOSITION LL LL
(the default position)



MAPPOSITION LR LR



MAPPOSITION CEN CEN



MAPPOSITION LL 6 3

In the last MAPPOSITION example on the previous page, the point on the MAPEXTENT is specified with the keyword LL while the point on the graphics page is specified as a coordinate point in PAGEUNITS. This specifies that the lower-left corner of the MAPEXTENT will be positioned at coordinate point 6, 3 on the graphics page. Note that when either of the points specified in MAPPOSITION is given as a coordinate point (absolute location) rather than as a keyword (relative location), the edge of the graphics page or MAPLIMITS will clip any coverage areas that overlap due to the specified MAPPOSITION.

How to make a map at a certain scale

Map scale is the dimensional relationship between reality and its cartographic representation. Scale is a ratio between a distance on the map and a distance on the Earth. This ratio is usually expressed as a fraction, such as 1:24000, which means that one unit of distance on the map represents 24000 of the same units of distance on the Earth. Because this ratio is a constant, it is true for whatever units the fraction is expressed in. So, on a map with a scale of 1:24000, one centimeter equals 24000 centimeters on the ground, just as one inch represents 24000 inches. On a 1:63360 scale map, one inch on the map equals one mile on the ground because one statute mile has 63360 inches.

Commonly used map scales

Map scale	One cm on the map represents	One km on the Earth is represented on the map by	One inch on the map represents	One mile on the Earth is represented on the map by
1:2000	20 meters	50 centimeters	186.24 feet	31.68 inches
1:5000	50 "	20 "	417.12 "	12.67 "
1:6000	60 "	16.66 "	500 "	10.56 "
1:9000	90	11.11	750	7.04
1:10000	100	10	834.24	6.34
1:12000	120	8.33	1000	5.28
1:20000	200	5	1668.48	3.17
1:24000	240	4.17	2001.12	2.64
1:25000	250	4	2085.60	2.53
1:31680	317	3.16	0.500 miles	2
1:50000	500	2	0.789 "	1.27
1:62500	625	1.60	0.986 "	1.014
1:63360	634	1.58	1	1
1:80000	800	1.25	1.26	0.792
1:100000	1000	1	1.58	0.634
1:125000	1250	0.80	1.97	0.507
1:126720	1267	0.79	2	0.5
1:250000	2500	0.40	3.95	0.253
1:500000	5000	0.20	7.89	0.127
1:1000000	10000	0.10	15.78	0.063
1:5000000	50000	0.02	78.91	0.013
1:10000000	100000	0.01	157.82	0.006

For example, a street map of Los Angeles printed on the side of a matchbox would have a scale of about 1:1000000. A street map of Los Angeles printed on a 4-meter-wide billboard would have a scale of about 1:10000. The map on the matchbox is at a much smaller scale than the map on the billboard.

The MAPSCALE command is used to specify the denominator of the scale at which the map will be drawn. You should use the MAPUNITS command before using MAPSCALE. MAPUNITS tells PC ARCPLOT what coordinate units the coverages are stored in that you will be drawing. Without this information, PC ARCPLOT cannot calculate how large your map should be drawn when you set the MAPSCALE.

These commands:

```
[Arcplot] MAPUNITS METERS
[Arcplot] MAPSCALE 24000
```

ensure that a map featuring coverages stored in meters will be drawn at a scale of 1:24000. The default MAPUNITS is inches, so if your coverages are stored in inches, you don't have to give the MAPUNITS command.

When you specify the MAPSCALE, PC ARCPLOT will try to draw the map at the specified scale on the graphics page or inside the MAPLIMITS if one has been set. As we have seen, the map is located at the lower-left of the graphics page or MAPLIMITS unless you have specified a different MAPPOSITION.

Sometimes the display area required for PC ARCPLOT to draw a map at your specified MAPSCALE will be larger than your available graphics page or specified MAPLIMITS. When this is the case, the map will still be drawn at your specified MAPSCALE, but those parts of the coverage area that fall outside the graphics page or specified MAPLIMITS will not be drawn and will be clipped around the edge of the graphics page or MAPLIMITS.

If you do not set a MAPSCALE, PC ARCPLOT will draw the map as large as possible within the available graphics page or MAPLIMITS. PC ARCPLOT does this by taking the maximum dimension of the map and automatically calculating a MAPSCALE that scales it to the maximum dimension of the MAPLIMITS or graphics page. Use the MAPINFO command if you want to find out what scale your coverage features are being displayed.

How to draw more than one map on the same plot

Drawing multiple maps on the same plot is easy because you can give the MAPLIMITS command any number of times during the session. Let's imagine that there are four coverages (ROADS, STREAMS, LANDUSE and PARCELS), each storing a different data layer for the same MAPEXTENT area. A single map is needed, no larger than 15 inches square, showing each of these coverages as a separate map. We could use these commands to create the plot:

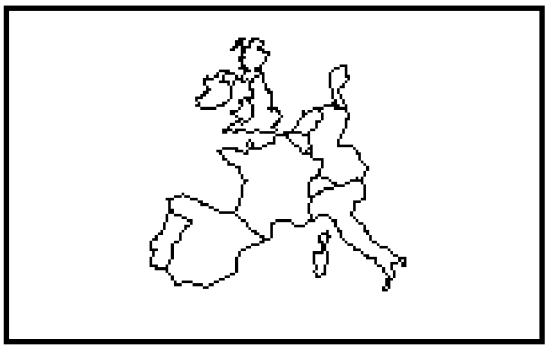
```
[Arcplot] PAGESIZE 15 15
[Arcplot] MAPEXTENT ROADS
[Arcplot] MAPPOSITION CEN CEN
[Arcplot] MAPLIMITS 2 2 7 7
[Arcplot] ARCS ROADS
[Arcplot] MAPLIMITS 8 2 13 7
[Arcplot] ARCS STREAMS
[Arcplot] MAPLIMITS 2 8 7 13
[Arcplot] ARCS LANDUSE
[Arcplot] MAPLIMITS 8 8 13 13
[Arcplot] ARCS PARCELS
```

MAPLIMITS is given four times to position each coverage on the page. Each MAPLIMITS specification defines a 5-inch by 5-inch area on the plot. There is a two-inch border around the plot in which titles, etc., could be placed. Because the coverages being drawn cover the same geographic area, it is only necessary to give MAPEXTENT once. Once MAPEXTENT has been set, coverage features from the specified coverage area can be drawn wherever you specify the MAPLIMITS. MAPPOSITION only has to be specified once for it to apply to all the MAPLIMITS areas.

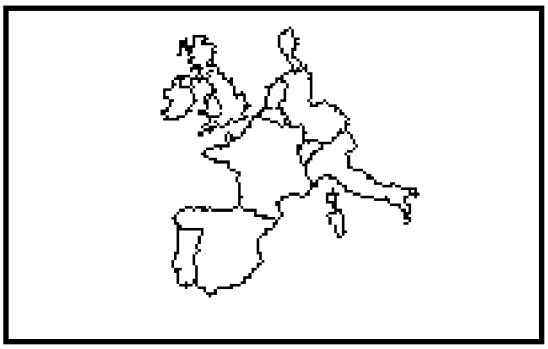
How to draw a map at a different angle

Usually, coverage features are drawn with exactly the same orientation they had when they were digitized or when they were last transformed or projected. However, you can use the MAPANGLE command if you want to change the angle at which the map is drawn. The angle is specified in decimal degrees counterclockwise from the horizontal, which is 0 degrees. After the map is drawn, it will appear rotated counterclockwise to the specified MAPANGLE.

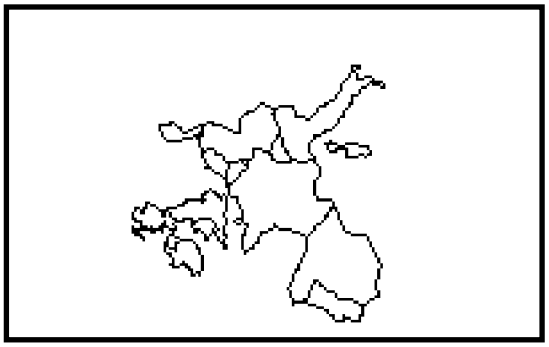
MAPANGLE sets the angle at which features from coverages are drawn. It has no effect on titles, legends, borders, scale bars, etc., that are not coverage features. The rotation takes place around the first point specified in the MAPPOSITION command (the point from the specified MAPEXTENT):



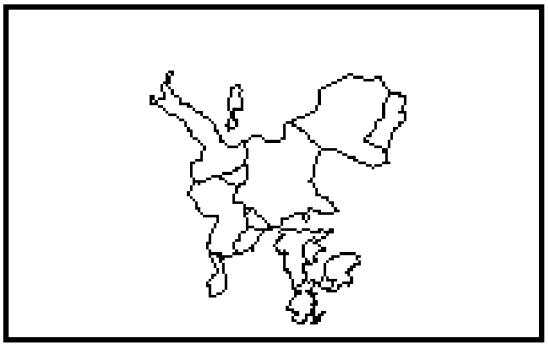
```
MAPPOSITION  CEN CEN
MAPANGLE 0
```



```
MAPPOSITION  CEN CEN
MAPANGLE 20
```



```
MAPPOSITION  CEN CEN
MAPANGLE 90
```



```
MAPPOSITION  CEN CEN
MAPANGLE 180
```

When a MAPLIMITS area is specified, any part of the rotated map that falls outside this area will be clipped. If the MAPPOSITION command is not given, the map will be rotated around the lower-left corner of the MAPEXTENT area.

How to specify everything in centimeters instead of inches

We have seen how to give the MAPUNITS command to specify in what coordinate units your coverage features are stored. This command is used to ensure that the coverage scaling specified with MAPSCALE is obtained correctly. You don't have to use the MAPUNITS command if you don't use the MAPSCALE command.

The PAGEUNITS command, on the other hand, specifies what coordinate units will be used to specify location on the device display page. We have already seen that the MAPLIMITS and PAGESIZE commands are always given in PAGEUNITS. The PAGEUNITS command defines the unit of measurement to be used by the graphic output device. PAGEUNITS applies only to the device display page and is not related to the MAPUNITS.

By default, the PAGEUNITS is INCHES. This means the MAPLIMITS and PAGESIZE commands are given in inches, as are the coordinates you give in drawing commands like BOX, LINE and PATCH. Symbols are measured in PAGEUNITS too, which means that specifications in commands like LINESIZE and TEXTSIZE are given in inches by default. You don't have to give the PAGEUNITS command if you want to make all your map layout and symbol size specifications in inches.

When you want to make all these specifications in centimeters, set PAGEUNITS to CM at the beginning of the PC ARCPLOT session. In these commands:

```
[Arcplot] PAGEUNITS CM
[Arcplot] MAPLIMITS 2 2 12 12
[Arcplot] LINESIZE 0.2
[Arcplot] ARCS ROADS
```

PAGEUNITS has been set to centimeters, so the MAPLIMITS area on the plot is a 10 centimeter square and the current line symbol is set to a line 0.2 centimeters wide.

You can set the PAGEUNITS by giving it as either INCHES or CM. You can also set the PAGEUNITS to be some other units by specifying the number of these units in one inch. For example, if you want the PAGEUNITS to be millimeters, you would set PAGEUNITS to 25.40 because there are 25.40 millimeters in an inch.

Setting PAGEUNITS does not affect the MAPEXTENT, MAPUNITS or MAPSCALE. For example, if you set PAGEUNITS to INCHES, draw a map, set PAGEUNITS to CM, and draw the

map again, the two maps will be drawn at exactly the same size and scale.

Setting PAGEUNITS does not change the current PAGESIZE. When you specify PAGEUNITS, the dimensions of your graphics page are automatically converted into the PAGEUNITS you specified, but the physical area of the graphics page remains the same.

Chapter 3 Specifying symbols

Specifying symbols

3 Cartographic design with PC ARCPLOT involves specifying symbols. There are four groups of symbols: line symbols, marker symbols, shade symbols and text symbols. Whenever you draw anything, PC ARCPLOT automatically uses the appropriate symbol group. Arcs, map borders and other lines are drawn using line symbols. Point features are drawn using marker symbols. Polygons are filled in using shade symbols. Text labels and titles are drawn with text symbols.

The symbols in each group are defined by a number of characteristics, such as pattern, color and size, that control the appearance of the symbols. You can give commands to change these characteristics any number of times during the PC ARCPLOT session. You can also create customized sets of symbols and save them for use in later sessions.

While there are only four groups of symbols to think about while you are working with PC ARCPLOT, the number of different symbol designs you can create for your maps is practically unlimited.

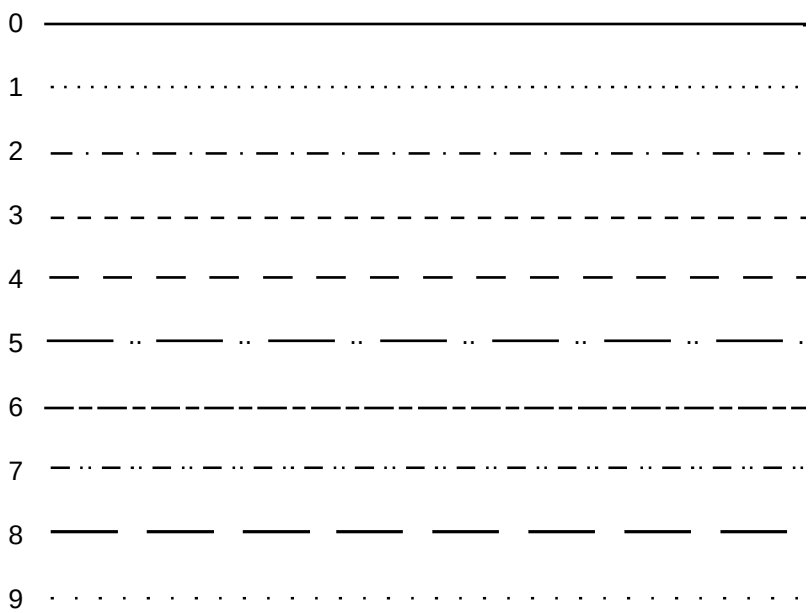
The current symbols

The current symbols are those defined by your current setting of the symbol characteristics. There is one current symbol for each of the four symbol groups: line symbols, marker symbols, shade symbols and text symbols. Most ARCPLOT commands that draw graphics use one of these current symbols.

For example, the ARCS command uses the current line symbol to draw the arcs from a coverage. So the symbol design used to draw the arcs is the one defined by your most recent choice of line symbol characteristics.

Setting the current line symbol

The LINEPATTERN command specifies which of the following pattern numbers will be used by the current line symbol. Pattern number 0 is the default, so if you don't give LINEPATTERN or specify a line symbol from a lineset file, the current line symbol will be a solid line.



You can also use LINEPATTERN to create a customized dashed pattern by specifying a numeric template up to 8 digits long. The digits define an alternating dash/gap sequence in millimeters with the first digit being a dash, the second a gap, the third a dash, and so on. So LINEPATTERN 1121 defines a line template with a dash of 1 mm, a gap of 1 mm, a dash of 2 mm and a gap of 1 mm. The template is drawn repeatedly to create the line pattern. If the pattern is to start with a dot, a negative sign has to be used to force a 0 value in the first dash digit (a dash of zero length). Thus if OPTION is given as -2, it is interpreted as 02, which is a dot followed by a gap of 2 mm, a template that will produce a simple dotted line. Here are some examples of customized LINEPATTERN specifications:

LINEPATTERN 1121

LINEPATTERN 1101

LINEPATTERN -2

LINEPATTERN 1101012

The LINECOLOR command specifies the screen color number or plotter pen number that will be used for the current line symbol. See the chapter 'Displaying maps' in this section for examples of default colors for various graphic devices.

Color number 1 is the default, so if you don't give LINECOLOR, the current line symbol will appear white on the PC monitor.

When your final output will be on a pen plotter, the different color numbers access the different plotter pen positions, so the colors that are displayed depend on the color of the pen in each position.

The LINESIZE command sets the width of the current line symbol. Specifying thick line widths can considerably increase the time it takes to draw lines.

If you don't give LINESIZE, the default width is the width of one pen, that is, the thinnest line that the graphics monitor or plotter can draw. Giving LINESIZE as 0 will set it back to the default size after you have used a different size.

LINESIZE is usually given in inches, but if you want to specify the sizes of your symbols in centimeters you can use the PAGEUNITS command with the CM option at the beginning of the PC ARCPLOT session. (Note that the digits in a customized LINEPATTERN specification are always given in millimeters, regardless of the PAGEUNITS.)

The line commands we have seen so far specify the individual design characteristics of the current line symbol. You can also store the characteristics for a set of line symbols in special files called lineset files. Each record in a lineset file stores the characteristics of

one line symbol, so you can set the characteristics of the current line symbol all at once simply by calling up one of these symbols using the LINESYMBOL command. LINESYMBOL accesses one of the line symbols defined in a lineset file by giving its unique symbol number. This symbol will automatically become the current line symbol.

Using lineset files also gives you a much wider range of possible line designs because lineset files let you specify some special characteristics for line symbols. You can specify different line pattern templates, like double, zigzag, hashed and scalloped. You can also create several layers for one line symbol. Each layer is a line design. By specifying several layers for line symbols you can create elaborate composite line designs; for example, you could make a line symbol for a railroad from two layers, the first a double line and the second a hashed line. As each layer can be designed individually, a very wide variety of line symbols can be created. These special characteristics can only be specified in lineset files because there are no PC ARCPLOT commands to set these characteristics individually.

We have seen how line symbols have two sets of characteristics. This is because the symbol specified with the LINECOLOR, LINEPATTERN and LINESIZE commands is always a fast-drawing, hardware generated symbol, whereas lineset files can feature more elaborate, software generated, as well as hardware generated, symbols. Because these two sets of characteristics are not compatible, you cannot use the LINESYMBOL command to access a line symbol from a lineset file to be the current line symbol and then use the LINECOLOR, LINEPATTERN and LINESIZE commands to change the characteristics of this current symbol. Instead, if you give one of these commands after the LINESYMBOL commands, the current symbol will revert back to being the hardware generated symbol defined by your most recent settings of the LINECOLOR, LINEPATTERN and LINESIZE commands.

PC ARCPLOT comes with three ready-to-use lineset files. The default lineset file, PLOTTER.LIN, provides 100 line symbols (symbol numbers 1 to 100). These symbols feature 25 line patterns in 4 different colors (color numbers 1 to 4), so the default lineset file

is especially useful for selecting line symbols for maps that will be drawn on four-color plotters. To select any one of these line symbols to be the current line symbol, give its symbol number in the LINESYMBOL command. Line symbol number 1 is the default current line symbol.

If you use the LINESET command to access a lineset file that has less than 100 symbols, line symbols from PLOTTER.LIN will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional lineset files. COLOR.LIN features 90 symbols made up of 6 different line patterns in each of the 15 monitor screen colors, plus an additional pattern in the first 10 colors. BW.LIN features 32 symbols made up of 32 different line patterns in color number 1. Use the LINESET command to access these lineset files.

PLOTTER.LIN, COLOR.LIN and BW.LIN reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these lineset files in the LINESET command. This is because LINESET automatically searches the SYMBOLS directory if the specified lineset file cannot be found in the current directory.

Setting the current marker symbol

The MARKERFONT and MARKERPATTERN commands are used to select the pattern of the current marker symbol from one of the PC ARCPLOT fonts. PC ARCPLOT provides 17 fonts, numbered 0 to 16, which are used to provide fonts for both marker symbols and text symbols. These fonts include letters, numbers, crosses, circles and a variety of other shapes. Typing:

```
[Arcplot] MARKERFONT  0
[Arcplot] MARKERPATTERN  5
```

specifies a diamond-shaped pattern to be the current marker symbol. For a complete table of PC ARCPLOT fonts, see the 'Guide to marker symbol characteristics' in Section V of this guide.

The MARKERCOLOR command specifies the screen color number or plotter pen number that will be used for the current marker symbol. MARKERCOLOR works in the same way as LINECOLOR. Color number 1 is the default.

The MARKERSIZE command specifies the height of the pattern cell in which the current marker symbol is drawn rather than the actual height of the symbol. The different marker patterns vary in how much of this cell they occupy. If the marker pattern selected for the current marker symbol does not occupy the entire height of the pattern cell, it will appear slightly smaller than your specified MARKERSIZE.

The marker commands we have seen so far specify the individual characteristics of the current marker symbol. You can also store the characteristics of a set of marker symbols in a markerset file. Each record in a markerset file stores the characteristics of one marker symbol. Use the MARKERSYMBOL command to access a symbol from a markerset file for use as the current marker symbol.

PC ARCPLOT comes with three ready-to-use markerset files. The default markerset file, PLOTTER.MRK, like the default lineset file, provides 100 marker symbols (symbol numbers 1 to 100) featuring 25 useful marker patterns in 4 colors. To select any one of these marker symbols to be the current marker symbol, give its symbol number in the MARKERSYMBOL command.

If you use the MARKERSET command to access a markerset file that has less than 100 symbols, marker symbols from PLOTTER.MRK will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional markerset files. COLOR.MRK features 90 symbols made up of 6 different marker patterns in each of 15 monitor screen colors, plus an additional marker pattern in 10 colors. BW.MRK features 16 symbols made up of 16 different marker patterns in color number 1. Use the MARKERSET command to access these markerset files.

PLOTTER.MRK, COLOR.MRK and BW.MRK reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these markerset files in the MARKERSET command. This is because MARKERSET automatically searches the SYMBOLS directory if the specified markerset file cannot be found in the current directory.

You can use MARKERSYMBOL to select one of the symbols in a markerset file to be the current marker symbol and then use any of the MARKERCOLOR, MARKERFONT, MARKERPATTERN and MARKERSIZE commands to change the individual characteristics of this current symbol. For example, these commands:

```
[Arcplot] MARKERSYMBOL 67
[Arcplot] MARKERCOLOR 14
[Arcplot] MARKERSIZE 0.4
```

set the current marker symbol to be marker symbol number 67, and then change the color and size of the current marker symbol. These changes only apply to the current marker symbol and are not saved permanently back in the markerset file.

Setting the current shade symbol

There are no commands to set the individual characteristics of the current shade symbol. Instead, shade symbols are always accessed from shadeset files. Each record in a shadeset file stores the characteristics of one shade symbol. The SHADESYMBOL command accesses one of the symbols defined in a shadeset file for use as the current shade symbol.

PC ARCPLOT comes with four ready-to-use shadeset files. The default shadeset file, PLOTTER.SHD, provides 100 shade symbols (symbol numbers 1 to 100). These symbols feature 25 shade patterns in 4 different colors. To select any one of these shade symbols to be the current shade symbol, give its symbol number in the SHADESYMBOL command. Shade symbol number 1 is the default current shade symbol.

If you use the SHADESET command to access a shadeset file that has less than 100 symbols, marker symbols from PLOTTER.SHD

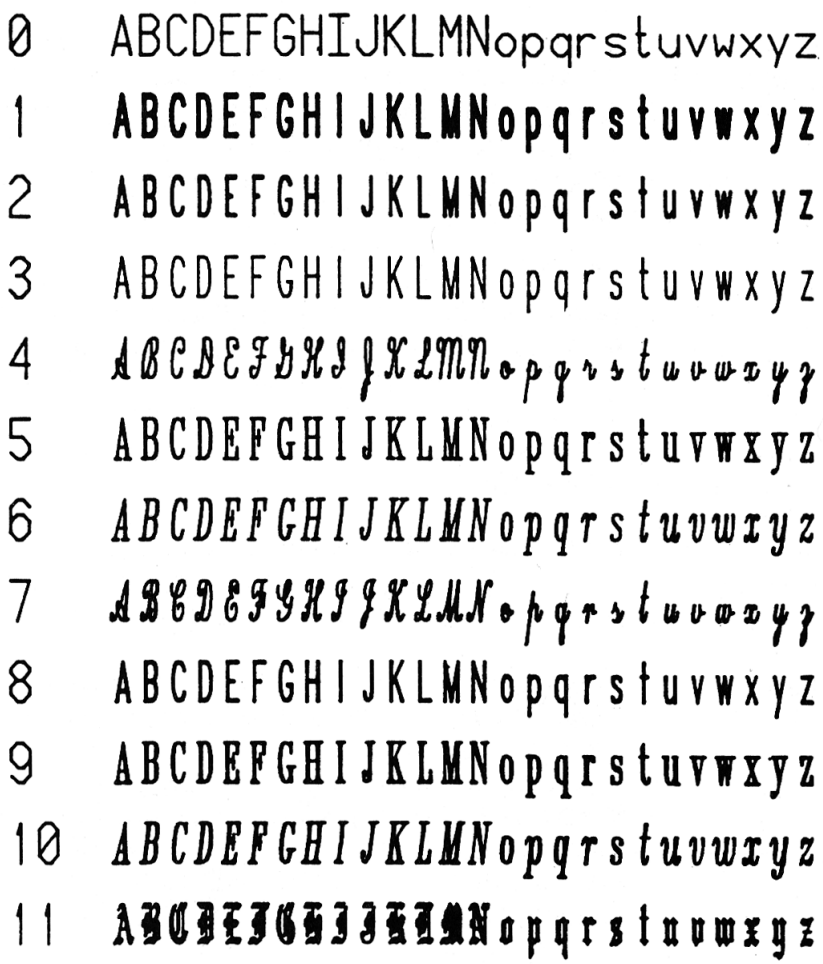
will still be available for the remaining SYMBOL numbers up to 100.

Three additional shadeset files are provided with PC ARCPLOT. COLOR.SHD is a set of 100 hardware generated, fast drawing shade symbols. These are made up of 6 shade patterns, in each of the 15 screen colors, plus an additional pattern in 9 colors and a black solid fill symbol. The first 15 symbols of COLOR.SHD are solid color fills in the 15 monitor screen colors. HARDWARE.SHD features the same symbols as COLOR.SHD but in a different order. BW.SHD features 16 symbols made up of 16 different shade patterns in color number 1.

PLOTTER.SHD, COLOR.SHD, HARDWARE.SHD and BW.SHD reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these shadeset files in the SHADESET command. This is because SHADESET automatically searches the SYMBOLS directory if the specified shadeset file cannot be found in the current directory.

Setting the current text symbol

The TEXTFONT command specifies which font will be used by the current text symbol. PC ARCPLOT provides 17 fonts of which the first 12, numbered 0 to 11, are used for text symbols. Font number 0 is the default.



The TEXTCOLOR command sets the color number used by the current text symbol. Color number 1, which is usually white on the PC monitor, is the default.

