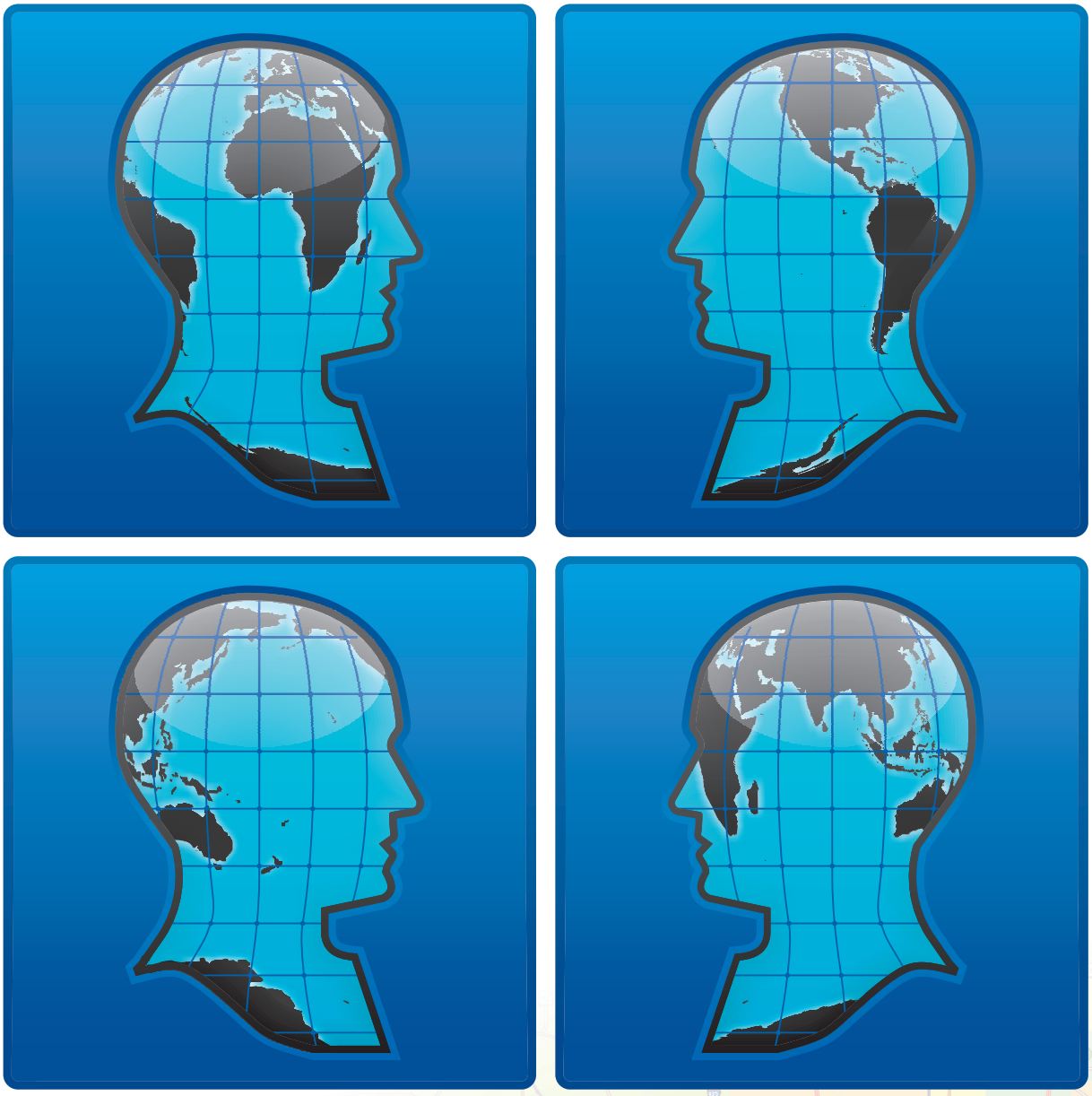

Maptitude®

Geographic Information System

Caliper®

Caliper Maptitude 2017 User's Guide

NOTICE

Information in this document is subject to change without notice. Although Caliper attempts to make the documentation accurate and up-to-date, users are cautioned that there may be occasional differences between the documentation and the operation of the software.

Companies and names used in examples herein are fictitious.

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CONTENTS:

PREFACE:

The **Maptitude® User's Guide** is designed to help you learn and use Maptitude. It describes in plain English how Maptitude works and how you can use Maptitude to get your work done. We've made this User's Guide easy to read and task-oriented, with lots of signposts you can use to find the information you want.

About You

We made a few assumptions about you when we put this book together:

- You are a busy professional with a lot on your mind, and a lot of work on your desk.
- You use a personal computer fairly often and have worked with other software that runs under Microsoft Windows.
- You don't necessarily know anything about maps or geography.

In response, we've done the following things:

- We made the User's Guide very clear and concise, and provided a comprehensive Table of Contents and Index to help you quickly find the information you need.
- We designed Maptitude and the User's Guide to be like other Windows applications, so you don't have to spend extra time and effort relearning things you already know.
- We started with the basics of maps and geography and made sure that the User's Guide tells you everything you need to know to create and use maps in your work.

If you are a transportation or GIS professional, you may wish to consider using the more advanced capabilities of TransCAD® Transportation Planning Software. If you would like to have interactive maps on your web site, you may wish to consider Maptitude for the Web. Contact Caliper for more information at 617- 527-4700 or on the Internet at WWW.CALIPER.COM.

About Maptitude

Maptitude Geographic Information System for Windows is the intelligent mapping solution for business, government, and education. Maptitude is a powerful combination of software and geographic data that provides everything you need to realize the benefits of desktop mapping and geographic analysis with a single, easy-to-use package. Using Maptitude you can:

- Create beautiful map displays
- Enhance reports and presentations with maps, charts, and page layouts
- Reveal geographic patterns that cannot be seen in database tables and spreadsheets
- Answer questions about the location and characteristics of map features (points, lines and areas)
- Create geographic data and share information with your work-group, department, or organization.

Maptitude includes extensive geographic and demographic data so you can get started as soon as you install the software. A basic global map is provided with every Maptitude license along with a detailed Country Package that includes a wealth of data unavailable in any other product, including an up-to-date street layer with addresses for pin-mapping (geocoding) and travel time information for computing routes and drive-time rings.

Create-a-Map Wizard™ can make a map at any scale from all the countries in the world to the local streets around an address, landmark or intersection. The Map Librarian manages numerous categories of pre-designed maps. You can open one or more of these maps for a selected location.

Maptitude lets you create maps using your own data. You can read data in many formats including Excel, dBASE, Access, Oracle, and text files, and you can access data from spreadsheets and database management systems using Open Database Connectivity (ODBC). You can link your data to features on a map or locate data on a map using street address and Postal/ZIP Code or by simply pointing to the correct location. In a few easy steps, you can color code Postal/ZIP Codes using sales data, and display the locations of customers or other points of interest.

Maptitude enhances your projects and decision-making by making it easy to ask and answer questions about geographic data. Where are the census tracts with the highest population density? How many people live within one mile, two miles, and three miles of this site? Where are potentials for growing my business? How many comparable properties are located in my neighborhood? What is the shortest route between delivery points? Maptitude provides the answer to these and many other questions in maps and dataviews that show selected map features, report data values and display new features.

Maptitude runs under Windows Vista, 7, 8, 10 or later. Maptitude is licensed in several different ways (see HTTP://WWW.CALIPER.COM/MAPTPRIC.HTM). Maptitude is network-aware and network-enabled. You can share tabular data, geographic files, maps, dataviews, charts, and layouts. Full control over read-write permissions is supported. Maptitude allows simultaneous editing of geographic and attribute data files by multiple users, a powerful feature in an enterprise wide GIS implementation. Maptitude also supports direct editing and access to corporate geographic databases (e.g. an Oracle Spatial database).

About This Book

This User's Guide is a one-stop learning and reference tool. The User's Guide combines explanations of the capabilities of Maptitude with lots of examples, step-by-step procedures for using the software, and brief tutorials that let you practice what you've learned. In addition, Chapter 2 has a comprehensive hands-on tutorial that will familiarize you with many of the concepts and features of Maptitude.

Conventions in the User's Guide

This User's Guide uses certain typographic styles to make it easier to read. The styles that you will encounter most often are:

Style	Example	Meaning
Bold word	**Map**	Important term
Bold and italic words	***File-Open***	Menu item
Picture of a button		The button to click on a toolbar

Several Maptitude dialog boxes include standard buttons. The buttons that you will encounter are:

Button	Description
Apply	Executes an action based upon the settings defined in the dialog box and keeps the dialog box open
Cancel	Cancels all changes, reverts to previous settings, and closes the dialog box
OK	Executes an action based upon the settings defined in the dialog box and closes the dialog box

Maptitude Help - The Other Way to Learn Maptitude

This book will help you to become an effective Maptitude user. However, Maptitude also offers a comprehensive, context-sensitive help system that you can use whenever you need it. To use the Maptitude Help, press the F1 key or choose ***Help-Maptitude Help***.

Maptitude also provides on-screen help when you use the menus and tools. Whenever you click on a menu, the status bar at the bottom of the screen gives you a brief description of the highlighted command. If you hold the cursor over a button in a toolbar or toolbox and wait for a moment, a small yellow box identifies the tool, and the status bar at the bottom of the screen gives a very brief description of how to use it.

Training and Support

Many users learn Maptitude more rapidly and effectively by participating in Maptitude training classes. Hands-on training is available from Caliper Corporation or Authorized Maptitude Trainers. Please contact Caliper Training at (617) 527-4700 or visit WWW.CALIPER.COM/TRAINING/MAPTITUDE.HTM for more information.

There are also videos on the Caliper website that demonstrate many common Maptitude tasks. Please visit WWW.CALIPER.COM/MAPTITUDE/MAPPING-SOFTWARE-VIDEO-TUTORIALS.HTM to see the available videos.

If You Need More Help...

If you find yourself stuck or in need of additional assistance, please contact our Technical Support department.

NOTE: You must be a registered user to receive Caliper Technical Support Services. Register your software by filling out Caliper Corporation's Internet registration form at WWW.CALIPER.COM/REGISTER.HTM. Caliper software support services are subject to support fees and terms in place at the time the services are used.

Write your serial number in the space below so that you will have it available when you contact Technical Support.

Serial Number:_____

You can get technical support from Caliper Corporation in four ways:

- Choose ***Help-Email Technical Support*** to send e-mail via the Internet. Your mail program will be launched with a message that includes data about your Maptitude installation.
- Choose ***Help-Technical Support on the Web*** to fill out a Technical Support Request. Your browser program will be launched with a form that is partially filled in with data about your Maptitude installation.
- Send e-mail to SUPPORT@CALIPER.COM.
- Call Maptitude Technical Support at (617) 527-8617.

You can reach Maptitude Technical Support by telephone between 8:30 a.m. and 6:00 p.m., Eastern Time, Monday through Friday.

When you call, please be at your computer, have your documentation available, and be prepared to provide the following information:

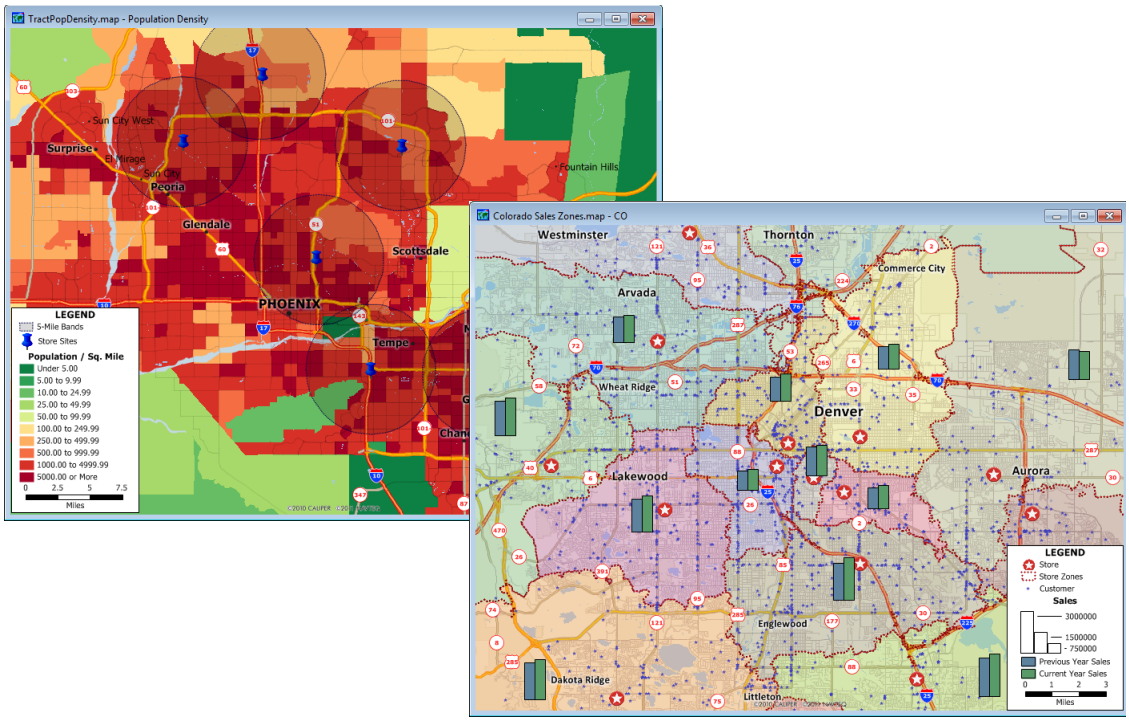
- The product serial number (Choose ***Help-About*** to check your serial number)
- Your name and organization
- The version of the product you are using (Choose ***Help-About*** to check your version number)
- The exact wording of any messages that appear on your screen

Thank you for purchasing Maptitude. And now, on to Chapter 1.

CHAPTER 1:
Introducing Maptitude

Maps communicate information that is related to space and location in a remarkably efficient way, reducing volumes of information to a single, clear visual presentation. A weather map lets you know in an instant whether it will be cloudy or sunny, how warm or cold it will be, and whether it will rain or snow. Traffic maps let you know in seconds what route you should take to avoid an accident or steer clear of construction. In politics, history, advertising, and recreation, maps are a part of our everyday lives because they tell us so much of what we want to know.

Maptitude provides the tools, maps, and demographic data you need, with commands and special functions that let you tie in the data you use every day in your work. The MapWizard® automatic mapping tools creates brilliant and informative maps with a single mouse click. Even more importantly, Maptitude provides ways for you to use the maps you create to analyze and understand how geography affects you and your business.



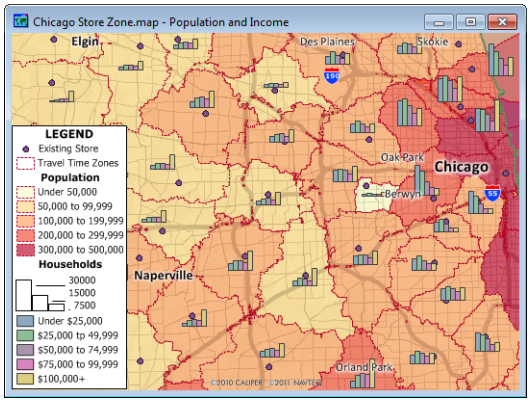
What Maptitude Can Do

Maps are a vital and indispensable tool for business, government, and education users that can provide a significant strategic edge in marketing, forecasting, planning, operations, training, and other tasks. Maps make data easier to understand by illustrating the spatial currents and patterns in data in a unique and distinctive fashion.

Here are a few of the ways that Maptitude can help you do your job better and make you more productive:

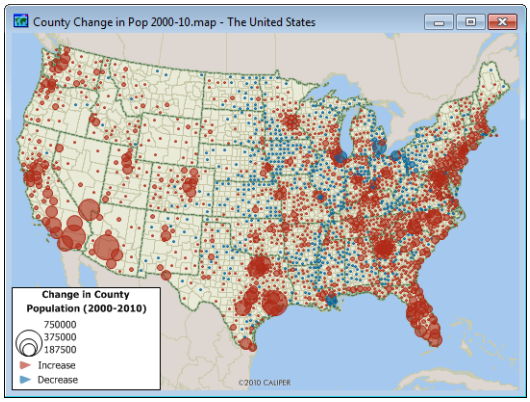
Visualize data in new and different ways.

See data on income, age, race, gender, employment, and other population and housing characteristics. Identify target markets of consumers and businesses. Use the data that come with Maptitude to your business advantage.



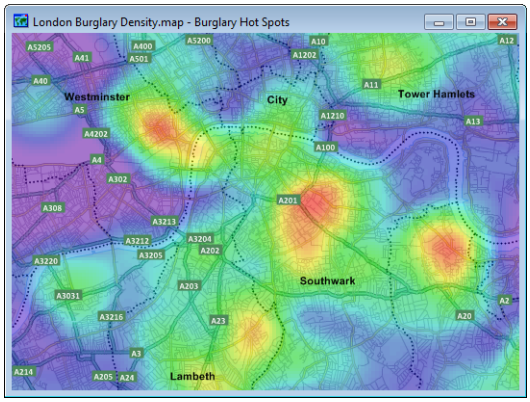
Create presentation graphics to use in meetings and reports.

Create elegant and informative maps and charts that add life to your reports. Convey information and deliver your message in a more powerful way. Use Maptitude maps to impress clients, inform constituents, and train students.



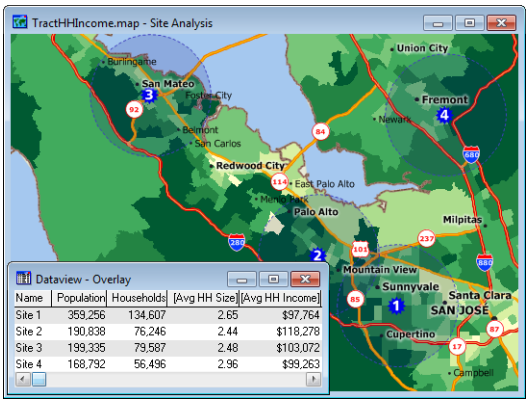
Unearth geographic patterns in your data.

Combine the data that come with Maptitude with your own data to reveal strengths and weaknesses in your organization. Create maps showing where clients and prospects are located, and where they're not. Overlay these data on population and economic data to explore how the characteristics of each region affect the success of your organization.



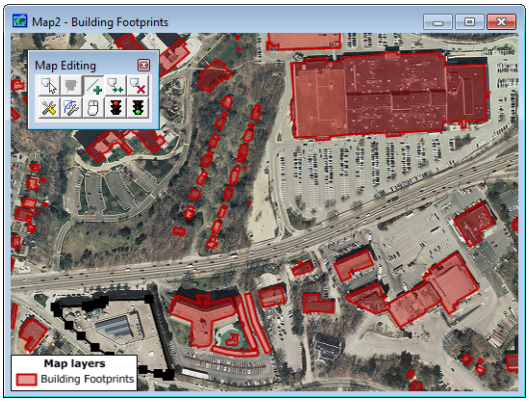
Learn which sites are best for your business.

Use demographic and business data to evaluate the potential market around possible sites, and make better decisions on where to locate and invest. Use analysis tools to define service areas and sales territories, and to create efficient travel routes. Evaluate sites for retail stores, schools, and government service offices.



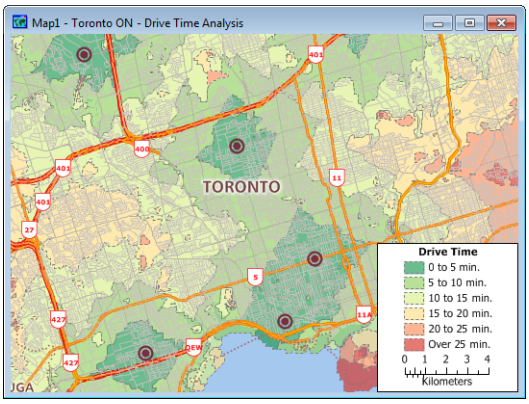
Maintain and update geographic data.

Create and maintain databases of facilities, customers, sales, voters, roads, utility lines, traffic signals, tax assessments, zoning, real estate, students, and much more. Maptitude includes volumes of geographic data you can use to create maps quickly and easily.



Create handsome and informative maps.

Maptitude is the best desktop software for making maps. In seconds, and with a few clicks of the mouse, Maptitude brings data to life with maps that impress and inform. Maptitude provides astonishing flexibility and power so you can enhance and customize maps in ways you never dreamed possible.



Maptitude Basics

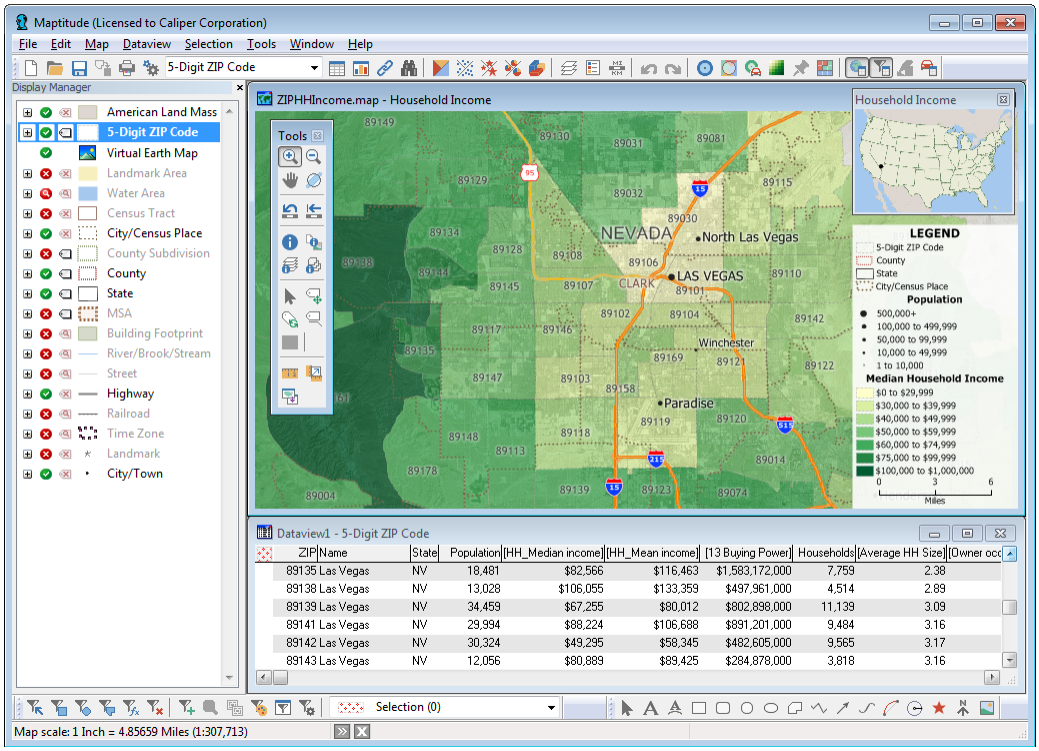
Maptitude combines many components into one package:

- A tremendous storehouse of data you can use to create detailed maps.
- A collection of capabilities for displaying, editing, and working with your own business data.
- Ways to link the built-in information to your own data.
- An assortment of tools for analyzing, interpreting, and presenting information using maps.

Let's take a look at some of the basic concepts to understand when working with Maptitude.

The Maptitude Screen

The Maptitude screen resembles many other Windows applications. Like most Windows programs, you use Maptitude by choosing commands from the menus or by using command buttons and tools in a toolbar. Toolbars can either be docked or floating. You can also right-click to choose from context-sensitive menus. Some commands and tools can be used only at certain times. When a tool or command cannot be used, it is displayed in gray. Commands also have hotkeys that are used by pressing the Alt key and the underlined character in the menu item.



Maptitude displays information in different types of windows. For example:

- **Map windows** show geographic features and their characteristics. You can choose the features you want to see and how you would like to see them.
- **Dataviews** display information from geographic files, databases, or spreadsheets in tabular format. In a dataview you can display and edit data, customize the way the data are displayed, perform statistical analyses, or link your own data to features on a map.

- **Figures** show prism maps and surface profiles.
- **Layouts** bring together any number of maps, dataviews, and figures in a single presentation and allow you to add freehand text, drawings, your company logo, and more.

The recently opened files are listed in the ***File*** menu. Windows that are open are listed in the ***Window*** menu. You can have any number of map windows open in your workspace.

▶ To Arrange Windows

1. If you have more than one window open, you can arrange the windows as follows:

Choose...	To do this...
Window-Tile Horizontally	Tile all non-minimized windows horizontally
Window-Tile Vertically	Tile all non-minimized windows vertically
Window-Cascade	Arrange all non-minimized windows so that they are the same size and their title bars are visible
Window-Minimize All	Minimize all windows
Window-Arrange Icons	Arrange all minimized windows
Window-Restore All	Restore all minimized windows to their previous size and location

Workspaces

Often you will have several windows of different types open on your screen. You can save all your open windows in a single step using a **workspace**. When you save a workspace, Maptitude puts information about all of your maps, dataviews, figures, and layouts into a single file. When you open this file, all the windows are restored.

Toolbars

Toolbars can be turned on using commands from the various menus or buttons on the Standard toolbar. You can customize the toolbars by choosing which ones are displayed and whether they are floating or docked. Floating toolbars can be resized or docked on any side of the Maptitude screen.

▶ To Dock Floating Toolbars

1. Drag the title bar of the toolbar you want to dock to any side of the Maptitude screen.

▶ To Resize Floating Toolbars

1. Position the cursor over one of the edges of the toolbar.
2. Click and drag until the toolbar is the shape you want.

▶ To Float Docked Toolbars

1. Click and drag the vertical bar on the left side of a docked toolbar.

▶ To Hide Toolbars

1. Click the Close button on the right side of the toolbar's title bar. The Standard toolbar cannot be hidden.

Geographic Files

Geographic files are special databases that store the geographic information that Maptitude uses to draw maps. Each geographic file is drawn on a map as a **layer**. Geographic files are installed separately from the program disc and are provided for a single country or geographic area as a region. You can have more than one region installed for use with Maptitude, and you can add and remove regions with the Region Manager.

Each region includes an extensive library of geographic and demographic data that help you get your projects started quickly. Typically, the geographic files in a region include a street layer with address ranges for geocoding, a highway layer, political boundary layers (e.g., states, provinces, counties), a railroad layer, point and area landmark layers, river and waterway layers, and a populated place layer. In addition, some regions may include a postal boundary layer (e.g., ZIP Codes in the U.S., Postcode sectors and districts in the U.K., Postcodes in Australia), census geography layers (e.g., Tracts in the U.S., Census Divisions and Subdivisions in Canada, Output Areas in the U.K.), and legislative boundaries (e.g., Westminster Constituency Boundaries in the U.K., Territorial Authorities in New Zealand).

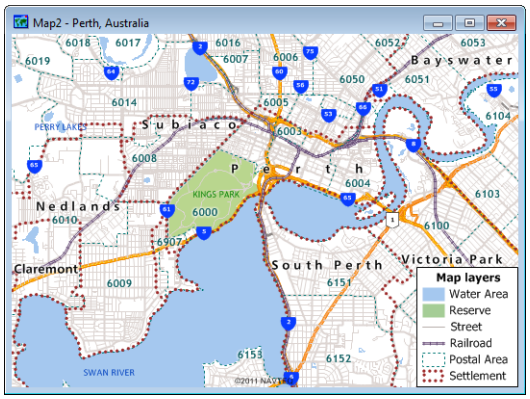
Several world geographic files are also provided with Maptitude. These include cities, countries, provinces (where available), and a world gazetteer.

NOTE: For a complete list of the geographic files included with a region, choose ***Help-Region Data*** and choose a region from the submenu. For more information on the Region Manager, see "Using the Region Manager" on page 105.

Maptitude also provides comprehensive tools for creating, editing, importing, and exporting geographic data. Maptitude has an open systems architecture with extensive support for data exchange. This lets you import data from, and export data to, most popular DBMS, CAD, and GIS software packages. Maptitude also lets you directly use Esri Shapefiles and Personal Geodatabases, MapInfo TAB files, Oracle Spatial tables, and any ODBC table with a coordinate as a map layer.

Layers

Maptitude organizes all of the features in a map by **layer**. When you create or work with a map, you choose the layers you want to see and decide how each layer should look. For example, this sample road map of Perth, Australia contains separate layers for water areas, reserves, settlements, postal areas, streets, and railroads.



For more information on layers, see "Changing the Contents of a Map" on page 60.

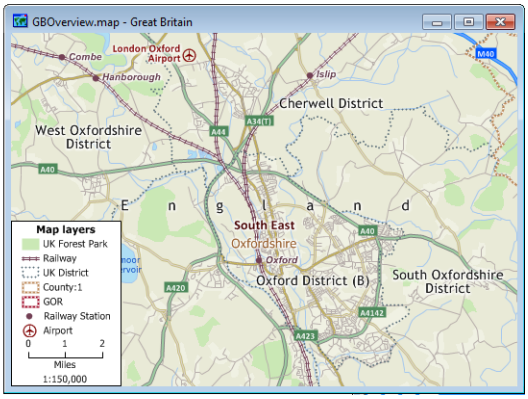
Labeling Features on a Map

Maptitude lets you **label** each feature on a map with its name or any other attribute. Maptitude lets you choose label position, size, color, style, and priority. In addition, you can move individual labels to suit your needs, use callouts, and rotate labels.

