Atlas GIS 4.0 Reference Manual

Environmental Systems Research Institute, Inc.

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1

Introduction

Atlas GIS is a full-featured information mapping system that combines the extensive analytical and presentation capabilities of mainframe mapping with the ease and affordability of desktop software. The purpose of this *Reference Manual* is to provide you with easily accessible information about these capabilities.

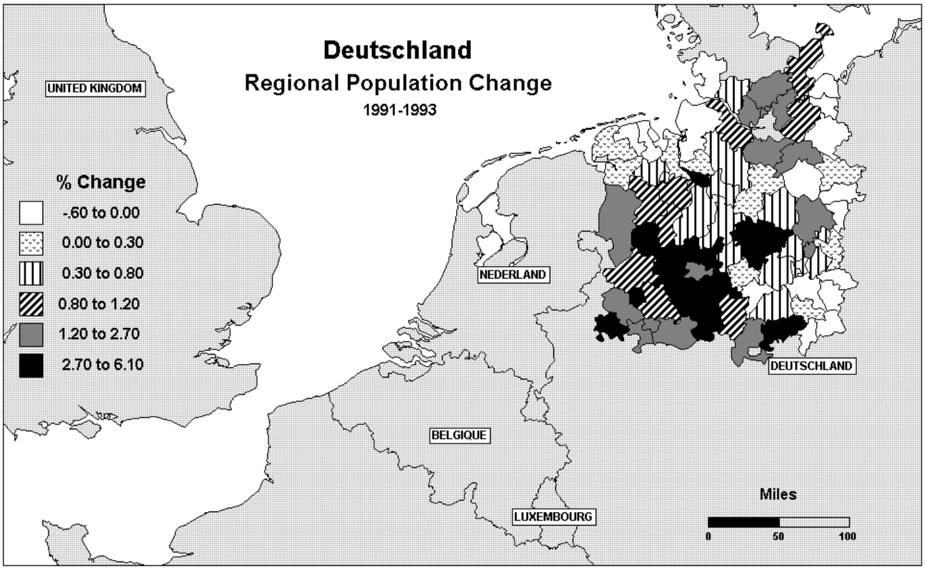

Figure 1.1 **Analytical and presentation capabilities of Atlas GIS**

In this book, you'll find detailed descriptions of the Atlas GIS commands, menu structure, expressions, functions, and system text strings. There is also a tutorial-like discussion of the Query Builder in one of the appendices.

If you're new to Atlas GIS for Windows or to mapping systems in general, we highly recommend that you read Chapters 2 and 3 in this manual, and then work through the *Tutorial*. If you're experienced with Atlas GIS for DOS, we recommend that you read through the *Transition Guide* to acquaint yourself with what's new in our Windows version. Also, if you haven't already installed Atlas GIS on your system, please refer to Chapter 2 in *Getting Started*.

The majority of the *Reference Manual* is devoted to detailed descriptions of the Atlas GIS menus and commands. The chapters themselves are arranged in menu order, but the individual commands in those chapters are arranged alphabetically. There are also some helpful appendices at the end of the manual.

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Chapter 3: Storing and Managing Data
Chapter 4: File Menu
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Command Descriptions

At the beginning of each chapter, we've included a table that lists each command in menu order and provides a brief description of it. There are more detailed descriptions of each command in the sections that follow. To make it easier for you to retrieve the information you need, each command description is divided into the following subsections:

- Description
  This one-, or two-line description provides a quick explanation of the commands basic functionality.

- Shortcuts
  Some commands have shortcuts available, such as command equivalents on the button bar, special key combinations, or both. If there's a quick method of executing a particular command, other than choosing it from the menus, that method is listed here. If this section is omitted from a command description, then the only way to execute that command is to choose it from the menu.

- Available When
  This section lists the conditions necessary for a command to be accessible. When a command is unavailable, it is dimmed in the menu list and cannot be executed. If this section is omitted from a command description, then that command is always available.

- How It Works
  This section describes in detail how the command works. For example, it would describe how the command interacts with other commands; the internal, behind-the-scenes action performed by the software; any limits or boundaries placed on the command; and the results of the command once it's been executed. The majority of each command's description is located in this section.

- Warning
  If there's something important that you need to be aware of before you execute a command, that information is placed in this section. For example, if an action can be very time-consuming, it's important that you're aware of this before you proceed.

- Recommended Uses
  Many commands have very specific applications, while others are most useful when used in conjunction with one or more other commands. This section lists a few examples of when a command is most useful.

- Associated Dialog Boxes
  This section provides a list of all the dialog boxes that are accessible from the command. Notice that the dialog boxes themselves are not described, they are just listed. If this section is omitted from a command description, then there are no dialog boxes associated with or available from that command.

  Note: For a detailed discussion of all dialog boxes, refer to the on-line help.

Typographic Conventions

This *Reference Manual* uses a specific set of typographic conventions to enhance readability and ease-of-use. Once you've become familiar with the general page layout of the book, you should be able to scan each section quickly and obtain any information easily. The following table describes the conventions used in this manual.

Table 1.1 **Typographic conventions**

CONVENTION	**DESCRIPTION**
FILE | OPEN command	Command names, when used in the body text, are small-capped with a vertical bar (|) to indicate the different menu levels. The example to the left is equivalent to writing, "The Open command from the File menu."
Redraw button	Button names are displayed in a bold, condensed sans serif typeface.
Unlinked option button	Option buttons (also called radio buttons) are displayed in a bold, condensed sans serif typeface.
Pattern […] button	When an ellipsis button on a dialog box is referred to, it appears with square brackets in a bold, condensed sans serif typeface.
New Table dialog box	Dialog box names are initial-capped.
Page Size group box	Group box titles are initial-capped.
Description text box	Names of text boxes, list boxes, and check boxes are initial-capped and italicized.
CTRL+S	Simultaneous key combos (such as menu shortcuts) are small-capped and use a plus sign (+) to separate keys.
ALT | F | O	Sequential key combos (such as command hot keys) are small-capped and use a vertical bar (|) to separate keys.
SFZIPS.PRJ	File names and file extensions are small-capped.
'632 E. Main Street'	Literal text that you type into a text field or choose from a list box appears in the text exactly as it does on the screen and is enclosed by single quotation marks.

2

Basic Mapping Concepts

There are a few simple, but important map concepts that you should understand as you're working with Atlas GIS. These concepts include map scale, longitude and latitude, direction and distance, and map projections.

Map Scale

The *scale* of a map is the ratio between a distance on the map (typically expressed as one) and the corresponding distance on the Earth. The map scale usually specifies the units of measurement for the map, such as miles per inch or kilometers per centimeter. Thus, when map scale is expressed as miles per inch, a scale of "1 inch : 200 miles" means one inch on the map equals 200 miles on the Earth.

When a map scale is *unitless* (that is, when no unit of measurement is specified), then the unit of measurement on the map is assumed to be the same as the unit of measurement on the Earth. Thus, a scale of 1:100,000 means one inch on the map equals 100,000 inches on the Earth (or one foot on the map equals 100,000 feet on the Earth, etc.).

The scale used for a particular map depends on the area covered and the amount of detail desired. For example, a map of a city might depict a large area with a low level of detail, showing only main streets and highways. Such a map might have a scale of ten miles per inch. If a map of the same city shows neighborhood streets and features in greater detail, it might have a scale of one mile per inch. Thus, even though these two maps portray the same city, the scale varies according to the amount of detail required.

Longitude and Latitude

A *rectangular*, or *x-y coordinate system*, is used to locate points on a flat, two-dimensional surface. In a rectangular coordinate system, an origin and two baselines (the x- and y-axes) are defined. The x-axis is a horizontal line, the y-axis is a vertical line, and the origin is the point at which they cross.

The area of a rectangular coordinate system is marked off by equally-spaced lines drawn parallel to the baselines. As a result, you can find any position on this grid by using two coordinates: one for its horizontal position (the x-coordinate) and one for its vertical position (the y-coordinate).

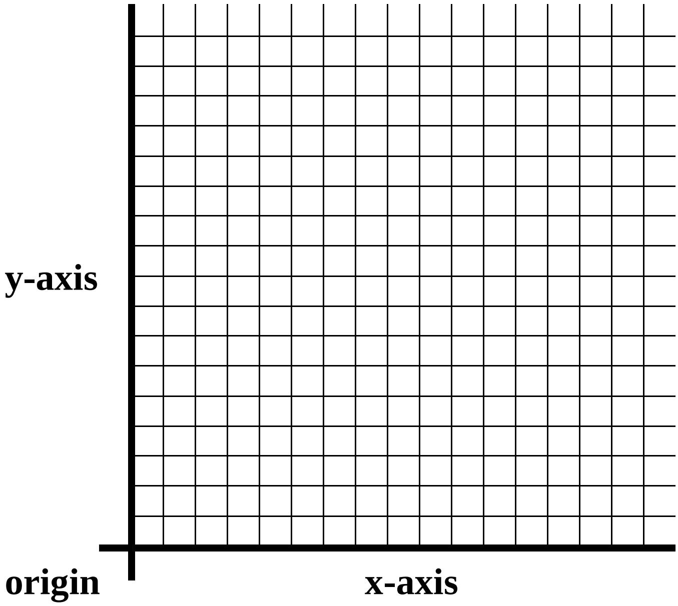


Figure 2.1 **Rectangular coordinate system**

In contrast, *degrees of longitude and latitude* are used to locate points on the Earth. Longitude and latitude coordinates, also called geographic coordinates, reflect the fact that the Earth is a globe, rather than a flat surface. In this coordinate system, the equator is the x-axis, and the prime meridian is the y-axis.

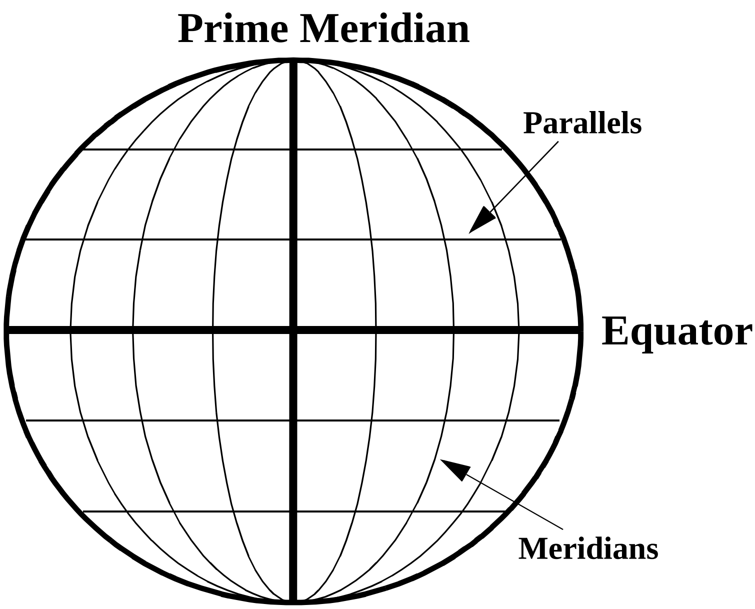


Figure 2.2 **Longitude and latitude coordinates**

Lines of longitude, called *meridians*, are formed by drawing semicircles from pole to pole. The degree of longitude represents the east-west position of a point (similar to the x-coordinate in an x-y coordinate system). Lines of longitude cross the equator and converge at the poles. At the equator, each degree of longitude marks approximately 69 miles. Moving toward the poles, the distance between the lines of longitude diminishes to zero. The prime meridian, or 0 degrees, runs through Greenwich, England. The International Dateline corresponds to roughly 180 degrees east or west of the prime meridian.

Lines of latitude, called *parallels*, are formed by drawing circles around the Earth parallel to the equator. The degree of latitude represents the north-south position of a point (similar to the y-coordinate in an x-y coordinate system). The equator, representing 0 degrees (neither north nor south), is the longest line of latitude. The north pole is 90 degrees north, and the south pole is 90 degrees south. Lines of latitude are parallel to the equator and equally spaced; each degree of latitude marks approximately 69 miles.

Lines of longitude and latitude are measured in degrees, minutes, and seconds, with a north, south, east, or west designation. For example, 120° 30' 50" W indicates a longitude of 120 degrees, 30 minutes, 50 seconds west of the prime meridian; similarly, the measurement 45° 20' 10" N indicates a latitude of 45 degrees, 20 minutes, 10 seconds north of the equator.

Alternatively, degrees of longitude and latitude are sometimes displayed in decimal degrees. Since there are 60 seconds in a minute, 60 minutes in a degree, and a total of 3600 seconds (60 times 60) in a degree, the decimal degrees for a longitude of 120° 30' 50" W are:

```
(120 + (30/60) + (50/3600))
(120 + 0.5 + 0.01)
120.51 W or -120.51
```

Direction and Distance

By definition, a north-south direction on the Earth is along any meridian, and an east-west direction is along any parallel. A *bearing* is expressed as the angle between a line and a reference meridian (typically a north-south meridian) combined with the quadrant in which the line lies. For example, a northeast direction is expressed as N 45° E, and a southwest direction is expressed as S 45° W. An *azimuth* is expressed as a clockwise angle measured from north. For example, a northeast direction is expressed as 45 degrees, and a southwest direction is expressed as 225 degrees.

Even though both *azimuths* and *bearings* indicate a direction on the Earth, each expresses that distance in a slightly different manner—Atlas GIS uses azimuths.

A *great circle* is a circle whose center is at the center of the Earth and whose radius is the radius of the Earth. A great circle is the largest circle that can be drawn on the Earth's surface. In fact, if the Earth were cut along a great circle, it would be sliced exactly in two. All lines of longitude form great circles when joined with their 180-degree opposites. Of the lines of latitude, however, only the equator is a great circle.

Note that as you move along a great circle (other than the equator or a meridian), you intersect each meridian at a different angle. The direction of a great circle arc is an azimuth and is given at its starting point—typically an angle in degrees, measured clockwise from north.

A *line of constant compass bearing* (also called a *rhumb line* or *loxodrome*) is a bearing line that intersects each meridian at the same angle. Because lines of longitude converge at the poles, a line of constant compass bearing tends to
spiral towards the pole.

Though it is convenient to follow a line of constant compass bearing when navigating by compass, it is not the shortest distance between two points. The shortest distance between two points is along a great circle. Therefore, when ships and aircraft are traveling by compass, they typically follow a line of constant compass bearing, but shift the bearing every so often to approximate a great circle arc.

When moving a specified distance and direction from any given point, Atlas GIS always moves along a great circle. When you look at a map on a flat piece of paper, remember that great circle arcs are not always straight lines, and the distance or scale is not always constant across the map.

Map Projections

When a paper map is created, the spherical surface of the Earth must be translated onto the flat piece of paper. This translation is called a *map projection*. The spherical surface of the Earth cannot be translated onto a flat surface without distorting either area, angle, distance, or direction. As a result, a large number of map projections have been developed that typically preserve one of these characteristics at the expense of others.

In reference to map projections, it is important to distinguish between a projection and a *coordinate system*. A given map projection has a number of parameters, such as an origin and standard parallels. A coordinate system is defined by a map projection and its set of projection parameters. For example, the seven California state plane coordinate systems all use the Lambert Conformal Conic projection, but each has a different set of projection parameters.

Additionally, Atlas GIS supports *user-defined* coordinate systems. A user-defined coordinate system may be any arbitrary rectangular coordinate system; however, since a user-defined coordinate system is not defined in terms of a known map projection, Atlas GIS cannot convert between user-defined coordinates and longitude and latitude coordinates.

Atlas GIS supports many sophisticated map projections and coordinate systems. It also allows you to easily convert a file from one coordinate system to another. The following types of map projections are the most common:

- *Equal-Area* projections preserve the relative size of regions. Projections such as the Albers Equal-Area Conic projection are often used for thematic mapping applications.

- *Conformal* projections preserve angles between features. These projections preserve local angles or shapes, but do not preserve shapes over large areas. Projections such as the Lambert Conformal Conic and the Transverse Mercator projections are often used for small-area maps.

- *Equidistant* projections maintain scale between one or two points and all other points on the map. No map projection shows scale correctly throughout the map, but with these projections, scale is typically maintained along one or more lines.

- *Azimuthal* projections correctly show the direction (azimuth) between all points and the center.

For some applications, (especially maps that depict a small area, such as a city or county), you can assume the Earth to be flat, and you can treat the degrees of longitude and latitude as though they were rectangular coordinates.

If your map contains smaller regions, or perhaps a single continent, a coordinate system based on one of the following projections may be appropriate:

- Albers Equal-Area Conic
- Lambert Conformal Conic
- Transverse Mercator

If your map requires more of a global context, a coordinate system based on one of the following projections may be appropriate:

- Miller
- Robinson
- Classic Mercator

When opening a file that contains longitude and latitude coordinates, Atlas GIS automatically performs a simple projection as it draws the map. This makes it possible to use longitude and latitude coordinates not only for a smaller area, but also for a medium-sized area such as a state.

Figure 2.3 **Longitude-latitude map of the United States**

Figure 2.4 **Albers equal-area conic map of the United States**

3

Storing and Managing Data

A map is a graphic representation of features on the Earth's surface. For that matter, a map can represent any set of objects in space. In Atlas GIS, a map contains locational information about each *map feature*, the shape of the feature and where it is located on the Earth, and how features are related spatially. Examples of map features are parcels, census tracts, ZIP code areas, and roads. A map can also contain information about the characteristics, or *attributes*, of each map feature. Some examples of attributes are zoning classifications, population totals, road types, and sales volumes.

In short, Atlas GIS is a geographic database manager that allows you to capture, store, retrieve, manipulate, analyze, display, and output locational and attribute information for map features.

As you work with Atlas GIS, you will encounter many different files. Most often, however, you will be working with two basic file types: *geo files* and *tables*. These files are the actual databases that store all the information about the map features. Tables can also be divided into two types: *attribute tables* and *point tables*—the differences between these types of tables are discussed later in this chapter.

Another especially important file discussed in this chapter is the *project file*. A project file contains a complete description of your map (such as the names of all open geo files and tables, page layout information, layer settings, and theme settings). All the information required to completely re-create you map is stored in the project file.

Summary of Different Files and Tables

The following table illustrates the different kinds of files you will encounter as you use Atlas GIS.

Table 3.1 **Atlas GIS file types**

EXTENSION	DESCRIPTION
.PRJ	Project file (.PRJ). Contains a complete description of the project, including names of the open files, program settings, descriptions of freehand objects, and page layout information.
.AGF	Main geographic database file. Contains variable-length information.
.AIF	Main geographic database file. Contains fixed-length information.
.AGX	Spatial index file. Contains the geographic index.
.AWX	String index file. Contains the feature ID and name indexes.
.LAY	Layer settings file. Contains descriptive information about all the layers in the geo file.
.DBF	Main database file for both attribute and point tables.
.N00	Key field index file for both attribute and point tables.
.N0*n*	User-defined index files. Atlas GIS supports seven index files (.N01 - .N07) per attribute or point table.
.DGX	Spatial index file for point tables.
.COL	Column settings file (.COL). Contains column names and structure information about the table columns.
.PAL	Color palette file.

Geo Files

The graphical and locational information about individual map features is stored in a *geo file;* and within the geo file, the map features are grouped into layers. This section describes map features, layers, and the basic information stored in the geo file. Standard geo files, such as county boundaries, census tracts, and 5-digit ZIP codes, are available from Strategic Mapping. It’s also possible to import geographic data from other sources into Atlas GIS.

A geo file is actually four separate DOS files acting as a single unit. If you want to rename a geo file or move it to a different directory, you need to know that the four files have the same base name, but different file extensions. These extensions, listed below, indicate the kind of information stored in the file.

- *filename*.AGF
  (main geographic database, containing variable-length information)
- *filename*.AIF
  (main geographic database, containing fixed-length information)
- *filename*.AWX
  (string index file, containing the feature ID and name indexes)
- *filename*.AGX
  (spatial index file, containing the geographic index)

Note: ESRI offers a utility program called *the Data Automation Kit* that converts different file formats to the Atlas GIS geo file format. Just a few of the file formats the Data Automation Kit can convert are Atlas ASCII files, Arc/Info export files, AutoCAD© drawing files, and Census Bureau TIGER and GBF/DIME files.

Map Features

Map features are defined as a series of connected longitude-latitude (or x-y) coordinates. These coordinates, also called *vertices*, indicate the shape of the feature and its position on the Earth. In Atlas GIS, a map feature can have up to 32,759 vertices. There are three fundamental types of map features:

- *Regions* (also known as *areas* or *polygons*) are defined by an ordered series of x-y coordinates, or vertices. Each vertex is connected to the next by a line segment. The last vertex automatically connects back to the first, closing the region. Some examples of regions are land-use areas, county boundaries, census tracts, and sales territories.

- *Lines* are also defined by an ordered series of vertices connected by line segments. Unlike regions, however, the last vertex in a line does not automatically connect back to the first. Lines are typically used to represent features that are not wide enough to be represented as regions, such as roads, rivers, and pipelines.

- *Points* are defined by a single x-y coordinate, representing a location or position on the map. Points are typically used to represent features that are not large enough to be represented as regions or lines, such as cities, landmarks, and locations of sales offices or customers.

  (In addition to regular point features, Atlas GIS also allows you to create and manage *table points*. Table points, discussed later in this chapter, more closely resemble data than permanent map features.)

Layers

The features in an Atlas GIS geo file are organized into *layers*. A map typically consists of various kinds of features represented in different layers. You can think of layers as a stack of transparencies, each containing features that combined make up the total map. For example, layers could be parcels, census tracts, planning districts, roads, or streams. Layers provide a way of logically grouping and managing the features in the geo file. A map layer can contain only one kind of feature, but you can have more than one layer for each type of feature. A single geo file can contain as many as 250 layers.

Atlas GIS allows you to specify how each layer is displayed. You can turn layers on or off, specify their line color and style, set their labeling options, set them to be visible only at certain scales, and turn on their theme. For more information about the display characteristics of Atlas GIS layers and how to control them, refer to the MAP | LAYERS & THEMES later in this manual.

In addition, you can perform spatial searches, overlay analysis, and other operations on layers in relation to each other. For example, a geo file might contain a ZIP code layer and a sales territory layer, with the locations of major accounts in a third layer. The ZIP codes might be drawn with thin lines and the sales territories with thick lines, and the major accounts depicted by a certain symbol and labeled with their names. You could then perform various analyses between the layers, such as finding the sales territory in which each major account is located, or aggregating ZIP code demographics to create sales territory demographics.

Atlas GIS allows you to open multiple geo files at one time. As a result, it's possible to open geo files with duplicate layer names. The program keeps track of layer names by appending them onto the file name. For example, if you opened two ZIP code files, NYZIPS.AGF and SFZIPS.AGF, each file would probably contain a ZIP code layer named something like ZIP_CODE. Opening these two files at the same time would not present a problem, because everywhere in the program that you would need to choose a layer, the two layer names would appear as NYZIPS:ZIP_CODE and SFZIPS:ZIP_CODE.

Another file that's closely related to the geo file is the *layer settings file*. This file has the same base name as the geo file, but an .LAY extension. The layer settings file stores the individual display settings for the layers in the geo file, and is automatically created or updated when you close a geo file. These layer settings are used when you first open the geo file, before you save the project file. Note that after you save a project file with a geo file open, the layer settings are stored in the project file—from then on, the settings in the project file override the settings in the layer settings file.

Geo Columns

In addition to locational data, a geo file also contains a basic set of pre-defined information about each map feature. This information is not stored in a table, but in columns in the geo file, and includes the following:

- Feature ID (_ID)

  Each feature is automatically assigned a 16-character ID that uniquely identifies the feature. You can edit or replace these IDs, as long as they remain unique within each layer. The feature ID is used to import and link table data to a geo file.

  When Atlas GIS creates a feature ID (such as when you add a new map feature to your map), it takes your 8-character user ID (specified when you installed the program and changeable with the FILE | PREFERENCES command) and appends an 8-character sequence number. If the layer is linked to a table, the sequence number begins with the number of records in the table and increases by one each time you add a feature. If the layer is not linked to a table, the sequence number begins with the number of features in the geo file.

- Primary Name (_NAME)

  While the feature ID is sometimes a code that has meaning only to Atlas GIS, the primary name is the name that you use to identify the feature. It can be up to 64 characters long, and should also be unique.

For example, the primary name for a census tract might be a combination of the state, county, and tract FIPS code, since this series of numbers uniquely identifies a tract anywhere in the U.S. The primary name can also be used for labeling.

- Secondary Name (_NAME2)

  A feature can have a secondary name in addition to its primary name. The secondary name is optional, and can be up to 64 characters long.

  The secondary name is typically an alternative or shorter version of the primary name, often used for labeling. For example, a layer of county regions might have 5-digit county FIPS codes as primary names, and county names as secondary names. Or, a street segment known by two different names could have one name as the primary name and the other as the secondary name.

- Area (_AREA)

  Regions have an area. This value is automatically calculated and maintained by Atlas GIS and cannot be edited. Lines and points do not have an area.

- Perimeter/Length (_LENGTH)

  Regions have a perimeter and lines have a length. These values are automatically calculated and maintained by Atlas GIS and cannot be edited. Points do not have a perimeter or length.

- Coordinates (_CENTX, _CENTY)

  The actual coordinate values for all vertices in all features are calculated and maintained by Atlas GIS. Although these values do not show up in the Table window and you cannot edit them, you can use the column names as part of an expression.

- Polygons and Vertices (_NPOLYS, _NVERTS)

  The number of vertices and the number of separate objects that make up each feature is calculated and maintained by Atlas GIS. A single region or line feature can have up to 32,759 vertices, and can consist of multiple polygons or lines grouped together (see “Islands and Lakes” later in this chapter). Although these values do not show up in the Table window and you cannot edit them, you can use the column names as part of an expression.

Centroids and Default Label Position

Atlas GIS automatically calculates and maintains a *centroid* and a *default label position* for each feature.

- For a region, the centroid is its mathematical center, and the default label position is the centroid, adjusted to always fall within the region (see Figure 3.1 below).
- For a line, the centroid is the calculated midpoint along the entire line, and the default label position is the midpoint of the longest segment in the line.
- For a point, the centroid and default label position are simply the coordinates of the point.

In some instances, it's possible for the mathematical centroid of a region to be located outside the borders of the region. When this occurs, Atlas GIS adjusts the centroid so that it is located inside the region. This *adjusted centroid* is illustrated below. Note that anytime a spatial calculation of some kind is required, such as with QUERY | SELECT BY LOCATION or TABLE | AGGREGATE DATA, the adjusted centroid is used.

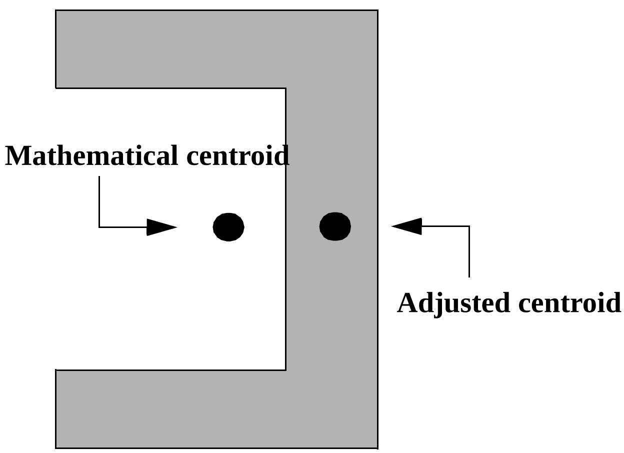


Figure 3.1 **Mathematical centroid and the adjusted centroid**

Islands and Lakes

While most regions are drawn as a single polygon, some regions consist of several separate polygons grouped together. When a region consists of a group of polygons, one is considered the main polygon and the others are considered *islands* or *lakes* of the main polygon.

An island is a polygon outside the main polygon. For example, the state of Hawaii consists of a main polygon and several island polygons. (Note that a line feature can also be made up of a main line and additional, unconnected island lines.)

Suppose you want to view the linked attribute data for the state of Hawaii. First, you have to select Hawaii, then display its attributes in the Info window, which displays the data for the last selected feature. To select Hawaii, you can point to any of the island polygons and click on it. This not only the selects the polygon you pointed to, but the others as well.

A lake is a polygon inside another polygon. In other words, the inside polygon creates a hole in the outer polygon. A lake can be an actual lake, or it can be an *embedded region* (that is, a region completely inside another region). In the case of an embedded region, the outer region contains a lake (hole) that encircles the embedded region, and the embedded region exists as a separate feature.

Attribute Tables

In addition to the geographic information stored in the geo file, you may want to store informational character or numeric data for each map feature. These data values, or *attributes*, describe various characteristics of each feature, such as census tract number, population, or average income, and are stored in an *attribute table*.

A table is simply a dBASE or dBASE-compatible database file, containing *rows* and *columns*. Each row corresponds to a map feature, and each column corresponds to a certain characteristic or attribute. The figure on the next page shows a table containing state demographic data. There is a row for each state and a column for each attribute.

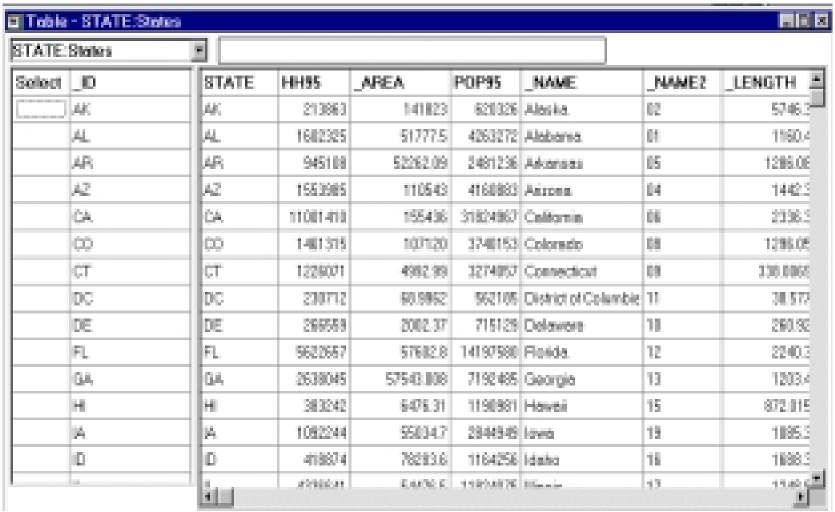


Table - STATE:States

STATE:States

Select	_ID	STATE	HH95	_AREA	POP95	_NAME	_NAME2	_LENGTH
	AK	AK	213863	141823	620326	Alaska	02	5746.3
	AL	AL	1682325	51777.5	4263272	Alabama	01	1160.4
	AR	AR	945108	52262.09	2481236	Arkansas	05	1286.06
	AZ	AZ	1553985	110543	4160883	Arizona	04	1442.3
	CA	CA	11081410	155436	31824967	California	06	2336.3
	CO	CO	1461315	107120	3740153	Colorado	08	1286.05
	CT	CT	1226071	4982.99	3274057	Connecticut	09	330.0065
	DC	DC	230712	60.9862	562105	District of Columbia	11	38.577
	DE	DE	269569	2002.37	715129	Delaware	10	260.92
	FL	FL	5622657	57602.8	14197580	Florida	12	2240.3
	GA	GA	2638045	57543.808	7192485	Georgia	13	1203.4
	HI	HI	383242	6476.31	1190981	Hawaii	15	872.015
	IA	IA	1082244	55034.7	2844949	Iowa	19	1085.3
	ID	ID	418874	78283.6	1164256	Idaho	16	1688.3

Figure 3.2 **Table containing attribute data**

In addition to the other columns, a table always has a column designated as its *key column*. This key column contains the *key values*, each of which matches one of the feature IDs in the _ID column in the geo file. In other words, each row in a table is linked to a map feature in a geo file by matching the key value in the row to the feature ID. The key column can be any table column you choose, but it must link to the _ID column in the geo file.

For example, if the key column in a table contained postal codes, then the geo file to which that table is linked would have to have postal codes in the _ID column. A row with the postal code 06510 in it's key column and a map feature with the postal code 06510 in its _ID column would be linked.

The column settings for a table, such as the key column name and the layer in the geo file to which the table is linked, are stored in a *column setting file*. This file has the same base name as the table, but with a .COL extension. The column settings file also stores table structure information.

For a single geo file, you can have several tables, each containing a different set of attributes for a different set of features. For example, if you have ZIP codes and parcels in the same geo file, you could have a table containing population demographics by ZIP code, as well as one containing zoning information for the parcels.

Since attributes convey useful information about map features, they can be used to display the map in different ways. For example, you can shade census tracts from light to dark according to their population, or display sales offices using small to large circles to show sales volume. These types of maps are called *theme maps*. For more details about theme maps, see MAP | LAYERS & THEMES later in this manual.

You can also use attributes to perform queries and sophisticated analytical operations. For example, you might perform a query to find all the parcels that are currently in rural use, have a soil composition that provides stable building sites, and are near a freeway. You could then highlight or label these parcels, or select them and save them to a new file to perform more advanced analyses on them.

A variety of demographic and attribute data is available from ESRI. In addition, you can enter data directly into Atlas GIS, or you can import it from text files or spreadsheet programs.

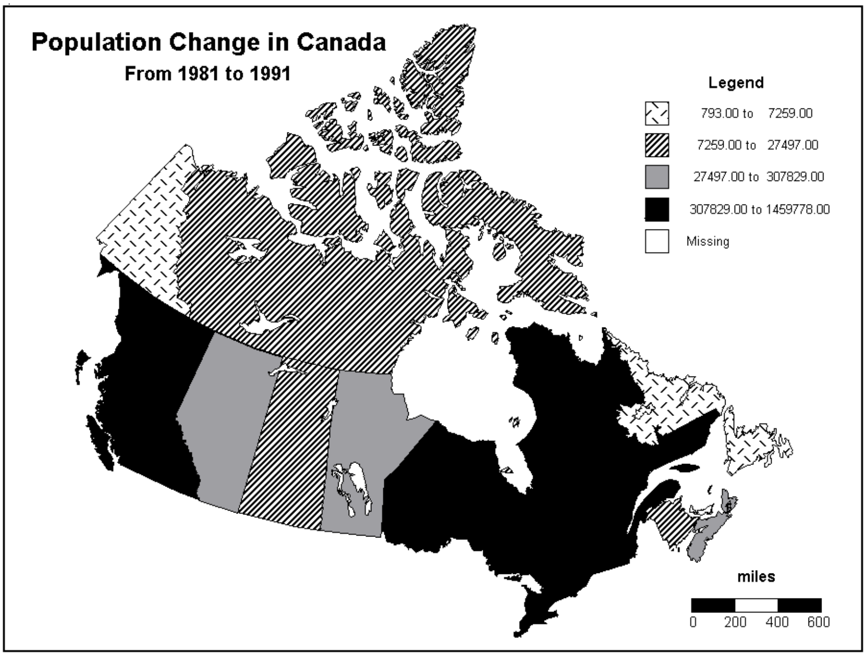


Figure 3.3 **Theme map displaying Canadian demographic data**

Point Tables

Point tables are a hybrid between point features and attribute tables. Points in a table have geographic coordinates, so when you open a point table in Atlas GIS, you can see the points on the map. These points also have attribute data associated with them, much as a linked attribute table would be associated with point features in a geo file. Point tables, however, represent a more permanent union between the points and the data—the points and data in the point table always stay together.

For example, you might have a point table containing the locations of all the physicians in a city, as well as specific information about each one. The table would include the name of each physician, the office address, the hospital the physician is associated with, the area of specialty, the number of times he or she has performed a particular procedure—basically an entire database full of specific information about each physician. And all of that data would be tied to coordinate points, so that you can see each location on the map.

In the example above, most of the information (or attribute data) in the table was very specific to each point. Such specific data wouldn't be very useful as an attribute table unless you had map features for the physicians in a geo file, which isn't very likely. Generally, you'll find that point tables have points and attribute data that are most useful when used together, and the points are not typical geographic features. So whereas an attribute table might contain demographic data for various cities (so you could link the table to points in a geo file), a point table might contain your customer locations and related information.

With Atlas GIS, you can easily create your own point tables. The software includes a U.S. ZIP code centroid file that allows you to assign ZIP code centroids to locations, creating table points. This process is called *geocoding*.

A point table is just like a map layer. You can choose a symbol, color, and size to display the points; specify a theme variable for the layer; and turn on labels. When you overlay a point table on a geo file, the table points act as another layer in your map. To display the table points properly, Atlas GIS converts the coordinates from the point table to the same projection as any open geo files.

Opening and Linking Files

Atlas GIS allows you to open multiple geo files at once. This allows an enormous amount of flexibility in the way you store and manage your geographic data. Within each geo file, you can have up to 250 layers—a limit that far surpasses most applications. It's important to remember that although Atlas GIS allows you to have as many as 250 layers open at one time, it also considers all open point tables and unlinked attribute tables as layers. As a result, the total number of open and active layers is based on the combined total of open geo files, unlinked tables, and point tables.

An attribute table is usually linked to a geo layer, to be used as part of that layer. When linking a table, Atlas GIS matches the *key column* you designate in the table to the _ID column in the geo file. When a value in the key column of the table matches an _ID value in the geo file, the two rows are linked. Each combined row then behaves like a single entity, though the attribute data is in the table and the geo data is in the geo file. For example, deleting a feature from the map deletes its row from both the geo file and the table.

When you open a table, the Table Link dialog box pops up, offering three linking options for the table:

- Linking it to a geo file:
  With this option, you specify the layer to which the table is linked and the column in the table to use as the key column. The values in the key column are then compared to those in the _ID column of the geo layer, and each matching pair is linked. This allows you to access the data in both the geo file and the table simultaneously for specific features. Each layer in the open geo file can have a linked table.

  Note that there is rarely a perfect one-to-one correspondence between the map features in a geo file and the rows in a linked table. Rather, there are usually features without matching table rows, table rows without matching features, or both. For more information about linked tables, see FILE | OPEN, TABLE | DEFINE COLUMNS, and TABLE | SORT in this manual.

- Opening it as unlinked:
  This opens the table with no ties to the map. An unlinked table is treated as its own layer (as is a point table), except that it is not drawn on the map. You will want to work with an unlinked table when you wish to make changes to a row without affecting the corresponding map feature.

- Opening it as a point table:
  A point table is identical to an attribute table, except that it contains columns in which the coordinate information is stored. While a point table is treated as its own layer, it acts like a point layer in a geo file, although it cannot have a table linked to it.

Viewing and Sorting Tables

In Atlas GIS, you use a *sort expression* to sort your table on a specific column name or on an expression built with one or more column names. Sort expressions allow you to view the table in a specific order in a Table window. They also allow you to search quickly for a specific value (in contrast, performing a non-sorted, sequential search could be time consuming—especially with a large table).

A *Table window* displays geographic and attribute data for the layer you choose in a spreadsheet format. You can view and edit the table data and select features, or you can perform more advanced operations, such as aggregating data, or calculating data to fill a column. For more information about Table windows, see Chapter 10, “Window Menu,” later in this manual.

Each Table window uses a sort expression to determine its *sort order*—the order in which its rows display. You can use one of the defined sort expressions provided with each table, or you can create your own. (The defined expressions sort on the _ID, _NAME, and _NAME2 column in the geo file, and on the key column in the table.) The sort order for the table can be based on either the geo file or the linked attribute table. Note that you can have multiple Table windows open for the same layer, each using a different sort order.

A sort expression can also be used by query operations (QUERY | SELECT BY VALUE) for increased speed, allowing you to search quickly for specific values. If you have a large table and will be performing multiple queries based on a particular column, creating a sort expression based on that column can save you time.

To understand and anticipate the results of Atlas GIS operations, it’s important to realize which map features or table rows will be affected when using a sort expression. When a sort expression is used, for example in a query operation, unmatched rows from either the geo file or the table will be ignored. (If the sort expression is based on the geo file, unmatched table rows are ignored; if the sort expression is based on the table, unmatched map features are ignored.)

Project Files

Project files are the documents you create with Atlas GIS. They contain complete descriptions of your maps, and can be quite useful. You can create a map once, save it in a project file, then recall and use it whenever you want. Or, you can save your work temporarily in a project file, and then pick up later where you left off. You can also use an existing project file as a starting point when you need to create a similar map.

The following information is saved with the project file:

- List of all open geo files and tables
- Display settings, such as the view of the map and page
- Position and properties of the page elements
- Layer and label settings
- Theme map settings
- Freehand objects and their properties
- Print settings from the Page Setup and Print Setup dialog boxes
- Table column settings
- Window positions
- Settings for key dialog boxes

Atlas GIS always has a project file open. When you first start Atlas GIS, a project file named UNTITLED.PRJ is automatically loaded for you. This project file contains the default settings stored in the default project file DEFAULT.PRJ. DEFAULT.PRJ is located in your Atlas GIS program directory and can be edited to start Atlas GIS with any group of settings you wish.

There are two commands in Atlas GIS you use to open a project file. Choose FILE | OPEN to load a specific project file, and choose FILE | NEW | PROJECT to clear your screen, load the default settings, and start a new project. There are also a variety of ways to launch Atlas GIS and load specific project files:

- You can double-click on the program icon in the Atlas GIS group box, and then use the FILE | OPEN command to load a project file.

- You can double-click on a specific project file in the Windows File Manager to automatically launch Atlas GIS and load the project file.

- You can drag-and-drop a project file onto the AGISW.EXE file name in the Windows File Manager to automatically launch Atlas GIS and load the project file.

When a project file is opened, all geo files and tables have the same settings and associations as when the project file was saved. If the geo files or tables were opened as read-only, they are again opened as read-only. Likewise, a table will be opened either linked to a geo layer, unlinked, or as a point table, depending on how it was opened when the project was last saved. A linked table again links to the same layer and has the same key column, and a point table uses the same longitude and latitude (or x and y) columns as before.

4

File Menu

The FILE menu contains commands for basic file operations, printing, and system configuration in Atlas GIS. You can also import, merge, and compress files with these commands. Here's a summary of the FILE commands, listed in menu order.

Table 4.1 **File menu**

COMMAND	**DESCRIPTION**
New	Create a new project file, a new geo file, or a new table.
Open	Open a project file, geo file, or table; import ASCII and spreadsheet files; start an AtlasApp.
SQL Access	Access an SQL database, and import data to a .DBF file for use as an Atlas GIS table.
Merge	Merge geo files or tables into an open file of the same type.
Close	Close one or more open files; stop an AtlasApp.
Save	Save the current project file.
Save As	Save a project file, geo file, or table under a new name or in a new location; save a subset of an open table or geo file.
Compress	Compress an open geo file or table.
Page Setup	Specify the page size, orientation, margins, and sizing options.
Print	Print the current page.
Print Setup	Choose or configure a printer.
Preferences	Customize the workspace, units, and system settings.
<*MRU*> list	Open one of the five "most recently used" project files.
Exit	Close all files and exits the program.

Note that in the remaining sections of this chapter, the individual FILE commands are discussed in alphabetical order, not in menu order.

File | Close

This command closes geo files, tables, or the entire project file. It also closes AtlasApps.

Available When

A geo file, table, or project file is open, or an AtlasApp is running.

How It Works

When you choose FILE | CLOSE, the Close dialog box pops up. You can close the current project file, or you can close one or more of the open tables and geo files. If an Atlas application is running, you can use this command to close (i.e., stop) it.

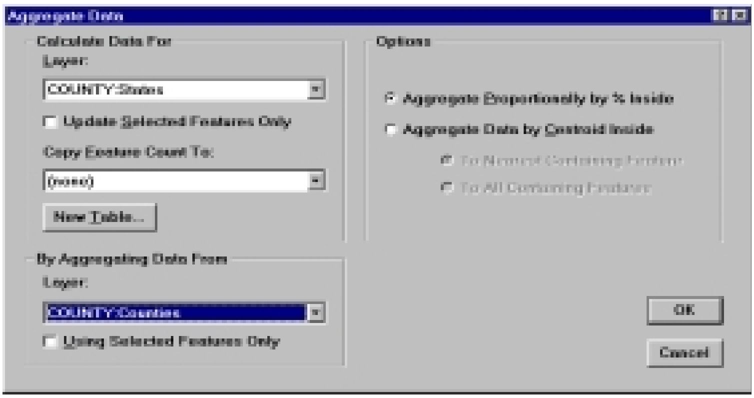


Figure 4.1 **Close dialog box**

Closing Geo Files

- When you close a geo file, the current layer settings are saved to a .LAY file. (This happens every time a geo file is closed, including when a project file is closed, or when you exit Atlas GIS.)

- If you close a geo file, and then save the project file, the closed geo file will not be opened next time you open the project file. The file name is no longer referenced by the project file.

- When you close a geo file that has a table linked to it, the table will remain open as an unlinked table. All Table or Statistics windows that reference the geo file's data will also be closed.

Closing Tables

- When you close a table, the current column settings are saved to a .COL file. (This happens every time a table is closed, including when a project file is closed, or when you exit Atlas GIS.)

- If you close a table, and then save the project file, the closed table will not be opened the next time you open the project file. The table name is no longer referenced by the project file.

- When you close an unlinked table or a point table, all Table or Statistics windows referencing its data will also be closed.

Closing Project Files

When you close a project file, you close all the open geo files and tables referenced by it.

Closing AtlasApps

You can use the FILE | CLOSE command to close one or more Atlas GIS script applications (.ATL extension). These applications, known as *AtlasApps*, are separate applications developed with either Atlas Script/C or Atlas Script/VB (companion products to Atlas GIS) that serve as add-ins to enhance the functionality or usability of Atlas GIS.

When you close an AtlasApp, the application terminates, and any add-in menu items, buttons, or functionality made available by the application is removed. Atlas GIS will remain open. Exiting Atlas GIS closes all running AtlasApps.

Associated Dialog Box

Close

File | Compress

This command permanently removes deleted features and rows from geo files and tables, and rebuilds all indexes.

Available When

At least one geo file or table is open.

How It Works

When you choose FILE | COMPRESS, the Compress dialog box pops up, allowing you to choose one or more files to compress.

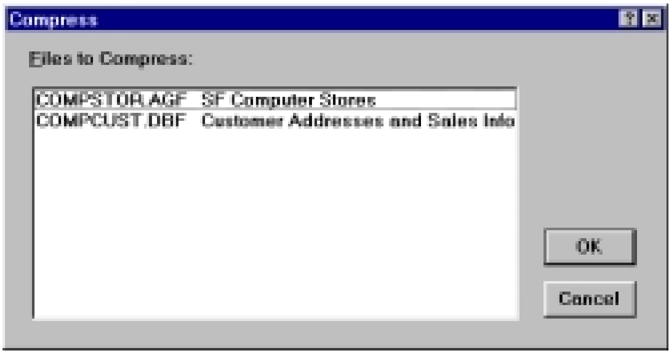


Figure 4.2 **Compress dialog box**

When you delete features or layers from a geo file, or rows from a table, the deleted item is not physically removed from the file. Instead, Atlas GIS marks the item internally as deleted, and you no longer see the item when working with the geo file or table. The FILE | COMPRESS command physically removes the deleted items, compresses the file, and saves the compressed file to disk.

If you check the size of the file before and after it's compressed, you'll see the decrease in size. In addition, compressing a file makes most query operations more efficient.

Notes:

- Before executing this command, make sure you have enough free space on your hard disk to temporarily store both the original file and the compressed copy. After the compressed file is written to disk, the original file is deleted and the disk space is again free. Atlas GIS will warn you if available disk space seems insufficient for this operation.

- If you want to stop the file compression, click on the Cancel button.

Recommended Uses

- To improve the efficiency of query operations.
- To reduce the amount of hard disk space used by your files.

Associated Dialog Box

Compress

File | Exit

This command closes all files and exits the program.

Shortcut

ALT+F4

How It Works

When you choose FILE | EXIT, all open files are closed, as is the application itself. If any changes were made to the project file since the last time it was saved, the program will prompt you to save the project file before exiting.

File | Merge

This command combines information from two or more files into a single file. You can merge either geo files or tables.

Available When

A geo file or table is open.

How It Works

When you choose FILE | MERGE, the Merge dialog box pops up. The file that you're merging into (the *target* file) must be open. The files that you want to merge (the *merging* files) into the target file must be the same type as the target file, and they must be closed.

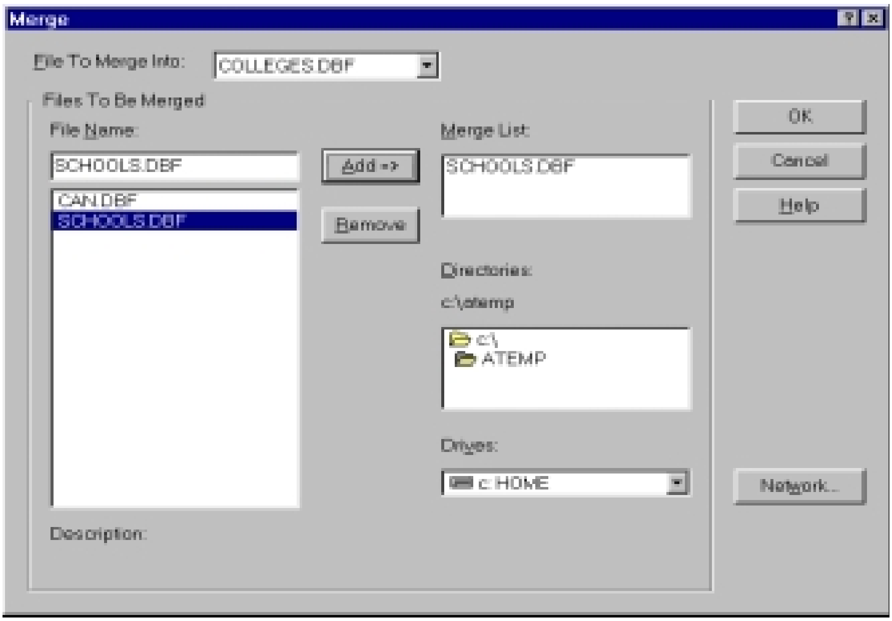


Figure 4.3 **Merge dialog box**

Notes:

- If the merging files are in different coordinate systems, you can choose to have Atlas GIS convert the files to match the coordinate system of the target file.

- If you are merging a large amount of data, remember that you need enough disk space to complete the operation.

- Only Atlas GIS tables can be merged. Any non-Atlas GIS .DBF file must first be opened with the FILE | OPEN command so that it can be used as a table. The table then needs to be closed before merging into another table.

Tables

When you merge tables, rows from the merging tables are added to the target table. Atlas GIS matches the column names, so the merging information is added in the correct columns.

The Merge Tables dialog box allows you to specify how the incoming table rows are to be handled.

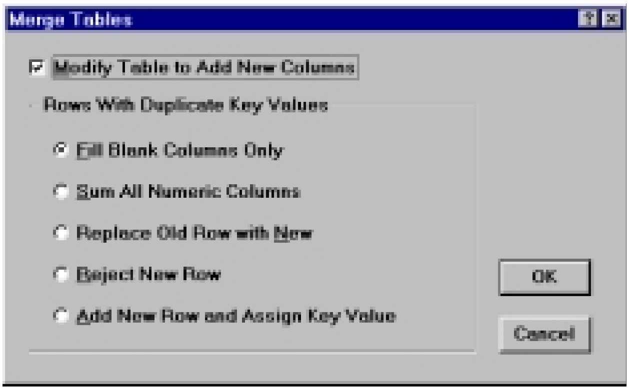


Figure 4.4 **Merge Tables dialog box**

Since every row's key value must be unique, you will specify what to do if a row from the merging file has the same key value as a row in the target file. The following option buttons are available:

- Fill Blank Columns Only
  Rejects the merging row except for column values that are blank in the target file. Replaces those blank values with the values from the merging table. Use this option if you're merging two tables that have the same rows, but different columns.

- Sum All Numeric Columns
  For each numeric column, the values from the merging files and the values in the target file are summed. Non-numeric columns are ignored.

- Replace Old Row with New
  Replaces the row in the target table with the merging row.

- Reject New Row
  Skips the merging row, leaving the row in the target file unchanged.

- Add New Row and Assign Key Value
  Adds the merging row to the target file as a new row, and replaces the key value with a new, unique one. The row in the target file remains unchanged.

If multiple tables are being merged (in a single merge operation), only rows can be added to the target table; columns from the merging tables that have no corresponding columns in the target table are ignored. However, if a single table is being merged, you can place a check in the *Modify Table to Add New Columns* box and have Atlas GIS add a column to the target table for each non-matching column in the merging table.

Geo Files

When merging geo files, Atlas GIS combines layers and features from one or more closed geo files into one open geo file, consolidating layers with the same name. If a layer in one of the files you are merging from (the merging files) does not exist in the file you are merging to (the target file), Atlas GIS automatically creates a new layer in the target file.

Since the _ID value of every feature in a layer must be unique, you will specify in the Merge Geo dialog box what to do if a feature from a merging layer has the same _ID value as a feature in the target layer.

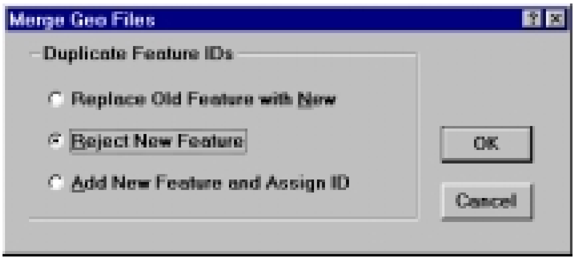


Figure 4.5 **Merge Geo dialog box**

The Merge Geo dialog box contains the following option buttons:

- Replace Old Feature with New
  Replaces the feature in the target file with the merging feature.

- Reject New Feature
  Skips the duplicate feature in the merging file, leaving the feature in the target file unchanged.

- Add New Feature and Assign ID
  Adds the feature from the merging file to the target file as a new feature, and replaces the _ID values with a new, unique _ID value. The feature in the target file remains unchanged.

Recommended Uses

- If you have separate county geo files, each containing a layer of ZIP code boundaries, use FILE | MERGE to create a single state geo file with a single ZIP code layer. If you do not merge them, opening each of these files produces a separate layer with the same name. It is most often more convenient to work with all these layers as a single layer.

- To combine data from separate tables into a single table that you want to link to a single geo layer.

- To combine data from separate tables that have the same rows but different columns (that is, different kinds of data about the same features).

Warning

There is no UNDO for this command, so if you're unsure about whether to merge files, it's always best to make a copy of the target file first.

Associated Dialog Boxes

Merge
Merge Geo Files
Merge Tables

File | New | Geo

This command creates a new geo file.

How It Works

When you choose FILE | NEW | GEO, the New Geo File dialog box pops up. The options in this dialog box allow you to specify the name, description, and projection for a new geo file, as well as the name, type, and description for the file's initial map layer.

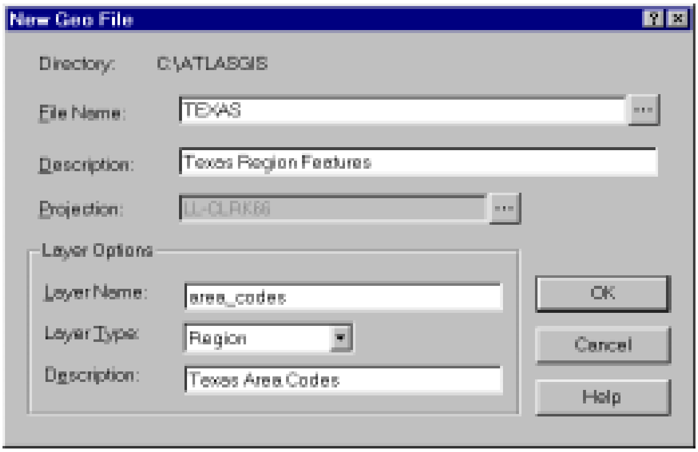


Figure 4.6 **New Geo File dialog box**

If there's no geo file or point table open (that is, a current projection has not been established), you need to specify the projection on which the geo file is based. If later you open another geo file or a point table, Atlas GIS will reproject the coordinates of that file or table to match those of the newly created geo file (if they do not already match).

General Rule: The file that's opened first, whether it's a geo file or point table, establishes the current projection. Once a current projection is established, all subsequent geo files or point tables must have that projection—if needed, Atlas GIS will reproject them before opening them.

Associated Dialog Box

New Geo File

File | New | Project

This command creates a new project file.

How It Works

This command closes any open project file and creates a new one. The new project file uses the default settings.

If you're using a project file that's been changed since it was last saved, you will be prompted to save the current project file before it is closed. The new project file appears as UNTITLED.PRJ until you save it and specify a name.

File | New | Table

This command creates a new table.

How It Works

When you choose FILE | NEW | TABLE, the New Table dialog box pops up. This command creates a new .DBF file, which can be a point table or an attribute table.

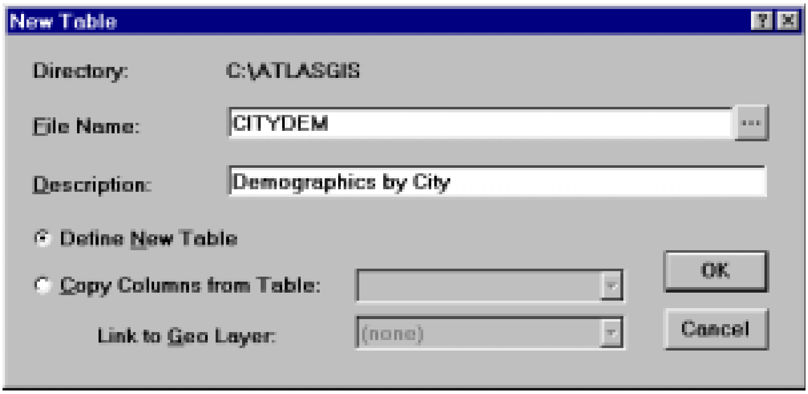


Figure 4.7 **New Table dialog box**

You can create the structure for a new table either by copying the existing structure from an open table, or by defining a new one.