The TEXTSIZE command sets the height of the current text symbol. The default text size is 0.08 inches, so if you don't give TEXTSIZE, an uppercase letter A drawn with the current text symbol will be 0.08 inches high. Lowercase letters will always be smaller than the specified TEXTSIZE.

The TEXTQUALITY command specifies whether the current text symbol will use PROPORTIONAL or CONSTANT spacing. In constantly spaced text, each character is placed the same distance away from its neighbors, regardless of its actual width. Proportionally spaced text appears typeset because the spaces between individual characters are made proportional to the actual widths of the characters. TEXTQUALITY CONSTANT is the default because text drawn with the default font number 0 is drawn faster on the PC monitor screen when constantly spaced.

You can specify special effects for the current text symbol. If you want to change the angle at which the current text symbol draws text, for example, if you want text to be drawn vertically along the side of a plot, use the TEXTANGLE command. If you want to increase the spacing between letters, for example, to stretch text across an area on a map, use the TEXTSPACING command. If you want to use superscripting, subscripting or underlining, use the TEXTSTYLE command.

The text commands we have seen so far specify the individual characteristics of the current text symbol. You can also store the characteristics of a set of text symbols in a textset file. Each record in a textset file stores the characteristics of one text symbol. Use the TEXTSYMBOL command to access a symbol from a textset file for use as the current text symbol.

PC ARCPLOT comes with three ready-to-use textset files. The default textset file, PLOTTER.TXT, provides 100 text symbols (symbol numbers 1 to 100) featuring 25 different text styles in 4

colors. To select any one of these text symbols to be the current text symbol, give its symbol number in the TEXTSYMBOL command.

If you use the TEXTSET command to access a lineset file that has less than 100 symbols, text symbols from PLOTTER.TXT will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional lineset files. COLOR.TXT features 15 symbols in the hardware default font number 0, one symbol for each of the 15 monitor screen colors. BW.TXT features 16 symbols in color number 1, one symbol for each of fonts 0 to 15. Use the TEXTSET command to access these textset files.

PLOTTER.TXT, COLOR.TXT and BW.TXT reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these textset files in the TEXTSET command. This is because TEXTSET automatically searches the SYMBOLS directory if the specified lineset file cannot be found in the current directory.

You can use TEXTSYMBOL to select one of the symbols in a textset file to be the current symbol and then use any of the commands like TEXTSIZE, TEXTQUALITY and TEXTFONT to change the individual characteristics of this current symbol. For example, these commands:

```
[Arcplot] TEXTSYMBOL 50
[Arcplot] TEXTCOLOR 8
[Arcplot] TEXTSIZE 0.15
```

set the current text symbol to be text symbol number 50, and then change the color and size of the current text symbol. These changes only apply to the current text symbol and are not saved permanently back in the textset file.

More about storing symbol specifications in symbolset files

We have seen that lineset, markerset, shadeset and textset files (collectively called symbolset files) can be created to store customized PC ARCPLOT symbols.

Symbolset files are a shortcut because you can use them to store the symbols you need most frequently. For example, if you are making maps for an organization that has a standard set of symbol specifications, symbols can be created using these standards and stored in symbolset files. These symbolset files could then be copied by all the PC ARCPLOT users in the organization to ensure that everyone uses the same standardized symbols.

Each symbolset file can store up to 100 symbols, with the exception of lineset files, which can store up to 150 line symbols.

To create your own lineset files, use the LINEEDIT program. With LINEEDIT you can design line symbols interactively on the PC graphics monitor and then save them automatically in lineset files. Symbols in existing lineset files can also be edited with LINEEDIT.

To create your own lineset, markerset, shadeset and textset files, use TABLES or your database manager to build data files in which the items define the symbol characteristics.

For a full description of the tabular items used for each of the four types of symbolset files, see these sections in Section V of this guide that discuss the characteristics of the different symbol groups:

Guide to line symbol characteristics
Guide to marker symbol characteristics
Guide to shade symbol characteristics
Guide to text symbol characteristics

For a description of how to use the LINEEDIT program to create lineset files interactively, see 'Using the LINEEDIT program' in Section V.

The LINESET, MARKERSET, SHADESET and TEXTSET commands are used in PC ARCPLOT to specify the names of the

symbolset files you wish to use. For example, if you've made a lineset file with PC LINEEDIT called ROADS.LIN and want to use symbols from it in a PC ARCPLOT session, you would use the LINESET command before using any drawing commands. So these commands:

```
[Arcplot] LINESET ROADS.LIN
[Arcplot] LINESYMBOL 4
[Arcplot] ARCS ROADS
```

will draw the arcs from a coverage called ROADS using line symbol number 4 from the ROADS.LIN lineset file.

As we shall see in the next chapter, some PC ARCPLOT commands that draw coverage features don't use the current symbol but instead use a variety of symbol numbers accessed from feature attribute tables or lookup tables. These symbol numbers are taken from the symbolset files, too. So if you have designed a set of shade symbols and stored them in a shadeset file called LANDUSE.SHD, the commands:

```
[Arcplot] SHADESET LANDUSE.SHD
[Arcplot] POLYGONSHADES FIELDS TYPE
```

will shade the polygons from the FIELDS coverage with shade symbols accessed from the LANDUSE.SHD shadeset file by using the values of the TYPE polygon attribute item as symbol numbers.

We have already made reference to the default PC ARCPLOT symbolsets. These files are called PLOTTER.LIN, PLOTTER.MRK, PLOTTER.SHD and PLOTTER.TXT. They each feature 100 symbols, made up of 25 patterns in 4 different colors (color numbers 1 to 4). These default sets are especially useful for selecting symbols for maps that will be drawn on four-color plotters.

If your own symbolset files have less than 100 symbols, symbols for the remaining symbol numbers will still be available from the PLOTTER default symbolset files. So if you use the MARKERSET command to access a markerset file that contains only 5 customized marker symbols numbered 1 to 5, marker symbols 6 to 100 from the default PLOTTER.MRK markerset will still be available.

PC ARCPLOT comes with two additional sets of four symbolset files. These are the COLOR and BW symbolsets. The COLOR symbolset files feature hardware generated, fast drawing symbols in the 15 monitor screen colors. These COLOR symbolsets are useful when you are drawing color maps on the PC monitor because the default PLOTTER symbolsets only use 4 colors, and take longer to draw because they are software generated.

COLOR.LIN, COLOR.SHD and COLOR.MRK each feature 90 symbols made up of 6 patterns in each of 15 colors, plus an additional pattern in 10 colors. COLOR.TXT features 16 test symbols using the hardware default font number 0.

So, for example, if you want to use the fast drawing hardware shade symbols, including solid color fills, instead of the default PLOTTER set, give this command:

```
[Arcplot] SHADESET COLOR
```

when you start your PC ARCPLOT session.

The BW symbolsets are useful for creating maps which will be displayed on a black-and-white graphics printer.

BW.MRK and BW.SHD each feature 16 symbols made up of 16 patterns in color number 1. BW.LIN features 32 symbols made up of 32 different line patterns in color number 1. BW.TXT features 16 symbols in color number 1, one symbol for each of the 16 fonts 0 to 15.

Symbolset files can be specified individually using the LINESET, MARKERSET, SHADESET and TEXTSET commands. The SYMBOLSET command can also be used to access 4 symbolset files at once, one of each symbol group, by giving the file name prefix. So the command:

```
[Arcplot] SYMBOLSET COLOR
```

will automatically load the COLOR.LIN, COLOR.MRK, COLOR.SHD and COLOR.TXT symbolset files that contain the fast drawing hardware symbols. (To use the SYMBOLSET command,

the symbolset file names must use the suffixes LIN, MRK, SHD and TXT.)

The PLOTTER, COLOR and BW symbolset files provided with PC ARCPLOT are stored in the \ARCEXE\SYMBOLS directory in the PC ARC/INFO installation. However, this full pathname does not have to be given if you want to specify these symbolset files (for example, if you want to use LINESET to access PLOTTER.LIN again after having used one of your own lineset files). This is because commands like LINESET and SYMBOLSET automatically search the \ARCEXE\SYMBOLS directory if the symbolset file you name cannot be found in your current workspace.

Since the \ARCEXE\SYMBOLS directory is automatically searched, you can store symbolset files that you have created in this directory, and they can then be accessed from any workspace using LINESET, etc. In order to take advantage of this feature, you must give the files the appropriate suffix (LIN, MRK, SHD or TXT).

Creating a custom symbolset with PC ARC/INFO

When using PC ARCPLOT, the default symbolsets are the PLOTTER group. The symbolsets provided were designed for drawing maps on a four-color plotter. Since most of our users have six- or eight-color plotters, the following describes a step-by-step procedure for creating a custom symbolset file.

Step 1

Read the appropriate documentation

First, you should become familiar with the characteristics of the four symbol types by reading about symbol characteristics in Section V.

Step 2

Become familiar with the symbolset files provided with PC ARCPLOT

In ARCEXE\SYMBOLS, you will find the symbolset files provided with PC ARCPLOT. These symbolsets can be accessed from any directory. You will not need to specify a full pathname to access them because commands like LINESET and SYMBOLSET automatically search this directory if the specified symbolset cannot be found in your current workspace. Because of this search procedure, you may find it handy to store all of your custom

symbolsets in the SYMBOLS directory.

```
LISTING OF C:\ARCEXE\SYMBOLS

BW.LIN          BW.MRK          BW.SHD          BW.TXT          COLOR.LIN
COLOR.MRK       COLOR.SHD       COLOR.TXT       EDGEBW.LIN      EDGECOLOR.LIN
HARDWARE.SHD    PLOTTER.LIN     PLOTTER.MRK     PLOTTER.SHD     PLOTTER.TXT
PLOTTER8.SHD
```

The BW group A small set of symbols is included in each of these symbolsets which use color 1. They aid in map display for monochrome monitors. The size units for BW files are inches.

The COLOR group The size units for COLOR files are in inches. Colors are set up to use the color numbers of the graphics card installed on the PC. In addition, COLOR.SHD uses the solid-panel fill patterns on your graphics card. Polygons shaded with solid-panel fill patterns must have 2,500 vertices or less.

HARDWARE.SHD This shadeset file is designed to take advantage of the hardware shade patterns available with your device. There are 100 symbols in this shadeset, accessing hardware patterns 1 to 100.

The PLOTTER group These files are loaded as the default symbolsets for PC ARCPLOT when it begins execution. Note that PLOTTER.TXT is also loaded as the default textset file in ARCEDIT. Since text is used in PC ARCEDIT for annotation, it is important to plot annotation using the same symbol sizes and spacing with which they are created in PC ARCEDIT by specifying the same textset.

A shade symbol file for eight pen plotters, called PLOTTER8.SHD, is also available.

Step 3

Make a symbolset data file template

You should not edit the symbolsets in \ARCEXE\SYMBOLS. First make a copy of the symbolsets data file that you would like to edit by using the ARC command COPYINFO from your current workspace to copy the item definition template. For example,

Using COPYINFO

```
(C:) [ARC] COPYINFO ARCEXE\SYMBOLS\PLOTTER.MRK TEST.MRK
```

After using COPYINFO, you will find a database data file in your workspace.

Step 4

Purging the data file created with COPYINFO

Using TABLES, select your new symbolset file. As you will see, the file will already have symbols within it. Use the PURGE command to empty this file. You will then be ready to ADD symbols to the new file.

Step 5

Adding records to the data file template

Now begin adding records to the data file template by first selecting the data file. Then use the ADD command. After typing ADD, you will be prompted with item names. These item names are the characteristics documented in the *PC ARCPLOT User's Guide*. At each prompt, enter the desired characteristic value.

Note: As a reminder, the numeric values for each symbol type are discussed in the section called 'Item definitions for an XXXX file' in each symbol guide. XXXX refers to the type of symbolset.

Chapter 4 Drawing coverage features

Drawing coverage features

4 This chapter shows you how to use the PC ARCPLOT commands that draw coverage features. Features can be drawn using one symbol design, or you can use a lookup table to specify different symbols for different coverage features.

Drawing coverage features using the current symbols

The simplest way to draw coverage features is with the drawing commands that use one of the current symbols.

The ARCS command and the POLYS command use the current line symbol. Typing these commands:

```
[Arcplot] LINECOLOR 12
[Arcplot] ARCS STREAMS
```

will draw all of the arcs in a coverage called STREAMS using a line symbol with color number 12.

The POLYS command draws those arcs that make up polygon boundaries. These commands:

```
[Arcplot] LINECOLOR 12
[Arcplot] POLYS EUROPE
```

will draw all of the polygon outlines in the EUROPE coverage using a line symbol with color number 12.

The LABELS, NODES and POINTS commands use the current marker symbol. In this example, the POINTS command:

```
[Arcplot] MARKERFONT 15
[Arcplot] MARKERPATTERN 118
[Arcplot] MARKERCOLOR 4
[Arcplot] POINTS MINES
```

will draw the points in the MINES coverage using a triangle-shaped marker symbol (defined by MARKERFONT and MARKERPATTERN) in color number 4.

The TICS command doesn't use the current marker symbol specified by the MARKERSYMBOL command to draw the tics in a coverage. The TICS command uses a square marker symbol and the current settings of MARKERCOLOR and MARKERSIZE. If a MARKERFONT other than 0 is specified, tics will be drawn as a question mark inside a box.

Drawing coverage features using one symbol number

Another way of drawing coverage features using one symbol design is to specify a symbol number in one of these commands: ARCLINES, LABELMARKERS, POINTMARKERS, or POLYGONSHADES. For example,

```
[Arcplot] ARCLINES STREAMS 34
[Arcplot] POINTMARKERS MINES 9
```

will draw all the arcs in the STREAMS coverage using line symbol number 34 and all the points in the MINES coverage with marker symbol number 9.

```
[Arcplot] POLYGONSHADES ZONES 2
```

will shade all the polygons from the ZONES coverage with shade symbol number 2. The symbol numbers are taken from the symbolset files currently in effect.

Drawing coverage features using a variety of symbols

So far, we have seen ways of drawing features from coverages using one symbol design to represent all the features. The ARCLINES, LABELMARKERS, POINTMARKERS and POLYGONSHADES commands also let you specify different symbols to represent different features. Symbols are assigned to features according to the attributes stored for the features in the coverage feature attribute tables.

For example, if you are making a road map, the ARCLINES command will let you draw the arcs from a roads coverage using different line symbols to represent different classes of roads. If you are making an urban land use map, you could use the POLYGONSHADES command to shade polygons from a land use coverage using different shade symbols to represent different land uses.

The ARCLINES, LABELMARKERS, POINTMARKERS and POLYGONSHADES commands can be used in two ways to access a variety of symbols.

The first method lets you use these commands by specifying any numeric item from one of a coverage's feature attribute tables. The values of this item will be used to access the symbol numbers used to draw the features. The item named in the command can be of any numeric type.

Item values with decimals are truncated to obtain symbol numbers, so a value of 23.9 would access symbol number 23. Features with negative item values or with an item value of 0 are not drawn. Features with item values greater than the highest symbol number in the appropriate symbolset file are also not drawn, so a feature with an item value of 105 will not be drawn if the largest symbol number in the symbolset file you are using is 100.

In this example, the command:

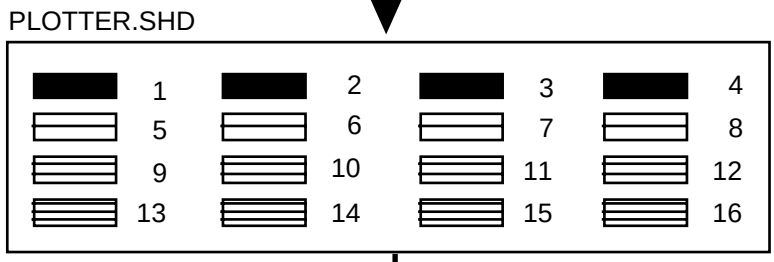
```
[Arcplot] POLYGONSHADES PARCEL TAX_VAL
```

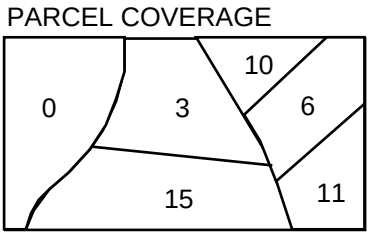
is used to shade the polygons in the PARCEL coverage using their values for the TAX_VAL item as shade symbol numbers:

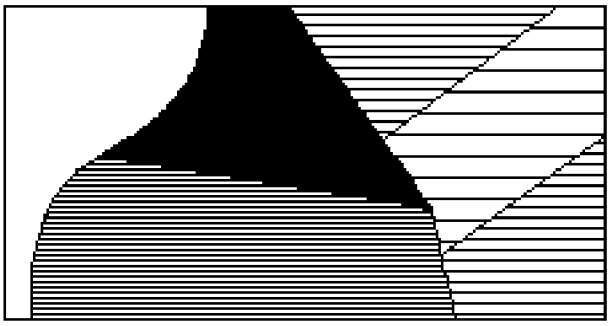
PARCEL.PAT

AREA	PERIMETER	PARCEL_	PARCEL_ID	TAX_VAL
4.391	4.509	2	1	0
1.854	3.625	3	2	10
1.957	4.212	4	3	6
5.231	11.967	5	4	15
2.744	8.912	6	5	3
1.294	3.107	7	6	11

POLYGONSHADES uses values from the TAX_VAL item as symbol numbers. The map below shows what these values are for each polygon. Note that when a polygon value is zero, no shade is drawn.







Using lookup tables to assign symbol numbers

The second method lets you use a lookup table to assign symbols to features. This method is more flexible than using item values directly as symbol numbers because the values of your attribute items will not usually provide desirable symbols.

A lookup table is a database data file. You have to create a lookup table in TABLES or your database management system before you can use it in PC ARCPLOT. Any item from one of a coverage's feature attribute tables can be used as the lookup item to a lookup table. The lookup table stores values from this lookup item. The lookup table also stores symbol numbers. To draw each coverage feature, PC ARCPLOT reads its value for the lookup item in the feature attribute table and then finds this value in the lookup table to obtain the assigned symbol number. Lookup tables define ranges for the values of the lookup item (see below).

How to create a lookup table

As mentioned earlier, a lookup table is a database data file which can be defined in TABLES or in your database management system. A lookup table consists of at least two items. The first item is the lookup item. This item is used to relate the lookup table to the coverage AAT or PAT. It stores values from the corresponding item in the coverage feature attribute table. This item must be the same item type as it is in the coverage attribute table.

The second item in the lookup table must be named SYMBOL or LABEL. Commands like POLYGONSHADES, ARCMARKERS and ARCLINES require an item named SYMBOL. This item stores the symbol numbers used for drawing the desired coverage features. This item may be defined as any numeric item. The text-labeling commands like POLYGONTEXT and LABELTEXT require an item named LABEL. This item stores the label text to be used for each value in the lookup item. LABEL can be defined as any ARC supported item.

The lookup table must be sorted in ascending order on the lookup item.

How to use lookup tables to define ranges

Successive records in a lookup table define ranges of values from the lookup item. This makes it easy to assign symbols to features based on a simple classification. Ranges are defined for numeric lookup items in numeric order. Ranges are defined for character lookup items in ASCII number order for each text string (same as alphabetical order).

When PC ARCPLOT reads a value for the lookup item in a feature attribute table, it will look for a match in the lookup table. If it does not find a matching value, it will use the record with the next greater value for the lookup item. For example, this lookup table assigns symbols to features based on their value for a lookup item called RAINFALL:

RAINFALL	SYMBOL
10	17
25	3
100	26
200	2

Features with RAINFALL values less than or equal to 10 are assigned symbol 17.
Features with RAINFALL values greater than 10 and less than or equal to 25 are assigned symbol 3.
Features with RAINFALL values greater than 25 and less than or equal to 100 are assigned symbol 26.
Features with RAINFALL values greater than 100 and less than or equal to 200 are assigned symbol 2.
Features with lookup item values greater than the largest value in the lookup table will use that record, so in this example, features with RAINFALL values greater than 200 are assigned symbol 2.

Note that the item in the lookup table that stores values from the lookup item must be named and defined as the same item type as the lookup item. In the example above, the item called RAINFALL must be defined as the same item type as the RAINFALL item in the feature attribute table of the coverage being drawn. The item storing the symbol numbers must be called SYMBOL but can be defined as any numeric item. When lookup tables are used to assign text labels to features (see chapter titled 'Labeling coverage features' in this section), the item storing the text labels must be called LABEL but can be defined as any item type. When lookup tables are created in the tabular database, they must always be sorted in ascending order on the lookup item.

In this example, the command:

```
[Arcplot] POLYGONSHADES NEWZONE ZONE ZONE.LUT
```

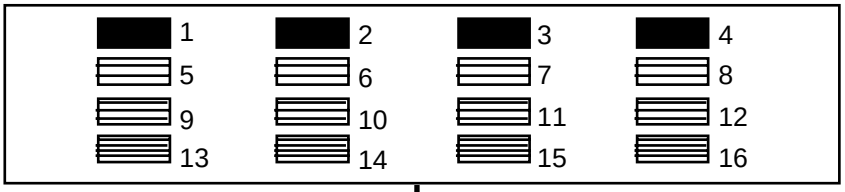
is used to shade the polygons from the NEWZONE coverage using the ZONE item as a lookup item to a lookup table called ZONE.LUT:

AREA	PERIMETER	NEWZONE_	NEWZONE_ID	ZONE
17.463	35.625	2	2	RA-1
24.617	78.892	3	3	RS-1
12.032	23.097	4	4	A2-1
8.920	15.901	5	5	M2-1
25.561	94.873	6	6	RA-1
20.432	54.542	7	7	M2-1
15.117	28.859	8	8	M2-1

ZONE.LUT

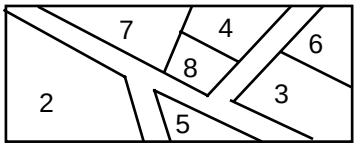
ZONE	SYMBOL	
A2-1		9
M2-1		14
RA-1		2
RS-1		6

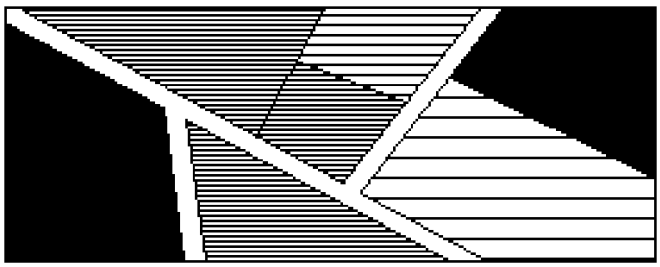
PLOTTER.SHD



Here, POLYGONSHADES uses values from the ZONE item to obtain symbols from a lookup table. The map below shows the NEWZONE_ID for each polygon.

NEWZONE Coverage

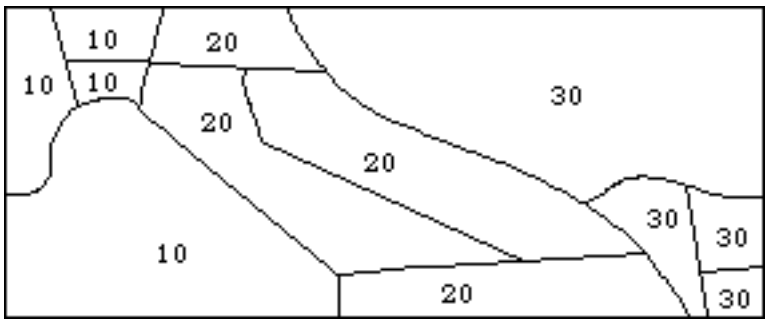




The DROPLINE command

DROPLINE is a special drawing command that suppresses the drawing of arcs that separate polygons having the same value for a specified attribute. Arcs between polygons that have the same value for the attribute are not drawn.

In this example, a coverage called STAND, here shown labeled with its item values for an item called CODE, is redrawn using DROPLINE.



The command is given as:

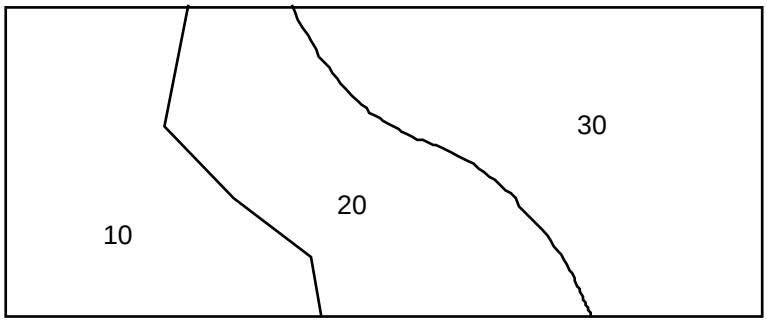
```
[Arcplot] DROPLINE STAND CODE
```

AREA	PERIMETER	STAND_	STAND_ID	CODE
4.854	8.625	2	2	30
3.675	8.212	3	3	10
5.231	11.967	4	4	30
3.744	8.912	5	5	10
2.626	3.107	6	6	30
8.126	15.908	7	7	20
21.393	43.665	8	8	20
34.756	57.492	9	9	10
41.671	67.453	10	10	30
19.873	45.610	11	11	20
6.661	12.029	12	12	10
13.123	24.781	13	13	20

ARCPLOT display of DROPLINE based on CODE. Notice that only those arcs bounding polygons with different CODE values are displayed.

STAND.PAT

AREA	PERIMETER	STAND_	STAND_ID	CODE
4.854	8.625	2	2	30
3.675	8.212	3	3	10
5.231	11.967	4	4	30
3.744	8.912	5	5	10
2.626	3.107	6	6	30
8.126	15.908	7	7	20
21.393	43.665	8	8	20
34.756	57.492	9	9	10
41.671	67.453	10	10	30
19.873	45.610	11	11	20
6.661	12.029	12	12	10
13.123	24.781	13	13	20



Chapter 5 Labeling coverage features

Labeling coverage features

5 This chapter shows you how to add text labels to coverage features you have drawn. Any item from the attribute tables can be used to supply text labels. A lookup table can also be used to assign text labels to different features. Text labels are always drawn using the current text symbol. This chapter also looks at annotation – a special way of storing text labels as coverage features – and how you can create it in PC ARCPLOT.

The four labeling commands

The ARCTEXT, LABELTEXT, POINTTEXT and POLYGONTEXT commands are used to label coverage features.

ARCTEXT adds labels to arcs. Various options are provided for positioning the text relative to the arcs. LABELTEXT adds text labels to label points. POINTTEXT labels point features. Various options are provided for positioning the text relative to the label

point or point feature. POLYGONTEXT labels polygons. These commands can be used in two ways.