For more information on labels, see "Using Labels" on page 86.

Map Scale and Location

While a paper map shows a fixed geographic region, Maptitude lets you move around the map from place to place, zooming in as you like, to see more and more geographic detail. You can use **autoscaling** so that layers appear automatically as you zoom in.

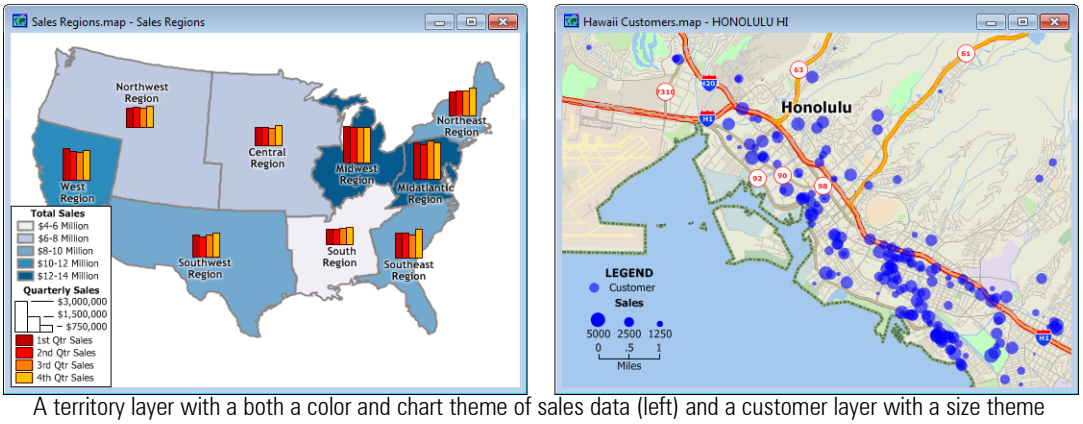


If you often want to look at one or more particular locations, you can save those locations by creating a **bookmark**. You can quickly zoom to the location of a bookmark from any map, or create a map based on a bookmark by using the **Map Librarian**. You can also use an **overview window** to show the location of a map and move the map to a new location.

For more information on changing the map scale and saving bookmarks, see *Chapter 4: Moving Around a Map*. For more information on autoscaling, see "Controlling Layers Automatically with Autoscale" on page 64.

Themes

A **theme** (or choropleth map or heat map) is a way to illustrate the data that go with a map layer. Maptitude lets you create many types of themes that use colors, patterns, charts, and symbols to make informative maps. When you create a theme, you choose the data you want to use and the type of theme you want. You can let MapWizard® automatic mapping do the rest, or customize the settings for the theme to make your map look exactly the way you want.

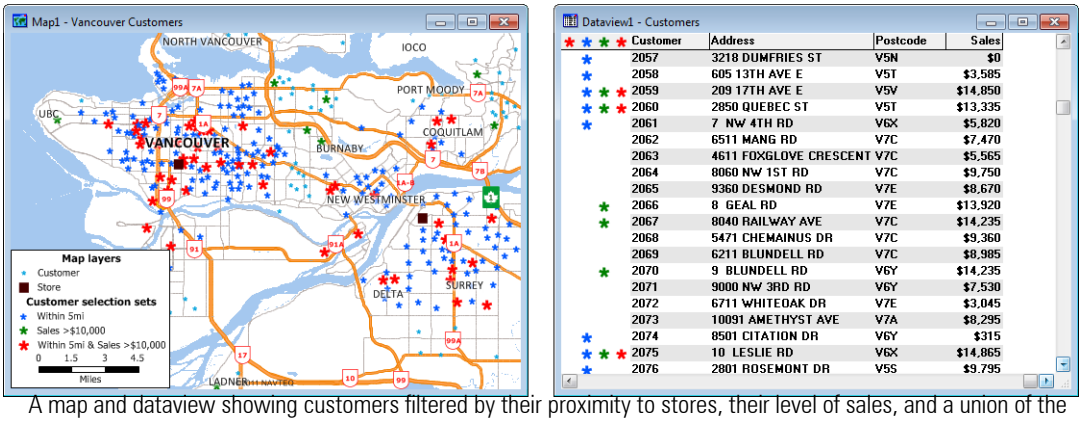


A territory layer with a both a color and chart theme of sales data (left) and a customer layer with a size theme showing sales data (right).

For more information on themes, see *Chapter 6: Using Themes to Present Information*.

Selection Sets/Filters

Maptitude provides tools for asking and answering questions about the features in a map and the data in a dataview such as which customers are more than 10 miles from a store, which ZIP Codes have a median household income over $75,000, or combination questions such as which tax parcels are zoned single-family residential and within 1/2 mile of a school? Maptitude stores the answers to these questions in **selection sets** which can highlighted on a map or in a dataview.

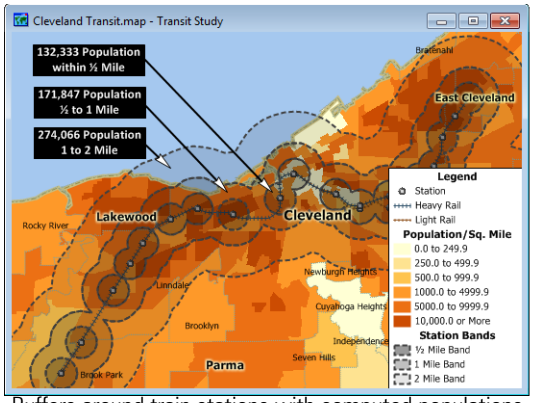


A map and dataview showing customers filtered by their proximity to stores, their level of sales, and a union of the two.

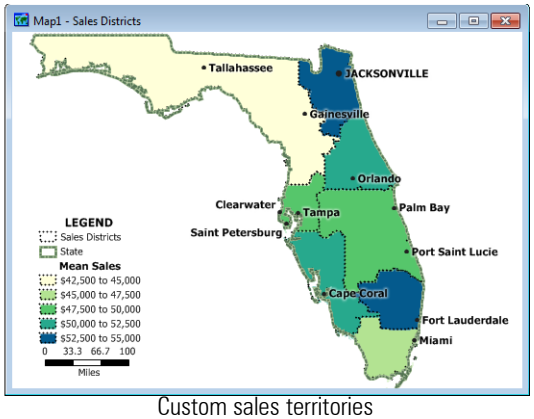
For more information on filters and selection sets, see *Chapter 8: Queries and Selection Sets*.

Geographic Analysis Tools

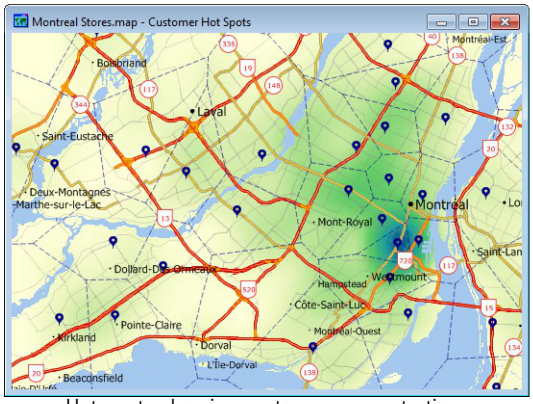
One of the best reasons to use a GIS is to unearth and analyze the geographic components of your data. You can create buffers (bands) around map features, create territories, define areas of influence and market catchment areas, find routes, identify hot spots, generate contours, and much more. Maptitude also makes it easy to overlay and aggregate data and compute statistics.



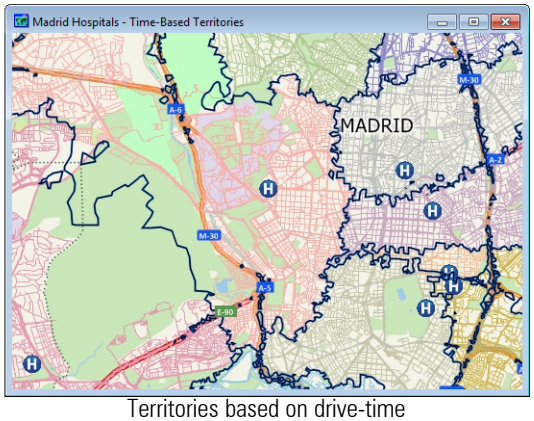
Buffers around train stations with computed populations



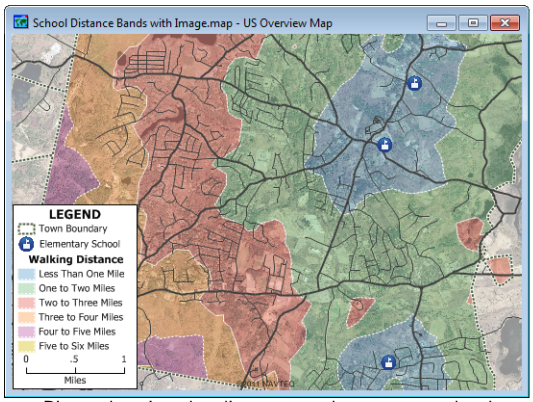
Custom sales territories



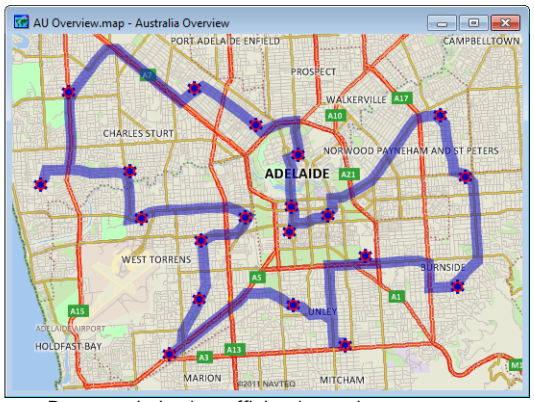
Hot-spots showing customer concentrations



Territories based on drive-time



Rings showing the distance to the nearest school



Route optimized to efficiently service customers

See *Chapter 10: Geographic Analysis Tools.*, *Chapter 11: Routing, Directions, and GPS*, and *Chapter 12: Surface Analysis Tools* for more information on the analysis tools in Maptitude.

Custom Application Development

Maptitude includes the **Geographic Information System Developer's Kit** (GISDK™). GISDK gives you the tools that you need to create a wide variety of products for delivering mapping and geographic analysis capabilities to your customers. Almost 800 functions can be called from Caliper Script, a complete programming language for designing menus and dialog boxes (including toolbars and toolboxes) and for writing macros. The Caliper Script code is stored in resource files that you can edit with your favorite text editor. With GISDK you can:

- Create add-ins or macros that extend the capabilities of Maptitude or that automate repeated operations. Add-ins can be freely distributed to any Maptitude user without restriction.
- Build custom applications that focus the user on the capabilities needed for a particular purpose by extending or replacing the standard Maptitude interface. You design the menus, toolbars, toolboxes and dialog boxes, and program the application to respond to user actions in any way you want.
- Access Maptitude from .NET to integrate it into a .NET application or access Maptitude as a COM Object to add maps or analysis functions to your own programs. The .NET classes included with Maptitude allow you to access the GISDK environment from a Windows desktop application (Windows Forms) written in any .NET language such as C#, Python, Visual Basic, etc. GISDK also allows you to call GISDK functions and macros from another application using COM. Maptitude can provide map, data, and geographic analysis services when accessed as a COM Object. You write your application in a programming language that can make COM calls, and when you need map services you call the Maptitude object to supply those services.

Choose ***Help-GISDK Help*** for information on GISDK.

For web applications, Maptitude for the Web provides an easy and cost-effective solution. For more information, visit WWW.CALIPER.COM or contact Caliper sales at 617-527-4700.

Installing Maptitude

Maptitude is easy to install. All you need to do is answer a few questions about where the program and data files should be stored.

▶ To Install Maptitude on Your Computer

1. Start Windows.
2. Insert the Maptitude Program DVD in your DVD drive to autorun the installation. If the installation does not automatically run, browse your computer for your DVD drive and double-click the SETUP.EXE file.

   The setup program guides you through the installation process, asking questions and making suggestions along the way.

3. Maptitude starts the Activation Wizard. Make sure your computer is connected to the Internet, choose **Request Activation Code from Caliper** and click Next.
4. Verify your registration information and click Next.
5. If the software is not automatically activated, you will receive an activation code from Caliper. You can either click the Back button until you are at the first screen of the Software Key Activation Wizard or click the Start button and choose Activation Wizard for Maptitude from the Programs menu, then follow the steps to activate Maptitude with the activation code.
6. Register your software via the World Wide Web.
7. Install the data as outlined in the following how-to.

TIP: If you do not have Microsoft Office installed, make sure to install the 2010 Access Database from Microsoft. It is used by Maptitude to read Excel and Access database files.

▶ To Install Region Data on Your Computer

1. If you have not already done so, install the Maptitude software as outlined in the previous how-to.
2. Insert the data disc that came with your Maptitude in your DVD drive to autorun the data installation. If more than one data disc was included, insert the disc labeled Data Disc 1. If the setup program does not automatically run, browse your computer for your DVD drive and double-click the DATAINSTALLER.EXE file.
3. Follow the prompts to install the region data.

If you want to share data files with other users, see Appendix B, Configuring Your Computer and LAN.

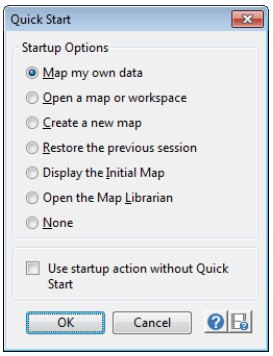
▶ To Uninstall Maptitude from Your Computer

1. Choose ***Settings*** from the ***Start*** menu.
2. Choose **Control Panel** from the Settings menu, then double-click **Add/Remove Programs**.
3. Choose **Maptitude**, then click **Add/Remove**.

The uninstall program guides you through the process of uninstalling the software and deactivating or retaining the license.

Starting Maptitude

When you first start Maptitude, the program displays the Quick Start dialog box:



The quick start dialog box has the following options:

Option	What it does...
Map my own data	Takes information from your data file and helps you make a map quickly and easily that helps you visualize your data
Open a map or workspace	Displays the File Open dialog box, which lets you open files of many different types
Create a new map	Displays the Create-a-Map Wizard™, which helps you build a new map from scratch
Restore the previous session	Opens all the maps, dataviews, layouts, and figures that you were using when you last closed Maptitude
Display the initial map	Displays a default map of your installed region
Open the Map Librarian	Displays the Map Librarian, from which you can open one or more existing maps for a specific location
None	Starts Maptitude with no files or maps open

If you don't want to see the Quick Start dialog box when you start Maptitude, check the box at the bottom of the dialog box before clicking OK. In the future, when you start Maptitude, it will always start with the option you last chose. To turn the Quick Start dialog box back on, choose ***Edit-Preferences*** and check the **Display the Quick Start Window on Start-up** box on the Settings tab.

Putting the Basics to Work

This chapter has provided an overview of some of the basic features of Maptitude. To try out these features, move on to Chapter 2 and work your way through the Maptitude Tutorial. In about a half hour, you'll see a number of these terms and concepts put into practice. At the same time, you'll get enough hands-on experience to help you understand what Maptitude can do for you.

You can also visit the caliper web site to see some video tutorials that show many common Maptitude tasks. Visit WWW.CALIPER.COM/MAPTITUDE/GETSTARTED to see the videos.

CHAPTER 2:
Tutorial

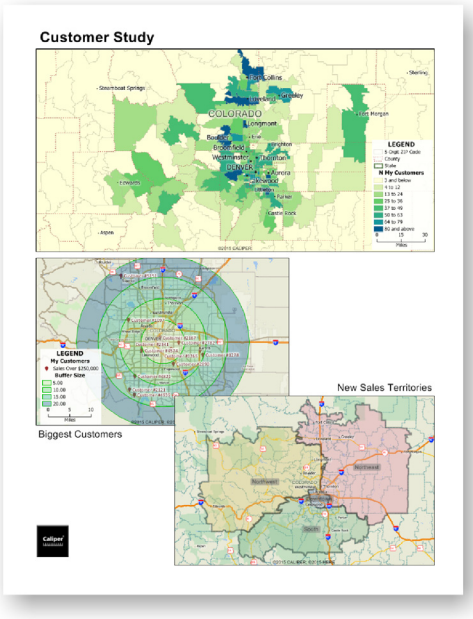
Now that you have learned some of the basics, let's work through a sample project that will give you some hands-on experience in creating and using maps. In this chapter, you will create the layout shown below and, in the process, practice using some of the most important features of Maptitude.

To do the tutorial, you must have installed the geographic data that come with Maptitude to a folder on your computer.

The Project

It is late morning and you have to make a sales presentation for the lunchtime staff meeting. You have an Excel spreadsheet that contains data about your customers including their addresses, the volume of sales, and the sales territory to which they belong. You are going to use Maptitude to analyze your sales data and present your findings. You will do this analysis in the following stages:

- Create an overview map of customer data by postal code to show where your customers are concentrated
- Create a map that shows where your customers are located
- Identify your best customers based on sales and proximity
- Find a route for efficiently visiting your best customers
- Show the proximity of your best customers to your location
- Display data for your customers of interest
- Modify your sales territories to make them more balanced and allocate your customers to the new territories
- Create and print a layout that illustrates your findings



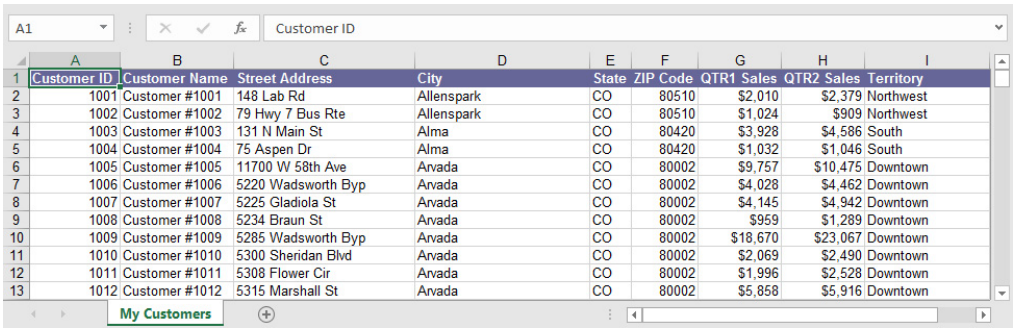
Along the way, you will learn many Maptitude basics such as changing the contents of a map, moving around a map, filtering records on a map, changing how features appear on a map, labeling features on a map, working with dataviews, and exporting results to Excel.

Let's begin.

Stage 1: Using Your Data in a Map

The Maptitude Create-a-Map Wizard™ guides you through many common Maptitude tasks. Whether you need to create a general purpose map of a neighborhood, a city, a country, or the whole world, or create a thematic map illustrating your data, or perform geographic analysis based on your data, Create-a-Map Wizard can help you get started.

The Tutorial folder in your Maptitude documents folder contains an Excel spreadsheet with sample customer data for your region (e.g., SAMPLE CUSTOMERS UNITED STATES.XLSX, SAMPLE CUSTOMERS AUSTRALIA.XLSX, etc.). It includes the customer name, address, 1st quarter sales, 2nd quarter sales, and sales territory.

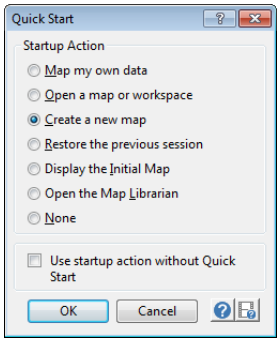


Customer ID	Customer Name	Street Address	City	State	ZIP Code	QTR1 Sales	QTR2 Sales	Territory
1001	Customer #1001	148 Lab Rd	Allenspark	CO	80510	$2,010	$2,379	Northwest
1002	Customer #1002	79 Hwy 7 Bus Rte	Allenspark	CO	80510	$1,024	$909	Northwest
1003	Customer #1003	131 N Main St	Alma	CO	80420	$3,928	$4,586	South
1004	Customer #1004	75 Aspen Dr	Alma	CO	80420	$1,032	$1,046	South
1005	Customer #1005	11700 W 58th Ave	Arvada	CO	80002	$9,757	$10,475	Downtown
1006	Customer #1006	5220 Wadsworth Byp	Arvada	CO	80002	$4,028	$4,462	Downtown
1007	Customer #1007	5225 Gladiola St	Arvada	CO	80002	$4,145	$4,942	Downtown
1008	Customer #1008	5234 Braun St	Arvada	CO	80002	$959	$1,289	Downtown
1009	Customer #1009	5285 Wadsworth Byp	Arvada	CO	80002	$18,670	$23,067	Downtown
1010	Customer #1010	5300 Sheridan Blvd	Arvada	CO	80002	$2,069	$2,490	Downtown
1011	Customer #1011	5308 Flower Cir	Arvada	CO	80002	$1,996	$2,528	Downtown
1012	Customer #1012	5315 Marshall St	Arvada	CO	80002	$5,858	$5,916	Downtown

You are going to use information contained in this file to complete this project.

▶ To Create the Sales Map

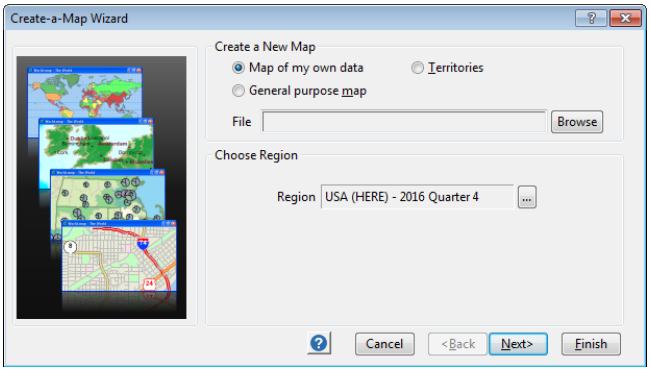
1. If you haven't already done so, start Maptitude by clicking the Start button and choosing Maptitude from the Programs menu.
2. From the Quick Start dialog box, choose the **Create a New Map** option and click **OK**.



If you don't see the Quick Start dialog box, choose ***File-New Map*** or click on the Standard toolbar.

Maptitude displays the Create-a-Map Wizard dialog box.

3. Choose **Map of My Own Data** from the radio list and click **Next**.



Maptitude displays the Choose the File that Contains Your Data dialog box.

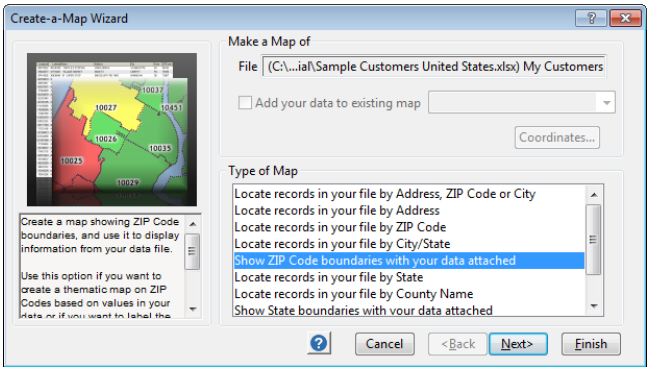
4. Make sure that **Excel Worksheet** is the file type, browse for the Tutorial folder in the Maptitude Documents folder (e.g., Documents\Caliper\Maptitude 2017\Tutorial), choose the sample Excel file, and click **Open**.

5. Click **OK** to use the "My Customers" sheet in the Excel file.

6. Click **Next.** Create-a-Map Wizard lists the mappable fields that it found in the Excel file.

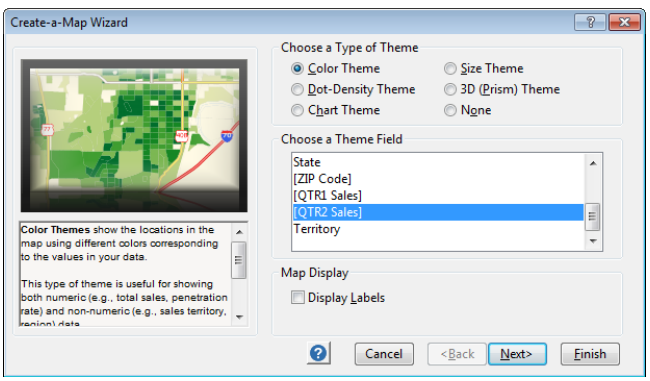
7. Click **Next**. Create-a-Map Wizard lists the types of maps that you can make based upon the data it finds in your spreadsheet.

8. Choose the **Show ZIP Code/Postal Area/FSA Code boundaries with your data attached** option (The exact wording will vary depending upon the country data you are using).



9. Click **Next**.

10. Create-a-Map Wizard shows the types of themes you can create with your data. Choose **Color Theme** from the radio list and **[QTR2 Sales]** from the scroll list.



11. Click **Finish**.

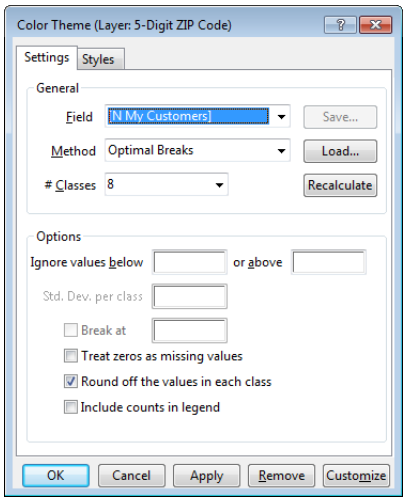
That's all there is to it. Maptitude totals the 2nd Quarter sales in each postal code and displays the map with a color theme illustrating the sales data.

When you use the Create-a-Map Wizard tool, Maptitude automatically selects data, styles, labels, and a map scale appropriate for the type of area you wish to display. In addition, Maptitude calculates the sums and averages of all of the numeric data in your Excel file, and counts the number of customers in each postal code.

Let's change the map to show the number of customers (stored in a field called [N My Customers]) in each postal code and customize the theme that is used.

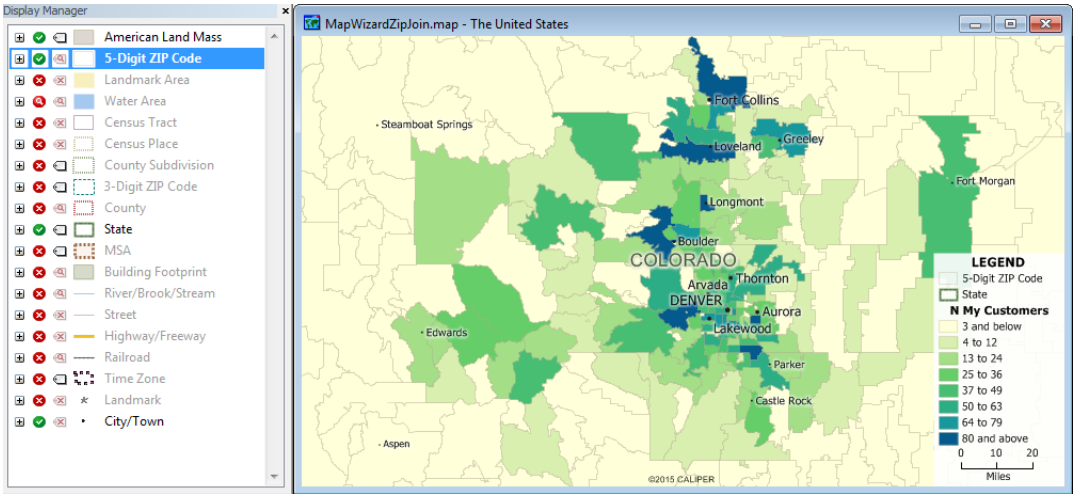
▶ To Change the Map Theme

1. Choose ***Map-Thematic Mapping-Color*** or click  on the Standard toolbar.
2. Choose **[N My Customers]** from the Field drop-down list.



3. Click the **Styles** tab and click **Next>>** to see different color schemes for the theme. When you find one you like, click **OK**.

If you are using the U.S. region, your map should look something like this:



The map shows the postal codes, places, and some other features in your study area. Maptitude organizes map features into layers. Each layer is a group of features of the same type. ZIP Codes, populated places, highways, counties, and states are some of the separate layers that comprise this map in the U.S. region, and other regions have similar layers. A map can contain any number of layers.

Notice, however, that not all of the layers are visible in the map. Layers can be hidden or they can be set to draw only when the map is at a particular scale. When you "zoom in" or "zoom out," you change the scale of the map. Most Maptitude maps are automatically set up to show different layers and labels as you change the scale of the map. This feature, called autoscale, makes maps more readable by reducing the clutter that can result from showing too much information at once. Maptitude also allows you to autoscale labels.