- If you copy the columns from another table, you can specify a geo layer to link the new table to, or you can choose <none> and open the table unlinked.
- If you choose to create a new table structure, the Define Columns dialog box pops up, displaying options to link the table to a geo layer, open it unlinked, or open it as a point table. For more information about creating a table's column structure, see TABLE | DEFINE COLUMNS.

If you want to link the table to a geo file, note that Atlas GIS matches the *key column* you designate in the table to the _ID column in the geo file. When a value in the key column of the table matches an _ID value in the geo file, the two rows are linked.

If you choose to create the new table as a point table, you need to specify the columns that will contain the longitude and latitude (or x and y) coordinates. If you already have a geo file or point table open (that is, a current projection has already been established), it is not necessary to specify the projection on which the coordinates are based. For a list of projections, see the Define Columns dialog box. The *Values Are* list box in the Contains Points subpanel lists the available types.

If there's no geo file or point table open (that is, a current projection has not been established), and you intend to use existing coordinate data in this table, you need to specify the projection on which the data is based. If later you open a geo file or point table, Atlas GIS will reproject its coordinates to match those of the newly created point table (if they do not already match).

General Rule: The file that's opened first, whether it's a point table or a geo file, establishes the current projection. Once a current projection is established, all subsequent point tables or geo files must have that projection—if needed, Atlas GIS will reproject them before opening them.

Notes:

- After the table columns are defined, you can view the new table with WINDOW | NEW TABLE WINDOW. The Table window will display the column headings and one blank row.

- If you want to add rows to the new table by typing in the Table window, use TABLE | ADD ROWS. You can enter data in the Table window, or you can calculate it with TABLE | CALCULATE COLUMN.

Associated Dialog Boxes

New Table
New Table Name
Define Columns

File | Open

This command opens an entire project file, or an individual geo file, table, or .DBF file. It imports spreadsheets or delimited ASCII text files as Atlas GIS tables. It also opens AtlasApps.

Shortcuts

- Open button on the button bar
- CTRL+O

How It Works

When you choose FILE | OPEN, the Open dialog box pops up. The file list in the Open dialog box shows all the files of a particular type that are in the specified directory. You can use the question mark (?) and asterisk (*) wild-card characters to list a specific set of files. The different file types in the list box represent the kinds of files you can either open, import, or run with FILE | OPEN.

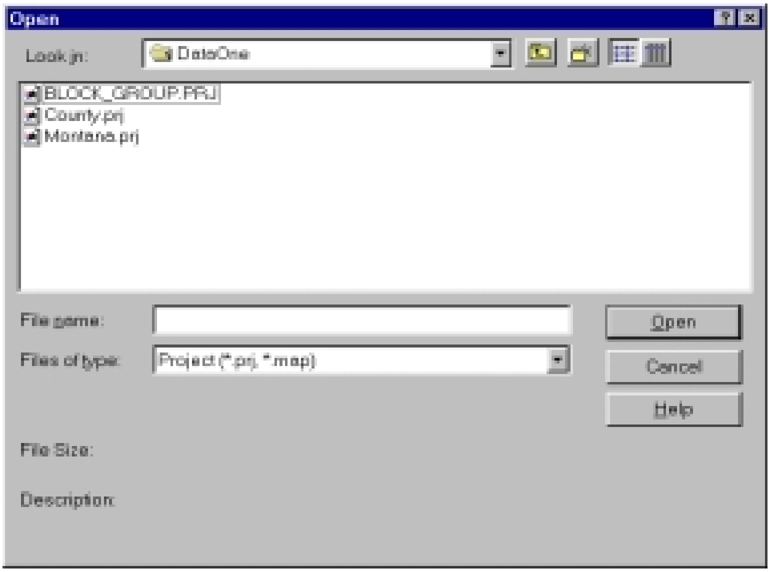


Figure 4.8 **Open dialog box**

Opening a Project File

A project file (.PRJ extension) contains a complete description of the project, including names of all open files and open windows, the program settings, descriptions of freehand objects, and page layout information. Opening a project file recreates the map as it was when the project file was last saved, except that selections are not restored.

When a project file is opened, all geo files and tables have the same settings and associations as when the project file was saved. If the geo files or tables were opened as read-only, they are again opened as read-only. Likewise, tables will be opened either linked to a geo layer, unlinked, or as a point table, depending on how it was opened when the project was last saved. A linked table again links to the same layer and has the same key column, and a point table uses the same longitude and latitude (or x and y) columns as before.

When you open a project file, the previous project is closed. If the previous project file has any unsaved changes, the program prompts whether to save it before closing it.

Near the bottom of the FILE menu, there is a list of your five most recently used (MRU) project files. This list acts as a shortcut for opening those files. Clicking on one of these items is the same as choosing FILE | OPEN and then specifying that same file from the directory listing. As with FILE | OPEN, the current project is closed before the new one is opened. If the current project file has any unsaved changes, Atlas GIS prompts whether to save those changes before it closes the project file.

Opening Tables and Geo Files

Because geo files and tables may be quite large, Atlas GIS does not load them into memory for editing. Instead, Atlas GIS updates them directly on the disk as you edit—there's no command for saving geo files or tables. As a result, you may want to make copies of your geo files and tables (with FILE | SAVE AS) and then make changes to the copies, rather than editing the original files. This may not be practical, though, for very large files (such as street-based geo files). In these instances, we recommend that you make frequent backups of your master files.

When a geo file is opened, Atlas GIS gets its layer settings from a layer settings file (.LAY extension). When a table is opened, Atlas GIS gets its column settings from a column settings file (.COL extension). When a project file is opened, its layer and column settings override the settings in both the .LAY or .COL files.

All open geo files and point tables must use the same projection. The first one opened sets the current projection for the map. Subsequently opened files are then re-projected as necessary. To change the projection of all open geo files and point tables, use MAP | CHANGE PROJECTION.

Opening linked or unlinked tables always pops up the Table Link dialog box so you can confirm that the table is being linked to the correct layer. Opening a point table does not pop up this dialog box, it simply redraws the map.

The Table Link dialog box offers three options for opening a table:

- Links to Geo
  To link a table to a geo file, click on the Links to Geo option button and specify a layer to link it to and a column to use as the key column. The values in the key column are then compared to those in the _ID column of that layer of the geo file. Each matching pair is linked, so that the table data and the internal geographic data are both available for specific features.

  For example, you might have a geo layer of ZIP code regions with ZIP codes in the _ID column, and a table containing a ZIP code column and demographic data about each ZIP code region. When the table is linked to the ZIP code layer, and the table's ZIP code column is the key column, the demographic data is linked to the correct map features.

  Note: Atlas GIS requires that the key column contain character data. So, if you specify a numeric column as the key column, Atlas GIS will prompt you for permission to convert it.

  For more information about linked tables, see Chapter 3, "Storing and Managing Data," and Chapter 9, "Table Menu," in this manual.

- Contains Points
  To open a table as a point table, click on the Contains Points option button. A point table has columns containing coordinate data (longitude-latitude, projected, or x-y coordinates). A point table acts like a point layer in a geo file, except that it cannot have a table linked to it.

The first time you open a point table, you must specify the columns that contain the coordinates, and the coordinate system upon which they are based. Note that if the table does not have columns for the coordinates, Atlas GIS can automatically create them for you.

Atlas GIS uses the coordinate system information to check whether the table uses the same projection as the current map, and to reproject the coordinates if not. If the coordinate data was created in Atlas GIS, you do not need to be concerned about the projection. If the coordinates have a different source, however, it is very important that you correctly specify the coordinate system. (It will usually be longitude-latitude.)

Important: If the coordinate system is incorrectly specified, the coordinates will be reprojected incorrectly, and the original coordinate data will be overwritten by erroneous data.

Atlas GIS checks the format of longitude-latitude coordinates as follows. If they contain one or more decimals, Atlas GIS assumes that they are in decimal degrees. If they are whole numbers, Atlas GIS assumes that they are in millions of degrees.

- Unlinked
  To open a table with no ties to the map, click on the Unlinked option button. An unlinked table is treated as its own layer (as is a point table), except that it is not drawn on the map. You will want to work with an unlinked table when you wish to make changes to a row without affecting the corresponding map feature.

If you want to link or unlink a table while working in Atlas GIS, use TABLE | DEFINE COLUMNS.

Opening Files Created in Atlas GIS for DOS

When map files, geographic files, or attribute/datapoint files from Atlas GIS for DOS are opened for the first time, they are automatically converted to the Atlas GIS for Windows format. For more information about opening Atlas GIS for DOS files, refer to Chapter 3 in this manual, or to the *Transition Guide*.

Opening dBASE or xBASE Files

Atlas GIS for Windows can use dBASE III Plus® or dBASE IV® database files. The .DBF files themselves are used directly as Atlas GIS tables, but the other files, such as index files and column settings files, are created by Atlas GIS.

For example, Atlas GIS stores column settings in a .COL file. If the .DBF file you are opening does not have an associated .COL file (or a .FED file if it's an Atlas GIS for DOS .DBF file), Atlas GIS creates the .COL file. Atlas GIS also creates an index on the table's key column (with an .N00 extension).

Like dBASE IV, Atlas GIS supports a maximum of 255 fields, and is downwardly compatible with dBASE III Plus. Atlas GIS, like dBASE III Plus, has a maximum record length of 4000 characters.

Atlas GIS does not use memo fields. As a result, if the .DBF file you're opening contains memo fields, the fields are simply ignored. The data, however, is preserved. The following field types are supported by Atlas GIS:

- *String:* From one to 254 characters wide, containing ASCII characters or digits.
- *Number:* From one to 19 characters wide, containing numeric data in binary coded decimal (BCD) format.
- *Float:* From one to 19 characters wide, containing numeric data stored as floating point numbers.
- *Date:* Eight characters wide, containing a calendar date. Date values are displayed according to the format set in FILE | PREFERENCES.
- *Bool:* One character wide, containing a true or false value.

When you open a dBASE file, Atlas GIS uses the actual file, rather than creating a copy. As a result, any edits you make to the table are made directly to the file. If you do not wish to overwrite the original file, remember to back up the original dBASE file before opening it.

Importing Other File Formats

With the FILE | OPEN command, Atlas GIS can import the following spreadsheets and ASCII text files:

- Microsoft Excel™ (.XLS)
- Lotus 1-2-3® (.WK*)
- Tab delimited ASCII text (.TXT)
- Comma delimited ASCII text (.CSV—comma-separated values)

If you try to open a file that does not have an Atlas GIS extension or one of the extensions listed above, the system asks whether to import the file to an Atlas GIS table. If you import a file as read-only, the file is first imported, and then it's opened as read-only.

As when opening an Atlas GIS table, you must specify whether to open the table linked to a geo layer, unlinked, or as a point table. The first time you open a file as a point table, you must specify which columns are to be used for the longitude and latitude (or x and y) coordinates, and the projection upon which they are based. Atlas GIS uses this information to check whether the table is based on the same coordinate system as the current map, and if not, to reproject the coordinates. It is very important to correctly specify the projection of imported coordinate data.

Important: If the coordinate system is incorrectly specified, the coordinates will be reprojected incorrectly, and the original coordinate data will be overwritten by erroneous data.

Spreadsheet Files

Atlas GIS can import spreadsheets in the following formats:

- *Lotus 1-2-3:*
  - 1-2-3 version 1A (.WKS)
  - 1-2-3 version 2.01, 2.2, or 2.3 (.WK1)
  - 1-2-3 version 3.0 or 3.1 (.WK3)
  - 1-2-3 version 4.*x* or 5.0 (.WK4)

- *Microsoft Excel:*
  - version 2.0 (.XLS extension)
  - version 3.0 (.XLS extension)
  - version 4.0 (.XLS extension)

You can specify the following options when importing a spreadsheet:

- whether to take the table column names from the first row (of the spreadsheet or the chosen range) or from a specified row
- whether to import the entire spreadsheet, or only a specified range of cells

Since many spreadsheet programs can create a .DBF file (standard dBASE format) from their spreadsheet data, you could use the spreadsheet program to create a .DBF file, and then simply open and use the .DBF file with Atlas GIS. In addition, if your spreadsheet program is a Windows application, you could copy the data to the clipboard, and then paste it into an Atlas GIS table.

ASCII Text Files

Atlas GIS imports text files in the following formats, which are exported by most DOS or Windows application programs:

- *Comma-delimited:* The default extension is .CSV. Values are separated by commas, and character strings may be enclosed in double quotation marks (“ ”). Quotation marks are necessary for strings that contain commas. The values in the first line of the file will be used as the table column names.

- *Tab-delimited:* The default extension is .TXT. Values are separated by tab characters, and no special notation is required for character strings. The values in the first line of the file will be used as the table column names.

Opening Files as Read-Only

Whether on a network or a single-user system, you may want a file to be accessed by multiple programs at once. That is, either multiple users may want to use the file, or you may want to open it in more than one application. In either case, it is important to use file-locking protection to ensure the integrity of your files. Use the DOS SHARE command to enable file-locking, whether on your local system for your own multiple access, or on a network server for multiple users. See your DOS manual for details.

You can open geo files or tables as read-only in Atlas GIS by placing a check in the *Read Only* box in the Open dialog box. When a file is opened as read-only, you can view it, but you cannot edit it. Other users or other programs can also open the file—but only as read-only. In Atlas GIS, a read-only status permits selecting and querying, but does not permit modifying the data or file structure in any way.

Note: The *Read Only* check box is visible only when ‘geo’ or ‘table’ are selected in the *List Files of Type* list box.

You can open a geo file or table for editing only if no other user or program is using the file. Opening it this way allows you to perform any operation you wish on the file. Then, from the time you open it to the time you close it, no other user or program can use that file.

You can also open a geo file as read-only, but link an editable table to it. This allows you to edit the data in the Table and Info windows, as well as execute commands such as TABLE | CALULATE COLUMN and TABLE | DEFINE COLUMNS.

There is no read-only option for project files. Unlike geo files and tables, which are used and edited directly on disk, a project file is always in RAM during use and is written to disk only when you save it. You can always change or save a project file.

***Note*:** The Atlas GIS *Read Only* option in the Open dialog box is in addition to the DOS read-only file attribute. That is, if a file is set as read-only in DOS, you can only open it in Atlas GIS as read-only. If, however, it is set as editable in DOS, you then have the option of opening it as either editable or read-only in Atlas GIS.

Opening AtlasApps

With the FILE | OPEN command, you can open Atlas GIS Script applications (.ATL extension). These script applications, also known as *AtlasApps*, are separate applications developed with either Atlas Script/VB or Atlas Script/C (companion products to Atlas GIS) that serve as add-ins to enhance the functionality or usability of Atlas GIS. AtlasApps do not run by themselves; instead, they require that Atlas GIS be running—if necessary, they will start Atlas GIS first.

Notes:

- You can have multiple AtlasApps open at the same time, and for each AtlasApp, one or more menu items or buttons may be installed.

- Some AtlasApps install menu items and buttons when they're opened, but do not actually run until you've activated them by a menu or button click. Others, however, run upon loading and remain in memory, ready to respond to your request.

You can also open AtlasApps using the File Manager or Program Manager, or by clicking on an AtlasApp file name in either the Table window or Info window. For more information about opening AtlasApps, see *Atlas GIS Help*.

Associated Dialog Boxes

Open
Spreadsheet Options
Table Import
New Table Name
Table Link

File | Page Setup

This command allows you to set the dimensions and orientation of the printed page.

How It Works

When you choose FILE | PAGE SETUP, the Page Setup dialog box pops up, allowing you to set the size and margins of the page, and how the page is oriented on the paper.

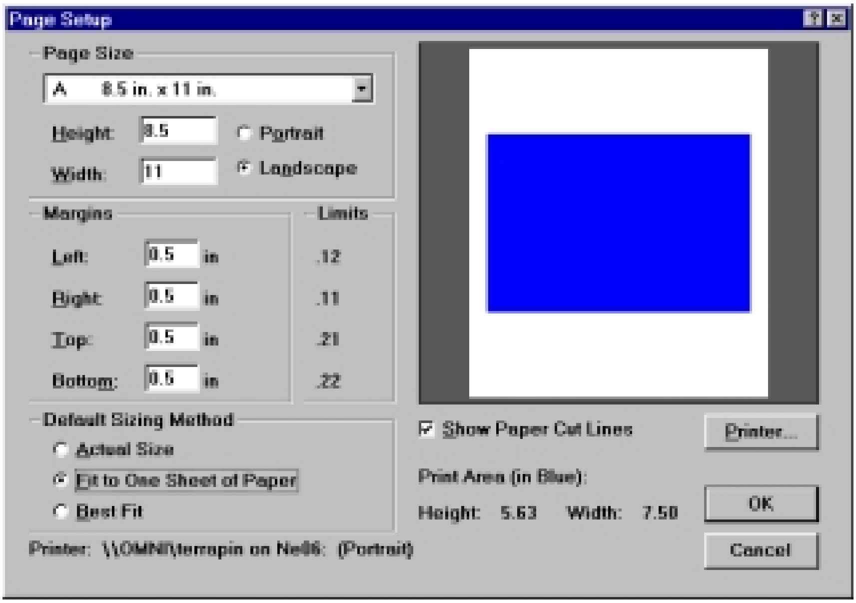


Figure 4.9 **Page Setup dialog box**

In Atlas GIS, the *page* is the final printed output, which includes the *printed area* (everything inside the page frame) plus the margins. The size of the page is not limited to the size of the paper used by your printer (though, this is normally the case); therefore, the page can be printed on multiple sheets of paper.

Note: The *paper* dimensions and orientation for printing are set in a standard Windows dialog box which you access by first clicking on the Printer button, and then clicking on the Setup button. The current printer and paper orientation is displayed at the bottom of the Page Setup dialog box.

You can set the page size to a standard size, such as 8.5 by 11 inches, or you can specify a custom size. The margin settings determine the width of the borders around the printed area. The margins must be equal to or larger than the limits (i.e., "hard margins" of the current printer) displayed in the Page Setup dialog box.

The orientation option buttons (Portrait and Landscape) are for the *page*, and are independent of the orientation of the sheets of paper in the printer. For example, your page can be in landscape orientation (wider than it is tall) even though the printer is in portrait orientation.

This command also sets the sizing method used to print the page. The following sizing options determine how the page is distributed on the sheets of paper required to print it. (Notice that the sizing method set in the Page Setup dialog box can be overridden for a particular print job by choosing a different sizing method with FILE | PRINT.)

- Actual Size
  Prints the page at the dimensions that appear in the Page Size and Margins group boxes. You may need to cut away the excess paper and join the sheets of paper to create the final page. This setting guarantees that the finished page size, margins, and orientation exactly match what you have set.

- Fit to One Sheet of Paper
  Fits the entire page on one sheet of paper. This setting ignores the measurements set in the Margins and Page Size group boxes, and resizes the page proportionally to fill one sheet of paper within the margins. The final dimensions and orientation of the page are determined by the size and orientation of the paper for the current printer.

- Best Fit
  Optimizes the use of paper, while printing the page at very nearly the measurements set in the Page Size group box. If your page is the same size as the paper, this option automatically sets the printer's orientation to match the page.

The *Best Fit* setting may change the page orientation in order to reduce the number of sheets used, and it may also enlarge or reduce the page size to obtain the “best fit” within the margins. Any resizing that is done is proportional, preserving the ratio between the height and width set in the Page Size group box. The map scale may also change slightly to reflect any resizing of the page.

When settings are changed in the Page Setup dialog box, the distribution of the page on the sheet (or sheets) of paper, and the size of the page margins are reflected in the print preview area. The margins are shown in white, and the printed area is shown in blue.

If multiple sheets of paper are required to print a page, the print preview can also display the cut lines that indicate where to cut and connect the sheets of paper. The shaded areas (that is, with diagonal fill pattern) in the preview are cut-away portions of paper. Notice how the picture changes when different sizing methods are chosen. For example, compare the efficiency of paper usage between Best Fit and Actual Size (when the page size is larger than the paper size).

The dimensions of the printed area (i.e., the page size less the margins) appear beneath the print preview. These dimensions are not editable—Atlas GIS calculates them based on the sizing method and the settings in the Page Size and Margins group boxes.

The current printer, port, and paper orientation are also displayed in the Page Setup dialog box. The Printer button allows you to change the target printer and set up various other printer options.

Note: Even if only a portion of the page is currently displayed on the screen, the entire page is printed (unless a range of sheets is specified in FILE | PRINT).

Associated Dialog Boxes

Page Setup
Print Setup

File | Preferences

This command allows you to customize your Atlas GIS working environment.

How It Works

When you choose FILE | PREFERENCES, the Preferences dialog box pops up, allowing you to specify workspace settings, choose units of measure for various functions, and define the system settings. The preference settings can be changed at any time. They are saved with the program (not in the project file) and are loaded every time Atlas GIS is started. The settings are divided among four options subpanels: General, Map, Units, and Directories.

General

The settings in the General subpanel include the User ID, monitor settings, page grid settings, and button bar and toolbox preferences. For a complete description of these settings, refer to the on-line help.

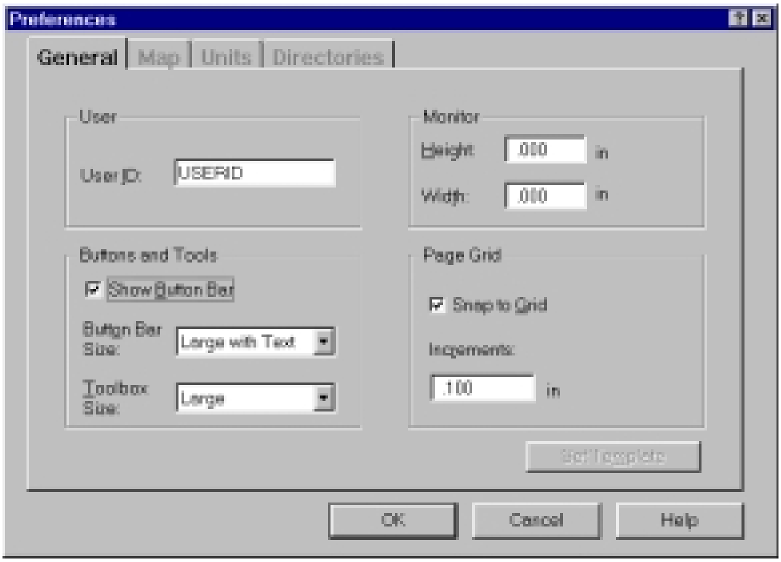


Figure 4.10 **General subpanel**

User ID

The user ID is a character string of up to eight characters. It is used as the prefix for the unique IDs that Atlas GIS assigns to new map features that you create. Each of these unique IDs in the _ID column is composed of the user ID and a system-generated number.

The user ID is also used as a prefix when naming temporary working files. When using Atlas GIS on a network, it is crucial that each user have a unique user ID.

When Atlas GIS creates a feature ID (such as when you add a new map feature), it takes this 8-character user ID (first specified when you installed the program) and appends an 8-character sequence number. If the layer is linked to a table, the sequence number begins with the number of records in the table and increases by one each time you add a feature. If the layer is not linked to a table, the sequence number begins with the number of features in the geo file.

Page Grid Settings

The page freehand layer has an invisible grid that you can snap to. This allows you to move to a precise position on the page. This is useful, for example, when you want to align page frames or create freehand objects. The "snap to" feature can be turned on or off. If the snap is turned on and you move a freehand object, the object's upper left corner snaps to the grid.

For even greater precision, you can also control the grid increment size. Notice that the setting for the increment size controls the size of the grid in both the x and y directions.

Controls

These settings allow you to specify whether to display the button bar, and if so, to specify the size for its individual icons. You can also specify the icon size for the toolbox. Choose 'Small' for displays with VGA resolution, and 'Large' or 'Large with Text' for displays with super-VGA resolution. (The 'Large with Text' setting specifies that the icons in the button bar are displayed in large format with descriptive text below each icon, and is not applicable to the toolbox icons.)

Monitor

In order to get the most accurate results when using the VIEW | ACTUAL SIZE command, you need to enter the dimensions of your monitor's display area.

Template

The Set Template button allows you to configure a portion of your digitizing tablet as a screen pointing area (referred to as a template). Configuring a screen pointing area allows you to use the digitizing cursor to point at the screen, as you would with a mouse, for operations such as editing, freehand drawing, and navigating through the command menus.

Note: The Set Template button is available only when a digitizing tablet is installed correctly for Windows.

In some situations, you may find a template very useful; however, it is not required for digitizing. For example, in certain configurations, such as a large tablet away from your computer, the template can save you from continually reaching for the keyboard or mouse. On a small tablet, you don't need to create a template area if you don't mind switching between the tablet and keyboard.

The template is set up by clicking on the Set Template button and digitizing two opposite corners of the template to define its location on the tablet. The template is typically placed on the digitizing tablet within easy reach of where you are working.

The template area can be turned on or off. To control the way you use the digitizing tablet, click on the cursor button that toggles the template on or off (the third button is the default). When the template area is on, the template is active and the remainder of the tablet is available for digitizing. When the template area is off, the template is disabled and the entire tablet is available for digitizing.

When the digitizing cursor is in an active template area, a pointer or small cross hair appears on screen. (If the pointer or cross hair is not visible on screen, its map location is indicated in the status bar.) This on-screen cursor will move according to the mode, sensitivity, and acceleration settings specified for the digitizing driver (located in the Windows Control Panel).

Map Subpanel

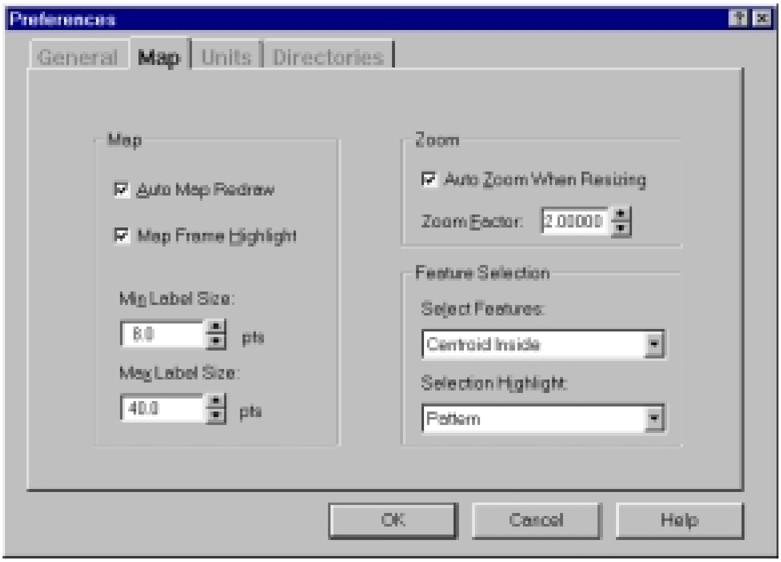


Figure 4.11**Map Subpanel**

Map Preferences

These settings control the display as you work with the map. Note that the label size constraints take precedence over the label settings defined with MAP | LAYERS & THEMES. For example, when a label size increases proportionally to the map as you zoom in, it will not increase to a size larger than the maximum label size specified in the Preferences dialog box.

If the *Map Frame Highlight* box is checked, the border around the current map frame is highlighted, allowing you to see which map frame you're working with. Notice that the current map frame is also indicated on the Current Map button on the status bar (e.g., 'Map 1').

Map Feature Selection

These settings control how map features are selected. (Note that these settings have no effect on how you select freehand objects.)

The *Select Features* list box allows you to specify which features are selected when using the Circle Select or Polygon Select tools, or when dragging to select with the Pointer tool.

- *Touching*
  Any features inside of or touching the selection boundary will be selected.
- *Inside*
  Only the features that are completely inside the selection boundary will be selected.
- *Centroid Inside*
  Only the features whose centroid is inside the selection boundary will be selected. (Note that this centroid is also the default label position.)

The *Selection Highlight* list box specifies how map features appear when they are selected. A selected feature can appear with a solid or patterned highlight.

Units Subpanel

The settings in the Units subpanel control the units of measure for various functions and commands in Atlas GIS. For a complete description of these settings, refer to the on-line help.

Note: Atlas GIS uses your Windows system settings for the separator characters for numeric data—that is, whether commas or periods are used to indicate decimal places or to separate thousands when displaying numbers. (To set the number format, click on the International icon in the Windows Control Panel.)

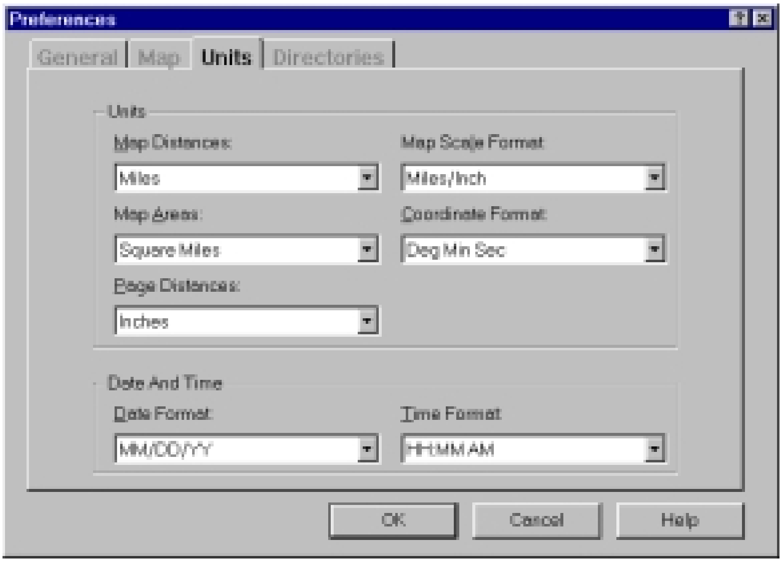


Figure 4.12 **Units subpanel**

Units

These settings specify the units of measure used for page distances, map distances, and map areas, as well as the formats for the map scale and coordinates. All of these settings use standard units of measure.

Map coordinates can be displayed in the status bar in either of two longitude-latitude formats, or as projected coordinates, as described below:

- Deg Min Sec
  In this format, for example, 120 30′ 50.00″ W would be displayed or entered as ‘120 30 50 W’.

- Decimal Degrees
  In this format, for example, 120 30′ 50.00″ W would be displayed or entered as ‘–120.51’.

- Projected
  In this format, the coordinates are displayed in the coordinate system of the current projection.

Date and Time

These settings specify the format used for date and time when editing date columns in tables, or when you specify the system text string for the date or time.

Directories Subpanel

The settings in the System subpanel control the basic system settings when using Atlas GIS (including the user ID, default data directory, scratch path, data path for the geocoder database, and custom bitmap directory). This is also where you specify the dimensions of your screen's display area, and where you add custom symbols to the Atlas GIS symbol table. For a complete description of these settings, refer to the on-line help.

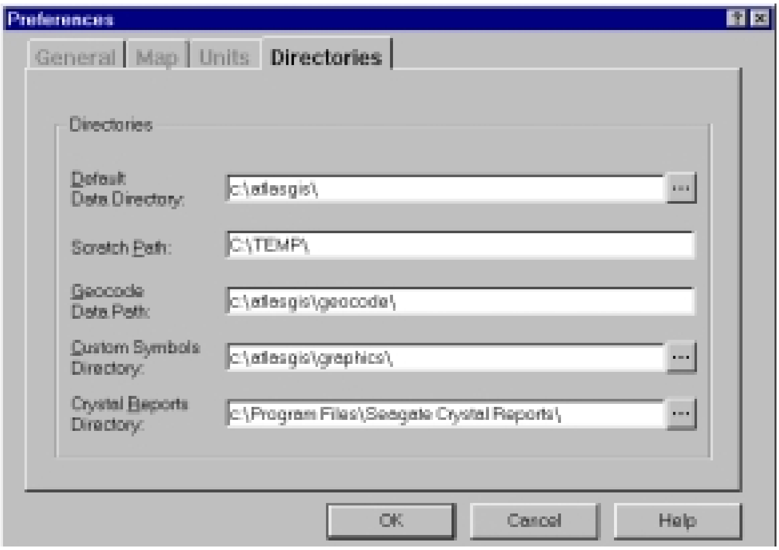


Figure 4.13 **System subpanel**

Default Data Directory

Atlas GIS stores data files (geo files, tables, and project files) in this directory and loads them from there, by default. (If, however, you load a project file from the Windows Program Manager rather than from Atlas GIS, that file's directory will be used as the default data directory instead.)

Scratch Path

When Atlas GIS builds temporary working files, it stores them in the directories listed in the scratch path. The directories in the scratch path are used in the order in which they are listed. Only one directory per drive should be listed. If one drive fills up, Atlas GIS goes to the next drive, using up to six. If all drives in the list are used, Atlas GIS displays an error message.

The default scratch path is as follows: first, the root directory of the last non-removable local drive (usually a RAM disk); then the Atlas GIS working directory (as set in the Windows Program Manager); then C:\; D:\; and so on, until all the non-removable local drives have been listed.

In general, most temporary files are small and fit on a RAM disk; however, some special commands, such as MAP | COMBINE BY VALUE, create very large temporary files. These commands use the drive in the path with the most free space.

The following are some guidelines for setting up the scratch path:

- When you specify a path, use the style of the PATH command in DOS, separating directories with semicolons. For example, a path could look like this: F:\; D:\TEMP.
- List your RAM disk first. This improves the program speed.
- Include as many physical hard drives in the path as possible, listing the drives with the most disk space available towards the beginning.
- If possible, do not include network drives. Using these drives can degrade program speed.

Geocode Data Path

Atlas GIS uses a couple of specialized, CD-compatible geocoding databases to derive locations for street addresses and ZIP+4 codes. Since these databases are typically large and are delivered on CD, the geocode data path is usually the drive from which your CDs are accessed.

Note, however, that the geocode data path does not have to be a CD drive—it can consist of any valid list of DOS drives and directories, with semicolons to separate the paths. For example, if you're doing geocoding for a single state, and you don't have permanent access to a CD drive, you could copy only the files you need to your local hard drive, and then add that drive and directory to the geocode data path.

Custom Symbol Directory

Atlas GIS allows you to include up to 30 user-defined, custom symbols in the Symbol table. These symbols must be bitmap files (.BMP extension), and to appear in the Symbol table, they must be stored in the custom symbol directory before you start Atlas GIS. Note that if a particular bitmap cannot be found or cannot be read, the default symbol from the Symbol table will be used. You can use any Windows paint program, such as Paintbrush, to create bitmap files.

If you use a custom symbol for a geo point layer, the name of the bitmap is stored with the geo file. In addition, if you use a custom symbol as a free-hand object, the name of the bitmap file is stored in the project file. This allows you to share geo files and project files, as long as the person you're sharing the files with has the same bitmap file in his or her custom symbol directory.

Crystal Reports Directory

The ability to create reports based on feature attribute or table information is provided by the Crystal Reports application. It can be installed with Atlas GIS. The path to the application must be present in the Crysta Reports Directory in order to access the application during a Table | New Report or Table | Open Report command.

Associated Dialog Box

Preferences

File | Print

This command allows you to specify settings for the current print job, and then print one or more copies of the current page.

Shortcuts

- Print button on the button bar
- CTRL+P

How It Works

When you choose FILE | PRINT, the Print dialog box pops up.

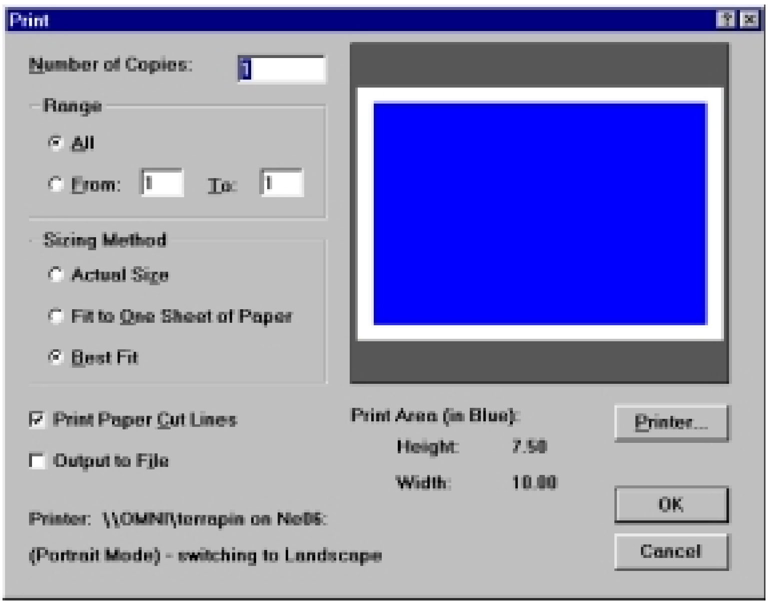


Figure 4.14 **Print dialog box**

This command prints or plots the page, which includes the map frame, the other page elements (title, legends, scale), and the margins. See FILE | PAGE SETUP for more information about settings related to the page.

Note: The size and orientation of the *page* are distinct from those of each sheet of *paper.* To change the page settings, use FILE | PAGE SETUP. The paper dimensions and orientation are set in a standard Windows dialog which you can access by first clicking on the Printer button from either the Print dialog box or the Page Setup dialog box, and then clicking on the Setup button.

If the page consists of multiple sheets of paper, you can print the entire page, or you can print a specific range of sheets. In the event of a printer malfunction, simply count the number of sheets that printed correctly, and then reprint the remaining ones. If, however, a few sheets in the middle were printed incorrectly, you need to know the printing sequence in order to determine the sheets to reprint. Here is the order in which the sheets are printed:

- The bottom right sheet is printed first.
- Printing proceeds to the left until the bottom left sheet is done.
- Then printing goes back to the right-hand side, to the row above the row just printed, and proceeds to the left again.
- This continues until the top left sheet is printed.

The figure below illustrates the print order for a nine-sheet printout:

9	8	7
6	5	4
3	2	1

Figure 4.15 **Print order for sheets of paper**

The current print job can use the default sizing method (which is specified with FILE | PAGE SETUP), or you can choose another sizing method just for this job. The sizing method determines how the sheets of paper are oriented, or whether the page is reduced or enlarged to fit well on the paper. The sizing method options are described below.

- Actual Size
  Prints the page at exactly the page size set in FILE | PAGE SETUP. Uses one or more sheets of paper according to the paper size and paper orientation. This setting guarantees the finished page size will exactly match what you have set.

- Fit to One Sheet of Paper
  Fits the entire page on one sheet of paper, reducing or enlarging the page proportionally to fill the paper to the margins. This setting ignores the page size settings. The dimensions and orientation of the page are in this case determined by the paper dimensions and orientation.

- Best Fit
  Optimizes the use of paper, while printing at very nearly the page size specified. This setting may change the orientation of the sheets of paper in order to save paper, or it may slightly reduce or enlarge the page to fit well on the sheets. Any resizing is proportional, preserving the ratio between the length and width of the map. The map scale may change slightly.

The print preview picture in the Print dialog box illustrates the effects of the chosen sizing method. The margins are shown in white, and the printed area in blue. Shaded areas (that is, with diagonal fill pattern) are cut-away portions of a sheet.

For a multi-sheet printout, you can print with cut lines. These indicate where the sheets are to be cut and attached.

You can also redirect the print output to a file for later printing, or for printing on a printer that is inaccessible from your Atlas GIS system. (Be sure that a driver for the remote printer is installed in your Windows system, and choose it as the current printer before printing to a file.)

The dialog box also contains some display-only information:

- The current printer and port. To change these, click on the Printer button.
- The default paper orientation setting of the printer. Regardless of this setting, the sheets of paper for your map will be printed using the orientation determined by the sizing method. The printer's default paper orientation setting determines how the printer will be reset after the current print job. To change this setting, first click on the Printer button, then click on the Setup button.
- The dimensions of the print area (page size minus the margins, perhaps adjusted according to the chosen sizing method). To change these dimensions, change the page size or margin settings in the Page Setup dialog. See FILE | PAGE SETUP for more information.

The Printer button is a shortcut from the Print dialog box to the Print Setup dialog box, which offers standard options pertaining to which print device and port are used, and how the printer or plotter is set up.

Associated Dialog Boxes

Print
Print Setup

File | Print Setup

This command allows you to choose a different printer or change the current printer's settings.

How It Works

When you choose FILE | PRINT SETUP, the Print Setup dialog box pops up, allowing you to set the current printer to either the Windows default printer (set in the Windows Control Panel) or to any other installed printer.

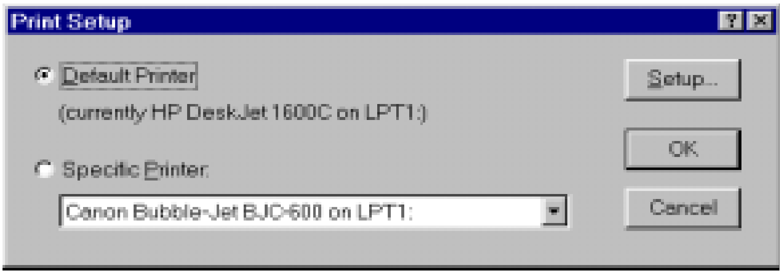


Figure 4.16 **Print Setup dialog box**

From the Print Setup dialog box, you can click on the Setup button to pop up another dialog box which allows you to set current printer options, such as the paper source, size, and orientation. From there, you can access many other standard Windows dialog boxes for further printer options. See your Windows manual for more information about installing printers, selecting the current printer, or setting printer options.

Notes:

- If you're printing on an HP printer, or compatible, and you experience objects being drawn on top when they should be drawn underneath, you may need to set your printer to print TrueType fonts as graphics. If your printer driver does not support this setting, check with the printer's manufacturer for the availability of a more recent driver.

- The paper size and orientation set with this command (or in the Windows Control Panel) are different from the Atlas GIS page size and orientation set with the FILE | PAGE SETUP command. See FILE | PAGE SETUP for more information about page settings.

Associated Dialog Box

Print Setup

File | Save

This command saves the current project file.

Shortcuts

- Save button on the button bar
- CTRL+S

How It Works

When you choose FILE | SAVE, the current project file is saved. If the file has never been saved before, the Save As dialog box pops up so you can name the project file. From then on, the project file is automatically saved with its current name, unless you again use FILE | SAVE AS.

The following information is saved with the project file:

- A list of all the open geo files and tables (and their associated files, such as index files)
- Display settings, such as the view of the map and page (except page zoom), and the position and properties of the page elements (the legends, scale, title, and map frame)
- Layer and label settings
- Theme map settings
- Freehand objects and their properties
- Print settings from the Page Setup and Print Setup dialog boxes (but not from the Print dialog box)
- Table column settings (display settings only, not table structure settings)
- Window positions

- Settings for the following dialog boxes:
  - QUERY menu:
    - Find
    - Select By Value
    - Select By Location (Inside, Outside, Touching, and Near)
  - MAP menu:
    - Create Buffers
    - Combine Selected
    - Combine By Value
  - TABLE menu:
    - Calculate Column
    - Aggregate Data
    - Geocode To ZIP

In summary, this command saves the complete information about the project file, except for the currently selected map features.

Note: Because geo files and tables can become quite large, Atlas GIS does not load them into memory for editing. Instead, they are updated directly on the disk as you edit them. As a result, there is no need for a command to save geo files or tables.

Associated Dialog Box

Save As

File | Save As

This command allows you to save a copy of a project file, a geo file, or a table, with a new name or in a new location. It also allows you to save a subset of a geo file or table.

How It Works

When you choose FILE | SAVE AS, the Save As dialog box pops up, allowing you to specify the file you want to save and its new file name or path.

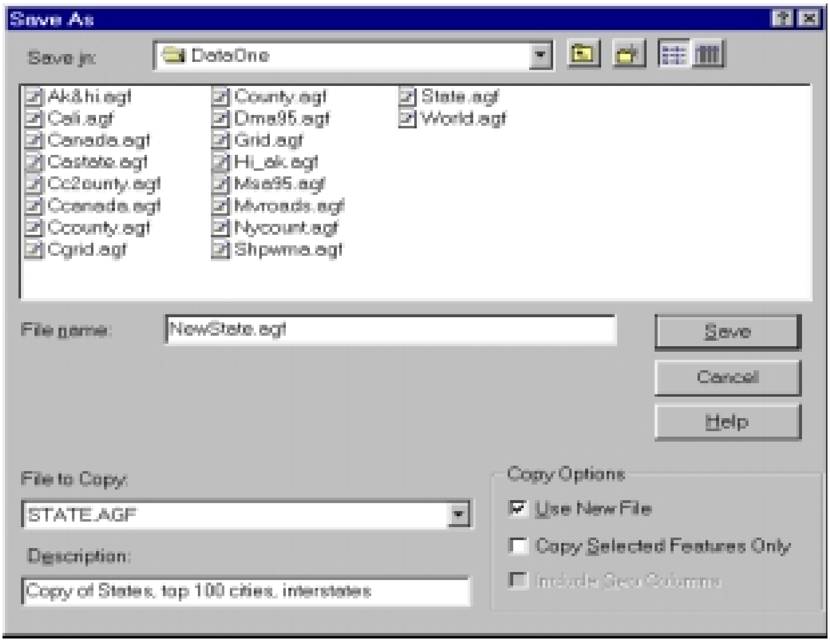


Figure 4.17 **Save As dialog box**

If a project file is specified, FILE | SAVE AS saves a copy of it to the specified file name or path. The original file is unaffected. Therefore, if any settings have been changed since the last time you saved the project file, the original file and the new one will be different. The changes are saved only in the new file.

For a geo file or table, this command creates a copy of the file under the new name. The original file and the copy are identical (unless the *Selected Features or Rows Only* or *Include Geo Columns* boxes are checked). All associated index files are also copied, as well as the layer settings file (.LAY) or the column settings file (.COL).

By default, after the new file is saved, it is in use by Atlas GIS. That is, Atlas GIS closes the original file and opens the new one. By unchecking the *Use New File* box, you can continue to use the original file instead.

You can save a subset of a geo file or table by placing a check in the *Selected Features or Rows Only* box. Depending on the file type, this will save only the selected features of a geo file, or only the selected rows of a table, to the new file.

If you're saving a copy of a linked table, you can place a check in the *Include Geo Columns* box to copy the values from the _NAME, _NAME2, _LENGTH, and _AREA columns in the linked geo file to corresponding columns in the new table. New columns are added to the table with the following unique names: A_NAME, A_NAME2, A_LENGTH, and A_AREA. If the 'A' prefix does not create a unique name, then a 'B' prefix is tried, then a 'C', and so on, throughout the rest of the alphabet. (If in the extremely unlikely event that a 'Z' prefix is tried and the column name still is not unique, then an error message is returned and the new table is not created.) These new columns will default to being hidden when you look at the table in a Table window. Use TABLE | DEFINE COLUMNS to make them visible.

Note: Geo files and tables can be very large, so before executing this command, make sure that you have enough free space on your disk for the copy of the new file.

Recommended Uses

- To create different projects from the same "base" project.
- To save a subset of features identified by a query to a new, separate file.
- To split large geo files or tables into several smaller, more manageable pieces.

Associated Dialog Box

Save As

File | SQL Access | Connect

This command allows you to connect to a database source, in order to perform an SQL query and work with the result in Atlas GIS.

Available When

A connection has not been established.

How It Works

When you choose FILE | SQL ACCESS | CONNECT, the SQL Data Sources dialog box pops up, allowing you to choose the type of database to connect to. The SQL Data Sources dialog box lists the installed and configured ODBC (Open Database Connectivity) data sources on your system.

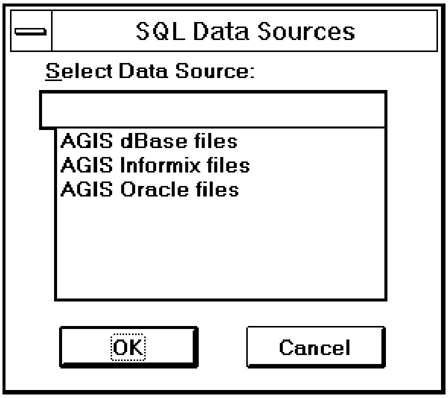


Figure 4.18 **The SQL Data Sources dialog box**

For SQL servers that require additional logon information, a dialog box specific to that type of database may pop up. See the *Atlas GIS Help* for all setup information and a full description of the available database types and required parameters.

Atlas GIS supports a large number of data sources for performing SQL queries. For more information on installing and configuring ODBC drivers for these various data sources, see *Atlas GIS Help*.

Notes:

- Atlas GIS can connect to only one database at a time, so you have to disconnect from one before you can connect to another.

- To add, delete, or modify the data sources, click on the ODBC icon in the Windows Control Panel and adjust the data sources and drivers as needed.

Associated Dialog Boxes

SQL Data Sources
Various database-specific logon dialog boxes

File | SQL Access | Disconnect

This command disconnects from the current database source.

Available When

A connection is established.

How It Works

When you choose FILE | SQL ACCESS | DISCONNECT, the connection to the current SQL database is broken. This is useful because Atlas GIS can connect to only one database at a time, so you have to disconnect from one before you can connect to another.

When you exit the program, Atlas GIS automatically disconnects you from any open connection.

File | SQL Access | New Query

This command allows you to build and issue a new SQL query. The results of the query are stored in an Atlas GIS table.

Available When

A connection is established.

How It Works

When you choose FILE | SQL ACCESS | NEW QUERY, the New Query dialog box pops up. This dialog box allows you to specify where the query results are to be stored (that is, the resulting Atlas GIS table).

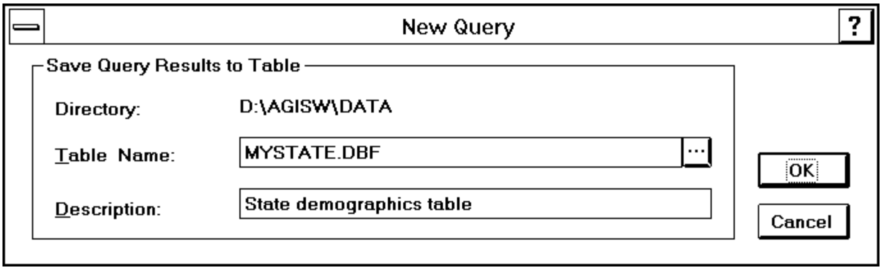


Figure 4.19 **New Query dialog box**

After you specify the resulting table and click OK, the Tables dialog box of the Query Builder pops up. This dialog box allows you to specify one or more tables to query.

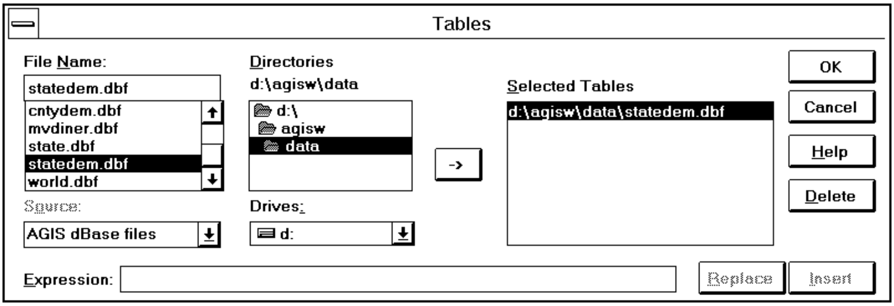


Figure 4.20 **Tables dialog box of the Query Builder**

If you specify more than one table, the Table Joins dialog box of the Query Builder pops up.

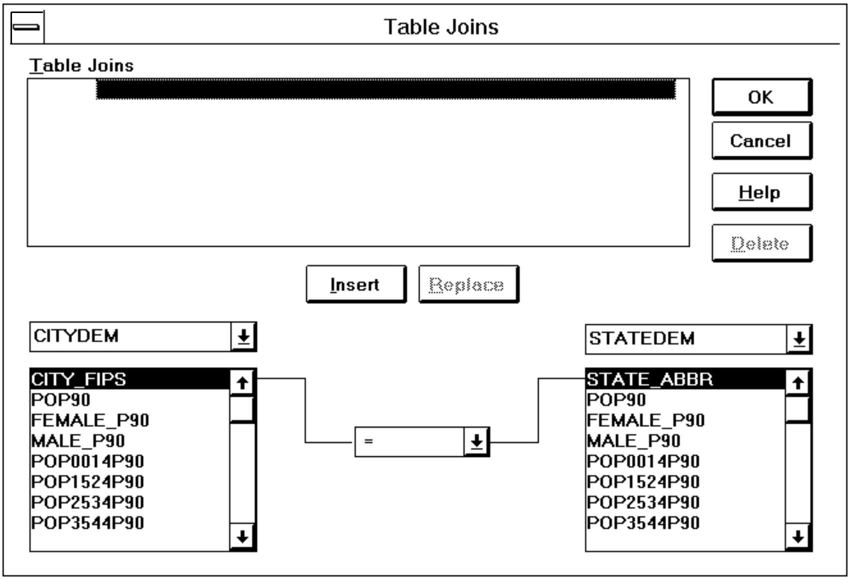


Figure 4.21 **Table Joins dialog box of the Query Builder**

Important: Whenever you specify more than one table, you *must* join them. Also, make sure that you do not use two columns with the same names in queries using multiple tables. The duplicate column names are easy to spot in the column list since the Query Builder puts the table name in front of them to make them appear unique.

After you specify the tables to query, Atlas GIS places you in the Query Builder where you can build and issue a new query. For more information on the Query Builder, the Tables dialog box, and the Table Joins dialog box, see *Atlas GIS Help* or Appendix B in this manual.

After you build and issue the query, Atlas GIS executes the query and stores the results in the Atlas GIS table you specified. Atlas GIS then displays the Table Link dialog box, so you can specify whether the table is an attribute, point, or unlinked table, and so you can indicate the key field.

Once you've built and issued the new query, you can save the query definition (the SQL Select statement) using the FILE | SQL ACCESS | SAVE QUERY command.

SQL Queries vs. Selecting By Value

- With FILE | SQL ACCESS | NEW QUERY (and OPEN QUERY), you can query a wide variety of data sources using simple or complex SQL queries. The results of the query are stored in a *new* Atlas GIS table. SQL queries can also be performed on existing Atlas GIS tables, since Atlas GIS tables are simply dBASE files; however, geographic fields (that is, columns in a linked geo file) cannot be included in an SQL query.

- With QUERY | SELECT BY VALUE, you can perform queries on *existing* Atlas GIS tables only. The rows that meet the query are selected, as well as any linked map features. A new table is not created, though the selected rows and/or features can easily be copied to a new table or layer. These queries are built using dBASE expressions, and geographic columns can be included.

Associated Dialog Boxes

New Query
Query Builder
Tables

File | SQL Access | Open Query

This command allows you to load an existing query definition, edit the query if desired, and then issue it. The results of the query are stored in an Atlas GIS table.

Available When

A connection is established.

How It Works

When you choose FILE | SQL ACCESS | OPEN QUERY, the Open Query dialog pops up, allowing you to specify the query definition file (.QEF extension) to open and the Atlas GIS table in which to store the query results.

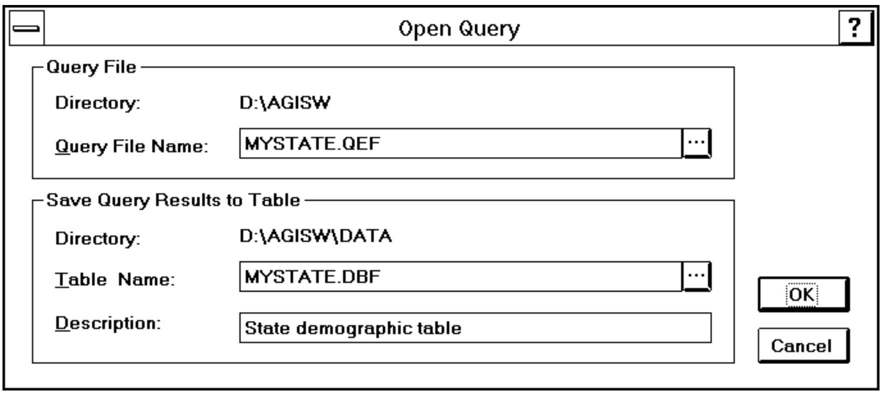


Figure 4.22 **Open Query dialog box**

After you specify the query to load and the resulting Atlas GIS table to create, Atlas GIS places you in the Query Builder where you can modify the existing query, or simply issue it as is. For more information on the Query Builder, see *Atlas GIS Help* or Appendix B in this manual.

Note: You cannot store the results of a query in an open table. So, if you want to re-issue a query and store the results in a table that's already open, you must close the table before you issue the query.

After you issue the query, Atlas GIS executes the query and stores the results in the Atlas GIS table you specified. Atlas GIS then displays the Table Link dialog box, so you can specify whether the table is an attribute, point, or unlinked table, and so you can indicate the key field.

Once you've built and issued the query, you can save the query definition (the SQL Select statement) using the FILE | SQL ACCESS | SAVE QUERY command.