In the first method, you specify any item from one of a coverage's feature attribute tables. The values of this item will be used as text to label the features. The item used to supply text labels can be of either character or numeric item type. The commands:

```
[Arcplot] TEXTSYMBOL 15
[Arcplot] POLYGONTEXT NEWZONE ZONE
```

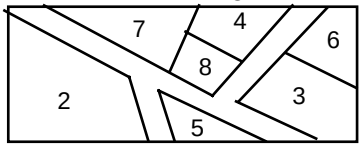
will label each polygon in the NEWZONE coverage with its value from the ZONE item in the PAT. The labels will be drawn inside each polygon:

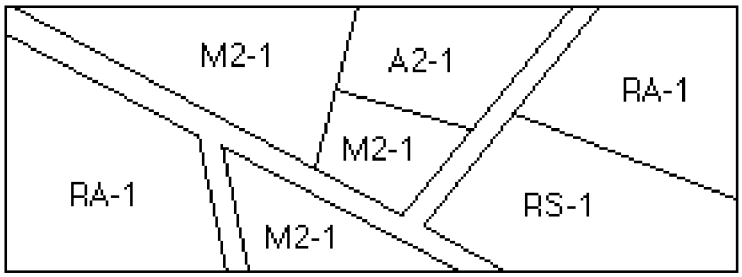
NEWZONE.PAT

AREA	PERIMETER	NEWZONE_	NEWZONE_ID	ZON
9.354	11.509	1	1	
17.463	35.625	2	2	RA-1
24.617	78.892	3	3	RS-1
12.032	23.097	4	4	A2-1
8.920	15.901	5	5	M2-1
25.561	94.873	6	6	RA-1
20.432	54.542	7	7	M2-1
15.117	28.859	8	8	M2-1

In this example, POLYGONTEXT uses values from the ZONE item to label polygons. The map below shows the NEWZONE_ID for each polygon.

NEWZONE coverage





Using lookup tables to assign labels

The second method uses a lookup table to assign text labels to features. This method is more flexible than the first because you can assign any text labels in the lookup table, rather than being limited to using the data values already stored in the attribute tables.

A lookup table is a database data file. Any item from one of a coverage's feature attribute tables can be used as the lookup item to the lookup table. The lookup table stores values from this lookup item and associates these values with text labels. To label each coverage feature, PC ARCPLOT reads its value for the lookup item in the feature attribute table and finds this value in the lookup table to obtain the associated text label.

Successive records in the lookup table specify ranges of values from the lookup item. This means that you don't have to define a record in the lookup table for every value of the lookup item in the feature attribute table. Thus, the lookup table can be defined with explicit ranges. When PC ARCPLOT reads the value of the lookup item in the feature attribute table, it will look for an exact match in the lookup table. If it does not find a match, it will use the next value greater than the lookup item value to determine the appropriate record in the lookup table. Lookup tables must be sorted in ascending order on the lookup item value for this feature to work. If the lookup item value is greater than the largest value in the lookup table, it will use the last record in the table. (The chapter titled 'Drawing coverage features' in this section contains more information on using lookup tables to define ranges.)

How to create a lookup table

As mentioned earlier, a lookup table is a database data file which can be defined in TABLES or in your database management system. A lookup table consists of at least two items, the first item being the lookup item. This item is used to relate the lookup table to the coverage AAT or PAT. It stores values from the corresponding item in the coverage feature attribute table. This item must be defined as the same item type as it is in the coverage attribute table and is commonly the coverage User-ID.

The second item must be named SYMBOL or LABEL. Commands such as POLYGONSHADES, ARCMARKERS and ARCLINES require an item named SYMBOL. Commands that add text such as POLYGONTEXT and LABELTEXT require an item named LABEL. This item stores the labels used for drawing the desired coverage features. This item can be defined as any numeric item.

For example,

```
Enter command: DEFINE ZONE.LUT
Item Name: ZONE
Item Width: 4
Item Type: C
Item Name: SYMBOL
Item Width: 2
Item Type: I
Item Name: (press ENTER)
Enter command: ADD
ZONE: A2-1
SYMBOL: 9
ZONE:
```

and so on.

Note: Always keep the lookup table sorted in ascending order by the lookup item.

In this example, the command:

```
[Arcplot] POLYGONTEXT ZONE COST COST.LUT
```

will label each polygon in the ZONE coverage using the COST item in the PAT as a lookup item to a lookup table, called COST.LUT, containing the label text for the polygons:

NEWZONE.PAT

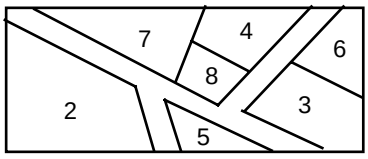
AREA	PERIMETER	ZONE_	ZONE_ID	COST
9.354	11.509	1	1	
17.463	35.625	2	2	325
24.617	78.892	3	3	25
12.032	23.097	4	4	890
8.920	15.901	5	5	230
25.561	94.873	6	6	95
20.432	54.542	7	7	40
15.117	28.859	8	8	210

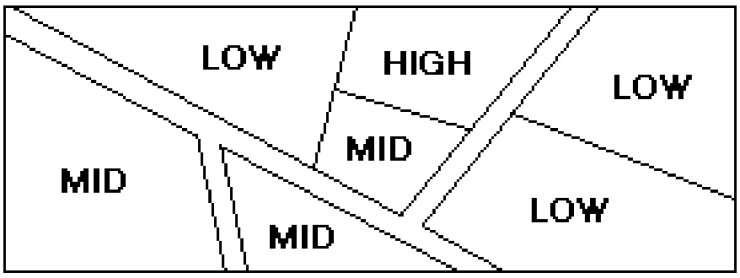
ZONE.LUT

COST	LABEL
100	LOW
500	MID
1000	HIGH

Here, POLYGONTEXT uses values from the COST item to obtain labels from a lookup table. Note that if the COST value does not match a value in the lookup table, the next greater value is used. The map below shows the ZONE_ID for each polygon.

NEWZONE coverage





Where are text labels drawn?

POINTTEXT, by default, draws the lower-left point of text labels to the upper-right of each point feature. You may also position text around the point feature by specifying a positioning parameter. For example, specifying CC will position the center point of the label on the point feature. Text labels are drawn horizontally unless you have used the TEXTANGLE command to set a different angle for the current text symbol.

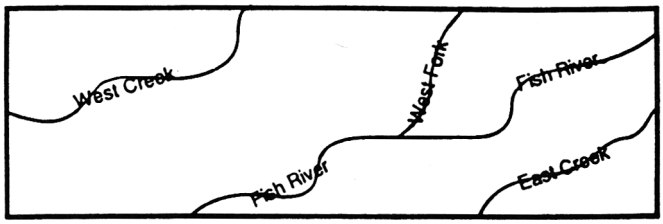
LABELTEXT draws the lower-left point of text labels to the upper-right of each label point inside a polygon. You may also position text labels around the polygon label point by specifying a positioning parameter. For example, specifying CC will position the center point of the label on the point feature. Polygons that have more than one label point will be given text labels at each label point.

POLYGONTEXT labels polygons by finding the best position inside each polygon at which to neatly fit the text label. There are two ways of handling text labels that will not fit neatly in a position inside the polygon. You can define an overflow area on the plot using these three commands: OVERAREA, OVERPOSITION and OVERSEPARATION. If the text label for any polygon will not fit inside the polygon, it is placed in the overflow area along with the Internal-ID of the polygon to which it belongs. The Internal-ID is also plotted inside the respective polygon on the map. The chapter titled 'Adding titles, key legends, neatlines, scale bars, etc.' in this section describes options for defining an overflow area. If you do not define an overflow area, text labels that do not fit neatly inside the polygons are drawn to the upper-right of the label points.

By default, ARCTEXT positions text labels to the upper-right of the arc midpoints. However, ARCTEXT features a set of options for controlling the placement and orientation of text labels. If you use the POINT2 option:

[Arcplot] **ARCTEXT STREAMS NAME POINT2**

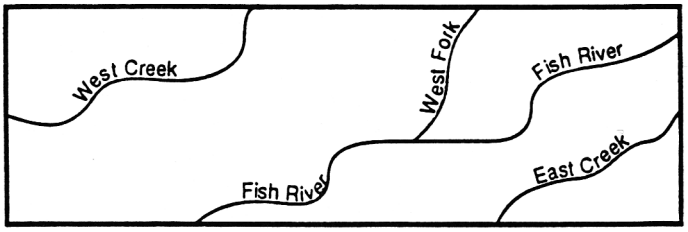
ARCTEXT will draw each label along a straight line at an angle determined by the general orientation of the arc:



Alternately, the LINE option:

[Arcplot] **ARCTEXT STREAMS NAME LINE**

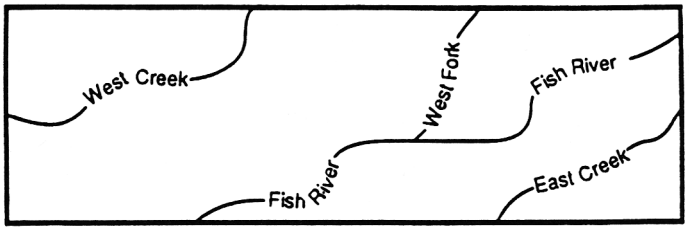
will spline each text label so that it follows the curve of the arc:



The BLANK option keyword can be added after the POINT2 or LINE options to specify that the text labels will also be used as masks so that the arcs will be blanked out under the labels. In this example,

[Arcplot] **ARCTEXT STREAMS NAME LINE BLANK**

the arcs in the STREAMS coverage are labeled with the values in the NAME item from the AAT. The labels are splined along the arcs masking out those parts of the arcs they cover:



To create this masking effect, ARCTEXT draws the arcs (using the current line symbol), as well as the text labels, so you do not have to draw the arcs with a separate command when you use the BLANK option.

Annotation

Coverage annotation is a special coverage feature class that stores text labels. Coverage annotation stores the text strings used in the labels, the text symbol numbers used to draw them and their locations. Annotation also stores the height of the text labels in MAPUNITS rather than PAGEUNITS. This means that when you draw text labels as annotation their height is recalculated as a function of their original text size and the current MAPSCALE. In this way, when you draw annotation, it is automatically scaled, positioned and proportioned correctly in relation to other coverage features.

You can organize frequently used annotation into annotation levels. For example, a coverage storing roads may have street names in one annotation level, highway names in another level, and place names in a third level. For different map products based on this coverage only one of these annotation levels may have to be drawn.

Coverage annotation can be created in PC ARCPLOT and in PC ARCEDIT. PC ARCEDIT features a complete set of commands for positioning and editing annotation. You may also edit annotation using the PC ARC/INFO Arc commands UNLOADANNO and LOADANNO.

Creating annotation in PC ARCPLOT

To create annotation, use the ANNOCOVERAGE command first. This specifies which coverage is going to receive the annotation. If you wish to store this annotation in a specific level, use the ANNOLEVEL command to specify a level. Once these commands have been given, any text labels that you draw with any labeling commands like POLYGONTEXT, ARCTEXT, etc., will be saved as annotation.

Text drawn with the TEXT and TEXTFILE commands is not saved as annotation unless you have first set the UNITS command to MAP.

Once you have finished drawing labels you can use the ANNOLEVEL command to open another annotation level or you can close the current annotation coverage with the command ANNOCOVERAGE NONE. In this command sequence:

```
[Arcplot] UNITS MAP
[Arcplot] ANNOCOVERAGE ROADS
[Arcplot] ANNOLEVEL 1
[Arcplot] TEXTSYMBOL 5
[Arcplot] ARCTEXT ROADS CLASS LINE
[Arcplot] ANNOLEVEL 2
[Arcplot] TEXTSYMBOL 14
[Arcplot] ARCTEXT ROADS WIDTH ROADS.LUT LINE
[Arcplot] ANNOCOVERAGE NONE
```

two levels of annotation are created for the ROADS coverage. A different text symbol was used for the text labels in each annotation level.

Drawing annotation

The ANNOTEXT command draws one or more levels of annotation. This command:

```
[Arcplot] ANNOTEXT ROADS 2
```

will draw annotation level two from the ROADS coverage. If you do not specify one or more levels, ANNOTEXT will draw all the levels for the coverage. Because annotation stores the text symbol numbers used for the text labels, the text drawn by ANNOTEXT is not affected by the current text symbol. However, if you used the

TEXTSET command to specify a particular set of text symbols when you created the annotation, you would have to give TEXTSET again before you draw the annotation in order to use the same set of text symbols in the drawing.

Chapter 6 Selecting coverage features for drawing

Selecting coverage features for drawing

6 Up to now, you have seen how to draw and label all the features of a particular type from a coverage. For example, POLYGONSHADES draws all the polygons from a coverage and POLYGONTEXT labels all the polygons. But what if we only want to draw and label some of the features from a coverage? In PC ARCPLOT, you can select a set of features from those in a coverage using the RESELECT, ASELECT, and NSELECT commands. Only those features in the selected set will be drawn or labeled.

You can select features according to their attributes or according to their location. Selecting features for drawing lets you control precisely what is shown on your maps.
The commands used for selecting features look similar to those used in the Arc processor for selecting records.

The RESELECT command is used for the initial selection of coverage features. The ASELECT command is used for adding more features to the selected set. The NSELECT command replaces the selected set with all the features that have not been selected. The CLEARSELECT command clears all the sets you have selected during the PC ARCPLOT session and makes all the features in each coverage accessible for drawing again. If you don't use any of these selection commands, all the features in each coverage will be accessible for drawing.

Selecting features for drawing according to their attributes

Lets say the ROADS coverage has an arc attribute item called WIDTH that stores the width of each road arc in meters. If we want to make a map showing only those arcs representing roads wider than 10 meters we would give these commands:

```
[Arcplot] RESELECT ROADS ARCS WIDTH GT 10
ROADS arcs : 15 of 25 selected.
[Arcplot] ARCS ROADS
```

The SHOW command can be used to determine the number of currently selected features.

```
[Arcplot] SHOW RESELECT
15 25
```

This selection includes only those ARCS in the ROADS coverage that have a value greater than (abbreviated as GT) 10 for the item called WIDTH in the arc attribute table. PC ARCPLOT carries out the selection and tells you how many features fall into the selected set of arcs from this coverage based on your selection criterion. The ARCS command will, automatically, only draw those arcs from the ROADS coverage that fall into this selected set.

We may have a LANDUSE coverage featuring a character item called TYPE that stores a text string describing what land use type is

represented by each polygon. To make a map showing just those polygons that represent industrial land use we could give these commands:

```
[Arcplot] RESELECT LANDUSE POLYS TYPE EQ 'INDUSTRIAL'
LANDUSE polys : 9 of 32 selected.
[Arcplot] POLYGONSHADES LANDUSE 12
```

Only those POLYS in the LANDUSE coverage that have a text string 'INDUSTRIAL' for the item called TYPE in the polygon attribute table are selected. POLYGONSHADES will only shade those polygons in this selected set. We could add to this map by giving these commands:

```
[Arcplot] NSELECT LANDUSE POLYS
LANDUSE polys: 23 of 32 selected.
[Arcplot] POLYGONSHADES LANDUSE 4
```

NSELECT is used to swap the selected and unselected sets. The selected set for this coverage now contains all those polygons that do not represent industrial land use. Polygons in this newly selected set are then shaded in with a different shade symbol. This gives us a map showing whether the polygons in the LANDUSE coverage represent industrial land use or not.

In these examples, the selection criteria WIDTH GT 10 and TYPE EQ 'INDUSTRIAL' are known as logical expressions. Those coverage features for which the logical expression is true become the selected set.

Selecting features for drawing according to their location

You can select features by defining a rectangular area from a coverage. All the coverage features of the specified feature class that fall at least partly inside this area can be selected. Optionally, you could specify that only the features contained entirely within the area will be selected. Using RESELECT or ASELECT with the BOX option lets you define this area by giving the coverage coordinates of two of its corners. You can also use the BOX * option, which lets you point out the corners of the area with the cursor on the monitor screen display. For the CIRCLE option, input the center point of the circle and a radius. CIRCLE * allows you to interactively point to the center and radius.

For example, imagine you want to make a map using two coverages called STREAMS and PRCLS that cover the same area. You want your map to show all the arcs from the first coverage, but only those polygons in the center of the second coverage. You can't use the MAPEXTENT command to window in on the polygons in the center of the PRCLS coverage because this MAPEXTENT area would not cover all of the arcs from the STREAMS coverage, which you also want to display. Instead, you can give these commands:

```
[Arcplot] MAPEXTENT STREAMS
[Arcplot] ARCS STREAMS
[Arcplot] RESELECT PRCLS POLYS BOX 34 1002 189 1034 WITHIN
PRCLS polys: 6 of 67 selected.
[Arcplot] LINESYMBOL 9
[Arcplot] POLYS PRCLS
```

Logical expressions

The general form of a logical expression used in RESELECT and ASELECT is:

```
[operand_1] [logical_operator] [operand_2]
```

Each [operand] can be: the name of an item from a coverage feature attribute table, a numeric constant, a character string enclosed in single quotation mark, or an arithmetic expression for which the following operators are permitted, +, -, /, *, ** (exponentiation), LN (natural logarithm), and WD (finds the number of characters in the proceeding character string).

The [logical_operator] is one of the following:

EQ	or	=	[operand_1] is equal to [operand_2]
NE	or	<>	[operand_1] is not equal to [operand_2].
GE	or	>=	[operand_1] is greater than or equal to [operand_2].
LE	or	<=	[operand_1] is less than or equal to [operand_2].
GT	or	>	[operand_1] is greater than [operand_2].
LT	or	<	[operand_1] is less than [operand_2].
CN			[operand_1] contains the single character string specified in [operand_2].
NC			[operand_1] does not contain the single character string specified in [operand_2].
IN			[operand_1] is contained in the set of numeric constants or character strings specified in [operand_2]. This set of constants or character strings must be enclosed in { } brackets. The individuals in the set must be separated by commas, unless they are being used to express a range, in which case -> is used to separate the individuals forming the lower and upper inclusive limits of the range. A range defined between two character strings is based on the ASCII number sequence, which is alphabetical.

Logical expressions can also be connected using these keywords:

AND	For the features to be selected the logical expressions on both sides of AND must be true.
OR	For the features to be selected the logical expression on one or both sides of OR must be true.
XOR	For the features to be selected the logical expression on one and only one side of XOR must be true.

There is no limit to the number of [operand_1] [logical_operator] [operand_2] combinations and connectors which can be used in a single RESELECT or ASELECT. However, the command string must be no longer than 254 characters in length, including blanks. Use the vertical '|' continuation character to continue a command string longer than 80 characters onto the next line. Operations are performed in sequence from left to right. Parentheses can be used to specify that logic within the parentheses be performed first. Operations inside the innermost set of parentheses have the highest precedence. Here are some more examples of RESELECT given with logical expressions:

```
RESELECT   STREAMS ARCS FLOW GE 10 AND WIDTH LE 34.5
RESELECT   PRCLS POLYS TAX <= 89 AND TAX > 12 OR ZONE = 'RW2'
RESELECT   FOREST POLYS VALUE GT YIELD * ( CLASS + 18 )
RESELECT   WELLS POINTS DEPTH IN {90,120,400,600->900}
RESELECT   STREETS ARCS NAME IN {'MAIN','OAK','15TH'}
```

in which RESELECT is used with the BOX option to select those polygons that fall within an area in the center of the PRCLS coverage. The coordinates 34, 1002 and 189, 1034, that specify the lower-left and upper-right corners of this area, are given in MAPUNITS (coverage units).

Another way of selecting features according to their location is to use the MAPEXTENT option in the RESELECT and ASELECT commands. All the coverage features of the specified feature class that fall at least partially within the current MAPEXTENT area are selected. So the ASELECT command here:

```
[Arcplot] RESELECT WELLS POINTS DEPTH GT 8200
WELLS points : 45 of 789 selected.
[Arcplot] MAPEXTENT CLAYBEDS
[Arcplot] ASELECT WELLS POINTS MAPEXTENT
WELLS points : 210 of 789 selected.
```

will add to the selected set of point features for the WELLS coverage all of the points that fall inside the current MAPEXTENT area.

Which commands use which selected sets of coverage features?

When a set of arcs has been selected for a coverage, the following commands will only draw or label those arcs in the selected set:

ARCARROWS
ARCLINES
ARCMARKERS
ARCS
ARCTEXT

When a set of polygons has been selected for a coverage, the following commands will only draw or label those polygons in the selected set:

LABELERRORS
LABELMARKERS
LABELS
LABELTEXT
POLYGONSHADES
POLYGONTEXT
POLYS

When a set of point features has been selected for a coverage, the following commands will only draw or label those points in the selected set:

POINTMARKERS
POINTS
POINTTEXT

The selected set of coverage features for any feature class is also used by these commands:

IDENTIFY
INFOFILE
LIST
MAPEXTENT

For example, if you specify MAPEXTENT by naming a class of features and a coverage, only those features in the selected set for that feature class will be used to find the MAPEXTENT. So here:

```
[Arcplot] RESELECT ECOSYS POLYS BIOMASS < 870.67
ECOSYS polys : 31 of 428 selected.
[Arcplot] MAPEXTENT POLYS ECOSYS
```

the MAPEXTENT area is made equal to the extent in the ECOSYS coverage covered by the polygons in the selected set.

The ANNOTEXT, NODES and NODEERRORS commands do not use the selected set of features for any feature class. For example, NODES draws all the nodes in a specified coverage regardless of any selected sets of arcs or polygons.

When you use the ARCS command to draw arcs from a polygon coverage, all the arcs will be drawn, regardless of the selected set of polygons. To draw just the outlines of polygons in the selected set, use the POLYS command.

Chapter 7 Adding titles, key legends, neatlines, scale bars, etc.

Adding titles, key legends, neatlines, scale bars, etc.

7

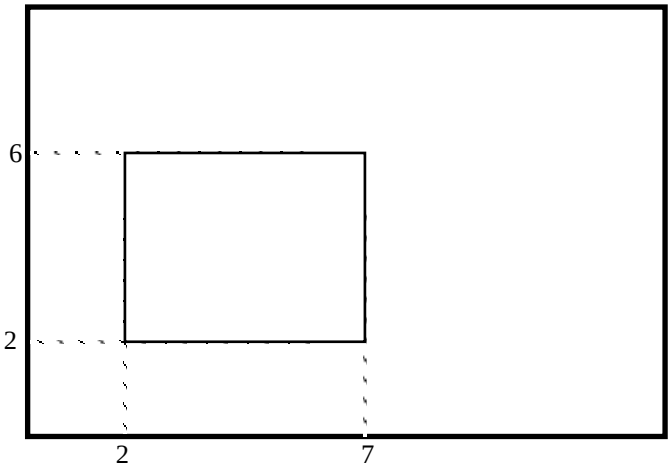
This chapter shows you how to complete your maps by adding reference text and graphics. PC ARCPLOT has a set of commands that draw graphic primitives such as text, lines, boxes and circles. By combining these graphic primitives together, you can design virtually any style of scale bar, North arrow and even your agency's logo. Alternatively, you can store complex reference graphics as coverages and draw them using the commands we have described in the previous chapters.

Commands that draw graphic primitives

In these commands, you specify the location of different graphic primitives by giving their coordinates on the map in PAGEUNITS. These commands can also be given with the * option which lets you use the screen cursor to position the graphic primitives. Graphic primitives are drawn using the current symbols.

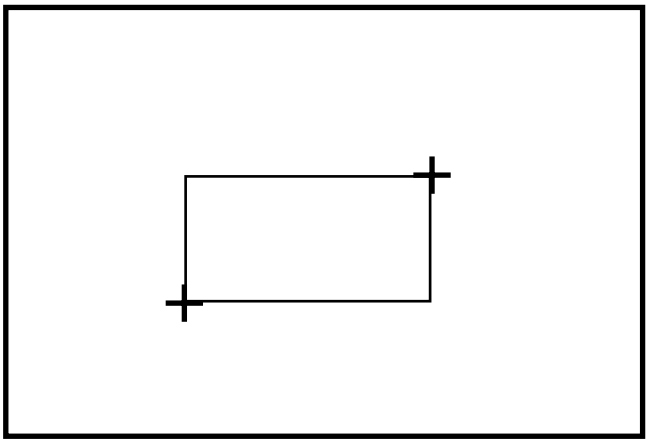
The BOX command draws a box between any two corner points specified in PAGEUNITS:

```
[Arcplot] BOX 2 2 7 6
```



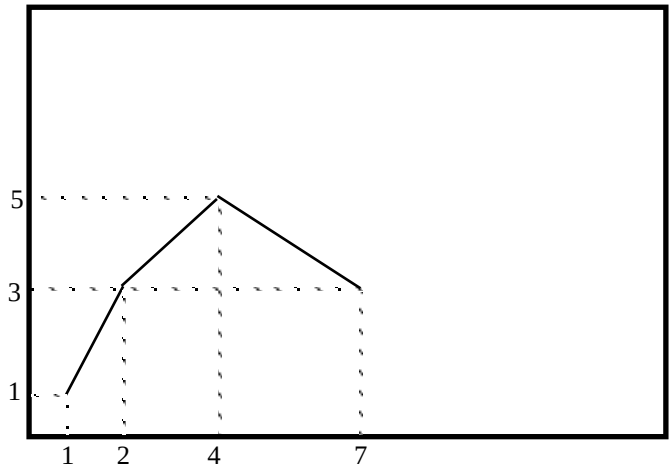
or specified interactively:

*To draw a box interactively, give the BOX command with the * option and enter any two corner points. To enter each corner point, position the screen cursor over the desired point and press any alphanumeric key.*



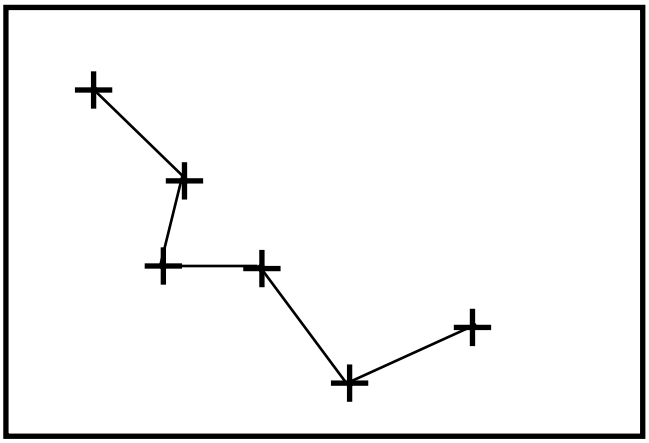
The LINE command draws a line between two or more points specified in PAGEUNITS:

```
[Arcplot] LINE 1 1 2 3 4 5 7 3
```



or specified interactively:

*To draw a line interactively, give the LINE command with the * option and enter any number of points. To enter each point, position the screen cursor over the desired point and press any alphanumeric key. To enter the last point, press the 9 key.*



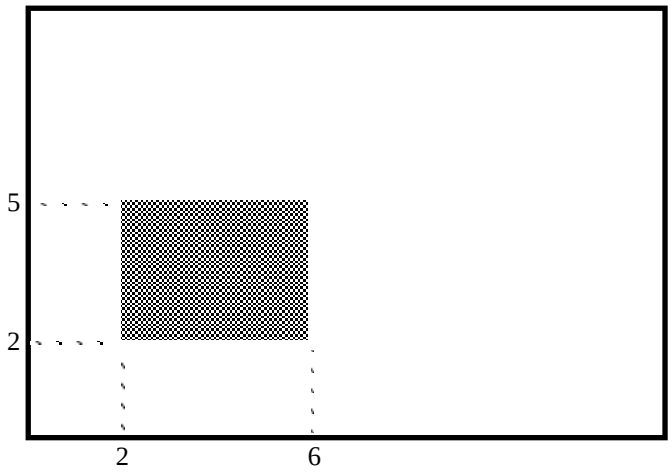
The DRAW command draws a line to a specified endpoint. The line starts at the last point that was drawn. You can also use the MOVE command to specify the start point for the line. In the example below, the last point that was drawn was point 1, 2 in the LINE command:

```
[Arcplot] LINE 1 1 1 2
[Arcplot] DRAW 4 4
```

BOX, LINE and DRAW all use the current line symbol. The MARKER command draws the current marker symbol at the specified point.