Also notice the Display Manager toolbox that is displayed with the map. The Display Manager allows you to view and control the style, visibility, and label settings for the layers in a map. With the Display Manager you can see the style of every layer in your map, whether or not labels are active for the layer, and whether or not the layer is currently visible. Layers that are visible have a symbol next to them, layers that are hidden have a symbol, and layers that are active but not visible because the scale is outside of their autoscale settings have a symbol.

Let's see how layers and autoscale work.

▶ To Change the Visible Layers in the Map

1. In the Display Manager, click the symbol next to a layer that is currently hidden. Use the County layer if you are using the U.S. region or some other hidden area layer if you are using another region. Maptitude draws the map with the layer visible.
2. Click the symbol next to the Railroad layer. The symbol changes to a because the Railroad layer is autoscaled to only display if the map is zoomed in farther. Click the symbol to turn off the autoscale settings and display the layer.

   Maptitude redraws the map with the Railroad layer visible.
3. In the Display Manager, right-click on the Railroad layer you changed in step 2 and choose ***Restore Show/Hide*** to turn the autoscale settings back on for the layer.

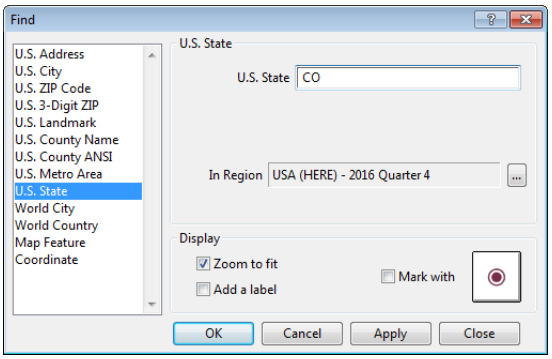
If you want to learn more about changing the layers in a map, see *Chapter 3: Creating Maps*.

▶ To Move About the Map

1. Choose ***Edit-Find*** or click on the Standard toolbar.
2. Choose a type of feature to find from the scroll list, type the name of the feature in the edit box, and click **OK**. For example:

   • If you are using the U.S. region, choose **U.S. State** from the scroll list, type "**CO**" in the edit box, and click **OK** to display all of Colorado in the map window.
   • If you are using the Australia region, choose **Australia State** from the scroll list, type "**Victoria**" in the edit box, and click **OK** to display all of Victoria in the map window.

- If you are using the Canada region, choose **Canada Province** from the scroll list, type "**Ontario**" in the edit box, and click **OK** to display all of Ontario in the map window.



3. Again, choose ***Edit-Find*** or click on the Standard toolbar.
4. If you are using the U.S. region, choose **U.S. County Name** from the scroll list, type "**Denver CO**" in the edit box, and click **OK**. Otherwise, choose to find another map feature such as **Australia Suburb** and type "**Newtown VIC**", or **Canada City/Town** and type "**Sudbury ON**", or **Mexico City or Town** and type "**Tijuana BJ**", etc.

   Maptitude zooms the map to the feature you chose. Notice that the status bar shows the scale in both miles (or kilometers) per inch (or centimeter) and as a ratio.
5. Click on the Tools toolbar to activate the Zoom In tool.
6. Click on the map. Maptitude zooms in by a factor of two. Notice that the status bar shows the current scale is half of what it was before.
7. Now, click and drag a rectangle on the map. Maptitude expands the contents of the rectangle so that it fills the map window.

   Notice that as you zoom in different layers and labels are added to the map.
8. Next, click on the Tools toolbar to activate the Zoom Out tool.
9. Click on the center of the map. Maptitude zooms out by a factor of two.
10. Finally, click on the Tools toolbar to activate the Pan tool.
11. Click and drag on the map to pan to a new location.

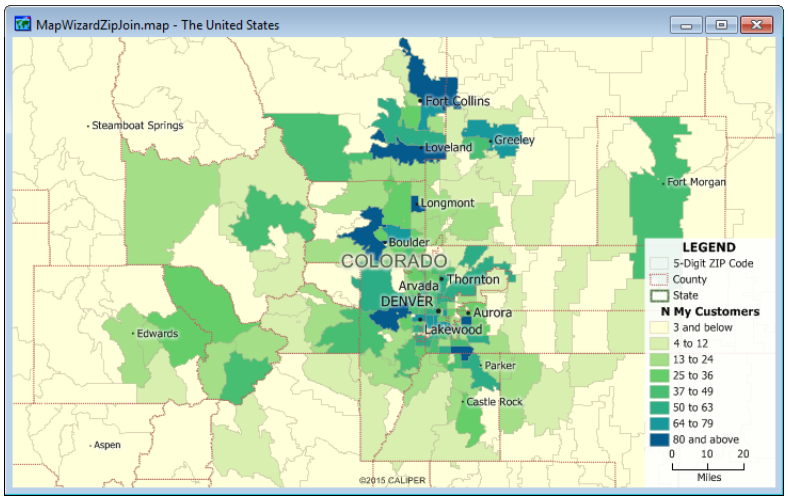
If you want to learn more about how to change the scale of a map, see *Chapter 4: Moving Around a Map*. To learn more about autoscale, see "Controlling Layers Automatically with Autoscale" on page 64 and "Autoscale with Labels" on page 90.

▶ To Return a Map to Its Original Scale

1. Choose ***Map-Zoom-Undo All*** or click on the Tools toolbar.

Maptitude draws the map with the extent that was used when the map was created.

You've finished the thematic map showing the number of your customers in every postal code which should look like the map below. Let's move on to stage 2.



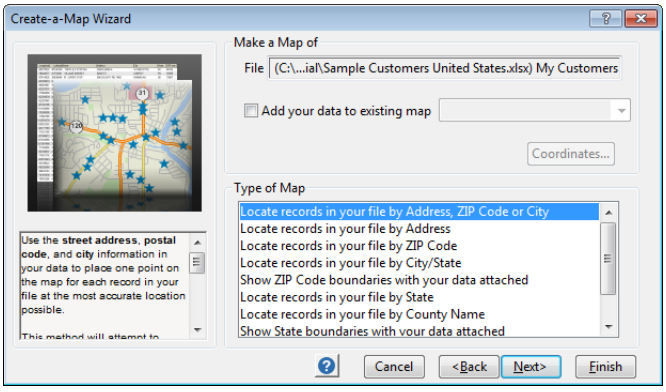
Stage 2: Locating Your Customers on a Map

Maptitude can read the address information from the customer file, and create a new map layer that contains one point at the location of each customer. This is sometimes called pin mapping or geocoding. To do this, Maptitude uses a comprehensive street database that contains detailed address information.

Again, we are going to use Create-a-Map Wizard to simplify the task.

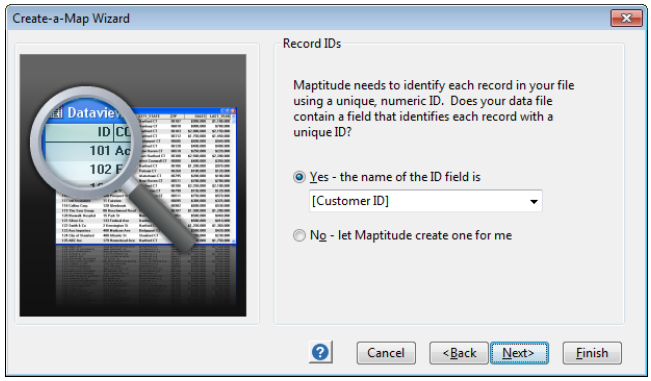
▶ To Create a Map of Your Customer Locations

1. Choose ***File-New Map*** or click on the Standard toolbar. Maptitude again displays the Create-a-Map Wizard dialog box.
2. Choose **Map of My Own Data** from the radio list. Notice that Maptitude remembers where your customer spreadsheet is.
3. Click **Next**. Again Maptitude finds the mappable fields in your data.
4. Click **Next**.
5. Choose the first locate option to locate records in your file. Maptitude will first attempt to locate the records by address, and then locate any remaining records by postal code or city.



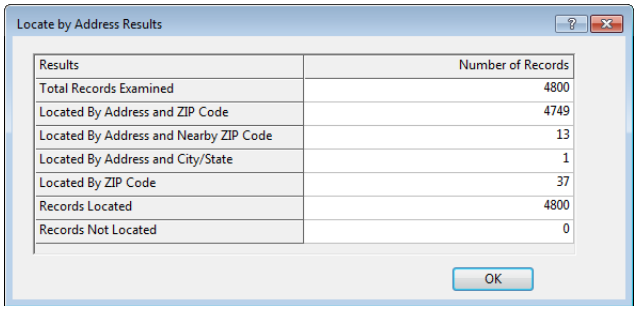
You could locate your customers on the map that we just created, but for our purposes, we want to create a second map with the customer locations, so make sure the **Add your data to existing map** box is not checked.

6. Click **Next**.
7. Maptitude requires a unique ID for every record it locates. If your data do not include unique IDs, you can choose to have Maptitude create an ID field automatically. Since our data contains a unique customer ID called **[Customer ID]**, choose it and click **Next**.



8. Type "**My Customers**" as the name for the new geographic file and click **Save**.
9. Create-a-Map Wizard shows the types of themes you can create with your data. Choose **None** from the radio list and click **Next**.
10. Create-a-Map Wizard shows the types of analysis you can do with your data. For example, if you are locating your stores, you might want to also show 5 or 10 mile buffers around them, if you are locating customers, you might want to find a weighted center to determine the best site to centrally service them. For now, choose **None** from the radio list and click **Finish**.

    Maptitude uses the addresses in your spreadsheet to create a new point layer of your customers. A dialog box is displayed reporting how many records were located and how they were located.



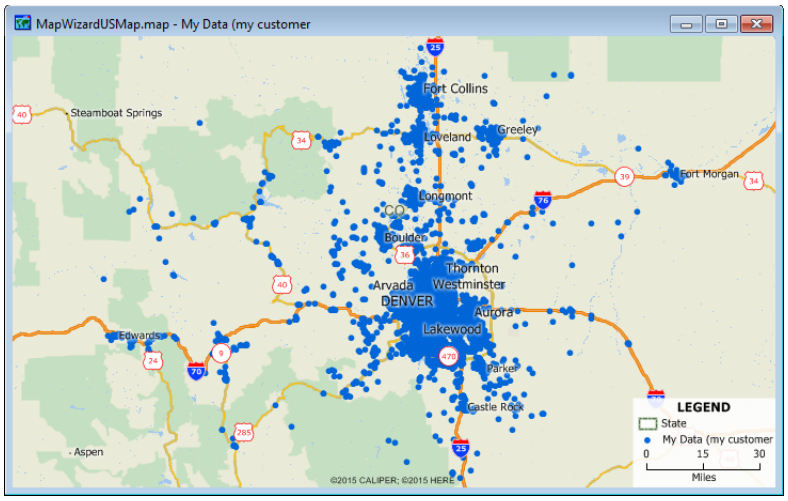
    For most customers, there are addresses and postal codes that match the Maptitude street layer. These customers are located by address and postal code.

    There are several reasons why some of the customers, however, were found using different methods. For example, a postal code may have been renumbered or a business may have its own postal code that differs from the area around it. In these cases, Maptitude will look for matching addresses anywhere in nearby postal codes or in the respective city. Other addresses may simply be Post Office boxes that are not part of the street file. In this case the customers are simply located at the postal code location.

11. Click **OK** to close the report.

    Maptitude displays a new map that includes a point layer with the locations it found in your data.

    You've finished the map showing the locations of your customers which should look like the map below.



Stage 3: Selecting Customers of Interest

Every one of the points that are on the map still has your data attached to it. You can use the Info tool to see the data for each customer on the map.

▶ To See Information for a Customer

1. Click on the Tools toolbar to activate the Info tool.
2. Click on a customer location on the map.

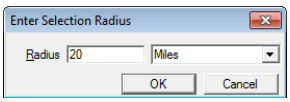
   Maptitude displays all of the data for the customer feature in an Info window on the screen. Notice that it has the all of the customer data, including address and sales data, that were in the Excel spreadsheet.

3. Click on several other customer locations to see the data associated with them, then click the Close button in the top right corner of the Info window to close it.

For your presentation, you want to identify the biggest customers that are also close to your down-town location.

▶ To Select the Customers Near the City Center

1. If the Selection toolbar is not visible, choose ***Selection-Toolbar*** or click on the Standard toolbar.
2. Choose **Selection (0)** from the drop-down list on the Selection toolbar.
3. Click on the Selection toolbar and click on the map near the city center to display the Enter Selection Radius dialog box. Type "**20**" as the radius and leave the units unchanged.



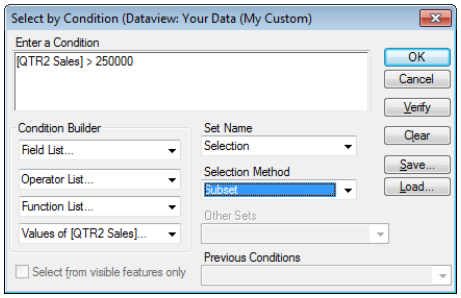
4. Click **OK**.

Maptitude selects all of the customers within 20 miles/kilometers of where you clicked and highlights them on the map.

Now let's select from these customers the ones with sales over $250,000 for the 2nd quarter.

▶ To Select the Biggest Customers

1. Choose ***Selection-Select by Condition*** or click on the Selection toolbar.
2. Choose **[QTR2 Sales]** from the Field List and **>** from the Operator List in the Condition Builder. "[QTR2 Sales] >" is added to the condition.
3. Type "**250000**" to complete the condition.
4. Choose **Subset** from the Selection Method drop-down list.



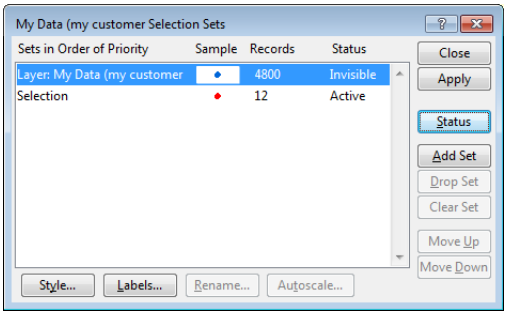
5. Click **OK**.

Maptitude selects the biggest customers and highlights them on the map. They may be difficult to see, so next we are going to hide the customers that are not selected.

If you want to learn more about selection sets, the selection tools, and selecting features based on attributes, see *Chapter 8: Queries and Selection Sets*.

▶ To Map Only the Biggest Customers

1. Choose ***Selection-Settings***, or click on the Selection toolbar to display the Selection Sets dialog box.
2. Click the Layer at the top of the scroll list and click **Status** to change the layer to invisible.



3. Click **Close**.

   Maptitude redraws the map with only the selected customer features visible.

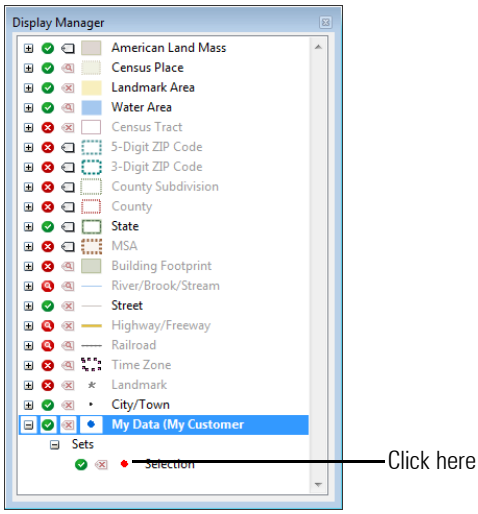
4. Click on the Selection toolbar.

Maptitude draws the map zoomed in to show all of the features in the selection set.

Now let's change the style of the big customers and add some labels.

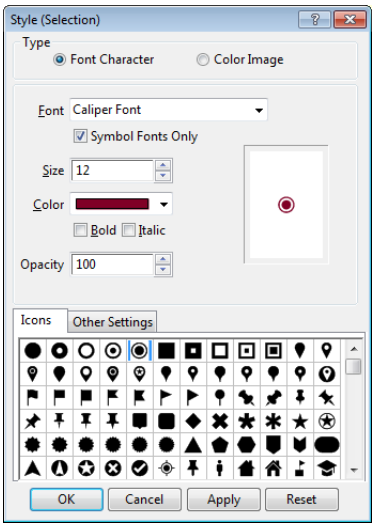
▶ To Change the Style of the Selected Customers

1. Click ⊞ next to the customer entry in the Display Manager to expand it and then expand the **Sets** entry.
2. Click the current symbol for the selected customers in the Display Manager.



TIP: You can also click on the Selection toolbar to change the style of the active selection set.

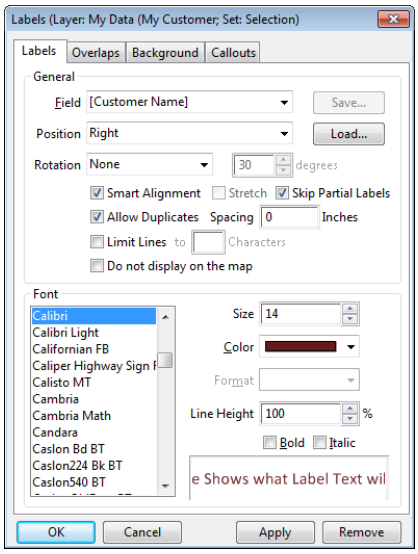
3. Choose a different symbol to use for the selected customers, change the size to 12 point, and choose a color you like.



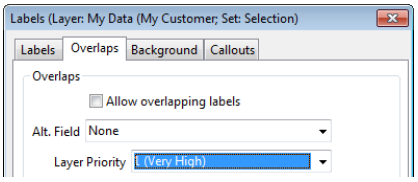
4. Click **OK**.

▶ To Label the Selected Customers

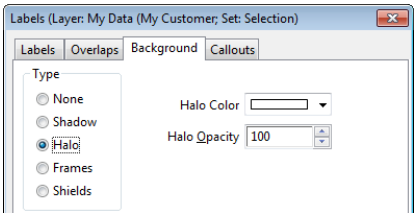
1. In the Display Manager, click the symbol next to the customer selection set.
2. Choose **[Customer Name]** from the Field drop-down list. If you want, you can also change the font, size, color, or style of the labels.



3. Click the Overlaps tab and choose **1 (Very High)** from the Layer Priority drop-down list. This ensures that your selected features will be labeled before anything else in the map.

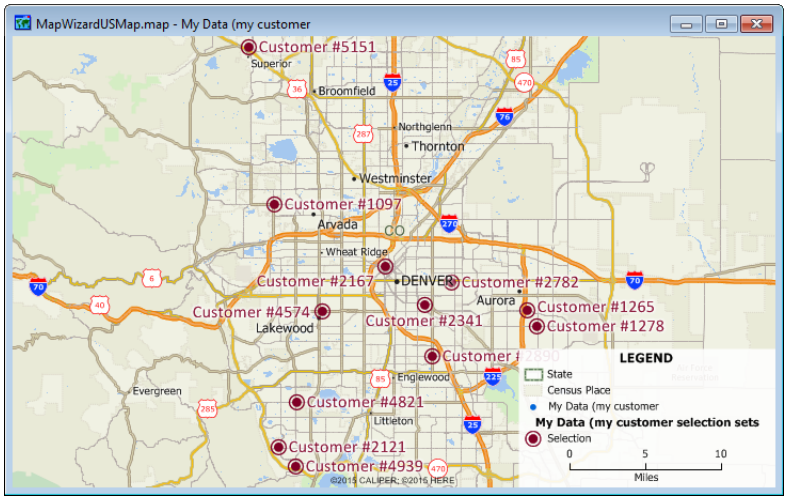


4. Click the Background tab and click **Halo** in the radio list.



5. Click OK.

Maptitude draws the map again, this time displaying the name of each customer. Your map should look like this:

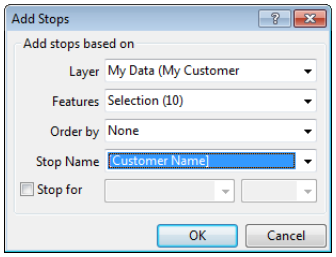


Stage 4: Finding a Route

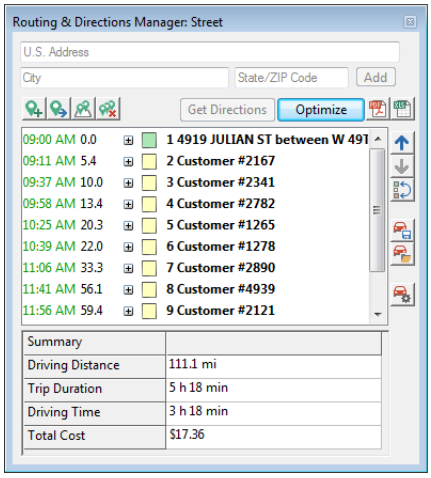
Suppose you want to visit each of the largest customers. You can use the Routing & Directions Manager to determine a route that minimizes the time you spend driving from customer to customer.

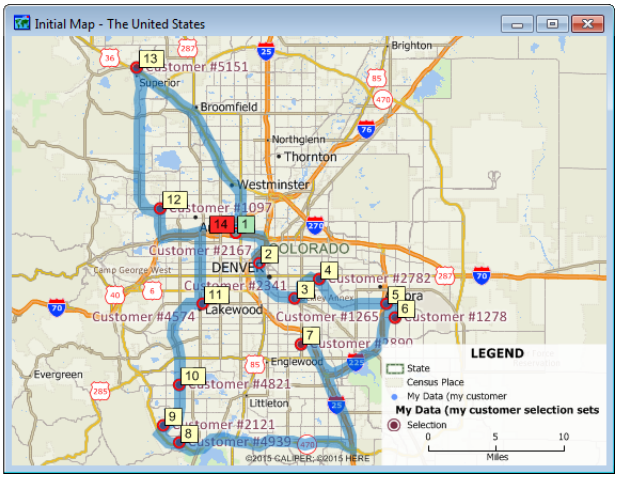
▶ To Find a Route

1. Click on the Standard toolbar to display the Routing & Directions Manager. If Maptitude displays a Confirm dialog box, click OK.
2. Click and click anywhere on the map for your starting location.
3. Click to display the Add Stops dialog box.
4. Verify that the customer layer is chosen in the Layer drop-down list, choose **Selection** from the Features drop-down list, and choose **[Customer Name]** from the Stop Name drop-down list.



5. Click **OK** to add your customer locations as stops in the Routing and Directions Manager.
6. Right-click on the first stop in the list and choose ***Choose as End*** to find a route that returns to your starting location. Click **Yes** to confirm you want to duplicate the start stop at the end.
7. Click **Optimize**. Maptitude determines the best route to visit the customers starting at the location that you chose and shows the route on the map and in the Routing & Directions Manager.





If you want, you could click to create a PDF report with the directions for visiting your customers that you could use in your meeting. For now, however, let's just close the Routing and Directions Manager and clear the route from the map.

8. Click on the Standard toolbar and click **Drop** when prompted.

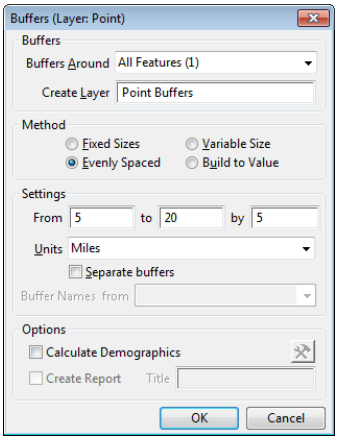
See *Chapter 11: Routing, Directions, and GPS*, if you want to learn more about routing and drive-time ring analysis.

Stage 5: Adding Distance Buffers to the Map

Now let's create buffers on the map to show how far these customers are from your downtown location. We'll do this using the Buffers toolbar. The Buffers toolbar lets you point and click on the map to add temporary features, and then build buffers of any distance around the features you added.

▶ To Add Buffers to the Map

1. Choose ***Tools-Analysis-Buffers Toolbar***.
2. Click  in the Buffers toolbar.
3. Click near the center of the city.
4. Click  in the Buffers toolbar and click **No** when Maptitude asks you if you want to save the point you added to a new layer. Maptitude displays the Buffers dialog box.
5. Choose **Evenly Spaced** from the Method radio list.
6. Type "**5**" in the From edit box, "**20**" in the To edit box, and "**5**" in the By edit box.



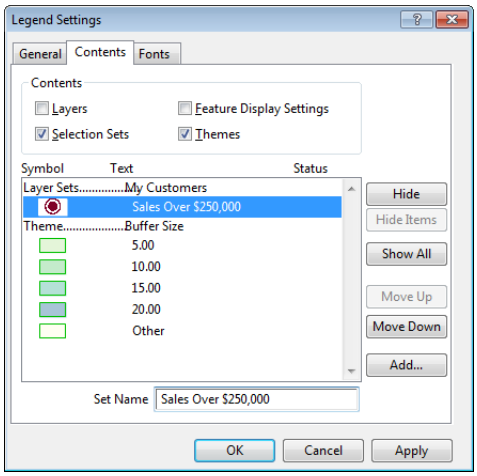
7. Click **OK**. Maptitude displays the Save As dialog box.
8. Type "**My Customer Buffers**" as the name for the new layer and click Save.

Maptitude creates buffers at 5 mile/kilometer intervals from the location where you clicked and displays them on the map so that you can see the proximity of the best customers to your location.

▶ To Customize the Legend

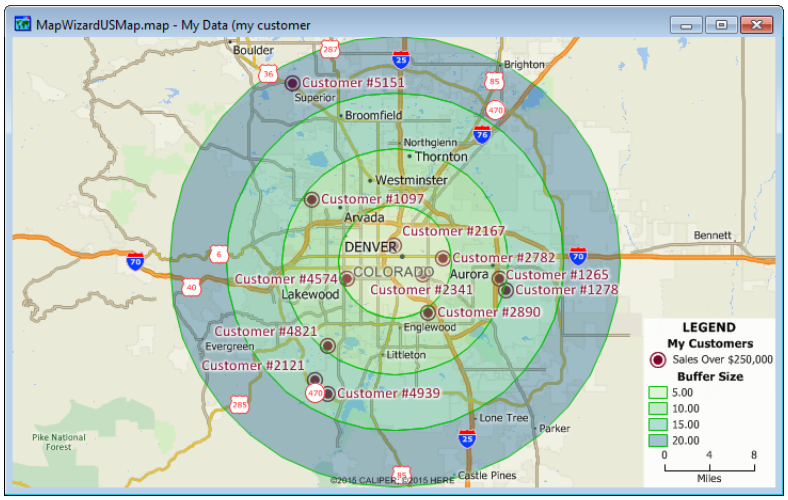
1. Right-click on the legend and choose ***Properties***.
2. Click the Contents tab.
3. Remove the check from the **Layers** box.
4. Highlight the **Layer Sets...My Data** item in the scroll list and replace the text in the Subtitle box with "**My Customers**" to rename the selection sets section of the legend.

5. Highlight the Selection item in the scroll list and replace the text in the Subtitle box with "**Sales Over $250,000**" to rename the selection set in the legend.



6. Click **OK**.

Your map should now look something like this:



Stage 6: Displaying Data for Customers of Interest

Now let's look at the data associated with our customers.

▶ To Display Data for all of the Customers

1. Right-click on the customer layer in the Display Manager and choose ***New Dataview*** to open a dataview with data about the customers.

2. Choose **Sales Over $250,000** from the drop-down list on the Standard toolbar to show only the selected customers.

Maptitude provides all kinds of commands to change the way information is displayed in a dataview. Let's use a few of these commands to customize the information about the customers.

▶ To Sort Customers by Sales

1. Click in the column named **[QTR2 Sales]**. You may need to use the scroll bars or the arrow keys to locate this column.
2. Click on the Standard toolbar or right-click on the column and choose ***Sort Decreasing***.

Maptitude sorts the customers in decreasing order by 2nd quarter sales.

▶ To Hide Columns in the Dataview

1. Click anywhere in the column named Longitude.
2. Click on the Standard toolbar, or right-click on the column and choose ***Hide***.
3. Hide all but the **Customer Name**, **Street Address**, **City**, **QTR1 Sales**, **QTR2 Sales**, and **Territory** columns the same way. You can select more than one column by holding down the Ctrl key while selecting the column headings and then click to hide them all at once.

Maptitude lets you hide and rearrange columns any way you like. For more information, see "Arranging Columns in a Dataview" on page 190.

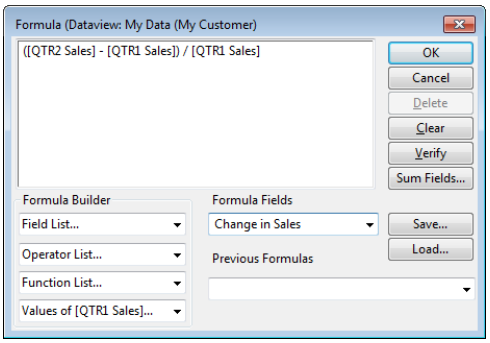
Now let's create a formula field that calculates the change in sales from the first quarter to the second quarter.