SQL Queries vs. Selecting By Value

- With FILE | SQL ACCESS | OPEN QUERY (and NEW QUERY), you can query a wide variety of data sources using simple or complex SQL queries. The results of the query are stored in a *new* Atlas GIS table. SQL queries can also be performed on existing Atlas GIS tables, since Atlas GIS tables are simply dBASE files; however, geographic fields (that is, columns in a linked geo file) cannot be included in an SQL query.

- With QUERY | SELECT BY VALUE, you can perform queries on *existing* Atlas GIS tables only. The rows that meet the query are selected, as well as any linked map features. A new table is not created, though the selected rows and/or features can easily be copied to a new table or layer. These queries are built using dBASE expressions, and geographic columns can be included.

Associated Dialog Boxes

Open Query
Query Builder

File | SQL Access | Save Query

This command allows you to save the most recently issued SQL query to a query definition file (.QEF extension). The query can then be easily loaded and re-issued at a later date.

Available When

You've issued an SQL query.

How It Works

When you choose FILE | SQL ACCESS | SAVE QUERY, the Save Query dialog box pops up, allowing you to specify the file where your current query definition will be saved.

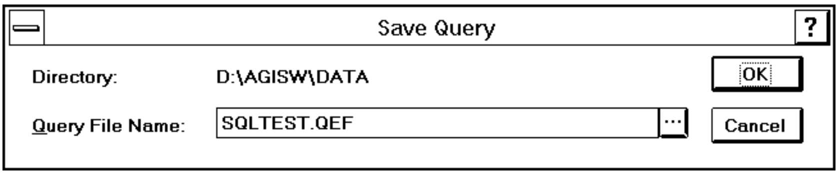


Figure 4.23 **Save Query dialog box**

Notes:

- SQL query definitions are not stored in an Atlas GIS project file. So, if you build and issue an SQL query that you will want to issue again at a later date, be sure to save it with this command.

- To create a new query definition, choose FILE | SQL ACCESS | NEW QUERY. To modify an existing query definition, choose FILE | SQL ACCESS | OPEN QUERY.

- For more information about the Query Builder, see *Atlas GIS Help* or Appendix B in this manual.

Associated Dialog Box

Save Query

5

Edit Menu

The EDIT menu contains the commands you use to perform basic editing of map and freehand objects, to undo certain operations in Atlas GIS, and to share data with other applications through the Windows clipboard. Here's a summary of the EDIT commands, listed in menu order.

Table 5.1 **Edit menu**

COMMAND	DESCRIPTION
Undo	Undo the last operation that can be undone.
Copy	Copy the selected map features, table rows, or freehand objects to the clipboard.
Paste	Paste the contents of the clipboard into the Table window or a text box.
Delete	Delete the selected map features, table rows, or freehand objects.
Copy to Layer	Move or copy features from one layer to another.
Change Properties	Change settings that control the display of freehand objects and page elements, freehand symbols, or freehand text.
Drawing Order	Adjust the drawing order for the selected freehand objects. Objects can be moved to the front or back for drawing.
Group	Group the selected freehand objects together.
Ungroup	Ungroup the selected freehand objects.
Align	Align the selected freehand objects or page elements. They can be aligned to the left or right, top or bottom, or horizontal or vertical center.

Note that in the remaining sections of this chapter, the individual EDIT commands are discussed in alphabetical order, not in menu order.

Edit | Align | Bottom

This command aligns the bottom edges of all selected freehand objects (and/or page elements) with the bottom edge of the lowest object.

Available When

Freehand objects or page elements are selected.

How It Works

Notes:

- Only the vertical position of the objects is affected—the horizontal position remains the same.
- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Align | Horizontal Center

This command horizontally centers selected freehand objects and page elements relative to each other.

Available When

Freehand objects or page elements are selected.

How It Works

The EDIT | ALIGN | HORIZONTAL CENTER command finds the horizontal center between the left edge of the left-most object and the right edge of the right-most object. Imagine this as a vertical line. Each object's horizontal center is placed on that imaginary line, while the object's vertical position is not affected.

Notes:

- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Align | Left

This command aligns left edges of all selected freehand objects (and/or page elements) with the left edge of the left-most object.

Available When

Freehand objects or page elements are selected.

How It Works

Notes:

- Only the horizontal position of the objects is affected—the vertical position remains the same.
- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Align | Right

This command aligns right edges of all selected freehand objects (and/or page elements) with the right edge of the right-most object.

Available When

Freehand objects or page elements are selected.

How It Works

Notes:

- Only the horizontal position of the objects is affected—the vertical position remains the same.
- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Align | Top

This command aligns the top edges of all selected freehand objects (and/or page elements) with the top edge of the highest object.

Available When

Freehand objects or page elements are selected.

How It Works

Notes:

- Only the vertical position of the objects is affected—the horizontal position remains the same.
- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Align | Vertical Center

This command vertically centers selected freehand objects and page elements relative to each other.

Available When

Freehand objects or page elements are selected.

How It Works

The EDIT | ALIGN | VERTICAL CENTER command finds the vertical center between the top edge of the highest object and the bottom edge of the lowest object. Imagine this as a horizontal line. Each object's vertical center is placed on that imaginary line, while the object's horizontal position is not affected.

Notes:

- This command is not available when map layers are active.
- Page elements can only be selected when the page freehand layer is active.

Edit | Change Properties | Objects

This command allows you to view or edit the current properties of selected freehand objects or page elements. It also allows you to view or edit the default properties for new objects before drawing a new one.

Shortcut

The Objects button on the button bar.

How It Works

When you choose EDIT | CHANGE PROPERTIES | OBJECTS, the Objects dialog box pops up. If you have freehand objects or page elements selected, this dialog box will display the *current properties* for those selected items. If you have no freehand objects or page elements selected, this dialog box will display the *default properties* for any new objects that you draw. The object properties include border width and color, fill pattern and color, shadows, and rounded or squared corners.

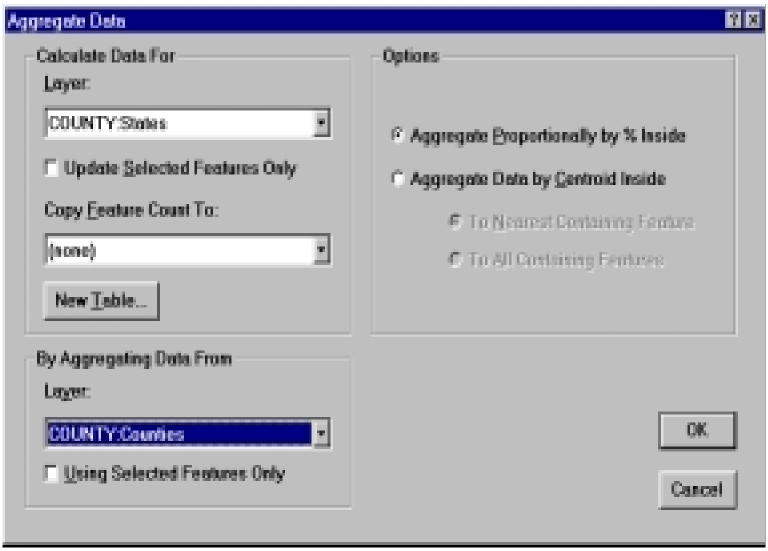


Figure 5.1 **Objects dialog box**

For purposes of this discussion, “freehand objects” include any objects drawn by the drawing tools (the Line, Polyline, Rectangle, Circle, and Polygon tools), but not any freehand symbols (added with the Symbol tool) or freehand text (added with the Text tool).

The Objects dialog box displays the settings for the last object selected. To change the current properties of one or more objects, select the objects, choose EDIT | CHANGE PROPERTIES | OBJECTS, and make the desired changes. If multiple objects are selected, you can assign the properties of the last object selected to all the selected objects simply by clicking OK (unless you change them, the current properties of the last object are displayed in the dialog box, and those properties become the current properties for each object in the selection).

To change the default properties for any new objects that you draw, make sure nothing is selected, choose EDIT | CHANGE PROPERTIES | OBJECTS, and set the properties in the Objects dialog box.

Selecting an object makes its current properties the default properties for any new objects you draw. This makes it extremely easy to draw an object with the same properties as another.

To summarize, a newly drawn object gets its properties from the most recent settings in the Objects dialog box. These settings are derived by either selecting an object and editing its properties, or simply by editing the properties in the dialog box with nothing selected.

Associated Dialog Boxes

Objects
Color
Line style table
Fill pattern table

Edit | Change Properties | Symbols

This command allows you to view or edit the current properties of selected symbols. It also allows you to view or edit the default properties for new symbols before adding a new one.

Shortcut

The Symbols button on the button bar.

How It Works

When you choose EDIT | CHANGE PROPERTIES | SYMBOLS, the Symbols dialog box pops up. If you have any freehand symbols selected, this dialog box will display the *current properties* for those selected symbols. If you have no freehand symbols selected, this dialog box will display the *default properties* for any new symbols that you add. The symbol properties include the symbol type, size, and color.

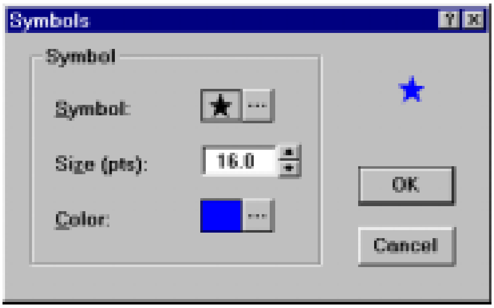


Figure 5.2 **Symbols dialog box**

The Symbols dialog box displays the settings for the last symbol selected. To change the current properties of one or more symbols, select the symbols, choose EDIT | CHANGE PROPERTIES | SYMBOLS, and make the desired changes. If multiple symbols are selected, you can assign the properties of the last symbol selected to all the selected symbols simply by clicking OK (unless you change them, the current properties of the last symbol are displayed in the dialog box, and those properties become the current properties for each symbol in the selection).

To change the default properties for any new symbols that you add, make sure nothing is selected, choose EDIT | CHANGE PROPERTIES | SYMBOLS, and set the properties in the Symbols dialog box.

Selecting a symbol makes its current properties the default properties for any new symbols you add. This makes it extremely easy to add a symbol with the same properties as another.

To summarize, a newly added symbol gets its properties from the most recent settings in the Symbols dialog box. These settings are derived by either selecting a symbol and editing its properties, or simply by editing the properties in the dialog box with nothing selected.

Notes:

- Freehand symbols are added to either the map freehand layer or the page freehand layer with the Symbol tool.

- The Carta font is necessary for displaying or printing symbols in Atlas GIS. If this font is deleted, you will not be able to see the Atlas GIS symbol set on the map or when you click on the Symbol […] button.

- Atlas GIS allows you to include up to 30 user-defined, custom symbols in the Symbol table. These symbols are stored in the custom symbol directory (refer to the FILE | PREFERENCES command) and appear in the Symbol table just like the standard symbol set.

Associated Dialog Boxes

Symbols
Color
Symbol table

Edit | Change Properties | Text

This command allows you to view or edit the current properties of selected text objects. It also allows you to view or edit the default properties for new text objects before adding a new one.

Shortcut

The Text button on the button bar.

How It Works

When you choose EDIT | CHANGE PROPERTIES | TEXT, the Text dialog box pops up. If you have any freehand text selected, this dialog box will display the *current properties* for those selected text objects. If you have no freehand text selected, this dialog box will display the *default properties* for any new text that you add. The text properties include the font type, size, and color, as well as alignment and formatting attributes.

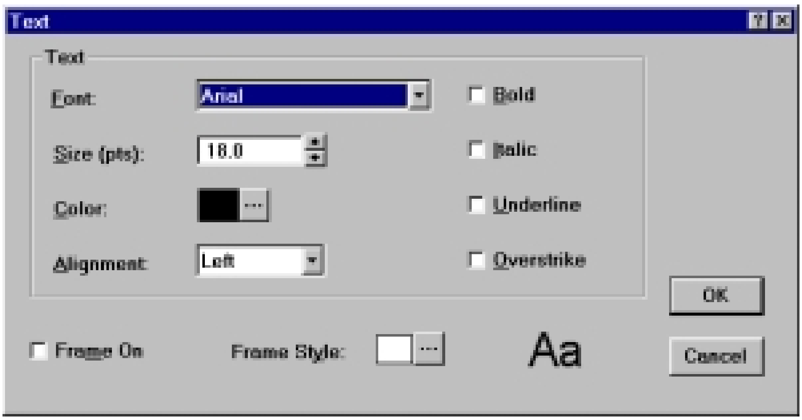


Figure 5.3 **Text dialog box**

The Text dialog box displays the settings for the last text object selected. To change the current properties of one or more text objects, select the objects, choose EDIT | CHANGE PROPERTIES | TEXT, and make the desired changes. If multiple text objects are selected, you can assign the properties of the last object selected to all the selected objects simply by clicking OK (unless you change them, the current properties of the last text object are displayed in the dialog box, and those properties become the current properties for each text object in the selection).

To change the default properties for any new text that you add, make sure nothing is selected, choose EDIT | CHANGE PROPERTIES | TEXT, and set the properties in the Text dialog box.

Selecting a text object makes its current properties the default properties for any new text you add. This makes it extremely easy to add a text object with the same properties as another.

To summarize, a newly added text object gets its properties from the most recent settings in the Text dialog box. These settings are derived by either selecting a text object and editing its properties, or simply by editing the properties in the dialog box with nothing selected.

Notes:

- Freehand text is added to either the map freehand layer or the page freehand layer with the Text tool.
- The properties for frames around text objects are the same as the rectangle object properties. As a result, it's more efficient to choose EDIT | CHANGE PROPERTIES | OBJECTS rather than EDIT | CHANGE PROPERTIES | TEXT to edit only these properties, and leave the text properties as they are.

Associated Dialog Boxes

Text
Color
Frame
Line style table
Fill pattern table

Edit | Copy *{variable text}*

This command copies the selected graphic objects or text to the Windows clipboard (used primarily for pasting text or objects into other applications).

Available When

EDIT | COPY is available in any of the contexts listed below. The variable text in the command name appears in the following forms, depending on what is selected.

Table 5.2 **EDIT | COPY command**

WHERE	CONTEXT	COMMAND APPEARS AS
Map layers	Nothing is selected	COPY VISIBLE PAGE
	A map feature is selected	COPY FEATURE
	Map features are selected	COPY FEATURES
Map freehand layer or Page freehand layer	Nothing is selected	COPY VISIBLE PAGE
	A freehand object or a frame is selected	COPY OBJECT
	Freehand objects or frames are selected	COPY OBJECTS
Table window	A row is selected	COPY ROW
	Rows are selected	COPY ROWS
Info window	A row is displayed	COPY INFO
Statistics window	Statistics are displayed	COPY STATISTICS
Inside a cell in either the Table or Info window	Data is selected inside a cell	COPY SELECTED TEXT
Text box in a dialog box	Data is selected inside	COPY SELECTED TEXT

Shortcut

CTRL+C

How It Works

EDIT | COPY copies the selected objects or data to the Windows clipboard. Exactly what is copied depends upon where you are working. Details about what is copied are given below. Graphic objects are copied to the clipboard in both bitmap and metafile format, and data is copied to the clipboard in either text or delimited text format.

Note: EDIT | COPY is intended primarily for copying data from Atlas GIS for use in other applications. Only in a limited number of cases can you paste back into Atlas GIS what you copied from Atlas GIS.

Map Features

- In map layers, EDIT | COPY copies all the selected map features to the clipboard in both bitmap and metafile format.

- If nothing is selected, the entire Page window is copied in both bitmap and metafile format exactly as it appears.

Map Freehand or Page Freehand Objects

- In either the map freehand layer or the page freehand layer, EDIT | COPY copies all the selected freehand objects or selected frames to the clipboard in both bitmap and metafile format.

- If nothing is selected, the entire Page window is copied in both bitmap and metafile format exactly as it appears.

Table Window

- In a Table window, all of the selected rows are copied, regardless of where the current focus is. (The selected rows are those that have a check in the Select column.) The selected rows are copied to the clipboard as delimited text.

- Columns that are hidden (that is, sized to zero) are *not* copied.

- While editing in a cell, the highlighted data is copied.

Info Window

- EDIT | COPY copies the entire contents of the Info window, including row and column headings, in delimited text format.

- While editing inside a cell, the highlighted data is copied.

Statistics Window

- EDIT | COPY copies the entire contents of the Statistics window, except for columns that are hidden (that is, sized to zero), but including row and column headings, in delimited text format.

Text Box in a Dialog Box

- While editing inside a text box in a dialog box, CTRL+C copies the highlighted data. Since the menus are not accessible when a dialog box is open, the menu shortcut (CTRL+C) should be used.

Copying Data to Another Application

Atlas GIS allows you copy data to other applications, such as spreadsheets or report writers, to generate reports using your data. There are three methods available:

1. You can copy the data to your favorite spreadsheet, using the spreadsheet's formatting capabilities. To copy a table, make the Table window in Atlas GIS the active window, and choose EDIT | COPY to copy all visible columns (including column names) to the clipboard. Then, open up your spreadsheet and choose its EDIT | PASTE command to copy the data from the clipboard to the spreadsheet. This method works well for smaller databases and simpler reports.

2. Use a third-party report writer for powerful, detailed reports using sorting, grouping, summary statistics, etc. Choose FILE | SAVE AS with the *Include Geo Columns* box checked (and the *Use New File* box unchecked) to create a .DBF file that includes the linked geo columns. Use this .DBF file with the report writer. This method works well for larger databases and more detailed reports.

3. If you don't have a spreadsheet or report writer, you can always use the MS Write program. You will need to set the tab stops wide enough so that the numbers line up. MS Write also has an option to align decimal points at the tab stops.

Recommended Uses

- To copy the entire page or selected features for use in a graphics or word processing program.
- To copy rows from the Table window or the Statistics window and paste them into a spreadsheet program for formatting and printing.
- To copy an expression from the *Expression* text box in one dialog box for use in another dialog box that requires the same or nearly the same expression.

Edit | Copy to Layer

This command allows you to copy map features from one layer to another. You can copy all the features, or you can copy only the selected ones. You can even copy features from one type of layer to another, and automatically convert the features to the new type.

How It Works

When you choose EDIT | COPY TO LAYER, the Copy To Layer dialog box pops up. This dialog box allows you to specify the layer to copy from, the layer to copy to, whether to copy only the selected features, and whether to delete the original features after they're copied.

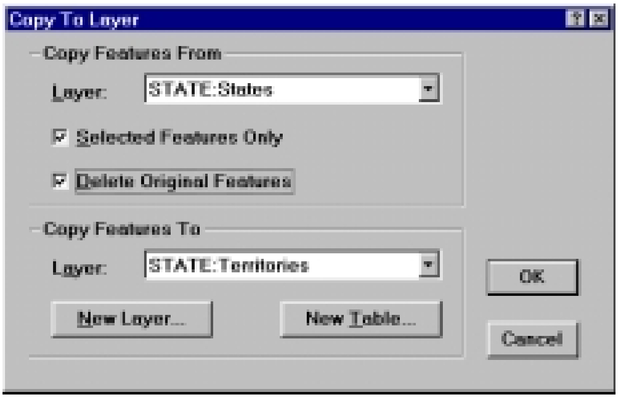


Figure 5.4 **Copy To Layer dialog box**

If both the layer you're copying from and the layer you're copying to have a linked table, then the attribute data for the features you're copying will be copied as well. If the tables have different structures, then no data will be copied, and Atlas GIS will pop up a warning message. If you do not wish to copy attribute data, then unlink the table from one of the layers. If the layer you're copying to is not linked to a table, and you choose to delete the original features after they're copied, then if the original features have linked data, only the features are deleted—the data remains in the table as an unlinked row.

Notes:

- Click on the New Layer button to create a new layer for the features you wish to copy. After you create a new layer, it becomes the layer that's displayed in the *Layer* list box in the Copy Features To group box.
- Click on the New Table button to create a new table for the layer you're copying to. This new table will have the same structure as the table that's linked to the layer you're copying from.
- Regions and lines can be copied to any type layer, but map points can only be copied to point layers. For more information, see "Converting Features to a Different Type" below.
- You can copy map points to map points and table points to table points. This command does not allow you to convert map points to table points or vice versa.

Converting Features to a Different Type

As an added capability, the EDIT | COPY TO LAYER command allows you to convert a region or line feature to a different feature type simply by copying it to a layer of a different type. The following table illustrates how this conversion is accomplished:

Table 5.3 **How features are converted**

CONVERSION	DESCRIPTION
Region to line layer	Regions are converted to lines that look exactly like the original regions (each region is converted to a closed polyline).
Region to point layer	The region's adjusted centroid (also called its default label position) becomes the new map point.
Line to Region layer	The line's last vertex is connected back to its first in order to close the new region.
Line to point layer	The centroid of the line (the exact midpoint of the line, not the default label position), becomes the new map point.
Point to region layer	This is not supported.
Point to line layer	This is not supported.

Associated Dialog Boxes

Copy To Layer
New Layer
New Table

Edit | Delete *{variable text}*

This command deletes selected freehand objects, map features, or table rows.

Available When

- A geo file or table is open.
- Something is selected in the layer or window you're working in. Notice that this command is *not available* from the Info window or a Statistics window.

EDIT | DELETE is available in any of the contexts below. The variable text in the command name appears in the following forms, depending on what is selected:

Table 5.4 **EDIT | DELETE command**

WHERE	CONTEXT	COMMAND APPEARS AS
Map layers	A map feature is selected	DELETE FEATURE
	Map features are selected	DELETE FEATURES
Map freehand layer or Page freehand layer	A freehand object is selected	DELETE OBJECT
	Freehand objects are selected	DELETE OBJECTS
Table window	A row is selected	DELETE ROW
	Rows are selected	DELETE ROWS
	Text inside a cell is selected	DELETE SELECTED TEXT

Shortcut

DEL key

How It Works

When you choose EDIT | DELETE, the selected freehand objects, map features, or table rows are deleted. Notice that this command does not use the clipboard.

Map layer

- In a map layer, EDIT | DELETE deletes all the selected map features. For any layer linked to a table, the corresponding table rows are also deleted. To delete map features without deleting the corresponding table rows, unlink the table from the geo file before using the EDIT | DELETE command.

- The deleted features are not physically removed from the geo file (or the linked table)—they are simply marked as deleted (this allows you to undo the operation immediately after performing it, in case you didn't really intend to delete the selected features). To permanently remove the features, use the FILE | COMPRESS command to compress the geo file. In addition, the x-y extents of the map are not adjusted until the file is compressed.

- Until another operation that can be undone is performed, or the file is closed or compressed, EDIT | UNDO can restore the deleted features (and table rows).

Map Freehand Layer or Page Freehand Layer

- All the selected freehand objects are deleted.
- There is no undo for this operation.

Table Window

- In a Table window, EDIT | DELETE deletes the selected rows. If the table is linked to a map layer, the corresponding map features are also deleted. To delete the rows while preserving the map features, unlink the table before performing the deletion.

- The deleted rows are not physically removed from the table—they are simply marked as deleted (this allows you to undo the operation immediately after performing it, in case you didn't really intend to delete the selected rows). To permanently remove the rows, use the FILE | COMPRESS command to compress the table.

- Until another operation that can be undone is performed, or the table is closed or compressed, EDIT | UNDO can restore the deleted rows (and linked map features).

Text Box in a Dialog Box

- While editing inside a text box in a dialog box, the DEL key deletes the highlighted text. Since the menus are not accessible when a dialog box is open, the menu shortcut (DEL key) should be used.

- There is no undo for this operation.

Edit | Drawing Order | Bring to Front

This command changes the drawing order of selected freehand objects so that they draw after other objects.

Available When

Page freehand or map freehand objects are selected.

How It Works

As you add freehand objects, they are automatically drawn in front and may obscure previously drawn objects. The EDIT | DRAWING ORDER | BRING TO FRONT command moves the selected objects to the front of the drawing so that they draw last.

This command changes the drawing order in only the page freehand and map freehand layers. Page freehand objects are always drawn after map freehand objects. The drawing order is as follows:

- Page background
- Map background
- Map layers
- Map labels
- Map freehand layer
- Page elements (legends, scale, title)
- Page freehand layer

Notes:

- If you've grouped multiple objects with the EDIT | GROUP command, the drawing order within the group is preserved.
- This command is not available when map layers are active.
- This command does not operate on page elements.

Edit | Drawing Order | Send to Back

This command changes the drawing order of selected freehand objects so that they draw before all other objects.

Available When

Page freehand or map freehand objects are selected.

How It Works

As you add freehand objects, they are automatically drawn in front and may obscure previously drawn objects. The EDIT | DRAWING ORDER | SEND TO BACK command moves the selected objects to the back of the drawing so that they draw first.

This command changes the drawing order in only the page freehand and map freehand layers. Page freehand objects are always drawn after map freehand objects. The drawing order is as follows:

- Page background
- Map background
- Map layers
- Map labels
- Map freehand layer
- Page elements (legends, scale, title)
- Page freehand layer

Notes:

- If you've grouped multiple objects with the EDIT | GROUP command, the drawing order within the group is preserved.
- This command is not available when map layers are active.
- This command does not operate on page elements.

Edit | Group

This command groups a set of selected freehand objects into a single object. Grouping objects allows you to combine simple objects into larger, more complex ones (such as a specialized logo or footnote paragraph). You can then edit or modify the grouped objects as one.

Available When

Freehand objects are selected.

How It Works

The EDIT | GROUP command combines a group of selected freehand objects into a single, more complex object. When you group the objects, the grouped object is selected. The grouped object can be ungrouped at any time with the EDIT | UNGROUP command. This command restores the grouped object to its original, separate pieces.

Notes:

- This command is not available when map layers are active.
- This command does not operate on page elements.

Edit | Paste

This command pastes the contents of the Windows clipboard into the Table window or in a text box within a dialog box.

Available When

- You are working in the Table window or in a text box within a dialog box.
- The clipboard contains text.

Shortcut

CTRL+V

How It Works

EDIT | PASTE pastes the contents of the Windows clipboard into one or more cells in a Table window, or into a text box in a dialog box. This command is intended primarily for copying data from a spreadsheet program into an Atlas GIS table.

Notes:

- Pasting can be undone.
- EDIT | PASTE is not intended as a partner to EDIT | COPY. Rather, EDIT | COPY is primarily used for copying graphics or data to another application, while EDIT | PASTE is primarily used for pasting data from another application.

Text Box in a Dialog Box

- While editing inside a text box in a dialog box, CTRL+V pastes the contents of the clipboard into the text box. Since the menus are not accessible when a dialog box is open, the menu shortcut (CTRL+V) should be used.

Table Window

- If there is already data in the cells, that data is overwritten. Pasting is done only into visible cells. Data is *not* pasted into any of the following:

  - Any column that has been sized to zero or not set as visible in TABLE | DEFINE COLUMNS.

  - Any unselected rows, if the table currently is showing selected rows only. For more information, see TABLE | SHOW SELECTED ONLY.

- If the clipboard contains undelimited text (as when a single spreadsheet cell was cut or copied), the text is pasted into the cell where the focus is.

- If the clipboard contains delimited text (as when a block of spreadsheet cells was cut or copied), the paste operation begins at the cell having the current focus and preserves the original shape of the block of cells (that is, the cell with the focus is treated as the upper left cell). If there aren't enough columns to the right, the data that does not fit is lost; however, if there aren'tt enough rows in the window, new rows are added at the bottom. If the table is linked, any new row whose key value matches a feature's _ID value will be linked to that feature.

Recommended Uses

- To paste data from a spreadsheet into an Atlas GIS table.

- To paste an expression from one dialog box in another dialog box that requires the same or nearly the same expression.

Edit | Undo *{variable text}*

This command undoes the previous operation, if possible (based on the type of operation).

Available When

A previous operation can still be undone.

Shortcut

CTRL+Z

How It Works

Only the operations listed in the table below can be undone. An operation can be undone until another undoable operation is performed, or another operation makes reversing it impossible. For example, a deletion of table rows cannot be undone after the table is closed or compressed.

EDIT | UNDO is available in any of the contexts listed below. The variable text in the command name appears in the following forms, depending on what operation can be undone.

Table 5.5 **EDIT | UNDO command**

OPERATION/CONTEXT	COMMAND	EFFECT
Selecting or deselecting one or more map features, by any method	UNDO SELECTION	Restores the previous selection
Deleting map features or table rows from either the map or the Table window	UNDO DELETE	Restores the map features or table rows
Pasting into cells of a Table window	UNDO PASTE	Removes pasted text and restores previous contents of the cells

Table 5.5 **EDIT | UNDO command**

OPERATION/CONTEXT	**COMMAND**	**EFFECT**
Editing of text in a Table or Info window cell or a dialog text box—-while still inside it	UNDO EDITING	Restores only the last insertion or deletion inside the cell or text box
Editing of text in a Table or Info window cell—after you've completed editing	UNDO FIELD EDIT	Restores previous contents of cell

Notes:

- The EDIT | UNDO menu item is dimmed when the previous operation cannot be undone.
- After an EDIT | UNDO, the menu item changes to EDIT | REDO, indicating that you can restore the results of the previous operation, reversing the EDIT | UNDO just performed.

Edit | Ungroup

This command ungroups a selected freehand object, restoring it to its original, separate pieces. The pieces can then be selected and edited individually.

Available When

Freehand objects are selected.

How It Works

The EDIT | UNGROUP command reverses the effects of the EDIT | GROUP command. When you ungroup a selected freehand object, the individual objects remain selected.

Notes:

- This command is not available when map layers are active.
- This command does not operate on page elements.

6

View Menu

The VIEW menu contains the commands that let you adjust the appearance of the map or page. You'll want to adjust your view during operations such as adding freehand objects, preparing your final map, or just improving the clarity of the map. For example, to make a group of selected census tracts easier to work with, you might want to zoom in on them so they fill the current map frame.

Here's a summary of the VIEW commands, listed in menu order.

Table 6.1 **View menu**

COMMAND	**DESCRIPTION**
Entire Map	Fit the map to the current map frame.
Previous Map View	Restore the previous view of the current map frame.
Selected Map Features	Set the map view so that selected map features fill the current map frame.
Entire Tablet	Set the map view to match the active area on the digitizing tablet.
Map Scale	Set the view in the current map frame to a specific scale or diameter.
Entire Page	Fit the entire page to the Page window.
Previous Page View	Restore the previous view of the page.
Map Frame	Fit the current map frame to the Page window.
Actual Size	View the page at its actual (printed) size.
Redraw	Refresh the screen by redrawing the Page window.

Note that in the remaining sections of this chapter, the individual VIEW commands are discussed in alphabetical order, not in menu order. For related information, refer to the Zoom In, Zoom Out, and Pan tools in the on-line help.

Map View and Page View

Each of the VIEW commands changes either the page view or one of the map views, except for the VIEW | REDRAW command, which simply refreshes the Page window display.

Changing one of the map views changes which part of the geo file is displayed in the current map frame by showing more or less of the map, or a different portion of it. You can change the map views with the Pan tool, the Zoom In tool, and the Zoom Out tool, or you can use the VIEW | PREVIOUS MAP VIEW, VIEW | ENTIRE MAP, VIEW | SELECTED MAP FEATURES, and VIEW | MAP SCALE commands. The map views control how much of the map is displayed in the map frames, and how much is printed. For example, to print a smaller portion of the overall map, you could simply zoom in on it.

As you zoom in or out on a map frame, the size of point features and the thickness of line features do not change. For example, if the line width of a highway in South Dakota is set to .035 of an inch, it is displayed with this absolute width whether the map view encompasses the entire U.S. or only South Dakota.

Changing the page view changes which part of the page is displayed. The page, which is actually the final printed output, includes everything inside the page frame, plus the margins. You can change the page view with the Pan tool, the Zoom In tool, and the Zoom Out tool, or you can use the VIEW | ENTIRE PAGE, VIEW | PREVIOUS PAGE VIEW, VIEW | MAP FRAME, and VIEW | ACTUAL SIZE commands.

Changing the page view does not change the content of the page. Neither the map scale nor any of the map views change (even though you may pan the map partially or totally out of view). Changing the page view does not change what will print—it's similar to moving a magnifying glass around on the page. Changing the page view is useful, for example, when you want to work on the map at its largest scale, while ignoring the other page elements, such as the title frame and legends (see VIEW | MAP FRAME).

As you zoom in or out on the page, the displayed size of point features and the thickness of line features change. For example, if the line width of a highway in South Dakota is set to .035 of an inch, it appears increasingly thicker as you zoom in on the page.

Map Frames and Insets

You can have up to four map frames open simultaneously on the page. Each map frame shares the same set of geo files and tables that are currently open in the project. In other words, having a layer visible in one frame doesn't exclude it from appearing in another map frame, even at a different view or while displaying a theme. Map frames also share the same map freehand layer.

Within each map frame, you can control the following settings for each layer open in the project:

- whether the layer is on or off
- whether its labels are on or off
- whether its theme is on or off

Since the maps share the same open geo files and tables, the following changes affect all of the maps:

- adding or deleting layers
- selecting, adding, deleting, or modifying map features
- changing the map scale range in which layers and labels are visible
- changing the display characteristics of map features
- changing the content, position, and display characteristics of labels
- moving labels
- creating or modifying the theme expression for a specific layer

To display any map frame, choose MAP | LEGENDS & FRAMES and place a check in the *Map On* box next to the map you want to display. Map 1 is on automatically when you create a new project. The default position of each map frame is shown in the following figure.

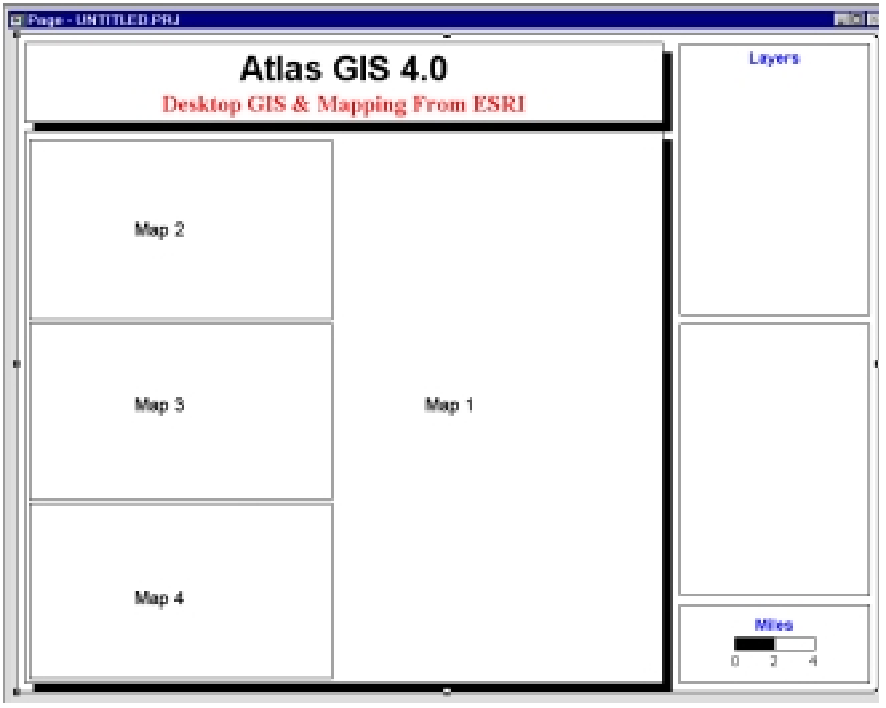


Figure 6.1 **Map frames in the default positions**

Like the other page elements, each map frame can be resized and moved, but they cannot be rotated. You can use a map frame as an inset (as shown in the figure above) or create maps of equal size.

The very first time you turn on Map 2, Map 3, or Map 4, the on/off settings for the layers, labels, and themes are the same settings currently used in Map 1, which is considered the main map. Note that the initial view in the frame is the entire map.

Important note: When a map is first turned on, the layers and labels may not be visible due to the visibility range settings in MAP | LAYERS & THEMES, and the minimum and maximum label sizes in FILE | PREFERENCES.

Changes in the on/off settings or the view of Map 1 do not affect another open map. If a map is off, changes in the Map 1 on/off settings are also made to the closed map—view settings in the map do not change relative to Map

1. When you save and close the project, the on/off and view settings for each map are saved.

When more than one map frame is on, certain Atlas GIS commands and tools operate on the current map only (i.e., the map that has the focus). The name of the current map is displayed on the face of the Current Map button, which is located on the status bar. (Note that the information displayed on the status bar is for the current map.)

When the *Map Frame Highlight* option in FILE | PREFERENCES is checked, the frame for the current map is highlighted. To change the focus, you can click on the Current Map button and choose the frame you want to work with, or when you are working with the map, you can use the Pointer tool and click on a map frame to place the focus on it.

The following commands and tools operate on the current map:

- VIEW | ENTIRE MAP
- VIEW | PREVIOUS MAP
- VIEW | SELECTED MAP FEATURES
- VIEW | MAP SCALE
- QUERY | FIND
- MAP | LAYERS & THEMES (on\off settings for layer, labels, and theme only)
- Zoom In and Zoom Out tools
- Pan tool
- Distance tool

Note: If more than one map is on, the dialog boxes for VIEW | MAP SCALE, QUERY | FIND, and MAP | LAYERS & THEMES display the name of the current map. You can right-click on any open map frame to pop up the Layers & Themes dialog box for that map frame.

View | Actual Size

This command sets the view of the page to its actual printed size.

How It Works

When you choose VIEW | ACTUAL SIZE, the Page window is redrawn with the page scale set to approximately 1:1. In other words, one inch on the screen is equal to approximately one inch on the final printed page.

Notes:

- To allow this command to accurately display the actual page size, it is important that the dimensions of your screen are properly set on the System subpanel in the Preferences dialog box (see FILE | PREFERENCES).

- Since the output page size is typically larger than the display area on the screen, you may need to use the Pan tool or the scroll bars to move the page inside the Page window after using this command.

- To set the actual, physical page size, choose FILE | PAGE SETUP.

Recommended Uses

- To ensure that all labels and freehand text are an acceptable text height before printing.

- To ensure that all page layout elements (legends, scale, map title, etc.) are correctly arranged on the page during final map editing.

View | Entire Map

This command adjusts a map view so that the entire map fits inside the current map frame.

Available When

At least one geo file or point table is open.

Shortcut

The View Map button on the button bar.

How It Works

When you choose VIEW | ENTIRE MAP, the map is redrawn to fit exactly within the current map frame. In other words, a full view of all the open geo files and point tables at their largest scale is displayed in the current map frame.

Note: The extents of the map include all layers—even those that are turned off. In addition, if you delete features or remove layers, the extents of the map do not change until you compress the file with FILE | COMPRESS.

Recommended Uses

- To view selected features that are totally or partially outside the current map frame.
- To see the impact of any editing changes that affect features outside the current map frame.
- To return quickly to the default map view.

View | Entire Page

This command adjusts the page view so that the entire page fits inside the Page window.

Shortcut

The View Page button on the button bar.

How It Works

When you choose VIEW | ENTIRE PAGE, the page is redrawn to fit exactly within the Page window. In other words, a full view of the page at its largest scale is displayed in the Page window.

Recommended Uses

- To restore your view of the other page elements after the VIEW | MAP FRAME command.
- To return quickly to the default page view.

View | Entire Tablet

This command adjusts the view in the current map frame to match the active area on the digitizing tablet.

Available When

A project file is open, which contains three (or more) active, valid control points; and a digitizing tablet is installed correctly for Windows.

How It Works

When you choose VIEW | ENTIRE TABLET, the map is redrawn to display the active area of the digitizing tablet in the current map frame. If the *Show Control Points* option is turned on (available via the MAP | CONTROL POINTS command), active control points will also be visible in the current map frame.

Recommended Use

To ensure that the entire active area of the digitizing table is visible in the current map frame.

View | Map Frame

This command adjusts the page view so that the entire map frame for the current map fits inside the Page window.

How It Works

When you choose VIEW | MAP FRAME, the page is redrawn so that the map frame for the current map fits exactly within the Page window. In other words, a full view of the current map frame at its largest scale is displayed in the Page window.

Notes:

- This command does not change the current map view. That is, the same portion of the map is visible in its map frame before and after this command.
- The map frame is enlarged proportionally, so depending on the size and shape of the Page window, portions of other page frames may still be visible.
- To return to a view of the entire page, choose VIEW | ENTIRE PAGE.

Recommended Use

To ignore the other page elements while you're working (viewing, selecting, or editing) with only one of the map frames.

View | Map Scale

This command allows you to set the map view in the current map frame to a specific scale or width. It also allows you to specify the longitude (x) and latitude (y) coordinates for a new map center.

Available When

At least one geo file or point table is open.

How It Works

When you choose VIEW | MAP SCALE, the Map Scale dialog box pops up. This dialog box contains the settings for the map view in the current map frame. To change the scale and width of the map, enter a new value in either the *Scale* or *Map Width* text box—note that changing the value in one automatically recalculates the value in the other.

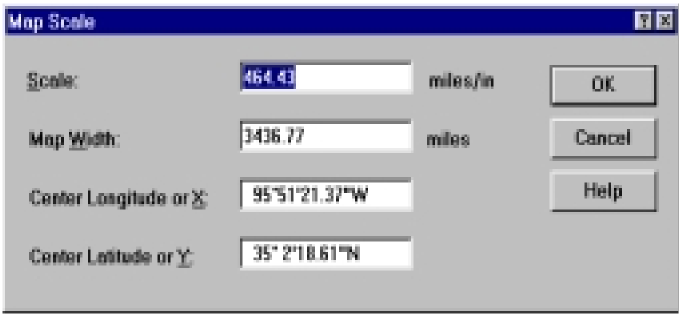


Figure 6.2 **Map Scale dialog box**

To reposition the map inside the current map frame, enter the coordinates for a new map center in the *Center Longitude or X* and *Center Latitude or Y* text boxes. Notice that the coordinates for the location of the pointer are displayed at the bottom of the application window in the status bar.

Notes:

- The map scale is the scale of the geo file on the printed page, not on the screen. One inch on the screen may not be the same as one inch on the final printed page.
- To undo the effects of this command, choose VIEW | PREVIOUS MAP VIEW.
- You can change the format for entering coordinates in the Preferences dialog box on the Units subpanel (see FILE | PREFERENCES).
- You can also use the Pan tool to re-center the map. For more information, see the on-line help.

Recommended Uses

- To print the map at an exact scale or specific width.
- To set one of the map views to a precise distance around a feature.

Associated Dialog Box

Map Scale

View | Previous Map View

This command restores the previous view of the current map frame.

How It Works

When you choose VIEW | PREVIOUS MAP VIEW, the last view of the current map is automatically restored, even if you're working in one of the freehand layers. Atlas GIS remembers the last ten map views for each map frame.

Recommended Uses

- To return to a previous view of the current map frame after zooming in for a closer look.

- To undo the effects of any command that affects one of the map views. This includes VIEW | ENTIRE MAP, VIEW | SELECTED MAP FEATURES, VIEW | MAP SCALE, and the Zoom In, Zoom Out, and Pan tools.

View | Previous Page View

This command restores the previous view of the page.

How It Works

When you choose VIEW | PREVIOUS PAGE VIEW, the last view of the page is automatically restored, even if you're working with one of the map layers. Atlas GIS remembers the last ten page views.

Note: If you change the page view by resizing the page window, this command will not resize the window and restore the previous view.

Recommended Uses

- To return to a previous view of the page after zooming in for a closer look.
- To undo the effects of any command that affects the page view. This includes VIEW | ACTUAL SIZE, VIEW | ENTIRE PAGE, VIEW | MAP FRAME, and the Zoom In, Zoom Out, and Pan tools.

View | Redraw

This command redraws the Page window.

Shortcuts

- Redraw button on the status bar
- CTRL-R

How It Works

When you choose VIEW | REDRAW, the Page window is redrawn without changing any of the map views or the selection status of map features and freehand objects.

The page elements are redrawn in the following order:

- The page background
- The map background
- The map layers
- The map labels
- The map freehand layer
- The legends, title, and scale
- The page freehand layer

By default, Atlas GIS redraws the map and page whenever changes are made to them; however, redrawing can be time-consuming, especially with highly detailed, street-based geo files. For manual control of when the map is redrawn, uncheck the *Auto Map Redraw* box in the Preferences dialog box (refer to FILE | PREFERENCES). When this box is unchecked, a full-page redraw is done only when you choose this command, or when you click the Redraw button on the status bar.

Notes:

- The Redraw button turns yellow whenever the page needs updating.

- To cancel a screen redraw, click on the Redraw button (which turns red and says Cancel while the screen is redrawing), or press ESC.

Recommended Uses

With the *Auto Map Redraw* box checked (the default):

- To redraw the map whenever it needs refreshing.

With the *Auto Map Redraw* box unchecked:

- To redraw the map after turning off a layer’s theme settings.
- To redraw the map after changing layer or label settings.

View | Selected Map Features

This command adjusts the map view so that all selected map features fill the current map frame.

Available When

At least one map feature is selected.

How It Works

When you choose VIEW | SELECTED MAP FEATURES, the map is redrawn so that the selected map features fit at their largest scale inside the current map frame, regardless of which layer you're working in.

Notes:

- This command works on selected map features, even when you're working in one of the freehand layers.
- To undo the effects of this command, choose VIEW | PREVIOUS MAP VIEW.

Recommended Uses

- To view all the selected map features.
- To zoom in on a selected map feature for editing or annotation.
- To view a selected feature from a set of small, densely-packed features.

7

Query Menu

The QUERY menu contains the commands to find and select map features for editing and other operations in Atlas GIS. These commands are used to select features by layer, based on their data, or based on their location. You can perform simple finds and complex queries, including complex queries by geographic location. Here's a summary of the QUERY commands, listed in menu order.

Table 7.1 **Query menu**

COMMAND	DESCRIPTION
Find	Find a map feature by name, or find the location of a ZIP, ZIP+4, or street address in the current map frame.
Select By Layer	Select, reset, or flip selection status of all map features in a layer.
Select By Value	Select map features by value, within a certain range, or by an expression.
Select By Location	Select map features that are inside, outside, touching, or near other features.

Features can also be selected with the Pointer tool, the Circle Select tool, and the Polygon Select tool. The Pointer selects features clicked on or located within a rectangular selection area that you drag with the tool. The Circle Select and Polygon Select tools select features contained in the circle or polygon drawn. (The Map Feature Selection setting in FILE | PREFERENCES determines whether partially contained features are selected.) For more information about the select tools, see the on-line help.

Note that in the remaining sections of this chapter, the individual QUERY commands are discussed in alphabetical order, not in menu order.

Query | Find

This command allows you to find within the current map frame a feature by its name; a location on the map by either its ZIP code or ZIP+4 centroid; or a street address. You can also zoom in on the feature or location, and if it's a feature, you can select it.

Available When

At least one geo file or point table is open.

Shortcut

The Find button on the button bar.

How It Works

When you choose QUERY | FIND, the Find dialog box pops up. The three option buttons in the Find group box control the contents of the switchable sub-panel on the right side of the dialog box.

Finding a Feature by Name

When you specify the feature's name, Atlas GIS searches the _ID, _NAME, and _NAME2 columns in a geo file, or the key column in a point table. You must enter the name exactly as it appears in the columns, including the exact capitalization. You can use the asterisk (*) and question mark (?) wildcard characters to find a feature by its name. Note, however, that only one feature at a time can be found with this command, so if more than one match is found (for example, when a wildcard character is used, or if several street segments have identical names), a list pops up for you to choose which feature to find.

If you place a check in the *Recenter Map* box, the current map frame zooms to the specified map width, with the feature located at the center of the map. If you place a check in the *Select Feature* box, Atlas GIS will also select the feature—all previous selections are unaffected.

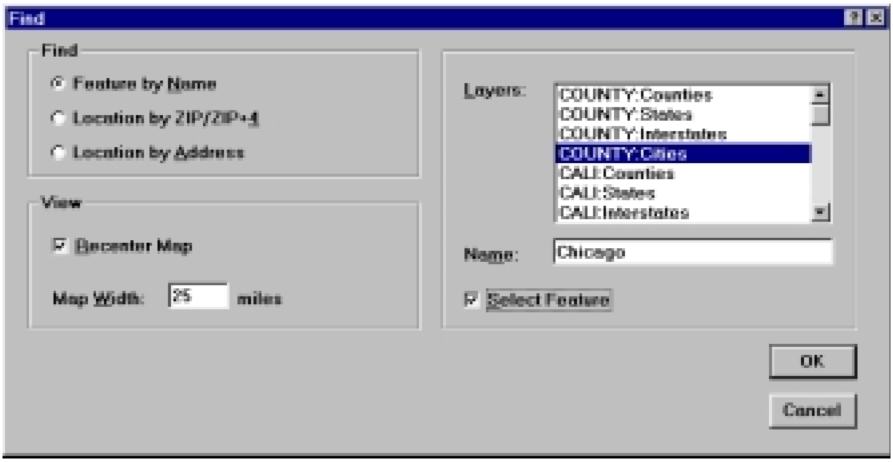


Figure 7.1 **Find dialog box for locating a feature by name**

Notes:

- If a feature is found, a temporary marker and label are placed on the feature in the current map frame. The marker and label remain until you press ESC or choose another menu command.
- If you have more than one map frame, the current map frame is indicated in the dialog box title.
- If you want to select more than one feature, choose the QUERY | SELECT BY VALUE command.

Locating a ZIP Code or ZIP+4

When you specify a 5-digit ZIP code, Atlas GIS searches the special centroid database file (CENTROID.DAT) provided with your Atlas GIS software. If the ZIP code is found, a temporary marker and label are placed on it in the current map frame. You must enter the exact ZIP code—wildcard characters (* and ?) are not valid and cannot be used.

When you specify a 9-digit (ZIP+4) ZIP code, Atlas GIS searches a different file. ZIP+4 codes for the entire U.S. are stored in a special database, compressed to fit on CD, and is sold separately by ESRI. If the ZIP+4 code cannot be found, or you're not licensed for that range of codes, then the 5-digit portion of the ZIP code will be searched for instead. If the 5-digit ZIP code cannot be found, Atlas GIS will return an error message. For more information about licensing specific ranges of ZIP+4 codes, contact ESRI or your sales representative.

Figure 7.2 **Find dialog box for locating a ZIP code or ZIP+4**

Notes:

- If the location is found, a temporary marker and label are placed on the location in the current map frame. The marker and label remain until you press ESC or choose another menu command.
- If you have more than one map frame, the current map frame is indicated in the dialog box title.
- If you place a check in the *Recenter Map* box, the current map frame zooms to the specified map width, with the ZIP code or ZIP+4 located at the center of the map.

Finding a Street Address

Street addresses for the entire U.S. are stored in a special database, compressed to fit on CD. The street address database is sold separately, so to locate a particular street address, you must first be licensed for the geographic area you're searching. For more information about licensing, contact ESRI or your sales representative.

The compressed street address database is separate from the geo files containing street features, which are used for displaying the actual streets on a map. This allows you to find the locations of street addresses even when you're not working with a geo file containing streets.

To locate a street address, you need only provide the street address and the ZIP code. Atlas GIS does not require that you also provide the city and state. The *City* and *State* text boxes are used only when a ZIP code is not provided. If a ZIP code is not provided, then Atlas GIS uses the information in the *City* and *State* text boxes to generate an internal list of possible ZIP codes to search.

Atlas GIS will attempt to find an exact match for the address you enter. If it's found, Atlas GIS displays the address on the map. If the address cannot be found, then it attempts to find a close match. If more than one close match is found, they are ranked, and the best one is selected. If two or more matches tie as the best, then Atlas GIS pops up a list for you to choose the best one. If no match can be found, then a message is returned, and you are returned to the dialog box to try another address.

Figure 7.3 **Find dialog box for locating an address**

Notes:

- If the address is found, a temporary marker and label are placed on the location in the current map frame. The marker and label remain until you press ESC or choose another menu command. The label shows the actual address that was found, which could be different from what you typed if no exact match was found, and the census code (for information on census codes, see the on-line help).

- If a near match is found, then the address that's displayed in the temporary label is the address that was found, not the address you entered.

- If you have more than one map frame, the current map frame is indicated in the dialog box title.

- If you place a check in the *Recenter Map* box, the current map frame zooms to the specified map width, with the address located at the center of the map.

Associated Dialog Box

Find

Query | Select by Layer

This command selects, resets, or toggles the selection status of all map features in the specified layers.

Available When

At least one geo file or point table is open.

How It Works

When you choose QUERY | SELECT BY LAYER, the Select By Layer dialog box pops up, allowing you to indicate how you want to affect the selection status of the features in the specified layers.

- Resetting the features in the selected layers deselects them all.
- Toggling the selection status deselects all features in the chosen layer or layers that were selected, and selects all those that were not selected.
- To undo the effects of this command, choose EDIT | UNDO.

Figure 7.4 **Select By Layer dialog box**

This command searches the geo file or point table and sets the selection status of all map features or table points in the specified layers. If the map features have corresponding table rows, the selection status of the rows is also set. The command has no effect on table rows that have no matching geographic features.

Recommended Uses

- To select everything in one or more layers, or deselect everything in one layer without affecting the selections in other layers. (Note, however, that the simplest way to deselect everything on the map is to click anywhere on the map, outside any map features.)

- To select all but a few map features—first select the few, then toggle the selection status for the entire layer.

Associated Dialog Box

Select By Layer

Query | Select by Location | Inside

This command selects map features that are inside other map features. For overlapping features that are not completely inside a containing feature, you can specify the method by which they qualify as being *inside*.

Available When

At least one geo file with a region layer is open.

How It Works

When you choose QUERY | SELECT BY LOCATION | INSIDE, the Select By Location - Inside dialog box pops up.

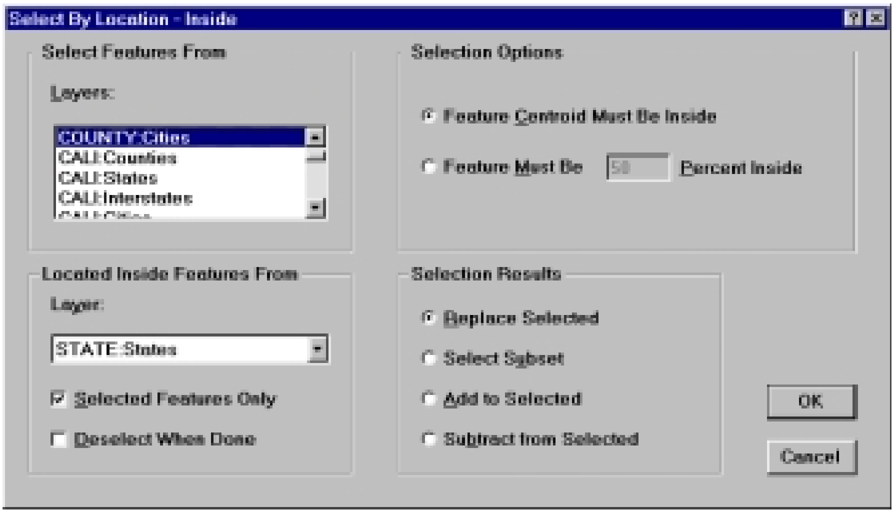


Figure 7.5 **Select By Location - Inside dialog box**

The *target layers* contain the map features that you ultimately want to select. You choose the target layers from the *Layers* list box in the Select Features From group box. The target layers can be of any type.

The *source layer* is a single region layer containing the map features that determine which features get selected in the target layers. You specify whether to use all or just the selected features in the source layer. If you use just the selected features, you can then specify whether they remain selected after the operation. The source layer must be a region layer.

With this command, you can determine the method by which features that overlap the containing regions are selected. If a map feature from a target layer is completely inside a region from the source layer, it is selected; however, if it's not completely inside, then it must meet one of the following requirements to be selected:

- Its centroid must be located inside the containing region (this is the default criterion).

- A user-specified percentage of a region's area or a line's length must fall within the containing region.

For example, suppose you want to select all ZIP code regions that fall within a 5-mile trade area. Since there will undoubtedly be some ZIP codes that overlap the edges of the trade area, you could specify that in order to be selected, a ZIP code must have at least 51% of its area inside the trade area.

A much faster, though less precise, method of determining when a feature is considered inside another is to indicate that only its centroid need be inside the containing region. Depending on the feature type, its *centroid* is defined as follows:

- For a region, the centroid is the *default label position*. This is usually the region's center of mass; however, if the center of mass is actually outside the region, Atlas GIS adjusts the centroid to be inside the region.

- For a line, the centroid is the half-way point along the line.

- For a point feature or a table point, the centroid is simply the point's physical location.

The following option buttons determine the final disposition of the set of target features that meets the selection criteria:

- Replace Selected
  Deselect any previously selected map features in the layers being queried, and select the map features that meet the selection criteria.

- Select Subset
  Select map features that meet the selection criteria only if they are selected already. All other map features are deselected. This allows you to get the intersection of the map features that are already selected and the map features that meet the selection criteria.

- Add to Selected
  Add any map features that meet the selection criteria to the set of map features that are already selected.

- Subtract from Selected
  Deselect any map features that meet the selection criteria from the set of map features that are already selected.

Recommended Uses

- To select all ZIP codes that are either completely inside or mostly inside a trade area.

- To select all customer locations that fall within a designated sales territory.

Associated Dialog Box

Select By Location - Inside

Query | Select by Location | Near

This command selects map features that fall within a specified distance from other features.

Available When

At least one geo file or point table is open.

How It Works

When you choose QUERY | SELECT BY LOCATION | NEAR, the Select By Location - Near dialog box pops up.