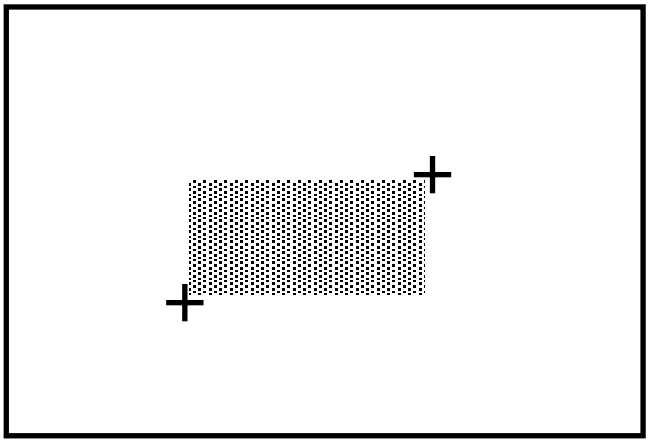
The PATCH command fills a box with the current shade symbol. Any two corner points of the box can be specified in PAGEUNITS:

```
[Arcplot] PATCH 2 2 6 5
```



or specified interactively:

*To draw a patch interactively, give the PATCH command with the * option and enter any two corner points. To enter each corner point position the screen cursor over the desired point and press any alphanumeric key.*

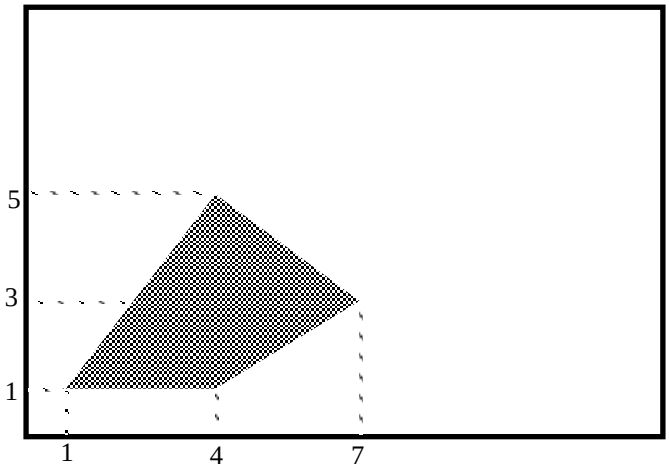


The PATCH command can be used to mask out areas of your map composition. This is useful for areas of a map that will be overwritten by cartographic additions, such as legends. Shade symbol 100 from COLOR.SHD will blank out the area specified by either the PATCH or SHADE command. This feature is useful for display only. The area masked out by either PATCH or SHADE would still plot with cartographic additions plotted on top.

The SHADE command draws a polygon shaded with the current shade symbol. You do not need to repeat the first point to close the

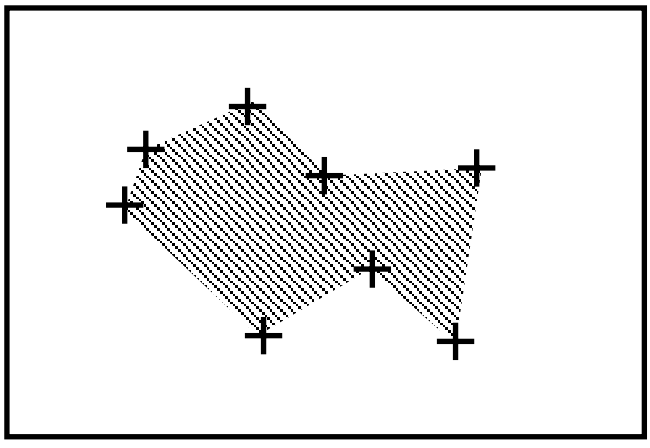
polygon because SHADE automatically closes the polygon. The points defining the polygon outline are specified in PAGEUNITS:

```
[Arcplot] SHADE 1 1 4 1 7 3 4 5
```



or specified interactively:

*To draw a shaded polygon interactively, give the SHADE command with the * option and enter any number of points. To enter each point, position the screen cursor over the desired point and press any alphanumeric key. To enter the last point, press the 9 key. SHADE automatically closes the polygon when you press the 9 key, so you don't need to indicate the first point again to close the polygon.*

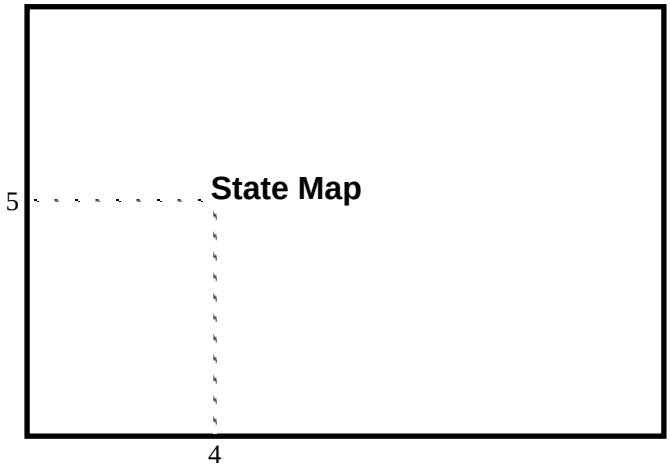


Adding titles

Titles may include information about data sources, map projections, analysis methods, etc., as well as the name of the map.

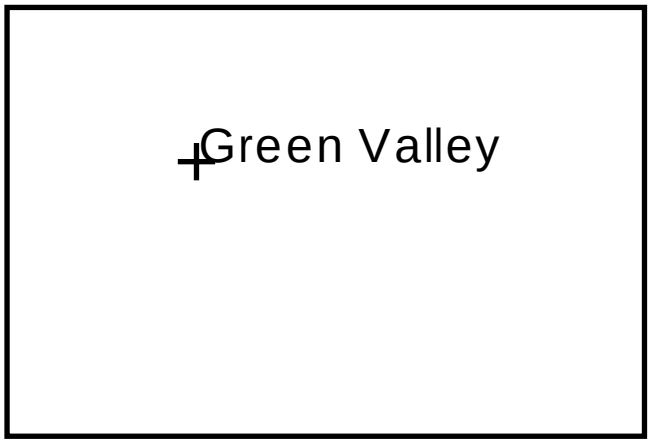
The TEXT command draws a specified text string at the point specified with the MOVE command. If the text string contains blank spaces, a single quote (') must be placed at the beginning and end of the string. The text string is drawn so that the lower-left corner of the first character in the string is located at the point specified in MOVE. The MOVE point can be specified in PAGEUNITS:

```
[Arcplot] MOVE 4 5
[Arcplot] TEXT 'State Map'
```



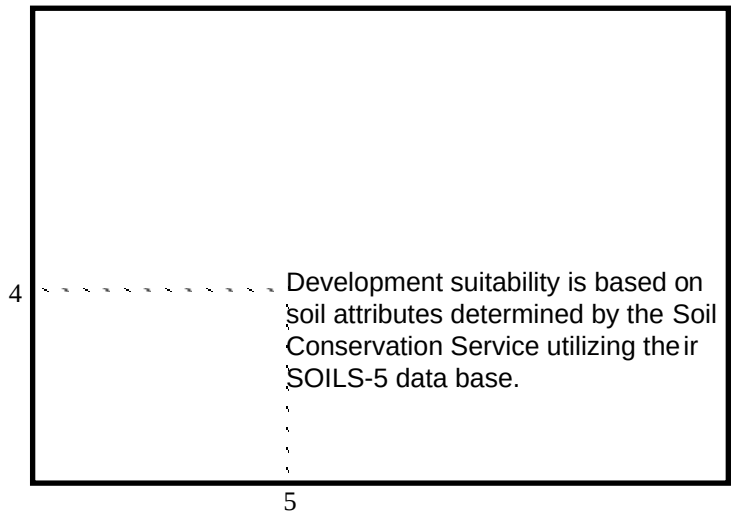
or specified interactively:

*To position text interactively, give the MOVE command with the * option, position the screen cursor over the desired start point for the text, and press any alpha-numeric key. Then give the TEXT command to specify the text string.*



The TEXTFILE command draws the contents of a specified ASCII text file at the MOVE position. The text file is drawn so that the lower-left corner of the first character in the first line is located at the point specified in MOVE. Any text editor producing output in ASCII format can be used to create the text file before the PC ARCPLOT session. TEXTFILE draws the contents of the ASCII file exactly as it appears in the file so that indents, spaces and carriage returns are preserved:

```
[Arcplot] MOVE 5 4
[Arcplot] TEXTFILE TITLE2
```



TEXT and TEXTFILE both draw text using the current text symbol.

Adding key legends

Key legends are not drawn as graphic primitives. Instead, there is a special set of commands to design and draw key legends. There are three types of key legends in PC ARCPLOT. Key legends that describe coverage features represented by line symbols are drawn with the KEYLINE command. Key legends that describe features represented by marker symbols are drawn with the KEYMARKER command. Key legends that describe features represented by shade symbols are drawn with the KEYSHADE command.

Key legends show samples of symbols drawn inside boxes along with associated descriptive text.

Key legends are defined by key legend files. These are ASCII files that are created with any text editor before the PC ARCPLOT session. A key legend file contains the symbol numbers of the symbols used on the map and the text describing what the symbols represent. Each symbol number must be on its own line in the key file and must be preceded with a period (.). The lines following each symbol number line contain the text that will be drawn next to that symbol. When the text is drawn, it appears exactly as it is given in the file so that indents, spaces and line returns are preserved. Here is a key legend file that defines a key legend describing what the line symbols on a map represent:

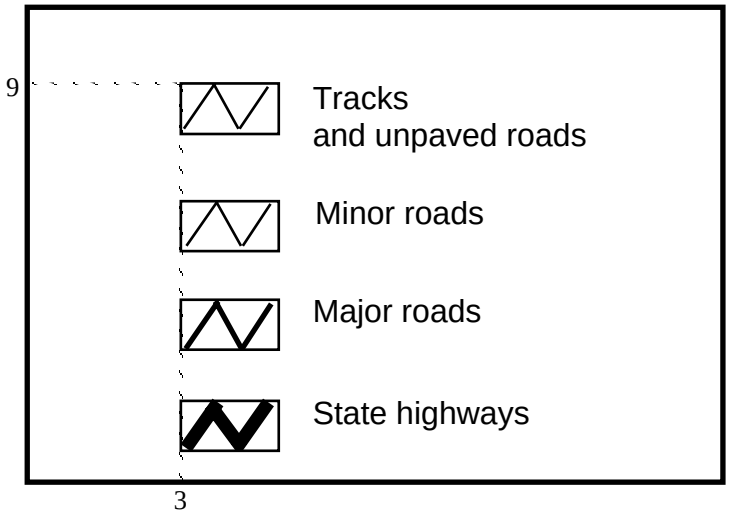
```
.1
Tracks
and unpaved roads
.3
Minor roads
.5
Major roads
.15
State highways
```

The key legend is drawn by naming the key legend file in the KEYLINE, KEYMARKER or KEYSHADE command, depending on whether it defines a line, marker or shade symbol legend. The text in the key legend is drawn with the current text symbol. Before you give the KEYLINE, KEYMARKER or KEYSHADE commands, you must give the KEYPOSITION command to specify where the key legend will be drawn. The key legend is drawn so that the top-left corner of its first key box is positioned at the point specified in KEYPOSITION. The KEYPOSITION point can either be given in PAGEUNITS or indicated with the screen cursor (* option).

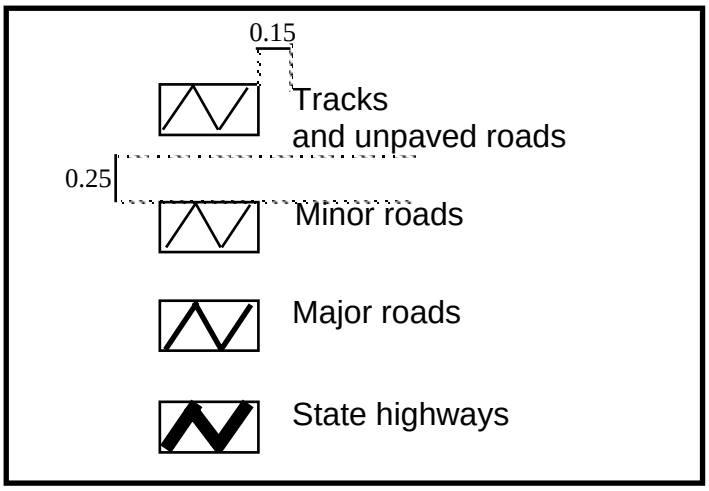
Before you give the KEYLINE, KEYMARKER or KEYSHADE commands, you may also give the KEYBOX and KEYSEPARATION commands. These commands have defaults so you are not required to give these commands.

In this example, the key legend file listed above is used to define the key legend:

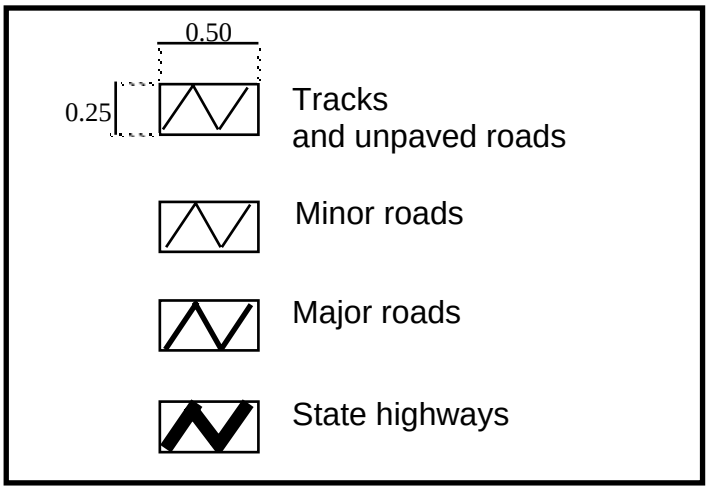
```
[Arcplot] KEYBOX 0.50 0.25
[Arcplot] KEYSEPARATION 0.15 0.25
[Arcplot] KEYPOSITION 3 9
[Arcplot] KEYLINE ROADS.KEY
```



The KEYSEPARATION command sets the distances, in PAGEUNITS, between the key boxes and their associated text, and between the different boxes. If you don't give KEYSEPARATION, both these distances default to 0.25 PAGEUNITS. In the example shown, KEYSEPARATION is set to 0.15, 0.25:



The KEYBOX command specifies the width and height of the key boxes. If you don't give KEYBOX, both the width and the height default to 0.5 PAGEUNITS. In the example shown, KEYBOX is set to 0.50, 0.25:



When a key legend is drawn, a solid line is drawn around each key box in the legend unless the NOBOX option is given in the KEYLINE, KEYMARKER or KEYSHADE command.

When a KEYLINE legend is drawn, each key box has a line symbol drawn inside it as a zigzag. If you would prefer each line symbol sample to be a straight horizontal line instead of a zigzag inside a box, specify KEYBOX with a width equal to the desired length of the straight line and a height of 0. Then when you draw the key legend with KEYLINE use the NOBOX option.

When a KEYMARKER legend is drawn, each key box has a marker symbol drawn in its center. When a KEYSHADE legend is drawn, each key box is filled in with a shade symbol.

Adding neatlines and borders

Neatlines and borders can be drawn with the BOX and LINE commands. Neatlines and borders are normally drawn around the whole plot, around the area containing the main map, and around titles and legends, depending on your map design.

Adding scale bars

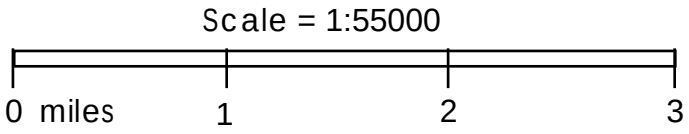
Scale bars enable the map user to easily measure real-world distances on the map. Scale bars show intervals of measurement in useful units drawn at the same scale as the main map on the plot. Some maps might feature two scale bars, one, for example, showing miles and one showing kilometers. Scale bars also usually feature a statement of the actual scale ratio.

Scale bars can be created from graphic primitives drawn with commands like BOX, LINE, DRAW, TEXT and PATCH.

Here is how to make a scale bar showing miles for a map that is at a scale of 1:55000. As the graphic primitives will be specified in inches, we first have to find out how many inches on the map represent one mile on the ground at a scale of 1:55000. We know that there are 63360 inches in a mile, so 63360 divided by 55000 gives us the number of inches that represent one mile at this scale, which works out here to be 1.152 inches. Now we can give commands to draw the scale bar with 1 mile divisions every 1.152 inches:

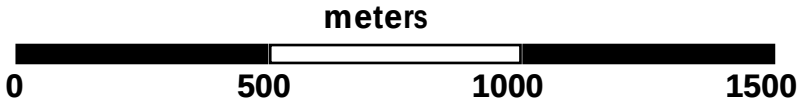
```
[Arcplot] BOX  10 5.10 13.456 5.20
[Arcplot] LINE 10 5 10 5.10
[Arcplot] LINE 11.152 5 11.152 5.20
```

```
[Arcplot] LINE 12.304 5 12.304 5.20
[Arcplot] LINE 13.456 5 13.456 5.10
[Arcplot] MOVE 11 5.30
[Arcplot] TEXT 'Scale = 1:55000'
[Arcplot] MOVE 9.95 4.85
[Arcplot] TEXT '0 miles'
[Arcplot] MOVE 11.102 4.85
[Arcplot] TEXT 1
[Arcplot] MOVE 12.254 4.85
[Arcplot] TEXT 2
[Arcplot] MOVE 13.406 4.85
[Arcplot] TEXT 3
```



Here is how to make a scale bar showing meters for a map at a scale of 1:15250. There are 39370 inches in a kilometer, so 39370 divided by 15250 gives us the number of inches that represent one kilometer at this scale, here, 2.582 inches. This scale bar would be drawn with 500 meter divisions every 1.291 inches:

```
[Arcplot] PATCH 15 10 16.291 10.1
[Arcplot] BOX 16.291 10 17.582 10.1
[Arcplot] PATCH 17.582 10 18.873 10.1
[Arcplot] MOVE 16.591 10.2
[Arcplot] TEXT meters
[Arcplot] MOVE 14.951 9.8
[Arcplot] TEXT 0
[Arcplot] MOVE 16.141 9.8
[Arcplot] TEXT 500
[Arcplot] MOVE 17.332 9.8
[Arcplot] TEXT 1000
[Arcplot] MOVE 18.623 9.8
[Arcplot] TEXT 1500
```



We can see that it takes lots of commands like BOX and LINE to draw complex scale bar designs. One way to avoid this is to use ADS in the the PC ARC/INFO STARTER KIT or PC ARCEDIT to digitize a scale bar as a coverage. Text can be added to the scale bar coverage as annotation. By storing a scale bar as a coverage, you can draw it using only a few commands, like ARCS and ANNOTEXT, and you can position it on the map with a single command, the MAPPOSITION command. Build topology for this coverage before you draw it in PC ARCPLOT.

If the scale bar coverage was digitized in inches, you should set the MAPSCALE to 1 before you draw it. This ensures that the scale bar will be drawn on the map at the same size it was digitized (because it will not be scaled). If you regularly produce maps at a few standard scales, you can create a different scale bar coverage for each of these scales.

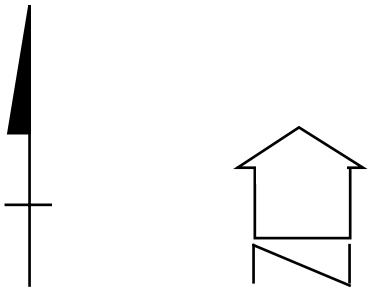
Another way of drawing scale bars as coverages is to store them in the same coverage coordinate units as the main coverages you will use to make the map. You can do this either by digitizing the scale bar coverage using tics from one of the main coverages as a template, or by transforming the scale bar coverage once you have digitized it. When you draw this scale bar, don't give the MAPSCALE command. Instead, let the MAPSCALE default at whatever scale the main map was drawn. In this way, the scale bar itself will always be automatically scaled to be drawn at the same scale as the map. This is very useful if you have to use the same coverages to make maps at a large variety of scales or at a variety of different sizes, because you can use the same scale bar coverage to draw scale bars on all of these maps.

For example, if you digitize a scale bar coverage to show 10000 meter intervals, store this coverage in the same coordinate units as your main coverages, and draw this coverage at the same scale as your map. The scale bar intervals will always represent 10000 meters on the map. If you created annotation for the scale bar coverage to label the intervals along the bar, the annotation will also be scaled automatically so that it matches the scale bar.

Adding North arrows

North arrows help orient the map user. Some maps do not feature North arrows because of the cartographic tradition of drawing maps with north at the top of the sheet. North arrows are, therefore, especially important when you make a map where north is not at the top of the sheet.

North arrows can be created using commands like BOX, LINE and PATCH. North arrows can also be digitized and then drawn as coverages. One advantage to storing North arrows as coverages is that when you draw a North arrow coverage, you can very easily rotate it using the MAPANGLE command. In this way, you can ensure that the North arrow matches any MAPANGLE rotation you may have specified when drawing the map. Here are two examples of North arrows:



Adding reference maps

Reference maps are small marginal maps that show the general area from which the main map is drawn. They may also be in the form of index maps that show the location of adjoining map sheets. Although reference maps and index maps could be drawn using graphic primitives, they are usually drawn using existing coverages from your database. For example, if your map shows a part of a coverage area, your reference map could show the main features of the whole coverage area.

Adding agency logos

Once a logo has been created as a coverage, you can easily draw it on your maps.

Adding reference grids

If you want to add a simple rectilinear grid to a map to divide it into

squares, use commands like LINE and DRAW. If you want to add a grid to a map that shows lines of longitude and latitude at particular intervals, store these lines in a coverage that is transformed and projected in the same way as the rest of your coverages. This will ensure that when the grid is drawn on the map with the other coverages, it will be scaled and positioned identically and will also appear projected correctly. Text can be added at the edge of the grid using MOVE and TEXT commands or as annotation.

Adding label overflow columns

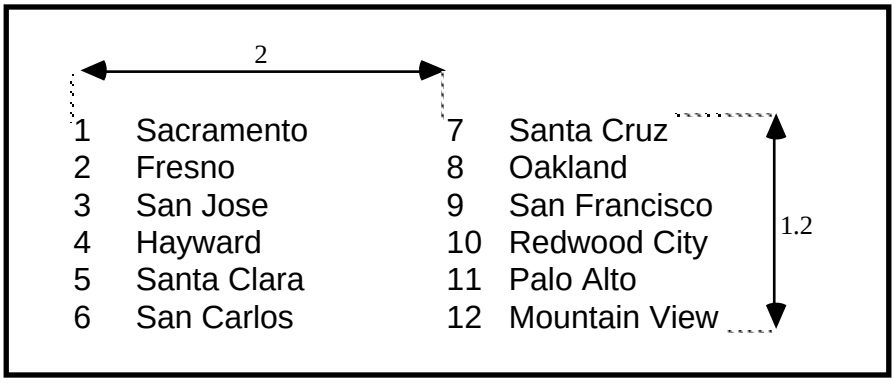
Label overflow columns are special marginal graphics that are used by the POLYGONTEXT command. As we have seen, POLYGONTEXT labels polygons using values from an item as text labels. These text labels are positioned automatically so that they fit neatly inside the polygons without touching the polygon boundaries.