▶ To Create a Formula Field with the Percent Change in Sales

1. Choose ***Dataview-Formula Fields*** or click on the Standard toolbar to display the Formula dialog box.
2. Type **(** in the formula text box, choose **[QTR2 Sales]** from the Field List drop-down list, choose **-** from the Operator List drop-down list, choose **[QTR1 Sales]** from the Field List drop-down list, type **)** in the formula text box, choose **/** from the Operator List drop-down list, and choose **[QTR1 Sales]** one more time from the Field List drop-down list. Your formula should look like this:

   ```
   ([QTR2 Sales] - [QTR1 Sales]) / [QTR1 Sales]
   ```

3. Type "**Change in Sales**" in the Formula Fields editable drop-down list.



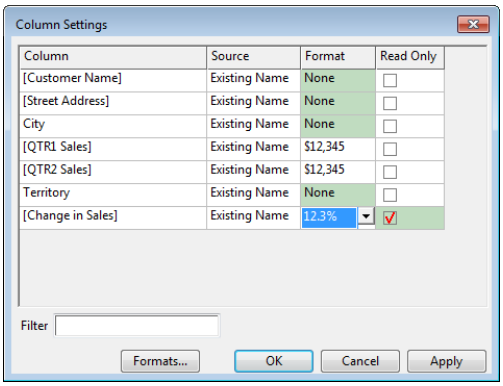
4. Click **OK**.

Maptitude creates the formula field at the end of the dataview. For more information on formula fields, see "Doing Calculations with Data" on page 194.

Finally, let's change the formats used for the three sales fields.

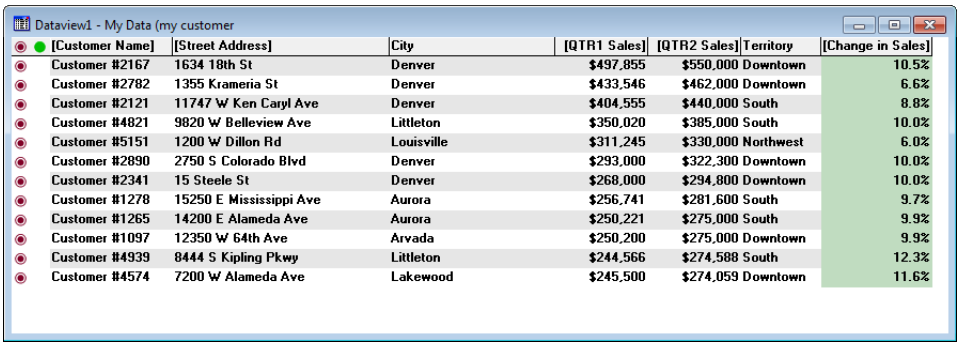
▶ To Change the Display Format

1. Choose ***Dataview-Fields-Properties*** or click on the Standard toolbar to display the Column Settings dialog box, which lists all column headings and display formats.
2. In the Format column of the grid view, choose **$12,345** from the drop-down list for both the [QTR1 Sales] and [QTR2 Sales] fields and choose **12.3%** for the [Change in Sales] field.



3. Click **OK**.

Your dataview showing the biggest customers should look something like this:



You can save a dataview with all of the display changes and formula fields so that you do not have to recreate it the next time you use Maptitude. You can also export the data in a dataview to Excel and several other formats. Let's export the information on the biggest nearby customers to an Excel spreadsheet.

▶ To Export a Dataview to Excel

1. Choose ***File-Save As*** to display the Save As dialog box.
2. Choose **Excel Worksheet** from the Save as Type drop-down list.
3. Type "**My Top Nearby Customers**" as the file name and click Save.

Now that we are done with the dataview, you can choose ***File-Close*** to close it.

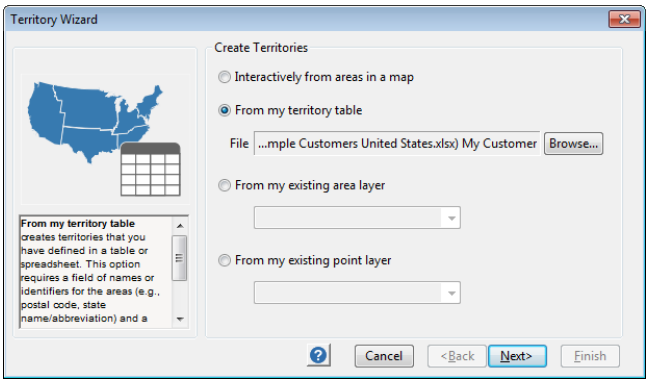
Stage 7: Creating and Modifying Territories

Maptitude lets you build territories such as sales territories or school districts. With the Territory Wizard you can create territories either interactively from areas in a map such as postal codes or states, by using a table with your territory definitions, or by using a point or area layer.

All of the customers in our spreadsheet have a territory assigned to them. In most cases the territories are based on postal code areas (e.g., ZIP Codes in the United States, FSAs in Canada, Postcode Districts in the United Kingdom, Postal Areas in Australia, France, and Germany). Let's use the territory fields to create territories from these postal layers.

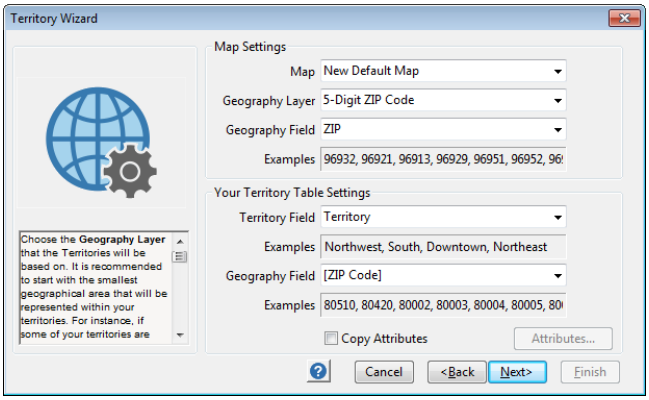
▶ To Create Territories from a Table

1. Choose ***File-New Map*** or click on the Standard toolbar to display the Create-a-Map Wizard dialog box.
2. Choose **Territories** from the radio list and click **Next**. Maptitude starts the Territory Wizard.
3. Choose **From my territory table** from the radio list. Maptitude opens the Choose File to Import dialog box.
4. Verify that **Excel Worksheet** is the file type, browse for the Tutorial folder in the Maptitude Documents folder (e.g., Documents\Caliper\Maptitude 2017\Tutorial), choose the sample Excel file, and click **Open**.
5. Click **OK** to use the My Customers sheet in the Excel file.



6. Click Next.
7. Choose **New Default Map** from the Map drop-down list to create a new map of the territories.
8. Maptitude will do its best to identify the geography layer in the map to use and the fields to use from the Excel file. Verify that the choices are correct as follows:
   - The map layer to use to build the territories is shown in the Geography Layer drop-down list. It should be the **5-Digit ZIP Code** layer if you are using the U.S. Country Package (**Postal Area** for Australia, **Postal Area** for Canada, **Postcode District** for the United Kingdom, etc.).
   - The field in the map layer you chose above that contains the names or codes that correspond to the postal fields in the Excel file is shown in the first Geography Field drop-down list. It should be the **ZIP** field if you are using the U.S. Country Package (**Postal** for Australia, **FSA** for Canada, **District** for the United Kingdom, etc.).
   - The field in the Excel file that contains the names or codes of the territories is shown in the Territory Field drop-down list. It is the **Territory** field in the Excel file for all Country Packages.

- The field in the Excel file that has the postal codes that correspond to the field you chose in the second bullet above. It should be [**ZIP Code]** if you are using the U.S. Country Package (**Postcode** for Australia, **FSA** for Canada, **Postal District** for the United Kingdom, etc.).



9. Click **Next**. The Territory Wizard lets you track values such as population or sales that you can use to help you balance the size of the territories. The values can come from a table or from a map layer.

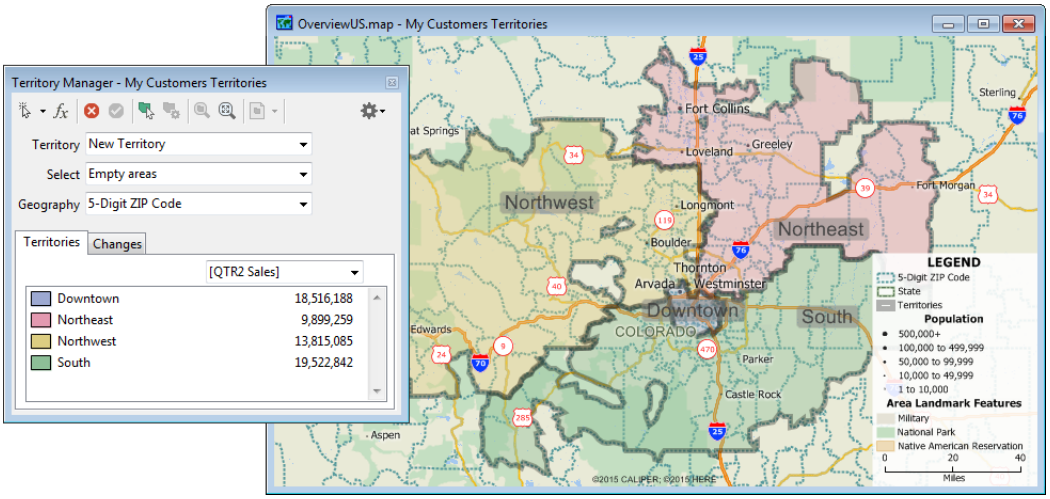
10. Click ✚ and choose ***Import Territory Table Fields***. Choose **[QTR2 Sales]** from the scroll list and click **OK** to track the second quarter sales values of the territories.

11. Click ✚ and choose ***Add Geography Layer Fields***. If your Country Package includes demographic data for the chosen geography layer, choose **Population** from the scroll list and click **OK** to track the population of the territories. Otherwise click Cancel.

12. Click **Finish** to display the Save Territory Layer As dialog box. Type "**My Customer Territories**" as the file name and click **Save**.

    Maptitude creates a territory layer using the postal code territory assignments from the Excel file, creates a new map with the territory layer, and opens the Territory Manager.

13. Notice the Territories tab on the Territory Manager. It lists the names of the territories that were created and shows the total second quarter sales for each of the territories derived from the sales data in the Excel file. If you tracked population, choose **Population** from the drop-down list on the Territories tab to see the population of each territory derived from the postal code layer.



If you want to make the territories more balanced, you can use the tools in the Territory Manager to move some of the postal codes from territories with high sales or population to territories with lower sales or population. The Territory Wizard makes it easy to track the changes on the Changes tab.

You may also notice that several of your territories may have holes in them. This occurred because there were no customers in your Excel file located in those postal codes. You can, however, also use the tools in the Territory Manager to fill in those holes if you desire.

▶ To Modify Territories with the Territory Manager

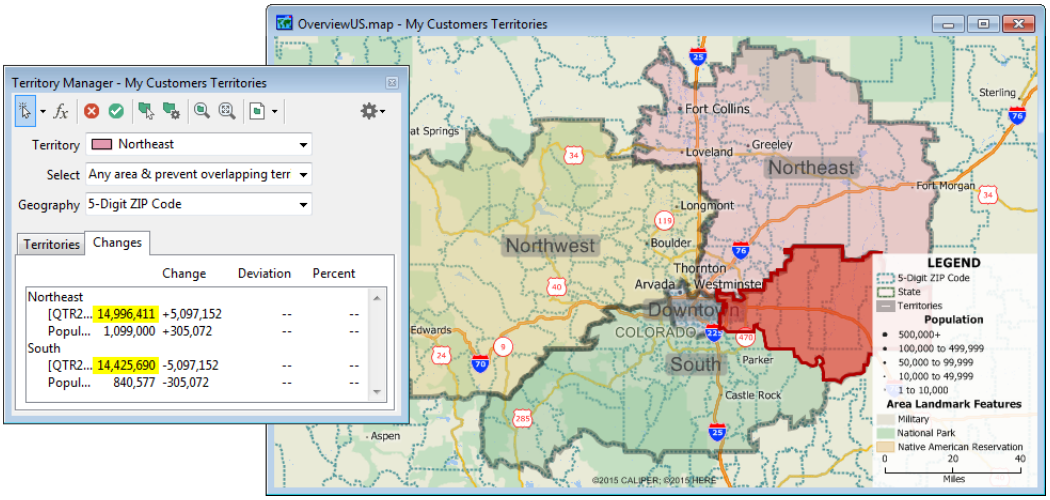
1. If one of your territories has a hole in it, choose it from the Territory drop-down list.
2. Click the Changes tab on the Territory Manager to see the tracking field values for that territory.
3. Click to activate the Select by Pointing tool and click on one or more of the holes in the territory you chose in step 1. Maptitude highlights the postal codes and shows the effect on the population that the added postal codes will have to the territory.
4. Click . Maptitude updates the territory boundary to include the areas you highlighted.

If you want, you can repeat the steps to fill the holes in any other territories.

Now let's balance the territories a little more based on the sales.

▶ To Balance Territories with the Territory Manager

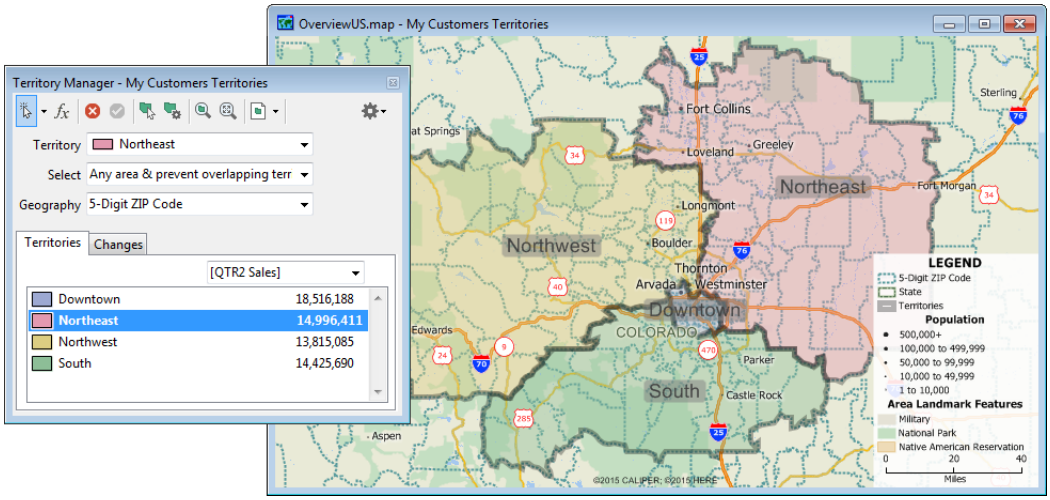
1. Click the Territories tab and choose **[QTR2 Sales]** from the drop-down list. You want to move some postal codes from a territory with high sales to one with low sales.
2. Choose a territory that has a low value of sales from the Territory drop-down list.
3. Choose **Any area & prevent overlapping territories** from the Select drop-down list. This will allow you to select postal codes that are already assigned to the high sales territory to be moved to the low sales territory.
4. Click the Changes tab on the Territory Manager to see the tracking field values for that territory.
5. Still using the Select by Pointing tool, click on some postal codes in a neighboring high sales volume territory. Continue selecting more postal codes until the sales volumes are closer to equal.



6. Click . Maptitude updates the boundaries of the affected territories.

Creating territories from a table is just one way to create a territory layer. You can also create territories interactively by clicking on a map, by using a point layer that includes territory assignments, by using an area layer, or by using selection sets on an area layer. To learn more about creating territories, see "Creating Territories" on page 299.

Your map should look something like this:



Finally, now that you have redefined the territories to make them more balanced, you may want to reassign customers whose territories have changed.

▶ Adding Your Customers to the Territory Map

1. Click on the Standard toolbar to display the Layers dialog box. We want to add the customer layer we created earlier to this territory map.
2. Click **Add Layer**.
3. Choose the **My Customers.dbd** file you created earlier and click Open.
4. Click **Hide Layer** because it is not necessary for the customers to be visible on the map to update their territory assignments.
5. Click **Close** to close the Layer dialog box. The map will be unchanged.

▶ Tagging the Customers to The New Territory Definitions

1. In the Display Manager, right-click on the customer layer that you just added and choose ***New Dataview***.
2. Click on the **Territory** column heading to highlight the whole column. We are going to replace the values in this column by tagging the customers to the new territory boundaries.
3. Choose ***Edit-Fill*** to display the Fill dialog box.
4. Click **Tag** in the radio list, choose **Territories** from the Using Layer drop-down list, **All Features** from the Selection Set drop-down list, and **Territory** from the Tag With drop-down list.
5. Click **OK**. Maptitude updates the field with the name of the territory that each customer is in.
6. Choose ***File-Close*** to close the dataview.

Now that we have the customers reassigned, let's prepare an Excel file that has the new territory definitions as well as demographic information about the territories that we created and the new allocation of the customers in those territories.

▶ Exporting the New Territories Back to Excel

1. Click the Territories tab in the Territory Manager to see the list of territories.
2. Click on the first territory in the list and drag to highlight all of the territories in the list.
3. Right-click on the highlighted territories and choose ***Export Territories to Excel***.
4. Type "**My Revised Customers**" as the new Excel file name and click **Save**.

   Maptitude exports the data and opens the new file in Excel. The new file contains the following sheets:

   - The Territories sheet lists your territories and their area, sales, and population values
   - The Territories Geography sheet lists all of the territories and the postal codes they comprise
   - The Overlay sheet lists demographic characteristics for your territories. The demographics will vary depending on which Country Package you are using. For example, for the United States, there will be population, income, gender, age, race, housing unit, and disposable income data for each of your territories.
   - The My Data sheet has all of your customer data including the updated territories to which they now belong

5. Close Excel and return to Maptitude.

Now you have a spreadsheet that contains your new territory allocations and demographics about the territories, the last thing to do is create a layout to illustrate your other findings.

Stage 8: Creating a Layout

A layout lets you arrange any number of maps and dataviews on a printed page, along with freehand text and other items. You're going to set up a layout, arrange your maps on it, add a title, and finally print the layout.

▶ To Create a New Layout

1. Choose ***Tools-Reports-New Layout***.

Maptitude displays a blank layout page.

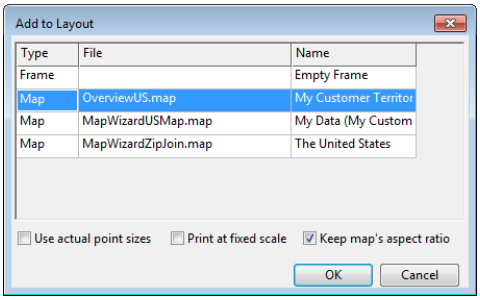
▶ To Set Up the Printer

1. Choose ***File-Properties***, click  on the Standard toolbar, or right-click on the layout window and choose ***Properties***.
2. If you have a color printer installed, choose it from the Printer Name drop-down list, otherwise, choose any printer from the drop-down list.
3. Choose **Letter (8½" x 11")** or a similar size (such as **A4**) from the Page Size drop-down list.
4. Choose **Portrait** from the Orientation options.
5. Click **OK**.

Now that the layout page is set up for your printer, let's place the maps using the Place tool.

▶ To Place the Maps in the Layout

1. If the Drawing toolbar is not visible, choose ***Edit-Drawing-Toolbar***.
2. Click on the Drawing toolbar to activate the Place tool.
3. Drag a rectangle across the top third of the page. Maptitude displays the Add to Layout dialog box.
4. Click on one of the maps in the grid view.



5. Click **OK**. Maptitude adds the map and the legend to the layout.
6. Drag another rectangle across the middle third of the page and place the second map in the layout, and drag a final rectangle across the bottom third of the page and place the third map.

Once the maps are placed, you may want to make them bigger or smaller, or change their size. Here's how:

▶ To Move or Resize a Layout Item

1. Click on the Drawing toolbar to activate the Pointer tool.
2. Click on one of the maps. Maptitude draws handles at the corners.
3. To change the size of the map, drag one of the handles.
4. To move the entire map, press and hold the mouse button in the center of the map, and drag the map to a new location. Similarly, you can move the legends by clicking and dragging them to a new location.

The Standard toolbar also has buttons you can use to change the alignment and position of items in the layout. To learn more about arranging items in a layout, see "Moving, Editing, and Arranging Layout Items" on page 487.

Now, let's add a title to the layout.

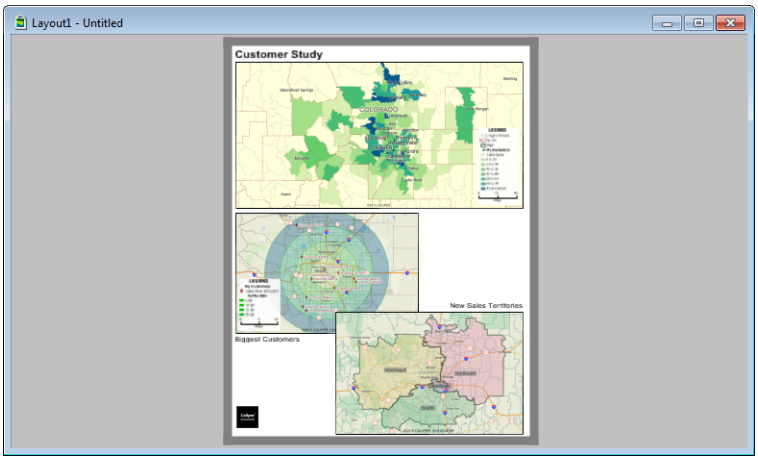
▶ To Add a Title to the Layout

1. Click on the Drawing toolbar to activate the Freehand Text tool.
2. Drag a short, wide rectangle across the top of the page.
3. Type the title "**Customer Study**" and press the Enter key.

If the title is the wrong size or in the wrong place, select it with the tool and resize it or move it. You can also double-click it with the tool and specify a font, size, color, and style.

If you have a company logo stored in an image file such as a JPEG, BMP, GIF, etc., you can drag a rectangle on the layout with the tool and add the logo to the layout.

Now, use the tool and the alignment buttons to adjust the sizes and placement of the maps, the legends, the dataview, and the title.



When you have an arrangement you like, it's time to save your work. You can save all of your open maps, dataviews, and layouts in a single file called a workspace.

▶ To Save a Workspace

1. Choose ***File-Save Workspace As***.
2. Choose a folder to save the workspace to.
3. Type "**My Presentation**" for the layout file.
4. Click Save.

There's only one more thing to do to complete the project.

▶ To Print the Layout

1. Choose ***File-Print*** or click on the Standard toolbar.
2. Choose the number of copies you want to print.
3. Click OK.

▶ To Close the Windows

1. Choose ***File-Close All***.
2. Because you already saved the workspace you can click No to All in the Save Your Work dialog box.

Congratulations! You've finished the project.

Where to Go from Here

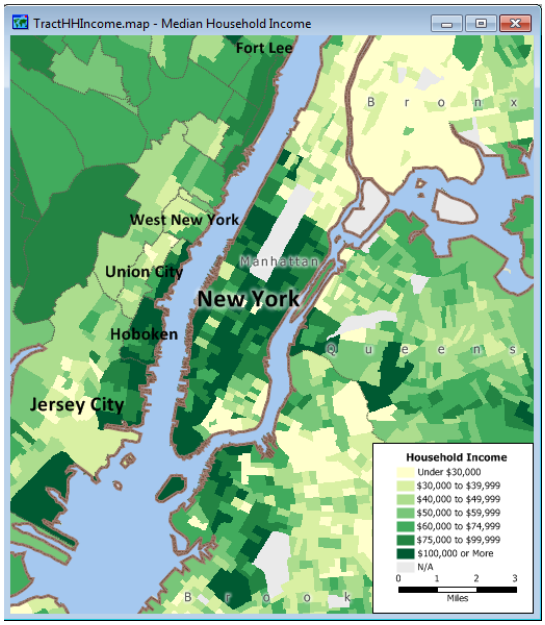
This tutorial has given you quite a bit of hands-on experience with Maptitude. Where you go from here is up to you. Here are a few of your choices:

- Visit the Getting Started section of the Caliper web site, WWW.CALIPER.COM/MAPTITUDE/GETSTARTED where there are links to videos that demonstrate many common Maptitude tasks.
- Read through the manual to learn all about Maptitude and its capabilities. After you have read a section, use the Tutorial for practice.
- Dive right in and play with the software. If you get stuck and need help, press F1 to use the Maptitude Help, or refer to the appropriate section of the manual for more information.
- Register for one of the free Maptitude webinars by visiting WWW.CALIPER.COM/TRAINING/MAPTITUDE-WEBINAR.HTM

CHAPTER 3:
Creating Maps

Maptitude organizes the information in a map into **layers**. Each layer is a group of features of the same type, such as states, highways, or airports that is stored in geographic files on your computer. When you open one or more geographic files, Maptitude creates a new map window in which to display the layers. In addition to the Caliper file formats, you can open many other geographic file formats as layers in your map. You can also use Create-a-Map Wizard™ to automatically select the appropriate layers to display an area of your choosing.

You can control the contents of a map by choosing which layers to include and the order in which they should be drawn. You can also set layers so that they display automatically at certain map scales. The Display Manager gives you a powerful tool for viewing and controlling your map settings.



In this chapter:

Creating a Map

There are several ways that you create a new map with Maptitude:

- Use Create-a-Map Wizard. Maptitude automatically chooses the appropriate geographic data files to display any location of your choice and gives you the option to attach your own data to the map.
- Open an existing map in the Map Librarian for a location of your choice.
- Manually choose one or more geographic files. Maptitude opens a new map that displays only the files that you have chosen.
- Duplicate an open map.
- Combine existing maps.

Maptitude comes with dozens of different geographic files. Most are included in the maps you create with Create-a-Map Wizard and the Map Librarian. For more information on geographic files that come with Maptitude, see "Maptitude Data Files" in the Maptitude Help. For more help on geographic files that come with your installed Country Package, choose ***Help-Regional Data Help-(Country Package Name)***.

Using Create-a-Map Wizard

Create-a-Map Wizard provides a fast, easy way to create a new map. All you need to do is choose whether to create a general purpose map or a map of your own data, answer a few simple questions, and Maptitude will create a map for you automatically.

NOTE: Create-a-Map Wizard uses your region data to assemble maps. If you have more than one region installed, you can use the Region Manager to specify the region to use. See "Using the Region Manager" on page 117 for more information.

▶ To Start Create-a-Map Wizard

1. In the Quick Start dialog box, choose **Create a New Map** and click **OK**.

   — OR —

1. Choose ***File-New Map***, click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***New Map***.

Create-a-Map Wizard takes over from there, walking you step by step through the process of creating a new map starting with choosing what kind of map you want to create.

NOTE: If Maptitude cannot find one or more files that it needs, it displays the File Not Found dialog box. For more information, see "File Not Found" on page 105.

Try It Yourself: Using Create-a-Map Wizard

1. Choose ***File-New Map*** or click on the Standard toolbar.
2. Choose **General Purpose Map** from the radio list.
3. The types of areas you can display with your regional data are shown in the scroll list. Choose a type such as City, County, State, or Postal Code, from the list.
4. In the edit box, type the name of a corresponding feature in your region (e.g. Victoria BC, New York NY, Cook IL, Queensland, M5T, 02461).
5. Click **Finish**. Maptitude creates a map of the location you specified.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

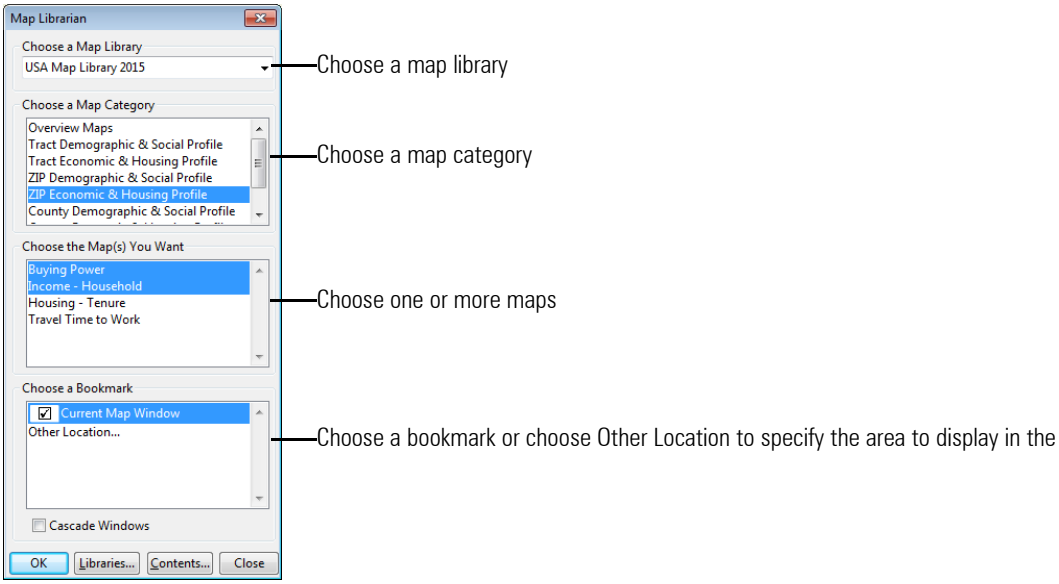
Using the Map Librarian

The Map Librarian makes it easy to organize maps into categories within libraries, and to open maps using bookmarks. A map library comes with Maptitude, to help you get started. You can also create your own map libraries, and you can add categories and maps to any map library. When you use the Map Librarian, you choose a map library, a category of maps within the library, one or more maps from the category, and the bookmark that sets the map location.