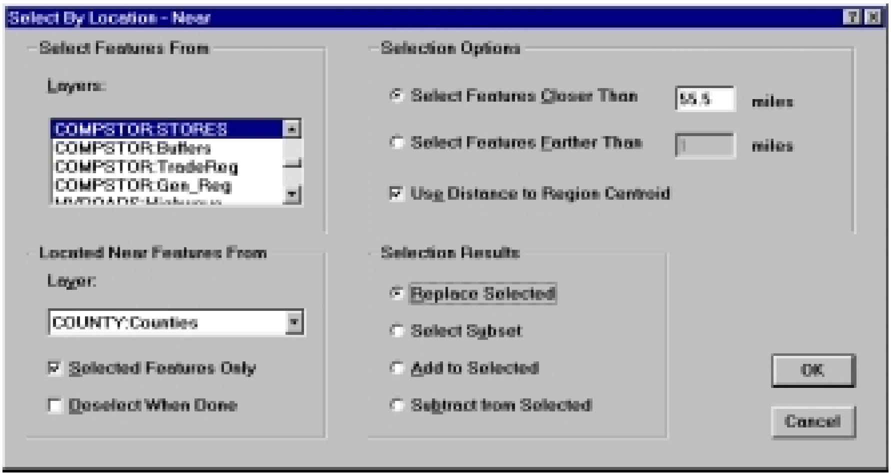


Figure 7.6 **Select By Location - Near dialog box**

The *target layers* contain the map features that you ultimately want to select. You choose the target layers from the *Layers* list box in the Select Features From group box. The target layers can be of any type.

The *source layer* is a single layer containing the map features that determine which features get selected in the target layers. You specify whether to use all or just the selected features in the source layer. If you use just the selected features, you can then specify whether they remain selected after the operation. The source layer can be of any type.

When a region layer is involved in the operation—regardless of whether it's the source layer or one of the target layers—you can specify how the distances are to be calculated. If the *Use Distance to Region Centroid* box is checked, then all distances are calculated to the region centroids. If the box is left unchecked, then all distances are calculated to the edges of the regions.

For a region, the centroid is its *default label position*. This is usually the region's center of mass; however, if the center of mass is outside the region, Atlas GIS adjusts the centroid to be inside the region.

The following option buttons determine the final disposition of the set of target features that meets the selection criteria:

- Replace Selected
  Deselect any previously selected map features in the layers being queried, and select the map features that meet the selection criteria.

- Select Subset
  Select map features that meet the selection criteria only if they are selected already. All other map features are deselected. This allows you to get the intersection of the map features that are already selected and the map features that meet the selection criteria.

- Add to Selected
  Add any map features that meet the selection criteria to the set of map features that are already selected.

- Subtract from Selected
  Deselect any map features that meet the selection criteria from the set of map features that are already selected.

Recommended Uses

- To select all residences within 300 feet of a city easement.
- To select shopping centers within five miles of high-income census tracts.
- To select all customers along a route (within 100 feet of the street segments that make up the route).

Associated Dialog Box

Select By Location - Near

Query | Select by Location | Outside

This command selects map features that are outside other map features. For overlapping features that are not completely outside a containing feature, you can specify the method by which they qualify as being *outside*.

Available When

At least one geo file with a region layer is open.

How It Works

When you choose QUERY | SELECT BY LOCATION | OUTSIDE, the Select By Location-Outside dialog box pops up.

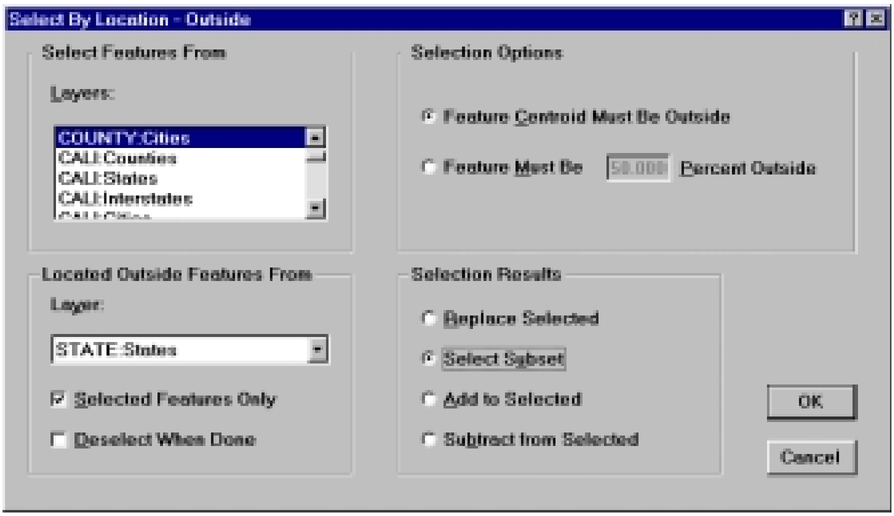


Figure 7.7 **Select By Location - Outside dialog box**

The *target layers* contain the map features that you ultimately want to select. You choose the target layers from the *Layers* list box in the Select Features From group box. The target layers can be of any type.

The source *layer* is a single region layer containing the map features that determine which features get selected in the target layers. You specify whether to use all or just the selected features in the source layer. If you use just the selected features, you can then specify whether they remain selected after the operation. The source layer must be a region layer.

With this command, you can determine the method by which features that overlap the containing regions are selected. If a map feature from a target layer is completely outside a region from the source layer, it is selected; however, if it's not completely outside, then it must meet one of the following requirements to be selected:

- Its centroid must be located outside the containing region (this is the default criterion).

- A user-specified percentage of a region's area or a line's length must fall outside the containing region.

For example, suppose you want to select all ZIP code regions that fall outside a 5-mile trade area. Since there will undoubtedly be some ZIP codes that overlap the edge of the trade area, you could specify that in order to be selected, a ZIP code must have at least 51% of its area outside the trade area.

A much faster though less precise method of determining when a feature is considered outside another is to indicate that only its centroid need be outside. Depending on the feature type, its *centroid* is defined as follows:

- For a region, the centroid is the *default label position*. This is usually the region's center of mass; however, if the center of mass is outside the region, Atlas GIS adjusts the centroid to be inside the region.

- For a line, the centroid is the half-way point along the line.

- For a point feature or a table point, the centroid is the point's physical location.

The following option buttons determine the final disposition of the set of target features that meets the selection criteria:

- Replace Selected
  Deselect any previously selected map features in the layers being queried, and select the map features that meet the selection criteria.

- Select Subset
  Select map features that meet the selection criteria only if they are selected already. All other map features are deselected. This allows you to get the intersection of the map features that are already selected and the map features that meet the selection criteria.

- Add to Selected
  Add any map features that meet the selection criteria to the set of map features that are already selected.

- Subtract from Selected
  Deselect any map features that meet the selection criteria from the set of map features that are already selected.

Recommended Use

To select locations outside a flood zone, or customers outside an existing trade area.

Associated Dialog Box

Select By Location - Outside

Query | Select by Location | Touching

This command selects map features that touch other features.

Available When

At least one geo file or point table is open.

How It Works

When you choose QUERY | SELECT BY LOCATION | TOUCHING, the Select By Location - Touching dialog box pops up.

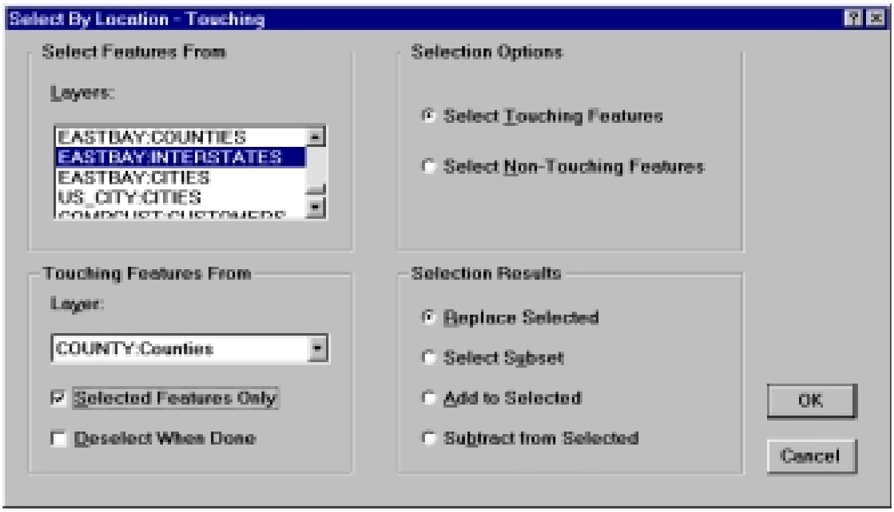


Figure 7.8 **Select By Location - Touching dialog box**

The *target layers* contain the map features that you ultimately want to select. You choose the target layers from the *Layers* list box in the Select Features From group box. The target layers can be of any type.

The *source layer* is a single layer containing the map features that determine which features get selected in the target layers. You specify whether to use all or just the selected features in the source layer. If you use just the selected features, you can then specify whether they remain selected after the operation. The source layer can be of any type.

With this command, you can select features from the target layers that either touch or do not touch features from the source layer. Depending on the feature type, *touching* is defined as follows:

- A region touches if it overlaps, encloses, is enclosed by, or shares a common vertex with the feature in the source layer.
- A line touches if it crosses, is enclosed by, or shares a common vertex with the feature in the source layer.
- A point touches if it is enclosed by or shares a common vertex with the feature in the source layer.

The following options determine the final disposition of the set of target features that meets the selection criteria:

- Replace Selected
  Deselect any previously selected map features in the layers being queried, and select the map features that meet the selection criteria.
- Select Subset
  Select map features that meet the selection criteria only if they are selected already. All other map features are deselected. This allows you to get the intersection of the map features that are already selected and the map features that meet the selection criteria.
- Add to Selected
  Add any map features that meet the selection criteria to the set of map features that are already selected.
- Subtract from Selected
  Deselect any map features that meet the selection criteria from the set of map features that are already selected.

Recommended Uses

- To select all regions bordering another region.
- To select all the regions through which a set of lines run.
- To select the containing region(s) for a point or set of points (that is, the inverse of a SELECT BY LOCATION | NEAR operation).

Associated Dialog Box

Select By Location - Touching

Query | Select by Value

This command selects map features (and their corresponding table rows) by a specific value, within a range of values, or by an expression.

Available When

At least one geo file or table is open.

How It Works

When you choose QUERY | SELECT BY VALUE, the Select By Value dialog box pops up, allowing you to select features that have a specific value or fall within a range of values. These values are based on either a column or an index. The dialog box also allows you to select features based on an expression.

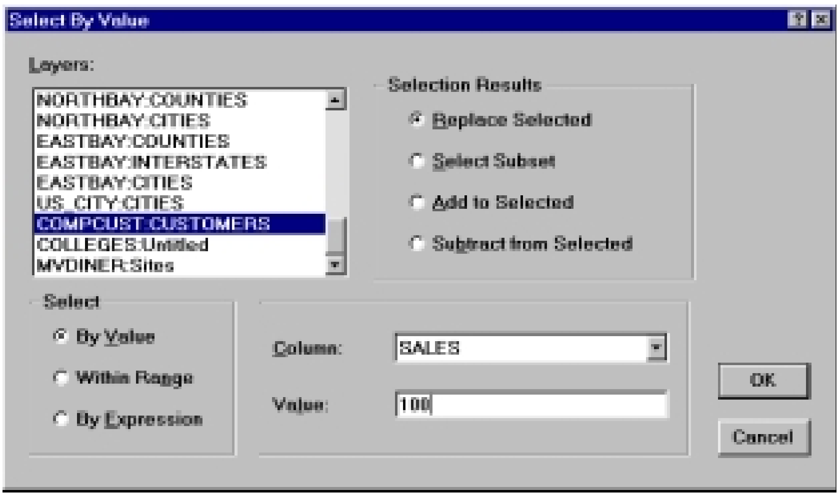


Figure 7.9 **Select By Value dialog box**

Note: A query on multiple layers can be based only on columns in the geo file.

The following option buttons determine the final disposition of the results of your query:

- Replace Selected
  Deselect any previously selected map features in the layers being queried, and select the map features that meet the selection criteria.

- Select Subset
  Select map features that meet the selection criteria only if they are selected already. All other map features are deselected. This allows you to get the intersection of the map features that are already selected and the map features that meet the selection criteria.

- Add to Selected
  Add any map features that meet the selection criteria to the set of map features that are already selected.

- Subtract from Selected
  Deselect any map features that meet the selection criteria from the set of map features that are already selected.

By Value

Clicking on the By Value option button allows you to select features and rows based on a specific value for a column or index. For example, to select the map feature that has a ZIP code of 94110, click on the By Value option button, choose the ZIP code column, and query on the value ‘94110’.

Now suppose you want to select the ZIP code regions that begin with ‘941’. If you use the asterisk (*) wildcard character, you can query on the value ‘941*’ to select all ZIP codes that start with ‘941’. You could also use the question mark (?) wildcard character and query on the value ‘941??’.

The *Column* list box includes each column name and each sort expression. If a column and an index have the same name (that is, the index is based only on the column values), only the index is listed, and the word “index” follows it. Note that sort expressions based on more than a single column name, such as POPULATION/FAMILIES, are not followed by the word “index”. See TABLE | SORT for more information about sort expressions.

Remember that the _ID, _NAME, and _NAME2 indexes (for a geo file) or the key column index (for a table) are always available. If you choose a sort expression, the query uses the corresponding index. For large databases, a query is much faster with an index. Always use an index if it is available.

Note that in general, QUERY | SELECT BY VALUE searches the geo file and linked table rows. As a result, table rows without matching features are not queried. If it is important to include unmatched table rows in your query, make sure you use an index based on table rows only—in this case, features without matching table rows are not queried.

Within Range

Clicking on the Within Range option button allows you to select features and rows that fall within a range of values for a column. For example, to select all regions with population between twenty and forty million, you would click on the Within Range option button, choose the POPULATION column, and query on the range from 20,000,000 to 40,000,000.

A query within a range of values never uses an index, and it always searches geo features and linked rows. Therefore, table rows without matching features will not be queried.

By Expression

Your query can also be based on any dBASE-compatible expression. After clicking on the By Expression option button, fill in the *Expression* text box with an expression to be evaluated. The expression must include a relational operator such as > (greater than), < (less than), or = (equals), and must not exceed 100 characters in length. For example, to select all regions whose population is more than 70% urban, you would enter '(URBAN POPULATION > .70) * POPULATION'.

Atlas GIS supports a powerful set of expressions, including almost the full set of dBASE or xBASE operators and functions, as well as a few extensions. See Appendix A for details about expressions, a complete list of operators, and a description of the Expression Builder.

A query by expression never uses an index, and always searches map features and linked rows. Therefore, table rows without matching features will not be queried.

Associated Dialog Boxes

Select By Value
Expression Builder

8

Map Menu

The MAP menu contains the commands you use to control the appearance and content of the map and page, and to perform such map operations as creating buffer regions, combining regions, and setting control points for digitizing paper maps. Here's a summary of the MAP commands, listed in menu order.

Table 8.1 **Map menu**

COMMAND	DESCRIPTION
Layers & Themes	Control all layer settings for the map, including adding and deleting layers, turning layers on and off, setting visibility scale for layers, changing layer styles, defining labels, and creating theme maps.
Legends & Frames	Set the contents and framing options for the page elements (that is, the page frame, map frame, layer legend, theme legends, map scale, and title).
Reset Labels	Reset the labels for one or more layers to their default settings (i.e., their default visibility, location, and angle).
Create Buffers	Create buffers around existing map features.
Combine	Combine map features and their associated data to create new map features. Combine either selected features or features grouped according to an evaluated expression.
Split	Create new features by splitting existing ones.
Generalize	Remove insignificant vertices from regions and lines.
Disperse Points	Disperse coincident map or table points in a random or circular pattern about their common location.
Change Coordinate System	Change the projection of all open geo files and point tables.
Control Points	Set control points for digitizing a paper map.

Note that in the remaining sections of this chapter, the individual MAP commands are discussed in alphabetical order, not in menu order.

Map | Change Projection

This command changes the projection of all open geo files and point tables.

Available When

At least one geo file or point table is open.

How It Works

When you choose MAP | CHANGE COORDINATE, the Change Coordinate System dialog box pops up. This dialog box allows you to convert the open geo files to any coordinate system in the coordinate systems list.

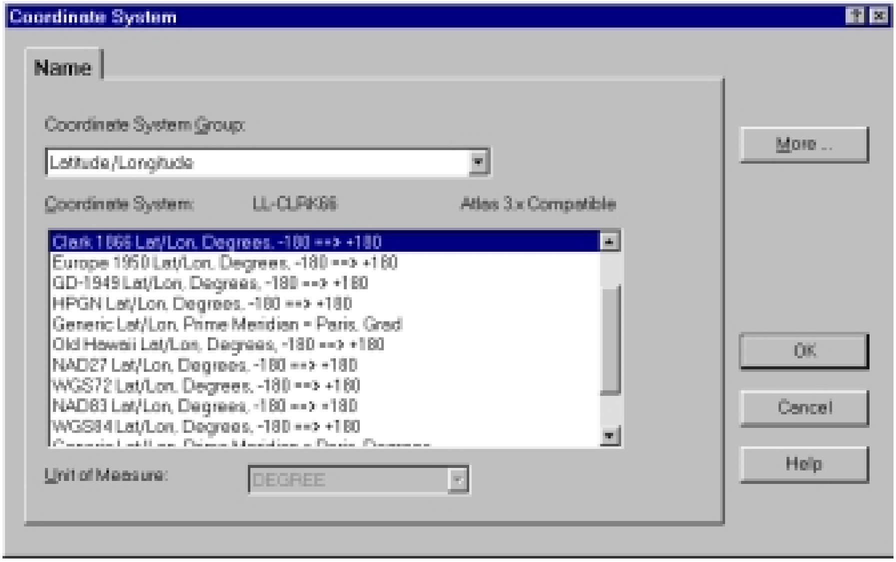


Figure 8.1 **Change Coordinate System dialog box**

Clicking on the ‘More’ button will exposel three additional tabs for this dialog box.

The ‘Parameters’ tab displays the relevant parameters for the coordinate system that is currently selected in the coordinate system list box, such as Origin of Longitude and Origin of Latitude. The parameter values that appear ‘grayed out’ are not relevant for the selected coordinate system.

The ‘Datum’ tab displays the values for the particular ‘Datum’ which the selected coordinate system uses in referencing its geographic coordinates.

The ‘Ellipsoid’ tab displays the values for the particular ‘Ellipsoid’ which the selected coordinate system uses in its calculations of the shape and size of the earth.

When the additional tabs are displayed, clicking on the ‘Less’ tab will display only the ‘Name’ tab.

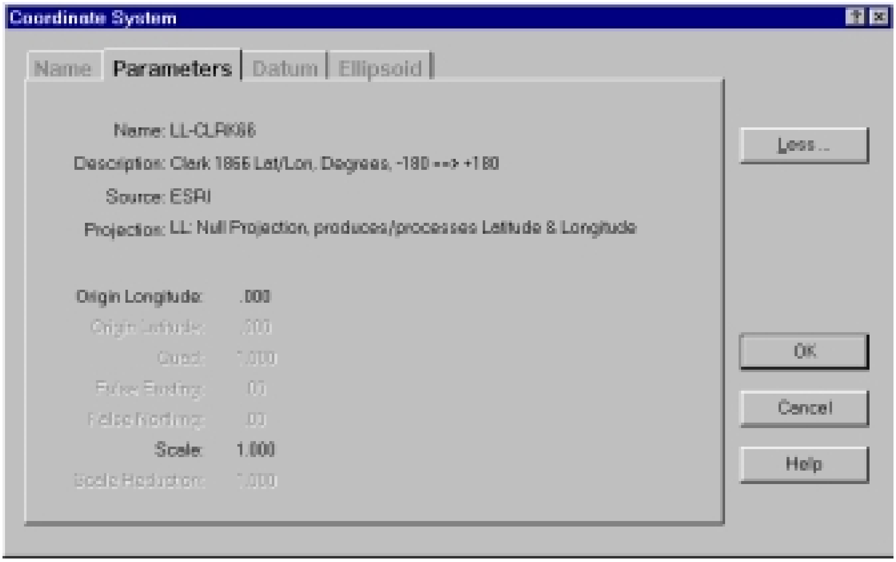


Figure 8.2 **Additional tabs for the Change Coordinate System Dialog Box**

Notes:

- To cancel a reprojection, click on the Cancel button in the Progress box. Note, however, that because all open geo files and point tables must have the same projection, canceling a reprojection will close all files that have not been reprojected. Also, canceling a reprojection will not undo the reprojections completed to that point.

- As you open additional geo files or point tables, they are automatically reprojected to match the geo files or point tables that are already open.

- Depending on the size of your geo file or point table, this operation may take some time, and is much quicker with a math coprocessor.

- When you reproject a file, Atlas GIS makes a temporary copy of the file and stores it on your hard disk, so make sure you have sufficient disk space to store temporarily the original file and the copy.

- Reprojecting a point table changes the values stored in the longitude and latitude (or x and y) columns.

- For more information on map projections and coordinate systems, you can refer to Chapter 2, "Basic Mapping Concepts." In addition, there are many books available on this subject. For example, one book that provides an abundance of information is *Map Projections—A Working Manual (U.S.G.S. Professional Paper 1395)* by John P. Snyder.

Projections and Coordinate Systems

Technically, the items in the projection list are coordinate systems rather than projections. To define a coordinate system, several parameters, such as an origin and standard parallels, are necessary in addition to the projection. For example, the seven California state plane coordinate systems all use the Lambert Conformal Conic projections, but each has a different set of projection parameters. For simplicity, however, we generally refer to them here as "projections."

Although longitude-latitude is not a projection, Atlas GIS does perform a simple, on-the-fly projection when it draws a longitude-latitude map: the length of a degree of longitude is based on the average latitude of the map, and is constant for the entire map.

If you are unsure of which “projection” to use, the following recommendations may be helpful:

- For mapping smaller areas, up to a U.S. state, longitude-latitude is usually suitable.
- For maps of larger areas, such as the entire United States, we recommend one of the Albers projections.
- For a world map, the Robinson or Miller projection is recommended.

User-Defined Coordinates

Atlas GIS also supports user-defined coordinate systems. A user-defined coordinate system can be any arbitrary rectangular coordinate system; however, since user-defined coordinates are not defined in terms of a known map projection, Atlas GIS cannot convert user-defined coordinates to other coordinate systems or vice versa.

Atlas GIS provides four pre-defined user-coordinate systems: USER, USER_2, USER_4, and USER_6. Depending on the number of decimal places you wish to maintain for the stored coordinates in your map, choose the appropriate user-defined coordinate system for either 0, 2, 4, or 6 decimal-place accuracy.

Associated Dialog Box

Change Coordinate System

Map | Combine | By Value

This command groups region or point features according to an expression and combines each group into a new feature. In addition, the data for each group can be aggregated.

Available When

A region or point layer is open.

How It Works

When you choose MAP | COMBINE | BY VALUE, the Combine By Value dialog box pops up, allowing you to specify the layer that contains the features to combine (the source layer), the layer where the new, combined features are to be placed (the target layer), and the expression upon which the features in the source layer are grouped.

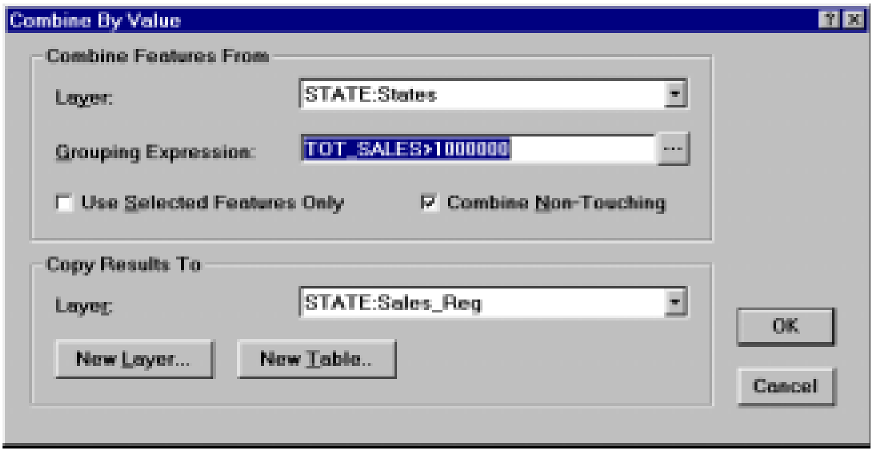


Figure 8.3 **Combine By Value dialog box**

Notes:

- This command does not select the new features, and the previous selections are not affected.

- Regions with common borders are combined into a single region without the common borders. By default, non-touching regions are included in the grouping. They are combined without changing their borders, and they become islands.

- Points are combined into a single point whose location is calculated as the average of the combined points' coordinates.

- Atlas GIS has a limit of 32,759 vertices per region. If this limit is reached for any group of features that is being combined, Atlas GIS copies the source features to the target layer without combining them, and displays a message reporting what happened.

Source and Target Layers

The source layer must contain regions or points. You can choose whether to use all of the features in the layer, or only the selected ones. The resulting new features are stored in the specified target layer, which must be of the same type as the source layer. If the source features are points, the target layer can be either a point layer in a geo file or a point table.

You can use an existing layer as the target layer, or you can create a new one by clicking on the New Layer button and filling out the New Layer dialog box. The target layer must be in a geo file that's already open. Notice that if you create a new layer, it is not automatically chosen in the *Layer* list box to copy the results to it—you will need to choose it.

If the target layer is linked to a table, a new row is created for each newly combined feature, and the results of aggregating the data are stored there. Each result is written to the target table column whose name matches the source table column name. If the target layer does not have a table, you can click on the New Table button to create a new table, and then write the aggregated results to it. If there is no table for the target layer, then no aggregation is performed.

Grouping Expressions

The grouping expression is evaluated for each source feature, and those features that have the same value are grouped together. Each group of features is combined to create a new feature of the same type, and (optionally) the attribute data for each member of the group is aggregated into a table row for the new feature. The original features are unaffected.

The grouping expression can be a column name or any valid dBASE expression. Clicking on the Grouping Expression […] button pops up the Expression Builder. For more information about Atlas GIS expressions and the Expression Builder, see Appendix A.

Aggregating Data

The aggregation method used to combine the data is specified in each column's definition. To view or change the aggregation methods, choose TABLE | DEFINE COLUMNS. The aggregation methods available for numeric columns are Sum, Average, Weighted Average, Minimum, Maximum, and First. For character columns, aggregation consists of copying the value of the first feature. (For more information, see TABLE | DEFINE COLUMNS.)

The _ID column for each new feature is the value of the grouping expression, converted to a character string and truncated if longer than 16 characters. The _NAME column for each new feature is also the value of the grouping expression, converted to a character string and truncated if longer than 64 characters. The _NAME2 column is left blank. If the target layer is a point table, the value of the grouping expression is copied to the key column.

Recommended Uses

- To combine sales territory regions to reflect your sales team's reorganization.

- To create territories for various targeted mailings by combining ZIP code regions of similar demographic character.

Associated Dialog Boxes

Combine By Value
New Layer
New Table

Map | Combine | Selected

This command creates a new feature by combining selected regions or points, and (optionally) aggregating their data.

Available When

Two or more regions or points in the same layer are selected.

How It Works

When you choose MAP | COMBINE | SELECTED, the Combine Selected dialog box pops up, allowing you to specify the layer that contains the features to combine (the source layer) and the layer where the new, combined features are to be placed (the target layer).

Figure 8.4 **Combine Selected dialog box**

Notes:

- After this command is completed, the new, combined features are selected, and the features in the source layer are deselected.
- Regions with common borders are combined into a single region without the common borders. Non-touching regions can also be combined into single map features without changing their borders or endpoints. The non-touching features become islands.

- Points are combined by averaging their coordinates.
- Since Atlas GIS has a limit of 32,759 vertices per region or line, you may not be able to combine features with an excessively large number of vertices. Atlas GIS will stop the operation when the limit is reached, and will display a message reporting what happened.

Source and Target Layers

The source layer must contain regions or points. Two or more selected regions or points in the source layer are then combined into a single, new feature. The original features are unaffected.

You can use an existing layer as the target layer, or you can create a new one by clicking on the New Layer button and filling out the New Layer dialog box. Both the source and the target layers must be the same type.

If the target layer is linked to a table, a new row is created for each newly combined feature, and the results of aggregating the data are stored there. Each result is written to the target table column whose name matches the source table column name. If the target layer does not have a table, you can click on the New Table button to create a new table, and then write the aggregated results to it. If there is no table for the target layer, then no aggregation is performed.

Aggregating Data

The aggregation method used to combine the data is specified in each column's definition. To view or change the aggregation methods, choose TABLE | DEFINE COLUMNS. The aggregation methods available for numeric columns are Sum, Average, Weighted Average, Minimum, Maximum, and First. For character columns, aggregation consists of copying the value of the first feature. (For more information, see TABLE | DEFINE COLUMNS.)

The _ID value for the new feature is the _ID value of the first source feature. The _NAME and _NAME2 columns for each new feature are left blank.

Recommended Uses

- To combine ZIP code regions or census tracts to create a trade area.
- To combine regions already created with MAP | CREATE BUFFERS.

Associated Dialog Boxes

Combine Selected
New Layer
New Table

Map | Control Points

This command allows you to set control points for digitizing a paper map. Control points establish the *tablet-to-map transformation* which allows Atlas GIS to translate any point on the tablet to the corresponding point on the map. This command also calculates the transformation error for each control point, which helps you determine if it is acceptable.

Available When

A geo file is open and a digitizing tablet is installed correctly for Windows.

How It Works

When you choose MAP | CONTROL POINTS, the Control Points dialog box pops up. The options in this dialog box allow you to define and display control points. Each row in the dialog box represents a single control point. Each cell in the row represents a particular characteristic for that control point: whether it's active, the name, the longitude-latitude (or x-y) coordinate, the coordinate of the digitized position on the tablet (measured in page distance units from the lower left corner of the active tablet area), and the transformation error.

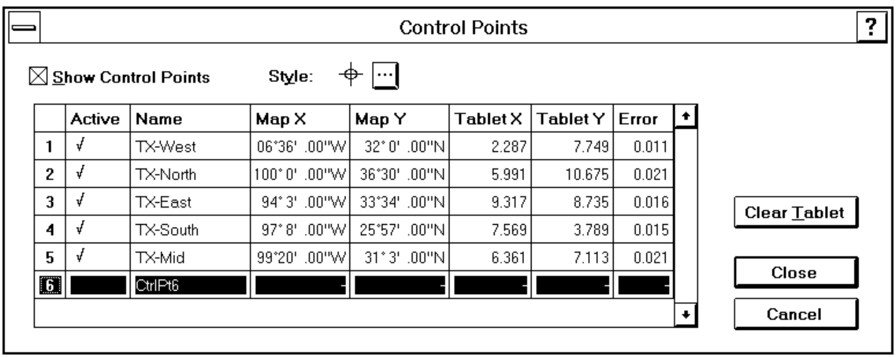


Figure 8.5 **Control Points dialog box**

When three or more control points have been defined and their locations digitized, Atlas GIS automatically calculates *transformation errors*. Transformation errors help determine the accuracy of the control points.

Note: Atlas GIS uses only the *active* control points to calculate the transformation errors. A control point is active when the *Active* cell for that particular control point is checked.

The information for the control points is saved in the project file when you choose FILE | SAVE. This allows you to use the information for future digitizing sessions.

Control Points

Control points are easily identifiable points on a paper map that have known coordinates. Control points are used to register, or reference, your paper map to a geo file. When you set control points, Atlas GIS uses an equation that enables Atlas GIS to translate positions on the digitizing table to coordinates in the geo file (i.e., a *tablet-to-map transformation*).

Using control points serves the following purposes:

- Once you specify the coordinate system of the geo file and digitize the control points, Atlas GIS can calculate actual geographic coordinates for each point you digitize on the paper map.
- Control points allow you to maintain consistent spatial alignment between a series of maps covering the same area. Similarly, you can digitize a large map by dividing it into sheets and using common control points.
- Control points allow you to restore the relationship between the geo file and the paper map on the tablet. This capability is useful for finishing maps that were not completely digitized in one session, or updating existing maps.

  For example, you can digitize part of a map, save the project file, and then remove the paper map from the tablet. To resume digitizing, place the map on the tablet, open the project file, and redigitize the tablet x and y coordinates for the control points. Atlas GIS can then relate the coordinates of the paper map to those in the geo file, and you can continue to digitize.

Note: If you want to digitize a paper map with unknown coordinates and you have a geo file covering the same area, you can use the existing geo file to extract control points for the new file. Using the mouse, click on the screen area to enter the coordinates of the points on the existing geo file that correspond to control points on the paper map.

The following are general guidelines for working with control points:

- Each control point must have a name, a longitude (or x-coordinate), and a latitude (or y-coordinate).
- At least three control points must be defined per map sheet. For a more accurate representation, a minimum of four points is recommended (with up to 100 control points allowed per project file), and the points should be spread evenly across the map sheet, as shown in the following figure.

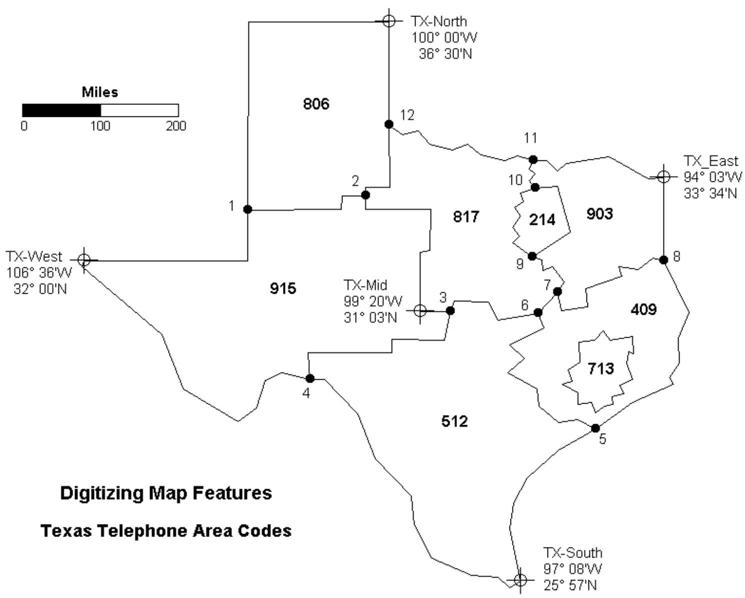


Figure 8.6 **Example of evenly distributed control points (⌖) on a map**

- When digitizing a large map that is divided into several sheets, each map sheet should share control points with the adjoining sheets. When you are setting control points for a sheet, be sure to redigitize each control point that it shares with previously selected sheets.

  Note: Make sure the control points that are not used for a particular sheet are not active.

- Once you begin digitizing features, it is important to keep the same set of control points active (i.e., don't check or uncheck the *Active* cell for any control point); otherwise, the features created near the newly active or inactive control points may possibly be distorted relative to the previously digitized features.

It is possible to digitize a map without control points; however, you must then use one of the User-Defined coordinate systems. In such cases, Atlas GIS uses the tablet coordinates (that is, inches or centimeters beginning in the lower left corner of the tablet) without converting them. As a result, you can't move the paper map once you've started digitizing, since there is no practical way to put it back on the tablet in exactly the same position.

Note: A geo file created using a user-defined coordinate system can't be combined or overlaid with any files that use a different coordinate system.

Transformation Errors

The transformation error represents the amount of error between the control point coordinates you entered and those calculated by the *tablet-to-map transformation equation*. The difference is given in page distance units on the tablet so that you can look at the paper map to determine if the difference is significant.

Three active control points produce a transformation error of zero, regardless of their position; therefore, transformation errors are calculated only when you have four or more active control points.

Note: Although Atlas GIS uses only the *active* control points to calculate the transformation errors, a transformation error is shown for each point in the Control Points dialog box.

The relative size of the transformation error determines whether a control point is acceptable for use. The transformation error should be on the same scale as the resolution of the digitizing tablet being used. For example, for a digitizing tablet with a resolution of thousands of lines per inch (lpi), an acceptable transformation error would be in the hundredths or thousandths of an inch. Generally, control points with transformation errors between zero and 0.1 inch are probably acceptable; those equal to or greater than 0.1 are probably unacceptable.

Large transformation errors may occur when:

- An incorrect control point coordinate is entered.

- The control point is digitized incorrectly (i.e., the digitizing cursor or the on-screen cross hair is not precisely placed upon the point).
- The coordinate system being used does not closely match the coordinate system of the paper map.

Associated Dialog Boxes

Control Points
Symbols
Color
Symbol table

Map | Create Buffers

This command generates buffers around map features based on either a radius or distance you specify. A buffer is an area (often a circle) around a map feature that selects all features in the same layer that fall within the buffer's boundaries.

Available When

A geo file is open.

Note: You can create buffers around any type of map feature, including table points; however, the created buffers are regions, and regions are stored in a region layer—hence, a geo file must be open.

How It Works

When you choose MAP | CREATE BUFFERS, the Create Buffers dialog box pops up, allowing you to specify the layer that contains the features to buffer (the input layer), the region layer where the new buffers are placed (the output layer), the buffer type, the buffer distance around the input features, and the degree of smoothness at the ends or corners of the buffer.

Notes:

- After the buffers are created, they can remain as separate regions, or you can use the MAP | COMBINE SELECTED command to dissolve overlapping borders between them.

- Atlas GIS has a limit of 32,759 vertices per region. If this limit is reached when buffering any feature, Atlas GIS stops working on that feature and continues with the other input features. A message is displayed when the operation is completed, explaining what happened.

Input and Output Layers

The input layer contains the existing features to be buffered. These features can be any type, and you can choose to create buffers around all or only the selected ones.

The output layer is the layer to which the newly created buffers are copied. The output layer must be a region layer, and it must be in a geo file that's already open. You can use an existing layer, or you can create a new one by clicking on the New Layer button and filling out the New Layer dialog box. Notice that when you create a new layer, it is automatically chosen in the *Layer* list box.

When you execute this command, each feature in the input layer is buffered by the designated distance, and the resulting buffers are written to the output layer. The new buffer regions are selected, and the previous selections are unchanged.

The _ID, _NAME, and _NAME2 values from the input features are copied to corresponding columns for the buffer regions. If table points are buffered, the key values from the input table points are copied to the _ID column of the buffer regions. No table rows are created for the new features, and no other data is copied.

Buffer Options

The input layer type controls the contents of both the Buffer Type and Buffer Options group boxes in the Create Buffer dialog box. Depending on the input layer type you specify, the switchable panels on the right side of the Create Buffers dialog box display the options that are appropriate for that layer.

The buffer radius or distance can be a fixed value, or it can be calculated from a column name or expression. Click on the Radius or Distance […] button to pop up the Expression Builder to build the expression upon which the buffer radius or distance is based. This option allows you to specify an exact buffer distance, or to perform variable-distance buffering (that is, a buffer distance/radius based on a column or expression value).

The rounding resolution determines the smoothness of the buffer border. The default value is 6 for buffering regions, 10 for buffering lines, and 60 for buffering points. These defaults will usually be satisfactory, but if you wish to increase the smoothness, increase the rounding resolution number. Keep in mind, though, that Atlas GIS has a limit of 32,759 vertices per region or line, and increasing the rounding resolution number increases the total number of vertices in the buffer region. Decrease the rounding resolution if you reach this limit.

Region Buffers

For region layers, you can specify whether to create buffers on the inside or the outside of the regions, the distance from the region borders to the buffer borders, and the degree of smoothness around the regions.

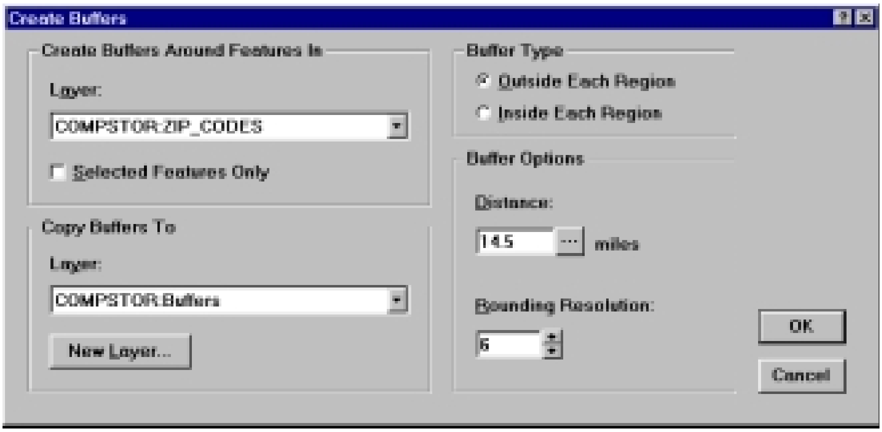


Figure 8.7 **Create Buffers dialog box for region buffers**

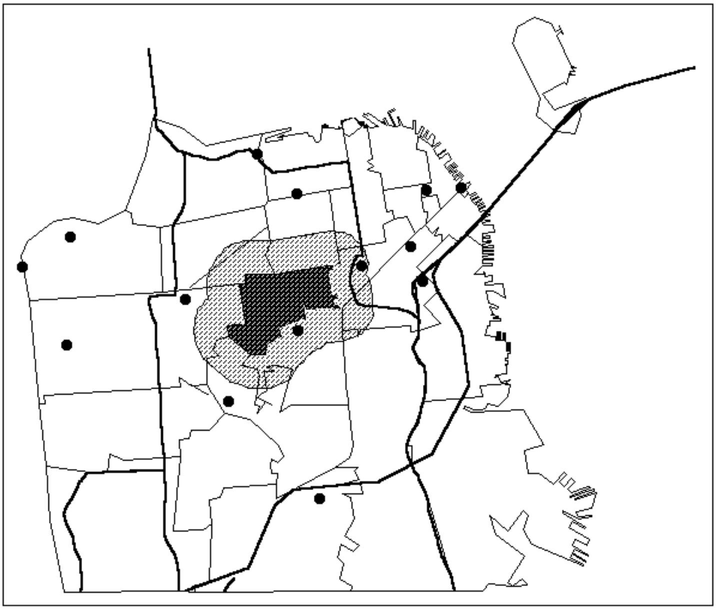


Figure 8.8 **Half-mile buffer around a ZIP code region in San Francisco**

Line Buffers

For line layers, you can specify the distance from the lines to the buffer borders, and the degree of smoothness around the lines.

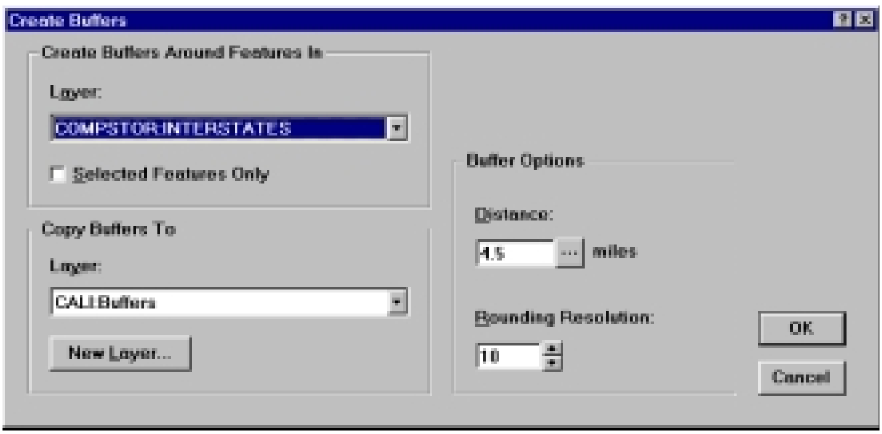


Figure 8.9 **Create Buffers dialog box for lines (corridors)**

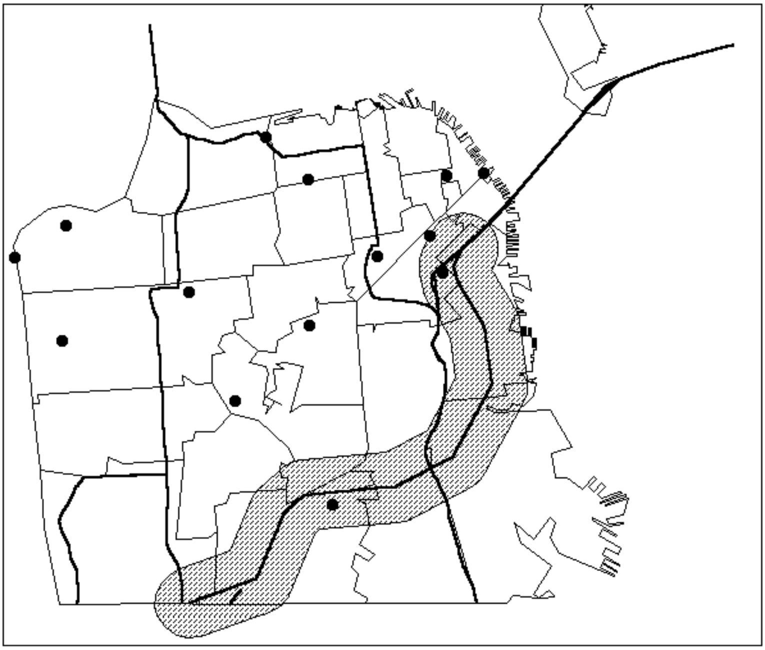


Figure 8.10 **Corridor buffer around I-280 in San Francisco**

Point Buffers

For map points and table points, you can specify the type of buffer to create, the inside radius of the buffer (band buffers only), the outside radius of the buffer, and the smoothness (i.e., the number of points making up each circular buffer).

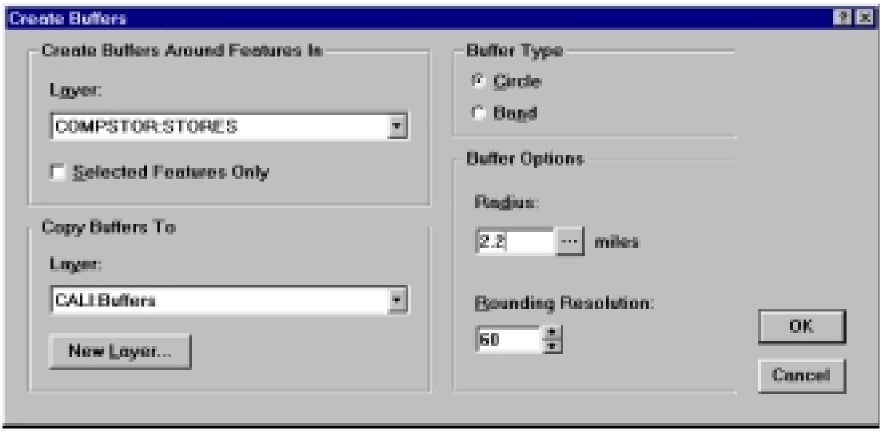


Figure 8.11 **Create Buffers dialog box for points (circle buffer)**

The Band option allows you to create a circular band or "donut" around each point. For example, you might create a circular buffer to cover a 3-mile area around a point, and then create a band buffer to cover the area from 3-10 miles.

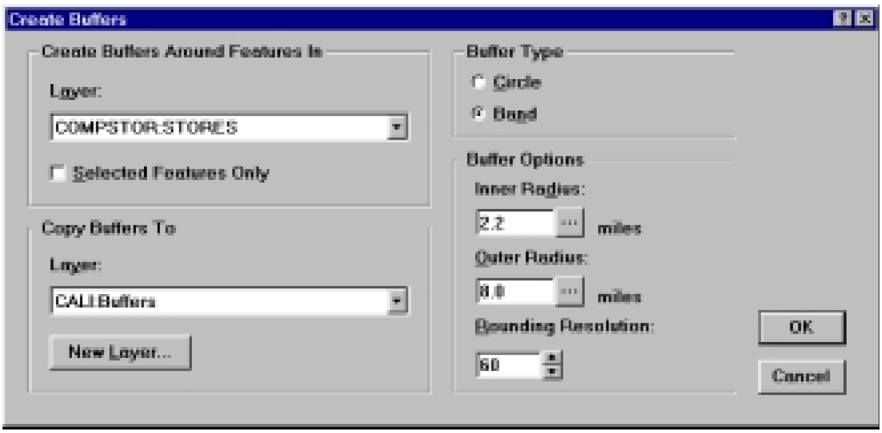


Figure 8.12 **Create Buffers dialog box for points (band buffer)**

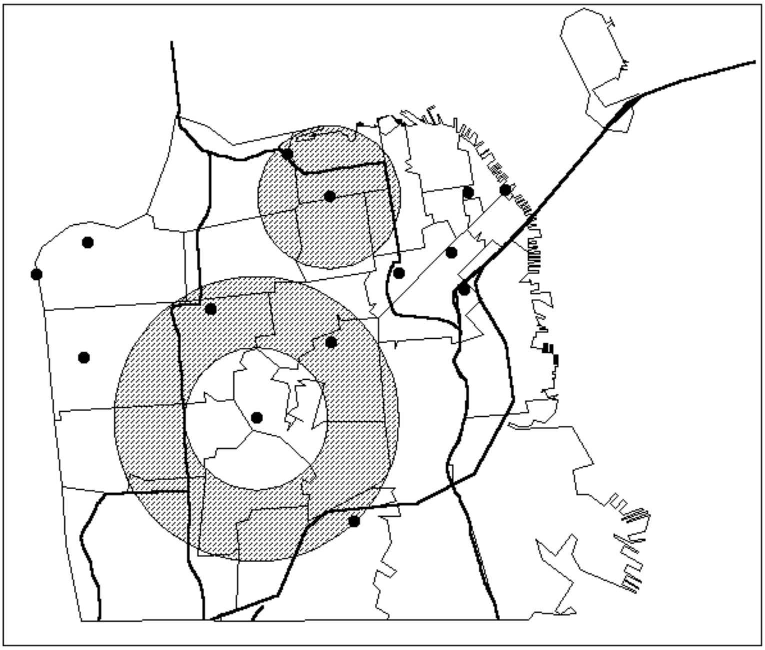


Figure 8.13 **Circle buffer (top) and band buffer (bottom)**

Recommended Uses

- To create circular trade areas around stores.
- To locate and inform all neighbors within 300 feet of a property, as required by most cities, before building permits are granted.
- To represent “areas of influence,” such as a flood plain around a river or a noise corridor along a highway.

Associated Dialog Boxes

Create Buffers
New Layer
Expression Builder

Map | Disperse Points

This command allows you to disperse map or table points that fall at exactly the same location. You can disperse the points in either a random or circular pattern about their location.

Available When

At least one point table or geo point layer is open.

How It Works

When you choose MAP | DISPERSE POINTS, the Disperse Points dialog box pops up, allowing you to specify whether to disperse points, or to undo a previous dispersion. The Points group box allows you to specify the point layer on which to operate and whether to disperse all or only the selected points.

If you click on the Disperse option button, you can specify a dispersion distance and the type of dispersion. The dispersion distance is the radius of the dispersal circle. Circular dispersions place the points evenly along the dispersal circle; random dispersals place the points randomly within the dispersal circle.

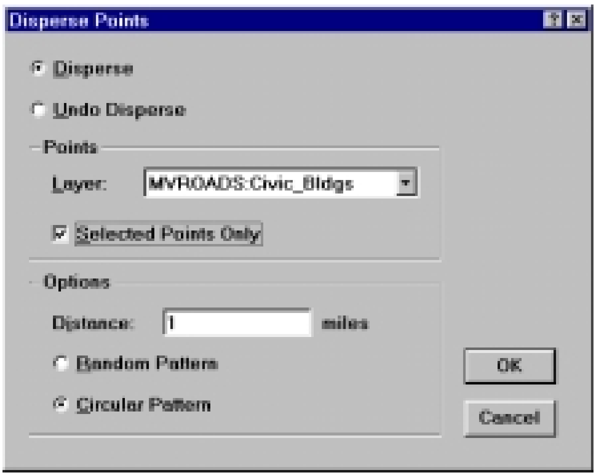


Figure 8.14 **Disperse Points dialog box**

If you click on the Undo Disperse option button, you can specify the grouping expression to use. Most of the time, this grouping expression will simply be one of the table columns. For example, suppose you had geocoded by 5-digit ZIP codes, and you had previously dispersed points that were at the same location (which is also the points that have the same ZIP code). You could then specify ‘ZIP_CODE’ as your grouping expression and undo the dispersion.

Notice that the grouping expression does not have to be a single column name. For example, the expression could be based on a ZIP+4 code that could be in two columns, or it could be a European postal code that was actually a subset of one of the table columns.

Notes:

- If you undo a circular dispersion, the original location can be recalculated; however, if you undo a random dispersion, the location that’s calculated is the average x-y coordinates of the dispersed points. Note that the more points you have in a random dispersion, the closer the calculated average location is to the original one.

- The least accurate method of assigning locations to table points is to geocode by 5-digit ZIP code centroids. Typically, as your method of geocoding becomes more accurate (e.g., using ZIP+4 centroids), the instances of coincident points become less of a problem.

Recommended Uses

- To visually enhance the look of your map by dispersing table points that were assigned the same location by the MAP | GEOCODE BY ZIP/POSTAL CODE command.

- To undo a previous dispersion before you re-geocode your point table. For example, if you add new rows to a customer point table, you may want to undo any previous dispersions before you geocode the new table rows.

- To redo a dispersion after choosing the wrong dispersion distance.

Associated Dialog Box

Disperse Points

Map | Generalize

This command is used to remove insignificant vertices from regions and lines. A vertex may be considered insignificant if its removal would have no appreciable effect on the accuracy of the map.

Available When

A geo file with at least one region or line layer open.

How It Works

When you choose MAP | GENERALIZE, the Generalize dialog box pops up, allowing you to specify the layer that contains the features to generalize (the input layer), the region or line layer where the new, generalized features are placed (the output layer), and the tolerance distance which is used to determine whether a vertex may be removed. You can also choose whether all or only selected features in the input layer are used.

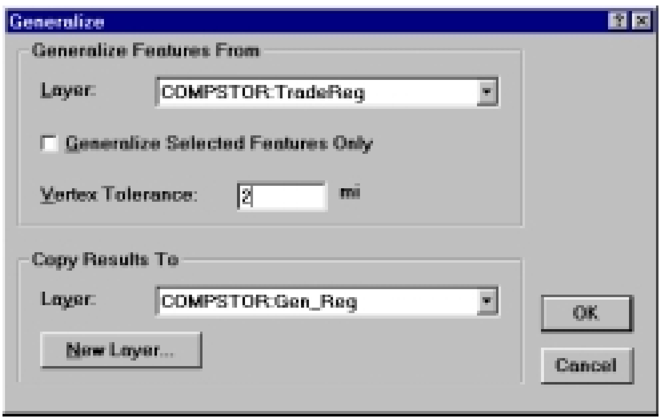


Figure 8.15 **Generalize dialog box**

Based on the specified tolerance distance, Atlas GIS determines whether a vertex may be considered insignificant and can be removed without affecting the accuracy of the map. To make this determination for a given vertex, Atlas GIS first draws an imaginary line between the vertices that immediately precede and follow the vertex being examined. Then Atlas GIS calculates the perpendicular distance from the imaginary line to the vertex. If the perpendicular distance is less than a user-specified tolerance, the vertex is removed. The figure below illustrates the process.

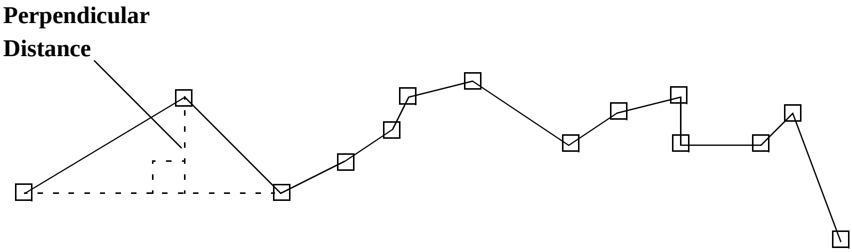


Figure 8.16 **Perpendicular distance used to determine vertex significance**

Notes:

- Regions with common borders in the input layer will still have common borders in the output layer. For features that are near each other, but do not have common borders, be aware that the generalized boundaries might cross each other.
- Generalized features will have the same _ID, _NAME, and _NAME2 in the output layer that they had in the input layer. The _ID for a new feature is modified, however, if there is a conflict with an already existing feature in the output layer.
- If the input layer is linked to a table, the attribute data in the table will not affected by the generalize operation.
- After this command is completed, the previous selections are unchanged. The new, generalized features are not selected.

Input and Output Layers

The input layer contains the existing features to be generalized. These features can be either regions or lines, and you can choose to generalize all or only the selected features in the layer.

The output layer is the layer to which the newly created, generalized features are copied. It must be a different layer than the input layer, but it must be the same type of layer (i.e., region or line). The output layer must be in a geo file that's already open. You can use an existing layer, or you can create a new one by clicking on the New Layer button and filling out the New Layer dialog box.

When you execute this command, the specified features from the input layer are generalized, and the resulting features are written to the output layer. The original features in the input layer are not changed. In the output layer, the newly created features are assigned the _ID, _NAME, and _NAME2 values from the input features.

Recommended Uses

- To improve map redraw speed.
- To reduce the number of vertices in features, so that you can combine more features before reaching the vertex limit. (Atlas GIS has a limit of 32,759 vertices per region.)
- To reduce the number or vertices in large-scale maps, which usually require less detail. This can improve the look of the map and increase the redraw speed.