When the text label is too large to fit inside a polygon, POLYGONTEXT draws the label to the upper-right of the polygon's label point. However, you can specify a label overflow column with the OVERAREA, OVERPOSITION and OVERSEPARATION commands. For example,

```
[Arcplot] OVERPOSITION 15 10
[Arcplot] OVERAREA 2 1.2
[Arcplot] OVERSEPARATION 0.2 0.05
[Arcplot] POLYGONTEXT NCAL NAME
```

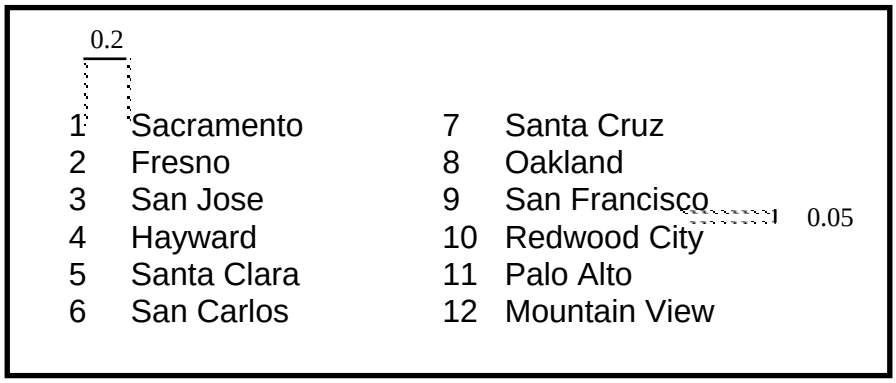
Once you have given these three commands, using POLYGONTEXT will cause each text label that does not fit inside its polygon to be drawn in the label overflow column instead, along with the Internal-ID number of its polygon. The Internal-ID number is also drawn inside this polygon on the map.
The OVERPOSITION command positions the overflow column on the map by specifying the point at which the top-left corner of the column will be drawn. The OVERPOSITION point can either be given in PAGEUNITS or indicated with the screen cursor (* option). In this example, OVERPOSITION is set to 15, 10:

The OVERAREA command specifies the width and height of the label overflow column in PAGEUNITS. If the overflow column length specified in OVERAREA is not long enough to accommodate all the text labels being written to the column by POLYGONTEXT, the remaining labels are automatically placed in a new column adjacent to the first. The new column has the same OVERAREA and OVERSEPARATION dimensions as the first. POLYGONTEXT will keep creating new columns side by side until all the overflow text labels are drawn. In this example, OVERAREA is set to 2 by 1.2:



The OVERSEPARATION command specifies the horizontal distance between the text labels and their corresponding internal

feature numbers, and the vertical distance between the rows of text labels. In this example, OVERSEPARATION is set to 0.2, 0.05:



The UNITS command

We have seen how graphic primitives are specified in the commands by giving their coordinates in PAGEUNITS. But you can also give these coordinates in MAPUNITS. The UNITS command lets you choose whether graphic primitives are specified in PAGEUNITS (the default) or MAPUNITS. In these commands:

```
[Arcplot] MAPEXTENT BASEMAP
[Arcplot] MAPLIMITS 2 2 30 15
[Arcplot] BOX 2 2 30 15
[Arcplot] UNITS MAP
[Arcplot] BOX 2491.32 8109.10 2503.67 8120.00
```

the first BOX command is given with coordinates in PAGEUNITS, and the second BOX command is given with coordinates in MAPUNITS. Giving UNITS as PAGE will set the coordinate specifications back to being in PAGEUNITS. How you set UNITS only affects these commands:

BOX
DRAW
LINE
MARKER
MOVE
PATCH
SHADE

UNITS has no effect on any other commands, like MAPLIMITS and PAGESIZE, that are always given in PAGEUNITS.
Setting UNITS to MAP is useful if you want to position certain graphic primitives accurately on the map relative to the coverage features, or if you want to draw additional details on the map that were not stored as coverage features. For example, you may need to draw a line on a map between two known points on the coverage, or you may need to place a name on a map at a particular coverage point.

Further uses for graphic primitives

Although this chapter has been concerned with titles, scale bars and other reference materials most usually found on maps, you could use the commands that draw graphic primitives to add any sort of graphics to your maps. For example, you could use commands like LINE and DRAW to create simple bar charts and graphs to illustrate the results of PC ARC/INFO statistical analyses associated with the map.

Chapter 8 Putting maps to work: query and update with PC ARCPLOT

Putting maps to work: query and update with PC ARCPLOT

8 You can put maps to work with PC ARCPLOT as well as create them. Graphics displayed on the monitor screen can be used interactively to retrieve information from the tabular database.

PC ARCPLOT's query functions also let you take measurements from a map display.

Using the IDENTIFY command

The IDENTIFY command lets you use the cursor to point at a coverage feature displayed on the monitor screen and obtain a list of its attributes. To use IDENTIFY, name the coverage that the feature belongs to and also the coverage feature class (either ARCS, POINTS or POLYS), and give * to specify use of the screen cursor.

For example, this command will let you identify one of the arcs from a coverage called ROADS:

```
Usage: IDENTIFY [cover] [feature_class] [* / x y] {item...item}

[Arcplot] IDENTIFY ROADS ARCS *
Enter feature location
```

To select an arc feature or a point feature, position the cursor on or near the feature. To select a polygon feature on the screen display, position the cursor anywhere inside the polygon and press any alphanumeric key. Once you have selected a feature, IDENTIFY will first redraw it on the screen (using the current line symbol for a selected arc or polygon feature, or the current marker symbol for a selected point feature). It then lists the attributes stored in the coverage's PAT or AAT for the selected feature. For example,

```
[Arcplot] IDENTIFY PARCEL POLYS *
Enter feature location
$RECNO     AREA   PERIMETER  PARCEL_  PARCEL_ID  NAME
   17    2432.473  901.877     23       23       SMITH
```

By default, IDENTIFY lists all the item values for the record in the PAT or AAT storing attributes for the feature you selected. If you don't want IDENTIFY to list all of the item values, you can name one or more items when you give IDENTIFY. Only those items you specify in IDENTIFY will be listed:

```
[Arcplot] IDENTIFY SITES POINTS * $RECNO NAME VALUE
Enter feature location
$RECNO   NAME       VALUE
   128   NW12908    542.000
```

IDENTIFY can also be used to list the values of related file items or the contents of MEMO items.

In the following example, a relationship is established between the cover PARCEL and the database data file LOCATE. The items can be displayed from both PARCEL.PAT and the related file LOCATE. ADDRESS is a MEMO item in the data file LOCATE. The contents of the MEMO item could be displayed by specifying ADDRESS on the command line.

```
[Arcplot] JOIN PARCEL.PAT LOCATE PARCEL_ID
[Arcplot] IDENTIFY PARCEL POLYS * $RECNO NAME #ADDRESS
Enter feature location

$RECNO   NAME       #ADDRESS
128      SMITH      14 Union St. E
```

The # symbol is used to denote an item from the related file. To display the contents of a MEMO item, you must explicitly reference the item name on the command line. Otherwise, a record number pointer to the memo data file will be displayed.

Concatenated items can also be displayed with IDENTIFY. Both concatenated and item range conventions may be used.

```
[Arcplot] IDENTIFY LANDUSE POLYS * TEXT:DESC
Enter feature location
TEXT    CLASS   SYM   DESC
COARSE   15      34   Sand and Gravel

[Arcplot] IDENTIFY PARCEL POLYS * TEXT+DESC
Enter feature location
TEXT+DESC
COARSE   15      34   Sand and Gravel
```

When you select an arc feature or a point feature, IDENTIFY uses the SEARCHTOLERANCE to search for the feature around the cursor. If IDENTIFY cannot find a coverage feature of the feature class you specify within the current SEARCHTOLERANCE, give IDENTIFY again and reposition the cursor closer to the feature. You can also use the SHOW command to return the value of the current search radius. You can then use the SEARCHTOLERANCE command to decrease the search radius before reissuing IDENTIFY.

Using the MEASURE command

To obtain information from a PC ARCPLOT map display about locations and areas that are not coverage features, you can use the MEASURE command. MEASURE can be used in three ways.

To find the coordinates of any point on the screen display, type:

```
[Arcplot] MEASURE WHERE
Enter location
```

and position the screen cursor anywhere on the map display, and press any alphanumeric key. The coordinates of the point you selected will be displayed immediately in MAPUNITS.

To find the length of a line drawn between any two or more points on the screen display, type:

```
[Arcplot] MEASURE LENGTH
Enter line, hit 9 when done:
121.11055 map units long
```

To enter each point along the line, position the cursor at the desired point, and press any alphanumeric key. To enter the last point, position the cursor and press the 9 key (not the 9 key on the numeric key pad). As you enter each successive point along the line, the length between the first point and the last point you entered will be displayed. When you have entered the last point, the total length of the line will be displayed in MAPUNITS. As you enter each point, the line is drawn on the screen using the current line symbol.

To find the area of a polygon defined by three or more points on the screen display, type:

```
[Arcplot] MEASURE AREA
Enter vertices, hit 9 to close polygon:
2802.59800 square map units
```

To enter each point around the polygon boundary, position the cursor at the desired point, and press any alphanumeric key. To enter the last point, position the cursor and press the 9 key. The first point and the last point will be linked automatically to close the polygon. Once the polygon is defined, its area will be displayed in

MAPUNITS. As you enter each point, the polygon boundary is drawn on the screen using the current line symbol.

The SHOW command can be used to return the value of the most recent MEASURE, either AREA or LENGTH. This value can either be displayed to the screen or stored in an SML variable.

```
[Arcplot] SHOW MEASURE 1
[Arcplot] &LV 1 1
VAR.    VALUE
%0001   2802.59800
```

The SHADE option of the MEASURE command works like the AREA option, but shades the area measured in the current shade symbol. The shaded area will be retained as a map element if used in a map composition.

```
[Arcplot] MEASURE SHADE
Enter vertices, hit 9 to close polygon:
2802.59800 square map units
```

IDENTIFY and MEASURE can only be used to obtain information from the map display drawn with your most recent MAPEXTENT specification. So if you have two maps on your screen that were drawn using two different MAPEXTENT specifications, you will only be able to use IDENTIFY and MEASURE on the map that was drawn from the last MAPEXTENT specification you gave.

Using LIST with RESELECT, ASELECT and NSELECT

The chapter 'Selecting coverage features for drawing' in this section described how to use the RESELECT, ASELECT and NSELECT commands. These commands let you query your tabular database in order to control which coverage features you draw on your maps. You can also use them in conjunction with the LIST command to list the attribute table records for the set of coverage features you have selected:

```
[Arcplot] RESELECT SITE POLYS AREA GT 3500
SITE polys : 4 of 67 selected
[Arcplot] LIST SITE POLYS
```

Whenever you give LIST with the name of a coverage and a feature class, only those records for the coverage features in the selected set for that feature class will be listed. As with IDENTIFY, all the item values are listed for the selected features unless you specify which items you require when you give the command:

```
[Arcplot] RESELECT STANDS POLYS AGE = 25
STANDS polys : 6 of 75 selected

[Arcplot] LIST STANDS POLYS $RECNO TYPE CODE
$RECNO  TYPE     CODE
    10  DOUGPINE   80
    31  DOUGPINE   80
    32  DOUGPINE   40
    33  OAK        60
    39  SPRUCE     80
    50  OAK        60
```

You can use LIST to list any database data file, such as lookup tables, by naming the data file. Note that if you give the LIST command and name a data file that is a feature attribute table:

```
[Arcplot] LIST STANDS.PAT
```

all the records for this feature attribute table will be listed, regardless of any currently selected feature sets.

Using INFOFILE with RESELECT and ASELECT

The INFOFILE command lets you write the records for the coverage features in a set you have selected to a new database data file. In this way, you can store the contents of a selected set permanently. You can specify which items from the selected records you wish to store in the new data file by naming them in the INFOFILE command. If you do not name any items, they will all be written to the new data file.

In this example,

```
[Arcplot] RESELECT SITE POLYS ZONE = 'RA-1'
SITE polys : 6 of 67 selected
[Arcplot] INFOFILE SITE POLYS NEW SITE_ID TAX
[Arcplot] LIST NEW
SITE_ID TAX
    18   45
    12   45
```

```
24   30
35   95
48   30
57   45
```

RESELECT is used to select a set of polygons from the SITE coverage, and a new database data file called NEW is created storing two items, SITE_ID and TAX, from the records for the selected set of polygons from SITE.

Using the LIST and INFOFILE commands with RESELECT, ASELECT and NSELECT lets you stay in PC ARCPLOT to do some of the basic tabular database query work which you would otherwise have to go into TABLES to perform. And as described in the chapter 'Selecting coverage features for drawing' in this section, when you have selected sets of coverage features in PC ARCPLOT, only those coverage features in the selected sets will be drawn.

Updating attributes using FORMS

The FORMS command can be used to update a selected record for a coverage feature or any database data file. FORMS pops up an input form that allows you to update the current item values for a specified record or a coverage feature that can be selected interactively much like IDENTIFY.

```
Usage: FORMS [cover] [feature_class] [record / * / x y]
             {item...item}
       FORMS [info_file] [NONE] [record] {item...item}

[Arcplot] FORMS LANDUSE POLYS *
Position cursor to desired location

AREA            0.2050000E+02         (20.500000)
PERIMETER       0.5181592E+01          (5.181592)
LANDUSE_                   5
LANDUSE_ID                 5
DESC            FOREST
CODE            200
TEXT            FINE
CLASS           TILL
SYM             53

Abort Update
Update record
_____________________________________________
```

An item can be selected using either the cursor or mouse. Once a key has been pressed, the cursor keys resume their normal edit functions and can be used to select a previous or original value.

You may update the record or abort the entire transaction. You may use both item ranges and concatenated items for {item...item}. If you use the concatenated items, then you have the ability to update several items at once. The total combined length for all items specified should not exceed 67 characters. The graphics environment will only display up to 67 characters of text. Character items or concatenated items that exceed 67 characters will be truncated for display only.

```
[Arcplot] FORMS LANDUSE POLY TEXT+SYM
Position cursor at desired location

TEXT+SYM     FINE     TIL     53

Abort Update
Update record           5
_____________________________________
```

All three items specified by TEXT+SYM may be edited at once as a single character item.

Updating using the CALCULATE and MOVEITEM commands with RESELECT, ASELECT and NSELECT

Both the CALCULATE and MOVEITEM commands can be used to facilitate the update of a number of records at one time. Both work similar to the CALC and MOVE commands in TABLES. For numeric items, each record in the currently selected set of a feature attribute table will be assigned the value defined by {expression}. This value is stored in the [target_item]. Standard rules for expressions apply and may include numeric items and SML variables.

```
Usage: CALCULATE  [cover] [feature_class]
                  [target_item] [=] [expression]
       CALCULATE  [cover] [feature_class]
                  [sml_var] [=] [expression]
```

In the following example, two polygons are reselected from coverage LANDUSE. The values for numeric item SYM are currently blank for both records.

```
[Arcplot] RESELECT LANDUSE POLY DESC = 'WATER' AND CODE |
|:= 100
LANDUSE polys : 2 of 7 selected.

[Arcplot] LIST LANDUSE POLY

$RECNO        6
AREA          1.5174
PERIMETER     5.1614
LANDUSE_      6
LANDUSE_ID    4
DESC          WATER
CODE          100
TEXT
CLASS
SYM

$RECNO        7
AREA          2.3457
PERIMETER     5.2542
LANDUSE_      7
LANDUSE_ID    5
DESC          WATER
CODE          100
TEXT
CLASS
SYM

[Arcplot] CALCULATE LANDUSE POLY SYM = 67
```

For character items, the MOVEITEM command will update the [target_item] for all currently selected records using the value of another character item or a specified character string.

```
Usage:  MOVEITEM  [cover] [feature_class] [item/string]
                  [TO] [target_item]
        MOVEITEM  [cover] [feature_class] [item/string]
                  [TO] [sml_var]
[Arcplot] MOVEITEM LANDUSE POLY TEXT = 'SCRUB'
[Arcplot] LIST LANDUSE POLY

$RECNO        6
AREA          1.5174
PERIMETER     5.1614
LANDUSE_      6
LANDUSE_ID    4
DESC          WATER
```

```
CODE          100
TEXT          SCRUB
CLASS
SYM           67

$RECNO         7
AREA           2.3457
PERIMETER      5.2542
LANDUSE_       7
LANDUSE_ID     5
DESC          WATER
CODE          100
TEXT          SCRUB
CLASS
SYM           67
```

The value of an item can also be stored in an SML variable using either CALCULATE or MOVEITEM.

```
[Arcplot] MOVEITEM LANDUSE POLY DESC TO 34
[Arcplot] CALCULATE LANDUSE POLY 35 = CODE

: &LV 34 35
VAR.    VALUE
%0034   WATER
%0035   100
```

The value of the first record for the item specified is stored in SML variables 34 and 35. You may also store character strings or numerical expressions.

Using the STATISTICS and CLASS commands

Both the CLASS and STATISTICS commands allow you to analyze selected feature attribute information during an ARCPLOT session. The results can be displayed graphically using the assigned class value for each feature or, for summary statistics, the results can be written to a file or stored in variables.

In the following example, the WELLS coverage contains point features representing different well locations and DEPTH as an additional attribute item. The example shows the range of values for item DEPTH.

```
[Arcplot] LIST WELLS POINTS WELLS_ID DEPTH

WELLS_ID              DEPTH
      11             4.1512
      13             4.6112
       1             5.6334
      16             6.3746
      10             6.8346
      12             6.8601
      20             7.1157
       9             8.1124
      17             8.8535
       8             9.0835
       2             9.8502
      14            10.7191
       3            11.6902
      15            12.4314
      19            12.6358
       7            14.0670
       4            14.7058
      18            15.8303
       6            16.5714
       5            19.6637
```

WELLS can be classified based on their depth and the category that each well falls into can be stored in another item, CLASS. The CLASS item could then be used as a {case_item} for summary statistics.

The QUANTILE method for classifying data will establish intervals so that the number of coverage features falling into each interval is the same. Note: It is not always possible to get evenly sized groups. This is largely dependent on your data.

In the following example, five class intervals are specified. The {COUNT} option will record the number of records that fall into each of the five class intervals.

```
Usage: CLASS [MANUAL / INTERVAL / QUANTILE] [cover]
             [feature_class] [in_item] [#classes] [out_item]
             [key_file] {NONE / COUNT / PERCENT}

[Arcplot] CLASS QUANTILE WELLS POINTS DEPTH 5 CLASS |
|: WELLS.KEY COUNT
```

Two things happen as a result of this command. The class number for each feature is written to [in_item] CLASS and the [key_file]

WELLS.KEY is written to include the class intervals. The {COUNT} option specifies that the number of features that fall into each interval is also written to the [key_file].

The classes are numbered sequentially from 1 to the [#classes] automatically. These class numbers can be used as symbol numbers to represent the class that each feature falls into.

Key files are used to draw key legends using symbols from the current symbolsets. They are ASCII files, usually created with your text editor. See the chapter 'Adding titles, key legends, neatlines, scale bars, etc.' for more information on key files and their uses.

The contents of [key_file] can be listed using the SML command &DISPLAY.

```
[Arcplot] &DISPLAY WELLS.KEY

.1
     <        6.8346       (4)
.2
6.8346 -      8.8534       (4)
.3
8.8535 -     11.6901       (4)
.4
11.6902 -    14.7058       (4)
.5
     >=      14.7059       (4)
```

In this example, there are an even number of features (4) for each class interval. Each of the symbol numbers (i.e., the numbers prefixed with a '.') corresponds to a class value assigned to each feature. The CLASS item values can be used as symbol numbers for displaying the wells according to their DEPTH classification.

```
[Arcplot] LIST WELLS POINTS WELLS_ID DEPTH CLASS

WELLS_ID          DEPTH        CLASS
    11            4.1512           1
    13            4.6112           1
     1            5.6334           1
    16            6.3746           1
    10            6.8346           2
    12            6.8601           2
    20            7.1157           2
     9            8.1124           2
```

```
    17          8.8535        3
     8          9.0835        3
     2          9.8502        3
    14         10.7191        3
     3         11.6902        4
    15         12.4314        4
    19         12.6358        4
     7         14.0670        4
     4         14.7058        5
    18         15.8303        5
     6         16.5714        5
     5         19.6637        5
```

Using classification values to symbolize features with graduated symbols

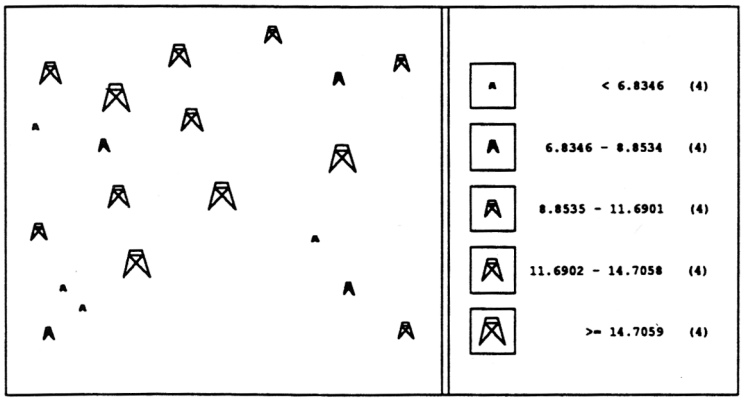
Using the MARKERSET command, a temporary markerset containing a symbol representing each of the five class values could be created. By specifying the same pattern, font and color, but using different sizes, the well locations could be displayed with graduated symbols. In this example, the markerset would be temporary. See 'Guide to marker symbol characteristics' for information on how to create permanent markerset files.

```
[Arcplot] MARKERSET *

Symbol:  1
Color:  1
Pattern:  93
Font:  16
Size:  .1
Symbol:  2
Color:  1
Pattern:  93
Font:  16
Size:  .2
```

Here, only the first two symbols are defined to illustrate that the same symbol is used, with different sizes to represent different classifications for DEPTH. In this example, symbol numbers 1 through 5 have been defined to represent the five class intervals, having sizes ranging from .1 to .5 inches. The POINT features from WELLS can be drawn with a key legend using the following commands.

```
[Arcplot] MAPEXTENT WELLS
[Arcplot] POINTMARKERS WELLS CLASS
[Arcplot] KEYMARKER WELLS.FIL
```



This example shows how the interactively defined symbols are used to represent the wells according to their DEPTH. Wells deeper than 14.7059 feet are represented by a symbol size of .5 inches. Those less than 6.8346 feet are represented by a symbol size of .1 inches, and so on.

The CLASS item or [out_item] can also be used as a case item for generating summary statistics. The {case_item} option of the STATISTICS command will summarize the data for each unique {case_item} value. The summary will include the MINIMUM and MAXIMUM depth values for each classification, as well as the SUM and MEAN for each CLASS value.

```
Usage: STATISTICS [cover] [feature_class] [item]
                  {case_item}
Usage: STATISTICS [info_file] [NONE] [item] {case_item}

[Arcplot] STATISTICS WELLS POINTS DEPTH CLASS

TOTAL STATISTICS FOR CLASSITEM
CASE   COUNT    MINIMUM       MAXIMUM         SUM          MEAN
  1      4      4.151190      6.374570      20.770402      5.192600
  2      4      6.834579      8.112383      28.922793      7.230698
  3      4      8.853510     10.719100      38.506323      9.626581
  4      4     11.690240     14.066950      50.824360     12.706090
  5      4     14.705850     19.663730      66.771350     16.692837
TOT204.151190   19.663730    205.795228      10.289761
```

The screen output can be saved to a file using the SML command &OPENW before issuing the STATISTICS command. The

summary total can also be stored in SML variables using the SHOW command.

```
[Arcplot] SHOW STATISTICS 1 2 3 4 5
[Arcplot] &LV 1 5

VAR.        VALUE
%0001       20
%0002       4.151190
%0003       19.663730
%0004       205.795228
%0005       10.289761
```

For summarizing and classifying POLYGON features, be sure to exclude the universe polygon unless it is required for your specific application. Both STATISTICS and CLASS commands will evaluate all selected records including the universe polygon.

Chapter 9 Using interactive map composition

Using interactive map composition

9 PC ARCPLOT lets you compose maps interactively on the graphics screen by creating and editing map compositions. A map composition is made up of a number of component map elements. The map elements in a map composition may be repositioned any number of times as you compose the map. You can also change their size and delete them. When you are satisfied with your map composition, you can send it to a plotter for hardcopy.

You can edit map compositions to add new map elements or to manipulate existing map elements. Standardized map formats can be stored as map compositions, and specific graphics can be added as new map elements.
You can also combine existing plot files and map compositions into new map compositions. This makes it easy to make a variety of new graphic products from your existing graphics.

These are the PC ARCPLOT commands used for interactive map composition

KILLMAP	deletes a map composition.
MASELECT	adds map elements to the currently selected set.
MAP	creates, modifies or closes a map composition.
MCOPY	copies selected map elements.
MBEGIN	specifies that graphics will be grouped into one map element until MEND is given.
MDELETE	deletes the currently selected map elements.
MEND	closes the map element that graphics have been grouped into since MBEGIN was given.
MFIT	reduces or enlarges the selected map elements into a specified box.
MFRESH	refreshes the graphics screen.
MGROUP	groups the selected map elements into one map element.
MINFO	lists all the map elements in a map composition.
MMOVE	moves the currently selected map elements to a new position.
MNSELECT	switches the selected and unselected sets of map elements.
MORDER	reorders the sequence of map elements in a map composition.
MROTATE	rotates and, if desired, moves and scales the selected set of map elements.
MSCALE	scales the selected map elements by a specified scale factor.
MSELECT	selects one or more map elements.
PLOT	plots an existing plot file, map composition or map element.

What are map elements?

Map elements are the basic components of a map composition. Typically, a map composition will have one map element for the map title, one map element for the North arrow, another for the scale bar, another for the key legend, and so on. Each map element stores the graphic output from one or more PC ARCPLOT drawing

commands. Each map composition can have up to 256 map elements.

Map elements can be positioned and repositioned on the map composition any number of times (MMOVE command). They may also be reduced or enlarged to fit into a box you specify (MFIT command), scaled by a specified scale factor (MSCALE command), or deleted (MDELETE command). You can manipulate map elements individually. You can also select a set of map elements (MSELECT command) and manipulate them together.
As you compose a map, PC ARCPLOT automatically keeps track of the map elements you have created and their locations. When you send a composition to a plotter, the map elements are automatically accessed and drawn in the layout you chose when the map was composed.

PC ARCPLOT lets you arrange map elements into compositions but you can't change the graphic content or symbol characteristics of a map element once it has been created. So, if you have already created a map element that is a black neatline around a map, but you really wanted a green neatline, you will have to delete the existing map element and draw a green neatline to create a new map element.

Starting a new map composition

First start PC ARCPLOT (if you have not already done so) and set DISPLAY to 4. You must set your display for graphics before using any of the map composition commands.

It is likely that the composition you want to create will be larger than the size of the graphics screen. If this is the case, give the PAGESIZE command next to specify the intended output dimensions of your composition. If your composition is to be 55 inches wide and 30 inches high, type:

```
[Arcplot] PAGESIZE 55 30
```

Once you have specified the PAGESIZE, everything you draw while composing the map will be scaled to fit onto the graphics screen so that you can create and view large format compositions in their entirety. When your map is displayed in reduced form to fit on the screen, symbols will appear smaller than their specified sizes; for

example, text specified to be 1 inch high will appear smaller on the screen.

If you create a map composition at a specific PAGESIZE, you should specify that same PAGESIZE each time you draw or plot it.

Note that if your final composition will be the same size as (or smaller than) the graphics screen, you don't need to give the PAGESIZE command, and no scaling down will occur.