A map category can be set with a range of scales (autoscale range) that is best for displaying the maps in the category. Bookmarks that will create maps within that range of scales have a ☑ symbol next to them, other bookmarks have a ☐ symbol. If a category does not have an autoscale range, all of the bookmarks will have a ☑ symbol. For more information on bookmarks, see "Saving and Using Bookmarks" on page 122.

▶ To Open Maps with the Map Librarian

1. Choose ***Map-Demographic Map Librarian*** to display the Map Librarian dialog box and make choices as follows:



2. Choose how to open the maps as follows:

To do this...	Do this...
Open the map at the same height and width as the bookmark	Remove the check from the **Cascade Windows** box
Cascade all open maps	Check the **Cascade Windows** box

3. Click **OK**.

Maptitude opens the maps you have chosen. The location of the maps is based on the bookmark.

NOTE: If none of the map layers have features within the bookmark, Maptitude will display a blank map. You can close the map and reopen it with a new bookmark, or use the ***Edit-Find*** command to move the map to an area with map features.

Creating a Map by Opening Geographic Files

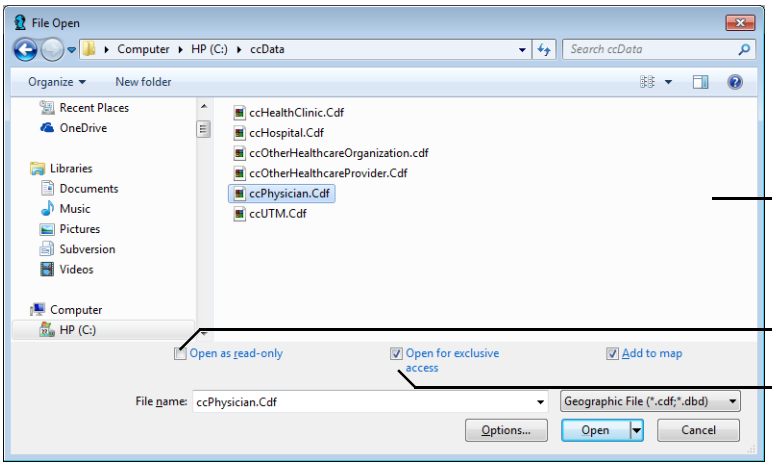
When you open one or more geographic files, Maptitude creates a new map and displays features from the files as layers in the map. You can choose whether to display the layers on a default map using additional layers from your Country Package or in a new map window containing just the geographic files that you choose to open.

TIP: Maptitude supports many other geographic file formats other than the ones provided in your Country Package. See "Using Other Geographic File Formats" on page 66 for more information.

▶ To Create a Map by Opening Geographic Files

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose Open. Maptitude displays the File Open dialog box.

2. Choose **Geographic File** as the file type and make choices as follows:



3. Check the **Add to Map** box if you want to add the geographic files to the current working map, or if no maps are open, to open a default map for your Country Package with the geographic files you chose. Uncheck the box to open a map that contains only the geographic file(s) you chose.

4. Click **Open**.

Maptitude creates a new map showing features from the file(s) you have chosen.

For more information on read-only and exclusive access, see "Sharing Maptitude Data Files" on page 525.

Try It Yourself: Creating a New Map

1. Choose ***File-Open*** or click on the Standard toolbar.
2. Choose **Geographic File** as the file type.
3. From the Maptitude Tutorial folder, choose the file named **CTCust.cdf** which contains a point layer of customers in Connecticut.
4. Verify that the **Add to map** box is checked.
5. Click **Open**. Maptitude displays a map that includes the Connecticut customer layer.
6. Choose ***File-Close*** and click **No** to close the map without saving it.

Duplicating a Map

You can quickly make a duplicate of the current map with the ***Map-Duplicate*** command. All of the settings, except the map title, are identical to those in the original map. You can then make changes, such as having different themes or additional layers, and then save this new map.

▶ To Duplicate a Map

1. Choose the map you want to duplicate by clicking on the map window or choosing it from the ***Window*** menu.
2. Choose ***Map-Duplicate***.

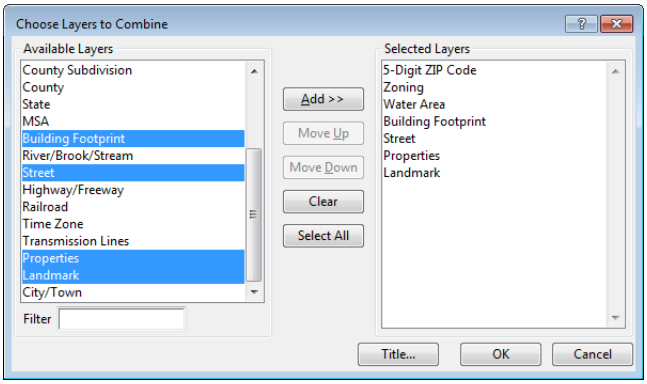
Maptitude duplicates the map, and makes the new map the current map.

Combining Existing Maps

You can create a new map by mixing and matching the layers that appear in your other maps.

▶ To Combine Existing Maps

1. Open two or more maps. The extent of the new map will match the extent of the map that is the current map.
2. Choose ***Map-Combine***. Maptitude displays the Choose Layers to Combine dialog box.



3. Choose which of the available layers in the open maps to include in the new map as follows:

To do this...	Do this...
Include all available layers in the new map	Click **Select All**.
Exclude particular layers from the new map	Highlight one or more layers in the Selected Layers scroll list and click **<<Drop**
Include particular layers from the open maps	Highlight one or more layers in the Available Layers scroll list and click **Add>>**
Change the order of layers in the new map	Highlight one or more layers in the Selected Layers scroll list and click **Move Up** or **Move Down**

4. If you want to specify a title for the new map, click **Title**, enter a title in the edit box, and click **OK**.
5. Click **OK**.

Maptitude creates a new map with the layers you chose and with the extent of the map that was current.

Interrupting the Drawing of a Map

You can stop a layer or map from drawing before it is done using the buttons on the status bar.

▶ To Stop a Map from Drawing

1. Click  on the Maptitude status bar or press the ESC key.

▶ To Stop a Layer from Drawing

1. Click  on the Maptitude status bar.

Maptitude interrupts the drawing of the layer and skips to the next layer.

Changing the Contents of a Map

For a map to be clear and easy to read, it must contain the right amount of information. When a map contains too much information, it is confusing and hard to read. When a map contains too little information, it is difficult to tell what the map is trying to show.

To help you manage the information in your maps, Maptitude organizes map features into layers. You control the amount of information that is shown on a map by choosing which layers to display.

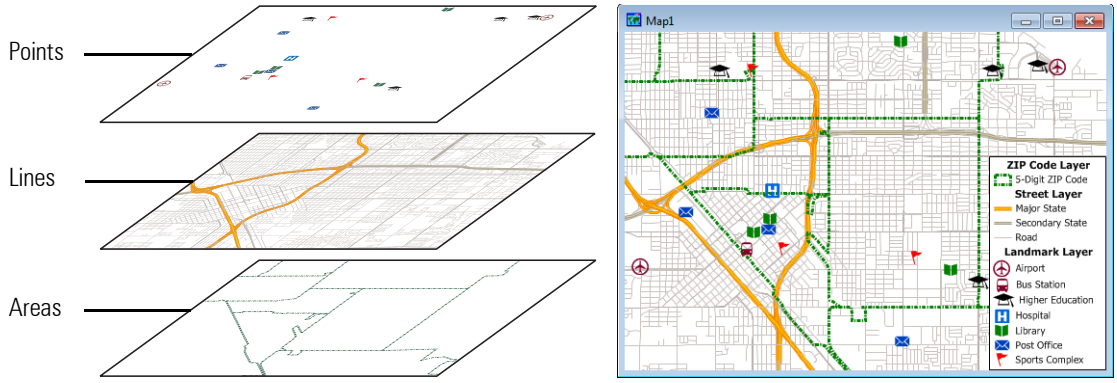
Layers and Some Examples

A layer is a group of features of the same type. Every geographic file contains at least one layer of information, and every layer has a name that describes the features within it.

There are several types of layers. Vector layers contain map features that are points, lines, or areas which are stored in a geographic file. The table below contains some examples of the type of information that can be stored in a vector layer:

Points	Lines	Areas
Retail Stores	Highways	Countries
Healthcare Providers	City Streets	ZIP or Postal Codes
Airports	Power Lines	Tax Parcels
Telephone Poles	Rivers	Census Tracts
Subway Stations	Railroads	Congressional Districts
Warehouses	Pipelines	Sales Territories

For example, the points in the following map are landmarks, the lines are street segments, and the areas are ZIP Codes, each in their own map layer.



NOTE: The geographic files included with Maptitude are nationwide and worldwide in scope. You can create your own subsets of these files by selecting features and exporting them to their own geographic files or by clipping them. See "Creating New Files from Selection Sets" on page 258 or "Clipping Geographic Files by Area" on page 450.

Grid layers are a special type of vector layer where the cells in the grid can represent any values, such as elevation, zoning, vegetation, or slope. Maptitude currently has tools for using grid layers that contain elevation data to analyze surfaces and create three-dimensional maps. For more information, see *Chapter 12: Surface Analysis Tools*.

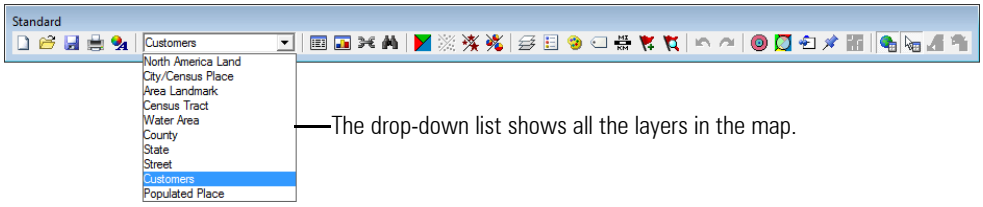
Raster layers include images such as an orthophoto, a picture of a map, or another type of image. The images are stored in files with formats such as GeoTIFF, MrSID, or DOQ. For more information on image layers, see "Using Images as Map Layers" on page 140.

Maptitude can also display geographic data stored in other file formats as map layers. See "Using Other Geographic File Formats" on page 66 for more information.

Using Layers in a Map

A map may contain many layers of information. The layers are drawn one at a time. This means that when a layer is drawn, features in that layer may hide or obscure features from an earlier layer. You choose the order in which layers are drawn to reflect the emphasis or focus that you want.

To help you out, the names of all the visible layers in a map appear in the order they will draw in a drop-down list on the Standard toolbar. You can change the order of these layers, and add or remove layers. When you make any changes, the layer list is automatically updated.



The Working Layer

The Maptitude commands that are used to set colors, styles, thematic map settings, and labels operate on one layer at a time. This layer is called the **working layer**. The name of the working layer is shown in the drop-down list on the Standard toolbar.

▶ To Change the Working Layer

1. Choose one of the visible layers in a map from the drop-down list on the Standard toolbar.

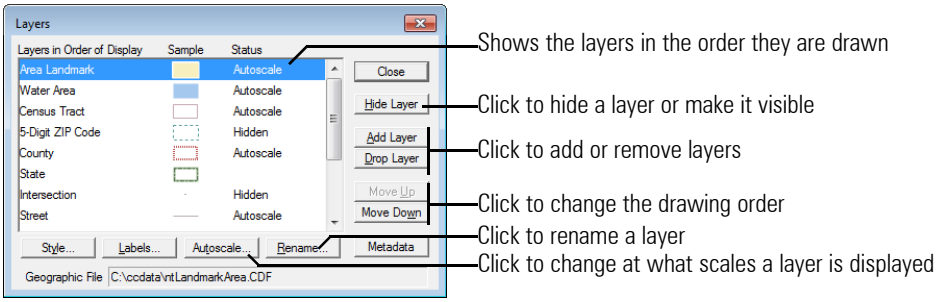
   —OR—

1. Right-click on a visible layer in the Display Manager and choose ***Make Working Layer***. See "To Use the Display Manager" on page 79 for more information.

Maptitude maintains a current layer. When a map window is active, the current layer is the working layer. When a dataview window is active, the current layer is the table or joined view in the dataview. For more information on dataviews, see *Chapter 7: Working with Tables, Databases, & Charts*.

Changing the Layers in a Map

Maptitude allows you to add layers to or remove layers from a map, change the order in which the layers are drawn, hide a layer temporarily without removing it from a map, make a hidden layer visible again, and rename a layer. You make all these changes using the Layers dialog box shown here:



NOTE: You can change the style of a layer and its labels from the Layers dialog box. For more information, see "Using Styles" on page 81 and "Using Labels" on page 86. You can also view metadata for a geographic file from the Layers dialog box. For more information, see "Viewing Metadata for a Geographic File" on page 421.

TIP: You can also use layers stored in other geographic file formats or image formats. See "Using Other Geographic File Formats" on page 66 and "Using Images as Map Layers" on page 140 for more information.

▶ To Add Layers to a Map

1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. Click **Add Layer** to display the File Open dialog box.
3. Choose **Geographic File** as the file type, and choose one or more geographic files.
4. Make choices as follows:
   - To protect the data from accidental changes, check the **Open as Read-Only** box.
   - To prevent other from opening the file at the same time, check the **Open for Exclusive Access** box.
5. Click **Open**. Map layers in the geographic files are added to the list of layers in the map.
6. Click **Close**.

Maptitude draws the map with the new layers. The layer list on the Standard toolbar is updated to include the added layers.

NOTE: If you add layers whose features are in a different geographic area from that visible in your map, you may need to change the scale or location to see features in those layers.

TIP: You can also hide and show layers with the Display Manager. See "Using the Display Manager" on page 78 for more information.

▶ To Change the Layers in a Map

1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. In the layer list, click on the layer or layers you want to change.
3. Make changes as follows:
   - To remove the layer(s) from the map click **Drop Layer**.
   - To draw the layers earlier or later click **Move Up** or **Move Down**.
   - To hide the layers click **Hide Layer** or to show the layers click **Show Layer**.
4. Click **Close**.

Maptitude draws the map with the changes.

Try It Yourself: Changing the Layers in a Map

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nelayers.map** in the Tutorial folder. Notice how the counties cover the highways and railroads.
2. Choose ***Map-Layers*** or click on the Standard toolbar, click on **County** in the layer list, and click **Move Up** until County is the first layer.
3. Click **Close**. The highways and railroads are now on top of the counties.
4. Choose ***Map-Layers*** or click on the Standard toolbar, click on **Railroad** in the layer list, and click **Hide Layer**. Hidden appears after Railroad in the layer list.
5. Click **Close**. The railroads are no longer drawn.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Controlling Layers Automatically with Autoscale

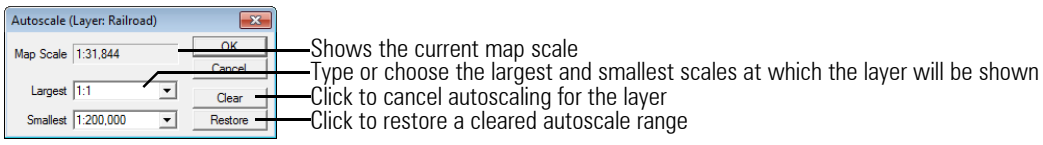
While you can manually control the layers in a map, Maptitude also lets you set up each layer so that it displays automatically within a range of map scales. As a result, you can design a map that shows more detail as you zoom in, and less detail as you zoom out. This feature is called **autoscale**.

Autoscale makes maps more readable by preventing too many features from being drawn in too small a space. For example, suppose you have a map of the U.S. that includes the U.S. Streets layer. When the scale of your map is set to show the entire U.S., you don't want to see all the streets. When you zoom in on a single city, however, you do want to see the streets. When autoscale is enabled, this happens automatically. Maptitude checks the scale each time a map is drawn and decides whether or not each layer should be drawn. If the scale is between the smallest and largest scales you have specified, the layer will be drawn.

The Autoscale dialog box displays map scales as ratios. A scale of 1:1,000 means that every feature on the map is shown at one thousandth of its actual size.

▶ To Control Layers with Autoscale

1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. In the layer list, click on a layer you want to scale automatically.
3. Click **Autoscale** to display the Autoscale dialog box and make choices as follows:



4. Click **OK** to return to the Layers dialog box. If you assigned autoscale values to the layer, the word Autoscale is displayed next to the name of the layer.
5. Click **Close** to draw the map with autoscale settings you chose.

From now on, Maptitude will display the layer only within the specified range of map scales.

If you use autoscaling for all of the layers in your map, you might find yourself displaying a map at a scale at which none of the layers is displayed! If your map is empty, you may want to change the map scale or change the autoscale settings.

Try It Yourself: Controlling Layers Automatically

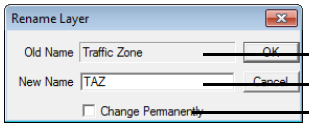
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nycauto.map** in the Tutorial folder. Only the New York state boundary is shown.
2. Click on the Tools toolbar to activate the Zoom In tool and click several times on New York City. As you zoom further and further in, additional layers appear: first County, then Tract, then Streets and School.
3. Choose ***Map-Zoom-Scale***, choose the **Ratio** method, and choose **1:100,000** from the drop-down list.
4. Click **OK**. The streets are displayed, but the schools are not because the current scale does not fall between the minimum and maximum autoscale settings.
5. Choose ***Map-Layers*** or click on the Standard toolbar, click on **School** in the layer list, and click **Autoscale**.
6. Change the smallest scale to **1:100,000**, click **OK**, then click **Close**. The map is drawn showing the schools.
7. Click on the Tools toolbar to activate the Zoom Out tool and click on the map to zoom out. The schools are no longer displayed and the status bar at the bottom of the screen shows that the scale is now smaller than the minimum value of 1:100,000 that you chose for the layer.
8. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Renaming a Layer

You can change the name of a layer using the Layers dialog box. When you change the name of a layer, the layer list, map legend, and Layers dialog box all use the new name for the layer in all open maps. The layer name can be changed for this session only or permanently. When you change the layer name permanently, the geographic file is changed and the new name is stored in the file. **If you change the layer name permanently, Maptitude will no longer be able to draw any maps, data-views, or layouts you created earlier that include the original name of the layer you renamed.** Layer names may be up to 20 characters long.

▶ To Change the Name of a Layer

1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. In the layer list, click on the layer you want to rename.
3. Click **Rename** to display the Rename Layer dialog box and make choices as follows:



4. Click **OK** to rename the layer. Maptitude updates the layer list in the Layers dialog box.
5. Close the Layers dialog box.

When you close the Layers dialog box, Maptitude updates the layer list on the Standard toolbar and the map legend. To learn more about legends, see "Using Legends" on page 130.

Using Other Geographic File Formats

In addition to displaying Caliper geographic files as layers in a map, Maptitude can also display geographic data in other file formats as map layers. If you want to use one of these geographic file formats, you do not need to import the geographic data first, since you can use these geographic file formats directly. Maptitude provides direct support for these geographic file formats:

- Records with a coordinate for a point, in any ODBC database
- Points, lines, and areas stored in an Oracle Version 7 (Spatial Data Option) or Version 8i or later (Oracle Spatial) database
- Points, lines, and polygons stored in a Microsoft SQL Server Spatial layer
- Esri Shapefiles, Esri ArcView 3.x Project Files, and Personal Geodatabases
- MapInfo TAB files
- Google Earth files

TIP: Maptitude also supports image layers. See "Using Images as Map Layers" on page 140 for more information.

Maptitude also can import data from many other geographic file formats including AutoCAD, MapPoint, OpenStreetMap, and others. When imported, Maptitude creates a new Caliper format geographic file based on the imported file. For more information, see "Importing Geographic Files" on page 424.

Some Maptitude commands require area files to be topological to give the expected result. For example, Shapefiles store each area as a complete polygon so the ***Tools-Editing-Merge by Value*** command cannot remove the common borders inside the merged areas because the areas are not stored topologically.

Creating a Map Layer from an ODBC Table

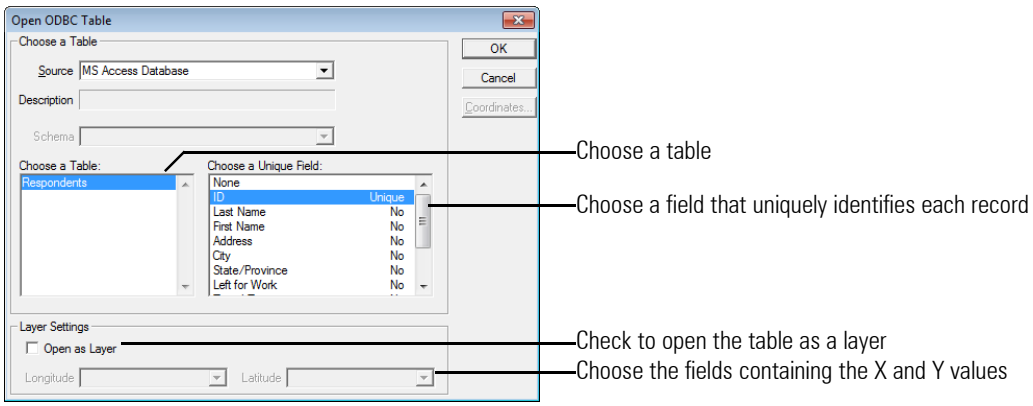
If there are coordinate fields in a table in a database that can be accessed via Open Database Connectivity (ODBC), you can display that table as a point layer in a map. If the coordinates are in an XY coordinate system rather than in longitude and latitude, you can specify the coordinate system.

There must be a field that uniquely identifies each record with a number. Some database managers such as Microsoft Access make it easy to create and maintain a unique ID field. The field can be numeric or character, but the value must be a unique number.

▶ To Create a New Map from an ODBC Table

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose Open. Maptitude displays the File Open dialog box.
2. Choose **ODBC Table** as the file type. Maptitude displays the Open ODBC Table dialog box.
3. Choose a source from the Source drop-down list. (If the source is generic, such as MS Access, Maptitude will display the Select Database dialog box. Choose a database, and click OK.)

4. Make choices as follows:



5. If the ODBC table has coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.

6. Click **OK**.

Maptitude opens the ODBC table and draws a new map with the layer.

▶ To Add a Layer from an ODBC Table to an Existing Map

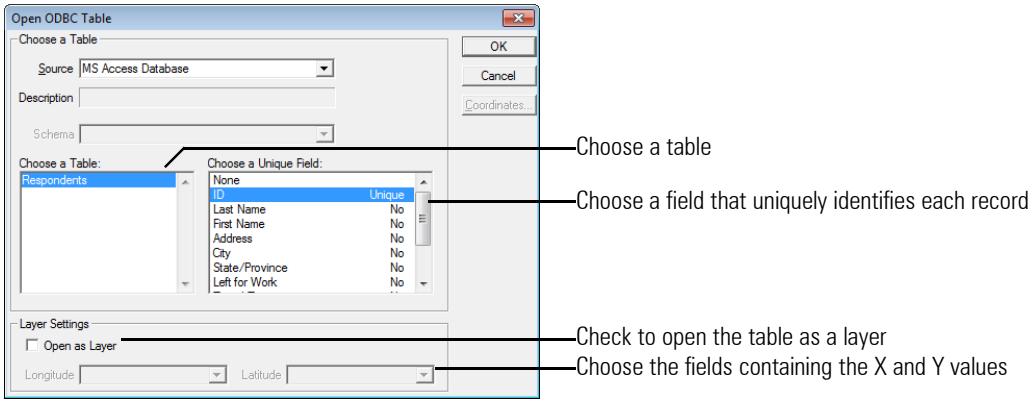
1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.

2. Click **Add Layer** to display the File Open dialog box.

3. Choose **ODBC Table** as the file type. Maptitude displays the Open ODBC Table dialog box.

4. Choose a source from the Source drop-down list. (If the source is generic, such as MS Access, Maptitude will display the Select Database dialog box. Choose a database, and click OK.)

5. Make choices as follows:



6. If the ODBC table has coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.

7. Click **OK**. Maptitude opens the ODBC table and adds it as a new layer.

8. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layer.

Creating a Map Layer from an Oracle Database

Maptitude can directly read and display map features stored in an Oracle database. Oracle Version 7 stores map features using the Spatial Data Option (SDO), which uses a standard relational model. Oracle Version 8i and later (including 9i and 10g) store map features using Oracle Spatial, which uses an object relational model.

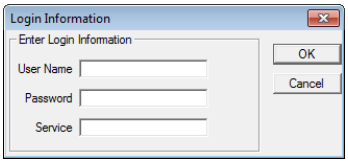
Oracle databases can contain a mixture of points, lines, and polygons. You must choose which type of map feature to display if there is a mixture. Maptitude supports multi-polygon records, which Oracle Spatial uses to store the boundaries of areas with islands and holes. Maptitude only displays the first point for multi-point records.

Maptitude supports records for arcs and circles in Version 8i and later. Arcs are converted to lines and circles are converted to polygons, with 60 points used to approximate a circle and a proportional number used to approximate an arc.

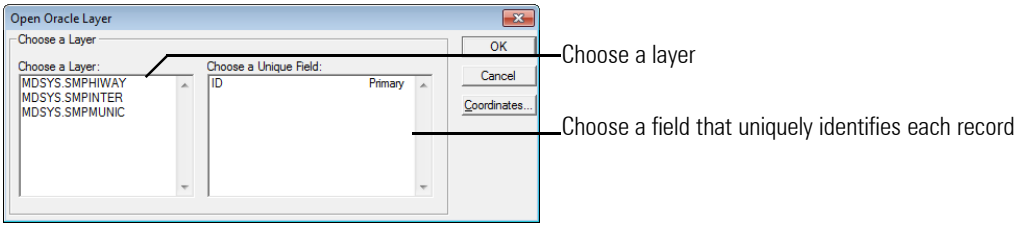
There must be a field that uniquely identifies each record with a number. The field can be numeric or character, but the value must be a unique number.

▶ To Create a New Map from an Oracle Database

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Oracle Spatial Layer** as the file type. Maptitude displays the Login Information dialog box.



3. Enter your user name, password, and the Oracle service you want to use, and click **OK**. Maptitude connects to the Oracle service and displays the Open Oracle Layer dialog box.
4. Make choices as follows:

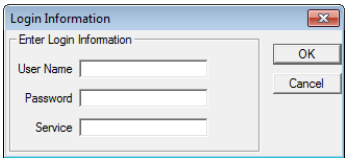


5. If the Oracle database uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
6. Click **OK**.

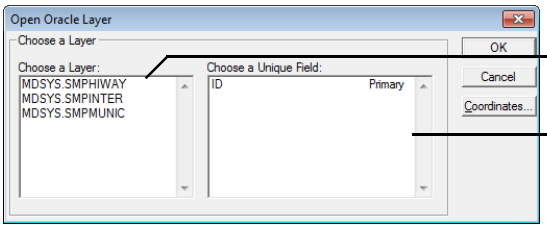
Maptitude opens the Oracle database as a point, line, or area layer and draws a new map with the layer.

▶ To Add a Layer from an Oracle Spatial Layer to an Existing Map

1. Choose ***Map-Layers*** or click on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. Click **Add Layer** to display the File Open dialog box.
3. Choose **Oracle Spatial Layer** as the file type. Maptitude displays the Login Information dialog box.



4. Enter your user name, password, and the Oracle service you want to use, and click **OK**. Maptitude connects to the Oracle service and displays the Open Oracle Layer dialog box.
5. Make choices as follows:



6. If the Oracle database uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
7. Click **OK**. Maptitude opens the Oracle database as a point, line, or area layer and adds it as a new layer.
8. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layer. The layer list on the Standard toolbar is updated to include the added layer.

Creating a Map Layer from a Microsoft SQL Server Spatial Layer

Maptitude can directly read and display map features stored in a Microsoft SQL Server Spatial layer. SQL Server 2008 and later store map features using the Spatial data types, "Flat Earth" (GEOMETRY or planar) and "Round Earth" (GEOGRAPHY or ellipsoidal).

SQL Server Spatial layers can contain points, lines, and polygons. You must choose which type of map feature to display if there is a mixture. Maptitude supports multi-polygon records, which SQL Server Spatial uses to store the boundaries of areas with islands and holes. Maptitude only displays the first point for multi-point records.