Associated Dialog Boxes

Generalize
New Layer

Map | Layers & Themes

This command controls all settings associated with the layers in your map, which in turn determine all aspects of the map's content and appearance.

Available When

A file is open.

Shortcuts

- Right-click inside the map frame
- Layers button on the button bar

How It Works

The MAP | LAYERS & THEMES command is quite extensive, branching to many dialog boxes that enable you to modify your map. This command allows you to do the following:

- Add or delete a layer
- Change a layer's drawing order
- Set the range in which layers and labels are visible
- Change a layer's name and add a layer description
- Change the display characteristics of map features
- Specify the content, position, and display characteristics of map labels
- Set up a theme for each layer

The functions provided by this command are covered in this section. Since the functions are so comprehensive, they have been divided into six categories to make it easier to locate desired information. Each of the following categories is discussed as a subsection under MAP | LAYERS & THEMES.

- Basic Layer Settings and Information
- Visibility
- Layer Info
- Style
- Labels
- Theme

Notes:

- Some capabilities of MAP | LAYERS & THEMES are also available from the Legends & Frames dialog box (see MAP | LEGENDS & FRAMES).

- If the automatic redraw option is disabled (i.e., if the *Auto Map Redraw* box is unchecked in the Preferences dialog box under FILE | PREFERENCES), changes made in the Layers & Themes dialog box may not appear immediately on the map. If so, choose VIEW | REDRAW to display the current settings after you've made changes to one or more layers.

Associated Dialog Boxes

The dialog boxes associated with MAP | LAYERS & THEMES are listed in the tables below. Because the command accesses so many dialog boxes, they've been organized according to their access method. Some access methods lead to multiple dialog boxes, while others lead to only one.

The primary dialog box for this command is the Layers & Themes dialog box. The remaining dialog boxes may be accessed by clicking on either a command button or an option button.

Table 8.2 **Associated dialog boxes, accessed by command buttons**

COMMAND BUTTON	DIALOG BOXES
New	New Layer
Delete	none
Legend	Layer Legend (see MAP | LEGENDS & FRAMES)

Table 8.3 **Associated dialog boxes, accessed through option subpanels**

OPTION BUTTON	DIALOG BOXES
Visibility	none
Layer Info	none
Style	Color Symbol table Line style table Fill pattern table
Labels	Expression Builder Label Text Frame
Theme	Ranged Fill Ranged Line Ranged Symbol Proportional Fill Proportional Line Proportional Symbol Dot Density Theme Legend—Ranged Theme Legend—Proportional Theme Legend—Dot Density Expression Builder Color Text Frame

Note: For more detailed information about any of the Atlas GIS dialog boxes, see the on-line help.

Basic Layer Settings and Information

The MAP | LAYERS & THEMES command controls many basic layer settings, including which layers are displayed, whether features are labeled, and whether or how to display data for the layers. You can also create or delete layers with this command, change the drawing order for layers, and access the layer legend controls.

The command buttons in the upper left corner of the Layers & Themes dialog box allow you to perform the following tasks:

- Add layers (to an open geo file)
- Delete layers
- Define the layer legend (see also MAP | LEGENDS & FRAMES in this manual)

The Layers group box displays a row for each layer in the map—whether from a geo file, a point table, or an unlinked table. The layers are listed in the order in which they are drawn. Each row contains basic information for a layer, such as the layer name, visibility, and style samples for features and labels. In summary, the Layers group box is where you control the following basic layer settings:

- View the layer's name, style, and label style
- Change the order in which layers are drawn
- Turn a layer on or off
- Turn a layer's labels on or off
- Turn a layer's theme on or off

When you choose a layer in the Layers group box, its settings will be displayed or editable in the Layers & Themes dialog box and its subdialog boxes. Only one layer can be chosen at a time.

Drawing Order

In the Layers & Themes dialog box, the layers are listed in drawing order in the Layers group box, and the *Order* column shows the order number. The first layer drawn is assigned a value of 1. By default, region layers are drawn first in alphabetical order, then line layers alphabetically, and finally point layers alphabetically. To change the drawing order, drag-and-drop a layer's order number to a different position in the list.

For the best visibility of features, it's usually best to draw regions first, then lines, then points. For example, you might draw county boundaries first, then roads, and then crime locations on top. Within these layer types, you might want to set the order specifically, for example to draw thick-lined state regions after thin-lined county regions so that the state borders are easily distinguishable.

The drawing order can also be used to order the layers in the layer legend. (The Layer Legend dialog box under MAP | LEGENDS & FRAMES offers the choice of drawing order or alphabetical order.)

Layer Status (On/Off)

When a layer is on, it displays in the map, and it can be chosen for Atlas GIS operations. Turning a layer off deselects any selected features in that layer. To turn a layer on or off, choose MAP | LAYERS & THEMES and set the layer status in the *Layer On* column in the Layers group box. This setting can also be changed in the Visibility subpanel (accessed by clicking on the Visibility option button).

Label Status (On/Off)

Labels can also be turned on or off for all features in a layer. When labels are turned on (i.e., when the *Labels On* column setting is 'Yes'), features are labeled with the information and format specified in the Labels subpanel. This subpanel can be accessed by clicking on the Labels option button. (Refer to the "Labels" section for more information on defining labels for a layer.)

When labels are turned on, they display when the map is viewed at the scale specified in the Visibility subpanel, which can be accessed by clicking on the Visibility option button. (Refer to the "Visibility" section for more information on setting the label visibility.)

Labels are normally visible at all scales, but they can be set to be visible only within a specific range. In addition, you can set labels to be visible only when they're unique, or only when they fit along a line segment or within a region.

Theme Status (On/Off)

When a layer's theme is turned on, the theme settings control the appearance of the map features in that layer. In the Layers group box, the *Theme On* column indicates whether a layer has a theme enabled. A layer's theme can be turned on or off here, or in the Theme subpanel (which is accessed by clicking on the Theme option button).

Creating a New Layer

The New button allows you to add a new map layer to an open geo file. This can be useful when creating new map features using the Atlas GIS tools or commands. For example, you might want to create a new layer before you start adding new map features with the drawing tools.

The New button pops up the New Layer dialog box, where you can choose a layer type and specify the file name, layer name (maximum of 16 characters), and description (maximum of 64 characters) for the new layer.

Figure 8.17 **New Layer dialog box**

Note: When a command (such as MAP | CREATE BUFFERS) creates new features for a new layer, its dialog box includes a New Layer button, which also pops up the New Layer dialog box.

Deleting a Layer

The Delete button deletes layers from open geo files. The layer to delete is selected in the Layers group box. A layer must be empty to be deleted (that is, it cannot contain any map features). Use QUERY | SELECT BY LAYER, and then EDIT | DELETE, to delete all the map features in the layer. If the selected layer is a point table or an unlinked table, the Delete button is dimmed.

Note: Even though point tables and unlinked tables appear as layers, you cannot delete these with the Delete button. Instead, use the FILE | CLOSE command to remove point tables and unlinked tables from the list of layers.

Where and When the Settings Are Stored

For geo layers, the layer settings are stored in both the project file (.PRJ extension) and the layer settings file (.LAY extension). For point tables, they're stored in both the project file and the column settings file (.COL extension). The layer settings file and the column settings file are updated whenever you make changes to any of the settings; the project file is updated whenever you save the project file.

The following layer settings are stored in the project file, the layer settings file, and the column settings file. Note that settings in the project file take precedence over settings in either the layer settings file or the column settings file.

- Layer name and description
- Visibility settings
- Style settings
- Label settings
- Layer drawing order

Visibility

Setting the visibility for layers and labels—by specifying a range of map scales at which they display—can enhance a map's usability. For example, a map might contain features at a national level, such as state boundaries, as well as features at a city level, such as streets. You could set the visibility for the street layer so that it only draws when you're zoomed in on the map. Otherwise, the streets would appear as a blot on the map when zoomed out at the national level.

The following functions are controlled by the Visibility option button:

- Set whether a layer is visible, and at what scale
- Set whether labels are visible, under what conditions, and at what scale
- Specify whether a layer appears in the layer legend

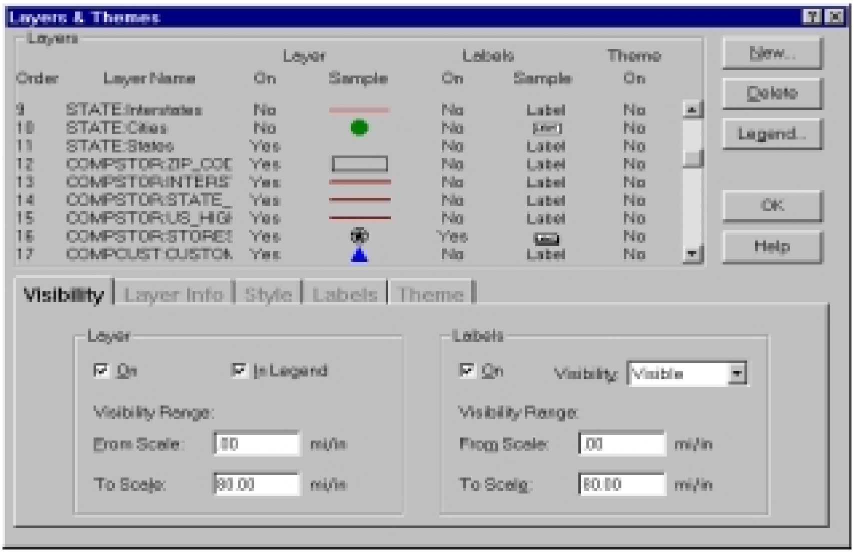


Figure 8.18 **Visibility subpanel**

Visibility Ranges

The current map scale changes when zooming in or out on the map. You can control the content of the map displayed at different map scales by specifying visibility ranges for features and labels. When a visibility range is specified, features and labels for a layer only display when the current map scale is within the specified range.

For example, a layer containing ZIP code regions might have a visibility range from 20 miles/inch to 5 miles/inch. Thus, when the map displays at a scale of 50 miles/inch, the features won't display, because the map scale isn't within the specified range. If you zoom in on the map, the features will not be visible until the map scale is 20 miles/inch; then the features will display. They will continue to display until you zoom beyond the map scale of 5 miles/inch, at which point they will no longer be visible on the map.

The visibility range settings are located in the Visibility subpanel. (Click on the Visibility option button to access this subpanel.) To set the visibility range, enter the scale values in the current map scale units. To specify *infinity* as the maximum visibility range, enter a '0' in the *To Scale* text box. To make a layer or its labels visible at all scales, enter '0' in both the *From Scale* and *To Scale* text boxes. For more information about map scales, refer to Chapter 2, "Basic Mapping Concepts."

Layer Settings

In addition to determining the layer visibility range, the Visibility subpanel also controls whether a layer displays on the map, and whether it is listed in the layer legend. To access more layer settings, click on either the Layer Info option button or the Style option button. See the "Layer Info" and "Style" sections later in this section for more information on available settings.

Label Settings

When a layer is on, labels for that layer can be displayed at all times, only under certain conditions, or not at all. These settings are located in the Visibility subpanel. Other label settings are found by clicking on the Labels option button. (See the "Labels" subsection under MAP | LAYERS & THEMES.)

If labels are turned on, you can specify at what map scales and under exactly what conditions they display. The *Visibility Range* settings determine the map scales; for more information on these settings, refer to “Visibility Ranges” earlier in this section.

The *Visibility* list box controls the conditions under which the labels will display. To display the labels, choose one of the following settings. Notice that some of the conditions are only available for certain layer types.

- *Visible:* All labels in the layer are displayed.
- *Fits* (for region or line layers only): For a region layer, labels display if they fit within their respective region. For a line layer, labels display if they fit between the two endpoints of a line segment.
- *Unique* (for line layers only): This setting displays only the first occurrence of a label when there is more than one feature with the same label. This option is useful when you’re working with line data, such as a street network, and you want to display a single street name for a series of street segments with the same name.
- *Unique Fits* (for line layers only): This combines the functionality of the Unique and Fits options. Only unique labels that fit are displayed.

Layer Info

While the Layers group box displays some basic information about each layer, you can access additional information with the Layer Info option button. Clicking on this button displays the Layer Info subpanel.

You can access and modify the following layer information:

- Layer name
- Layer description
- Linked table (for geo file layers)

You can also view the following layer information:

- Source of layer (file name and path)
- Layer type (regions, lines, points)
- Number of features in layer

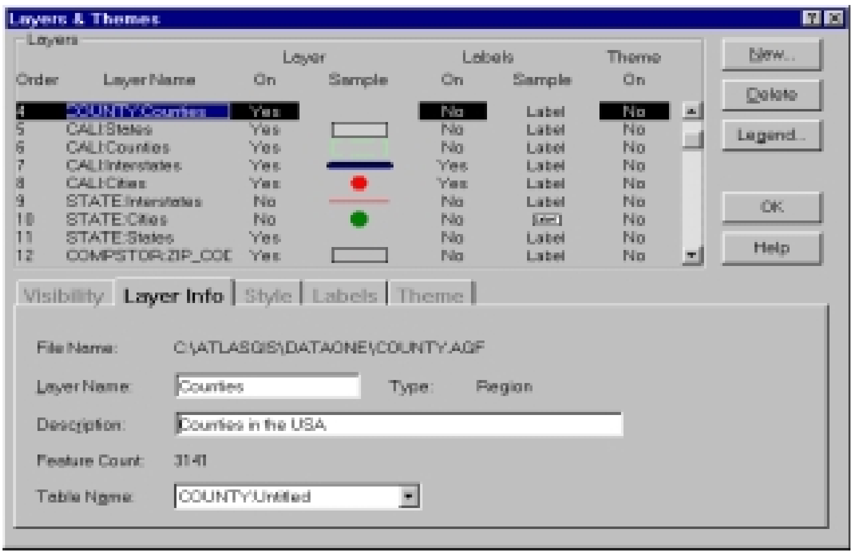


Figure 8.19 **Layer Info subpanel**

Layer Location

The Layer Info subpanel lists the name of the file containing the layer, as well as the path for that file. If the layer is a point table layer or an unlinked table layer, this is the table name; otherwise, this is the geo file name. The file name is not editable.

Layer Name

The name of the selected layer is editable and displays in the Layer Info subpanel. The layer name can be a maximum of 15 characters and cannot contain spaces. Notice that although the layer name appears in the Layers group box, it can only be edited in the Layer Info subpanel.

Layer Type

In the Layer Info subpanel, the *Type* field indicates whether the layer contains regions, lines, or points. The layer type cannot be changed.

Layer Description

Each layer can have a description to help identify the layer contents. The description can be edited in the Layer Info subpanel, and then displayed in the layer legend. (Refer to MAP | LEGENDS & FRAMES for information on displaying descriptions in the layer legend.)

Linked Table Name

If the layer is in a geo file, the name of the attribute table linked to the layer (if any) appears in the *Table Name* list box; if no table is linked, '<None>' displays in the list box. This list box contains the names of all currently open tables. Choosing a different table name unlinks the original table and links the new table to the layer; choosing '<None>' unlinks the table.

When viewing layer information for an unlinked table or a point table, the list of tables will not drop down, since tables cannot link to other tables. For more information about linking, see TABLE | DEFINE COLUMNS or FILE | OPEN in this manual.

Number of Features

The *Feature Count* field shows the number of features the layer contains. This count cannot be edited.

Style

Setting the display characteristics of map features can add meaning, clarity, and design to a map. For the features in a layer, you can alter any of the following style settings by clicking on the Style option button and accessing the Style subpanel:

- Line and fill patterns for region layers
- Line properties for line layers
- Symbol properties for point layers

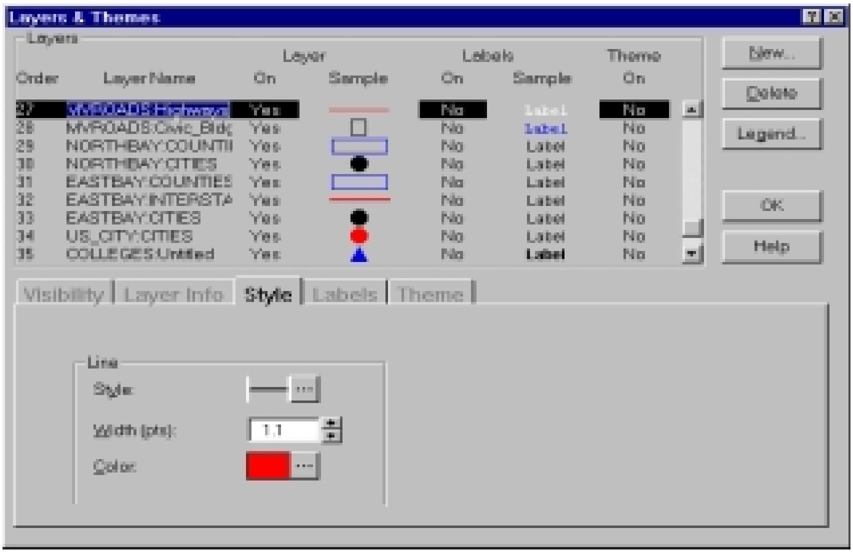


Figure 8.20 **Style subpanel (for a region layer)**

This capability allows you to distinguish the similarities, differences, and interrelationships between features. For example, you can visually classify road types in a transportation map by applying different colors and line widths.

The options available in the Style subpanel depend upon the layer type (region, line, or point). The settings affect all features in the layer as follows:

- For regions, the settings control the outline of the regions (line style, width, and color), and the region color and fill pattern.
- For lines, the settings define the line style, width, and color.
- For points, the settings define the symbol, size, and color.

Notes:

- Line widths are specified in points on the page. Therefore, the width of region borders does not change when the map scale is changed. To display the regions without borders, set the line width to 0.
- If the layer has a theme turned on, the theme settings override the style settings.
- Symbol size is also specified as points on the page. As a result, when you zoom in on the map, the symbols maintain a consistent size.

  Note: Atlas GIS allows you to include up to 30 user-defined, custom symbols in the Symbol table. These symbols are stored in the custom symbol directory (refer to the FILE | PREFERENCES command) and appear in the Symbol table just like the standard symbol set.

Labels

Applying labels to features can significantly improve a map's readability and usefulness. Labels can be very basic, such as store names, or they can be used to show a unique application, such as displaying the latest sales figures for each sales territory. The label content can be any column in the geo file or table, or any valid dBASE expression. You can design the style of the labels to complement the map while conveying the desired information.

The labels for a layer are turned on or off in the Layers group box; however, the following label settings are controlled through the Labels subpanel, which is accessed by clicking on the Labels option button.

- Content and format
- Position
- Text font, size, and color
- Frame background color and fill
- Frame border style and color

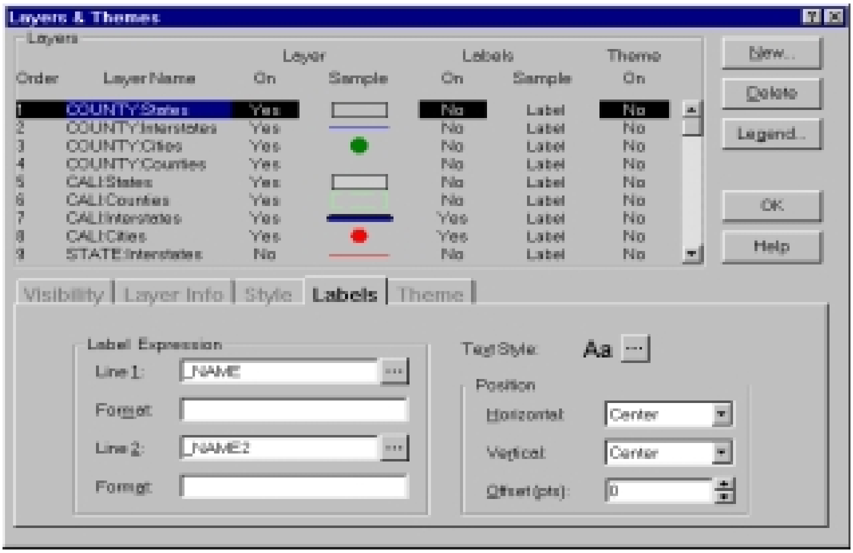


Figure 8.21 **Labels subpanel**

It's important to note that label size is tied to the map. As a result, once you get your labels to fit well on the map, they maintain their same size in relation to the map features, regardless of how far you zoom in and out on the map. Since the labels get smaller as you zoom out and larger as you zoom in, you may want to set the minimum and maximum label size with FILE | PREFERENCES.

Notes:

- Label visibility settings are accessed through the Visibility subpanel. These options allow you to specify a map scale range within which the labels are visible.
- Labels appear and can be edited in the *Labels layer*. When the Labels layer is the default layer set, select a label and use EDIT | HIDE LABEL to hide it. To unhide a label, click on the map feature with the hidden label.
- To label an individual feature, rather than all features in a layer, use the Text tool to create freehand text in the map freehand layer. The text will not be part of the map layer, but you can design, edit, and position the text as you like.

Content

Labels can contain one or two lines of information. Each label expression defines a line of the label content. For example, to label cities with their names, one expression would be defined. To label each city with its name and population, two label expressions would be used.

A label expression can be based on any column in a geo file or table, or any dBASE-compatible expression using attribute data. To create a label expression, use the Expression Builder, which lists all the column names as well as the expression functions and operators. The Expression Builder can be accessed by clicking on the Line 1 or Line 2 [...] button. See Appendix A for more information about valid Atlas GIS expressions, and examples.

When labels are numeric, the *Format* text box controls the format. To specify a format, enter a sample of the desired format. (This is called *picture formatting*.) For example, if you enter '$9,999.99', the label values display with a leading dollar sign, four digits before the decimal point, and two digits after the decimal. When the *Format* text box is blank, the default format is used. For more information about picture formatting, see Appendix C.

Position

The actual text of a label is positioned relative to the label position specified in the Labels subpanel. The Position group box, in the Labels subpanel, allows you to change the position of labels relative to their respective features. This is especially useful for point features. Labels can be above, below, or centered vertically with respect to the features; they can also be left, right, or centered horizontally. When the horizontal or vertical position is not center, the labels can be offset by a specified number of points on the page; the labels are offset in the horizontal and vertical directions specified for the label position. This ensures that for point features the labels don't overlap the point symbols themselves.

You can also change the position of individual labels. When you are working with the Labels layer, you can select a label and use the edit handle to move or rotate the label. (For more information on editing labels, see "Moving a Label" and "Rotating a Label" in *Atlas GIS Help*.)

Notes:

- By default, text is centered horizontally and vertically on the map feature's default label position (for more information on default label position, see Chapter 3, "Storing and Managing Data.").
- When you use the options in the Position group box, all labels in the layer are affected, including any labels that have been moved individually.
- To restore labels to their default label position, use the MAP | RESET LABELS command and specify the map layer in which to reset the labels.

Text and Frame Style

The appearance of the label text—its font, size, and color—is defined in the Label Text dialog box. (This dialog box pops up when you click on the Text Style [...] button in the Labels subpanel.) Settings for the minimum and maximum label size can be accessed through FILE | PREFERENCES.

Label frames are also controlled through the Label Text dialog box. To draw borders around the labels, check the *Frame On* box, and click the Frame Style [...] button to pop up the Frame dialog box. You can specify all aspects of the frame appearance, including details of the outline, fill pattern and color, rounded corners, and shadows.

Theme

Within MAP | LAYERS & THEMES, you can design themes to graphically illustrate your geographically correlated data. Not only do theme maps show you the numbers, they also show you where those numbers are located geographically. They can help disclose relationships that could be overlooked in a typical spreadsheet or pie chart.

Theme maps illustrate relationships in your attribute data by using different colors, patterns, and symbols for map features based on their data values. The attribute data can be from any column in the geo file or table, or from a dBASE expression. Atlas GIS for Windows offers many options for representing a large amount of data clearly and powerfully and for customizing your theme maps in detail.

For example, a theme map might show sales volume per individual sales region. The sales regions could have different colors to indicate high, medium, or low sales volumes. You could also indicate sales volume versus potential market size—in addition to the different colors showing high, medium, and low sales volumes, the estimated potential market size could be indicated by fill patterns. Sales offices might also be represented, using proportional symbols. The symbol size could indicate the sales goal for the year, with colors indicating whether or not the goal was achieved.

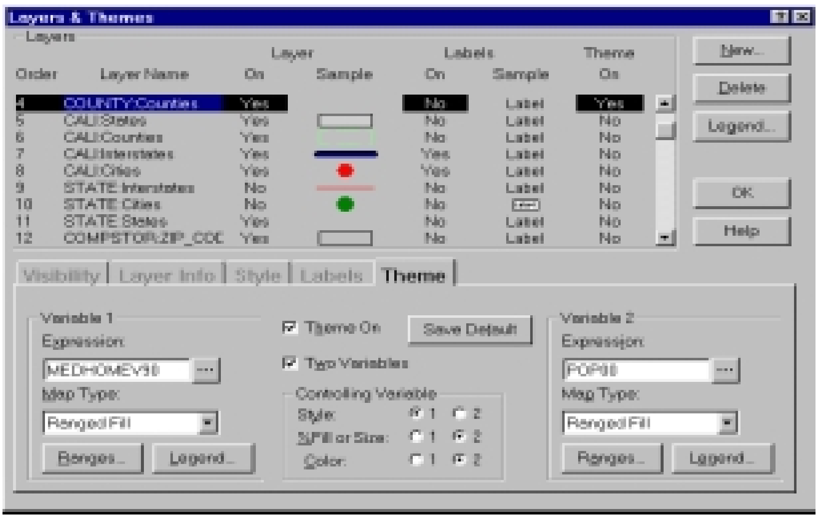


Figure 8.22 **Theme subpanel**

In the Layers & Themes dialog box, the Theme subpanel (accessed with the Theme option button) enables you to perform the following:

- Turn a layer's theme on or off.
- Define the type of theme map (ranged, proportional, or dot-density).
- Define one or two variables.
- When displaying two variables for the same layer, specify which variable controls each aspect of the theme map's appearance.
- For each data range, define its color and pattern, or set up the proportional or dot-density parameters.
- Set up the theme legends.

For conceptual and reference information on these topics, refer to the appropriate section below. Refer to the on-line help for information on the Layers & Themes dialog box controls.

Theme Map Types

You specify a map type for each variable used. Atlas GIS offers three types of theme maps: ranged, proportional, and dot-density. Theme maps can show data pertaining to any kind of layer: region, line, point, even table point. The following table summarizes the types of theme maps available for each type of layer.

Table 8.4 **Summary of theme map types**

LAYER TYPE	MAP TYPES AVAILABLE	DESCRIPTION OF MAP TYPE
Region	Ranged Fill	Divides the data into ranges and uses fill colors and/or patterns to indicate each data range.
	Proportional Fill	Creates a map where the percentage of fill or shade for each feature is in proportion to its data value.
	Ranged Symbol	Creates a ranged map using symbols placed at the region centroid to indicate each data range. (If the centroid falls outside the actual boundaries of the region, Atlas GIS moves it to a location inside.)

Table 8.4 **Summary of theme map types (Continued)**

LAYER TYPE	MAP TYPES AVAILABLE	DESCRIPTION OF MAP TYPE
Region *(continued)*	Proportional Symbol	Creates a proportional map using a variable sized symbol placed at the region centroid to indicate the range of data values. (If the centroid falls outside the actual boundaries of the region, Atlas GIS moves it to a location inside.)
	Dot-density	Creates a dot-density map using a series of randomly placed symbols or dots, each of which represents a certain value.
Line	Ranged Line	Uses line style, color, and width to indicate each data range.
	Proportional Line	Uses a variable line thickness to indicate the range of values.
Point	Ranged Symbol	Uses different symbol types, sizes, and colors to indicate the data ranges.
	Proportional Symbol	Uses variable symbol sizes to indicate the data ranges.

Ranged Maps

Ranged maps use a variety of methods to divide the data into distinct ranges. Each data range is represented by a fill color and pattern for regions; line color, style, and width for lines; or symbol style, color, and size for points. For ranged maps, you can set the following parameters:

- Ranging method
- Number of ranges
- Minimum and maximum values (depending on the ranging method)
- Fill pattern and color
- Line style, width, and color
- Symbol size and color

Note: If you change either the ranging method, the number of ranges, or the minimum or maximum values above, the Calculate button in the Ranging group box turns yellow, indicating that the ranges need recalculating. Click on the button to calculate new ranges.

Ranging Methods

There are eight different ranging methods to help you break up the data into the desired ranges. To create a ranged theme map, you specify the ranging method to use and the number of data ranges. Then you specify the color, style, or pattern for each range. This section describes the different ranging methods in Atlas GIS.

The first three ranging methods are *automatic methods*. After you specify the number of data ranges, these methods automatically create the limits and statistics for each data range.

- Quantiles
  This method creates ranges where each contains the same number or percentage of the data values. For example, the Quantiles method with four data ranges places roughly 25% of the data values in each range.

- Equal Size
  This method creates ranges of the same size (for example, 100–200, 200–300, 300–400, and so on). It takes the difference between the values in the Maximum Value and Minimum Value fields and divides it by the number of ranges.

- Standard Deviation
  This method creates ranges of one standard deviation in size around the mean. For an even number of ranges, it distributes the data around the mean in equal ranges of one standard deviation in size. For an odd number of ranges, the data is also distributed around the mean in equal ranges of one standard deviation; however, the middle range is actually two standard deviations in size.

The next five ranging methods are *manual methods*. After you specify the number of data ranges, you can specify the exact data range limits for each range.

- Counts
  This method creates ranged maps in which you supply the number of data values that each data range will contain. If the sum of the numbers you enter does not equal the total number of values, the difference is shown as the number of out of range values. The Counts method is essentially the same as the Quantiles method, except that you can fine-tune the number of data values in each range.

- Percentages
  This method creates ranged maps in which you supply the percentage of in-range data values that each range will contain. If the percentages you enter do not add up to 100%, the difference is shown as out of range. The Percentages method is essentially the same as the Quantiles method, except that you can fine-tune the percentage of data values in each range.

- Continuous
  This method creates ranged maps in which you supply the maximum data value for each range. You can create unbroken, or continuous, data ranges. Atlas GIS automatically fills in the minimum value for the first range, using the minimum value shown in the Statistics group box.

  The minimum value for the other ranges is the maximum value of the previous range. When you enter the maximum value for each range, the minimum value is automatically calculated for the next range.

- Discontinuous
  This method creates ranged maps in which you supply the minimum and the maximum data value for each range. With this method, you can create data ranges that are not continuous (that is, there may be gaps between the ranges).

  For example, suppose you only want to display areas where lower or upper income households reside. You can, for instance, set your data ranges as $7,000 to $15,000 and $75,000 to $100,000. There is a large gap in the data between 15,000 and 75,000, because you have chosen to omit the middle income households.

  Another common example is when you have integer data, and you want to set up ranges such as 0–10, 11–20, 21–30, and so on.

- List of Values
  This method creates ranged maps in which you supply a list of distinct data values (numeric or character) for each range. This method lets you match the ranges with exact data values from the fields in the attribute file. Use this method when you have character data.

Calculating the Ranges

When you click on the Ranges button on the Theme subpanel, either the Ranged Fill, Ranged Line, or Ranged Symbol dialog box pops up, depending on the type of ranged map you're creating. Use the list of ranges at the bottom of each dialog box to enter range limits, counts, percents, or values for each range.

You can also set the colors and patterns for each range. There is a Smooth button that allows you to calculate subtle gradations for all the assigned colors between the lowest range and the highest range in the list of ranges. Click the Color column for the lowest range to pop up the Color dialog box, and choose a color from one of the palettes. Repeat the process for the highest range. After you've selected colors for the lowest and highest values, click on the Smooth button.

Summary Statistics

Any dialog box that pops up when you click on the Ranges button displays summary statistics for the entire data set. These statistics provide useful information about the dispersion of the data and may aid you in designing your data ranges. For instance, after you choose a ranging method, you can use these statistics if you're fine-tuning the minimum and maximum values for each data range.

Proportional Maps

Proportional maps depict data by varying the percent of fill, the line width, or the symbol size for each feature in direct proportion to its data value. There are three types of proportional maps: proportional fill (region layers), proportional line (line layers), and proportional symbol (region and point layers). The options are slightly different for each type:

- For a proportional fill map, the data values are assigned a variable percent of fill.
- For a proportional line map, the data values are assigned a variable line width.
- For a proportional symbol map, the data values are assigned a variable symbol size.

When you click on the Ranges button in the Theme subpanel, either the Proportional Fill, Proportional Line, or Proportional Symbol dialog box pops up (depending on the theme layer type). In these dialog boxes, you can set the following parameters:

- Percent fill, line width, or symbol size for the high and low data values.

  The percent fill, line width, or symbol size for every other data value is calculated accordingly by a direct, linear relationship. For example, a data value that falls exactly halfway between the high and low values will be assigned either a percent fill, line width, or symbol size that's half as large as the high value (and twice as large as the low value). For negative values, the absolute value of the number is used to determine the percent of fill, line width, or symbol size (for example, -50 is assigned the same percent of fill, line width, or symbol size as +50).

  For proportional line and proportional symbol maps, you can also set limits for how small or how large the line widths or symbol sizes can get. This is useful if you have one or two very small or very large data values that are much different than the remaining data values. You can avoid, for example, having a huge symbol that's three times the size of any other.

- Fill pattern and color, line style and color, or symbol type and color for positive and negative data values.

  For proportional fill maps, all positive data values are assigned the same fill pattern and color, but their percent of fill increases proportionally as their data values increase. To distinguish between positive and negative values, the negative values can be assigned a different fill pattern and color. Thus, -50 has the same percent of fill as +50, but a different pattern and color.

  For proportional line maps, all positive data values are assigned the same line style and color, but their line widths increase proportionally as their data values increase. To distinguish between positive and negative values, the negative values can be assigned a different line style and color. Thus, -50 has the same line width as +50, but a different style and color.

  For proportional symbol maps, all positive data values are assigned the same symbol type and color, but their symbol size increases proportionally as their data values increase. To distinguish between positive and negative values, the negative values can be assigned a different symbol type and color. Thus, -50 has the same symbol size as +50, but a different type and color.

Dot-Density Maps

Dot-density maps fill regions with dots that are randomly placed and uniformly sized. Each dot represents a certain value, and their density in various regions can reveal distinct patterns, such as clustering. For dot-density maps, you can set the following parameters:

- Data value for each dot

  This is the data value that each dot represents. For example, if the dot value is 25, then a region with a data value of 100 (or even -100) would contain four dots.

- Maximum number of dots per region

  This option is useful when there are a few data values that are considerably larger than the rest. Setting this number helps avoid having regions that display as a complete mass of densely packed dots.

- Symbol type, size, and color for positive and negative data values

  All corresponding positive and negative data values are assigned the same number of dots, with the number of dots increasing as the absolute value of the data values increase. To distinguish between positive and negative values, the negative values can be assigned a different symbol type, size, and color. Most of the time, however, you would only assign them a different color. Thus, -50 has the same number of dots as +50, but a different color.

Theme Variables

Variables are the data values that determine the display characteristics of a layer, e.g., which column to display, what type of map (ranged or proportional), etc. Each variable can be a column, or it can be an expression based on the attribute data from a geo file layer, linked table, or point table. The maximum length of the theme expression is 250 characters.

You can have up to two theme variables per layer. When a map contains a layer that has two theme variables, the map is called a *bivariate* map. For a bivariate map, at least one of the variables must be ranged—you cannot specify two proportional variables. You can, however, specify two ranged variables. If one of the variables is proportional, that variable must control either the percentage of fill (region layers), the line thickness (line layers), or the symbol size (point layers).

You can have as many themes as you want in a map, but you can only display four theme legends at once. Each legend explains the meaning of the colors, fill patterns, symbols, or dot density groupings for a particular layer's theme. When multiple variables are used, only one variable per layer can be proportional.

Setting Up the Legends

As discussed earlier, you can have a theme for every layer in your map, but for those themes, you can display only four legends at one time. To access the Theme Legend dialog box, click on the Legend button in the Theme subpanel. You can also right-click on the theme legend itself, or use the Legends & Frames dialog box to access the Theme Legend dialog box (see MAP | LEGENDS & FRAMES for more information).

There are three separate Theme Legend dialog boxes—one for ranged maps, one for proportional maps, and one for dot-density maps. In each of the dialog boxes, you can set the following parameters:

- the number of columns in the legend
- the style, color, and width of the legend border
- the text size, color, and font for the legend title
- the size, order, and spacing for the legend entries, text, and font

Saving Theme Settings

The theme settings are stored in the project file, which is updated when you save it. Atlas GIS allows you to save the theme settings and use them as the default settings for future themes. To save the settings, click on the Save Default button. This button allows you to change the default settings used for new themes. This is important if you typically need different settings than those provided as the Atlas GIS defaults.

For example, a project file might contain several geo files, each containing features and attribute data for a different state. You can define theme settings for a layer in one state file, and save them as the default settings. These settings would then appear by default when you turned on the theme for layers in the other state geo files, thereby saving you the time and effort of redefining them for each layer to be included in the theme map.

Map | Legends & Frames

This command allows you to set the appearance and content of each page element.

Shortcuts

The Legends button on the button bar
(or right-click on any page element to edit that one element).

How It Works

When you choose MAP | LEGENDS & FRAMES, the Legends & Frames dialog box pops up, providing a central location from which to view and set all display options for all page elements: the map frames, theme legends, layer legend, title, map scale and page frame. For each page element, you determine how and whether the element and its border are displayed.

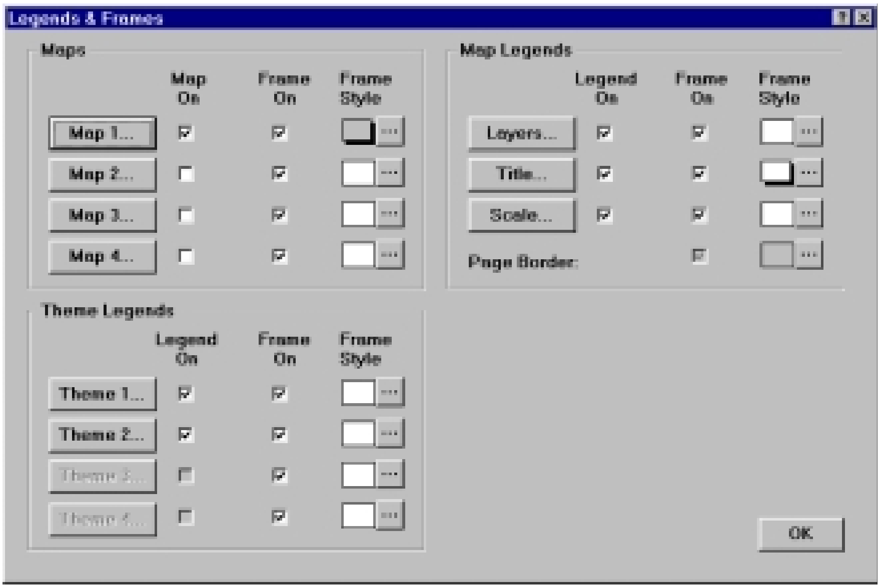


Figure 8.23 **Legends & Frames dialog box**

The buttons that are arranged in a column on the left side of each group box pop up other dialog boxes that control the contents of the various legends and frames. The *Map On* and *Legend On* check boxes immediately to the right of the buttons determine whether that particular page element is turned on or off.

The 'Frame Style' samples display the outline and background properties for each page element, including its line style, width, and color, and its fill pattern. Clicking on one of the Frame Style […] buttons pops up the Frame dialog box, which allows you to change the frame properties. The *Frame On* check boxes determine whether the outlines and backgrounds are displayed.

You can access the following legends and page elements with this command:

- Map frames 1 through 4
- Theme legends 1 through 4
- Layer legend
- Title frame
- Scale frame
- Page border

Notice that since the page doesn't really have "contents" (that is, no contents other than the other elements), there is not a button for it, and you cannot turn it off. You can, however, turn its frame on and set its border and background color. All the other page elements can be turned on and off, and their frame borders, background colors, and contents can be set. To set the page size and orientation, choose FILE | PAGE SETUP.

For each button in the Legends & Frames dialog box, the following dialog boxes are available. For more details about the options in any of these dialog boxes, see the on-line help.

Layers & Themes
Clicking on one of the Map buttons accesses its corresponding Layers & Themes dialog box (also available by right-clicking inside any map frame, choosing the MAP | LAYERS & THEMES command, or by clicking on the Layers button on the button bar). This dialog box allows you to control the settings for your layers, labels, and theme maps. For more information, see MAP | LAYERS & THEMES.

Theme Legend
Clicking on one of the Theme buttons accesses its corresponding Theme Legend dialog box (also available by right-clicking inside a theme legend, and by clicking on the Legend button from within the Layers & Themes dialog box). This dialog box allows you to control the appearance of your ranged, proportional, and dot density theme legends.

Layer Legend
Clicking on the Layers button accesses the Layer Legend dialog box (also available by right-clicking in the layer legend). This dialog box allows you to control the content appearance of the layer legend.

Title
Clicking on the Title button accesses the Title dialog box (also available by right-clicking in the title frame). This dialog box allows you to control the content and appearance of the title.

Scale
Clicking on the Scale button accesses the Scale dialog box (also available by right-clicking in the map scale frame). This dialog box allows you to control the content and appearance of the scale.

Associated Dialog Boxes

Frame
Layer Legend
Layers & Themes
Legends & Frames
Scale
Theme Legend
Title

Map | Reset Labels

This command resets the labels for one or more layers to their default location, visibility status, and angle of rotation. In other words, you can undo any changes you make to a layer with the Label tool.

How It Works

When you choose MAP | RESET LABELS, the Reset Labels dialog box pops up, allowing you to highlight the layers that contain the labels to reset.

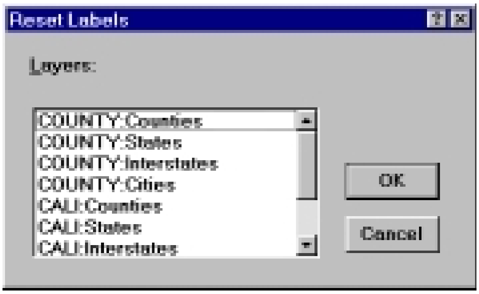


Figure 8.24 **Reset Labels dialog box**

Recommended Uses

- To undo the label edits made with the Label tool
- To reset the labels in a map converted from Atlas GIS for DOS

Associated Dialog Box

Reset Labels

Map | Split

This command is used to create new map features by overlaying one layer with another layer. With this command, the features in the input layer are split by the features in the overlay layer, and the results are copied to a separate layer.

Available When

At least one geo file is open, with at least two region or line layers.

How It Works

When you choose MAP | SPLIT, the Split dialog box pops up, allowing you to specify the layer that contains the features to split (the input layer), the layer that contains the regions to use as the cutting pattern (the overlay layer), and the layer where the new, split features are placed (the output layer). You can also choose whether all or only selected features in the input layer and the overlay layer are used, and specify the size of the smallest region to create.

Figure 8.25 **Split dialog box**

With the MAP | SPLIT command, you can work with regions or lines in either of the following ways:

- Split a region layer by a region layer. An example of this is shown in Figure 8.26. The input region is split by every overlay region that overlaps it. Each piece becomes a separate map feature. If a piece is overlapped by more than one overlay region, that piece receives its data from the first overlay region Atlas GIS encounters (which is often the leftmost region). To determine which region was used, refer to the new feature's name.
- Split a line layer by a region layer. An example of this is shown in Figure 8.27. Note that if part of a line follows the border of the overlay region, that part is considered to be *inside* the region.
- Split a line layer by a line layer. An example of this is shown in Figure 8.28.
- Split a region layer by a line layer. An example of this is shown in Figure 8.29.

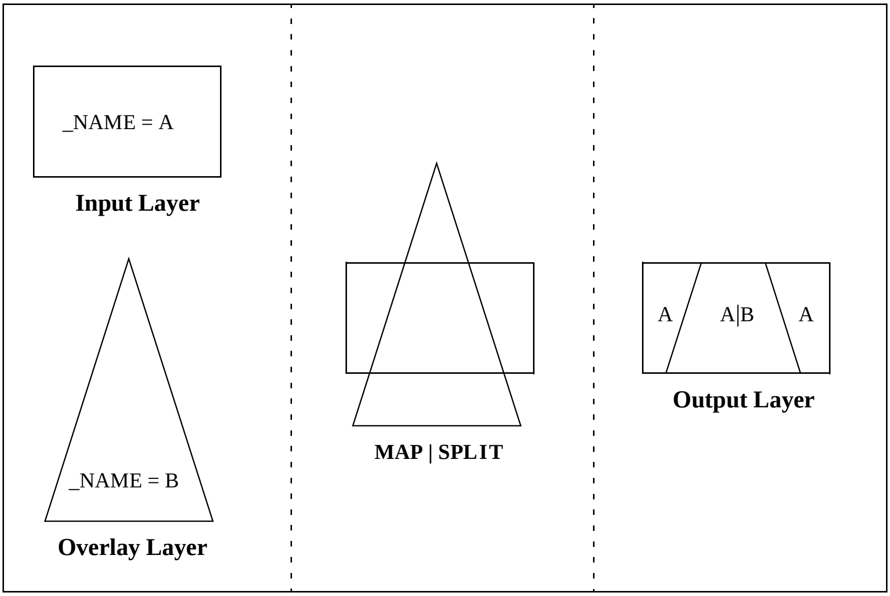


Figure 8.26   **Splitting a region layer by a region layer**

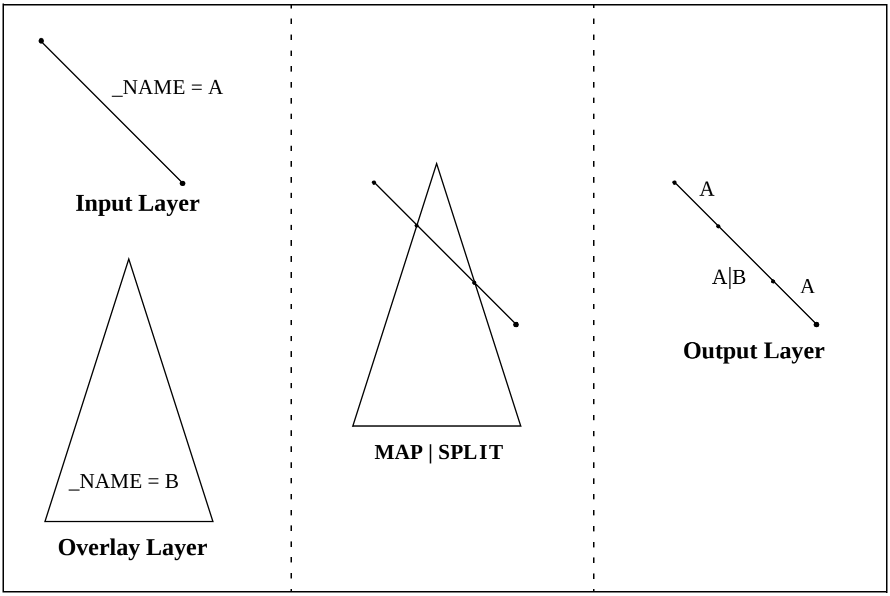


Figure 8.27 **Splitting a line layer by a region layer**

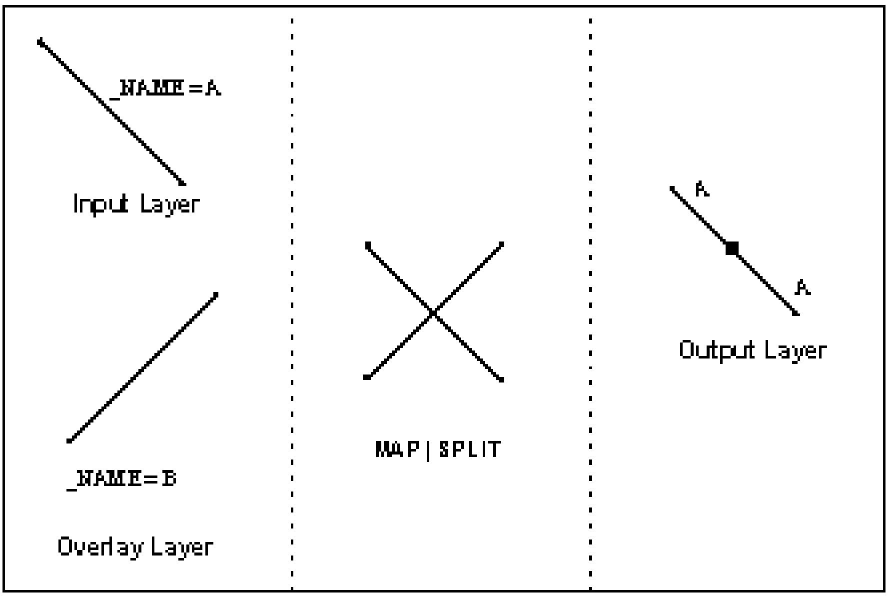


Figure 8.28**Splitting a line layer by a line layer**

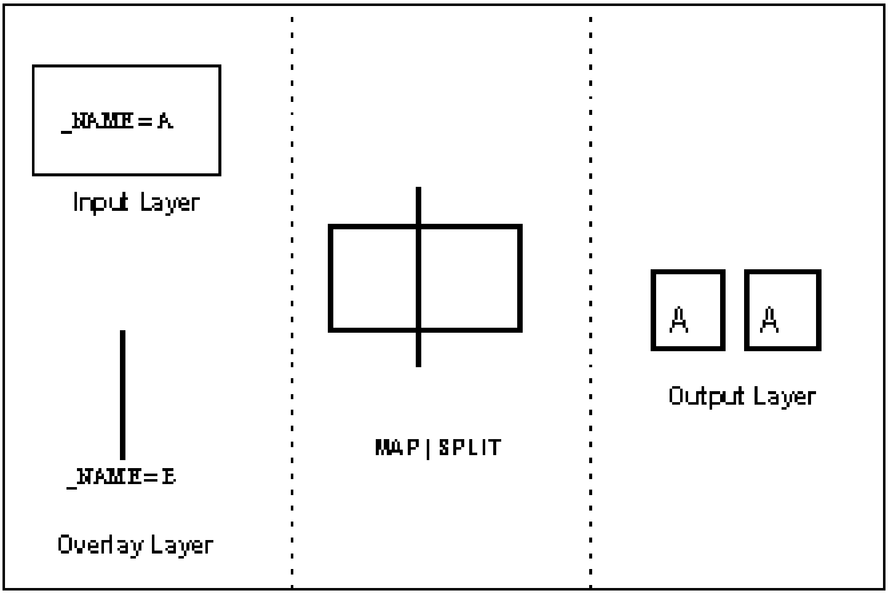


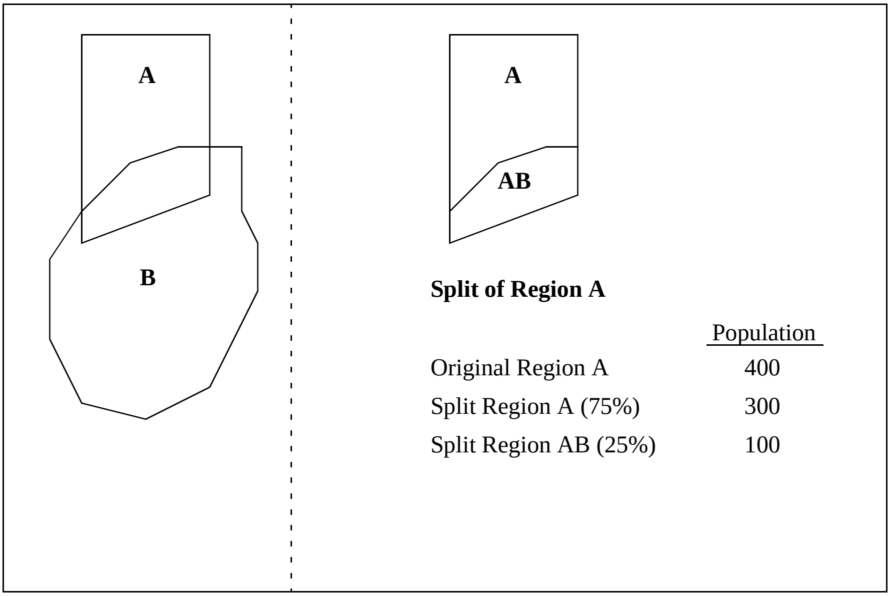
Figure 8.29**Splitting a region layer with a line layer.**

For each new feature created, data might be assigned from a parent feature in either the input or overlay layer. For each writable column associated with the new feature, Atlas GIS first checks for a matching column name in the input layer. If there is no match, then Atlas GIS checks the overlay layer for a matching column name. Read-only columns are skipped.

When a matching column is found, Atlas GIS then checks whether the columns are the same type (i.e., whether both are numeric). If the columns are not the same type, no data is copied. If both columns are the same type, and they are not numeric, the data is copied from the source feature to the new feature. If both columns are numeric, and the aggregation method specified for the column in the output layer is *Sum*, then the data is disaggregated from the source feature; otherwise, the data is copied.

To disaggregate data from a source feature, Atlas GIS calculates a disaggregation ratio. When the new feature is created, Atlas GIS determines what fraction of the area or length of the source feature is represented by the output feature. Then it multiplies the source data by that ratio, and assigns the result to the output feature. Thus, a percentage of data from the source feature is assigned to the new feature, that is the percentage of the original feature which was used to create the new feature.

For example, a census region with a population value of 400 is split into two parts by a water district. The resulting areas of the two new features are 25 and 75 percent of the original region size. The population value for the census region is proportioned by the same amount to 100 and 300, respectively, as shown in the following figure.



Split of Region A

	Population
Original Region A	400
Split Region A (75%)	300
Split Region AB (25%)	100

Figure 8.30 **Disaggregating numeric data**

Notes:

- There is no UNDO for this operation; however, if the operation is cancelled before completion, all the new features are deleted from the output layer.
- During the split operation, the progress bar updates at the end of the split of each feature from the input layer. Thus, if a feature is overlaid by many features in the overlay layer, the split for that feature may take some time; the progress bar will not update until the feature has been split by all of the features that overlay it.

- The split features will have the same _ID in the output layer that they had in the input layer. The _ID may be modified, however, if there is a conflict with an already existing feature in the output layer.
- The primary and secondary names (_NAME and _NAME2) of the new features are formed by concatenating the names of each intersecting feature. The new names are a combination of the input feature name and as many of the overlay feature names as can fit in 64 characters, with the name components separated by vertical bars (|). For example, if the input feature name is "Parcel 20" and the overlay feature name is "Soil 1," the split feature's name would be "Parcel 20|Soil 1."

  Note: If the _NAME and _NAME2 columns for the input and overlay features are empty, the _NAME and _NAME2 columns will also be empty.
- When disaggregating data, the proportional values may not add up exactly to the original number due to rounding, but the cumulative error will be minor.

Input, Overlay, and Output Layers

The input layer contains the existing features to be split. These features can be either regions or lines, and you can choose to split all or only the selected features in the layer.

The overlay layer contains the existing features to use as the cutting pattern when splitting the input features. This layer must be a region layer, and it must be a different layer than the input layer.

The output layer is the layer to which the newly created, split features are copied. It must be a different layer than the input layer, but it must be the same type of layer (i.e., region or line). The output layer must be in a geo file that's already open. You can use an existing layer, or you can create a new one by clicking on the New Layer button and filling out the New Layer dialog box.

When you execute this command, the features from the input layer are copied into memory and then split using the features in the overlay layer. (The original features in the input layer are not changed.) The results are written to the output layer. Thus, all of the split features from the input layer, as well as the features that were not split by overlaying features, will appear in the output layer. For example, if none of the features in the overlay layer actually overlay any features from the input layer, all of the features from the input layer will appear in the output layer, without any new, split features.

Recommended Uses

- To create new features by splitting one layer by another layer, and disaggregate the data proportionally. For example, a census region might be split into two parts by a store trade area. The resulting areas of the two new features are 25 and 75 percent of the original census region size. Thus, the population value for the region is proportioned by the same amount, so that 25 percent of the value is assigned to one feature, and 75 percent is assigned to the other.
- To find the intersection of features in two layers. For example, you can determine the areas where a proposed industrial park coincides with critical wetland environment.
- To obtain information from one geographic reporting level for another area and disaggregate the data. For example, a market researcher can obtain information by postal code regions for the people living within a five-mile trade zone of a store. The postal code regions can be split by the five-mile trade zone and the data disaggregated. Then the data for the regions and partial regions inside the trade zone can be summarized.
- To generate new information from two different region coverages, each with a different type of attribute data. For example, land use polygons can be overlaid and split by soil polygons to create new polygons that show land use by soil type. The attribute table might look like this:

	LAND USE	**SOIL TYPE**
Land Use Polygon A	Rural	—
Soil Polygon B	—	Clay
New Overlay Polygon AB	**Rural**	**Clay**

Associated Dialog Boxes

Split
New Layer
New Table

9

Table Menu

The TABLE menu contains the commands you use to work with table data in Atlas GIS. Some of these commands affect the display of a table or its structure. Others calculate data for the table from an expression you specify, by aggregating data from other features, or by matching ZIP codes and assigning coordinate data. Here's a summary of the TABLE commands, listed in menu order.