Next use the MAP command to name the map composition to be created:

```
[Arcplot] MAP MAP1
```

Adding map elements

Once you have given the MAP command, any graphics you draw on the screen will be saved automatically to your new composition as map elements. Every PC ARCPLOT command you give that draws anything on the screen will create one new map element. For example, these commands:

```
[Arcplot] MAP MAP1
[Arcplot] PAGESIZE 55 30
[Arcplot] MAPEXTENT CANALS
[Arcplot] MAPLIMITS 2 2 30 20
[Arcplot] LINECOLOR 4
[Arcplot] LINEPATTERN 3
[Arcplot] ARCS CANALS
[Arcplot] LINESYMBOL 13
[Arcplot] BOX 2 2 30 20
[Arcplot] MOVE 12 18
[Arcplot] TEXT 'Map of Canals'
```

will create three map elements: one for the ARCS, one for the BOX, and one for the TEXT.

You can also use MBEGIN and MEND to group graphics from several drawing commands into one map element. In this way, graphics that belong together can be manipulated in the composition as one map element. This is often more convenient than having each drawing command create a single map element. For example, if you are drawing a variety of different coverage features for the same

MAPEXTENT area, you may want to group these graphics into a single map element so that they can be moved around together without becoming unregistered. This is because coverage features drawn from the same MAPEXTENT area are explicitly registered by virtue of them being coverage data. Once you have given MBEGIN, all the graphics created by the commands following it will be stored in one map element. To close the map element, use MEND. So these commands:

```
[Arcplot] MBEGIN
[Arcplot] MAPEXTENT STATE
[Arcplot] POLYGONSHADES PRCLS TYPE TYPE.LUT
[Arcplot] LINECOLOR 3
[Arcplot] ARCS ROADS
[Arcplot] LINESYMBOL 10
[Arcplot] ARCS COUNTY
[Arcplot] MEND
```

create a single map element. Another occasion when you might use MBEGIN and MEND is in the creation of scale bars and North arrows. Scale bars and North arrows are often made up of graphics, such as lines and text, drawn by more than one PC ARCPLOT command. Using MBEGIN and MEND when you give these commands will group the graphics into one map element so that you can move the scale bar or North arrow around on the composition as a single component.

How to manipulate map elements

As you compose a map, you can use the MCOPY, MMOVE, MFIT, MSCALE, MROTATE and MDELETE commands at anytime to manipulate any of the map elements you have added so far. Whenever you give one of these commands, it only affects the currently selected map element or map elements. Use the MSELECT command to select one or more map elements for manipulation.

Note that when you add a new map element, it automatically becomes the currently selected map element and unselects whatever was already selected. This means that if you just want to MMOVE, MFIT, MSCALE or MDELETE the last map element that you added, you don't have to use the MSELECT command but, instead,

you can simply give the appropriate command right away. For example, giving these commands:

```
[Arcplot] ARCS EUROPE
[Arcplot] MMOVE *
```

adds a new map element storing the ARCS from the EUROPE coverage and will then let you move this map element to a new position interactively. Giving these commands:

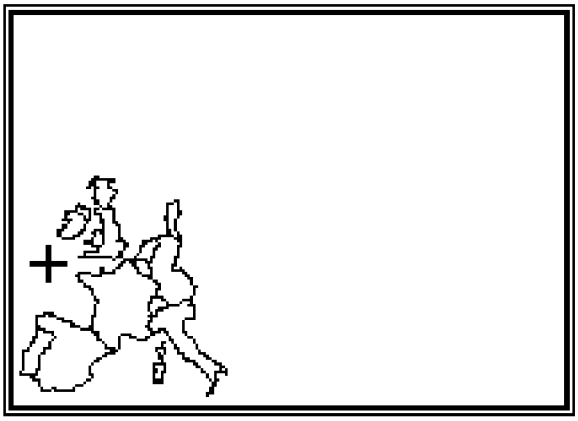
```
[Arcplot] MBEGIN
[Arcplot] MAPEXTENT NORTHARR
[Arcplot] ARCS NORTHARR
[Arcplot] MEND
[Arcplot] MFIT *
[Arcplot] MMOVE *
```

adds a new map element storing a North arrow, will let you reduce or enlarge this North arrow into a box you specify with the screen cursor, and will then let you reposition it.

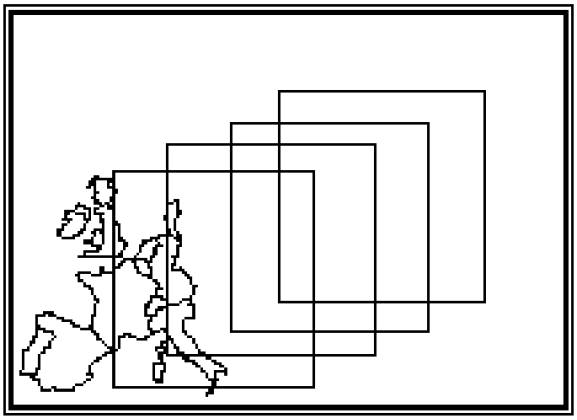
Moving map elements with the MMOVE command

MMOVE lets you move the currently selected map element(s) to a new position. Here is how to use MMOVE with the * option:

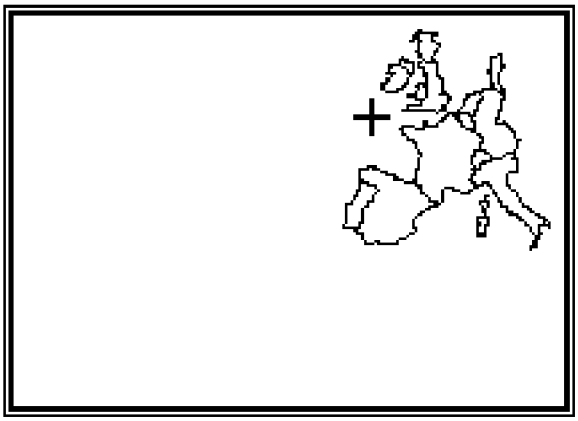
First position the screen cursor at any point on or near the map element(s) that will be moved, and press any alphanumeric key. This indicates the 'from' point.



Next, move the cursor in the direction you wish to move the map element(s). As you move the cursor, you can press the 1 key to flash a box on the screen showing the position of the map element(s) relative to your current cursor position.



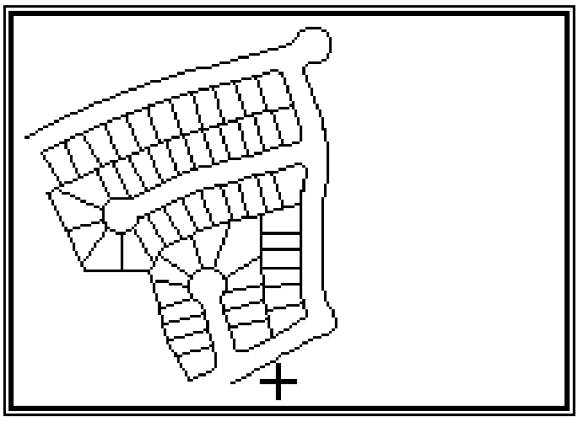
Finally, press any alpha-numeric key (except 1) to enter the 'to' point. The map element will be erased from its original position and redrawn so that the 'from' point is located at the 'to' point.



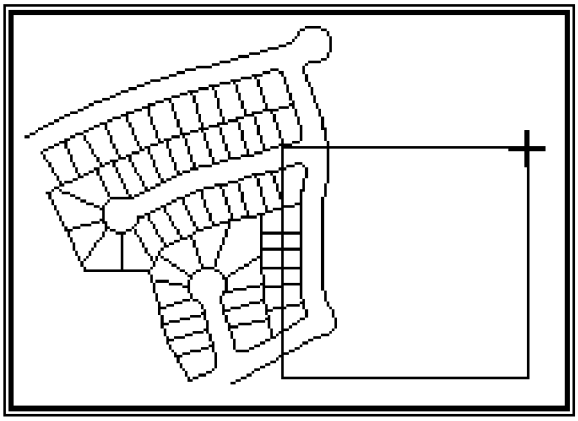
Resizing map elements with the MFIT command

MFIT lets you reduce or enlarge the currently selected map element(s) by fitting it into a box. Here is how to use MFIT with the * option. This option lets you specify the box with the screen cursor:

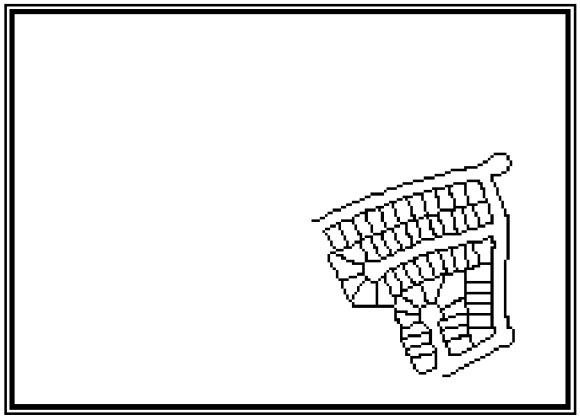
First, position the screen cursor at one corner of your desired box and press any alphanumeric key.



Next, position the cursor at the second corner of your desired box and press any alphanumeric key.



The map element will be erased from its original position and redrawn to fit inside your specified box. Depending on how large your box is, this will either reduce or enlarge the map element. The proportions of the map element will remain constant.



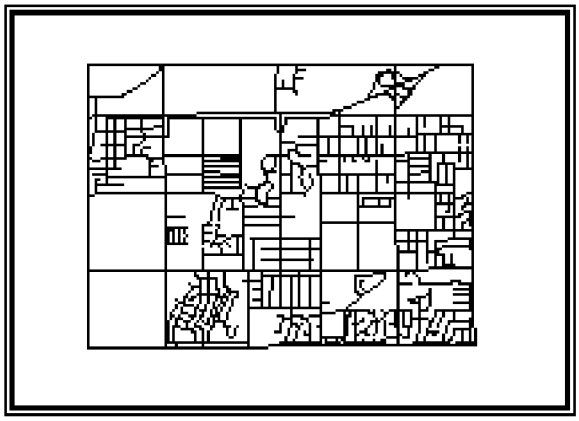
Scaling map elements with the MSCALE command

MSCALE scales the currently selected map element(s) by a specified scale factor. For example, giving these commands:

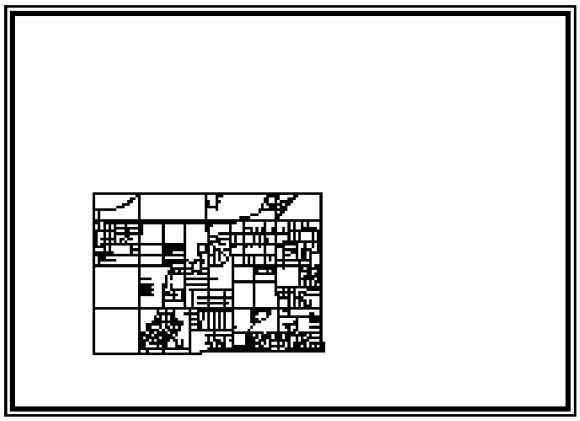
```
[Arcplot] MAPSCALE 200000
[Arcplot] ARCLINES ROADS 7
[Arcplot] MSCALE 0.5
```

will scale the ARCS from the ROADS coverage by 0.5, so they will be redrawn to be half their original size. As the original scale was 1:200000, the arcs will be redrawn at a scale of 1:400000.

Before the MSCALE command



After the MSCALE command, the map element is redrawn at the specified scale factor. The map element is redrawn so that the position of its lower-left corner is not changed.



The MDELETE command

To delete the currently selected map element(s), use MDELETE. When you give MDELETE, the map element(s) will be removed from the screen. You will then be prompted to confirm that you really wanted to make the deletion.

Selecting map elements with the MSELECT command

MSELECT lets you select one or more map elements for manipulation. Map elements can be selected interactively with the screen cursor by specifying their map element numbers, or by selecting them all. When you give MSELECT with the * option:

```
[Arcplot] MSELECT *
```

yellow selection handles are drawn at the lower-left corner of each map element on the screen, and this menu appears in the command dialog area:

```
1=Select, 2=Next, 3=Show, 4=Done, 5=Box, 9=Quit
```

To select one of the map elements on the screen, position the screen cursor over its selection handle and press the 1 key. The selection handle will turn red to indicate that the element has been selected. You can repeat this procedure to select a number of map elements. If the map element you select by pressing the 1 key is not the correct one and it is one of a group of elements whose handles overlap, you can press the 2 key to use the 'Next' option. This option will unselect the map element you have selected, and then select the next map element in that group.

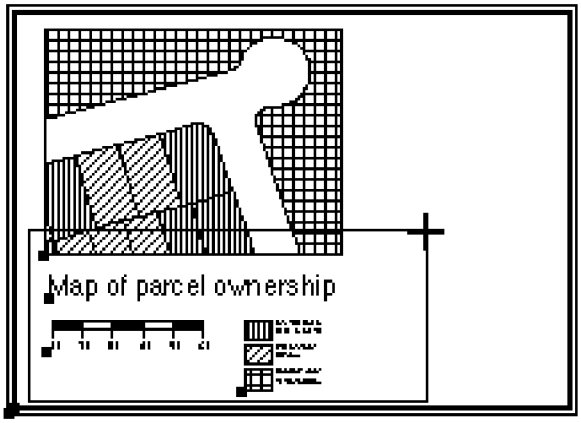
To display a list of the currently selected map elements, press the 3 key.

To leave MSELECT after you have selected one or more map elements, press the 4 key.

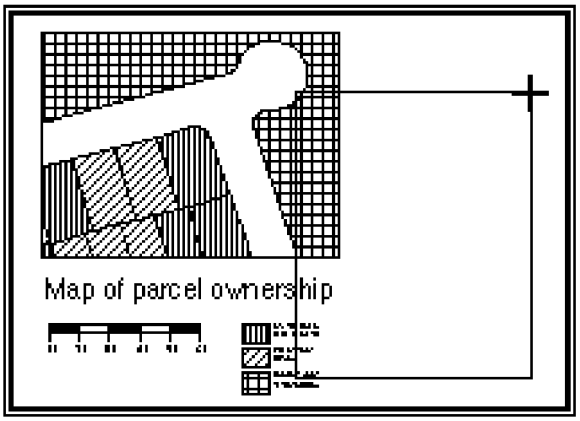
To define a box to select map elements, press 5. All the selection handles that fall inside the specified box are selected. The box is indicated with the screen cursor. Any two opposing corners may be entered in any order. To enter each corner point, position the cursor over the desired point location and press any alphanumeric key.

In the following example, the map elements making up part of a map are selected by defining a box and then fitted into a specified box with the MFIT command:

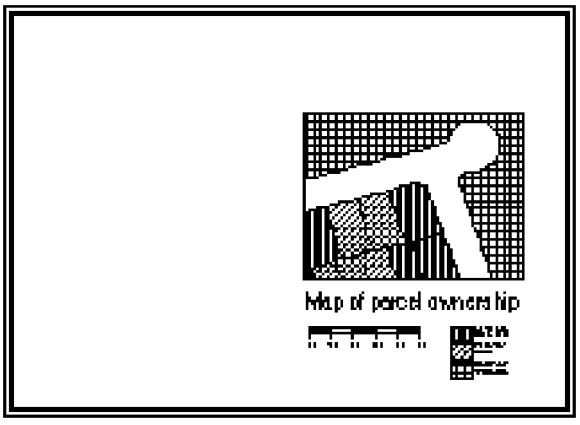
First, the MSELECT command is given. Selection handles appear at the lower-left corner of each map element and the MSELECT menu is displayed in the dialog area. Press the 5 key (box option) and use the screen cursor to specify a box that encompasses the handles of the map elements to be selected. Press the 4 key to leave the MSELECT menu.



*Next, the MFIT command is given with the * option. The screen cursor is used to specify a box into which all the selected map elements will be drawn.*



The selected map elements have been redrawn into the specified box. The relative positions of the different map elements are not changed by redrawing.



To quit MSELECT without retaining the set of map elements you have selected, press the 9 key. When you press 9, the previous

selected set of map elements (those that were selected before you entered MSELECT) will be restored as the currently selected set.

MSELECT can also be given with an ALL option:

```
[Arcplot] MSELECT ALL
```

which selects all the map elements in the current map composition.

You may also specify map element numbers in MSELECT. Each map element in a map composition has an integer number between 1 and 256. These numbers are listed when you use MINFO and whenever any map elements are redrawn. You can specify one or more of these integer numbers in the MSELECT command to select map elements. The following command selects elements E0001 and E0003:

```
[Arcplot] MSELECT 1 3
```

This way of using MSELECT is especially useful when you are creating PC ARCPLOT macros in SML and want to use MSELECT without interactive work with the screen cursor.

After selecting one or more map element(s) with MSELECT, all the MMOVE, MFIT, MSCALE and MDELETE specifications you give will apply to the currently selected map element(s), until you either give MSELECT again to make another selection, or you use a PC ARCPLOT drawing command to create a new map element. When you create a new map element, it automatically becomes the currently selected map element and unselects whatever was already selected.

Changing the selected group of map elements

You can alter the selected set of map elements with the MASELECT or MNSELECT commands. MASELECT adds one or more map elements to the current group. MNSELECT will switch the selected set of map elements with the unselected set.

Using the MGROUP command to group existing map elements

MGROUP permanently groups all the currently selected map elements into one map element. MGROUP serves a similar function to the MBEGIN and MEND commands. The difference is that MBEGIN and MEND are given as you are initially creating map elements while MGROUP is given after you have selected existing map elements.

MGROUP is useful, for example, if you have created a key legend, a title and a neatline that fits around them both, and you want to be able to move these map elements as a group without having to keep selecting them individually. You may not have used MBEGIN and MEND to group these graphics when you first created them because you needed to move the title by itself to make sure it was aligned with the key legend. But now, after selecting these three map elements, giving MGROUP will glue them together so that the next time you want to move them, they will be stored in one map element. Once you give the MGROUP command, the new map element that is created is automatically selected.

MGROUP is permanent, so you can't ungroup map elements once you have grouped them together.

Combining plot files and map compositions with the PLOT command

The PLOT command gives you almost unlimited capabilities for combining plot files and map compositions. PLOT lets you add an existing plot file or map composition to the map you are currently composing. The plot file or map you add with PLOT becomes a new map element that you can manipulate like any other map element. This makes it easy to create complicated plots featuring a variety of maps and coverage areas. There are three ways of using PLOT. You can simply give the command with the name of an existing plot file or map:

```
[Arcplot] PLOT GREENV.PLT
```

in which case, it will be positioned so that its lower-left corner is drawn at the lower-left corner of the screen. You can also use the screen cursor to specify the point on the screen where the lower-left corner of the plot or map will be positioned:

```
[Arcplot] PLOT GREENV.PLT *
```

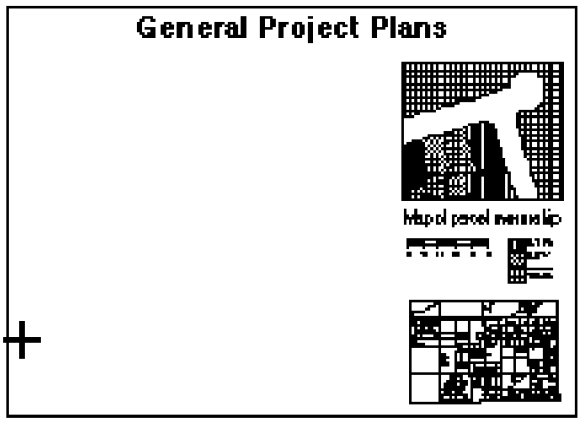
In both of these options, no scaling takes place if the plot or map you are drawing with the PLOT command is larger than your current PAGESIZE. So, if the plot you are drawing was originally created at a PAGESIZE 80 inches wide and 35 inches high, but you are working with a smaller PAGESIZE on the screen, you will only see the lower-left part of the plot when it is drawn.

The third option, BOX, lets you use the screen cursor to specify a box inside which the named plot or map will be drawn. Typing:

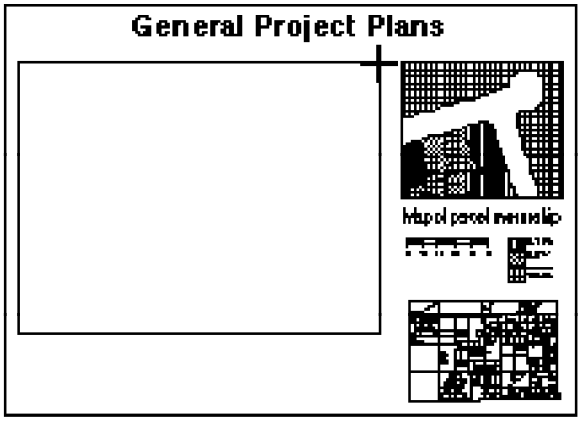
```
[Arcplot] PLOT GREENV.PLT BOX *
```

will let you draw the GREENV.PLT plot file inside a box. Here is how to use PLOT with the BOX * option:

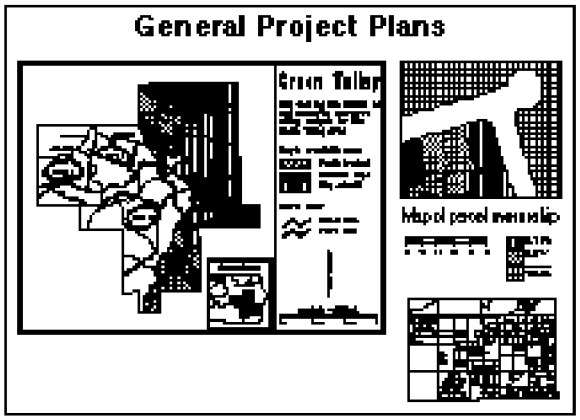
First position the screen cursor at one corner of your desired box and press any alphanumeric key.



Next position the cursor at the second corner of your desired box and press any alphanumeric key.



The specified plot file is drawn inside your specified box as a new map element. The plot is positioned so that its lower-left corner matches the lower-left corner of your box.



You can also specify the PLOT position or the corners of the BOX by giving coordinate pairs (in either PAGEUNITS or MAPUNITS) rather than by using the screen cursor. Note that you can give the PLOT command at anytime during a PC ARCPLOT session, and you don't have to be composing a map or be in screen graphics mode to use it.

Reordering map elements with the MORDER command

When a map composition is plotted or drawn on the screen, the map elements are drawn in their map element number order. Map element number 1 is drawn first, and so on. This means that on a graphics screen, the later map elements will overwrite the earlier ones. This will affect the appearance of the screen display and any screen dump hardcopy made from it. It may also affect the appearance of a plot, depending on the plotter device being used and the particular colors involved.

For example, if you use POLYS to draw polygon outlines and then use POLYGONSHADES to fill these polygons, the shading will overwrite the outlines. The MORDER command lets you reorder the sequence of map elements in the current map composition without having to reissue the drawing commands. So, if these are the map elements in your composition (listed with the MINFO command):

```
[Arcplot] MINFO
E0001: BOX *
E0002: POLYS LANDUSE
E0003: POLYGONSHADES LANDUSE
```

the command:

```
[Arcplot] MORDER 3 2
```

will move map element number 3 to position 2 in the list:

```
[Arcplot] MINFO
E0001: BOX *
E0002: POLYGONSHADES LANDUSE
E0003: POLYS LANDUSE
```

The MFRESH command

MFRESH is used to redraw the screen. When you compose maps in PC ARCPLOT, existing graphics on the graphics screen may often be partially erased when map elements that overlap them are erased and redrawn. You may also notice tiny white dots on the screen that are drawn whenever you position the cursor and press a key. These effects are not being added to your map and are simply a result of how PC ARCPLOT updates the screen display. Giving MFRESH will clean things up because it clears the screen and redraws all the map elements you have created. In this way, any partially erased graphics are fully restored so you can see exactly what your composition looks like so far.

MFRESH has a BRIEF option which allows you to speed up drawing and editing operations. MFRESH BRIEF will redraw unselected map elements as yellow bounding boxes. Each box represents one map element. The boxes will continue to be redrawn

anytime elements are moved, edited or displayed until the MFRESH command is given without the BRIEF option or MAP is given with the DRAW option.

How to modify an existing map

This works in the same way as creating a new map. First, you must give the PAGESIZE command if the map composition you want to modify is at a larger format than the size of your graphics screen. If the map composition to be modified was scaled with the PAGESIZE command at the time it was created, you must issue the PAGESIZE command with the original PAGESIZE dimensions. This will ensure that the map composition is correctly scaled onto the screen and will also ensure that modifications made to the map composition will be scaled correctly during the MAP session.

Next give the MAP command and name the existing map composition you wish to modify:

```
[Arcplot] MAP MAP1
```

All the map elements in this map will then immediately be drawn on the screen. If you gave the PAGESIZE command, everything will be scaled down correctly to fit on the graphics screen. You can now use MSELECT to select existing map elements for manipulation in the usual way. You can also add new map elements.

Map elements are stored in the current page coordinates. This makes it very important to specify the same page size before you reopen your map composition. Also, changing the page size during a map composition session could have undesirable results.

If UNITS is changed to map units, the additions will be stored in page coordinates.

If you specify map units before opening a map composition, then the screen coordinates will be positioned relative to the page in map units, and not where the original elements were located.

Avoid opening a map composition with UNITS set to MAP.

Guide to line symbol characteristics

August 2000

Guide to line symbol characteristics

PC ARCPLOT line symbols are used to represent arcs and any other lines drawn on maps. Line symbols have two different sets of characteristics because the symbol specified with the LINECOLOR, LINEPATTERN and LINESIZE commands is always a fast-drawing hardware-generated symbol, whereas lineset files can feature more elaborate, software-generated, as well as hardware-generated, symbols.

When you specify the current line symbol in PC ARCPLOT by giving the LINECOLOR, LINEPATTERN and LINESIZE commands, you are limited to the three characteristics specified by those three commands:

COLOR
PATTERN
SIZE

Characteristics of line symbols in lineset files

When you specify line symbols in lineset files, there is a greater range of line symbol characteristics allowing virtually unlimited possibilities for customization of line symbols. You can specify different line pattern templates, like double, zigzag, hashed and scalloped. You can also create several layers for one line symbol to produce composite line designs, such as railroad symbols and geological symbols. Line symbols defined in lineset files have these characteristics:

SYMBOL
LAYER
TYPE
COLOR
OFFSET
OUTERDIAMETER
INNERDIAMETER
INTERVAL
PATTERN
OPTION

A lineset file is a system file that stores symbol definitions for a set of up to 150 line symbols. Each line symbol in a lineset file is made up of a number of layers. Each layer is a line design. Simple line symbols will only have one layer. More complex line symbols will feature several layers. By specifying several layers for line symbols you can create elaborate composite line designs, such as railroad symbols and geological symbols. As each layer can be designed individually, a very wide variety of line symbols can be created.