There must be a field that uniquely identifies each record with a number. The field can be numeric or character, but the value must be a unique number.

▶ To Create a New Map from a Microsoft SQL Server Spatial Layer

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **SQL Server Spatial Layer** as the file type. Maptitude displays the Connect to SQL Server dialog box.
3. Type the server name in the Server Name edit box and choose Windows or SQL Server authentication from the Authentication drop-down list.

   For SQL Server authentication, type your user name in the Login edit box and, if necessary, type your password in the Password edit box
4. Click **OK**. Maptitude connects to the SQL Server service and displays the Open SQL Server Spatial Layer dialog box.
5. Choose a database from the Database drop-down list and choose a schema from the Schema drop-down list.
6. Choose a layer from the Choose a Layer scroll list. Maptitude displays the fields that are in the layer.
7. Choose a field that uniquely identifies each record from the Choose a Unique Field scroll list.
8. If the SQL Server Spatial layer uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**.
9. Click **OK**.

Maptitude opens the SQL Server Spatial layer as a point, line, or area layer and draws a new map with the layer.

▶ To Add a Layer from a Microsoft SQL Server Spatial Layer to an Existing Map

1. Choose ***Map-Layers*** or click  on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. Click **Add Layer** to display the File Open dialog box.
3. Choose **SQL Server Spatial Layer** as the file type. Maptitude displays the Connect to SQL Server dialog box.
4. Type the server name in the Server Name edit box and choose Windows or SQL Server authentication from the Authentication drop-down list.

   For SQL Server authentication, type your user name in the Login edit box and, if necessary, type your password in the Password edit box
5. Click **OK**. Maptitude connects to the SQL Server service and displays the Open SQL Server Spatial Layer dialog box.
6. Choose a database from the Database drop-down list and choose a schema from the Schema drop-down list.
7. Choose a layer from the Choose a Layer scroll list. Maptitude displays the fields that are in the layer.

8. Choose a field that uniquely identifies each record from the Choose a Unique Field scroll list.
9. If the SQL Server Spatial layer uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**.
10. Click **OK**. Maptitude opens the SQL Server Spatial layer as a point, line, or area layer and adds it as a new layer.
11. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layer. The layer list on the Standard toolbar is updated to include the added layer.

Using Esri Shapefiles as Map Layers

Maptitude can directly read and display map features stored in Esri Shapefiles. The Shapefile format is an open file specification from Esri and is the native geographic file format for ArcView 3.x. ArcGIS can also read and write Shapefiles.

TIP: You can also import Shapefiles into a Caliper geographic format file. "Importing Esri Shapefiles" on page 427 for more information.

Maptitude supports polygon records with multiple rings, which are used to store the boundaries of areas with islands and holes. Maptitude only displays the first point in a multipoint record. M (measure) values and Z (height) values are ignored in records where they appear.

If the Shapefile includes the spatial index files (.SBN and .SBX), which are not part of the open file specification, Maptitude can use them to speed display of the Shapefile. Otherwise, Maptitude will build a Caliper spatial index.

Maptitude can use an ArcView Legend (.AVL) file that has the same file name as the Shapefile to apply display settings to the map layer that is based on the Shapefile. The settings can define a layer style or a theme. Most ArcView settings can be translated into Maptitude settings, but there are some ArcView settings that have to be approximated because of differences in the way maps, layers, and styles are created in Maptitude.

The ArcView methods for themes are very similar to the Maptitude methods for color and pattern themes, but they are stored as discrete classes and are normally treated as Manual themes. There is an option to use the Maptitude method when possible, so that the theme can be managed from the regular theme dialog box. Otherwise, the theme needs to be managed from the Manual Theme dialog box.

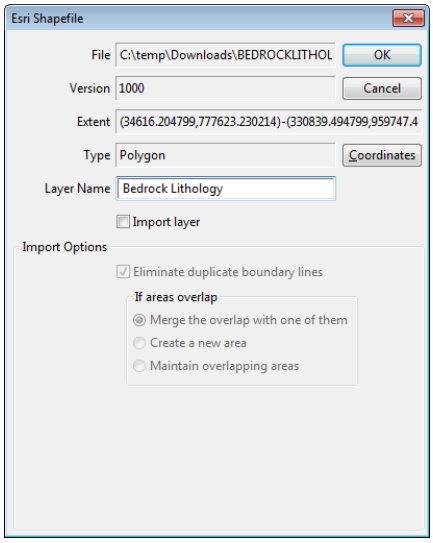
A Legend file can be thought of as a subset of an ArcView Project (.APR) file; see "Opening an Esri ArcView 3.x Project File" on page 73 for more information.

▶ To Create a New Map from an Esri Shapefile

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Esri Shapefile** as the file type and choose a Shapefile.

3. Check the **Add to Map** box if you want to add the Shapefile to the current working map, or if no maps are open, to open a default map for your Country Package with the Shapefile you chose. Uncheck the box to open a map that contains only the Shapefile you chose.

4. Click **Open**. Maptitude displays the Esri Shapefile dialog box.



5. If the Shapefile uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.

6. If there is an ArcView Legend (.AVL) file associated with the Shapefile, Maptitude displays the Get ArcView Shapefile Legend Settings dialog box. Make one of the following choices:

To do this...	Do this...
Use Maptitude theme methods	Check **Use Maptitude theme method**. This will use the equivalent Maptitude method when possible, so that the theme can be managed from the regular theme dialog box.
Use ArcView theme methods	Remove the check from **Use Maptitude theme method**. This will treat as Manual themes all of the methods that ArcView stores as discrete classes.

   Click **OK** to return to the Esri Shapefile dialog box.

7. If there is a Caliper spatial index associated with the Shapefile and you want to rebuild it, such as when the index was built with the wrong coordinate system, check the **Rebuild Spatial Index** box.

8. Click OK.

Maptitude opens the Shapefile and draws a new map with the layer. If there is an ArcView Legend (.AVL) file associated with the Shapefile, Maptitude applies the display settings to the map layer.

▶ To Add Layers from Esri Shapefiles to an Existing Map

1. Choose ***Map-Layers*** or click  on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.

2. Click **Add Layer** to display the File Open dialog box.

3. Choose **Esri Shapefile** as the file type.
4. Choose one or more Shapefiles and click **Open**. Maptitude displays the Esri Shapefile dialog box for each Shapefile.
5. If the Shapefile uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
6. If there is an ArcView Legend (.AVL) file associated with the Shapefile, Maptitude displays the Get ArcView Shapefile Legend Settings dialog box. Make one of the following choices:

To do this...	Do this...
Use Maptitude theme methods	Check **Use Maptitude theme method**. This will use the equivalent Maptitude method when possible, so that the theme can be managed from the regular theme dialog box.
Use ArcView theme methods	Remove the check from **Use Maptitude theme method**. This will treat as Manual themes all of the methods that ArcView stores as discrete classes.

   Click **OK** to return to the Esri Shapefile dialog box.
7. If there is a Caliper spatial index associated with the Shapefile and you want to rebuild it, such as when the index was built with the wrong coordinate system, check the **Rebuild Spatial Index** box.
8. Click **OK**. Maptitude opens the Shapefile and adds it as a new layer.

   If you are adding more than one layer, return to step 5 until all of the layers are added.
9. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layers. If there are ArcView Legend (.AVL) files associated with the Shapefiles, Maptitude applies the display settings to the map layers. The layer list on the Standard toolbar is updated to include the added layers.

Opening an Esri ArcView 3.x Project File

You can open an Esri ArcView 3.x Project (.APR) file, and create ArcView-based map windows in Maptitude (called views in ArcView) with the appropriate size, shape, placement, and projection. Views that are not open become minimized map windows. The map layers (called themes in ArcView) will have appropriate settings such as show/hide, autoscale, layer style, and theme. The ArcView equivalents of color/pattern, dot-density, size, and chart themes are all handled by Maptitude. The Shapefiles referenced by a Project file need to either be in the location referenced by the Project file or in the same folder as the Project file.

You can use an ArcView Project (.APR) file to open one or more maps that have layers based on Esri Shapefiles. The command handles project files created by ArcView 2.x and 3.x; a totally different file format is used by the 8.x (ArcGIS) version of ArcView. You can open any number of project files, because each is turned into a set of maps, and Maptitude has no practical limit on the number of maps that can be open. Other document types in the project file, such as Tables and Scripts, are ignored.

The command reads a project file and finds the ArcView settings that can be translated into Maptitude settings. Because ArcView and Maptitude list themes (layers) in opposite orders, themes are read from last to first. Most, but not all, settings can be used. Here are some notes:

- ArcView can have only one theme per layer, but can add a layer more than once to add additional themes. Maptitude can have several different types of themes per layer, but can only add a layer once to a map. The last theme for a Shapefile is the one used, because it is the first one read.
- If the coordinates are longitude/latitude, then the projection is set to Equidistant Cylindrical. Otherwise, the projection can be one of the 20 projections handled by ArcView.
- ArcView has six types of themes. A single symbol theme is used as the layer settings. A graduated color theme becomes a color or pattern theme. Because a graduated symbol theme has discrete classes, it is not a true size theme, so it becomes a color or pattern theme. A unique value theme is treated as a color or pattern theme with a List of Values method. Dot density and chart themes are handled as expected.
- ArcView has five methods, which are very similar to Maptitude methods for color and pattern themes. Equal Area would be Equal Weight, Equal Interval would be Equal Steps, Equal Number of Features would be Quantiles, and Standard Deviation would be the same. Maptitude does not have a Natural Breaks method. However, all of these methods are stored as discrete classes and are normally treated as Manual themes. There is an option to use the Maptitude method when possible, so that the theme can be managed from the regular theme dialog box. Otherwise, the theme needs to be managed from the Manual Theme dialog box.
- The No Data class in ArcView is the Other class in Maptitude. Normalization can be done by field, but not by percent of total. The precision (number of decimal places) of values is handled.
- In ArcView, point symbols are called markers. Maptitude handles basic markers, and for a composite marker Maptitude uses the last basic marker. Font characters are used if the font is available; otherwise, Maptitude uses a solid circle from the Caliper Cartographic font.
- Markers can be created from stipples, which are color bitmaps stored with the settings. Maptitude writes each one to a .BMP file in the BMP folder in the Maptitude program folder, using a file name that is "AV" plus the name of project file plus the object number of the stipple. The default color bitmap is GEO.BMP in the BMP folder. A special type of bitmap called an AVIcon is not handled.
- In ArcView, line symbols are called pens. Maptitude handles basic pens, vector pens such as arrow, diamond, dot, and hollow, and composite pens. Maptitude renders vector line markers by drawing M on top of a line at the marker positions.
- In ArcView, area symbols are called fills. Maptitude handles solid fills, and 8x8 patterns with white or transparent (null) as the background color of pattern. Maptitude renders vector fill with a V pattern and composite fill with a C pattern.

Maptitude does nothing with ArcView labels or label settings; it is better to use the automatic labeling capabilities of Maptitude.

▶ To Open an Esri ArcView 3.x Project File

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Esri 3.x Project File** as the file type.
3. Choose a Project file and click **Open**. Maptitude displays the Get ArcView Project File dialog box.
4. Make one of the following choices:

To do this...	Do this...
Use Maptitude theme methods	Check **Use Maptitude theme method**. This will use the equivalent Maptitude method when possible, so that the theme can be managed from the regular theme dialog box.
Use ArcView theme methods	Remove the check from **Use Maptitude theme method**. This will treat as Manual themes all of the methods that ArcView stores as discrete classes.

5. Click **OK**.

Maptitude creates map windows from views with the appropriate size, shape, placement, and projection. Views that are not open become minimized map windows. The map layers (called themes in ArcView) will have appropriate settings such as show/hide, autoscale, layer style, and theme. The ArcView equivalents of color/pattern, dot-density, size, and chart themes are all handled by Maptitude.

Creating a Map Layer from an Esri Personal Geodatabase

Maptitude can directly read and display point, line, and area features stored in tables in an Esri personal geodatabase. Each table stores points, lines, or areas. Each record has a unique numeric ID, a shape field containing one or more coordinates, and attributes that describe the map feature. Maptitude only displays the first point for multipoint records, and only displays the first line for multi-line records.

An Esri personal geodatabase is stored in Microsoft Access (.MDB) database. Maptitude does not currently support multiuser geodatabases, which can be stored in a variety of database management systems and require ArcSDE as middleware.

Maptitude recognizes Microsoft Access files that contain Esri personal geodatabases, and opens a table as a map layer. For more information on opening a table as a dataview, see "Creating a Dataview from a Microsoft Access Table" on page 218.

▶ To Create a New Map from an Esri Personal Geodatabase

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **ESRI Personal Geodatabase** as the file type and choose a personal geodatabase.

3. Check the **Add to Map** box if you want to add the personal geodatabase to the current working map, or if no maps are open, to open a default map for your Country Package with the personal geodatabase you chose. Uncheck the box to open a map that contains only the personal geodatabase you chose.
4. Click **Open**. Maptitude displays the Open Geodatabase Layer dialog box.
5. Highlight one or more tables in the scroll list.
6. If the table uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
7. Click **OK**.

Maptitude opens the personal geodatabase table as a point, line, or area layer and draws a new map with the layer.

▶ To Add a Layer from an Esri Personal Geodatabase to an Existing Map

1. Choose ***Map-Layers*** or click  on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. Click **Add Layer** to display the File Open dialog box.
3. Choose **Esri Personal Geodatabase** as the file type.
4. Choose a personal geodatabase and click **Open**. Maptitude displays the Open Geodatabase Layer dialog box.
5. Highlight one or more tables in the scroll list.
6. If the table uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
7. Click **OK**. Maptitude opens the personal geodatabase table as a point, line, or area layer and adds it as a new layer.
8. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layer. The layer list on the Standard toolbar is updated to include the added layer.

Using MapInfo TAB Files as Map Layers

Maptitude can directly read and display map features stored in MapInfo TAB files. TAB files can contain a mixture of points, lines, and areas. If Maptitude detects more than one type of map feature, you can choose the layer type.

TIP: You can also import MIF files. See "Importing MapInfo Interchange Format (MIF) Files" on page 430.

▶ To Create a New Map from a MapInfo TAB File

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **MapInfo TAB File** as the file type.

3. Choose a TAB file and click **Open**. Maptitude displays the MapInfo TAB File dialog box.
4. Type a name for the layer in the Layer Name edit box.
5. If the file contains a mixture of points, lines, and areas, choose a layer type from the radio list.
6. If the TAB file uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
7. Click **OK**.

Maptitude opens the TAB file and draws a new map with the layer.

▶ To Add Layers from MapInfo TAB Files to an Existing Map

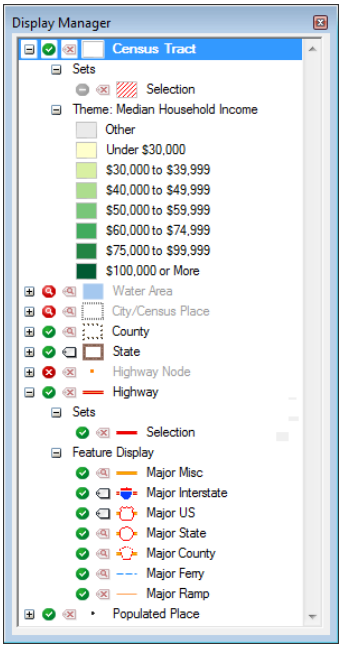
1. Choose ***Map-Layers*** or click  on the Standard toolbar, or right-click on the map window and choose ***Layers***. Maptitude displays the Layers dialog box.
2. Click **Add Layer** to display the File Open dialog box.
3. Choose **MapInfo TAB File** as the file type.
4. Choose one or more TAB files and click **Open**. Maptitude displays the MapInfo TAB File dialog box for each TAB file.
5. Type a name for the layer in the Layer Name edit box.
6. If the file contains a mixture of points, lines, and areas, choose a layer type from the radio list.
7. If the TAB file uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
8. Click **OK**. Maptitude opens the TAB file and adds it as a new layer.

   If you are adding more than one layer, return to step 5 until all of the layers are added.
9. Click **Close** to close the Layers dialog box.

Maptitude draws the map with the new layers. The layer list on the Standard toolbar is updated to include the added layers.

Using the Display Manager

The **Display Manager** is a toolbox for viewing and controlling the style, visibility, and label settings for the layers in a map.



With the Display Manager you can see the style of every layer in your map, whether or not labels are active for the layer, and whether or not the layer is currently visible. In addition, you can expand the layer sections by clicking the plus symbol (⊞) to see visibility, style, and label status of any selection sets, themes, or feature display settings that are present for the layer.

For each item in the Display Manager toolbox, there is a sample of its style as well as symbols indicating the display and label status:

Symbol	Definition
	Indicates a layer is visible, a selection set is active, or a feature display setting is active
	Indicates a layer, selection set, or feature display is active, but is currently autoscaled off
	Indicates a layer or selection set is hidden
	Indicates a selection set or feature display setting is inactive
	Indicates a layer, selection set, or feature display setting has labels
	Indicates a layer, selection set, or feature display setting has labels, but currently they are autoscaled off
	Indicates a layer, selection set, or feature display setting has no labels

The working layer is also indicated in the Display Manager with bold type.

You can also use the Display Manager to quickly change the visibility status of items and as a shortcut to the dialog boxes necessary for changing other display settings. The Display Manager toolbox does not replace dialog boxes such as Layers, Style, Labels, Selection Settings, Feature Display Settings, Autoscale, or the various theme dialog boxes. Instead, it provides you with another way to control your map design.

▶ To Use the Display Manager

1. Choose ***Map-Display Manager Toolbar***.
2. Make changes to the Display Manager contents as follows:

To do this...	Do this...
Expand/collapse an item	Click ⊞ to expand an item or click ⊟ to collapse an expanded item
Expand/collapse all items	Right-click on an item in the Display Manager and choose ***Expand All*** or ***Collapse All***
Sort layers by drawing order	Right-click on an item in the Display Manager and choose ***Sort by Drawing Order***
Sort layers alphabetically	Right-click on an item in the Display Manager and choose ***Sort by Name***
Include/exclude node layers	Line layers comprise both line and node features. Generally the node features are hidden and not included in the Display Manager. Right-click on an item and choose ***Show Node Layers*** if it is not checked to include node layers in the Display Manager. Choose ***Show Node Layers*** again to exclude the node layers.

3. Make changes to the map as follows:

To do this...	Do this...
Hide an item	Click on the symbol next to a layer or selection set item to change it to a red ⊗.
Show an item	Click on the symbol next to a layer, selection set, or feature display item to change it to a green ✓.
Make an item inactive	Click on the symbol next to a selection set or feature display item to change it to a gray ⊖.
Change the style of an item	Click on the style sample next to a layer, selection set, theme, or feature display item to display the Style dialog box. Make changes to the style and click OK. See "Using Styles" on page 81for more information.
Change the label of an item	Click on the label symbol next to a layer, selection set, or feature display item to display the Labels dialog box. Make changes to the label and click OK. See "Creating Labels" on page 86 for more information.
Rename an item	Right-click on a layer, theme, selection set, or feature display item and choose ***Rename***, type a new name for the item and click OK.
Show autoscaled off labels	Right-click on a layer, feature display, or selection set whose labels are autoscaled off and choose ***Show Labels*** (Clear Autoscale).
Show selected features only	Right-click on a layer and choose ***Show Selected Only***.
Drop an item from the map	Right-click on a layer, selection set, or feature display item and choose ***Remove***.
Zoom to an item	Right-click on a layer or a selection set item and choose ***Zoom***.

4. Make other choices as follows:

To do this...	Do this...
Change the working layer	Right-click on a layer and choose ***Make Working Layer***.
Create a dataview	Right-click on a layer or a selection set item and choose ***New Dataview***.

Try It Yourself: Using the Display Manager

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the map **display.map** in the Tutorial folder.
2. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
3. Right-click on any item in the Display Manager and choose ***Expand All*** to see all elements of the map.
4. Click  next to Railroad. Maptitude displays the railroads in the map and changes the symbol to  .
5. Click  next to Highway to hide the highway layer.
6. Click the black star next to the State Capital selection set to display the Style dialog box. Change the color to dark red and click **OK**.
7. Click the label symbol next to the State Capital selection set to display the Labels dialog box. Change the color to the same dark red and click **OK**.
8. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Using Styles

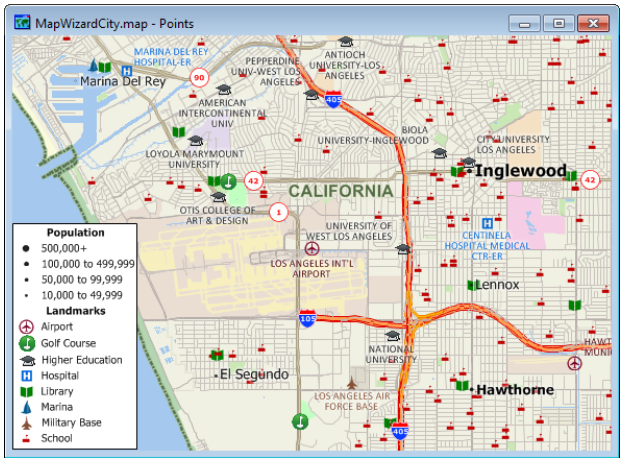
Maptitude uses the term **style** to talk about the colors, patterns, symbols, and lines that are used to draw map features. You change the style of a layer, selection set, or feature display using the Style dialog box. The Style dialog box looks different for point, line, and area layers because you have different choices for each type of layer.

NOTE: Many of the layers supplied with Maptitude use feature display settings to style groups of features. Expand the Display Manager to see the Feature Display settings for the various layers.

Styles for Point and Grid Layers

Features in a point layer are drawn with your choice of symbol type:

- Font character from a Windows TrueType font: you can choose the font, the symbol or other character, the color, the size, and a few other settings.
- Color image: you can choose the image file, which can be an Icon (.ICO), Enhanced Metafile (.EMF), Windows bitmap (.BMP), JPEG (.JPG), portable network graphics (.PNG), GIF (.GIF) or TIFF (.TIF), and you choose the size. Maptitude includes many image files in the BMP\ICONS folder in the Maptitude program folder.



For features in a grid layer you can also choose to autosize the grid icons so that they will get larger as you zoom in and smaller as you zoom out, rather than stay a fixed size as with a point layer. If you choose a solid square symbol as the icon, it will fill each grid cell at any scale. For more information on grid layers, see "Grid Layers" on page 353.

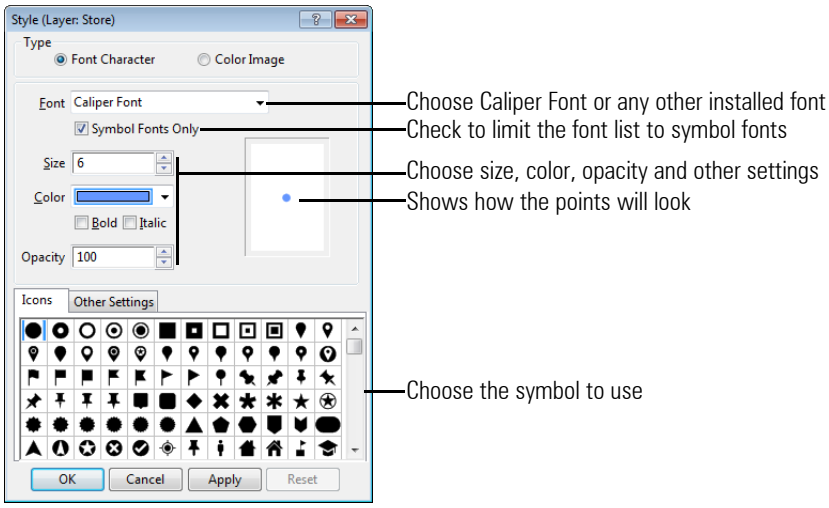
▶ To Change the Style of a Point or Grid Layer Feature

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the style sample of the point feature you want to modify to display the Style dialog box.
3. Choose either **Font Character** or **Color Image** from the Type radio buttons. Maptitude shows the appropriate settings.

TIP: You can also get to the Style dialog box from the Layers dialog box and the Selection toolbar.

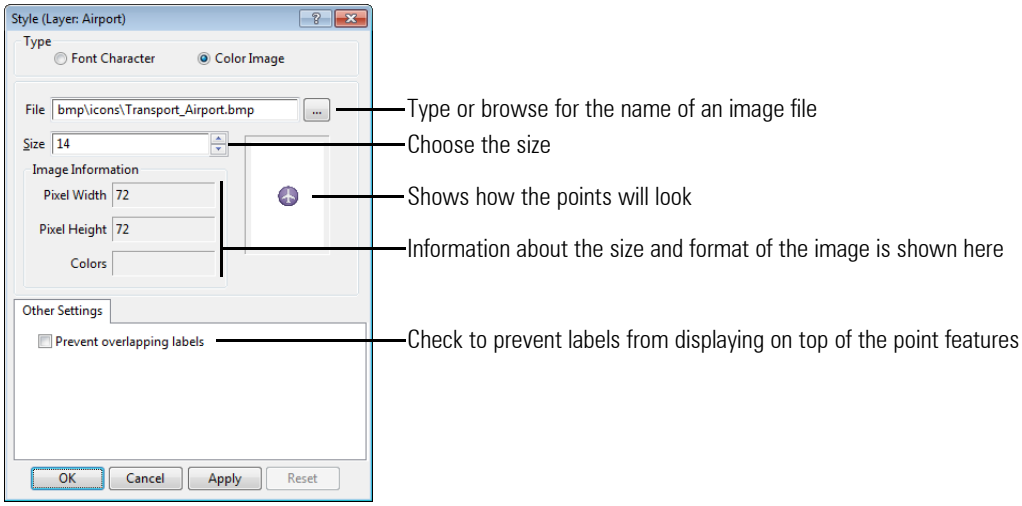
TIP: Press Ctrl+ on your keyboard to make all point symbols and labels larger and all lines and area borders wider, or press Ctrl- to make them smaller. Press Ctrl 0 to reset the sizes to the default.

4. If you chose Font Character, choose the style settings as follows:



Click the Other Settings tab and check the **Prevent overlapping labels** box if you want to keep labels from displaying on top of the point features, and check the **Autosize grid icons** box if you want grid icons to change size with the map scale.

If you chose Color Image, choose the style settings as follows:



5. Click **OK**.

Maptitude draws the point layer with the new style settings.

Try It Yourself: Changing the Style of Point Features

1. Choose ***File-Open*** or click on the Standard toolbar, then open **nycstyle.map** in the Tutorial folder.
2. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
3. Click the style sample for the School layer in the Display Manager to display the Style dialog box for a point layer.
4. Change the size to **12** points, the color to bright red, and choose a different symbol.
5. Click **OK**. Maptitude redraws the map with the new point style.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

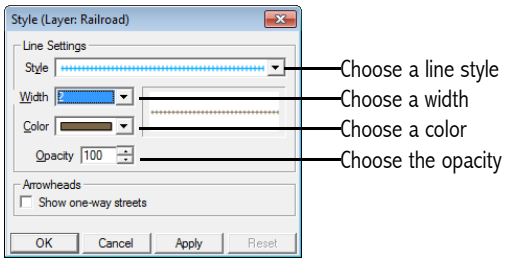
Styles for Line Layers

Features in a line layer are drawn using one of over 200 predefined line patterns. You choose the pattern, width, color, and opacity.

TIP: You can also get to the Style dialog box from the Layers dialog box and the Selection toolbar.

▶ To Change the Style of a Line Layer

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the style sample of the line feature you want to modify to display the Style dialog box.
3. Make choices as follows:



TIP: Press Ctrl+ on your keyboard to make all lines and area borders wider and all point symbols and labels larger, or press Ctrl- to make them smaller. Press Ctrl 0 to reset the sizes to the default.

4. Click **OK**.

Maptitude draws the line layer with the new style settings.

Try It Yourself: Changing the Style of Line Features

1. Choose ***File-Open*** or click on the Standard toolbar, then open **nycstyle.map** in the Tutorial folder.
2. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
3. Click the blue line sample for the Street layer in the Display Manager to display the Style dialog box for a line layer.
4. Change the width to **2** points, the color to light gray, and click **OK**. Maptitude redraws the map with the new line style.
5. Choose ***File-Close*** and click **No** to close the map without saving any changes.

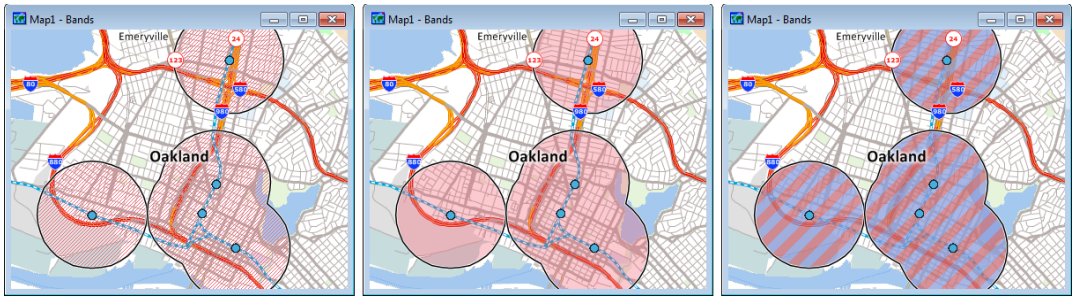
Styles for Area Layers

Features in an area layer are drawn with a border style and a fill style. You choose the pattern, width, and color for the border, and the pattern, color, and opacity for the interior of the area.