Table 9.1 **Table menu**

COMMAND	DESCRIPTION
Sort	Sort a table to control the display order of data in a Table window.
Show All/Selected Only	Show all the table rows or only the selected ones in a Table window.
Define Columns	Control the format and structure of columns in the table; add and delete columns; link tables to map layers, or unlink them.
Add Rows	Add a row to the table.
Calculate Column	Calculate values for a column in the table.
Assign Data by Location	Retrieve data from an input feature and assign it to a target feature based on whether the target feature is inside of or near the input feature.
Aggregate Data	Aggregate data from features in one layer, and assign the calculated values to features in another layer.
Geocode by Address	Derive street address locations, ZIP+4 centroids, ZIP+2 centroids, or 5-digit ZIP code centroids, and assign the coordinates to rows in a point table; standardize addresses in a point table.
Geocode by ZIP	Derive locations for 5-digit ZIP code centroids, and assign the coordinates to rows in a point table.
Geocode by Map Layer	Derive locations for map feature centroids, and assign the coordinates to rows in a point table.

Table 9.1 **Table menu**

COMMAND	DESCRIPTION
New Report	Creates a new Report Template (*.rpt) file based on a selected layer's data, and launches the report file into the Crystal Reports application.
Open Report	Opens an existing Report Template (*.rpt) file with the option of using either the existing report data or a new data source with the Report Template and launches the report file into the Crystal Reports application.
Delete Report	Allows you to select a Report Template (*.rpt) file and delete it.

Note that in the remaining sections of this chapter, the individual TABLE commands are discussed in alphabetical order, not in menu order.

Table Windows

A *Table window* in Atlas GIS displays data (geographic and attribute) for the layer you choose. You can view and edit the table data and select features through the Table window.

Each Table window uses a sort expression to determine its *sort order*—the order in which its rows display. You can use one of the defined sort expressions provided with each table, or you can create your own. (The defined expressions sort on the _ID, _NAME, and _NAME2 column in the geo file, and on the key column in the table.) The sort order for the table can be based on either the geo file or the linked attribute table. Note that you can have multiple Table windows open for the same layer, each using a different sort order.

If the rows in the table or the map features in the geo file do not all have matching counterparts, the Table window may not display all the features in the layer or all the rows in the table. When the sort order is based on the geo file, the Table window will not display rows in the table that don't have corresponding map features in the geo file. When the sort order is based on the table, unmatched map features in the geo file will not be shown in the Table window. Furthermore, the contents of the Table window do not necessarily correspond to what is processed by a query operation, which may use a different sort expression.

For example, suppose you select all the features in a layer (with QUERY | SELECT BY LAYER) and then delete the selected rows in the Table window (with EDIT | DELETE ROWS). This does not necessarily delete all rows from the Table window. If the Table window's sort order is based on a column in the table, the window may display some unmatched table rows which don't have corresponding map features. Since QUERY | SELECT BY LAYER searches the geo file, these unmatched table rows do not get selected. Consequently, when selected rows are deleted from the Table window, the unmatched rows remain unaffected.

For more information about the Table window, refer to WINDOW | NEW TABLE WINDOW. For more information about sort orders, see TABLE | SORT.

Table | Add Rows

This command allows you to add rows to a table.

Available When

- A Table window is open and does not display the selected rows only.
- The sort order is based on the table, not on the geo file.

How It Works

Choosing TABLE | ADD ROWS places a check mark before the menu item and scrolls to the bottom of the table (in the topmost Table window), where a blank row is added. When you place the cursor in this new row, Atlas GIS assigns a default value to the key column and creates another blank row beneath the new row. You can enter a desired value in the key column (replacing the assigned default) when adding data to the new row.

When a table is linked to a layer in a geo file, if the layer contains a map feature without a matching row in the table, a new (matching) table row is automatically created when you type in an attribute value for that feature in the Table window or Info window (when TABLE | ADD ROWS is checked).

To turn off the command, choose TABLE | ADD ROWS from the menu again. The following actions uncheck the TABLE | ADD ROWS menu item and dim it, so that the command is unavailable.

- Choosing TABLE | SHOW SELECTED ONLY.
- In TABLE | SORT, choosing a sort order based on the geo file (for linked tables).

Table | Aggregate Data

This command aggregates data from features in one layer and assigns the calculated values to features in another layer. In other words, you can calculate attribute data for one set of features by aggregating the data from another set of features.

Available When

A geo file or point table is open.

How It Works

The software determines whether a feature from the input layer is *in* or *near* a feature from the target layer, and depending on the type of layers involved, one of the following processing methods is used:

- Point-in-Region
  Calculates data for a region layer based on the points inside each region.

- Region-in-Region
  Calculates data for a region layer based on the regions inside each region.

- Point-near-Point
  Calculates data for a point layer based on the points near each point.

- Point-near-Line
  Calculates data for a line layer based on the points near each line.

The column names in the input and target tables are compared, and data is aggregated for only those columns that appear in both tables. The aggregated data is stored in the target table and provides a statistical summary of the input features.

When you choose TABLE | AGGREGATE DATA, the Aggregate Data dialog box pops up, allowing you to specify the following:

- The *target layer* (the layer you're aggregating data for)
- Whether to aggregate data for all or only the selected features in the target layer
- Whether and in what column to record the number of input features from which the aggregated data was derived
- A new table (if needed) for the target layer
- The *input layer* (the layer you're aggregating data from)
- Whether to aggregate data from all or only the selected features in the input layer
- The options for the types of layers being processed

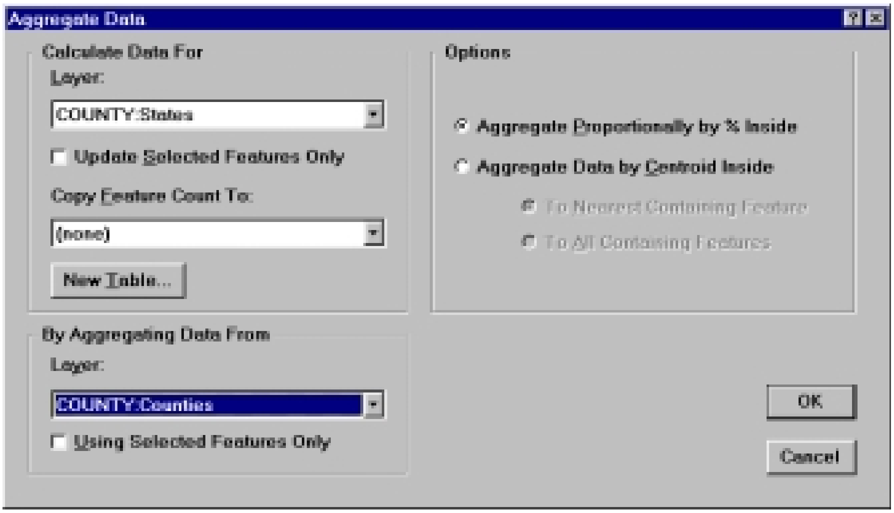


Figure 9.1 **Aggregate Data dialog box for region-in-region processing**

If an existing table is to be used for the aggregation results, it must already be open and contain the columns that will receive the aggregation data. If you need to create any new columns, use TABLE | DEFINE COLUMNS. Remember, however, that the names of the new columns must match those of the input layer.

If the target layer has no table, you can create one by clicking on the New Table option button and filling out the New Table dialog box. This is also the easiest way to ensure that the column names in the new table match the column names in the input table—just click on the Copy Columns from Table option button in the New Table dialog box and specify the input table in the drop-down list.

The data aggregation method for each column was specified when the input table was created. The following aggregation methods are available:

- Sum
- Average
- Weighted Average
- Minimum
- Maximum
- First
- None

See TABLE | DEFINE COLUMNS for more information about specifying aggregation methods.

The type of layers specified in the Aggregate Data dialog box determine the processing method used. The Options subpanel displayed varies, depending upon the layers chosen (and therefore, the processing method used).

Point-in-Region

Since an input point can fall in an area where multiple regions overlap, you need to specify how the data for that point is to be aggregated for the target regions. For example, if a potential customer location falls in an area where two trade areas overlap, you might want the data for that potential customer to be aggregated to both trade areas, or perhaps only the closest trade area.

Click on one of the following option buttons to specify how to aggregate data for input points that are contained inside more than one target region:

- Aggregate to Nearest Containing Feature
  Aggregate the data to the containing region whose centroid is nearest the input point. If an input point falls exactly on the boundary between two or more regions, then the data is aggregated to the smallest region.

- Aggregate to All Containing Features
  Aggregate the data to each containing region.

Region-in-Region

An input region can be completely outside, completely inside, or overlap the border of a target region. For input regions completely outside any target regions, no data aggregation occurs; however, for features that are completely or partially inside target regions, you can specify how the data is to be aggregated.

Click on one of the following option buttons to choose what to do if an input region is partially, but not completely inside a target region:

- Aggregate Proportionally by % Inside
  Aggregate the data to all of the target regions that contain at least part of the input region. The data is aggregated to an overlapping target region weighted by the percentage of area inside. For example, if the input region is 25% inside, then each data value is weighted by .25 (if an input region is 25% inside one target region and not inside any others, only 25% of its data is aggregated). So if a ZIP code is 25% inside a trade area, this counts 25% of its data value (population, market potential, etc.), rather than counting either 0% or 100%.

  If an input region is completely contained within the target region, then 100% of the data value is aggregated.

- Aggregate Data by Centroid Inside
  Aggregate the data to the target region whose centroid is the closest to the centroid of the input region.

Note: Area-weighting is more accurate, but calculating by centroid inside is significantly faster because there is less computation.

If you click on the Aggregate Data by Centroid Inside option button above, you essentially convert the processing method to Point-in-Region. As a result, the centroid for the input region may actually fall within an area where two target regions overlap.

Click on one of the following option buttons to specify how to aggregate data for centroids that are located inside more than one target region:

- To Nearest Containing Feature
  Aggregate the data to the target region whose centroid is closest to the input region's centroid.

- To All Containing Features
  Aggregate the data to each target region that contains the input region's centroid.

Point-near-Point and Point-near-Line

To define *near*, specify a distance (in current map units) in the *Aggregate Data if Nearer Than* text box. Then, the data for an input point will be included in the aggregation for a target feature if the point is within the specified distance of the target feature.

The following option buttons determine what to do if an input point is within the specified distance of more than one target feature:

- Aggregate Data to Nearest Feature
  Aggregate the data to the nearest point or line (note that point-to-line distance is the perpendicular distance from the point to the line).

- Aggregate Data to All Near Features
  Aggregate the data to each point or line that's within the specified distance of the input point.

Warning

Make sure that the column sizes in the target table are large enough to accommodate the aggregated results before you begin the aggregation process. If not, you'll get an error message, in which case you'll need to restructure the table and then restart the aggregation process.

Recommended Uses

- Suppose you have a point table with customer data and you want to compile a profile, or statistical summary, of the customer base for each sales territory. You could aggregate the customer data within each sales territory and store those statistics in the sales territory table. (This uses point-in-region processing.)

- Suppose you have ZIP code or census tract-level data. You could calculate demographic/marketing/consumer data for trade areas based on the ZIP code or census tract data. (This uses region-in-region processing, with area-weighting.)

- Suppose you have customer or potential customer point locations. You could sum these to the nearest store or sales office. (This uses point-near-point processing, to the nearest feature.)

- Suppose you're preparing a state-level analysis for the entire U.S., but your data is organized by county. You could aggregate data for all counties in a state and store the statistics in the state table. (This uses region-in-region processing, but area-weighting isn't necessary because counties are wholly contained within a state.)

Associated Dialog Boxes

Aggregate Data
New Table

Table | Assign Data by Location

This command retrieves data from an input feature and assigns it to a target feature based on whether the target feature is inside of or near the input feature.

Available When

A geo file or point table is open.

How It Works

When you choose TABLE | ASSIGN DATA BY LOCATION, the Assign Data By Location dialog box pops up.

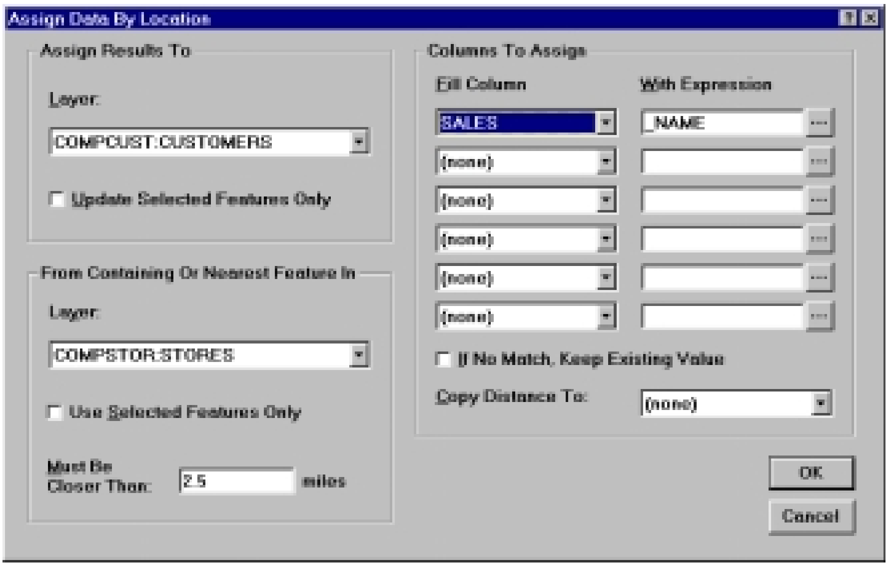


Figure 9.2 **Assign Data By Location dialog box**

Options in the Assign Data By Location dialog box allow you to specify the following:

- The *target layer* (the layer you're assigning data to)
- Whether to assign data to all or only the selected target features
- The columns in the target layer to which data is written
- The *input layer* (the layer you're retrieving data from)
- Whether to retrieve data from all or only the selected input features
- The maximum distance to search if assigning data to points from nearby points or regions
- The columns to assign data to, and the expression used to derive data from the input layer
- Whether to leave existing data in the target layer unchanged, or fill the column with blanks when there is no input layer feature from which to retrieve data

The target layer you select in the Assign Results To group box determines the layers you can select from in the From Containing Or Nearest Feature In group box. Depending on the layers involved, data is assigned using one of five processing methods:

- Point-in-region
- Line-in-region
- Region-in-region
- Point-near-point
- Point-near-line

Point-in-region, *line-in-region*, and *region-in-region* are used for assigning data to features from the regions they are inside of. *Point-near-point* and *point-near-line* are used for assigning data to points from the nearest point or line.

The software determines whether a feature from the target layer is in or near a feature from the input layer. (Note that lines and regions are considered to be inside a region when their centroids are located inside the region.) If a feature is contained in overlapping regions, Atlas GIS assigns data from the region whose centroid is closest to the contained feature.

You can fill up to six columns with the results of an expression, plus you can fill a column with the distance from the input feature (this is mostly useful when doing *point-near-point* or *point-near-line* processing). If there is no input feature from which to retrieve data, the target features existing data can be blanked out or left unchanged.

Note:

- The geo file or table to which data is assigned must already be opened and contain the columns that will receive the data. If you need to create any new columns, use TABLE | DEFINE COLUMNS.

Examples

The section demonstrates the two most common processing methods: *point-in-region* and *point-near-point*.

Point-in-Region

A company has obtained some valuable new economic data by county, and it needs to be incorporated into their customer database. The customers are listed in a geocoded point table. Using the TABLE | ASSIGN DATA BY LOCATION command, the customer table points are matched to the county region they are inside of, and the county name is assigned to each table point. With the county name added to each point table row, the company can now perform a market analysis study by county.

Point-near-Point

A retail chain maintains an active customer mailing that offers discounts and other specials. The customers and their addresses are in a point table. When new customers are added, they are geocoded to display on the map. Then the closest store to the new customer is determined by using the TABLE | ASSIGN DATA BY LOCATION command. The process determines which store the customer is nearest to, and the store name is assigned to the customer record. As a result, the customer receives a mailing about the closest store.

Associated Dialog Box

Assign Data By Location

Table | Calculate Column

This command allows you to fill a column with either the calculated value of an expression or a constant value, or with the distance from a specified point on the map to each feature.

Available When

A geo file or table is open.

Shortcut

The Calc Col button on the button bar.

How It Works

When you choose TABLE | CALCULATE COLUMN, the Calculate Column dialog box pops up.

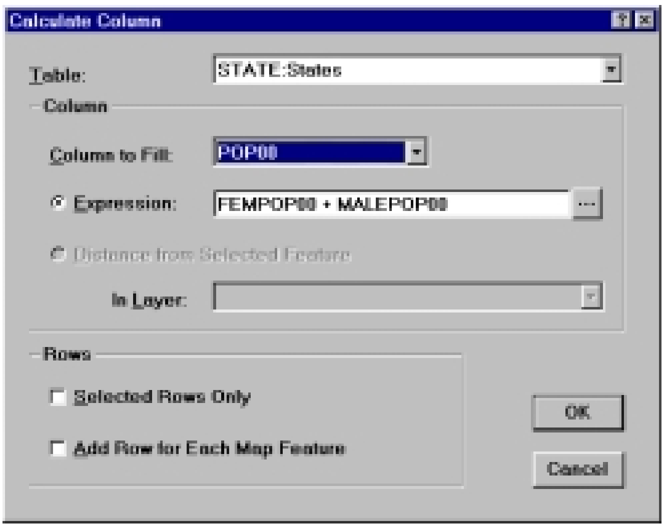


Figure 9.3 **Calculate Column dialog box**

TABLE | CALCULATE COLUMN assigns or calculates a value for an editable column in a geo file or table. (Some columns containing geographic data are not editable, such as _AREA.) Column values can be constant values, or they can be calculated using a valid dBASE expression. (For examples of valid expressions, see Appendix A.) You can also fill a column with the distance from a specified point on the map to each feature.

To calculate the distance from a specified (base) point, first select the base point. TABLE | CALCULATE COLUMN calculates the distance from the base point to the centroid (center) of each feature.

You can calculate values for rows as follows:

- Selected rows only.
- All rows.
- All rows, and creating new rows in the table for any feature without a matching table row. For this option, check the *Add Row For Each Map Feature* box.

Notes:

- This operation calculates values for map features and linked (matching) table rows. Therefore, if a linked table contains any rows without matching features, values will not be calculated for those rows. To calculate values for those rows, unlink the table first.

- Atlas GIS stores only the results of a specified expression. It does not store the expression.

Associated Dialog Boxes

Calculate Column
Expression Builder

Table | Define Columns

This command allows you to create new columns in a table, delete existing columns, or modify the appearance or definition of the table or its columns. It also allows you to change the linking status of a table.

Available When

A table is open.

Shortcut

The Define Col button on the button bar.

How It Works

When you choose TABLE | DEFINE COLUMNS, the Define Columns dialog box pops up if you have an open Table window. If no Table window is open, a list of tables pops up for you to choose from.

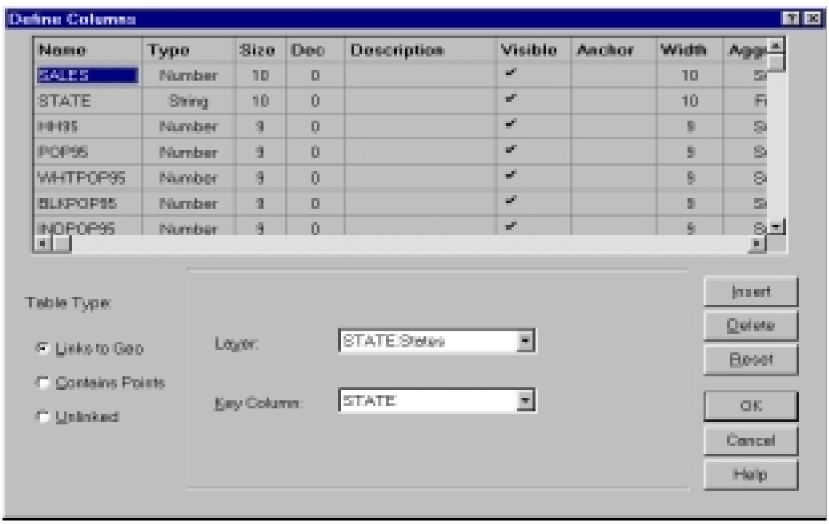


Figure 9.4 **Define Columns dialog box**

The table columns are listed in the order in which they actually occur in the table file, rather than the order in which you may have them displayed in the Table window. Only columns from the table (*not* from the geo file) are shown. (Note that you're defining the table columns, even though they are shown in this spreadsheet as rows.)

The columns of the spreadsheet control various characteristics of each column in the table. Some of these settings are structural, defining the table itself, while others are display settings, controlling how the table is displayed or viewed in a Table window. For example, the 'Size' setting controls the length of the entries for that column in the table, while the 'Width' setting controls the displayed width of the table column in the Table window.

Changing a structure setting for the table causes Atlas GIS to rewrite the file (when you exit the Define Columns dialog box). This may take a while for large tables, so it is most efficient to make all structural changes to a table at one time.

Notes:

- A table can have a maximum of 254 columns. The maximum combined size of all columns in a table is 4096.
- The settings in FILE | PREFERENCES control the format for Date data.
- When creating a point table, set the column size to 11 or greater for the longitude (or x) column, and 10 or greater for the latitude (or y) column. For both columns, set the decimal value to at least 6.
- Because changing the structure of the file requires Atlas GIS to completely rewrite the file, make sure that you have enough free disk space to store temporarily both the original and modified copies of the file. After the restructuring is completed, the original file is deleted. Atlas GIS will warn you if the amount of available disk space appears to be insufficient.
- The Reset button resets the column display settings to match the corresponding order and width settings in the table structure. This command does not reorder table columns (except for the Reset button). To reorder them, go to the Table window and drag the column titles to the desired locations.

- To add a table column, either fill in the blank row at the bottom of the spreadsheet, or position the focus where you want the new row to appear and click Insert.

For each new table column, fill in the structure and display settings, which are described below in the order they appear in the Define Columns dialog box.

Structure Settings

The first few settings of the Define Columns spreadsheet define the structure of the table.

Name

The name of the column, which must start with a letter and can include letters, numbers, and the underscore character. Its length can be a maximum of ten characters.

When creating a new table, the first column in the new attribute table is automatically named ID, since the table must contain a unique key value for each row (to link to unique feature IDs in a geo file). This ID column can be renamed.

Type

Type of data to be stored in the column. From the list box, choose one of the following types:

- *String:* String data may include letters, numbers (that won't be calculated), and punctuation symbols. A string column can be up to 254 characters long.

- *Number:* Numeric data consists of numbers that can be calculated (rather than, for example, street address numbers, which are stored and used as text). A number column can contain numbers, a decimal point, and a leading plus or minus sign. The length can be up to 19 digits. In Atlas GIS, number columns are exactly the same as float columns. Atlas GIS performs floating-point arithmetic on number columns (not BCD arithmetic).

- *Float:* Floating-point data consists of numbers that can be calculated. A floating-point column can contain numbers, a decimal point, and a leading plus or minus sign. The length can be up to 19 digits. Atlas GIS performs floating-point arithmetic on these columns.

- *Bool:* Boolean data indicates true/false, or yes/no. The length is preset to one character.

- *Date:* Date data has a preset length of eight characters.

Size

The size of the column in the .DBF file. The maximum number of characters in a column depends on its type: number and floating-point columns may have up to 19 characters, string columns up to 254, boolean columns always have one character, and date columns always have eight. For number or floating-point columns, be certain to make the size large enough to include a leading plus or minus sign, decimal point, or both, if needed. (The maximum size of all columns combined is 4096.)

Dec

The number of decimal places. This number must be between 0 and 15 and must be at least two less than the column size. This setting applies only to numeric columns (that is, Number or Float).

Display Settings

The remaining settings in the Define Columns spreadsheet control how the table is displayed or viewed in a Table window.

Description

A description of the column, intended to be longer and more informative than the column name. When you browse through the Table window, Atlas GIS shows the description at the top of the window.

Visible

A setting controlling whether the column is visible in the Table window or the Info window. A check mark indicates that the column will be visible.

Anchor

A setting controlling whether the column is anchored in the Table window. When checked, this option anchors the column in the left pane of the Table window, where it never scrolls out of view. When this option is unchecked, the column appears in the right pane and scrolls. Note that you can also change this setting directly in the Table window by dragging a column name to the desired pane.

Width

The display width of the column, in number of characters (based on average character width). Usually this is the same as the *Size*; however, you can set it smaller to display only a portion of the stored data, or larger to provide more white space for improved readability. This setting is most often changed for string columns. Note that you can also change the width directly in the Table window by dragging the column's right border.

Aggr

The method used when data in the column is aggregated (used by TABLE | AGGREGATE DATA, MAP | COMBINE SELECTED, and MAP | COMBINE BY VALUE). The data aggregation methods are as follows:

- Sum
- Average
- Wgt. Avg.
- Min
- Max
- First
- None

To compute a column's *weighted average*, each value is first multiplied by the value in the weight column, and then the sum of the column being averaged is divided by the sum of the weight column (see *Weight*, below).

When the 'None' option is chosen, there is no aggregation—no data is placed in the column.

String columns must use either 'None' or 'First'.

Weight

Name of column containing the weight value for a weighted average aggregation. Used only for numeric columns if *Aggr* is set to 'Wgt. Avg'.

Linking Options

TABLE | DEFINE COLUMNS can also be used to change the linking status of a table. There are three options, described below:

- Links to Geo
  Links the table to the specified layer in a geo file. Atlas GIS matches the *key column* you designate in the table to the _ID column in the geo file. When a value in the key column of the table matches an _ID value in the geo file, the two rows are linked.

- Contains Points
  Indicates the table is a point table—it has columns containing coordinate data (longitude-latitude, x-y, or projected coordinates). A point table acts like a point layer of a geo file (except that it cannot have a table linked to it). When the layer is on, the points display on the map.

- Unlinked
  Allows the table to be used independently from the map. An unlinked table is treated as its own layer (as is a point table), except that it is not drawn as part of the map.

For more information about tables and linking information, see FILE | OPEN and Chapter 3, "Storing and Managing Data."

Recommended Use

To create an additional column to store a calculated value for each feature. For example, use this command to create a column before using TABLE | CALCULATE COLUMN.

Warning

If you delete a table column, sort orders using that column will be invalidated.

Associated Dialog Box

Define Columns

Table | Geocode by Address

This command is used to assign map locations to point table rows that lack geographic point coordinates but contain street addresses. It derives street address locations, ZIP+4 centroids, or 5-digit ZIP code centroids, and assigns the coordinate values to the longitude and latitude (or x and y) columns. This allows you to display the street addresses on a map.

Available When

A point table is open and geocoding data is licensed.

Note: This command uses U.S. street address data and ZIP+4 centroids that are stored in a special database, highly compressed and optimized for use from a CD. The CD is provided with Atlas GIS software, but the data is licensed separately. Therefore, before you can perform geocoding by address, you must first license the data for the area you want to use. For more information about licensing, contact ESRI or your sales representative.

How It Works

TABLE | GEOCODE BY ADDRESS allows you to match an address (row) in a point table to a street segment in the geocoding database to determine the coordinate location of the address. The result of geocoding is the addition of the longitude and latitude coordinate values to each row in the point table, allowing each row to be displayed as a point on the map. For example, a police department could geocode a list of crime locations and then display the table points to observe the spatial distribution of crime activity. Similarly, a company could create table points from a list of customers to monitor customer distribution.

Displaying table points on a base map is also known as *pin mapping* or *incidence mapping*. In this kind of mapping, the points are more like data than permanent map features. After a point table has been geocoded, you can then display the table points along with your geo files. For example, you could open a census tract geo file of San Francisco and display the table points to observe their distribution by census tract.

When you choose TABLE | GEOCODE BY ADDRESS, the Geocode By Address dialog box pops up.

Figure 9.5 **Geocode By Address dialog box**

The following sections describe geocoding essentials, the geocoding process, setting up geocoding, batch versus interactive processing, and match codes.

Geocoding Essentials

This section provides an introduction to the column structure of point tables and data. Some of these columns are required for any geocoding process, while others are useful only for certain applications. Geocoding with Atlas GIS is a flexible process, and you can integrate these columns into your point tables as the need arises.

A point table, like an attribute table, is a dBASE-compatible database file. Each row contains information for one point, and each column corresponds to a characteristic or attribute. A point table always contains a longitude and a latitude (or x and y) column. These columns give the geographic location of each point on the map. Thus, a point table contains both locational and attribute information all in one file.

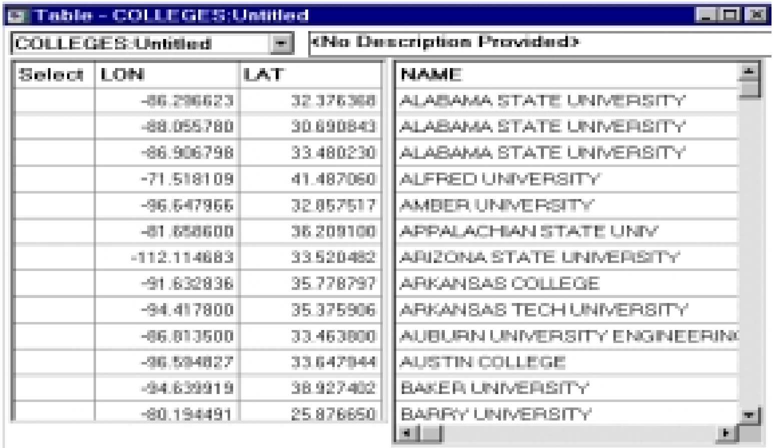


Table - COLLEGES:Untitled

COLLEGES:Untitled <No Description Provided>

Select	LON	LAT	NAME
	-86.296623	32.376368	ALABAMA STATE UNIVERSITY
	-88.055780	30.690843	ALABAMA STATE UNIVERSITY
	-86.906798	33.480230	ALABAMA STATE UNIVERSITY
	-71.518109	41.487060	ALFRED UNIVERSITY
	-96.647966	32.857517	AMBER UNIVERSITY
	-81.658600	36.209100	APPALACHIAN STATE UNIV
	-112.114683	33.520482	ARIZONA STATE UNIVERSITY
	-91.632836	35.778797	ARKANSAS COLLEGE
	-94.417800	35.375906	ARKANSAS TECH UNIVERSITY
	-86.813500	33.463800	AUBURN UNIVERSITY ENGINEERIN
	-96.594827	33.647944	AUSTIN COLLEGE
	-94.639919	38.927402	BAKER UNIVERSITY
	-80.194491	25.876650	BARRY UNIVERSITY

Figure 9.6 **Sample point table, showing longitude and latitude columns**

When you open a point table, it appears as another layer in your map. You can view, query, perform analytical operations, and create theme maps with point tables just like you can with any map layer.

When you geocode a point table, the table must contain columns for the longitude and latitude (or x and y) values, the address and ZIP code, and optionally for the standardize code, match code, and census code.

Longitude and Latitude Columns

As mentioned earlier, each row in a point table contains a longitude column and a latitude column. During geocoding, these columns are assigned the projected coordinate of the matched address location. When you first open a point table, you must specify the names of these columns.

Opening or importing a point table will automatically add the longitude and latitude (or x and y) columns if they don't exist. If Atlas GIS adds these columns, their default names are LON and LAT, they are number type columns, and their default widths are 11.6 and 10.6, respectively. To add the columns to the table manually, or to change the column type, use the TABLE | DEFINE COLUMNS command.

Address Columns

In addition to the longitude and latitude columns, Atlas GIS uses the following columns during the geocoding process. In order for an address to be matched, it must have street address and ZIP code information, or street address, city, and state information. The columns containing this information must be in the table prior to geocoding.

- *Display Name*
  This column is optional. It can contain information such as the names of customers, restaurants, stores, etc.
- *Address*
  This column is required for geocoding. An address column contains the street address without the city, state, or ZIP code. This must be a string type column.
- *Address 2*
  Optional column that contains additional street address information. If a valid street address is not found in the main address column, Atlas GIS will attempt to use data from the specified Address 2 column. This column must be a string type column.
- *City*
  This column contains the city name portion of the address. City data is used only if ZIP code information is incorrect or not available; and then, both city and state data are used to geocode the address.
- *State*
  This column contains the 2-letter postal abbreviation for the state. State data is used only if ZIP code information is incorrect or not available; and then, both city and state data are used to geocode the address.
- *ZIP/ZIP+4*
  This column contains the 5-digit or full 9-digit ZIP code portion of the address. If some of the ZIP codes are only 5 digits, and you are licensed for ZIP+4 codes in the area you're geocoding, the Standardize Addresses feature can append the +4 extension to the end of the 5-digit ZIP, or it can add the +4 extension to the +4 column (see below). The ZIP/ZIP+4 column must be a string type column and is required for geocoding.

Note: If the column that contains the ZIP/ZIP+4 data does not appear in the ZIP/ZIP+4 list box, it is probably because the column is not a string type column. To change the column to a string type column, use TABLE | DEFINE COLUMNS.

- *+4*
  This column contains the last 4 digits of a 9-digit ZIP code when the ZIP/ZIP+4 column contains the first 5 digits. If the ZIP/ZIP+4 column contains the 5-digit ZIP code and the ZIP/ZIP+4 column is blank, the Standardize Addresses feature can add the +4 extension to this column. The +4 column must be a string type column.

Results Columns

In addition to filling the longitude and latitude columns, Atlas GIS can assign some optional geocoding data to the point table for each address that is processed. The options in the Results Columns group box allow you to specify the columns for standardize codes, match codes, and/or census geographic codes. If you want this information added to the table, specify the columns in the Geocode By Address dialog box. These columns must be in the table prior to geocoding. (To add a column, or change its type, use the TABLE | DEFINE COLUMNS command.)

- *Standardize Code Column*
  A standardize code indicates whether an address is standardized or why it was not, which parts of the address were changed, and a general physical description of the address (for example, a multi-unit building). The standardize code column must be a string type column. A column width of 8 characters is required for the entire standardize code; however, it can be as short as one character to retrieve only the first character of the standardize code. (For more information about standardize codes, see the on-line help.)

- *Match Code Column*
  A match code indicates whether an address is matched or why it was not. Match codes can contain up to eight characters, where each character has a specific meaning. (See “Match Codes” later in this section for more information on individual codes.) The match code column must be a string type column. A column width of eight characters is recommended; however, it can be as short as one character to retrieve only the first character of the match code.

- *Block Code, Block Group, or Census Tract*
  In the Result Columns group box, you can also specify one of these census codes and the column in which it will be captured. The census code column must be a string type column. A column width of 18 characters is recommended for the entire census block code; however, it can be as short as two characters to retrieve only the two-digit state code.

  For each row that is geocoded, Atlas GIS can return one of the following census codes:

  - Census tract *SSCCCTTTT.TT*
  - Block group *SSCCCTTTT.TTB*
  - Block code *SSCCCTTTT.TTBBB*

  where:

  SS is the two-digit state code

  CCC is the county code

  TTTT.TT is the tract code

  BBB is the entire block code (the first character is the block group number)

  Census codes also appear when you use the QUERY | FIND command to find by address. (For more information, see QUERY | FIND or the on-line help.)

Offset from Street

The number you type in the *Distance* text box determines how far from the street the points will display on the map. For example, if you type ‘50’ in the box, all points will move back from the street line on the map to display as if they were 50 feet from the street. This is useful for very small area maps where great detail of the streets is shown, since you won’t want the points to appear in the middle of the street line.

Street Intersections and Common Place Names

The process of geocoding is further enhanced by the ability to match an intersection address. An intersection address would be, for example, *12th and Vine*. Atlas GIS looks for the intersection of the two streets and assigns the location to the point table row. An intersection address must contain two addresses separated by one of these key words: AND, &, AT, or @.

You can convert a common place name (e.g., City Hall) to a regular address using an entry in the ADDRESS.TRN translation file. Atlas GIS then matches the address in the usual manner. For information about translation files and adding an entry to them, see "Translation Files" later in this chapter.

The Geocoding Process

Geocoding involves two major parts: parsing the address and matching the address. Atlas GIS performs both parts automatically; however, you can manually alter both parsing and matching to shape the process to reflect the complexities of your particular data set. These manual capabilities are introduced in this section. This section describes each part and should help you get the most out of geocoding.

Parsing the Address

In the first part of the geocoding process, Atlas GIS takes the address from a point table row and parses it (divides it) into five components: house number, prefix directional, street name, street type, and suffix directional. For example, "2763 NW Thurman St." would be parsed as follows:

- 2763 (house number)
- NW (prefix directional)
- Thurman (street name)
- St. (street type)
- — (this address does not contain a suffix directional)

Each piece of the address is then matched to the corresponding address information in the geocoding database. When a street segment is found, address range numbers are used to determine the side of the street (based on odd or even numbers) and the approximate location along the street where the address is located. The actual location is then offset from the street by the distance you specify in the Geocode By Address dialog box.

The Parsing Steps

Atlas GIS performs the following steps during parsing:

- Uses the ADDRESS.TRN file to translate the entire address, or any portion of the address.

- Removes non-essential address information (and anything in parentheses). The following words are removed along with any string that succeeds the word:

apt	apartment		
floor	fl		
suite	ste		
room	rm		
P.O. Box	Box	PO#	etc.

- Uses the STRDIR.TRN file to extract and translate any prefix and suffix directions, and uses STRTYPE.TRN to extract and translate the street type.

Translation Files

To help parse the addresses correctly, Atlas GIS uses four special files called translation files (ADPARSE.TRN, ADDRESS.TRN, STRDIR.TRN, and STRTYPE.TRN). These files allow Atlas GIS to translate any peculiarities in the addresses. For example, suppose that a street named *Market* has been abbreviated to *Mkt* in some addresses in your point table. Atlas GIS will not be able to match *Mkt* to street segments named *Market* unless *Mkt* is translated into *Market*. Each translation file is a standard text file, and you can look at the top of each file for a description of its contents. Here's a brief description of each file:

ADPARSE.TRN

This file contains information that allows geocoding to be configured for a particular format of addresses and for a particular language. The file contains six sections that allow you to specify how Atlas GIS is to parse addresses.

For example, you can specify the following:

- Address component ordering
- Suffixes for numeric street names
- Intersection conjunctions
- Removal of non-essential address information at the beginning
- Removal of non-essential address information at the end

ADDRESS.TRN

This file contains single and multi-word translations that are performed on the entire address. For example, you can convert the following address components:

- Spelled out numbers to their numeric equivalent
- Common street name or place name abbreviations to the full street name
- Street names that have changed
- Place names to street addresses

Here are some examples of using the ADDRESS.TRN file.

- You could enter the translation for the name change from *Union Ave.* to *Martin Luther King Jr. Blvd*.

  The address *237 Union Ave.* would be converted to *237 Martin Luther King Jr. Blvd*.

- For the place name *Columbia University,* you could enter the street address, *722 W. 168th St*.

  The address *Columbia University* would be converted to *722 W. 168th St*.

- For the street name *Market*, which is often abbreviated to *Mkt*, you could enter the translation *Market.*

  The address *849 Mkt St* would be converted to *849 Market St.*

STRDIR.TRN

This file contains translations for both prefix and suffix directions, and is used by Atlas GIS to recognize a word as a direction, then convert it to the standard spelling or format. For example, southeast is translated to *SE.*

STRTYPE.TRN

This file contains translations for street types, and is used by Atlas GIS to recognize a word as a street type, then convert it to the standard spelling or format. For example, *Rd* is translated to *Road*. This file comes with all the possible TIGER street types, and a large list of possible misspellings and abbreviations.

Adding Your Own Translations

You can add your own translations to any of the translation files. The files are stored in the \GEOCODE subdirectory, and you can edit them at any time using a text editor or word processor.

The format of these files is two strings on each line, where the first string is the translated *from* string and the second string is the translated *to* string. The following is an example of the STRTYPE.TRN file:

Rd	Road
Road	Road
Fwy	Frwy
Frwy	Frwy
Freeway	Frwy

When adding a new word to the *to* column of the STRTYPE.TRN file, you should also add a row that contains that word in both the *from* and *to* columns. For example, notice Road → Road in the list above.

Matching the Address

After parsing your point table address into its address components, Atlas GIS matches the components with the corresponding street segment in the address database. First, Atlas GIS looks for an exact match in the specified ZIP code. If none is found, then it looks for all close matches and ranks them. You can use the relaxation options to control which types of close matches you are willing to accept.

If there's one best match, then it is taken. If two or more tie as the best, then a multiple match is declared, and you'll have to resolve it in interactive mode by choosing one from a list. If there are no close matches in the specified ZIP code, then Atlas GIS looks for an exact match in a nearby ZIP code. If a city and state were specified, but no ZIP code, then Atlas GIS looks for an exact match in all ZIP codes for that city.

It is important to note that the name component is treated differently from the other components. If Atlas GIS cannot find an exact match for the street name and the name component is relaxed, it looks for a close name. A close name is a name that sounds similar, such as *Main* and *Maine*. If you relax the other address components and Atlas GIS cannot find an exact match, it looks for a street segment with a different street type, prefix direction, or suffix direction.

In other words, if you relax the name, the address still has to match a “close” name, but if you relax the type, direction, or number, the address doesn’t have to match at all. For more information on relaxing address components, see “Relaxation Options” later in the chapter.

Custom Geocoding Database

Normally during geocoding, Atlas GIS looks at a standard geocoding database provided with Atlas GIS to find matches. If you wish to have Atlas GIS check a different database before checking the standard geocoding database, you may create a custom geocoding database. This database should contain the following:

- The same addresses as those in the table you’re geocoding
- Coordinates locations for the addresses

You should only use a custom geocoding database if you feel confident that it’s more up-to-date than the standard geocoding database, or if the standard geocoding database does not cover the area you wish to geocode.

If both the custom and the standard geocoding database generate multiple matches, the possible matches from both will appear in the Geocode Multiple Match dialog box, with an asterisk (*) before the addresses from the custom geocoding database.

In addition to the asterisk in the Geocode Multiple Match dialog box, the match codes also indicate which database the address came from. The last character of the match code will be a ‘1’ or ‘2’, where ‘1’ indicates that the address came from the custom geocoding database, and ‘2’ indicates that the address came from the standard geocoding database.

For detailed information on creating a custom geocoding database, see the on-line help.

Match Statistics

When you geocode a point table, statistics are displayed on the screen and written to a text file called GC_STATS.TXT. These statistics include the number of matched and unmatched addresses, a numeric breakdown of matched addresses by match type, and the number of addresses that were standardized. GC_STATS.TXT is stored in the program directory if you're using a local copy of Atlas GIS, or if your user directory if you're using a network version of Atlas GIS. This file can be read by a text editor or any word processor that reads text files.

Setting Up Geocoding

In addition to specifying the columns used in geocoding by address, you can also specify the addresses (rows in the point table) to process, the match method, and the precision of the matching.

Addresses To Process

Initially, the longitude and latitude columns contain zeros or blanks. A longitude-latitude value of 0,0 (or blanks) indicates that the address has not been geocoded. During the geocoding process, the longitude and latitude columns are filled with a coordinate value when a match is made. If no match is made, the longitude and latitude columns are unchanged.

Atlas GIS provides three options for choosing the rows to process:

- *Unmatched Rows Only*
  This option matches rows with longitude-latitude values of 0,0. Use this option for additional passes when you are interested in working with any non-geocoded records.

- *Selected Rows Only*
  This option matches only those addresses selected on the map or in a Table window, whether or not they have been previously geocoded.

- *All Rows*
  All the rows in the table are processed.

Standardizing Addresses

During the geocoding process, Atlas GIS checks your addresses against a postal database immediately prior to assigning coordinates. This process is called *standardization*. Standardization serves two functions: it checks to make sure your addresses adhere to postal standards, and it attempts to correct your addresses that were not found in the postal database by looking for a close match.

Standardization uses relaxation options the same way matching does, so if the ZIP code option is relaxed, and the ZIP code is wrong in the address, it will enter the correct ZIP code in the row.

In addition to checking each address against a postal database, standardization will also make sure that the address adheres to postal standards. For example, all occurrences of ‘Road’ will be converted to ‘Rd’. Also, if you are licensed for ZIP+4 codes in the area you’re geocoding, 5-digit ZIP codes will be converted to ZIP+4 codes (if you relax the ZIP code option), either by appending the +4 extension to the end of the 5-digit ZIP code, or by adding it to the +4 column. For more information on how standardization appends +4 ZIP codes, see the on-line help.

To select the columns you want updated, place a check in the *Save Standardized Data* box next to the column or columns of your choice. While it will always consider all columns when standardizing, Atlas GIS will only *update* the data in your rows in the columns you specify. This is useful for preserving any data you don’t want changed.

Note: When you choose to have Atlas GIS update your columns with the standardized data, the new data will be written in mixed case, even if the original data in your table is all upper- or lower-case letters. This will affect only the new, standardized data written to the columns in your table.

During the geocoding process, the standardization statistics appear in the Geocode By Address Progress dialog box. When the geocoding process is complete, the statistics are written to a text file called GC_STATS.TXT, the same file that contains match statistics.

Standardization does not assign coordinates, and therefore is not actually a function of geocoding. Standardization takes effect during the geocoding process, however, checking and standardizing your data before each row is geocoded. This helps Atlas GIS geocode more accurately on the first pass.

Match Methods

The Match Method group box lists the address-matching methods available. Basically, this box lets you indicate how precise you need the coordinates to be, and how imprecise you'll allow them to be. If you need an exact match only, select the *Address* option only. If you don't need the points to display at the exact street addresses (especially if you're using larger area maps), select the ZIP code options as well as *Address*. The methods diminish in precision from top to bottom. At least one of the methods must be checked to indicate how locations are to be derived. If more than one of the methods is selected, then they will be used in the order shown, with a particular method being used only when the preceding method was unable to derive a location. So, if all the methods are checked, Atlas GIS will attempt to derive a location first by address, then by ZIP+4 and ZIP+2, and finally by 5-digit ZIP codes.

The following geocoding methods are available:

- *Address*
  This is the most precise method. It matches the street address to a street segment in the geocoding database.

- *ZIP+4 Centroid*
  This method assumes that your point table has been ZIP+4 coded, and uses the ZIP+4 code to look up a centroid location in the ZIP+4 centroid database.

- *ZIP+2 Centroid*
  This method is less accurate than geocoding by ZIP+4 codes, but is more accurate than geocoding by ZIP. If the ZIP+4 code is not found in the centroid database, Atlas GIS will look for the first seven digits of the ZIP+4 code in other ZIP+4 codes. (Normally, there are multiple ZIP+4 codes with the same first seven digits.) Atlas GIS interpolates the final coordinates by averaging the centroids of all the ZIP+4 codes that contained the same first seven digits as the ZIP+4 code in the table, essentially creating a ZIP+2 centroid.

- *ZIP Code*
  This is the least precise method. It allows you to use simple 5-digit ZIP code centroids when a more precise method is not available. If this is the only method available, then the results are similar to using the TABLE | GEOCODE BY ZIP command. Note, however, that the TABLE | GEOCODE BY ADDRESS command assigns the ZIP code's geographic

centroids, and the TABLE | GEOCODE BY ZIP command assigns the population centroids for the ZIP codes.

Relaxation Options

During address geocoding, there are typically a number of rows in the point table for which an exact match cannot be obtained. The relaxation options allow you to specify which close matches are acceptable. The check boxes in the Relax Options group box allow you to gradually relax specific components of the street address to achieve a match. When you relax a component, Atlas GIS looks for alternatives when (and only when) an exact match cannot be found.

The following relaxation options are available:

- Directionals (both prefix and suffix)
- Street Type
- Street Name
- House Number
- ZIP Code

If more than one relaxation option is checked, then close matches are ranked. If all relaxation options are checked, then initially only the prefix and suffix directionals are relaxed. Next, both the directionals and street type are relaxed, and so on. Matching the street name exactly counts the most, then the address, then the street type, then the directionals. So if everything but the directionals match, then that is a closer match than if everything but the street type matched.

When you relax a component, Atlas GIS looks for alternatives when (and only when) an exact match cannot be found. It is important to note that the street name component is treated differently from the other components. If Atlas GIS cannot find an exact match for the street name, and the *Street Name* option is relaxed, it looks for a close name with a correct number. A close name is a name that sounds similar, such as *Main* and *Maine*.

Although relaxing address components will help match some non-matches, you must interactively edit more complex problems. In addition, relaxing components can lead to either multiple matches or incorrect matches.

In a city where most of the streets have prefix directions, relaxing the directionals component can lead to a multiple match. For example, if an address in the point table is *1739 Hawthorne* and the directionals are relaxed, Atlas GIS finds both *1739 SE Hawthorne St.* and *1739 SW Hawthorne St.* In this situation, you would choose from these two addresses in the Geocode Multiple Match dialog box.

The following is an example of a situation where it would be useful to relax the *Street Name* option:

- An exact match is required, and the address *100 SE Mane St* is marked as a non-match. The street name is misspelled. By relaxing the *Street Name* option, the address is matched to *100 SE Maine St*, the correct street. *Maine* is found because it is close in sound to *Mane*.

The following is an example of a situation where it would be useful to relax the street type component:

- An exact match is required, and the address *207 Clement* is marked as a non-match. The street type was not included in the address; however, in the geocoding database, Clement contains a street type. By relaxing the *Street Type* option, the street type is ignored and the address is matched to *207 Clement St*, the correct street.

Batch vs. Interactive Processing

You can perform geocoding in either batch mode or interactive mode. For most point tables, a combination of both methods is useful. Batch processing looks at the point table from beginning to end and attempts to match the specified addresses. Geocoding your file in batch mode is an efficient way to geocode as many addresses as possible, and to identify the problems with addresses that do not geocode. Addresses that cannot be geocoded can be marked with a match code identifying the specific problem.

Interactive processing allows you to see how Atlas GIS has parsed the address, to observe the match results, and to see the data assigned to various columns. This is visible in the Geocode By Address Interactive dialog box. (For information about the dialog box, see the on-line help.) You can then make edits as necessary to complete a match.

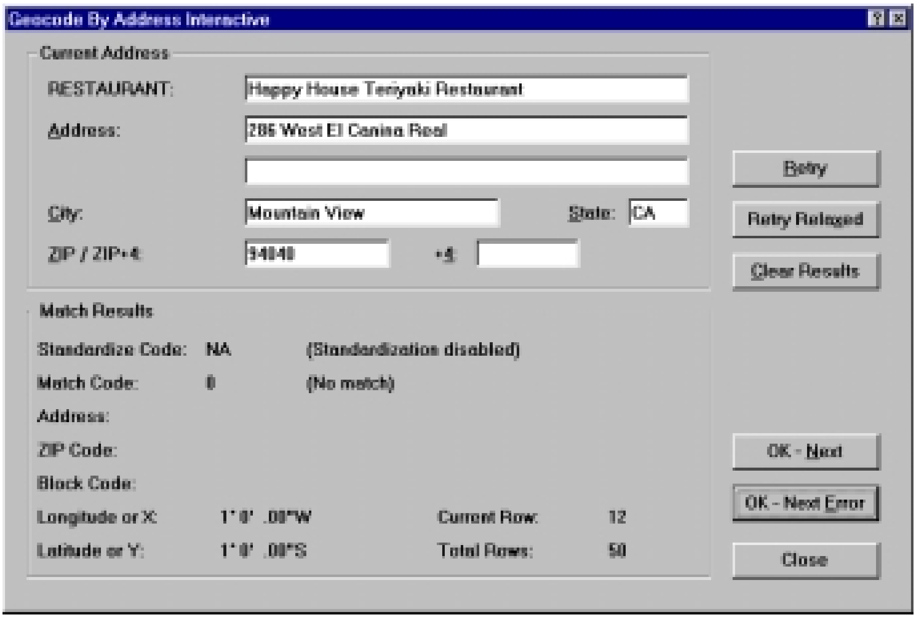


Figure 9.7 **Geocode By Address Interactive dialog box**

If there is more than one possible match, the Geocode Multiple Match dialog box appears.

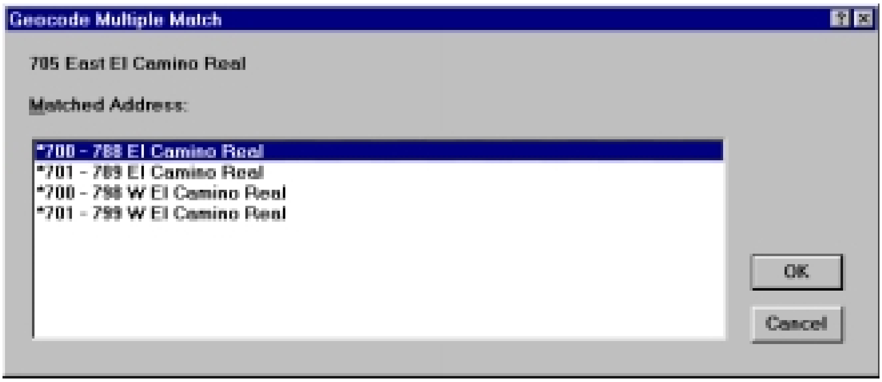


Figure 9.8 **Geocode Multiple Match dialog box**

The Geocode Multiple Match dialog box allows you to choose the closest match. Notice that there can be more than one match in the same range of addresses. This is because one contains the odd-numbered addresses and one contains the even numbers. In the above example, if the correct address is 705 El Camino Real, you would highlight the second address listed, since it contains the odd numbers. This is important when you are working with very small area maps, as the choice you make here will determine the side of the street on which the point displays.

If you are using a custom geocoding database, you may notice that some of the addresses in the Geocode Multiple Match dialog box are preceded by an asterisk. The addresses that come from the custom geocoding database are preceded by an asterisk, whereas the addresses from the standard geocoding database are not preceded by any special character. This can help you determine which address to choose if your custom geocoding database is more up-to-date than the standard geocoding database, for example.

Geocoding interactively is useful for the following purposes:

- Resolving multiple matches
- Resolving non-matches
- Manually inspecting close matches
- Working closely with an address file that you know contains problematic data

Match Codes

Atlas GIS returns a match code for each row it processes. You can specify a column in the point table to assign the match codes to. (For more information on the match code column itself, see “Results Columns” earlier in this section.) Match codes are character strings (up to eight characters in length) that Atlas GIS can return to tell you if an address was matched or why it was not.

Each character in the match code has a specific meaning. The first character is one of the following numbers:

0	no match or unresolved multiple match
1	ZIP code centroid match
2	ZIP+2 centroid match
3	ZIP+4 centroid match
4	relaxed street match or user-resolved multiple match (street)
5	exact street match, but different ZIP code
6	exact street match

For 0 (if an unresolved multiple match), 4, 5, and 6 above, the first characater is followed by the string, ‘NHTDS’, where each letter represents an address component, as follows:

N	street name
H	house number
T	street type
D	directional prefix or suffix
S	street side

If a character in the string is upper-case, then that particular street component got an exact match. If a character is lower-case, then that component did not match. For example, ‘4NHtdS’ means that the address was a relaxed match (4), and that although the street name (N), house number (H), and street side (S) matched, the address as a whole did not match because the street type (t) and directionals (d) did not match.

For non-matches (0), ZIP centroid matches (1), and ZIP+4 matches (3), the first character will be followed by an ‘L’ if either the street or ZIP code was untried because the address fell outside your licensed area. For example, ‘0L’ means that the ZIP code for the address is outside the licensed data range and no match could be accomplished. In the case of an unresolved multiple match, an ‘M’ will be appended to the string.

Note: The street side (S) is not a part of the address that you enter; it is interpolated from the house number. A lower-case ‘s’ indicates that the number *was* found within a certain range of addresses, but there was not enough information in the database to determine definitively whether it was on the correct side of the street (e.g., 100 Castro is even-numbered, but the only possible match is a range of odd-numbered addresses: 99 Castro-103 Castro). This can happen if the house number is wrong, but still falls within a range of existing addresses on the other side of the street; or if the side of the street on which the address falls was not included in the geocoding database.

During geocoding, Atlas GIS always relaxes the street side. So if there’s only one possible match, and that match appears to be on the wrong side of the street, Atlas GIS will accept the match. As a result, it’s possible for Atlas GIS to return an exact match, while still leaving open the possibility that the address is on the wrong side of the street (‘6NHTDs’). If you happen to be working with a small-area map, such as a map of a single block, you should use the QUERY | SELECT BY VALUE command to find the addresses with a lower-case ‘s’ in the match code column. Then, you can use the reshape tool to move the points to the correct side of the street. Additionally, block codes for these addresses will not be accurate, so you should also correct these manually.

The last character of the match code will be either a ‘1’ or a ‘2’. This number tells you whether the address came from a custom geocoding database (‘1’), or if it came from the standard geocoding database (‘2’). Additionally, in the Geocode Multiple Match Dialog box, an asterisk (*) in front of an address indicates that it came from a custom geocoding database.

Standardize Codes

Like match codes, standardize codes will be added to the column you specify to indicate the results of the standardization, and will appear in the Geocode By Address Interactive dialog box to indicate if and how an address was standardized. The codes contain three parts:

- A number indicating if and how the address was standardized
- Five letters indicating which parts of the address were standardized
- A number describing the physical address, such as ‘Multi-Unit Building’

For complete information on the standardize codes, see the on-line help.

Recommended Approaches

Notes:

- The first two approaches use address standardization. It is important to note that standardization may help Atlas GIS geocode more accurately on the first pass, depending on the initial quality of your data. If your data is not very recent and you are not confident in its accuracy, standardization may be very useful. If your data is quite recent and you feel confident in its accuracy, you should not use standardization.
- As with any software program, it is recommended that you create a back-up copy of your original data before using any function that may overwrite it.