The maximum number of line symbols that can be stored in a lineset file depends on how many layers are used for the lines. A lineset file can have a maximum of 150 records, each of which stores data for one layer. At most, a lineset file can have 150 one-layer symbols. A more typical lineset file might, for example, feature 100 symbols, each with between one and three layers.

Lineset files can be created using the LINEEDIT program. This lets you design line symbols interactively and then save them in lineset files. See 'Using the LINEEDIT program' in this section.

Item definitions for a lineset file

Lineset files can also be created as data files in TABLES. There is one item in the data file for each line symbol characteristic, and each record in the data file defines one layer. In TABLES, the database data file must be sorted in ascending order on the SYMBOL item. The lineset file name must have a .LIN extension. Here are the item definitions for a lineset file:

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC
1	SYMBOL	3	N	0
4	LAYER	1	N	0
5	TYPE	1	N	0
6	COLOR	1	N	0
7	OFFSET	5	N	3
12	ODIA	5	N	3
17	IDIA	5	N	3
22	INTERVAL	5	N	3
27	PATTERN	16	C	0
43	OPTION	3	N	0

Each line symbol characteristic is described below:

SYMBOL sets the line symbol number. This number identifies the line symbol. It must be a positive integer, and has a possible maximum of 150. This SYMBOL number is specified in the LINESYMBOL command to select a line symbol from a lineset file to be the current line symbol. A lineset file created in the tabular database should be sorted in ascending order on the SYMBOL item.

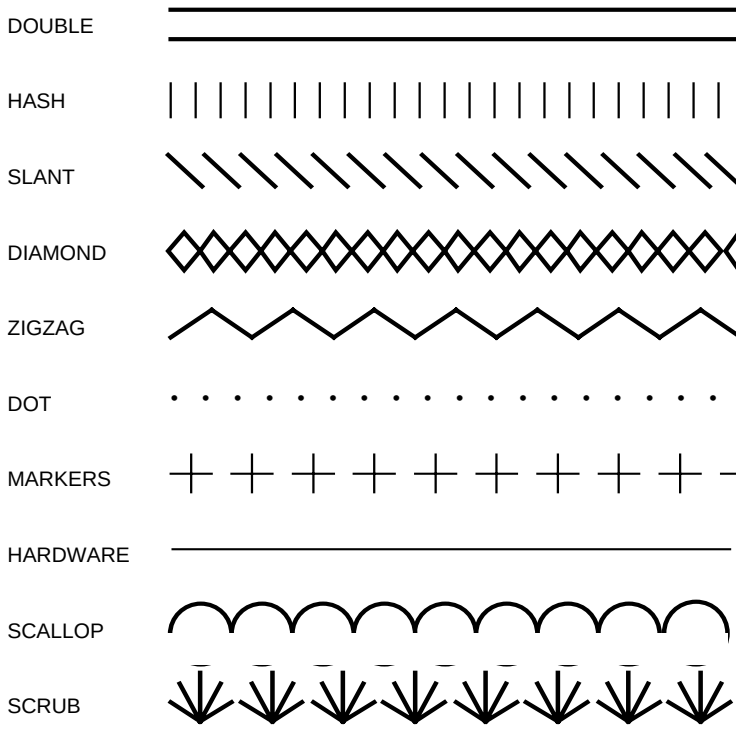
LAYER specifies the layer number. LAYER must be a positive integer. To specify multiple layers for a symbol when you are creating a lineset file in TABLES, give successive records in the lineset file with the same SYMBOL number and a different LAYER number. Note that very complex multiple-layer line symbols may sometimes require lengthy plotting times.

When a multiple-layer line symbol is used on a map, the layers will be drawn in their LAYER number order. Layers with low LAYER numbers will be overwritten by those with high LAYER numbers. So when you design a multiple-layer line symbol, be sure to give the background layers of the line symbol low LAYER numbers and the

foreground layers of the line symbol high LAYER numbers. In this way, you can ensure that when the line is drawn on the screen or plotted, the foreground layers will overwrite the background layers.

TYPE specifies the layer type. There are ten possible layer types and a NONE option. If you are creating a lineset file in TABLES, TYPE is given as a number, as shown below.

0 = NONE
1 = DOUBLE
2 = HASH
3 = SLANT
4 = DIAMOND
5 = ZIGZAG
6 = DOT
7 = MARKERS
8 = HARDWARE
9 = SCALLOP
10 = SCRUB



No layer will be drawn if the TYPE is NONE.

Note that when the TYPE is HARDWARE, the layer has a fixed width one pen wide (the thinnest line the graphic monitor or plotter can draw), so the OUTERDIAMETER characteristic has no effect. If you want a single line of a specified width, set TYPE to DOUBLE, use OUTERDIAMETER to set the desired width, and set INNERDIAMETER to 0.

	TYPE						
	HARDWARE	**DOUBLE**	**MARKERS**	**DOTS**	**HASH DIAMOND**	**SLANT ZIGZAG SCALLOP**	**SCRUB**
PEN	color number used to draw the layer						
OUTERDIAM	- - - - - -	layer width	marker symbol diameter	layer width			
INNERDIAM	- - - - - -	distance between double lines	- - - - - -	diameter of blank space inside dot	- - - - - - - - - - - -		diameter of blank stem of scrub
OFFSET	specifies offset from centerline (positive - left negative - right)						
INTERVAL	specifies length of the marks and gaps in PATTERN						
PATTERN	specifies mark and gap pattern						
OPTION	specifies line pattern (see LINEPATTERN command)	when OPTION = 1 boxes are drawn	marker symbol number	- - - - - - - - - - -		when OPTION = 1 the layer is flipped about its centerline	

COLOR specifies the color number that will be used to draw the layer. This must be an integer. The possible values for the COLOR numbers depend on the device that will eventually be used to display the line symbol. COLOR numbers are interpreted as pen numbers by plotters.

See the chapter 'Displaying maps' in Section III of this guide for examples of default colors for various graphic devices.

The COLOR characteristic is set by the LINECOLOR command when you are specifying line symbols in PC ARCPLOT without using lineset files.

OFFSET specifies at what distance the layer will be offset from the centerline of the line symbol. A positive OFFSET places the layer to the left of the centerline (looking along the line in the from-node to to-node direction). A negative value places the line on the right side of the centerline. An OFFSET value of 0 specifies no offset. OFFSET can be any real number and is given in PAGEUNITS (the default PAGEUNITS is INCHES).

Using offset layers makes it easy to design asymmetrical line symbols. These symbols highlight one side of a line to show, for example, on which side of a contour line the downhill slope falls. This contour line with down-slope hashing could be specified as two layers, the first a HARDWARE TYPE line layer for the contour itself and the second a HASH TYPE line layer with a specified OFFSET to one side of the contour.

Because the OFFSET is always to one side of the line in the from-node to to-node direction, it will help if the arcs that you will eventually represent with an offset line symbol are originally digitized in one direction. For example, if all your contour lines are digitized with the downslope side on the left in the to-node direction, they can all be represented with the same offset symbol, because the down-hill side will be on the same side for all of them. If you are not sure what the from-node to to-node direction is for your arcs, you can draw them in PC ARCPLOT using the ARCARROWS

command. ARCARROWS draws arrowheads at either the from-nodes or the to-nodes of arcs (you specify which).

OUTERDIAMETER (ODIA)

specifies the outer diameter (i.e., the width) of the layer. This can be any real number and is given in PAGEUNITS. When the OUTERDIAMETER is 0, the layer is drawn with a width of one pen (the thinnest line the graphic monitor or plotter can draw).

OUTERDIAMETER has no effect when the layer TYPE is HARDWARE because the HARDWARE type is always drawn with a fixed width of one pen.

The OUTERDIAMETER characteristic is set by the LINESIZE command when you are specifying line symbols in PC ARCPLOT without using lineset files.

INNERDIAMETER (IDIA)

sets the inner diameter for the DOUBLE, DOTS and SCRUB layer TYPES. INNERDIAMETER can be any real number and is given in PAGEUNITS. INNERDIAMETER works as follows:

- When the TYPE is DOUBLE, INNERDIAMETER specifies the distance between the two lines. This distance is, thus, the width of the blank space inside the double line. If INNERDIAMETER is set to 0, no blank space appears, and the DOUBLE line is drawn as a single solid line.

- When the TYPE is DOTS, INNERDIAMETER specifies the diameter of the blank space inside each dot. If INNERDIAMETER is set to 0, no blank space appears and each dot will be drawn completely filled in.

- When the TYPE is SCRUB, INNERDIAMETER specifies how much of the stem of each scrub will be blank. If INNERDIAMETER is set to 0, each scrub's stem will be drawn completely.

INNERDIAMETER has no effect on any of the other layer TYPES and should be set to 0 for these.

INTERVAL controls the length of the marks/gaps when the PATTERN characteristic is being used to define a line pattern. Each mark/gap digit given in the PATTERN specification is multiplied by the value given in INTERVAL to determine the length of the mark or gap (whichever the digit represents). INTERVAL can be any real number and is given in PAGEUNITS.

PATTERN defines a line pattern for the layer. PATTERN is a string of up to sixteen digits. The digits define an alternating mark/gap pattern with the first digit being a mark, the second a gap, the third a mark, and so on. The length of the mark or gap is controlled by the value given for the INTERVAL characteristic. Each digit in PATTERN is multiplied by the INTERVAL value to determine the length of the mark or gap (whichever the digit represents).

For example, when INTERVAL is 0.2 inches, a PATTERN of 1221 defines a line pattern comprising a mark of 0.2 inches, a gap of 0.4 inches, a mark of 0.4 inches, and a gap of 0.2 inches. This mark/gap pattern is drawn repeatedly to form the line.

When the PATTERN specification contains only one digit (i.e., when the PATTERN string has a value of between 0 and 9) it produces a continuous mark pattern with no gaps. Hence when PATTERN is 0 and TYPE is HARDWARE, the layer will be a continuous solid line. The default PATTERN is 0.

When the PATTERN specification has more than one digit, the first digit in the string may be 0. A PATTERN with 0 as the first digit will start with a gap (because the initial mark in the pattern has no length).

Unlike the dash/gap line pattern that can be specified using OPTION when the TYPE is HARDWARE, the mark/gap PATTERN specification does not interpret mark digits that have the value 0 as

dots. You can, however, simulate a dot in PATTERN by specifying a very small INTERVAL.

Each layer TYPE draws the marks in PATTERN differently:

- When the TYPE is HARDWARE, each mark in PATTERN is drawn with the dashed line pattern specified with OPTION. Combining PATTERN and OPTION settings enables you to create an unlimited range of customized dashed and dotted lines. The OPTION default is 0, for which each mark in PATTERN is drawn with the standard solid line.

- When the TYPE is DOUBLE, each mark in PATTERN is drawn as two parallel solid lines, with the spacing between them controlled by the INNERDIAMETER.

- When the TYPE is MARKERS, each mark in PATTERN is drawn as a number of identical marker symbols, the number being the same as that mark's digit. The OPTION parameter is used to specify which marker symbol will be used by giving its symbol number. This marker symbol will be taken from whatever markerset file is current. The marker symbols are spaced out along each mark according to the value of INTERVAL, the centers of the markers being one INTERVAL apart. The size of the markers is set by OUTERDIAMETER.

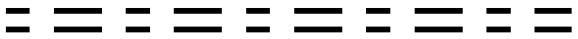
For example, when the marker symbol is an asterisk and the PATTERN is 41, the layer pattern appears as four asterisks followed by a gap.

Here are some examples of PATTERN specifications with different line TYPES.

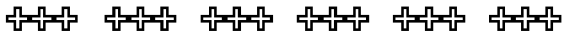
```
PATTERN 21
TYPE HARDWARE
INTERVAL 0.2
OPTION 9
```



```
PATTERN 1121
TYPE DOUBLE
OUTERDIAM 0.1
INNERDIAM 0.05
INTERVAL 0.1
```



```
PATTERN 31
TYPE MARKERS
OUTERDIAM 0.1
INTERVAL 0.1
OPTION 97
```



```
PATTERN 11
TYPE MARKERS
OUTERDIAM 0.1
INTERVAL 0.1
OPTION 97
```

```
PATTERN 21
TYPE DIAMOND
OUTERDIAM 0.1
INTERVAL 0.1
```

```
PATTERN 42
TYPE HASH
OUTERDIAM 0.05
INTERVAL 0.05
```

- When the TYPE is HASH, SLANT, DIAMOND, ZIGZAG, DOTS, SCALLOP or SCRUB, each mark in PATTERN is drawn as a number of units of the particular layer TYPE, the number being the same as that mark's digit.

For example, when the TYPE is DIAMOND and the PATTERN is 31, the layer pattern appears as three diamonds followed by a gap. Each diamond will be one INTERVAL long.

OPTION this integer parameter is interpreted differently according to which layer TYPE has been set for the layer. The default OPTION is 0 for all layer types. OPTION can create the following effects:

- When the TYPE is DOUBLE, OPTION can be set to 1 to add verticals to a dashed double line, and so create a boxed line.

- When the TYPE is MARKERS, OPTION specifies the marker symbol that will be used to draw the layer. Use the MARKERSET command to specify the markerset file from which the marker symbols specified in OPTION will be taken. The specified marker symbol is drawn repeatedly to form the line.

- When the TYPE is DOTS, HASH or DIAMOND, the OPTION parameter has no effect.

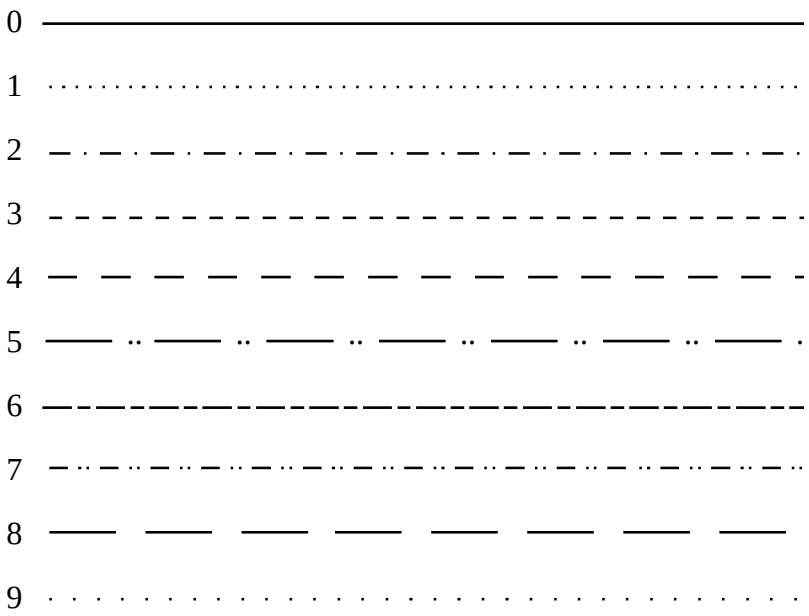
- When the TYPE is SLANT, ZIGZAG, SCALLOP or SCRUB, OPTION can be set to 1 to flip the layer about the centerline.

- When the TYPE is HARDWARE, OPTION specifies a dashed line pattern in exactly the same way as you use the LINEPATTERN command when you are specifying line symbols in PC ARCPLOT without using lineset files. OPTION is given as an integer number.

Note: HARDWARE TYPE line symbols are drawn at the same scale regardless of the PAGESIZE. Standard line patterns 1-9 will retain their mark/gap intervals, whereas other line TYPEs (HASH, SCALLOP, etc.) will scale the mark/gap interval depending on the PAGESIZE. By assigning values for PATTERN and INTERVAL, the hardware line patterns 1-9 will be scaled.

Note: COLOR.LIN contains 100 fast drawing HARDWARE line symbols. PLOTTER.LIN contains line symbols that will be scaled (with the exception of symbols (77, 78, 79, 80).

An OPTION value between 0 and 9 specifies one of these ten standard line patterns. The default OPTION value is 0, which is the standard solid line.



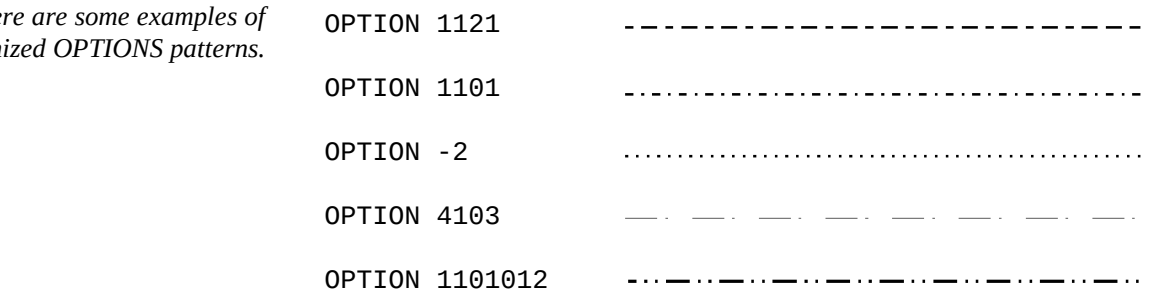
An OPTION value of 10 or more is interpreted as a template defining a dashed line pattern. The template specified in OPTION can have between two and eight digits.

The digits define an alternating dash/gap pattern with the first digit being a dash, the second a gap, the third a dash, and so on. The dashes and gaps are measured in millimeters. Hence, an OPTION of 1121 defines a line template with a dash of 1 mm, a gap of 1mm, a dash of 2mm and a gap of 1mm. The template is drawn repeatedly to form the line pattern.

A value of 0 for a dash digit indicates that a dot is desired (a dash of zero length). Hence, an OPTION of 1101 is a dash of 1mm, a gap of 1mm, a dot, and a gap of 1mm. A value of 0 for a gap means that no gap will be drawn.

If the pattern is to start with a dot, a negative sign has to be used to force a 0 value in the first dash digit. Thus, if OPTION is given as -2, it is interpreted as 02, which is a dot followed by a gap of 2mm, a template that will produce a simple dotted line.

Here are some examples of customized OPTIONS patterns.



OPTION specifies a dash/gap pattern only when the TYPE is HARDWARE. To specify a dashed line pattern for other line types, use the PATTERN characteristic.

Accessing line symbols from lineset files

Once you have created a lineset file in TABLES, use the LINESET command in PC ARCPLOT to name the lineset file from which you wish to access line symbols.

To select a line symbol from this lineset file to be the current line symbol, specify its SYMBOL number in the LINESYMBOL command. These commands:

```
[Arcplot] LINESET COLOR.LIN
[Arcplot] LINESYMBOL 10
[Arcplot] ARCS PARCELS
```

will draw the ARCS from the PARCELS coverage using LINESYMBOL 10 from the LINESET file called COLOR.LIN.

Line symbols from lineset files will also be accessed when you use the ARCLINES command to draw arcs from a coverage.

We have seen how line symbols have two sets of characteristics. This is because the symbol specified with the LINECOLOR, LINEPATTERN and LINESIZE commands is always a fast-drawing, hardware-generated symbol, whereas lineset files can feature more elaborate, software-generated, as well as hardware-generated symbols. Because these two sets of characteristics are not compatible, you cannot use the LINESYMBOL command to access a line symbol from a lineset file to be the current line symbol and then use the LINECOLOR, LINEPATTERN and LINESIZE commands to change the characteristics of this current symbol. Instead, if you give one of these commands after the LINESYMBOL command, the current symbol will revert back to being the hardware-generated symbol defined by your most recent settings of the LINECOLOR, LINEPATTERN and LINESIZE commands.

The default lineset file

The default lineset file is PLOTTER.LIN. This file is immediately accessible in PC ARCPLOT whenever a session is started and provides 100 line symbols with symbol numbers 1 to 100. These symbols feature 25 line patterns in 4 different colors, making PLOTTER.LIN especially useful for creating maps to be drawn on four-color plotters.

If you use the LINESET command to access a lineset file that has less than 100 symbols, line symbols from PLOTTER.LIN will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional lineset files. COLOR.LIN features 90 symbols made up of 6 different line patterns in each of the 15 monitor screen colors plus an additional pattern in 10 colors. BW.LIN features 32 symbols made up of 32 different line patterns in color number 1. Use the LINESET command to access these lineset files.

PLOTTER.LIN, COLOR.LIN and BW.LIN reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when

specifying one of these lineset files in the LINESET command. This is because LINESET automatically searches the SYMBOLS directory if the specified lineset file cannot be found in the current directory.

Lineset files from other ARC/INFO platforms

The lineset files available with other platform versions of ARC/INFO have a different format than the PC ARC/INFO lineset files. This makes the lineset files distributed with other versions of ARC/INFO incompatible with PC ARC/INFO. However, you could approximate these lineset files by creating your own custom lineset file based on the lineset file definitions for linesets on other ARC/INFO platforms.

Guide to marker symbol characteristics

August 2000

Guide to marker symbol characteristics

PC ARCPLOT marker symbols are used to represent point features. Marker symbols have these characteristics:

SYMBOL
COLOR
PATTERN
FONT
SIZE

You can specify the current marker symbol by using the following commands, each of which sets one marker symbol characteristic:

MARKERCOLOR
MARKERPATTERN
MARKERFONT
MARKERSIZE

You can also store the characteristics of a set of marker symbols in a markerset file. The MARKERSYMBOL command accesses a marker symbol from a markerset file to be the current marker symbol.

A markerset file is a system file that stores symbol definitions for a set of up to 100 marker symbols. Markerset files are created as database data files in TABLES. There is one item in the data file for each marker symbol characteristic, and each record in the data file defines one marker symbol. In TABLES, the data file must be sorted in ascending order on the SYMBOL item. The markerset file name must have a .MRK extension.

Item definitions for a markerset file

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC
1	SYMBOL	3	N	0
4	COLOR	1	N	0
5	PATTERN	2	N	0
7	FONT	2	N	0
9	SIZE	5	N	3

Each marker symbol characteristic is described below:

SYMBOL sets the marker symbol number. This number identifies the marker symbol. It must be an integer between 1 and 100. This SYMBOL number is specified when using the MARKERSYMBOL command to select a marker symbol from a markerset file to be the current marker symbol.

COLOR specifies the color number that will be used to draw the marker symbol. This must be an integer. The possible range of COLOR numbers depends on the device that will be used to draw the marker symbol. COLOR numbers are interpreted as pen numbers by plotters.

See the chapter 'Displaying maps' in Section III of this guide for examples of default colors for various graphic devices.

PATTERN specifies the pattern number of the marker symbol. This may be any integer between 0 and 127. The PATTERN is taken from the specified FONT.

FONT specifies the font number from which the marker pattern will be taken. PC ARCPLOT provides 17 fonts, numbered 0 to 16, which are used for text symbols and to provide patterns for marker symbols. Each font has up to 128 patterns, numbered 0 to 127. These patterns include letters, numbers, Greek characters, crosses, circles and a variety of other shapes. The default font number is 0, which is a basic font provided by the hardware device being used for display.

With the FONTEDIT program, new patterns can be designed and added to the fonts already provided, so that customized marker symbols can be created and drawn on PC ARCPLOT maps. New fonts containing customized patterns can be given font numbers 17 to 24 if they are to be used together with the existing set of fonts. See 'Using the FONTEDIT program' in this section for additional information.

SIZE specifies the size of the marker symbol. SIZE is given as a real number in PAGEUNITS, the default units being INCHES. SIZE specifies the height of the pattern cell inside which the marker symbol is drawn, not the actual height of the marker symbol. If the pattern being used for the marker symbol only occupies part of the pattern cell, the pattern will appear smaller than the specified SIZE.

Accessing marker symbols from markerset files

Once you have created a markerset file and saved it as a system file, it is ready for use in PC ARCPLOT. Give the MARKERSET command in PC ARCPLOT to name the markerset file from which you wish to access marker symbols.

To select a marker symbol from this markerset file to be the current marker symbol, specify its SYMBOL number in the MARKERSYMBOL command. Marker symbols from this markerset file will also be accessed when you use the POINTMARKERS, LABELMARKERS or ARCMARKERS commands to represent points, labels or arc midpoints, respectively, with a variety of marker symbols. These commands:

```
[Arcplot] MARKERSET COLOR.MRK
[Arcplot] POINTMARKERS WELLS WELLS_ID
```

will draw the points from the WELLS coverage using the values of the WELLS_ID item as symbol numbers. Marker symbols with these symbol numbers will be accessed from the MARKERSET file called COLOR.MRK.

You can use MARKERSYMBOL to select one of the symbols in a markerset file to be the current marker symbol and then use any of the MARKERCOLOR, MARKERFONT, MARKERPATTERN and

MARKERSIZE commands to change the individual characteristics of this current symbol. For example, these commands:

```
[Arcplot] MARKERSYMBOL 67
[Arcplot] MARKERCOLOR 14
[Arcplot] MARKERSIZE 0.4
```

set the current marker symbol to be marker symbol number 67, and then change the color and size of the current marker symbol. These changes only apply to the current marker symbol. They are not saved permanently in the markerset file.

The default markerset file

The default markerset file is PLOTTER.MRK. This file is automatically loaded into PC ARCPLOT whenever a session is started and provides 100 marker symbols with symbol numbers 1 to 100. These symbols feature 25 marker patterns in 4 different colors, making PLOTTER.MRK especially useful for creating maps to be drawn on four-color plotters.

If you use the MARKERSET command to access a markerset file that has less than 100 symbols, marker symbols from PLOTTER.MRK will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional markerset files. COLOR.MRK features 90 symbols made up of 6 different marker patterns in each of 15 monitor screen colors plus an additional pattern in 10 colors. BW.MRK features 16 symbols made up of 16 different marker patterns in color number 1. Use the MARKERSET command to access these markerset files.

PLOTTER.MRK, COLOR.MRK and BW.MRK reside in the SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these markerset files in the MARKERSET command. This is because MARKERSET automatically searches the SYMBOLS directory if the specified markerset file cannot be found in the current directory.

Markerset files from other ARC/INFO platforms

The markerset files available with other platform versions of ARC/INFO have a different format than the PC ARC/INFO markerset files. This makes the markerset files distributed with other versions of ARC/INFO incompatible with PC ARC/INFO. However, you could approximate these markerset files by creating your own custom markerset file based on the markerset file definitions for markersets on other ARC/INFO platforms.