You can select from several fill styles for areas, including None. If you choose None, backgrounds, layers and features drawn before that layer will show through. If you choose a solid or patterned fill style for your area layer, backgrounds and features drawn before that layer will not show through unless you can change the fill opacity or you choose to make a pattern fill transparent. The opacity value you specify determines how much you can see through the layer. Setting higher levels of opacity makes the underlying layers less visible.

Maptitude also includes several color pattern fills in the BMP\FILLS folder in the Maptitude program folder. In addition, you can create your own custom color pattern fills styles from any BMP, GIF, ICO,

JPEG, PNG, or TIFF image file.

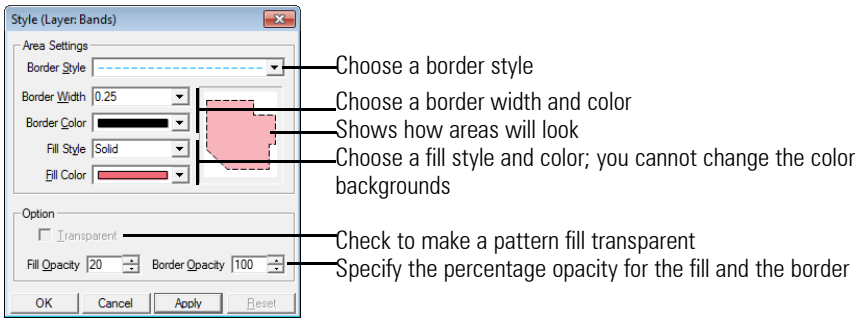


An area layer with a transparent pattern fill (left), a solid fill with 25% opacity (center), and an image fill with 75% opacity (right)

TIP: You can also get to the Style dialog box from the Layers dialog box and the Selection toolbar.

▶ To Change the Style of an Area Layer

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the style sample of the area feature you want to modify to display the Style dialog box.
3. Make choices as follows:



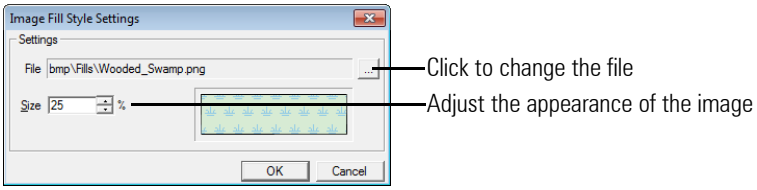
TIP: Press Ctrl+ on your keyboard to make all area borders and lines wider and all point symbols and labels larger, or press Ctrl- to make them smaller. Press Ctrl 0 to reset the sizes to the default.

4. Click **OK**.

Maptitude draws the area layer with the new style settings.

▶ To Use a Custom Fill Style for an Area Layer

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the style sample of the area feature you want to modify to display the Style dialog box.
3. Choose **Image** from the bottom of the fill style drop-down list to display the Choose Fill Style Image dialog box.
4. Choose a file type from the Files of Type drop-down list
5. Browse for the file and click **Open**. Maptitude displays the Image Fill Style Settings dialog box.
6. Make choices as follows:



7. Click **OK**.

8. Make any additional choices as described in "To Change the Style of an Area Layer" above and click OK.

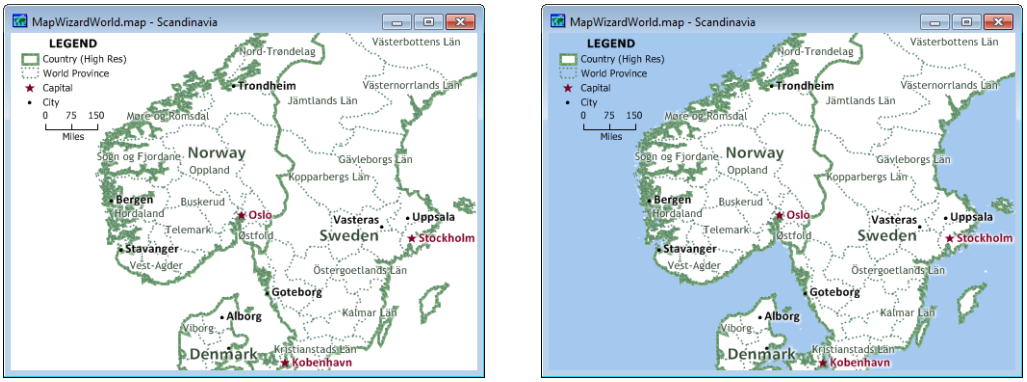
Maptitude draws the area layer with the new style settings.

Try It Yourself: Changing the Style of Area Features

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nycstyle.map** in the Tutorial folder.
2. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
3. Click the style sample for the Tract layer in the Display Manager to display the Style dialog box for an area layer.
4. Change the border style to a dashed line, change the border opacity to **75**, and click **OK**. Maptitude redraws the map with the new area style.
5. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Style of the Map Background

You can set the background style to enhance the appearance of your maps. For example, you could use a solid blue background to show water or a pastel background to make other features in a map stand out.



The map on the left has no background style whereas the background and the countries both have solid fills in the map on the right

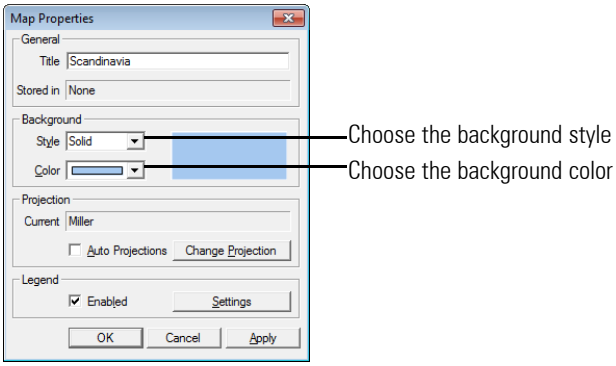
If you draw an area layer that has no fill pattern over a background that does have a pattern, the background pattern will show through the area layer. Therefore, when you use a background color or pattern, you also may want to use a fill pattern and fill color for one or more of the area layers in your map.

You can also use satellite and aerial imagery as your map background by choosing ***Map-Imagery*** and then choosing one of the available imagery options such as Virtual Earth Map. See "Using Images as Map Layers" on page 140, for more information.

▶ To Change the Background Style

1. Choose ***File-Properties***, or click on the Standard toolbar, or right-click on the map window and choose ***Properties***. Maptitude displays the Map Properties dialog box.

2. Choose how you want to change the map background as follows:



3. Click OK.

Maptitude draws the map with the new background style.

Using Labels

Labels are used to identify the features in a layer, selection set, or feature display set by their names or other characteristics. To label features, you choose a data field containing the information you want to see and a style in which the labels should be displayed. Maptitude displays labels using the most effective combination according to rules you set, such as whether labels can overlap, which labels have the highest priority, at what scales labels should display, and how labels should be aligned.

You can also customize individual labels. You can adjust the location of a label, embellish the style of individual labels, call out labels, and suppress or prioritize the display of individual labels.

NOTE: Many of the layers supplied with Maptitude use Feature Display settings to label groups of features. Expand the Display Manager to see the settings for the various layers.

Creating Labels

When you label features, Maptitude decides exactly which features should be labeled and where the labels should be placed based on the choices that you make. Each time the map is drawn, Maptitude displays the most effective combination of labels according to the rules you set. There are a number of choices for displaying labels:

- Change the position of labels and whether to include partially visible labels
- Choose whether or not to rotate labels
- Screen out or include duplicate labels
- Prevent labels from overlapping and control the priority of labels within and across layers
- Limit the length of labels by wrapping words onto new lines
- Choose the scale at which labels will appear
- Change the background of the label, with a shadow, halo, frame or shield
- Create multiple field labels

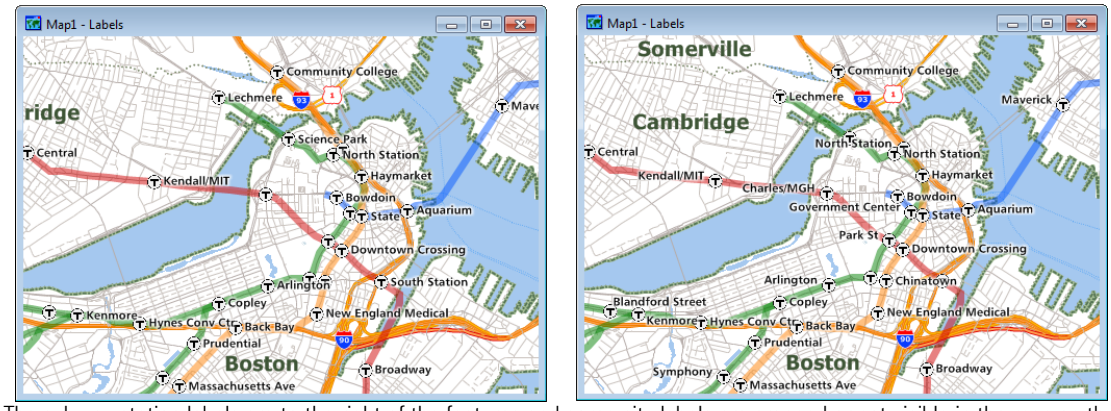
Label Position

You can choose one of nine label positions around a point feature, or choose to align labels either above, below or along the centerline of line features. You can also choose the Smart Alignment option, which helps Maptitude label more features by trying alternate locations to reduce the conflicts between labels. Smart Alignment behaves differently for each type of layer:

For this type of layer...	Smart alignment does this...
Point	If the label priority is such that it would not be displayed at the default position, Smart Alignment attempts to label the point at other positions.
Line	If the label would be placed at a bend in the line, Smart Alignment attempts to move the label to various positions along the different line segments of the feature, and positions which span multiple segments.
Area	If the normal location for an area label is outside the map extent, Maptitude will try to move the label into the map. Also, If the label does not fit completely within the boundaries of the area, Smart Alignment attempts to move the label to various positions within the area, prioritizing by width of the feature at different vertical positions, and proximity to the centroid.

For area layers, you can also stretch labels so that they fill the area with which they are associated. If you choose to stretch labels, Maptitude increases the spacing between characters so that the label fits the area it describes.

Once a label is positioned, if only part of the label would be visible and the rest would be cut off by the edge of the map, you can choose to skip labels.

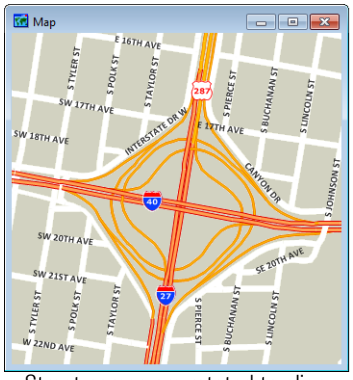


The subway station labels are to the right of the features and some city labels are cropped or not visible in the map on the left. With Smart Alignment applied to the map on the right, more subway stations are labeled and the city labels are

Label Rotation

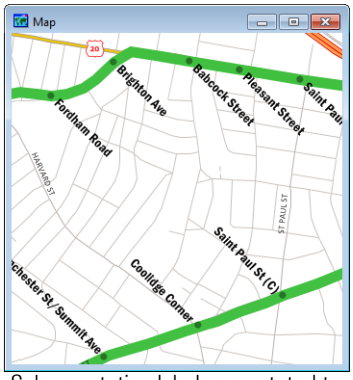
You can choose whether or not to rotate the labels. Rotation options depend on the type of layer:

- Labels for line features are normally angled so that they are drawn along the line features, but you may want Maptitude to draw labels with no rotation; shields cannot be rotated.
- For point and area layers you can choose to rotate labels so they are along lines of latitude or horizontal
- For point layers you can also rotate labels to a specific angle.



Street names are rotated to align with the lines; shields are not rotated

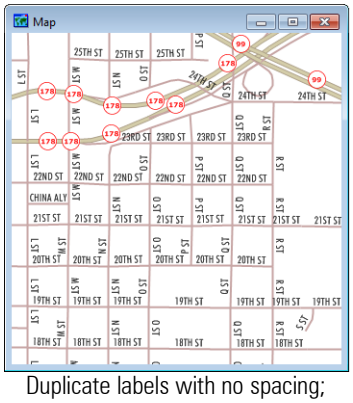
City and state labels are rotated to align with the lines of latitude



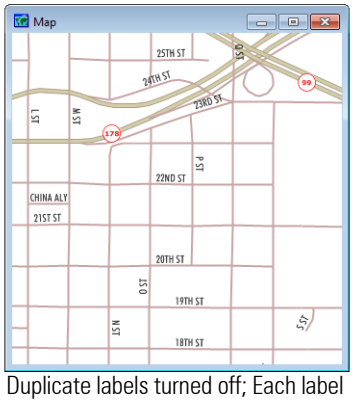
Subway station labels are rotated to a 45-degree angle

Duplicate Labels

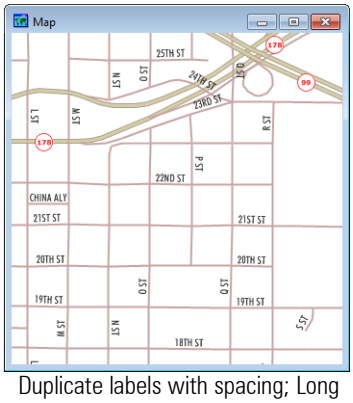
Labeling a map can be very tricky because you want to include enough labels to identify key features of the map, without including so many labels that the map is hard to read. In the following example, the map on the left includes a label for nearly every single street segment. While the labels don't overlap, the map is still difficult to read. When Maptitude draws a map with labels, it normally screens out duplicate labels, resulting in a map like the middle one. You can also tell Maptitude to allow duplicate labels, but to space the duplicates a certain distance apart. For example, the map on the right allows duplicates labels, but spaces them at least two inches apart.



Duplicate labels with no spacing; Almost all street segments are labeled



Duplicate labels turned off; Each label appears only once



Duplicate labels with spacing; Long streets are labeled on more than one segment

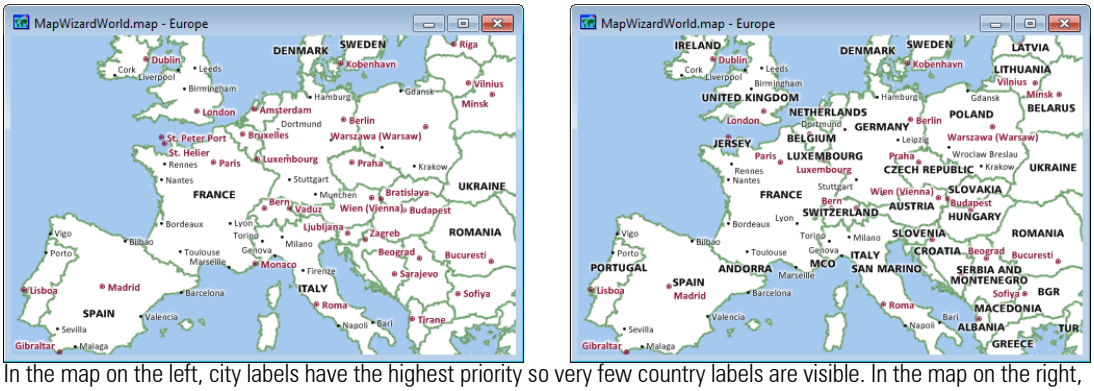
Overlaps

Maptitude normally prevents labels from overlapping so the map is easier to read. This means that at certain map scales, some features will be labeled and others will not. You can change the way Maptitude handles overlapping labels by setting a higher priority for certain layers or features, using alternate fields to label features, or allowing labels to overlap.

Label priority settings are used to make sure that the most important features on your map are labeled when you have chosen to prevent labels from overlapping. When you use these options, Maptitude decides which features to label and which ones to skip based on the priority you set.

There are three ways that you can specify how to handle label conflicts:

- **Layer priority**: choose from the drop-down list: Highest priority is 1, and 9 is the lowest. For example, if a map contains Stores and Highways, you can help make sure that Stores are labeled by assigning them a higher label priority than Highways.
- **Priority among features in a layer**: use a data field and choose the order from the drop-down list. For example, you can help make sure that busy streets are labeled by setting priority based on higher values of flow.
- **Alternate Fields**: choose a data field containing a shorter label for Maptitude to try to use when the regular label will not fit. For example, the two-letter postal abbreviations for a state may fit on a map when the full name is too long to fit.



In the map on the left, city labels have the highest priority so very few country labels are visible. In the map on the right, country labels have the highest priority. Countries with a higher population have a higher priority than those with a lower population, and an abbreviation is used when the name does not fit.

Line Length

When labels are particularly long, you can choose to have the labels wrap on to another line by specifying a maximum character length for a line. Multiple line labels are left-aligned if they are positioned to the right of a feature, right-aligned if they are positioned to the left, and center-aligned if they are positioned to the center of a feature. You can also set the spacing (leading) between the lines.

Autoscale with Labels

Just as you can set a layer so that it displays only at certain scales, you can set labels so they display only at certain scales. For example, you can arrange your map so that the labels turn on automatically when you zoom in past a certain scale. Doing so can help to make your map easier to read.

Backgrounds

You can add a shadow or halo around each label, or you can enclose each label in a frame or shield. Doing so can help the labels stand out more clearly against features drawn behind the labels. With shields you can enclose highway numbers in the appropriate local, state or federal highway shield. Shields can only display up to four characters.

Multiple Field Labels

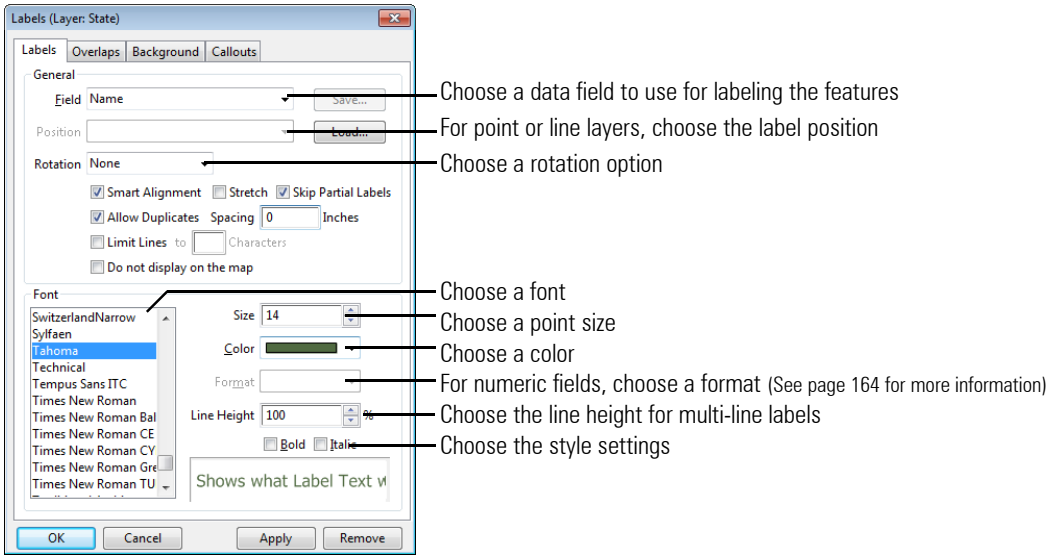
You can label features with values from more than one field. When you choose "Multiple Fields" as the field to use for labeling, Maptitude displays the Multiple Fields in Label dialog box, in which you can choose the fields you want to use in the label. Each field is displayed on a separate line in the label, and you can adjust the line height.

TIP: You can also get to the Labels dialog box from the Layers dialog box and the Selection Settings dialog box.

TIP: Press Ctrl+ on your keyboard to make all labels and point symbols larger and all lines and area borders wider, or press Ctrl- to make them smaller. Press Ctrl 0 to reset the sizes to the default.

▶ To Label a Map Layer, Selection Set, or Feature Display Setting

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the label icon next to the item you want to label. Maptitude displays the Labels dialog box.
3. Make choices as follows:



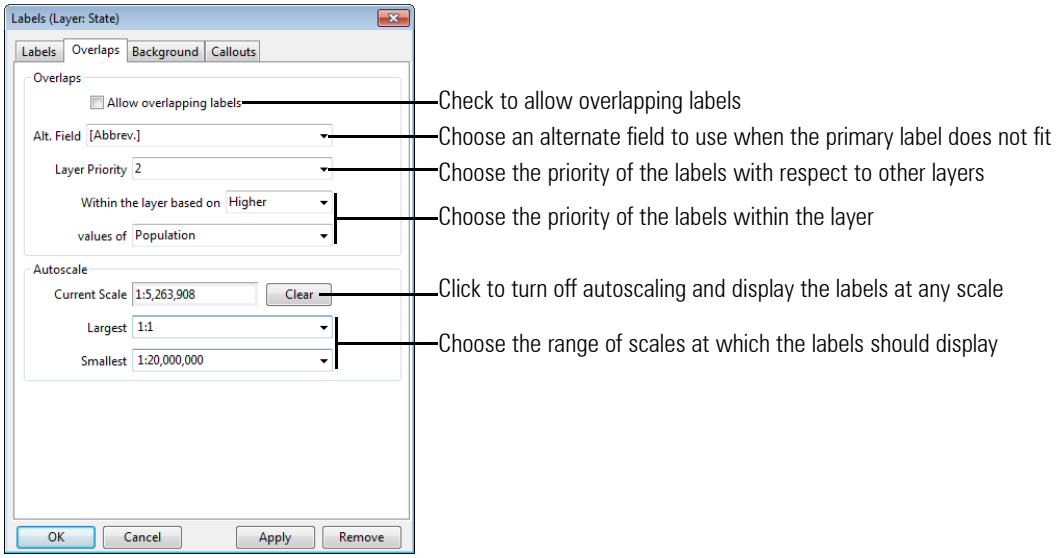
Choose additional options as follows:

To do this...	Do this...
Use Smart Alignment	Check the **Smart Alignment** box
Wrap long labels onto additional lines	Check the **Limit Lines To** box and type the number of characters in the edit box
Stretch area labels	Check the **Stretch** box

To do this...	Do this...
Skip drawing partial labels	Check the **Skip Partial Labels** box
Label as many features as possible	Check **Allow Duplicates** and type "**0**" in the Spacing edit box
Allow duplicates some distance apart	Check **Allow Duplicates** and type the desired spacing in the Spacing edit box
Eliminate duplicate labels	Make sure **Allow Duplicates** is not checked
To remove labels and clear the settings	Click **Remove**
To remove labels and preserve the settings	Check the **Do Not Display on the Map** box

If you have multiple field labels, you can choose a color for each line. Choose **Multiple** near the bottom of the Color drop-down list to display the Multiple Fields Colors dialog box, choose a color for each line, and click OK. After you have set different colors, you can click the button next to the Color drop-down list to make further changes. To use a single color again, choose a color from the Color drop-down list.

4. Click the Overlaps tab to display the Overlaps page and make changes as follows:



5. Click the Background tab to display the Background page and make changes as follows:

To do this...	Do this...
Have no background	Click the None radio button
Add a shadow	Click the Shadow radio button and choose a shadow color and opacity
Add a halo	Click the Halo radio button and choose a halo color and opacity
Add a frame	Click the Frames radio button and choose a frame, choose the border style, width, and color, and choose the fill style, color, and opacity
Add a shield	Click the Shields radio button and choose a shield

6. Optionally, click the Callouts tab and choose a default style for callouts. For more information on callouts, see "Customizing Labels" on page 92.

7. Click OK.

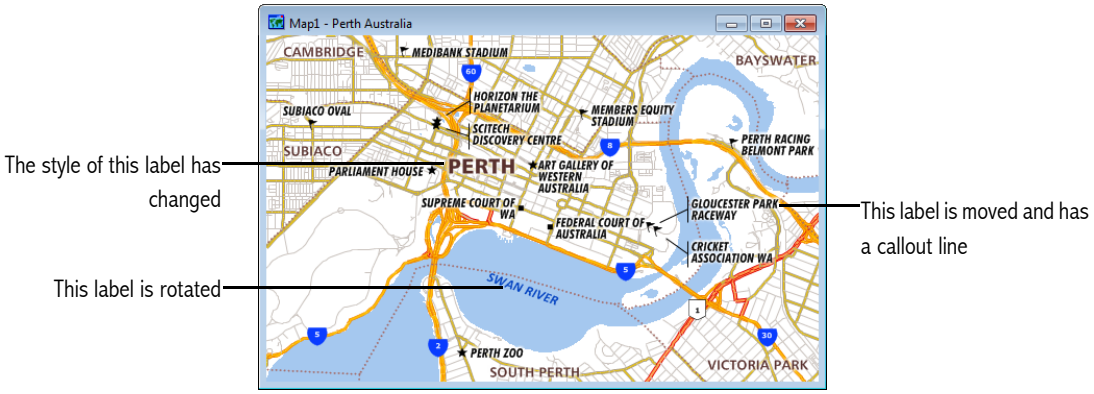
Maptitude draws the map based on the current label settings. When you change the map scale or center, Maptitude adjusts the labels as needed.

Try It Yourself: Labeling Features in a Map

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nesouth.map** in the Tutorial folder.
2. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
3. Click the label symbol in the Display Manager next to the County layer.
4. Choose **[County Name]** from the Field drop-down list. Maptitude sets a default position, font, size, style, and color. Click **Apply** to preview the labels. Since the labels overlap, not all counties are labeled.
5. Click the Overlaps tab. Choose **Population** from the Values Of drop-down and click **Apply**. Counties with higher populations are labeled.
6. Click the Background tab. Click the **Halo** radio button and click **Apply**. The labels are displayed with halos.
7. Click the Overlaps tab. Choose **1:1,000,000** from the Smallest drop-down list and click **OK**. The labels are autoscaled off.
8. Click on the Tools toolbar to activate the Zoom In tool and click on the map to zoom in. As you zoom, the county labels come on.
9. Click next to the Highway layer to expand it and then click next to Sets to see the highway layer selection sets.
10. Click the label symbol next to the Interstate selection set.
11. Change the font size to **9** points, uncheck the **Bold** box, and click **OK**. The interstate labels are drawn with the new settings.
12. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Customizing Labels

You can customize a label by making changes to the label with the Customize Label tool, the Rotate Label tool, or the Callout Label tool on the Tools toolbar.



You can:

- Change the location of the label
- Rotate the label
- Change the anchor point of the label
- Align customized labels
- Change the priority of display to highest or lowest
- Add a callout line to a label and choose its style
- Change the font style of the label
- Restore the label settings, so that it is no longer customized

You can also show all of the hidden labels, so you can customize labels so that they are no longer hidden.

▶ To Customize Labels

1. Click  on the Tools toolbar to activate the Customize Labels tool.
2. To show hidden labels, choose ***Map-Labels-Show Hidden Labels***. Maptitude places a check next to the command to indicate that hidden labels are being shown. Choose ***Map-Labels Show Hidden Labels*** again to hide those labels.
3. Make changes to the label to customize it as follows:

To do this...	Do this...
Move a label	Click on the label and drag it to a new location. As you move a label, Maptitude will snap the label to align with other moved labels. A dashed line indicates which label you are aligning to. You can turn off snapping by pressing the Space Bar while moving the label.
Move a label and add a callout	Hold the Shift key, click on the label, and drag it to a new location. You can also click  on the Tools toolbar and then click and drag a label to a new location.
Add a callout to a moved label	Right-click on the label and choose ***Draw Callout***
Rotate a label	Hold the Ctrl key, click on the label, and drag to rotate the label. You can also click  on the Tools toolbar and then click and drag to rotate the label.
Change the anchor point	Right-click on the customized label and choose ***Set Anchor Point*** to display the Set Anchor Point dialog box. Click a radio button and click **OK**. Changes to the customized label, such as rotation, will now be based on the new anchor point. In general, you want the anchor to be on the side of the label closest to the feature it references.
Change the priority of display	Right-click on the label and choose ***Prioritize Display***, to give the label the highest priority, or choose ***Suppress Display*** to prevent a label from being drawn for that feature.
Change the font or callout style	Right-click on the label and choose ***Customize Style*** or double-click the label. Maptitude displays the Custom Label Style dialog box. Change the font, style, size, or color on the Label page, or click the Callout tab and change the style, width, or color of the callout. Click **OK** when you are done.
Restore the label location	Right-click on the customized label and choose ***Restore Default Location***.

TIP: When you move a label, Maptitude will automatically set the anchor point to the typical location required based on the new position.