The Simplest Approach:

This approach is useful for displaying points on larger area maps (such as state, province, or country), as it geocodes to the nearest 5-digit ZIP centroid. If you want to display them on a smaller area map where you need more precision, go on to the next approach.

1. Specify all four match methods, turn off all relaxation options, and place a check in the *Standardize Addresses* box. If you want your table updated with the corrected addresses, place checks in the *Save Standardized Data* boxes next to the columns you want edited. Click on the Batch button to do a batch run.

2. Process the remaining unmatched rows in interactive mode to resolve as many as possible. Or, you can select just the rows that got a multiple match, and process these interactively, ignoring other non-matches. To select just those rows that are ungeocoded because of a multiple match, use the QUERY | SELECT BY VALUE command with the following expression:

   LEFT(MATCH_CODE, 1) = “0” AND RIGHT(TRIM(MATCH_CODE), 1) = “M”

   For more information on Atlas GIS expressions and the Expression Builder, see Appendix A, “Expressions and Functions.”

For Improved Accuracy and/or Speed:

1. Specify all match methods except 5-digit ZIP code, turn on all relaxation options, turn on *Standardize Addresses*, and do a batch run.

   Relaxing the ZIP code during address geocoding slows down processing significantly. So if you have a very large point table, and you are concerned about speed, do two batch runs—first, do all rows with everything relaxed except ZIP, then do the remaining unmatched rows with everything relaxed, including ZIP.

2. When it's done, click on the Interactive button to view the results and manually match any records that were not matched during the first pass.

3. Use the 5-digit ZIP code method to process any remaining ungeocoded points, or leave them ungeocoded.

For Maximum Accuracy:

1. Turn off all relaxation options, turn on standardization, specify *Address* as the match method, and do a batch run to get as many exact matches as possible.

2. Turn on all relaxation options, do an interactive run, and inspect all close matches, non-matches, and multiple matches. Or, try relaxing one option at a time, doing a batch run each time, until all options are relaxed. Then do an interactive run on any remaining unmatched rows.

Recommended Uses

- To create points from a customer database to monitor customer location and sales distribution.
- To geocode crime locations and display them on an area map to observe the spatial distribution of crime activity.
- To assign locations to any address databases for displaying or querying on a map.

Associated Dialog Boxes

Geocode By Address
Geocode By Address Interactive
Geocode By Address Progress
Geocode Multiple Match

Table | Geocode by Map Layer

This command is used to assign the centroid coordinates from features in a map layer to the longitude and latitude (or x and y) columns in a point table. You may also use this command to assign centroids from one point table to another.

Available When

A geo file (or previously geocoded point table) and the point table to be geocoded (must contain longitude and latitude or x and y columns) are open.

How It Works

When you choose TABLE | GEOCODE BY MAP LAYER, the Geocode By Map Layer dialog box pops up.

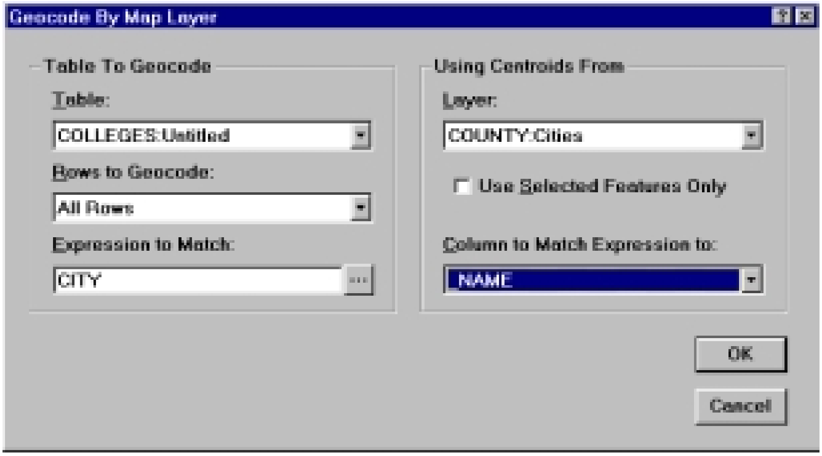


Figure 9.9 **Geocode By Map Layer dialog box**

In the Table To Geocode group box, you will specify the name of the table and the rows in the table you want geocoded. Additionally, you'll enter an expression in the *Expression to Match* text box that indicates the column(s) that contains the same information as the map layer column you specify in the

Column to Match Expression to list box. Normally, the expression will simply be a column name, but if the data you're matching is not contained in one column (e.g., if you're matching by postal code, and the postal codes are split across two columns), you will need to enter an expression that will manipulate the data so that it can be matched to the map layer column. (For more information on expressions and the Expression Builder, see Appendix A of this manual.)

In the Use Centroids From group box, you will specify the name of the map layer, whether or not you want to use selected features in the map layer only, and the column that contains the same information as the column(s) indicated in the expression you specified. (For more detailed information on the Geocode By Map Layer dialog box, see the on-line help.)

When you click OK, Atlas GIS compares the point table column(s) you specified in the expression with the map layer column you specified. When a row in the point table contains matching information to a feature in the map layer, the centroid coordinates from that map feature are added to the longitude and latitude (or x and y) columns of the matching row in the point table.

Notes:

- Geocoding by street addresses is more accurate, but requires separately sold data.
- If points in your table are geocoded to the same location (i.e., more than one row is assigned the same coordinates) you can use MAP | DISPERSE POINTS to spread them out on the map.
- For information about creating a point table, see FILE | NEW | TABLE.

Recommended Use

- To assign map locations to table points that cover a large area, where precise locations are not necessary. For example, for a table that contains customer addresses for California, geocoding each point to its nearest city centroid is sufficient.
- To geocode the postal code centroid coordinates from one point table to another point table. Substitute the geocoded point table (the one that contains the coordinates) in place of the map layer in the instructions above.

- Geocoding areas where street files are not available, but small geographic region boundaries are available.

Associated Dialog Box

Geocode By Map Layer

Table | Geocode by ZIP

This command is used to assign map locations to table rows that lack geographic point coordinates, but contain U.S. ZIP codes. It looks up the ZIP codes from the centroid file, and assigns the centroids' coordinates to the longitude and latitude (or x and y) columns in the table.

Available When

A point table is open.

How It Works

When you choose TABLE | GEOCODE BY ZIP, the Geocode By ZIP dialog box pops up.

Figure 9.10 **Geocode By ZIP dialog box**

The process of deriving coordinates for the rows in a point table is called *geocoding*. Points stored in a table generally represent data that is less permanent or less geographic than typical map points in a geo file. For example, map points may represent buildings or cities, while table points may represent crime incidents or current customers.

By default, this command uses the centroid database CENTROID.DAT, provided with the Atlas GIS software. This database contains the longitude and latitude coordinates for the centroids of all U.S. 5-digit ZIP codes. (The centroid of a region is its geographic center.) If you're an international user and you want to geocode by your own Postal codes, see TABLE | GEOCODE BY MAP LAYER.

In the Geocode By ZIP dialog box, you specify which table you want geocoded and which file contains the centroids. In the *Table to Geocode* list box, highlight the table to geocode. In the *Rows to Geocode* list box, choose 'all rows', 'selected rows', or 'uncoded rows'. Uncoded rows are those whose longitude and latitude (or x and y) values are either blank or zero. In the *ZIP Code Column* list box, highlight the column that contains the ZIP codes.

The coordinate columns must be numeric columns. The longitude (or x) column must have a length of at least 11, with 6 decimal places; the latitude (or y) column must have a length of at least 10, with 6 decimal places. If you open or import a table as a point table, Atlas GIS will automatically add these columns if they don't exist, or you can add them yourself with TABLE | DEFINE COLUMNS.

TABLE | GEOCODE BY ZIP looks up each row's ZIP code in the centroid file, and obtains the longitude and latitude coordinates for the centroid of that ZIP code. It copies the coordinates to the specified longitude (or x) and latitude (or y) columns of the table. For rows without ZIP codes, or whose codes are not in the centroid file, the longitude (or x) and latitude (or y) columns are ignored.

After a table has been geocoded, you can then display its points. If you have a geo file open when you geocode the table, or you open the point table later, Atlas GIS automatically converts the table's longitude and latitude coordinates to the projection used by the geo file. The point table is treated as another layer in the map. You can view, query, perform analytical operations, and create theme maps with table points just as with any other layer.

Notes:

- Geocoding by street addresses and/or ZIP+4 centroids is more accurate, but requires separately sold data.
- If you have points with the same ZIP code, they will geocode to the same location; you can use MAP | DISPERSE POINTS to spread them out.
- When you use the TABLE | GEOCODE BY ZIP command, Atlas GIS assigns the ZIP code's population centroid to each matched address. To assign the ZIP code's geographic centroid to an address, use the TABLE | GEOCODE BY ADDRESS command and the ZIP code match method only.

See “Geocoding by ZIP” and “Geocoding by ZIP Using TABLE | GEOCODE BY ADDRESS” in the on-line help for instructions.

- For information about creating a point table, see FILE | NEW | TABLE.

Recommended Uses

- To assign map locations when ZIP codes are available, but full address data is not.
- To assign map locations to table points that cover a large area, where precise locations are not necessary. For example, for a table that contains customer addresses for the entire U.S., locating each point to its nearest ZIP code centroid is sufficient.

Associated Dialog Boxes

Geocode By ZIP

Table | Show All

This command causes the Table window to display all rows in the table (rather than selected rows only).

Available When

A Table window is open and showing selected rows only.

How It Works

This command becomes available after you choose TABLE | SHOW SELECTED ONLY. When you choose TABLE | SHOW ALL, the active Table window displays all rows.

Notes:

- The TABLE | SORT command may cause some rows not to display, independent of the TABLE | SHOW SELECTED ONLY or TABLE | SHOW ALL commands. See TABLE | SORT for more information.

- This command only affects what is displayed in the Table window. It does not affect what is searched by other Atlas GIS commands.

- This command affects EDIT | PASTE, which pastes only into visible rows in a Table window.

Table | Show Selected Only

This command causes the Table window to display only selected rows.

Available When

A Table window is the active window, and it currently shows all rows (rather than selected rows only).

How It Works

When you choose TABLE | SHOW SELECTED ONLY, the active Table window displays only the currently selected rows. The rows may have been selected by using the Pointer tool to select a map feature, by checking the SELECT column in the Table window, or by querying.

Notes:

- The TABLE | SORT command may cause some rows not to display, independent of the TABLE | SHOW SELECTED ONLY or TABLE | SHOW ALL commands. See TABLE | SORT for more information.
- This command only affects what is displayed in the Table window. It does not affect what is searched by other Atlas GIS commands.
- This command affects EDIT | PASTE, which pastes only into visible rows in a Table window.

Recommended Use

To see only the rows selected after a complex query.

Table | Sort

This command allows you to choose the sort expression (index) which will control the display order of the rows in the Table window, to define new sort expressions, or to delete existing ones.

Available When

A table is open.

How It Works

If you choose TABLE | SORT, the Sort dialog box pops up if you have an open Table window. If no Table window is open, a list of layers pops up for you to choose from. By default, TABLE | SORT affects the topmost Table window.

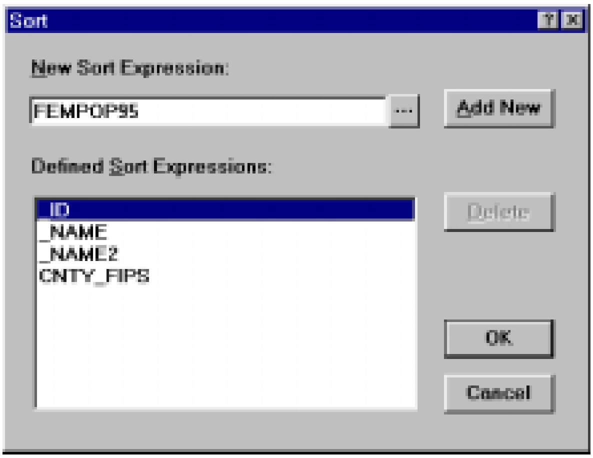


Figure 9.11 **Sort dialog box**

A *sort expression* creates an index of the values in a table or geo file. A sort expression can be used for two purposes. First, a sort expression can determine the sort order for a Table window. This is the order in which the rows display.

Second, a sort expression can be used by query operations (QUERY | SELECT BY VALUE) for increased speed, allowing you to search quickly for specific values. If you have a large table and will be performing multiple queries based on a particular column, creating a sort expression based on that column can save you time.

Certain sort expressions are defined automatically for each geo file or table. Each of these sort expressions is named according to the column it sorts on:

- _ID: The unique ID column of the geo file.
- _NAME: The primary name column of the geo file.
- _NAME2: The secondary name column of the geo file.
- The key column of the table. (This index has the file name extension .N00.)

A column settings file (.COL extension) keeps track of all the sort expressions. The index files created by the sort expressions are updated automatically when you add or delete table rows, or change values in the table.

Creating a Sort Expression

A sort expression can be any table column or any valid dBASE expression based on one or several columns in the table. Columns in the geo file cannot be used in new sort expressions; however, sort expressions based on the _ID, _NAME, and _NAME2 columns are already defined for you. For example, you can define a sort expression based only on the POPULATION column, or based on an expression like '(BLACKPOP/POPULATION)*100'. For more details and examples of Atlas GIS expressions, see Appendix A.

When you create new sort expressions, the index files are named after the file they sort on, with the extensions .N01, .N02, etc. You can have up to seven user-defined index files (in other words, .N01 through .N07).

You can create new sort expressions using TABLE | SORT, without changing the sort order for the active Table window. To do this, just click on the Cancel button in the Sort dialog box after you've defined the new sort expressions.

Notes:

- Once a sort expression is created, it cannot be modified. You must delete it and create a new one.

- Note that creating a new sort expression does not create a new table column. If you wish the value of the sort expression to be visible in the table, you must use TABLE | DEFINE COLUMNS to create a new column containing the sort expression.

- Sort expressions can also be used for searching, using QUERY | SELECT BY VALUE.

- The maximum length of a sort expression is 100 characters.

- To create a sort expression that sorts on two character columns at once, build an expression that adds the columns together. For example, suppose you have a table containing the 2-digit state FIPS codes (ST_FIPS column) and the 3-digit county FIPS codes (CO_FIPS column). You could then build a sort expression, such as (ST_FIPS + CO_FIPS), that would sort the table according to the combined 5-digit FIPS code that uniquely identifies each county in the U.S.

Sort Order in the Table Window

Each Table window uses a sort expression to determine its *sort order*—the order in which its rows display. You can use one of the defined sort expressions provided with each table, or you can create your own. (The defined expressions sort on the _ID, _NAME, or _NAME2 column in the geo file, or on the key column in the table.) The sort order for the table can be based on either the geo file or the linked attribute table. Note that you can have multiple Table windows open for the same layer, each using a different sort order.

The sort expression chosen in the Sort dialog box defines the *sort order* of the active Table window, controlling the display of the rows in the window. Note that a newly created sort expression does not automatically become the sort order for the active Table window; you must specify the sort expression for the sort order.

Furthermore, the contents of the Table window do not necessarily correspond to what is processed by a query operation, which may use a different sort expression.

Note: If the Table window is sorted on _NAME2, any rows without a _NAME2 value will not be displayed. For any other column (in the geo file or table), rows with blank values will be displayed.

Linked Tables

When you are working with a linked table, the sort order determines which map features and table rows you can see and work with in the Table window. If the rows in the table, or the map features in the geo file do not all have matching counterparts, the Table window may not display all the features in the layer or all the rows in the table, as follows:

- When the sort order is based on the geo file, the Table window will not display rows in the table that don't have corresponding map features in the geo file.
- When the sort order is based on the table, unmatched map features in the geo file will not be shown in the Table window.

Recommended Uses

- To view the table rows in a particular order in the Table window.
- To accelerate searches of a large table by indexing on the table column or expression most often searched for.

Associated Dialog Box

Sort

Table | New Report

Available When

At least one table or geo is open.

How It Works

When you choose TABLE | NEW REPORT, the New Report dialog box opens, allowing you to designate the name of the report template to be created, the type of report to create, and the data layer to base the report on. You can also choose whether or not to base the report template on the Data Layer's selected features only.

This command loads the "Crystal Reports" application with the newly created report. Before choosing this command, you must designate the path to the 'crw32.exe' executable in the FILE | PREFERENCES dialog box.

Notes

The Report file (*.rpt) that is created is a template based on the data source that you choose. This template contains column names, page formatting, and basic report style. When created from Atlas GIS, however, the Crystal Report option to 'Save Data with Report' is utilized, so the report file contains data as well as the template.

If the 'Selected Features Only' box is checked, your report will only include data for the currently selected features. Therefore, before using this command, make sure that you have selected the appropriate features. These features can be selected through any Query command methods, with the map select tool, or in the Table window.

To create the report template to be loaded into Crystal Reports, the Table | New Report Command saves the Data Layer's table that you select out to a *.dbf file. This file will have the same suffix name as the Report (*.rpt) file.

For example:

Designating the new Report filename, 'newreport.rpt' and selecting the layer 'States:Regions' creates a *.dbf file named 'newreport.dbf'. 'Newreport.rpt’ is then created, based on ‘newreport.dbf’, and is loaded into Crystal Reports.

Table | Open Report

Available When

At least one table or geo is open.

How It Works

When you choose TABLE | OPEN REPORT, the Open Report dialog box opens, allowing you to choose a report template file to load into ‘Crystal Reports’.

Opening an existing report file in Atlas GIS allows you to do one of the following things:

1) Open the report template into ‘Crystal Reports’ with the data that was originally saved with the report file. To do this, select ‘Use Previous Data’ from the Data Layer list box.

2) Open the report template into ‘Crystal Reports’ with different data then what was originally saved with it. To do this, select the layer that you want to use with the existing report file from the Data Layer list box. To do this successfully, the new Data Layer and the report template file must have similar column names.

This command loads the “Crystal Reports” application with the chosen report template. Before choosing this command, you must designate the path to the ‘crw32.exe’ executable in the FILE | PREFERENCES dialog box.

Notes

If the ‘Selected Features Only’ box is checked, and a new Data Layer is chosen for the report template, your report template will only include data for the currently selected features. Therefore, before using this command, make sure that you have selected the appropriate features. These features can be selected through any Query command methods, with the map select tool, or in the Table window.

If you choose a different Data Layer from the Data Layer list box to be used with the Report File (*.rpt), the File | Open Report command saves the Data Layer's table that you select out to a *.dbf file.   This file will have the same suffix name as the Report file (*.rpt), and will therefore overwrite the *.dbf originally written out to be used with the Report file (.rpt) template. This is important, because when you open an existing Report file template with a different Data Layer, you will lose the information originally saved with the Report file.

For example:

Opening 'myreport.rpt' and selecting the layer 'States:Regions' creates a *.dbf file named 'myreport.dbf'. The file 'myreport.dbf' which was created when you created 'myreport.rpt' is overwritten. 'Myreport.rpt' is then loaded into Crystal Reports.

Table | Delete Report

Available When

At least one table or geo is open.

How It Works

When you choose TABLE | DELETE REPORT, the Delete Report dialog box opens, allowing you to designate the name of the Report template (*.rpt) to be deleted.

Notes

When deleting a Report (*.rpt) template, the *.dbf that was created by the FILE | CREATE REPORT Command to create the report template is also deleted.

For example:

Designating the Report filename ‘oldreport.rpt’ to be deleted also designates ‘oldreport.dbf’ (in the same directory) to be deleted as well. Note that this table file was created when you originally created the report (.rpt) file in Atlas GIS.

10

Window Menu

The WINDOW menu contains the commands you use to open, arrange, and bring forward the various windows in Atlas GIS. You can also hide and unhide the toolbox and Info window from this menu, as well as hide or unhide an AtlasApp button palette. Here's a summary of the WINDOW commands, listed in menu order.

Table 10.1 **Window menu**

COMMAND	**DESCRIPTION**
New Table Window	Open a new Table window.
New Statistics Window	Open a new Statistics window.
Show/Hide Info Window	Open or close the Info window.
Show/Hide Toolbox	Open or close the Toolbox.
Show/Hide AtlasApps	Open or close an AtlasApp button palette.
Tile	Tile the open windows.
Cascade	Cascade the open windows.
1 Page - <*project name*>	Restore or bring to the front the Page window.
# Table - <*layer name*>	Restore or bring to the front the specified Table window.

Note that in the remaining sections in this chapter, the individual WINDOW commands are discussed in alphabetical order, not in menu order.

Floating Windows

In order to minimize the on-screen manipulation of the open windows in Atlas GIS, the ones that you almost always want on top are floating windows. The Info window and the Statistics windows are always on top of the Page window, any open Table windows, or the Toolbox.

List of Open Windows

A numbered list of open windows (Page and Table) is displayed at the bottom of the WINDOW menu. When you click on one of the windows in the list, the currently active window is deactivated, and the selected window is activated and displayed on top of the other windows.

The first window in the list is always the Page window (to the right of the word 'Page,' the name of the current project file is displayed). After the Page window, all currently open Table windows are listed in the order in which they were opened. The Page window is always the first in the list, and the list can display up to nine open windows (the Page window plus eight open Table windows).

Window | Cascade

This command arranges and resizes the open, non-floating windows (the Page and Table windows) so the contents of the top window are visible, but only the title bars of the other windows are visible.

Window | New Statistics Window

This command opens a new Statistics window and allows you to view the summary statistics for selected features in a layer.

Shortcut

The Stats button on the button bar.

Available When

A file is open, and the combined total of open Table windows and Statistics windows is less than eight.

How It Works

For each numeric column, the Statistics window displays the following summary statistics. These statistics dynamically update as the selection is changed.

Table 10.2 **Statistics menu**

STATISTIC	DESCRIPTION
Count	The total number of selected features that have a value for a particular column.
Sum	The arithmetic sum of the data values from all the selected features that have a value for a particular column.
Average	The arithmetic average of the data values from all the selected features that have a value for a particular column.
Wt. Average	The weighted average of the data values from all the selected features that have a value for a particular column. The weighted average is the sum of the column values times the weight column value divided by the sum of the weights. (The weight column is specified in the Define Columns dialog box.) ***Note:*** The weighted average is only calculated when the aggregation method (as designated in the Define Columns dialog box) is set to “Weighted.”

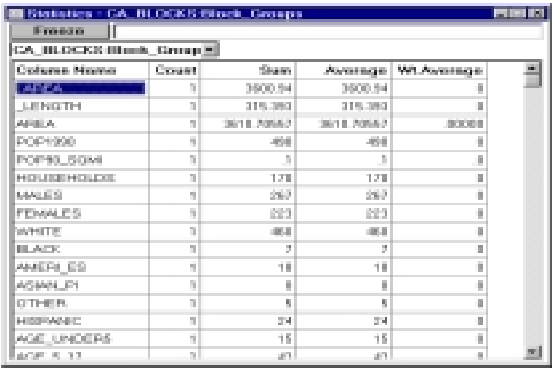


Figure 10.1 **Statistics window showing statistics summary and title**

When you choose WINDOW | NEW STATISTICS WINDOW, the Window Layer dialog box pops up, allowing you to specify the layer for which the Statistics window is opened. When a Statistics window is open, the window's title includes the name of the layer. Within each Statistics window, you can change the layer for which the statistics are shown.

The names of the numeric columns (such as _AREA, _LENGTH, TOTPOP, etc.) appear as rows in the Statistics window, in the same order as the columns occur in the table. If you reorder the columns in a Table window (by dragging the column name to a different location), the rows in the Statistics window are rearranged as well. To open a Table window, use the WINDOW | NEW TABLE WINDOW command.

You can open multiple Statistics windows for a single layer, and you can capture and hold the summary statistics for a group of selected features with the Freeze button. This is useful when you want to compare statistics for two different sets of features in the same layer, or when you want to compare the statistics against a base set. You can select a group of features, freeze the Statistics window, open another Statistics window for the same layer, and then view the statistics for a different group of features.

To help differentiate between open Statistics windows and the data displayed in them, you can add descriptive text to each window. The window, shown in the figure above, has the description "Demographics — Charlotte, North Carolina." This text can be edited any time, even after you click on the Freeze button.

The information in the columns of a Statistics window is non-editable; however, you can copy its contents, including the descriptive text and the row and column headings, to the clipboard. To copy the contents of a Statistics window to the clipboard, make sure that the current focus is on the Statistics window, then press CTRL+C, or use EDIT | COPY.

A Statistics window is a floating window and is always on top of the Page window, any Table windows, or the toolbox. Statistics windows and the Info window are allowed to overlap, but the window that has the current focus will be the one on top.

Notes:

- If a numeric column in the table is hidden (see TABLE | DEFINE COLUMNS), it will not appear in a Statistics window.
- No more than eight Table and Statistics windows (combined total) can be open at once.
- A Statistics window cannot be maximized, but it can be minimized. You can close it by double-clicking on its control-menu box.

Window | New Table Window

This command opens a new Table window.

Shortcut

The Table button on the button bar.

Available When

A file is open, and the combined total of open Table windows and Statistics windows is less than eight.

How It Works

When you choose WINDOW | NEW TABLE WINDOW, the Window Layer dialog box pops up, allowing you to specify the layer for which the Table window is opened. A Table window shows you all columns for a layer. If you have a geo layer with a linked table, you see columns in both the geo file and table.

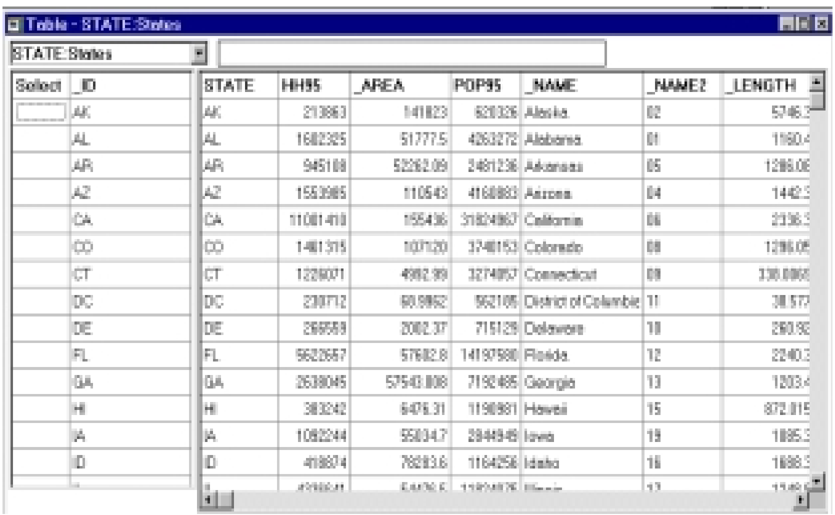


Figure 10.2 **Table window with state demographic data**

When a Table window is open, the window's title includes the name of the layer. Inside each Table window, you can change the layer for which the window is open simply by choosing a different one from the list box in the upper-left corner of the window. Directly to the right of the list box, the long description for the current column is displayed.

The table row order is based on the sort expression chosen with the TABLE | SORT command, which may also cause some rows not to display (see TABLE | SORT for more information). For instance, if the sort order is based on a column in the geo file, then unlinked table rows will not appear; if the sort order is based on a column in the table, then unlinked map feature rows will not appear.

When you first open a Table window, all the rows in the table are displayed. If, however, you're working with only a few rows and you'd like to see only them, you can choose TABLE | SHOW SELECTED to show only the selected rows in the window. When you want to see the complete table again, choose TABLE | SHOW ALL.

Notes:

- No more than eight Table and Statistics windows (combined total) can be open at once.
- A Table window can be minimized, maximized, and closed by clicking on its Control-menu box. To restore a Table window after it's been minimized, either double-click on its icon or open the WINDOW menu and click on the table name in the list of open windows.
- If a cell contains a file name as a text string, you can right-click on that cell to launch any Windows application associated with that file's extension. For example, this would allow you to associate a scanned image with each point on a map, or perhaps associate a spreadsheet with each sales territory.

Reordering the Columns

To change the order of the columns in the Table window, click on a column title and drag it to a different location. The column is inserted to the left of the current column at that location.

Anchored and Unanchored Columns

A Table window is divided into two panes. The pane on the left contains the anchored columns; the pane on the right contains the unanchored columns. When a column is in the left pane, it remains in view as you scroll through the columns in the right pane. You can easily anchor or unanchor a column by dragging it to either the left or right pane. (You can also anchor and unanchor columns with the TABLE | DEFINE COLUMNS command, by placing a check in the *Anchor* column in the Define Columns dialog box.)

Selecting Rows and Features

The first column in the Table window is the SELECT column—it is always anchored. When the SELECT column is checked for a given row, that row and the corresponding map feature are selected. Likewise, if you select a map feature, the corresponding row in the Table window is also selected.

To select an entire layer, click on the column heading for the SELECT column. To select a range of rows, click and drag through the desired rows. To deselect a row without affecting the other selections, CTRL+CLICK in the SELECT column of the desired row.

Editing the Table Columns

Most of the information in a Table window is fully editable; however, there are some columns that contain display-only or safe-guarded information. When a geo file or a table that is linked to a geo file is displayed, the columns that contain the geographic data (for example, _AREA, _LENGTH, etc.) are display-only. The columns in a point table that contain longitude and latitude coordinates are safe-guarded against inadvertently editing of the location data. When you click on a cell in either the longitude or latitude column, the Edit Coordinate dialog box pops up and allows you to edit the coordinate values.

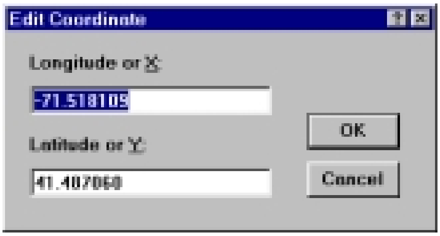


Figure 10.3 **Edit Coordinate dialog box**

You can perform the following cell-editing and row-editing operations in the Table window:

- Copy selected text to the clipboard
- Paste text from the clipboard
- Delete text
- Copy selected rows to the clipboard
- Paste data from the clipboard
- Delete a row
- Undo any of the above operations

To add a new column to the table, use TABLE | DEFINE COLUMNS. To bring up the Define Columns dialog box, right-click on any column heading in the Table window. To calculate values for that column, use TABLE | CALCULATE COLUMN. For more information about adding columns to a table and calculating values for it, see TABLE | DEFINE COLUMNS and TABLE | CALCULATE COLUMN earlier in this manual.

To add new rows to the table, use the TABLE | ADD ROWS command. Notice that before you can use the TABLE | ADD ROWS command, the table must be sorted on an index expression based on a table column (see TABLE | SORT), and the Table window cannot be displaying only the selected rows (see TABLE | SHOW ALL). For more information about adding rows to a table, see TABLE | ADD ROWS earlier in this manual.

To resize a column, point to the column's right border (notice that the cursor changes to a *double-arrow* resize marker) and drag the resize marker to either increase or decrease the column width. To hide a column, simply resize it down until it disappears. To restore a hidden column, point to the column border (notice that the cursor changes to a *single-arrow* resize marker) and drag the cursor in the direction of the arrow on the resize marker. (You can also resize the column in the Define Columns dialog box. See TABLE | DEFINE COLUMNS.)

The following table summarizes the mouse and keyboard commands that are available in a Table window.

Table 10.3 **Mouse and keyboard commands in a Table window**

MOUSE	KEYBOARD	EFFECT
Click on a cell.	Arrows, tab, or shift-tab.	Moves the focus (for editing) but does not change the selection (*except* on Select column).
	Tab from last column or shift-tab from first column.	Wraps around to the other side of the table, changing the focus.
Right-click on a cell containing a file name.		Launches the Windows application associated with the file name extension.
Right-click on a column heading.		Pops up the Define Columns dialog box.
Click on Select column.		Selects the row and deselects all others.
Shift+click on Select column.		Extends the current selection to the clicked-on cell (for contiguous selection).
Ctrl+click on Select column.		Toggles the clicked-on row.
Drag over Select column.		*Replaces* current selection with the dragged-over rows.
Shift+drag over Select column.		Extends current selection to the cell without deselecting anything. Same as a shift+click on the cell.
Ctrl+drag over Select column.		*Toggles* the selection status of each dragged-over row, while preserving any previous selections that were not dragged over.
Click on a cell (other than the Select column) that already has the focus.		Begins cell editing.
Double-click on a cell.		Begins cell editing.
	Space or Enter (on cell other than the Select column).	Begins cell editing.

Table 10.3 **Mouse and keyboard commands in a Table window**

MOUSE	KEYBOARD	EFFECT
	Alpha numeric character.	Begins cell editing, overwriting existing cell contents.
Drag the divider (between left and right panes).		Changes relative widths of left pane (the anchored columns) and right pane (the unanchored columns).
Point to column border, drag resize cursor left or right.		Resizes the column.
Drag resize cursor until the column disappears.		Hides the column.
Click on column heading and drag to a new location.		Moves the column.

Window | Show AtlasApps

This command displays the AtlasApps button palette.

Note: AtlasApps are separate applications developed with either Atlas Script/VB or Atlas Script/C (companion products to Atlas GIS) that serve as add-ins to enhance the functionality or usability of Atlas GIS. These applications do not operate on their own; instead, they require that Atlas GIS be running.

Available When

An AtlasApp is open.

How It Works

When you choose WINDOW | SHOW ATLASAPPS, the AtlasApps button palette appears. This palette is a floating box with one or more buttons. The size of the buttons is set with FILE | PREFERENCES using the same preference setting that determines the size of the tools in the toolbox. You can also resize the palette using the resize handles.

This command toggles its name depending on whether the AtlasApps button palette is displayed or hidden. If the palette is displayed, HIDE ATLASAPPS appears as the command name in the menu; if the palette is hidden, SHOW ATLASAPPS appears.

Window | Show Info Window

This command opens and closes the Info window, which displays data for the last selected feature.

Shortcut

The Info button on the button bar.

How It Works

The Info window displays all the data for the last selected feature or table point. If you've selected a map feature and there's a table linked for that feature, the Info window shows columns from both the geo file and table.

Figure 10.4 **Info window**

There is only one Info window. As a result, this command toggles its name depending on whether the Info window is open or closed. If the Info window is open, HIDE INFO WINDOW appears as the command name in the menu. If the Info window is closed, SHOW INFO WINDOW appears.

The rows in the Info window correspond to the columns in the table. If you've used TABLE | DEFINE COLUMNS to hide a column, that column will not appear in the Info window. If you reorder the columns in a Table window (by dragging the column name to a different location), the rows in the Info window are rearranged as well. To open a Table window, use the WINDOW | NEW TABLE WINDOW command.

The information in the Info window is fully editable. To begin editing a cell, press SPACE or ENTER or double-click in the cell (you can single-click on the cell if it already has the focus). In addition, you can also copy the contents of the Info window to the clipboard. To do this, make sure that the current focus is on the Info window, then press CTRL+C or use the EDIT | COPY command.

The Info window is a floating window and is always on top of the Page window, any Table windows, or the toolbox. The Info window and Statistics windows are allowed to overlap, but the window that has the current focus will be the one on top.

Notes:

- The selected item can be in any layer; it does not have to be in a layer in the default layer set.
- If there are multiple selections, only the data for the last selected feature is displayed.
- If a cell contains a file name as a text string, you can right-click on that cell to launch the Windows application associated with the file's extension. For example, this could allow you to associate a scanned image with each point on a map, or perhaps associate a spreadsheet with each sales territory.
- The Info window cannot be maximized, but it can be minimized. You can close it by clicking on the Info button on the button bar, or by double-clicking on its control-menu box.

Window | Show Toolbox

This command opens and closes the toolbox.

How It Works

By default, the toolbox is open and displays to the right of the Page window. The toolbox cannot be minimized; however, it can be closed (by using either its control-menu box or the WINDOW | HIDE TOOLBOX command). If the toolbox is closed, you can use this command to reopen it.

This command toggles its name depending on whether the toolbox is open or closed. If the toolbox is open, HIDE TOOLBOX appears as the command name. If the toolbox is closed, SHOW TOOLBOX appears as the command name.

The toolbox is a floating window and is always on top of the Page window and any Table windows. It does not, however, float on top of the Info window or any Statistics windows. If the toolbox is behind another window, you can use this command to bring it to the front.

Notes:

- The default tool is the Pointer tool.
- The size of the toolbox is controlled in the Preferences dialog box (FILE | PREFERENCES) by the *Button Bar/Toolbox Size* list box in the Workspace subpanel. (See the description of the Preferences dialog box in the on-line help.)

Window | Tile

This command arranges and resizes the open, non-floating windows (the Page and Table windows) so they are all visible at once.

11

Help Menu

The HELP menu contains commands for using help in Atlas GIS. You can select a topic from the list for assistance, search for information on a specific item, or pop up information about Atlas GIS. Here's a summary of the HELP commands, listed in menu order.

Table 11.1 **Help menu**

COMMAND	**DESCRIPTION**
Contents	List the topics available in the on-line help for Atlas GIS.
Search for Help On	Search for help topics on keywords from a keyword list.
How to Use Help	Access the standard Windows on-line instructions for using on-line help.
About Atlas GIS	Display information about Atlas GIS, including the version number of your copy.

Note that in the remaining section of this chapter, the individual HELP commands are discussed in alphabetical order, not in menu order.

Help | About Atlas GIS

This command displays information about Atlas GIS, such as the version number of your copy.

How It Works

When you choose HELP | ABOUT ATLAS GIS, a dialog box pops up, displaying the Atlas GIS version number and your registration information, including the serial number, user name, and company. The dialog box also contains a copyright message and the address of Environmental Systems Research Institute, Inc.

If you have the need to call our Customer Services Department, please have this registration information at hand.

Help | Contents

This command lists the main topics available in the on-line help for Atlas GIS.

How It Works

When you choose HELP | CONTENTS, the Help window opens to display a list of the main categories of on-line help. These categories are described below.

Button Bar
Shows the buttons on the button bar and their menu command equivalents.

Command Summary
Contains a list of menu commands. Click on a menu command in the list to display its submenu with short descriptions. Select a command from the submenu to get a full summary.

Dialog Boxes
Contains an alphabetical list of dialog boxes (by title). Click on a title in the list to get an explanation of the elements in that dialog box. These help screens can also be accessed directly from the individual dialog boxes, using the F1 key or the ? button.

Keyboard & Other Shortcut
Describes the various keyboard and mouse shortcuts you can use with Atlas GIS.

Status Bar
Describes the items in the status bar.

Step-By-Step Instructions
Contains a comprehensive list of step-by-step procedures that demonstrates the many built-in capabilities of Atlas GIS.

Toolbox
Shows a picture of the toolbox. Click on a tool in the picture to get information about that tool and how to use it.

Windows equivalents for Atlas GIS DOS commands
For users familiar with Atlas GIS for DOS. For each Atlas GIS for DOS command, provides the name of the corresponding command in Atlas GIS for Windows.

Recommended Uses

- To look up step-by-step procedures in the on-line user's guide.
- To get information about a particular menu command.
- To get an explanation of the elements in a dialog box.
- To learn about a tool in the toolbox or an item in the status bar.

Help | How to Use Help

This command opens the Help window and provides the standard Windows on-line instructions for using on-line help. If you require additional information, refer to your Windows documentation.

Help | Search for Help On

The command searches for all help topics relating to a specified *keyword*, enabling you to find a topic without knowing its exact name.

How It Works

When you choose HELP | SEARCH FOR HELP ON, the Help window opens and displays a dialog box that allows you to search for topics containing specific keywords. When you choose a keyword in the Search dialog box, the on-line help lists all topics associated with the keyword. You can then select a topic to read.

Recommended Uses

- To look up listings for help on a general topic, such as “expressions.” Rather than looking through the Contents list to find each topic that discusses expressions, use the keyword search to find all the related topics.
- To browse through keywords when you need help, but you’re not sure what topic to look up.

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Expressions and Functions

Atlas GIS occasionally requires that you specify an expression in order to initiate an action. This action is usually based on some calculations involving the data values found in your attribute table. For example, in the Theme subpanel of the Layers & Themes dialog box, you must specify an expression that represents the data variable to map. Also, in the Calculate Columns dialog box, you can calculate values for columns in your table based on the results of an expression.

Each of these require you to enter a proper dBASE-compatible expression before any action is taken. In this appendix, we will discuss the components of an Atlas GIS expression, give examples of valid expressions, and offer some tips on troubleshooting in case you encounter problems. Although not intended to be a comprehensive discussion of any particular database management system, this appendix does give you an overview of what's required of an Atlas GIS expression.

What Is an Expression?

Simply stated, an *expression* is any combination of operands and operators that yields a single value when evaluated. *Operands* are constants, variables, or functions that are manipulated by the operators. *Operators* are the symbols that specify how the operands are manipulated. An expression can consist of a single operand or a combination of operands with one or more operators.

Look at the following examples of Atlas GIS expressions:

- Population
- Population > 25000
- Annual_Inc >= 15000 .AND. Annual_Inc <= 30000
- (Age_Male > 30) + (Age_Female >= 25)
- ROUND (ABS (Pcnt_Men - Pcnt_Women), 1)

In the first example, notice that an expression does not have to have any operators at all. It can consist of a single operand (in this case, a data value from the attribute table). The value associated with “Population” is a *variable* because its value will be continually changing for every row in the table.

In the second example, 25000 is considered a constant. *Constants* are values that do not change during the calculation of the expression. As the expression is evaluated for every row in the attribute table, the value 25000 will not change.

Look at the fifth example. There are two functions present in this expression: ROUND and ABS. *Function* allows you to perform special operations on the data. Usually, these operations are difficult, if not impossible, to do with operators alone.

Additional examples of Atlas GIS expressions follow the discussion of functions later in this appendix.

Operators

The sample expressions in the preceding section illustrate some of the operators you can use in Atlas GIS expressions. For example, notice the >, <, +, =, and ( ) operators. These symbols indicate how the operands are to be manipulated. Operators perform one of four types of operations: mathematical, relational, logical, or string.

Mathematical Operators

Mathematical operators perform calculations on numeric expressions, generating a numeric result.

+	Addition
–	Subtraction
*	Multiplication
/	Division
**	Exponentiation
^	Exponentiation
( )	Grouping

Relational Operators

Relational operators compare two expressions and return a logical true or false. The expressions can be either numeric, logical, or date; however, both must be the same type.

<	Less than
>	Greater than
=	Equal to
<>	Not equal to
#	Not equal to
<=	Less than or equal to
>=	Greater than or equal to
$	Is contained in

Logical Operators

Logical operators compare two logical expressions and return a logical true or false.

.AND.	Logical AND
.OR.	Logical OR
.NOT.	Logical NOT
( )	Grouping

String Operators

String operators concatenate (that is, combine) two or more character expressions.

+	String concatenation. Trailing spaces from each string remain at the end of each string.
–	String concatenation. Trailing spaces from the string preceding the operator are moved to the end of the string following the operator.

Precedence Rules

The operators have a precedence order in which they operate. In other words, in an expression, some operators are evaluated before others. This is important to remember, since it could affect the outcome of the expression. When two operators have the same precedence, they're evaluated from left to right. You can, however, group items within parentheses to force their evaluation first.

The order of precedence for mathematical operators is

1. Unary + and – (for example, changing 1 to –1)
2. Exponentiation
3. Multiplication and division
4. Addition and subtraction

The order of precedence for logical operators is

1. .NOT.
2. .AND.
3. .OR.

The order of precedence for relational and string operators is left-to-right evaluation.

Expression Builder

For Atlas GIS commands that require you to enter an expression, you can pop up the Expression Builder and create the expression with the tools provided. When you exit the Expression Builder, the expression you created is entered in the *Expression* text box you used to access the Expression Builder.

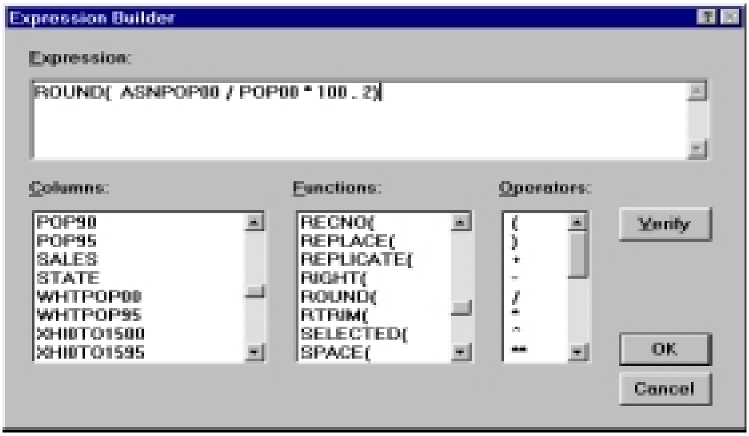

Figure A.1 **Expression Builder**

The Expression Builder allows you to choose columns, functions, and operators from lists to build an expression, so that you don’t have to type in all of the components. When you choose a component from one of the lists, it’s entered in the *Expression* text box, at the end of any existing entry. You can edit the expression in the text box, for example, to add numeric values to the expression, or to remove a component you no longer want included.

The *Columns* list box containts all the columns in the geo file, table, or point table you’re working with. You can click on a column name in the list to add it to the *Expression* text box. Notice that a long description of the highlighted column is displayed at the bottom of the Expression Builder.

The *Functions* list box contains all the functions supported by Atlas GIS, which are described later in this appendix. The descriptions include the type and number of parameters required for each function. Notice that although the function names appear in all uppercase letters, you do not have to make them uppercase when typing them into your expressions.

The *Operators* list box contains all the operators supported by Atlas GIS, which were discussed earlier in this appendix. These operators specify how the operands are to be manipulated.

Notice that Atlas GIS includes spaces around each item that it adds to the *Expression* text box. These spaces are added to enhance readability. You are not required to include spaces in your expressions.

When you've finished creating the expression, you can click on the Verify button to make sure it's a valid expression. A message will pop up telling you whether it's correct.

When you exit the Expression Builder, the expression you created is entered in the *Expression* text box you used to access the Expression Builder. To change the expression before executing the command, you can edit the expression directly in that text box, or you can pop up the Expression Builder again.

Functions

The following functions are supported by Atlas GIS. They can be used anywhere an expression is required. Notice that the function names are written in all uppercase letters. This is simply to make them more readable in the text. You do not have to make them uppercase when you use them in Atlas GIS.

The following style conventions are used in the function definitions to designate the type of expressions required:

N	A numeric-type expression
C	A character-type expression
D	A date-type expression
L	A logical-type expression
exp	Any type expression
exp1	The first expression in an argument list
exp2	The second expression in an argument list
[ ]	Optional information

Table A.1 **Supported functions**

FUNCTION	DESCRIPTION
ABS (N)	Returns the absolute value of N. For example, ABS(-10) and ABS(10) both return 10. With this function, you can test for the difference between two numbers, regardless of which one is larger. For example, if x equals 5 and y equals 10, ABS(x - y) and ABS(y - x) would both return 5.
ASC (C)	Returns the ASCII value (0 - 255) of the leftmost character of C. For example, ASC("A") returns 65. Use ASC to convert a character to an ASCII value, and CHR to convert an ASCII value to a character.
AT (C1, C2)	Returns the starting position of C1 within C2. If the first string is not contained within the second string, then the function returns 0. For example, AT("Main", "123 Main Street") returns 5.
CDOW (D)	Returns the name of the day of the week of D, as a character string. For example, CDOW(CTOD("12/31/92")) returns "Thursday."
CHR (N)	Returns the character whose ASCII value is N. N must be in the range 0 - 255. For example, CHR(65) returns "A." CHR(34) returns a double-quote, etc. Use CHR to convert an ASCII value to a character, and ASC to convert a character to an ASCII value.
CMONTH (D)	Returns the name of the month of D, as a character string. For example, CMONTH(CTOD("12/31/92")) returns "December."
CTOD (C)	Converts C (in the format MM/DD/YYYY) to a date value. For example, to find out what day of the week New Year's Day 2000 falls on, you could say CDOW(CTOD("1/1/2000")).
DATE ( )	Returns the system date as a date value. For example, if today is December 31, 1993, DTOC(DATE( )) returns "12/31/1993."
DAY (D)	Returns the numeric day of the month of D. For example, DAY(CTOD("12/31/93")) returns 31.

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
DECODE (C1, C2)	Returns the position of the string C2 within the list of strings C1 (the first character in the list of strings is the delimiter). The function compares C2 to each string within C1, and returns the number of the matching string, or 0 if there is no matching string. For example, DECODE("/Red/Green/Blue", "Blue") returns 3, and DECODE("/Light Red/Medium Red/Dark Red", "Red") returns 0. Use DECODE to convert a string to its position in a list, and ENCODE to convert a position in a list to its string.
DOW (D)	Returns the numeric day of the week of D. Sunday is day 1 and Saturday is day 7. For example, DOW(CTOD("12/31/93")) returns 6 (for Friday).
DTOC (D)	Converts D to a character string in the format MM/DD/YYYY. For example, DTOC(CTOD("12/31/93")) returns “12/31/1993.”
DTON (D)	Converts D to a numeric Julian date. The numeric Julian date is the number of days from 0 A.D. For example, DTON(CTOD("12/31/93")) returns 728358.
DTOS (D)	Converts D to a character string in the format YYYYMMDD. For example, DTOS(CTOD("12/31/93")) returns “19931231.”
ENCODE (C, N)	Returns the string in position N within the list of strings C (the first character in the list of strings is the delimiter). The function returns the Nth string, or a null string if C does not contain N strings. For example, ENCODE(";Red;Green;Blue", 3) returns “Blue”, and ENCODE(";Red;Green;Blue", 4) returns a null string (“”). Use ENCODE to convert a position in a list to its string, and DECODE to convert a string to its position in a list.
EXP (N)	Returns the result of raising e (the base for natural logarithms) to the power N. For example, EXP(1) returns e, or 2.718282, EXP(2) returns 7.389056, EXP(3) returns 20.085537, etc.
IIF (L, exp1, exp2)	If L is true, this function returns the result of exp1; otherwise, it returns the result of exp2. The expressions exp1 and exp2 can be either numeric, character, or date types.

Table A.1 **Supported functions (Continued)**

FUNCTION	**DESCRIPTION**
INT (N)	Truncates N to an integer. In other words, it takes the result of N and chops off all digits to the right of the decimal point. The effect of this function is to round down positive numbers and round up negative numbers. For example, INT(1.1) returns 1, and INT(-1.1) returns -1. Use INT to truncate decimal digits and ROUND to round to the nearest.
ISALPHA (C)	Returns true if the leftmost character of C is a letter of the alphabet (a-z or A-Z). For example, ISALPHA("123 Main Street") returns false.
ISDIGIT (C)	Returns true if the leftmost character of C is a digit (0-9). For example, ISDIGIT("123 Main Street") returns true.
ISLOWER (C)	Returns true if the leftmost character of C is a lowercase letter (a-z). For example, ISLOWER("John Smith") returns false.
ISMISSING (exp)	Returns true if exp is a missing value. Use this function to test for missing values. For example, ISMISSING("A", Expr) returns true if the numeric expression Expr returns a missing value for the current attribute row.
ISUPPER (C)	Returns true if the leftmost character of C is an uppercase letter (A-Z). For example, ISUPPER("John Smith") returns true.
LEFT (C, N)	Returns the leftmost N characters of C. For example, LEFT("95117", 3) returns "951". This is an extremely useful function for creating substrings. For example, to convert a 5-digit ZIP code string to a 3-digit ZIP code string, you could say LEFT(ZIP, 3). Or to pad a string of unknown length with spaces out to 80 characters, you could say LEFT(string + SPACE(80), 80).
LEN (C)	Returns the length of C. For example, LEN("How long is this string?") returns 24.
LOG (N)	Returns the natural (base e) logarithm of N. For example, LOG(e) or LOG(2.718282) returns 1, LOG(7.389056) returns 2, etc. To find the base 10 logarithm of N, use the LOG10 function, or use the formula LOG(N) / LOG(10).

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
LOWER (C)	Converts C to all lowercase. For example, LOWER("John Smith") returns “john smith”.
LTRIM (C)	Trims leading blanks from C. For example, LTRIM(" John Smith") returns “John Smith”. To ensure one space before a string, you could say " " + LTRIM(string).
MAX (N1, N2)	Returns the value of N1 or N2, whichever is greater. For example, MAX(5, 10) returns 10. This function provides an easy, concise way to find the maximum of two numbers or numeric expressions. For example, MAX(MAX(a, b), c) returns the greater of a, b, or c.
MIN (N1, N2)	Returns the value of N1 or N2, whichever is smaller. For example, MIN(5, 10) returns 5. This function provides an easy, concise way to find the minimum of two numbers or numeric expressions. For example, MIN(MIN(a, b), c) returns the smaller of a, b, or c.
MISSINGD ( )	Returns the date missing value. Use this function to insert a missing value into a date column, or to test if a date value is the missing value.
MISSINGL ( )	Returns the logical missing value. Use this function to insert a missing value into a logical column, or to test if a logical value is the missing value.
MISSINGN ( )	Returns the numeric missing value. The numeric missing value is different than 0. Use this function to insert a missing value into a numeric column, or to test if a numeric value is the missing value.
MOD (N1, N2)	Returns the remainder of N1 / N2. For example, MOD(10, 3) returns 1.
MONTH (D)	Returns the numeric month of the year D. For example, MONTH(CTOD("12/31/93")) returns 12.

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
NTOD (N)	Converts the numeric Julian date N to a date value. The numeric Julian date is the number of days from 0 A.D. For example, to add 100 days to a date, you could say NTOD(DTON(date) + 100).
RECNO ( )	Returns the row number. For example, (RECNO( ) = RECCOUNT( )) returns true if the current table row is the last row in the file.
REPLACE (C1, C2, C3)	Replaces the first occurrence of C2 with C3 in C1. C2 can include the wildcard characters * and ?. For example, REPLACE("123 Main Street", "Street", "St") returns “123 Main St”. REPLACE("123 Main Street", "St*", "St") also returns “123 Main St”.
REPLICATE (C, N)	Returns a character string consisting of C repeated N times. For example, REPLICATE("-", 80) returns a string consisting of 80 dashes. Note that REPLICATE(" ", N) is the same as SPACE(N).
RIGHT (C, N)	Returns the rightmost N characters of C. For example, RIGHT("06085", 3) returns “085”. This is an extremely useful function for creating substrings. For example, to extract the 3-digit county FIPS code from the 5-digit state plus county FIPS code, you could say RIGHT(Fips, 3). Or to trim one character at a time off of the beginning of a string of unknown length, you could say RIGHT(string, LEN(string) - 1).
ROUND (N1, N2)	Returns the value of N1 rounded to N2 decimal places. If N2 is a negative number, the specified number of digits to the left of the decimal point are rounded off. For example, ROUND(5.54, 1) returns 5.5, ROUND(5.55, 1) returns 5.6, ROUND(-5.55, 1) returns -5.6, and ROUND(5555, -2) returns 5600. Use ROUND to round to the nearest digit and INT to truncate decimal digits.

FUNCTION	DESCRIPTION
RTRIM (C)	Trims trailing blanks from C (same as TRIM). Note that when you get a character value out of a column in a table, it is padded with trailing blanks if it is shorter than the column width. The _NAME and _NAME2 columns in a geo file are also padded out to 64 characters when used as part of an expression. Use the RTRIM function to trim these trailing blanks. For example, RTRIM("John Smith ") returns "John Smith". To ensure one space after a string, you could say RTRIM(string) + " ". Or to trim both leading and trailing blanks, you could say LTRIM(RTRIM(string)).
SELECTED ( )	Returns true if the current map feature or table row is selected. For example, SELECTED( ) returns true if the current map feature is selected.
SPACE (N)	Returns a character string consisting of N spaces. For example, SPACE(80) returns a string consisting of 80 spaces. Thus to pad a string of unknown length with spaces out to 80 characters, you could say LEFT(string + SPACE(80), 80).
SPAN (C1, C2)	Returns the position of the first character in C1 not contained in the set of characters C2, minus 1. In other words, it returns the number of consecutive characters starting from the beginning of C1 that are contained in the set of characters C2. For example, SPAN(", 200, 300", " ,") returns 2.
SQRT (N)	Returns the square root of N. N must be a non-negative number. For example, SQRT(25) returns 5.
STR (N1 [, N2 [, N3]])	Converts N1 to a character string of length N2 rounded to N3 decimal places. The default length is 10 and the default decimal places is 0. For example, STR(3.14159, 4, 2) returns "3.14". Use STR to convert a number to a string, and VAL to convert a string to a number.

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
STRTNAME ( )	Returns the full primary street name for the current map feature. This function concatenates the columns _PREDIR, _NAME, _STYPE, and _SUFDIR for the current map feature, with one space between each, into a single text string. For example, if _PREDIR = "SW", _NAME = "Terwilliger", _STYPE = "Blvd", and _SUFDIR = "", STRTNAME( ) would return “SW Terwilliger Blvd”. This is a convenient function to use as the label expression for street layers. Use STRTNAME to get the full primary street name and STRTNAME2 to get the full secondary street name.
STRTNAME2 ( )	Returns the full secondary street name for the current map feature. This function concatenates the columns _PREDIR2, _NAME2, _STYPE2, and _SUFDIR2 for the current map feature, with one space between each, into a single text string. For example, if _PREDIR2 = "SW", _NAME2 = "Terwilliger", _STYPE2 = "Blvd", and _SUFDIR2 = "", STRTNAME2( ) would return “SW Terwilliger Blvd”. Use STRTNAME to get the full primary street name and STRTNAME2 to get the full secondary street name.
STUFF (C1, N1, N2, C2)	Starting at position N1 in C1, removes N2 characters and inserts C2. In other words, N1 is the start position within C1. From the start position, N2 characters are removed, and C2 is inserted. For example, STUFF("John C. Smith", 6, 2, "Calhoun") returns “John Calhoun Smith”.
SUBSTR (C, N1 [, N2])	Starting at position N1 in C1, extracts N2 characters. In other words, N1 is the start position within C, and N2 is the number of characters to extract. If N2 is not specified, all characters from the start position to the end of the string are extracted. For example, SUBSTR("123 Main Street", 5, 4) returns “Main”, and SUBSTR("123 Main Street", 5) returns “Main Street”.
TIME ( )	Returns the system time as a character string in the format HH:MM:SS. For example, if the system time is exactly one minute past noon, TIME( ) returns “12:01:00”.