Guide to text symbol characteristics

August 2000

Guide to text symbol characteristics

PC ARCPLOT text symbols are used to represent any labels, annotation or titles drawn on maps. Text symbols have these characteristics:

SYMBOL
COLOR
STYLE
FONT
QUALITY
ANGLE
WIDTH
HEIGHT
CHARACTER SPACING
LINE SPACING

You can specify the current text symbol by using the following commands, each of which sets one text symbol characteristic:

TEXTCOLOR
TEXTSTYLE
TEXTFONT
TEXTQUALITY
TEXTANGLE
TEXTSIZE (specifies both WIDTH and HEIGHT)
TEXTSPACING (specifies both **CHARACTER SPACING** and **LINE SPACING)**

You can also store the characteristics of a set of text symbols in a textset file. The TEXTSYMBOL command accesses a text symbol from a textset file to be the current text symbol.

A textset file is a database data file that stores symbol definitions for a set of up to 100 text symbols. Textset files are created as data files in TABLES. There is one item in the data file for each text symbol characteristic, and each record in the data file defines one text symbol. In TABLES, the data file must be sorted in ascending order on the SYMBOL item. The textset file must have a .TXT extension.

Item definitions for a textset file

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC
1	SYMBOL	3	N	0
4	COLOR	1	N	0
5	STYLE	1	N	0
6	FONT	1	N	0
7	QUALITY	1	N	0
8	ANGLE	5	N	3
13	WIDTH	5	N	3
18	HEIGHT	5	N	3
23	CHR_SPACE	5	N	3
28	LIN_SPACE	5	N	3

Each text symbol characteristic is described below:

SYMBOL sets text symbol number. This number identifies the text symbol. It must be an integer between 1 and 100. This SYMBOL number is specified when you use the TEXTSYMBOL command to select a text symbol from a textset file to be the current text symbol.

COLOR specifies the color number used by the text symbol. This must be an integer. The possible range of COLOR numbers depends on the device that will be used to draw the text symbol. COLOR numbers are interpreted as pen numbers by plotters.

See the chapter 'Displaying maps' in Section III of this guide for examples of default colors for various graphic devices.

STYLE specifies whether the text symbol will accept IGL typesetting commands. These commands can be embedded in text strings before the text strings are drawn to specify subscripting, superscripting, slanted characters, underlining, etc. Give STYLE as either number 1 or 2 as shown:

1 = no IGL typesetting commands will be used
2 = IGL typesetting will be used

See the TEXTSTYLE command reference in Section IV of this guide for a list of the IGL typesetting commands.

FONT specifies the font number used by the text symbol. PC ARCPLOT provides 17 fonts of which the first 12, numbered 0 to 11, are used for text symbols. The default font number is 0.

The illustration below shows each of the text symbols provided in fonts 0 to 11.

QUALITY specifies the mode of intercharacter spacing used when text strings are drawn. Give QUALITY as either number 1 or 2 as shown:

1 = Constant mode
2 = Proportional mode

constant

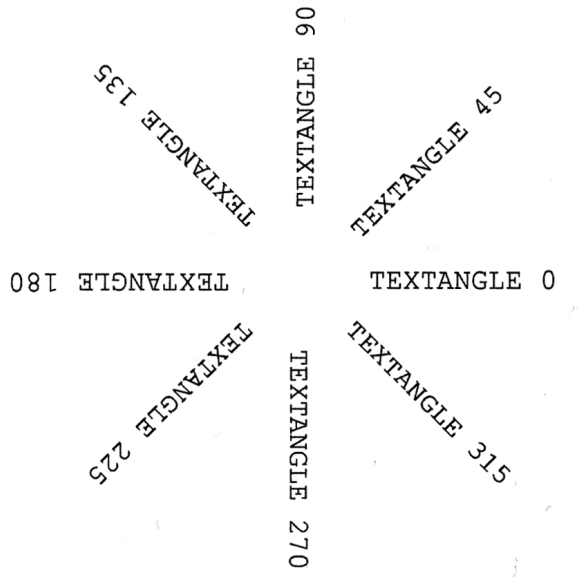
In Constant mode, each character is placed a constant distance away from the preceding character, regardless of the actual width of the

preceding character. This results in all the characters being drawn approximately the same distance apart.

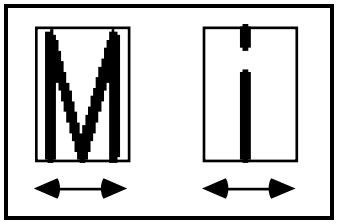
proportional

In Proportional mode, the actual width of the characters is taken into account in the spacing. This results in varying intercharacter spacing. Proportional mode text more closely approaches professional typeset quality than Constant mode text. However, Proportional mode text takes slightly longer to draw than Constant mode text.

ANGLE specifies the angle at which text will be drawn. ANGLE is given in degrees counterclockwise from the horizontal, which is 0 degrees. The whole text string is rotated by the angle.



WIDTH



specifies the width of the character cell used to draw each character in a text string. WIDTH is given as a real number in PAGEUNITS, the default units being INCHES. Note if the character being drawn does not occupy the entire width of the character cell, the character will appear narrower than the specified cell WIDTH.

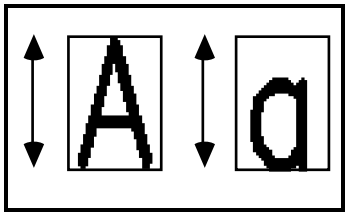
Giving WIDTH as 0 makes it default to 3/4 of the height of the character cell:

HEIGHT 1
WIDTH 0 (default)

HEIGHT 1
WIDTH 1

HEIGHT 1
WIDTH 1.5

HEIGHT



specifies the height of the character cell used to draw each character in a text string. HEIGHT is given as a real number in PAGEUNITS, the default units being INCHES. Note that if the character being drawn does not occupy the entire height of the character cell, as with a lowercase letter, the character will appear smaller than the specified cell HEIGHT.

Giving HEIGHT as 0 specifies the default height, which, depending on the device being used, is approximately .08 inches. (However, if HEIGHT is set to 0 and a value other than 0 is given for WIDTH, the height will default to 4/3 of the width.)

If you need to replicate cartographic text specifications expressed in points and picas, the table below will help you find the correct HEIGHT value:

1 point = 0.0139 inches
12 point = 0.1666 inches
16 point = 0.2222 inches
18 point = 0.25 inches

1 pica = 12 points
6 picas = 1 inch

CHARACTER SPACING controls the size of the intercharacter spaces used when text strings are drawn.

For example, when the QUALITY is Constant and CHARACTER SPACING is 2, each character in a text string is drawn 2 character cell widths apart from the left side of the preceding character. The character cell WIDTH is the same for all characters, whatever their width.

When the QUALITY is Proportional and the CHARACTER SPACING is 2, each character in a text string is drawn 2 times the actual width of the preceding character apart from the left side of the preceding character.

In these examples, QUALITY is Constant

CHARACTER SPACING 0 (default)

CHARACTER SPACING 2

CHARACTER SPACING 3

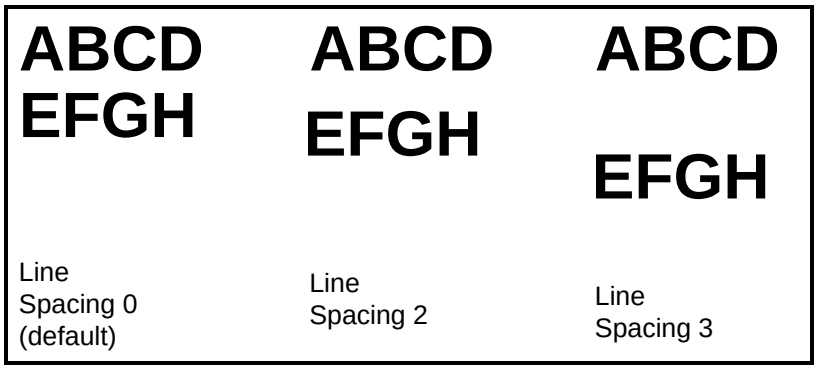
The CHARACTER SPACING is usually set to the default of 0, which produces normally spaced out characters, whatever the QUALITY mode, but is sometimes specified when special text effects are required. For example, to draw a name on a map so that it is stretched across an area, the CHARACTER SPACING can be set to produce large intercharacter gaps (try a setting of 3 or more).

CHARACTER SPACING is given as a real number. Apart from the default value of 0, settings less than 1.2 may cause unwanted overlapping of characters.

LINE SPACING controls the size of the interline spaces used when text featuring more than one line is drawn.

For example, when the LINE SPACING is 2, the base of each line of text is drawn 2 times the character cell height beneath the base of the line above it. The character cell HEIGHT is the same for all characters, whatever their actual height.

The LINE SPACING is usually set to the default of 0, which produces normally spaced lines. Apart from the default value of 0, settings less than 1.2 may cause unwanted overlapping of lines.



Accessing text symbols from textset files

Once you have created a textset file and saved it as a system file, it is ready for use in PC ARCPLOT. Give the TEXTSET command in PC ARCPLOT to name the textset file from which you wish to access text symbols.

To select a text symbol from this textset file to be the current text symbol, specify its SYMBOL number in the TEXTSYMBOL command. These commands:

```
[Arcplot] TEXTSET COLOR.TXT
[Arcplot] TEXTSYMBOL 6
[Arcplot] TEXT 'Scale 1:12000'
```

will draw the specified TEXT string using TEXTSYMBOL number 6 from the TEXTSET file called COLOR.TXT.

You can use TEXTSYMBOL to select one of the symbols in a textset file to be the current symbol and then use any of the commands like TEXTSIZE, TEXTQUALITY and TEXTFONT to change the individual characteristics of this current symbol. For example, these commands:

```
[Arcplot] TEXTSYMBOL 50
[Arcplot] TEXTCOLOR 8
[Arcplot] TEXTSIZE 0.15
```

set the current text symbol to be text symbol number 50, and then change the color and size of the current text symbol. These changes only apply to the current text symbol and are not saved permanently back in the textset file.

The default textset file

The default textset file is PLOTTER.TXT. This file is automatically loaded into PC ARCPLOT whenever a session is started, and provides 100 text symbols with symbol numbers 1 to 100. These symbols feature 25 different text styles in 4 different colors, making PLOTTER.TXT especially useful for creating maps to be drawn on four-color plotters.

If you use the TEXTSET command to access a textset file that has less than 100 symbols, text symbols from PLOTTER.TXT will still be available for the remaining SYMBOL numbers up to 100.

PC ARCPLOT also provides two additional textset files. COLOR.TXT features 15 symbols in the hardware default font number 0, one symbol for each of the 15 monitor screen colors. BW.TXT features 16 symbols in color number 1, one symbol for each of fonts 0 to 15. Use the TEXTSET command to access these textset files.

PLOTTER.TXT, COLOR.TXT and BW.TXT reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these textset files in the TEXTSET command. This is because TEXTSET automatically searches the SYMBOLS directory if the specified textset file cannot be found in the current directory.

Textset files from other ARC/INFO platforms

The textset files available with other platform versions of ARC/INFO have a different format than the PC ARC/INFO textset files. This makes the textset files distributed with other versions of ARC/INFO incompatible with PC ARC/INFO. However, you could approximate these textset files by creating your own custom textset file based on the textset file definitions for textsets on other ARC/INFO platforms.

Guide to shade symbol characteristics

August 2000

Guide to shade symbol characteristics

PC ARCPLOT shade symbols are used to shade polygons. Shade symbols have these characteristics:

SYMBOL
TYPE
OPTION
COLOR1
PATTERN1
ANGLE1
DISTANCE1
OFFSET1
COLOR2
PATTERN2
ANGLE2
DISTANCE2
OFFSET2
COLOR3
PATTERN3
ANGLE3
DISTANCE3
OFFSET3

Shade symbols can be hardware-generated patterns, solid color fills, or customized pattern designs. Customized pattern designs are composed of up to three layers. Each layer is a lattice of parallel lines that PC ARCPLOT creates by repeatedly drawing a single line. The single line, and how it is drawn in the lattice, is specified with the COLOR, PATTERN, ANGLE, DISTANCE and OFFSET characteristics. There are three sets of these characteristics, because one customized shade symbol pattern can be composed of up to three layers.

There are no PC ARCPLOT commands to set the individual characteristics of shade symbols. Instead, shade symbols are always accessed from shadeset files. The current shade symbol is always accessed from a shadeset file using the SHADESYMBOL command.

A shadeset file is a database data file that stores symbol definitions for a set of up to 100 shade symbols. Shadeset files are created as database data files in TABLES. There is one item in the data file for each shade symbol characteristic and each record in the data file defines one shade symbol. In TABLES, the data file must be sorted in ascending order on the SYMBOL item. The shadeset file name must have a .SHD extension.

Item definitions for a shadeset file

COLUMN	ITEM NAME	WIDTH	TYPE	N.DEC
1	SYMBOL	3	N	0
4	TYPE	1	N	0
5	OPTION	1	N	0
6	COLOR1	1	N	0
7	PATTERN1	1	N	0
8	ANGLE1	7	N	3
15	DISTANCE1	5	N	3
20	OFFSET1	5	N	3
25	COLOR2	1	N	0
26	PATTERN2	1	N	0
27	ANGLE2	7	N	3
34	DISTANCE2	5	N	3
39	OFFSET2	5	N	3
44	COLOR3	1	N	0
45	PATTERN3	1	N	0
46	ANGLE3	6	N	3
52	DISTANCE3	5	N	3
57	OFFSET3	5	N	3

Each shade symbol characteristic is described below:

SYMBOL sets the shade symbol number. This number identifies the shade symbol. It must be an integer between 1 and 100. This SYMBOL number is specified when using the SHADESYMBOL command to select a shade symbol from a shadeset file to be the current shade symbol.

TYPE indicates whether the shade will be a hardware-generated pattern or a pattern design composed of up to three layers. TYPE is given as follows:

1 = the shade symbol will be a hardware-generated pattern or a color solid fill.

2 = the shade symbol will be a pattern design composed of up to three layers.

OPTION when TYPE = 1, OPTION gives the device-generated pattern number or solid-fill color number, as follows:

Set OPTION to a positive integer to specify the device-generated default fill pattern accessed with that number. These vary according to the PC graphics card being used, or the plotter being used. Some plotters may have no built-in, device-generated default fill patterns.

To specify a solid-fill color, give the desired color number as a negative value in OPTION. For example, an OPTION of -2 will produce a solid fill of color 2. The possible range of color numbers depends on the graphics card or device that will be used to draw the shade symbol. Color numbers are interpreted as pen numbers by plotters. To specify a solid fill of color number 0, give OPTION as 0. See the chapter 'Displaying maps' in Section III for examples of default colors for various graphic devices.

When TYPE = 2, OPTION is not used and should be given the value 0. When TYPE = 2, the shade symbol will be a user-specified pattern design composed of up to three layers. Use the three sets of layer characteristics to design these layers. If only one or two layers will be used in the shade pattern, give the remaining layer characteristics the value 0. When TYPE = 1, the three sets of layer characteristics are not used and should all be given the value 0.

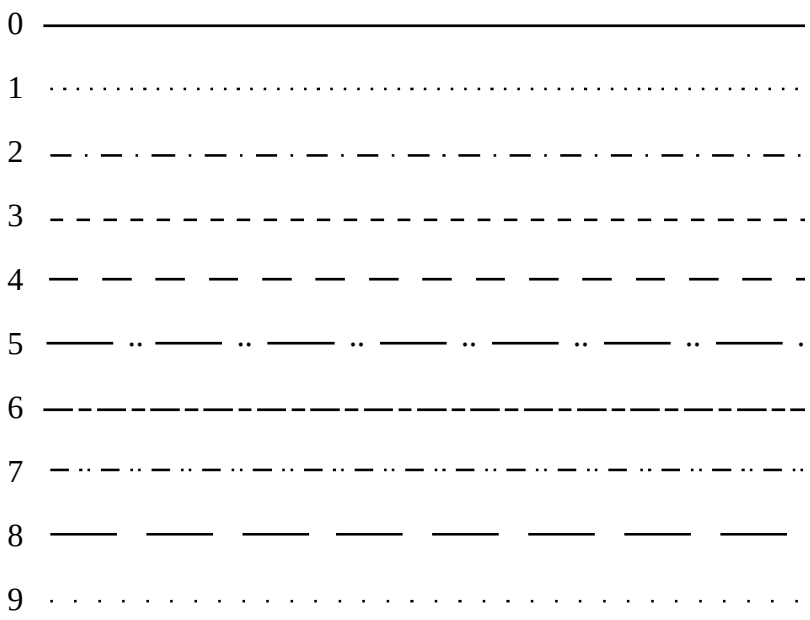
COLOR1 sets the color of the line used to create the first layer, and is given as a color number. The possible range of color numbers for the lines

depends on the device that will be used to draw the shade symbol. COLOR numbers are interpreted as pen numbers by plotters.

COLOR2 and COLOR3 are specified in the same way.

PATTERN1 specifies the pattern of the line used to make up the first layer. The pattern is given as an integer number. This works the same as the LINEPATTERN command.

A PATTERN1 value between 0 and 9 specifies one of these ten standard line patterns, pattern 0 being a narrow solid line.



A PATTERN1 value of 10 or more is interpreted as a template defining a dashed line pattern. The template specified can have between two and eight digits. The digits define an alternating dash/gap sequence with the first digit being a dash, the second a gap, the third a dash, and so on. The dashes and gaps are measured in millimeters. Therefore, a pattern of 1121 defines a line template with a dash of 1 mm, a gap of 1 mm, a dash of 2 mm and a gap of 1 mm. PC ARCPLOT draws the template repeatedly to create the line pattern.

A value of 0 for a dash digit indicates that a dot is desired (a dash of zero length). Hence, a pattern of 1101 is a dash of 1 mm, a gap of 1 mm, a dot, and a gap of 1 mm. A value of 0 for a gap means that no gap will be drawn.

If the pattern is to start with a dot, a negative sign has to be used to force a 0 value in the first dash digit. Thus, if the pattern is given as -2, it is interpreted as 02, which is a dot followed by a gap of 2 mm, a template that will produce a simple dotted line.

OPTION 1121

OPTION 1101

OPTION -2

OPTION 4103

OPTION 1101012

PATTERN2 and PATTERN3 are specified in the same way.

ANGLE1 sets the angle at which the lines in the first layer will be drawn. The angle is given in degrees counterclockwise from the horizontal, which is 0 degrees. 90 degrees is vertical.

ANGLE2 and ANGLE3 are specified in the same way.

DISTANCE1 sets the distance between the lines that make up the first layer. DISTANCE1 thus controls the density of lines in the layer. DISTANCE1 is a real number given in PAGEUNITS (the default PAGEUNITS is INCHES). Setting a very small distance, less than 0.01 for example, may result in the lines being drawn so close together that the shade appears as a solid fill.

DISTANCE2 and DISTANCE3 are specified in the same way. Distance must be set to a value greater than 0 for each layer that is

used in the user-defined, three-layer shade design. A layer with a distance of 0 will not be drawn.

OFFSET1 can be set to shift the origin used to position the first layer. OFFSET1 is a real number given in PAGEUNITS. When a shade is drawn, layers drawn with the same angle will have overlapping lines unless an offset is specified for one of the layers. Setting offset to 0 means that there will be no offset.

OFFSET2 and OFFSET3 are specified in the same way.

Accessing shade symbols from shadeset files

Once you have created a shadeset file, it is ready for use in PC ARCPLOT. Give the SHADESET command in PC ARCPLOT to name the shadeset file from which you wish to access shade symbols.

To select a shade symbol from this shadeset file to be the current shade symbol, specify its SYMBOL number in the SHADESYMBOL command. These commands:

```
[Arcplot] SHADESET COLOR.SHD
[Arcplot] SHADESYMBOL 8
[Arcplot] PATCH *
```

will draw a specified PATCH using SHADESYMBOL 8 from the SHADESET file called COLOR.SHD.

Shade symbols from shadeset files are also accessed when you use the POLYGONSHADES command to draw polygons using a variety of shade symbols.

The default shadeset file

The default shadeset file is PLOTTER.SHD. This file is automatically loaded into PC ARCPLOT whenever a session is started and provides 100 shade symbols with symbol numbers 1 to 100. These symbols feature 25 shade patterns in 4 different colors, making PLOTTER.SHD especially useful for creating maps to be drawn on four-color plotters.

If you use the SHADESET command to access a shadeset file that has less than 100 symbols, shade symbols from PLOTTER.SHD will still be available for the remaining SYMBOL numbers up to 100.

Three additional shadeset files are provided with PC ARCPLOT. COLOR.SHD is a set of 100 hardware-generated, fast-drawing shade symbols. These are made up of 6 shade patterns, in each of the 15 screen colors, plus an additional pattern in 9 colors and a black solid-fill symbol. The first 15 symbols of COLOR.SHD are solid-color fills in the 15 monitor screen colors. HARDWARE.SHD features the same symbols as COLOR.SHD but in a different order. BW.SHD features 16 symbols made up of 16 different shade patterns in color number 1.

PLOTTER.SHD, COLOR.SHD, HARDWARE.SHD and BW.SHD reside in the ARCEXE\SYMBOLS directory in the PC ARC/INFO software installation, but no pathname to this directory is needed when specifying one of these shadeset files in the SHADESET command. This is because SHADESET automatically searches the SYMBOLS directory if the specified shadeset file cannot be found in the current directory.

Shadeset files from other ARC/INFO platforms

The shadeset files available with other platform versions of ARC/INFO have a different format than the PC ARC/INFO shadeset files. This makes the shadeset files distributed with other versions of ARC/INFO incompatible with PC ARC/INFO. However, you could approximate these shadeset files by creating your own custom shadeset file based on the shadeset file definitions for shadesets on other ARC/INFO platforms.

Appendices

Appendix A - Description of the Green Valley sample data set
Appendix B - Useful conversion constants

Appendix A Description of the Green Valley sample data set

The sample data set, Green Valley, can be used to construct the map shown in Section II of this guide by following the method described below. The Green Valley data set will be in the GREENVAL subdirectory under ARCTRN\ARCPLOT if you have installed the PC ARCPLOT demo data. This directory contains a number of coverages which comprise the data set. Also found in this directory are two key files, a text file, and a lineset file which are used in conjunction with the data set to create the Green Valley map. These coverages and files are listed below.

COVERAGES

BEARRIV	contains the river coverage for the reference map
HOLDINGS	contains the polygons for the reference map
MINES	contains the point locations of the mines
NORTHARR	contains the North arrow for the title block
ROADS	contains the roads coverage
SCALEBAR	contains the scale bar for the title block
SITES	contains the polygons describing the locations of potential sites
STREAMS	contains the streams coverage
ZONES	contains polygons describing the analysis zones

FILES

ROADS.KEY	key file for the roads legend
ZONES.KEY	key file for the zones legend

SITES.LIN	lineset file containing the line symbol for the potential sites
TITLE2	text file containing descriptive text for the title block
GREEN.SML	macro to display a map of GREEN VALLEY on the PC monitor's screen

By attaching to ARCTRN\ARCPLOT\GREENVAL, executing the command:

```
ARC ARCPLOT
```

and entering the commands listed on pages 14-19 of the section called "Creating a map with PC ARCPLOT" in Section II, the map on pages 12-13 will be created. If the command **DISPLAY 1039** is given at the beginning of the session, the map will be contained in an ESRI plot file which can then be sent to a graphic output device (see Section III, Chapter 1, in this guide). Alternatively, setting DISPLAY 4 at the beginning of the session will display the map on the PC monitor's screen.

Also included in the GREENVAL directory is an SML macro called GREEN.SML. Executing this macro will display the Green Valley map on the PC monitor's screen. All of the commands used to draw the map will be displayed in the dialog area as the map is being drawn. To initiate the GREEN.SML macro, attach to the ARCTRN\ARCPLOT\GREENVAL directory and type:

```
ARC ARCPLOT GREEN
```

at the Command prompt.

Appendix B Useful conversion constants

To convert these units	multiply by	to obtain these units
acres	0.4047	hectares
acres	43560	square feet
acres	4047	square meters
acres	0.001562	square miles
acres	4840	square yards
centimeters	0.03281	feet
centimeters	0.3937	inches
centimeters	0.00001	kilometers
centimeters	0.01	meters
centimeters	0.000006214	miles
centimeters	10	millimeters
centimeters	0.01094	yards
chains	66	feet
chains	792	inches
chains	100	links
feet	30.48	centimeters
feet	0.0003048	kilometers
feet	0.3048	meters
feet	0.0001894	miles
feet	304.8	millimeters
hectares	2.471	acres
hectares	107600	square feet
inches	2.540	centimeters
inches	0.0254	meters
inches	0.00001578	miles
inches	25.40	millimeters
inches	0.02778	yards
kilometers	1000000	millimeters
kilometers	100000	centimeters
kilometers	1000	meters
kilometers	1093.60	yards
kilometers	3281	feet
kilometers	39370	inches
kilometers	0.6214	miles

links	0.66	feet
links	7.92	inches
links	0.01	chains
meters	100	centimeters
meters	3.281	feet
meters	39.37	inches
meters	0.001	kilometers
meters	0.0006214	miles
meters	1000	millimeters
meters	1.094	yards
miles	160900	centimeters
miles	5280	feet
miles	63360	inches
miles	1.609	kilometers
miles	1609	meters
miles	1760	yards
miles	0.8684	nautical miles
millimeters	0.1	centimeters
millimeters	0.003281	feet
millimeters	0.03937	inches
millimeters	0.000001	kilometers
millimeters	0.001	meters
millimeters	0.0000006214	miles
millimeters	0.001094	yards
sq centimeters	0.001076	square feet
sq centimeters	0.1550	square inches
sq feet	0.00002296	acres
sq feet	929	square centimeters
sq feet	0.0929	square meters
sq feet	0.00000003587	square miles
sq inches	6.452	square centimeters
sq kilometers	247.10	acres
sq kilometers	10760000	square feet
sq kilometers	0.3861	square miles
sq meters	0.0002471	acres
sq meters	10.76	square feet
sq meters	0.0000003861	square miles
sq miles	640	acres
sq miles	27880000	square feet
sq miles	2.590	square km
sq millimeters	0.00001076	square feet

sq yards	0.0002066	acres
sq yards	0.8361	square meters
sq yards	0.0000003228	square miles
yards	914.40	millimeters
yards	91.44	centimeters
yards	0.0009144	kilometers
yards	0.9144	meters
yards	0.0005682	miles