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
TRANSFORM (exp, C)	Converts exp to a character string formatted according to the picture C. For more information on pictures, see “Picture Formatting” in Appendix C of the *Reference Manual*. For example, TRANSFORM(1234, "$999,999.99") and TRANSFORM(1234, "$###,###.##") both return “$ 1,234.00”. TRANSFORM("This is too long", "XXXXXXXXXX") returns “This is to”. Any character other than the special picture characters displays exactly as specified. For example, TRANSFORM("abcd1234", "! ! ! !---") returns “A C 1 3-”.
TRIM (C)	Trims trailing blanks from C (same as RTRIM). Note that when you get a character value out of a column in a table, it is padded with trailing blanks if it is shorter than the column width. The _NAME and _NAME2 columns in a geo file are also padded out to 64 characters when used as part of an expression. Use the TRIM function to trim these trailing blanks. For example, TRIM(“John Smith ") returns “John Smith”. To ensure one space after a string, you could say TRIM(string) + " ". Or to trim both leading and trailing blanks, you could say LTRIM(TRIM(string)).
TYPE (C)	Returns a character (“N”, “C”, “D” or “L”) indicating the data type of the expression C. “N” stands for numeric, “C” for character, “D” for date, and “L” for logical.
UPPER (C)	Converts C to all uppercase. For example, UPPER("John Smith") returns “JOHN SMITH”.
VAL (C)	Converts C to a numeric value. If C is not a number represented as a string, or does not begin with a number, then the function returns 0. For example, VAL("123.45") returns 123.45 as a numeric value, VAL("123 Main Street") returns 123, and VAL("Main Street") returns 0. Use VAL to convert a string to a number, STR to convert a number to a string.

Table A.1 **Supported functions (Continued)**

FUNCTION	DESCRIPTION
WILD (C1, C2)	Returns true if the string C1 matches the wildcard string C2. For example, WILD("abcd", "^ab*") returns true, but WILD("abcd", "^b*") returns false; Or, to test if a 5-digit county FIPS code string begins with "06" (for California), you could say WILD(Fips, "^06*").
YEAR (D)	Returns the numeric year of D. For example, YEAR(CTOD("12/31/93")) returns 1993.

Expression Examples

You can use expressions with several Atlas GIS commands. For example, with TABLE | CALCULATE COLUMN, you can use an expression to fill in or recalculate column values; with QUERY | SELECT BY VALUE, you can enter an expression to act as your selection condition; and with MAP | LAYERS & THEMES, you specify an expression in the Theme subpanel as your variable to map. You can also use expressions to create labels for your map. Following are some examples of how expressions may be used in each of these scenarios.

Calculating Columns

Let's say you have an attribute table that includes a numeric column containing annual sales figures (SALES), a numeric column containing the estimated market size (MKT_SIZE), and there is one row for every ZIP code in the state. You have another numeric column in which you want to show the percentage of market share (MKT_SHARE) that your sales figures represent for each ZIP code area. You have data for SALES and MKT_SIZE, but the MKT_SHARE column, which you just added, is blank. Using Atlas GIS, you can choose TABLE | CALCULATE COLUMN to fill in the MKT_SHARE column for each row with the results of the following expression:

```
ROUND(SALES/MKT_SIZE * 100,2)
```

The expression SALES/MKT_SIZE * 100 yields the market share percentage. If SALES contains 658954, and MKT_SIZE contains 1456334, the result of this calculation would be 45.24745010417. The ROUND function rounds the resulting value to 2 decimal places, yielding 45.25.

Many database functions and operations involve the manipulation of character strings. These functions can also be used with TABLE | CALCULATE COLUMN to fill in data for specified fields. Imagine that you have a file with an _ID column that contains the 2-letter state postal abbreviation, the 2-digit state FIPS code, and the 3-digit county FIPS code (e.g., CA06085). You have created another field (CNTYCODE) and want to fill it using the 3-digit county FIPS code from the _ID column. Use the SUBSTR function to replace the contents of CNTYCODE, as follows:

```
SUBSTR(_ID,5,3)
```

Atlas GIS takes the contents of the _ID column, beginning at position 5, and extracts 3 characters. You could also do this with the RIGHT function:

```
RIGHT(RTRIM(_ID),3)
```

Notice that you also had to use the RTRIM function to remove trailing blanks from data contained in the _ID column. That's because the ID (CA06085) is 7 characters long, but the defined field length is 16 characters. Since character fields are left-justified, positions 8 through 16 of the _ID column are blank. If we had used the RIGHT function alone, RIGHT(_ID,3), the expression would have yielded 3 blanks.

Selecting Features

Let's return, for the moment, to the first scenario in which you used an expression to fill in data for the MKT_SHARE column. Now you want to use that data to perform other analyses. Let's assume that the database also has some basic demographic data for each ZIP code, and you are interested in finding out how closely your market share figures correlate with demographic data for each region. In the following expression, the POP0014 column contains the percentage of population 14 years of age and younger, and the POP1524 column contains the percentage of population 15 to 24 years old. The under-25 population is your target market, and you want to see how many regions with a market share greater than 10% also have an under-25 population greater than or equal to 20% of the total population. You can select these rows with QUERY | SELECT BY VALUE using the following expression:

```
(MKT_SHARE > 10) .AND. ((POP0014 + POP1524) >= 20)
```

This expression would select those ZIP codes that have a market share greater than 10% and a percentage of population under 24 years of age, greater than or equal to 20%.

Let's look at another example. Say that you wish to select all the U.S. postal customers with a ZIP code between 95101 and 95150, inclusively. Your database has a column called ZIP, which contains ZIP codes. You could use the following expression:

```
VAL(ZIP) >= 95101 .AND. VAL(ZIP) <= 95150
```

Because ZIP is a character column, we have to convert it to a numeric value in order to compare it with our selection range, which is numeric.

Sometimes, you may wish to search your database for a particular text string. For example, you may want to find all businesses in Los Angeles city. To do this, you could search the database for rows with a CITY column containing "Los Angeles."

```
"Los Angeles" $ CITY
```

The $ operator means "is contained in." It does not look for an exact match, like the = operator, it just looks for the occurrence of "Los Angeles" anywhere in the CITY column. The match with "Los Angeles" must be exact and correct in case a record containing "LOS ANGELES" or "Los angeles" would not match; however, a row containing "East Los Angeles" or "Los Angeles area" would match.

Now, suppose you want to find only the businesses in Los Angeles that are located on Wilshire Boulevard.

```
("Los Angeles" $ CITY) .AND. ("Wilshire" $ ADDRESS)
```

This expression checks for the occurrence of "Wilshire" in the ADDRESS column and "Los Angeles" in the CITY column.

Theme Maps

In our example of using expressions with the QUERY menu, we selected regions with a market share greater than 10% and an under-25 population greater than or equal to 20%. If we wanted to create a theme map of those regions, we could choose MAP | LAYERS & THEMES and enter the following expression in the Theme subpanel:

```
IIF(MKT_SHARE > 10 .AND. (POP0014+POP1524) >= 20,1,0)
```

The IIF function has three components: (1) a logical expression to be evaluated, (2) an expression to be returned if (1) is TRUE, and (3) an expression to be returned if (1) is FALSE. In this IIF function, our selection expression (MKT_SHARE . . . 20) is the logical expression. If it is TRUE for a region, the result returned is 1; otherwise, it is 0. In defining the map ranges, we would then select the Discontinuous ranging method and set up two ranges, 0-0 and 1-1. If we assigned the color red to the 1-1 range and left the 0-0 range blank, we would have a theme map showing as red all the regions that met our market share and population criteria.

Creating Labels

Another way that Atlas GIS uses expressions is in creating labels for your maps. Label expressions can range from simple to complex. In their most simple form, they contain a column name, such as SALES. When you name a single numeric field as the label expression, Atlas GIS automatically converts it to a string for you.

Often you will want to combine character strings with numeric data, to create more meaningful labels. When you do that, you need to convert the numeric data to character data. Look at the following example:

```
"Sales = " + LTRIM(STR(SALES))
```

The first part of this expression inserts a string into the label so that the resulting label will read Sales = n, where n is the sales amount from the column SALES. To concatenate the SALES number with a character string and use it in a label, we must first convert it to a string with the STR function. Then we have to use the LTRIM function to trim leading blanks from the string—here's why. Numeric fields are right-justified. When you convert a number to a string, it remains right-justified and all the spaces between the beginning of the field and the leftmost character are considered part of the new string.

If we added the string without trimming the leading blanks, we could end up with something like this:

```
Sales =        234567.
```

Let's look at another, more complex way to use expressions in labels. Say you work for a police department and are investigating a series of crimes. You have a point table storing information about the crime incidents. In addition to locational data, you also have columns with the crime date (CDATE) and time (CTIME). You are looking for patterns in the occurrences of these crimes, so you want to label your map with the following information: day of the week, date, number of days after the first crime, and the time of the incident. In other words, you want your labels to look like this:

```
MON  07/06/92
Day 2,  5:16p
```

To use an expression to create this label, choose MAP | LAYERS & THEMES and click on the Labels option button to access the Labels subpanel. For this example, July 4, 1992 (07/04/92), represents the date of the initial crime in the series we are labeling. In the Label Expression group box, enter the following:

Line 1:

```
UPPER(SUBSTR(CDOW(CDATE),1,3)) + " " +
STUFF(DTOC(CDATE),7,4,"92")
```

Line 2:

```
IIF(CDATE = CTOD("07/04/92"), "FIRST CRIME, " +
CTIME, "Day " + LTRIM(STR(CDATE - CTOD("07/04/92")))
+ ",  " + CTIME)
```

Here's how the above expressions are evaluated. The first item in Line 1 of the label is the day of the week, abbreviated to the first three letters and capitalized. We use the CDOW function to read the date contained in CDATE and generate the day of the week for that date (Monday). The SUBSTR function extracts the first three letters (Mon), and the UPPER function converts them to uppercase (MON). The next part of the expression (+ " " +) adds a space; otherwise the label would read "MON07/06/92." The last part of the expression yields the date. First DTOC is used to convert the date contained in CDATE to a character format, mm/dd/yyyy. Since we want to use the shorter mm/dd/yy format, we use the STUFF function to manipulate the format of the string. Beginning at position 7, we remove 4 characters and replace them with “92.”

The expression that generates Line 2 of the label was written so that the first crime site would be labeled differently from the rest. The IIF function checks for a condition, then assigns one of two defined outcomes, depending on whether the condition is TRUE or FALSE. In this example, the logical expression (CDATE = CTOD("07/04/92")) checks to see whether the date contained in CDATE matches the initial crime date. Note that the initial crime date had to be converted to a date format, using the CTOD function, for the comparison to be valid. If the expression had been evaluated as true, the second expression would have been returned, and the second line of our label would have looked like this:

```
FIRST CRIME, 5:16p
```

This was a result of the expression combining the character string “FIRST CRIME,” with the contents of CTIME.

Since the logical expression in our IIF argument was evaluated as false, the third expression ("Day. . .CTIME) was returned instead. This expression inserted the word “Day” into the label, calculated the number of days since the first crime had been committed, formatted the result, and inserted the time from the CTIME column, along with appropriate punctuation and spaces. To subtract the initial crime date from the date in CDATE, we again used CTOD to convert the character string to the date format. The result of this operation was 2.000000; we used the STR function to convert it to a string (2) and LTRIM to trim the leading blanks (2).

Expression Troubleshooting

If you are having problems forming expressions in Atlas GIS, the following checklist of common errors may help.

1. Are all of your column names spelled correctly?

   Check for:

   - Misspellings
   - Omission of special characters, such as the underscore in _NAME or _ID

2. Are parentheses used correctly?

   Check for:

   - Unbalanced parentheses, especially if you have nested functions
   - Proper use with functions-must enclose the function argument(s)

3. Are quotation marks used correctly?

   Check for:

   - Unbalanced quotation marks
   - Character strings or dates that should be enclosed in quotation marks

   Note: Remember to enclose all character strings and pieces of text you want interpreted literally in quotation marks. Atlas GIS will read unenclosed text as a field name and will return an expression error message when it does not find a field by that name. Numbers defined as character data (like the ZIP code example that follows) also need to be enclosed in quotation marks.

   Examples:

```
LASTNAME = "Smith" .AND. FRSTNAME = "William"
CTOD("08/31/92")
"12345" $ ZIP_CODE
VAL("4356.01")
SUBSTR("12345-6789",1,5)
STUFF("LASTNAME",1,4,"FRST")
```

4. Do you have a data type mismatch?

   Check for:

   - unallowed comparisons between different field types
   - incorrect expression type used in functions
   - improper use of conversion functions, such as VAL, STR, or CTOD

In the following example sets, CHAR, NUM, and DATE represent character, numeric, and date fields, respectively.

Table A.2 **Example sets**

WRONG	RIGHT
CHAR > 10	NUM > 10
NUM = "Smith"	CHAR = "Smith"
DATE = "08/31/92"	DATE = CTOD("08/31/92")
SUBSTR(DATE,1,5)	SUBSTR(DTOC(DATE),1,5)
VAL(NUM)	VAL(CHAR)
VAL(3456.01)	VAL("3456.01")
STR(CHAR)	STR(NUM)
STR("3456.01",7,2)	STR(3456.01,7,2)

5. Does the result of your expression look different than you expected? Is it blank or only partially represented? Do your fields run together without spaces between them, or are there too many spaces between characters or strings?

   Check for:

   - Incorrect manipulation of strings in concatenating operations
   - Failure to trim leading or trailing blanks

   Note: Review the structure of your table if you are having trouble manipulating strings. Take note of the widths of the columns you put in your expressions. If the string you want to extract is smaller than the defined width, use SUBSTR, LTRIM, RTRIM, LEFT, and RIGHT functions to eliminate unwanted blanks or other segments of data strings. Add a space between fields (+ "   " +) when appropriate in concatenating operations.

6. Does the result of your expression(s) exceed the allowed number of characters for a valid Atlas GIS expression?

   Check for:

   - characters in excess of the 255-character limit for expression results

7. Does your expression use U.S. numeric formatting conventions?

   Check for:

   - Use of comma in place of decimal period
   - Use of period as thousands separator

   Note: Remember that although expressions must be entered using the U.S. numeric format, the results of expressions will follow whatever convention you have specified on the Windows Control Panel. This means that if you have Windows configured with a comma as the decimal separator and a period as the thousands separator, the results of your expressions will use those symbols in place of the U.S. ones. The following examples assume that Windows has been configured to use a comma for decimals and a period for thousands.

Table A.3 **Examples of international expression results**

EXPRESSION	**INTERNATIONAL RESULT**
TRANSFORM(12345.67,"$###,###.##")	$ 12.345,67
STR(12345.675,8,2)	12345,68
VAL("2,5")	2
VAL("2.5")	2,5

B

SQL Query Builder

This appendix explains the Query Builder, how it simplifies your task of building query definitions, and how to use it to build a new query definition. This appendix also explains the various components of the SQL Select statement.

You will want to use the Query Builder to build query definitions for the following reasons:

- You can build the complete query definition before querying the database, thus reducing network traffic.
- You can easily see the entire query definition and make changes to it.
- You can build and modify complex query definitions quickly and easily.
- You can use complex *Where* clauses, adding parentheses to force the order of evaluation.
- You can display only a few fields from a database that has numerous fields.
- You can modify any part of the query statement without resetting all conditions and sorting.

The User Interface

To invoke the Query Builder and create a new query definition, use the FILE | SQL ACCESS | NEW QUERY command. To invoke the Query Builder to modify an existing query definition, use the FILE | SQL ACCESS | OPEN QUERY command. When you invoke the Query Builder, the Query Builder window is displayed. This window has a menu and icon bar across the top, and a status bar across the bottom.

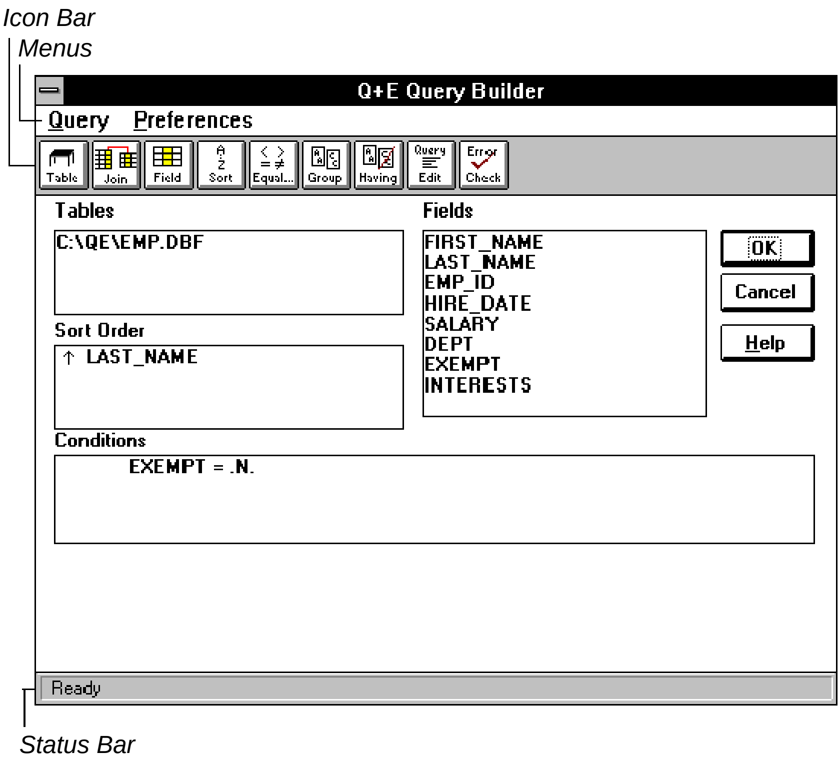

Figure B.1 **The Query Builder window**

The Query Window displays the definition of the current query, as shown in each of the group boxes below:

- Tables — Lists the database tables from which records will be retrieved.
- Fields — Lists the fields in the database table to be displayed in columns.
- Sort Order — Lists the sort orders for the records.
- Conditions — Lists the conditions used to specify which records are to be displayed.

There are three additional group boxes that can be displayed: a Table Joins box, a Group By box and a Having box. A Table Joins group box is displayed when you have defined a join among database tables. The other two boxes are displayed when you have defined a *Group By* clause.

In the figure above, the query definition selects the eight fields listed in the Fields group box from the EMP.DBF file, as shown in the Tables group box, sorts the records by LAST_NAME, as shown in the Sort Order group box, and displays only records of employees who are non-exempt (EXEMPT = N), as shown in the Conditions group box.

The Query menu contains the commands that allow you to define and modify your query statement. These commands correspond to the nine icons on the icon bar, and are defined in the following table.

Table B.1 **Query Menu and Icons**

ICON	**DEFINITION**
Table	Allows you to define the database tables from which columns will be selected.
Joins	Allows you to specify how to relate tables. This is valid only if you have specified more than one database table for the query.
Fields	Allows you to specify which columns of the table you want retrieved.
Sort	Allows you to specify by which columns you want the rows sorted.
Conditions	Allows you to specify conditions (for example, display all employees who have an annual salary greater than $30,000).
Grouping	Allows you to group sets of rows, and to define aggregate functions to compute (for example, average the salaries in each department).
Having	Allows you to specify additional conditions for groups of rows (for example, retrieve only the departments that have an average salary of more than $20,000). You can have a *Having* clause only if you have already defined a *Group By* clause.
Edit Query Text	Displays the SQL Select statement that corresponds to the current query definition. You can edit the statement from this screen.
Validity Check	Checks the syntax of an SQL Select statement that you have modified and reports any errors.

In addition, there are six icons that are available when you're in the Edit Query Text dialog box.

Table B.2 **Edit Icons**

ICON	DEFINITION
Cut	Removes a highlighted section of text from the screen and places it onto the clipboard.
Copy	Copies a highlighted section of text from the screen and places it onto the clipboard.
Paste	Pastes the contents of the clipboard onto the screen in front of the cursor.
Find	Searches and moves the cursor to a value that you specify.
Find Next	Finds the next occurrence of the specified value.
Replace	Searches for a specified value and replaces it with another value that you have specified.

The Preferences menu contains the following options you can set. (Note that when an option is set, it has a check mark beside it.).

Table B.3 **Preferences Menu**

COMMAND	DEFINITION
Use Database to Validate	When set, the Query Builder uses the database system to validate the query conditions as you build them. If not set, the Query Builder does not use the database system to check for errors, so you may construct conditions that have errors when you execute the query. The default is to validate.
Large/Small Icons	This option determines whether large or small icons are displayed on the icon bar. Large icons are the default.
Sample Values from Database	This option determines whether database values are displayed in the Value Expression list box of the Conditions dialog box when you are defining field conditions. The default is to show values.

Connecting to a Data Source

Before you can issue an SQL query, you must first connect to a data source. In this example, we will connect to the dBASE data source.

1. Choose FILE | SQL ACCESS | CONNECT.

   The SQL Data Sources dialog box pops up.

2. Choose the dBASE data source and click OK.

Building A New Query Definition

This example builds a query definition that selects a subset of fields (first name, last name, department, salary, and hire date) from an employee dBASE database file (EMP.DBF). The query defines the following display and retrieval conditions:

- Display records in ascending order by last name (sort order)
- Retrieve employees in department D101 that either make more than $40,000 or were hired after Jan 30, 1987

To select a database table:

1. Choose FILE | NEW QUERY | NEW QUERY.

   The New Query dialog box pops up.

2. Enter a name for the table to contain the query results, and click OK.

   The Tables dialog box pops up.

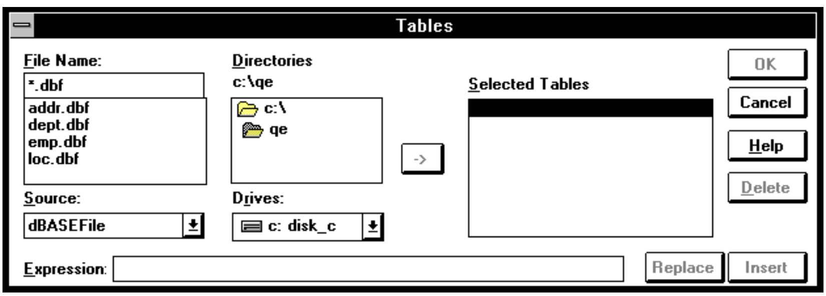

Figure B.2 **Tables dialog box**

3. In the *File Name* list box, choose 'EMP.DBF' and click on the >= button. This adds the EMP.DBF file to the Selected Tables list box.

   Note: When specifying the file name of a database table, you must make sure the correct source, the correct drive, and the correct directory path are specified so that all valid database table file names are listed in the *File Name* list.

4. Click OK.

   The Query Builder pops up.

To selecting the fields of the database table:

The fields the query will retrieve are FIRST_NAME, LAST_NAME, HIRE_DATE, SALARY, and DEPT.

1. Choose QUERY | FIELDS.

   The Fields dialog box pops up.

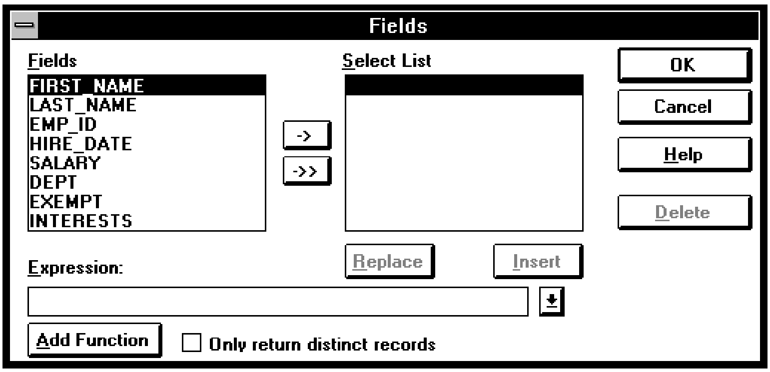

Figure B.3 **Fields dialog box**

2. In the Fields list box, choose 'FIRST_NAME' and then click on the -> button to add the field to the *Select List* box. Repeat this step for each of the other fields, LAST_NAME, HIRE_DATE, SALARY, and DEPT.

3. Click OK.

To define the sort order:

The records are to be sorted by the LAST_NAME field in ascending order (the default).

1. Choose QUERY | SORT.

   The Sort Order dialog box appears.

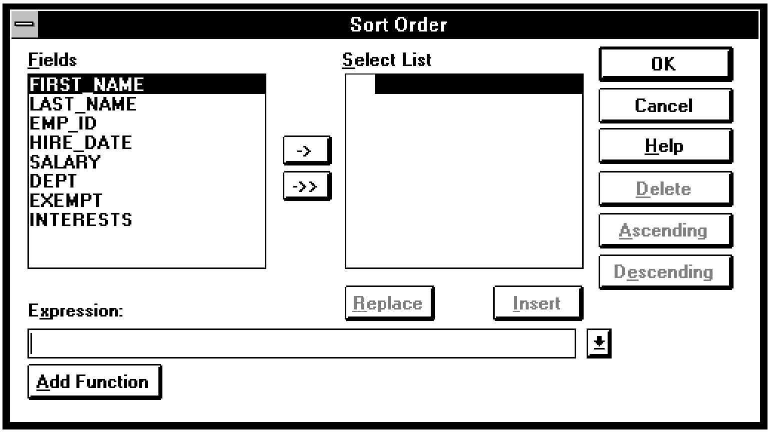

Figure B.4 **Sort Order dialog box**

2. In the Fields list box, choose 'LAST_NAME' and click on the >= button to add the field to the *Select List* box. The fields are sorted in ascending order by default. Notice how an up arrow is automatically placed by the field name.

3. Click OK.

To define conditions:

This example query definition further limits the records that are retrieved from the database table by adding a condition for three fields—SALARY, HIRE_DATE, and DEPT (as previously stated).

1. Choose QUERY | CONDITIONS.

   The Conditions dialog box appears.

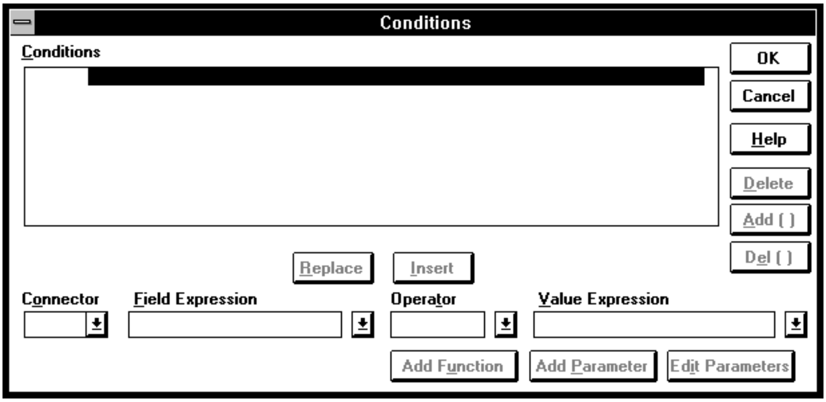

Figure B.5 **Conditions dialog box**

2. In the *Field Expression* list box, choose 'SALARY'. In the *Operator* list box, choose '>'. In the *Value Expression* text box, type '40000'.
3. Click on the Insert button to add this condition to the *Conditions* list box.
4. To add the second condition, set the options according to the following table.

OPTION	**SETTING**
Connector	`OR`
Field Expression	`HIRE_DATE`
Operator	>=

5. In the Value Expression text box, type '{01/30/87}'.
6. Click on the Insert button to add this condition to the *Conditions* list box.
7. To add the third condition, set the options according to the following table.

OPTION	**SETTING**
Connector	`AND`
Field Expression	`DEPT`
Operator	`=`
Value Expression	`D101`

Notice that ‘D101’ was a choice in the Value Expression list box. You didn’t choose a value expression for the first two conditions because the values specified were not values in the database file (therefore, not displayed in the list box).

8. Click on the Insert button to add this condition to the *Conditions* list box. The dialog box now looks like this:

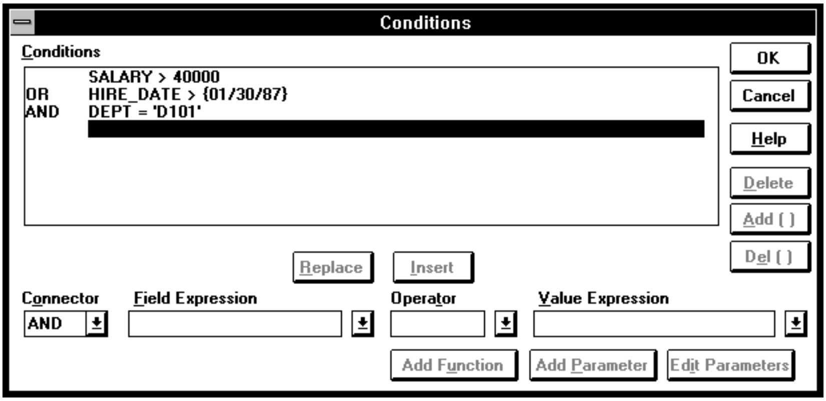

Figure B.6 **Conditions dialog box with three conditions**

9. For the conditions to be evaluated correctly, you must enclose the SALARY and HIRE_DATE conditions in parentheses. Select the text as shown in the following figure and click on the Add () button.

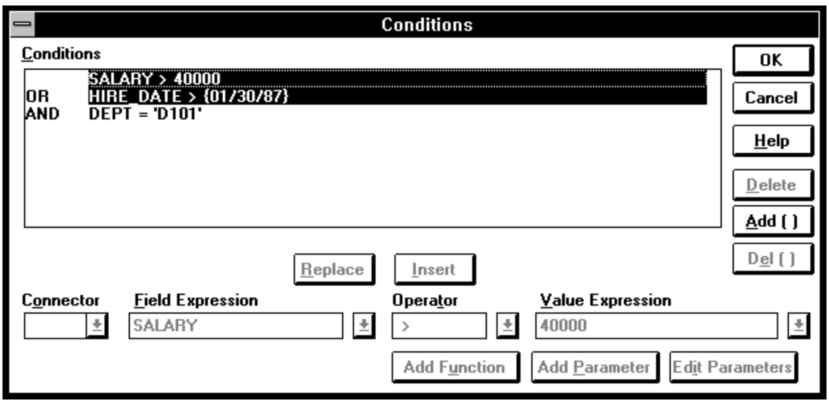

Figure B.7 **Text to enclose with parentheses**

10. Click OK to save these field conditions.

11. Click OK to exit the Query Builder and issue the query.

The Resulting Report

After the query is performed, the Table Link dialog box pops up, allowing you to specify how the resulting table is to be opened.

1. Open the table as unlinked, and click OK.

2. Click on the Table button to open a new Table window to display the unlinked table.

   The results of your query should look like the following:

FIRST_NAME	LAST_NAME	HIRE_DATE	SALARY	DEPT
David	McClellan	7/27/82	41500.00	D101
Tim	Sampair	12/2/87	27000.00	D101
George	Woltman	8/7/82	53500.00	D101

Select Statements

This section describes the SQL Select statement used by the Query Builder to query records from a database. The Select statement discussed in this chapter is in the form supported by the flat-file database drivers—Btrieve, dBASE, Paradox, Excel, and text files. The form of the Select statement supported by the flat-file drivers is as follows:

```
SELECT [DISTINCT] {* | column_expression, ...}
FROM filespec, ...
[ WHERE conditions ]
[ GROUP BY {column_expression, ...} ]
[ HAVING {conditions} ]
[ UNION [ALL] (SELECT...) ]
[ ORDER BY {sort_expression [DESC | ASC]}, ... ]
[ FOR UPDATE OF {column_expression, ...}]
```

The SELECT and FROM clauses are required; the WHERE, GROUP BY, HAVING, ORDER BY, FOR UPDATE OF clauses are optional, along with the DISTINCT and UNION operators.

Select Clause

Follow SELECT with a list of *column_expressions* you want to retrieve or an asterisk (*) to retrieve all fields.

The most common *expression* is simply a field name (for example, last_name). More complex expressions may include mathematical operations or string manipulation (for example, SALARY * 1.05). Refer to the "SQL Expressions" section later in this appendix.

You can list any number of column expressions, as long as you separate them by commas (for example, last_name, first_name, hire_date).

Field names may be prefixed with the table name or alias. For example emp.last_name or E.last_name, where E is the alias for table emp.

The DISTINCT operator can precede the first column expression. This operator eliminates duplicate rows from the result of a query. For example,

```
SELECT DISTINCT STATE
FROM emp
```

Aggregate functions can also be a part of a SELECT clause. Aggregate functions return a single value from a set of records. An aggregate can be used with a field name (for example, AVG(salary)), or in combination with a more complex column expression (for example, AVG(salary * 1.07)). The column expression can be preceded by the Distinct operator. The Distinct operator eliminates duplicate values from an aggregate expression. For example,

```
COUNT (DISTINCT last_name)
```

In this example, only different last name values are counted.

The following lists the valid aggregate functions:

SUM — Returns the total of the values in a numeric field expression. For example, `SUM(salary)` returns the sum of all salary field values.

AVG — Returns the average of the values in a numeric field expression. For example, `AVG(salary)` returns the average of all salary fields.

COUNT — Returns the number of values in any field expression. For example, `COUNT(name)` returns the number of name values. When using `COUNT` with a field name, `COUNT` returns the number of non-null field values. Another example is `COUNT(*)`—which returns the number of records in the set including those records with null values.

MAX — Returns the highest value in any field expression. For example, `MAX(salary)` returns the highest salary field value.

MIN — Returns the lowest value in any field expression. For example, `MIN(salary)` returns the lowest salary field value.

From Clause

Follow `FROM` with a list of file specifications (*filespec*). File specifications have the form:

`FROM` *tablename* [*options*] [*table_alias*]

The *tablename* can be a simple table name in the current working directory, or a complete pathname (C:\ODBC\EMP).

The *options* are database-dependent. For example, for dBASE, one option is the level of record locking used. Refer to the appropriate database driver in the on-line help.

The *table_alias* is a name used to refer to this table in the rest of the Select statement. Database field names may be prefixed by the table alias. Given the table specification, `FROM emp E`, you may refer to the `last_name` field as `E.last_name`. Table aliases must be used if the `SELECT` statement joins a table to itself. For example,

```
SELECT * FROM emp E, emp F
WHERE E.mgr_id = F.emp_id
```

Where Clause

The `WHERE` clause specifies the conditions that records must meet to be retrieved. The `WHERE` clause contains conditions in the form:

`WHERE` *expr1 rel_operator expr2*

The variables *expr1* and *expr2* may be field names, constant values, or expressions. *Rel_operator* is the relational operator that links the two expressions. (Refer to the “SQL Expressions” section later in this appendix.) For example, the following `SELECT` statement retrieves the names of employees that make at least $20,000

```
SELECT last_name,first_name FROM emp
WHERE salary >= 20000
```

Group By Clause

The `GROUP BY` clause specifies the names of one or more fields by which the returned values should be grouped. This clause is used to return a set of aggregate values.

It has the following form:

`GROUP BY` *column_expressions*

The *column_expressions* variable can be one or more field names of the database table, separated by a comma (`,`) or one or more expressions, separated by a comma (`,`). Refer to “SQL Expressions” later in this appendix.

The following example sums the salaries in each department.

```
SELECT dept_id, sum(salary)
FROM emp
GROUP BY dept_id
```

This statement returns one row for each distinct department ID. Each row contains the department ID and the sum of the salaries of the employees in the department.

Having Clause

The `HAVING` clause enables you to specify conditions for groups of records (for example, display only the departments that have salaries totaling more than $200,000). This clause is valid only if you have already defined a Group By clause.

It has the following form:

`HAVING` *expr1 rel_operator expr2*

The variables *expr1* and *expr2* can be field names, constant values, or expressions. *Rel_operator* is the relational operator that links the two expressions. Refer to the “SQL Expressions” section later in this appendix.

The following example returns only the departments whose sums of salaries are greater than $200,000.

```
SELECT dept_id, sum(salary)
FROM emp
GROUP BY dept_id
HAVING sum(salary) > 200000
```

Union Operator

The `UNION` operator combines the results of two `SELECT` statements into a single result. The single result is all of the returned records from both `SELECT` statements. By default, duplicate records are not returned. To return duplicate records, use the `ALL` keyword (`UNION ALL`). The form is

`SELECT` *statement*
`UNION [ALL]`
`SELECT` *statement*

When using the `UNION` operator, the select lists for the `SELECT` statements must have the same number of column expressions with the same data types and in the same order. For example,

```
SELECT last_name, salary, hire_date
FROM emp
UNION
SELECT name, pay, birth_date
FROM person
```

This example has the same number of column expressions, and each column expression, in order, has the same data type.

The following example is *not* valid because the data types of the column expressions are different (`salary` from `emp` has a different data type than `last_name` from `raises`). This example does have the same number of column expressions in each `SELECT` statement but the expressions are not in the same order by data type.

```
SELECT last_name, salary
FROM emp
UNION
SELECT salary, last_name
FROM raises
```

Order By Clause

The `ORDER BY` clause indicates how the records are to be sorted. The form of the clause is:

`ORDER BY {`*sort_expression* `[DESC | ASC]}, ...`

The *sort_expression* can be field names, expressions, or the positional number of the column expression to use. For example, to sort by `last_name` you could use either of the following `SELECT` statements:

```
SELECT emp_id, last_name, first_name FROM emp
ORDER BY last_name
```

or

```
SELECT emp_id, last_name, first_name FROM emp
ORDER BY 2
```

In the second example, `last_name` is the second column expression following `SELECT`, so `ORDER BY 2` sorts by `last_name`.

For Update Of Clause

The `FOR UPDATE OF` clause locks the records of the database file that are selected by the Select statement. The form is

`FOR UPDATE OF` *column_expressions*

The *column_expressions* variable is a list of field names in the database file that you intend to update, separated by a comma (`,`).

The following example returns all of the records of the employee database that have a `salary` field value of more than $20,000. When each record is fetched, it is locked. The lock is released when you do a positioned update or delete using a `WHERE CURRENT OF` *cursor_name* statement and `COMMIT` the update or delete. If the record is not updated or deleted, the lock is released when you fetch the next record.

```
SELECT *
FROM emp
WHERE salary > 20000
FOR UPDATE OF last_name, first_name, salary
```

For further information regarding the current of cursor statement, refer to the sections on `UPDATE` statements and `DELETE` statements in this appendix.

SQL Expressions

Expressions are used in the `WHERE` clauses, `HAVING` clauses, and `ORDER BY` clauses of SQL Select statements.

Expressions allow you to use mathematical operations as well as character string and date manipulation to form complex database queries. Valid expression elements are as follows:

- Field names
- Constants
- Numeric operators
- Character operators
- Date operators
- Relational operators
- Logical operators
- Functions

Field Names

The most common expression is simply a field name. You can combine a field name with other expression elements.

Constants

Constants are values that do not change. For example, in the expression `PRICE * 1.05`, the value `1.05` is a constant.

You must enclose character constants in pairs of single (`'`) or double quotes (`"`). To include a single quote in a character constant enclosed by single quotes, use two single quotes together (for example, `'Don''t'`). Similarly, if the constant is enclosed by double quotes, use two double quotes to include one.

You must enclose date and time constants in braces (`{}`), for example, `{01/30/89}` and `{12:35:10}`. The form for date constants is `MM/DD/YY` or `MM/DD/YYYY`. The form for time constants is `HH:MM:SS`.

The two logical constants are `.T.` for true and `.F.` for false.

Numeric Operators

You may include the following operators in numeric expressions:

OPERATOR	MEANING
`+`	Addition
`-`	Subtraction
`*`	Multiplication
`/`	Division
`**`	Exponentiation
`^`	Exponentiation

The following shows examples of numeric expressions. For these examples, assume `salary` is `20000`:

EXPRESSION	RESULTING VALUE
`salary + 10000`	`30000`
`salary * 1.1`	`22000`
`2 ** 3`	`8`

You can precede numeric expressions with a unary plus (`+`) or minus (`-`). For example `-(salary * 1.1)` returns `-22000`.

Character Operators

Character expressions may include the following operators:

OPERATOR	MEANING
`+`	Concatenation keeping trailing blanks.
`-`	Concatenation moving trailing blanks to the end.

The following shows examples of character expressions. In the examples `last_name` is `'BENNETT   '` and `first_name` is `'TYLER     '`:

EXPRESSION	RESULTING VALUE
`first_name + last_name`	`'TYLER     BENNETT   '`
`first_name - last_name`	`'TYLERBENNETT        '`

Note: Some flat-file drivers return character data with trailing blanks as shown in the table. However, you cannot rely on the driver to return blanks. Therefore, if you want an expression that works with drivers that do and do not return trailing blanks, use the `TRIM` function before concatenating strings to make the expression portable. For example,

```
TRIM(first_name) + '' + TRIM(last_name)
```

Date Operators

You may include the following operators in date expressions:

OPERATOR	MEANING
`+`	Add a number of days to a date to produce a new date.
`-`	The number of days between two dates, or subtract a number of days from a date to produce a new date.

The following shows examples of date expressions. In these examples, `hire_date` is `{01/30/90}`:

EXPRESSION	RESULTING VALUE
`hire_date + 5`	`{02/04/90}`
`hire_date - {01/01/90}`	`29`
`hire_date - 10`	`{01/20/90}`

Relational Operators

The relational operators separating the two expressions may be any one of the following:

OPERATOR	MEANING
`=`	Equal to
`<>`	Not equal to
`>`	Greater than
`>=`	Greater than or equal to
`<`	Less than
`<=`	Less than or equal to
`LIKE`	Matching a pattern
`NOT LIKE`	Not matching a pattern
`IS NULL`	Equal to null
`IS NOT NULL`	Not equal to null
`BETWEEN`	Range of values between a lower and upper bound

OPERATOR	MEANING
`IN`	A member of a set of specified values or a member of a subquery
`EXISTS`	“True” if a subquery returned at least one record
`ANY`	Compares a value to each value returned by a subquery. `ANY` must be prefaced by `=`, `<>`, `>`, `>=`,`<`, or `<=`. ***Note:*** `=ANY` is equivalent to `IN`
`ALL`	Compares a value to each value returned by a subquery. `ALL` must be prefaced by `=`, `<>`, `>`, `>=`,`<`, or `<=`

The following list shows some examples of relational operators:

```
salary <= 40000
dept = ’D101’
hire_date > {01/30/89}
salary + commission >= 50000
last_name LIKE ’Be%’
salary IS NULL
salary BETWEEN 10000 AND 20000
WHERE salary = ANY (SELECT salary FROM emp WHERE dept
= ’D101’)
WHERE salary > ALL (SELECT salary FROM emp WHERE dept
= ’D101’)
```

Logical Operators

Two or more conditions may be combined to form more complex criteria. When two or more conditions are present, they must be related by `AND` or `OR`. For example,

```
salary = 40000 AND exempt = .T.
```

The logical `NOT` operator is used to reverse the meaning. For example,

```
NOT (salary = 40000 AND exempt = .T.)
```

Operator Precedence

As expressions become more complex, the order in which the expressions are evaluated becomes important. The following precedence table shows the order in which the operators are evaluated. The operators in the first line are evaluated first, then those in the second line, and so on. Operators in the same line are evaluated left to right in the expression.

PRECEDENCE	OPERATOR
1	`Unary -, Unary +`
2	`**`
3	`*, /`
4	`+, -`
5	`=, <>, <, <=, >, >=, LIKE, NOT LIKE, IS NULL, IS NOT NULL, BETWEEN, IN, EXISTS, ANY, ALL`
6	`NOT`
7	`AND`
8	`OR`

The following example shows the importance of precedence:

```
WHERE salary > 40000 OR
hire_date > {01/30/89} AND
dept = 'D101'
```

Because `AND` is evaluated first, this query retrieves employees in department `D101` hired after January 30, 1989, as well as every employee making more than $40,000, no matter what department or hire date.

To force the clause to be evaluated in a different order, use parentheses to enclose the conditions to be evaluated first. For example,

```
WHERE (salary > 40000 OR hire_date > {01/30/89})
AND dept = 'D101'
```

This retrieves employees in department D101 that either make more than $40,000 or were hired after January 30, 1989.

Functions

The flat-file drivers support a number of functions that you may use in expressions. In the following tables, the functions are grouped according to the type of result they return: character strings, numbers, and dates.

Table B.4 **Functions That Return Character Strings**

FUNCTION	DESCRIPTION
CHR	Converts an ASCII code into a one-character string. CHR(67) returns C.
RTRIM	Removes trailing blanks from a string. RTRIM('ABC ') returns 'ABC'.
TRIM	Same as RTRIM. TRIM('ABC ') returns 'ABC'.
LTRIM	Removes leading blanks from a string. LTRIM(' ABC') returns 'ABC'.
UPPER	Changes each letter of a string to uppercase. UPPER('Rappl') returns 'RAPPL'.
LOWER	Changes each letter of a string to lowercase LOWER('Rappl') returns 'rappl'.
LEFT	Returns left-most characters of a string. LEFT('Woltman',3) returns 'Wol'.
RIGHT	Returns right-most characters of a string. RIGHT('Woltman',4) returns 'tman'.
SUBSTR	Returns a substring of a string. Parameters are the string, the first character to extract, and the number of characters to extract (optional). SUBSTR('Holcomb',2,3) returns 'olc'. SUBSTR('Holcomb',2) returns 'olcomb'.
SPACE	Generates a string of blanks. SPACE(5) returns ' '.
DTOC	Converts a date to a character string. An optional second parameter determines the format of the result: 0 (the default) returns MM/DD/YY 1 returns DD/MM/YY 2 returns YY/MM/DD 10 returns MM/DD/YYYY 11 returns DD/MM/YYYY 12 returns YYYY/MM/DD. An optional third parameter specifies the date separator character. If not specified, a slash (/) is used DTOC({01/30/89}) returns '01/30/94'. DTOC({01/30/89}, 0) returns'01/30/94'. DTOC({01/30/89}, 1) returns '30/01/94'. DTOC({01/30/89}, 2,'-') returns '94-01-30'.
DTOS	Converts a date to a character string using the format YYYYMMDD. DTOS({01/23/90}) returns '19900123'.

Table B.4 **Functions That Return Character Strings**

FUNCTION	DESCRIPTION
`IIF`	Returns one of two values. Parameters are a logical expression, the true value, and the false value. If the logical expression evaluates to true, the function returns the true value. Otherwise, it returns the false value. `IIF(salary>20000,'BIG','SMALL')` returns `'BIG'` if the salary is greater than 20000. If not, it returns `'SMALL'`.
`STR`	Converts a number to a character string. Parameters are the number, the total number of output characters (including the decimal point), and optionally the number of digits to the right of the decimal point. `STR(12.34567,4)` returns `'12'`. `STR(12.34567,4,1)` returns `'12.3'`. `STR(12.34567,6,3)` returns `'12.346'`.
`STRVAL`	Converts a value of any type to a character string. `STRVAL('Woltman')` returns `'Woltman'.` `STRVAL({12/25/53})` returns `'12/25/53'`. `STRVAL (5 * 3)` returns `'15'`. `STRVAL (4 = 5)` returns `'False'`.
`TIME`	Returns the time of day as a string. At 9:49 PM, `TIME()` returns `'21:49:00'`.
`USERNAME`	Returns the name of the current user as a character string. If Bennett is the current user, `USERNAME()` returns `'Bennett'`.

Table B.5 **Functions That Return Numbers**

FUNCTION	DESCRIPTION
`MOD`	Divides two numbers and returns the remainder of the division. `MOD(10,3)` returns `1`.
`LEN`	Returns the length of a string. `LEN('ABC')` returns `3`.
`MONTH`	Returns the month part of a date. `MONTH({01/30/94})` returns `1`.
`DAY`	Returns the day part of a date. `DAY({01/30/94})` returns `30`.
`YEAR`	Returns the year part of a date. `YEAR({01/30/94})` returns `1994`.
`MAX`	Returns the larger of two numbers. `MAX(66,89)` returns `66`.
`MIN`	Returns the smaller of two numbers. `MIN(66,89)` returns `66`.
`POW`	Raises a number to a power. `POW(7,2)` returns `49`.
`INT`	Returns the integer part of a number. `INT(6.4321)` returns `6`.
`ROUND`	Rounds a number. `ROUND(123.456, 0)` returns `123`. `ROUND(123.456, 2)` returns `123.46`. `ROUND(123.456, -2)` returns `100`.
`NUMVAL`	Converts a character string to a number. If the character string is not a valid number, a zero is returned. `NUMVAL('124')` returns the number `123`.
`VAL`	Converts a character string to a number. If the character string is not a valid number, a zero is returned. `VAL('123')` returns the number `123`.

Table B.6 **Functions That Return Dates**

FUNCTION	DESCRIPTION
`DATE`	Returns today's date. If today is 12/25/94, `DATE()` returns `{12/25/94}`.
`TODAY`	Returns today's date. If today is 12/25/94, `TODAY()` returns `{12/25/94}`.
`DATEVAL`	Converts a character string to a date. `DATEVAL('01/30/94')` returns `{01/30/94}`.
`CTOD`	Converts a character string to a date. An optional second parameter specifies the format of the character string: `0` (the default) returns `MM/DD/YY`. `1` returns `DD/MM/YY` `2` returns `YY/MM/DD`. `CTOD('01/30/89')` returns `{01/30/89}`. `CTOD('01/30/89',1)` returns `{30/01/89}`.

The following examples use some of the number and date functions.

- Retrieve all employees that have been with the company at least 90 days:

```
SELECT first_name, last_name FROM emp WHERE DATE() -
hire_date >= 90
```

- Retrieve all employees hired in January of this year or in January of last year:

```
SELECT first_name, last_name FROM emp WHERE
MONTH(hire_date) = 1 AND (YEAR(hire_date) =
YEAR(DATE()) OR YEAR(hire_date) = YEAR(DATE()) - 1)
```

C

System Text Strings and Picture Formatting

Atlas GIS provides two display features that help you tailor your map to your exact specifications. You can access certain system variables, such as the date or current map projection, and display them on your map. These variables are accessed through the text boxes in dialog boxes, such as the Title text box in the Theme Legend dialog box. This allows you to display system text strings that change as the variables change.

You can also format numeric data with the picture formatting symbols. These symbols allow you to specify how you want the numeric data to be displayed. For instance, you can use picture formatting to specify how you want the data range descriptions to display in a theme legend.

System Text Strings

When you enter text in Atlas GIS, you can either type a text string, or you can type an *@ code* to access system variables such as the date, the name of the current project file, or the map projection. For example, if you set the text of your map title to *Weekly Traffic Volume Report – @da,* the code *@da* will display the current date after the title text. Each time you display the map, the current date is shown in the title.

System text strings can be used in various text fields in Atlas GIS such as the map title, map scale, and theme and layer legends. You can also specify a system text string in the Date Format and Time Format text boxes in the Preferences dialog box (in the Units options).

Note: You can use more than one @ code in a single entry.

Formatting System Text Strings

In Atlas GIS text boxes (for example, in the Title dialog box, the Line 1 text box), type the desired @ code. If necessary, you can even use more than one @ code in a text box. You can also combine regular text with a system text string; Atlas GIS passes any unrecognized characters through without changes.

The general format for the @ codes is as follows:

@[<][>][–][num]code

@	Identifies the following text as a system text string code.
<	Causes all text to appear in lowercase. Optional.
>	Causes all text to appear in uppercase. Optional.
–	Causes overwrite rather than insertion. Optional.
num	Causes the field to take, at most, this number of characters. Optional.
code	Two-letter code identifying the system variable.

Note: If you type an unrecognized @ code, it is simply passed through unchanged. If you type @@, it is converted to a single @.

System Text String Functions

The following table describes the @ codes available in Atlas GIS. Use the formatting guidelines outlined above in "Formatting System Text Strings."

Table C.1 **Available @ codes**

	CODE	**DESCRIPTION**
Date Functions	@dy	Year (2-digit)
	@dc	Year (4-digit)
	@dm	Month (number 1 through 12)
	@dd	Day
	@da	Completely formatted date (in default format specified in the Preferences dialog box)

Table C.1 **Available @ codes (Continued)**

	CODE	DESCRIPTION
Time Functions	@ti	Completely formatted time (in default format specified in the Preferences dialog box)
	@t2	Hour (24-hour)
	@th	Hour (12-hour)
	@tm	Minutes
	@ts	Seconds
	@tp	A.M. or P.M.
Numeric Display Functions	@n.	Decimal separator
	@n,	Thousands separator
	@n;	ASCII file delimiter
Singular Unit Systems	@sm	Map distance
	@sp	Page distance (paper, screen)
	@sa	Map area
	@st	Text height
	@sl	Line width
Plural Unit Systems	@us	Scale (normal display usage)
	@um	Map distance
	@up	Page distance
	@ua	Map area
	@ut	Text height
	@ul	Line width
Miscellaneous Functions	@pg	Page number (useful only on printed reports)
	@fg	Name of the first geo file listed in the default layer set
	@fa	Name of the first attribute table listed in the default layer set
	@fd	Name of the first point table listed in the default layer set
	@fm	Name of the current project file
	@v1	Theme expression for Theme Legend 1

Table C.1 **Available @ codes (Continued)**

CODE	DESCRIPTION
@v2	Theme expression for Theme Legend 2
@v3	Theme expression for Theme Legend 3
@v4	Theme expression for Theme Legend 4
@pj	Current map projection
@pn	Program name (Atlas GIS for Windows)
@rc	Count in current range (useful only in legend descriptions)

Aligning System Text Strings

You can use the vertical bar character (|) to set the alignment of text strings in the map title. You can left-justify, right-justify, or center the text. By default, the text is centered.

Imagine that the title area consists of three pieces (a left, a middle, and a right piece). Depending on where the vertical bar (|) is placed relative to the string, the text is aligned as follows:

ALIGNMENT	BAR PLACEMENT
Center	No vertical bar required. Text is centered by default.
Left	Vertical bar to the right of the string. For example, @da|.
Right	Vertical bar to the left of the string. For example, |@fg.

Note: You can use up to three vertical bars in a single entry. Refer to “System Text String Examples” in the on-line help for examples of how the vertical bars are used.

Picture Formatting

The numeric variables that occur in map feature labels or theme legend range descriptions can be formatted with a *picture template*. A picture template is a sequence of characters used to format a number or a string. They can be used to indicate how many characters or decimal numbers to display, as well as where to place commas, periods, dollar signs, and other symbols.

Picture Formatting Symbols

Atlas GIS provides the picture formatting symbols listed in the table below. These symbols can be used exclusively, or with picture formatting functions. For example, for map labels, you can use picture formatting symbols in the Labels options in the Layers & Themes dialog box. For a theme legend, you can use picture formatting symbols in the corresponding Theme Legend dialog box.

Table C.2 **Picture formatting symbols**

CHARACTER	DESCRIPTION
# or 9	Displays digit, sign, or leading space for numeric data
.	Specifies decimal position (U.S. format). Also used as thousands separator, when there are digits to left (international format)
,	Specifies decimal position (international format). Also used as thousands separator, when there are digits to left (U.S. format)
$	Displays dollar sign in place of leading space
*	Displays asterisk in place of leading space
X, A or N	Displays any character for character data
!	Displays any character as uppercase
L	Displays T or F for a logical value
Y	Displays Y or N for a logical value

Note that any character other than a special picture character is displayed exactly as specified in the text box. The following table demonstrates a few examples.

Table C.3 **Picture formatting examples**

VALUE	PICTURE	RESULT
1234	999999	‘ 1234’
1234	$999,999.99	$ 1,234.00
1234	$###,###.##	$ 1,234.00
1234	Germany: #### DM	Germany: 1234 DM
Too Long	XXXXXX	Too Lo

Picture Formatting Functions

There are some special picture *functions* you can include at the beginning of a picture template, before any picture formatting symbols. The picture functions are listed in the table below.

Table C.4 **Picture functions**

FUNCTION	DESCRIPTION
@B	Left-justifies numbers
@Z	Displays the number 0 as a blank
@(	Places negative numbers inside parenthesis
@C	Places ‘ CR’ after positive numbers
@X	Places ‘ DB’ after negative numbers
@!	Displays the entire string, all uppercase
@D	Displays a date value as MM/DD/YY (U.S. format)
@E	Displays a date value as DD/MM/YY (European format)

The following table illustrates some more examples using the special picture functions.

Table C.5 **Picture formatting examples with special picture functions**

VALUE	PICTURE	RESULT
1234	999999	‘ 1234’
1234	@B999999	‘1234 ’
0	@Z999999	‘ ’
-1234	@($999,999.99	($ 1,234.00)
1234	@C$999,999.99	$ 1,234.00 CR
-1234	@X$999,999.99	$ 1,234.00 DB
abc	@!	ABC
abcdefgh	@!	ABCDEFGH