▶ To Undo Label Changes

1. Choose ***Map-Labels-Undo Label Customizations*** to display the Undo Label Customizations dialog box.
2. Choose which options to restore as follows:

Option	What it does
Location	Check to restore all labels that you have moved to their default locations
Style	Check to restore all labels that you have modified to their default style
Callouts	Check to restore all callouts that you have modified to their default callout style. This option is disabled if you are also restoring label locations
Display priority	Check to restore all labels to their default display priority

3. Click **OK**.

Try It Yourself: Customizing Labels

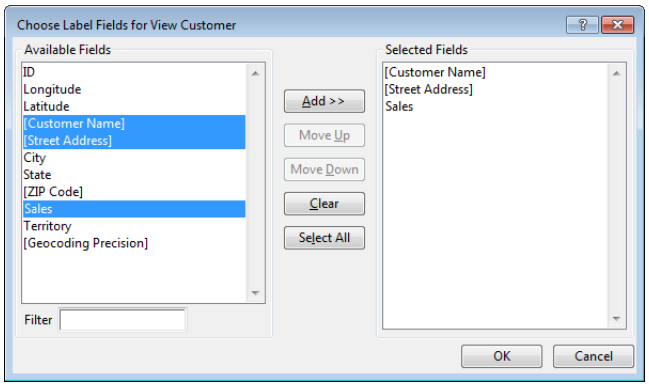
1. Choose ***File-Open*** or click on the Standard toolbar then open the map **locator.map** in the Tutorial folder.
2. Click in the Tools toolbar.
3. Click on the "Massachusetts" label and drag it to a new location.
4. Right-click on the "Rhode Island" label and choose ***Suppress Display***. Maptitude draws the map without the label.
5. Double-click on the "Boston" label, increase its size, and click **OK**. Maptitude draws the map with the larger label.
6. Press the Shift key and drag the "Boston" label to the east. Maptitude draws the map with the label moved and a callout line pointing to the feature.
7. Click in the Tools toolbar.
8. Click and drag another city label to the east until the left side aligns to the "Boston" label. Maptitude draws the map with the label aligned and with a callout pointing to the feature.
9. Right-click on the "Boston" label and choose ***Restore Default Location***. Maptitude restores the label to its original location.
10. Double-click on the "Boston" label and click ***Reset***. Maptitude draws the map with the label restored to its original style.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Multiple Field Labels

You can label features with values from more than one field.

▶ To Label Features with More than One Field

1. In the Display Manager, click the label icon next to the item you want to label. Maptitude displays the Labels dialog box.
2. Choose **Multiple Fields** from the Field drop-down list to display the Choose Label Fields dialog box.



3. Choose the fields you want in the label as follows:

To do this...	Do this...
Add a field to the label	Choose one or more fields in the Available list and click **Add**. To find a particular field, type part of the field name in the Filter edit box to display just those fields that contain the text you entered.
Drop a field	Choose one or more fields in the Selected list and click **Drop**.
Add all fields	Click **Select All**.
Drop all fields	Click **Clear**.
Change the order of the fields	Choose one or more fields in the Selected list and click **Move Up** or **Move Down**.

4. Click OK to return to the Labels dialog box.
5. To label the fields with different colors, choose Multiple... from the Color drop-down list. Maptitude displays the Multiple Fields Colors dialog box. Choose colors for each field from the drop-down menus and click OK.
6. Choose other settings as described in steps 3-6 of "To Label a Map Layer, Selection Set, or Feature Display Setting" on page 90.
7. Click OK.

Maptitude creates a Multiple Fields Label field and labels the map with it.

Copying Label Settings

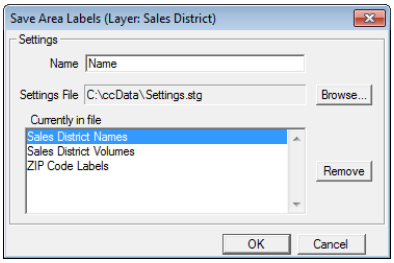
Maptitude lets you copy the label settings from another layer in your workspace or from a settings (.STG) file. All of the settings for labels including font, size, color, autoscale settings, background, and other options can be saved and can be quickly applied to other layers, selection sets, or feature display settings.

▶ To Choose the Default Settings File for Storing Saved Label Settings

1. Choose ***Edit-Preferences*** and click the Map tab to display the Map page of the User Preferences dialog box.
2. Click ... in the Default Settings File frame to display the Choose Settings File dialog box.
3. Choose an existing settings file or choose a location on your hard drive, type a file name, and click Save.

▶ To Save Label Settings to a Settings File

1. If you have not yet defined a default settings file, do so as described in "To Choose the Default Settings File for Storing Saved Label Settings" above.
2. Set the label settings, options, and background as you would like to have them saved.
3. Click **Apply** to apply the labels to the map. The Save button on the Settings page of the dialog box is enabled. If you are not on the Settings page, click the Settings tab.
4. Click **Save**. Maptitude displays the Save Labels dialog box.



5. Type a name for the label settings in the Name edit box.
6. Click OK to return to the Labels dialog box.

Maptitude saves the labels to the settings file.

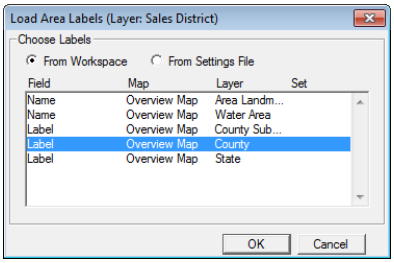
▶ To Copy Label Settings or Apply Saved Label Settings

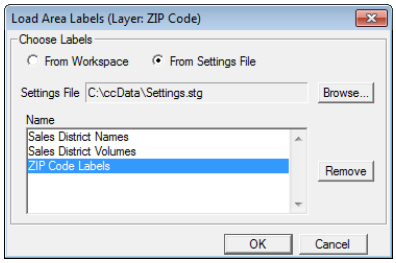
1. If you want to copy label settings from another map, open the map that contains the labels you want to copy.
2. Make the map to which you want to apply the labels the active map.

3. Choose what to label as follows:

To label...	Do this...
A layer	Click the label symbol next to the layer in the Display Manager to display the Labels dialog box.
A feature display setting	Click the label symbol next to the feature display setting in the Display Manager or choose the layer that contains the feature display from the drop-down list on the Standard toolbar, choose ***Tools-Editing-Feature Display***, choose a setting from the scroll list, and click **Labels** to display the Feature Display Labels dialog box.
A selection set	Click the label symbol next to the selection set in the Display Manager or choose the layer that contains the selection set from the drop-down list on the Standard toolbar, choose ***Selection-Settings*** to display the Selection Sets dialog box, highlight the selection set in the scroll list, and click **Labels** to display the Labels dialog box.

4. Click Load to display the Load Labels dialog box.



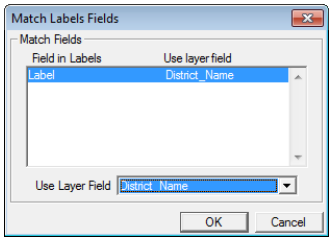


5. Make choices as follows:

To do this...	Do this...
To copy labels from a layer or selection set	Click the **From Workspace** radio button and highlight the label to copy in the scroll list
To load a saved label	Click the **From Settings File** radio button and highlight a label in the scroll list

6. Click OK to close the Load Labels dialog box.

   If the layer you are labeling does not contain the field on which the labels you are copying is based, Maptitude displays the Match Label Fields dialog box.



   The scroll list shows the field that is used for labeling that is not in the current layer. Choose a corresponding field from the Use Layer Field drop-down list and click OK to close the Match Label Fields dialog box.

7. Click OK.

Maptitude adds labels to the layer, selection set, or feature display with the chosen settings.

▶ To Remove Labels from the Settings File

1. Click **Load** to display the Load Labels dialog box and click the From Settings File radio button.

   — OR —

   Click **Save** to display the Save Labels dialog box.
2. Highlight the label you want to delete in the scroll list.
3. Click **Remove**. Maptitude displays a Confirm dialog box.
4. Click **Yes**. Maptitude removes the chosen label settings from the settings file.
5. Click **OK** to close the Load Labels or Save Labels dialog box.
6. Click **Cancel**.

Maptitude closes the Labels dialog box.

Where a Layer Gets Its Style and Label Settings

When you create a new map or add a layer to the map, Maptitude looks in several places to find the style and label settings for a layer:

- If the geographic file has a style (.STY) file, Maptitude uses any style, feature display, and label settings, along with settings for any themes and selection sets that are stored in the style file. For more information, see "Saving Settings for a Geographic File" on page 418.
- If the geographic file has just a feature display settings (.ST0, .ST1, or .ST2) file, Maptitude uses the settings that are active. For more information, see "Using Feature Display Settings" on page 148.
- Any features that still do not have style settings are assigned the default styles for points, lines, or areas. These defaults can be set by choosing the ***Edit-Preferences*** command and clicking on the Map tab.

Once in the map, you can change a layer's styles and labels with the Display Manager and with various commands including the ***Map-Layers*** command, the MapWizard buttons for creating themes (*Chapter 6: Using Themes to Present Information*), and the ***Selection-Settings*** command for managing selection sets (*Chapter 8: Queries and Selection Sets*). When you save a map or a workspace, all of these settings are saved.

With all of these ways to control the display of features, how does Maptitude decide which takes precedence? There is a strict order that Maptitude follows. First Maptitude checks to see if a feature is in a selection set that is active. If the feature is in more than one active selection set, Maptitude uses the last among them on the selection set list. Otherwise, Maptitude checks whether the feature is thematically mapped, and if so uses the style of the appropriate thematic class. If the feature is not in a theme, Maptitude checks to see if there is a feature display setting for this feature. If no other settings apply, Maptitude will display the feature with the layer settings in the map.

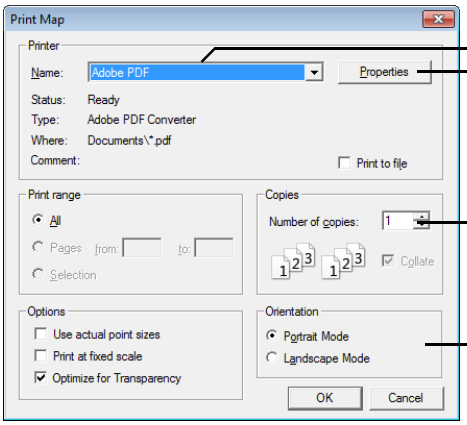
Printing a Map

You can print a Maptitude map to any installed printer. When you print a map, Maptitude normally changes the scale so that the printed map is as large as it can be on the page, based on the paper size, paper orientation, and margin settings you choose. Otherwise, the printed map appears exactly as you see it on the screen. You can choose several print options that change this behavior.

If you want to print several maps on a page, add titles to your map, or print a map and a dataview on the same page, see *Chapter 15: Creating and Using Layouts*.

▶ To Print a Map

1. Choose ***File-Print*** or click  on the Standard toolbar, or right-click on the map window and choose ***Print***. Maptitude displays the Print Map dialog box.
2. Choose the printer and other settings:



3. Choose any desired options from the following table:

Option	What it does
Use actual point sizes	Maptitude will use the chosen point sizes for labels, symbols, line styles, and pie and bar charts instead of scaling them up or down to fit the page. The printed map may not exactly match the map window.
Print at fixed scale	Maptitude will print the map at the exact same scale that is used in the map window. The printed map may cover a smaller or larger geographic area than the map window depending on the paper size and other settings.
Optimize for Transparency	When checked, Maptitude prints through a high resolution bitmap to properly handle effects such as opacity, halos, and shadows. When unchecked, Maptitude prints directly to the printer. **NOTE:** If you are printing to a PDF, set the PDF properties to maximize the resolution of the bitmap image.

4. Click OK to print the map.

Saving, Closing, and Opening Maps and Workspaces

Just as you can save documents in a word processor, you can save Maptitude maps in a file on disk to use again later. The map file saves the settings necessary to recreate the map. When you close a map or exit the program, Maptitude alerts you if the map has changed since you opened it and asks if you want to save the map in its current form.

Often you will have several maps or several windows of different types open on your screen. You can save all your open windows in a single step using a **workspace**. When you save a workspace, Maptitude puts information about all of your maps, dataviews, and layouts into a single (.WRK) file. When you open this file later on, all of the windows will be restored.

You can also save the map image as in one of several graphic file formats including BMP, EMF, GIF, JPEG, PNG, and TIFF or as an HTML file with an associated graphic of the map in a JPEG file. For more information see "Saving Maptitude Windows as Graphic Files" on page 498.

▶ To Save a Workspace

1. Choose ***File-Save Workspace As*** or right-click anywhere inside the Maptitude frame except on a window and choose ***Save Workspace As***.
2. Type a name for the workspace file, and click **Save**.

Maptitude saves information about all of the open windows on your screen in a workspace.

TIP: You can quickly open recently used workspaces by choosing ***File-Recent Files*** and choosing the workspace from the submenu.

▶ To Open a Saved Workspace

1. Choose ***File-Open Workspace*** or right-click anywhere inside the Maptitude frame except on a window and choose ***Open Workspace***. Maptitude displays the File Open dialog box with Workspace as the file type.

   — OR —

   Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box and choose **Workspace** from the Files of Type drop-down list.
2. Choose a workspace  file from the list.
3. Click **Open**.

Maptitude displays all the windows in your workspace on the screen.

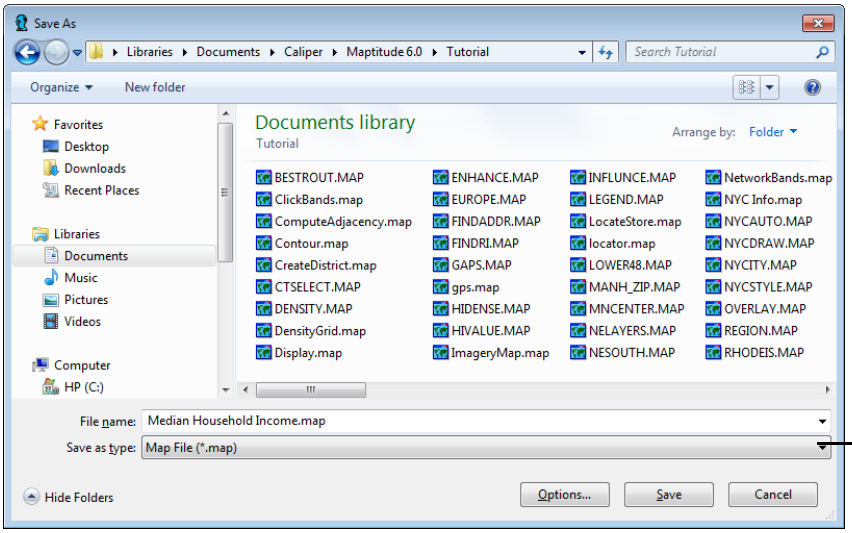
▶ To Save a Map

1. Choose ***File-Save*** or click  on the Standard toolbar, or right-click on the map window and choose ***Save***.
2. If you are saving the map for the first time, Maptitude displays the Save As dialog box. Type a name for the file and click **Save**.

Maptitude saves the map to a file with the extension .map. If you are saving the map for the first time, you can also choose other file types; see the next how-to for details. Note, Maptitude 2017 maps cannot be opened in earlier versions of Maptitude.

▶ To Save a Map with a New Name

1. Choose ***File-Save As*** or right-click on the map window and choose ***Save As*** to display the Save As dialog box.



2. Choose **Map File (*.map)** as the file type. For information on saving maps to other file types, see "Saving Maptitude Windows as Graphic Files" on page 498 for more information.
3. Type a new name for the map file.
4. Click **Save**.

Maptitude saves the map to the new file name.

TIP: You can quickly open recently used maps by choosing ***File-Recent Files*** and choosing the map from the submenu.

▶ To Open a Saved Map

1. Choose ***File-Open*** or click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Map, Dataview, Figure, Layout** from the Files of Type drop-down list.
3. Choose a map file from the list.
4. Click **Open** to open the file and display the map.

▶ To Close a Map or Other Window

1. Choose a method from the following table:

To do this...	Do this...
Close the active window	Choose ***File-Close***, right-click and choose ***Close***, or click the close box in the upper right corner of the window.
Close all of the windows	Choose ***File-Close All***.

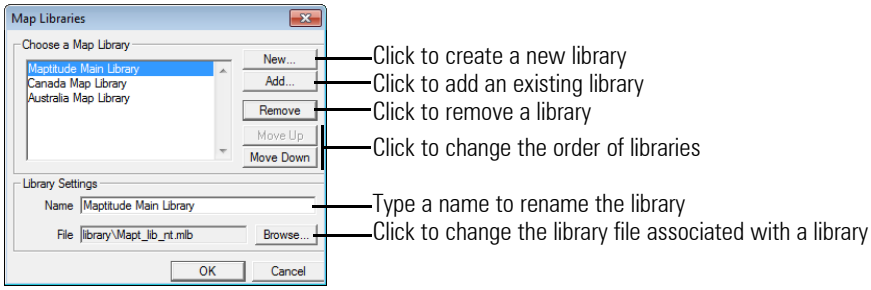
Maptitude begins closing the active window or all of the windows. If any windows have changed and have not been saved, Maptitude displays the Save Your Work dialog box. Choose whether or not to save the active window.

Organizing Maps in a Map Library

You can organize your saved maps into one or more map libraries.

▶ To Configure Map Libraries

1. Choose ***Map-Demographic Map Librarian*** to open the Map Librarian dialog box.
2. Click **Libraries** to display the Map Libraries dialog box.
3. Make changes to the map libraries as follows:

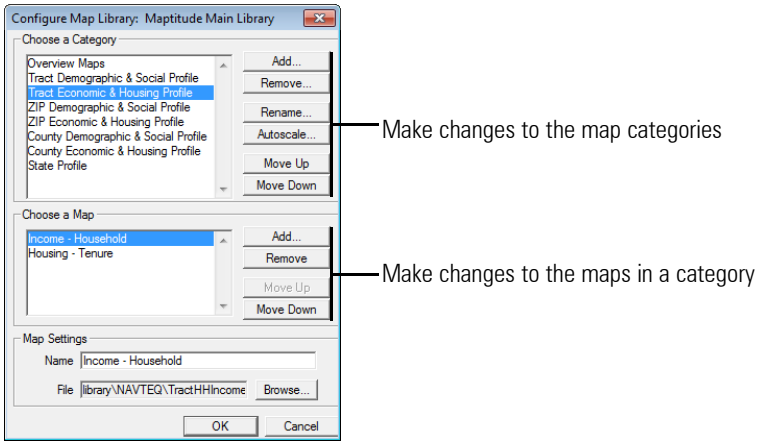


4. Click **OK** to close the Map Libraries dialog box. Maptitude displays the Confirm dialog box.
5. Click **Yes** to save the changes, or **No** to cancel the changes. Maptitude returns to the Map Librarian dialog box.
6. Click **Close**.

Maptitude closes the Map Librarian dialog box.

▶ To Change the Contents of a Map Library

1. Choose ***Map-Demographic Map Librarian*** to open the Map Librarian dialog box.
2. Choose the map library that you want to change from the Choose a Map Library drop-down list.
3. Click **Contents** to display the Configure Map Library dialog box.



4. Make changes to the map categories as follows, using the buttons next to the Choose a Category scroll list:

To do this...	Do this...
Add a map category	Click **Add** to display the Add a New Category dialog box. Type the name of the new category in the Description text box, and click OK. Maptitude adds the new category at the end of the list, and highlights the new category.
Rename a map category	Choose a map category, and click **Rename** to display the Rename Map Category dialog box. Type a new name, and click OK.
Autoscale a map category	Choose a map category, and click **Autoscale** to display the Autoscale for Category dialog box. Choose the largest and smallest scale that you recommend for this category, and click OK.
Clear autoscaling for a map category	Choose a map category, and click **Autoscale** to display the Autoscale for Category dialog box. Click **Clear**, then click OK.
Change the order of categories in the list	Choose a map category and click **Move Up** or **Move Down**.
Remove a map category	Choose a map category, click **Remove**, and click Yes to confirm its removal.

5. Make changes to the maps in a category. First choose the category, then use the buttons next to the Choose a Map scroll list:

To do this...	Do this...
Add a map	Click **Add** to display the Choose the Map to Add dialog box. Choose a map file, and click OK. Maptitude adds the map (named using the file name) at the end of the list, and highlights the new map.
Change the name of a map	Choose a map, and edit the map name in the Name text box.
Change the file for a map	Choose a map, and click **Browse** to display the Select a Map File dialog box. Choose a map file and click Open.
Change the order of maps in the list	Choose a map and click **Move Up** or **Move Down**.
Remove a map	Choose a map, click **Remove**, and click **Yes** to confirm its removal.

6. Click **OK** to close the Configure Map Library dialog box. Maptitude displays the Confirm dialog box.
7. Click **Yes** to save the changes, or **No** to cancel the changes. Maptitude returns to the Map Librarian dialog box.
8. Click **Close**.

Maptitude closes the Map Librarian dialog box.

Locating Geographic and Other Data Files

In order to display a map, Maptitude needs access to map data that are stored in geographic files. When you save a map, layout, or workspace to a file, that file contains a list of all the geographic files that Maptitude needs to use when it comes time to draw the map, layout, or workspace.

Sometimes you may delete, move, or rename geographic files. Here are some possibilities:

- You copied some geographic files from one hard drive to another to free up some space
- You reorganized your geographic files into a new set of folders
- You copied one or more geographic files to a network drive so that you could share them with other Maptitude users

When you open a map, layout, or workspace, Maptitude looks for the geographic and other files in the place where they were stored when the map, layout, or workspace was saved. If you have deleted or renamed one or more of these files, Maptitude will not be able to find them. If you have moved them, Maptitude will try several things when a file it needs is not found:

- Look in the folder where the map, layout, or workspace was originally saved to see if it contains the file
- Look in the folder where you opened the map, layout, or workspace to see if it contains the file
- Look through all the folders in your search path to see if the file is located in any of those locations
- Display a dialog box that asks you where the file can be found

Maptitude may be able to find a geographic file, but the layer name has changed. When a layer is not found, Maptitude gives you several ways to proceed.

Search Paths

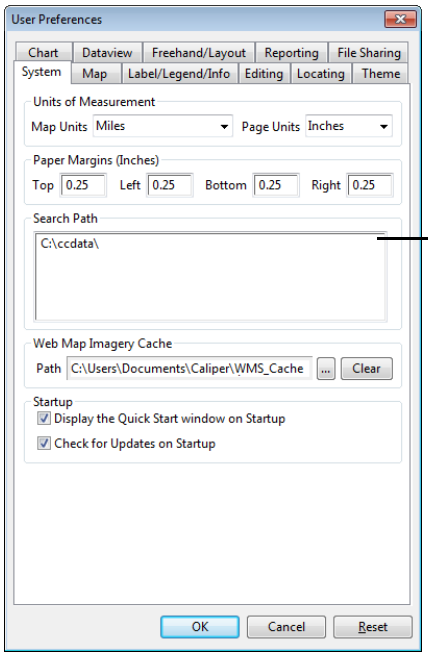
The **search path** is a list of the names of folders that store geographic and other data files. The search path is automatically used every time you start Maptitude. The search path can point to any combination of local and network drives. When you enter a search path, you list all of the folders you want to search, with semicolons separating them. Here are some sample search paths:

- c:\ccdata
- c:\ccdata;e:\
- c:\ccdata;c:\ccdata\international;c:\ccdata\streets;e:\
- c:\ccdata;d:\cdf;h:\shared\data;h:\shared\images

▶ To Set or Change the Search Path

1. Choose ***Edit-Preferences*** to display the User Preferences dialog box.
2. Click the System tab.

3. Type a search path in the Search Path text box.



4. Click **OK**.

From now on, Maptitude will search all of the directories or folders in your search path when it needs to locate a geographic or other data file.

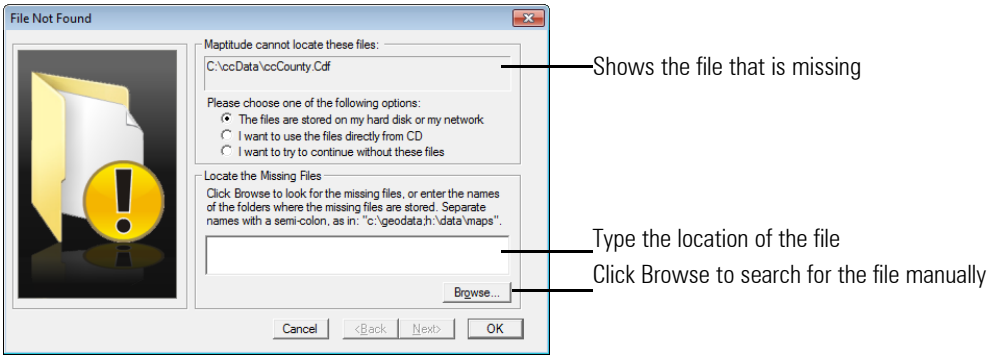
File Not Found

When Maptitude cannot locate a file it needs, even after searching the folders in your search path, it asks for your help by displaying the File Not Found dialog box. When this occurs, you can do one of several things:

- Type the name of the folder in which the file can be found
- Browse through your local and network drives to see if you can locate the file
- Try to continue without the missing file
- Cancel the operation in progress

▶ To Locate a Missing File

1. When Maptitude cannot locate a file that it needs, it displays the File Not Found dialog box.



2. Choose an option for proceeding from the table below:

To do this...	Do this...
Locate the files on your hard disk or network	Choose the first option from the radio list, type the location in the Locate the Missing Files text box or browse for the files, and click OK.
Use files directly from disc	Choose the second option from the radio list, place the disc that contains the missing files into your CD/DVD drive, and click OK.
Skip the missing files	Choose the third option from the radio list and click OK. Maptitude creates a map without the missing layer.

In some circumstances, if the File Not Found dialog box appears, you cannot skip the missing files. For example, if you want to find a particular ZIP Code, Maptitude must be able to find the ZIP Code files. In this case the options available are:

To do this...	Do this...
Locate the files on your hard disk or network	Choose the first option from the radio list, type the location in the Locate the Missing Files text box or browse for the files, and click OK.
Use files directly from disc	Choose the second option from the radio list, place the disc that contains the missing files into your CD/DVD drive, and click OK.
Cancel the operation	Choose the third option from the radio list and click OK.

Layer Not Found

When Maptitude locates a geographic file it needs but the layer name has changed, it asks for your help by displaying the Layer Not Found dialog box. When this occurs, you can do one of several things:

- Choose a layer in the geographic file
- Cancel the operation in progress

▶ To Locate a Missing Layer

1. When Maptitude locates a geographic file it needs but the layer name has changed, it displays the Layer Not Found dialog box.
2. Choose an option for proceeding from the table below:

To do this...	Do this...
Choose a layer	Click the first radio button, highlight the correct layer in the scroll list, and click OK
Cancel the operation	Click the second radio button and click OK

Opening a Map in Esri ArcMap

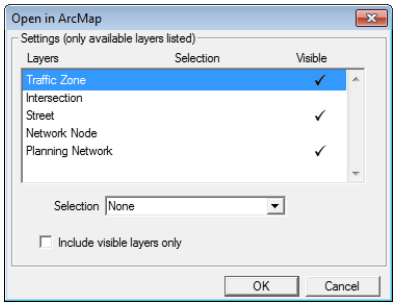
If you must have ArcGIS installed and registered on your computer, Maptitude can open the current map in ArcMap, one of the programs that is part of the Esri ArcGIS system of software. Layers based on Caliper compact format (.CDF) geographic files will not be included. Any other layers that are not already Esri Shapefiles are exported to temporary files in Shapefile format. You can choose whether to include all layers, or only those that are currently visible. You can also choose to retain a selection set for each included layer; ArcMap only allows one selection set per layer.

The map in ArcMap will be at the same scale and with the same map projection as the map in Maptitude. To the extent possible, layers are displayed with the same styles and themes, with the same visibility and autoscale settings, and with the same selected features.

▶ To Open a Map in Esri ArcMap

1. Make sure that ArcGIS is installed and registered on your computer.
2. In Maptitude, create or make current a map that has at least one layer that can be included in the map opened in ArcMap. Maptitude displays a message if none of the layers can be included.
3. Choose ***File-Export ArcMap***. Maptitude checks to make sure that ArcMap is available and, if so, displays the Open in ArcMap dialog box; otherwise, Maptitude displays a message that ArcMap is not available.

   The scroll list in the dialog box shows the layers in the Maptitude map that can be included in the map opened in ArcMap.



4. Make any necessary changes to settings as follows:

To do this...	Do this...
Retain a selection set for a layer	Highlight the layer in the scroll list, and choose a selection set from the Selection drop-down list.
Not have a selection set for a layer	Highlight the layer in the scroll list, and choose None from the Selection drop-down list.
Include only the visible layers	Check the Include Visible Layers Only box. Only the layers with checks in the Visible column of the scroll list will be included in the map opened in ArcMap.
Include all layers	Remove the check from the Include Visible Layers Only box.

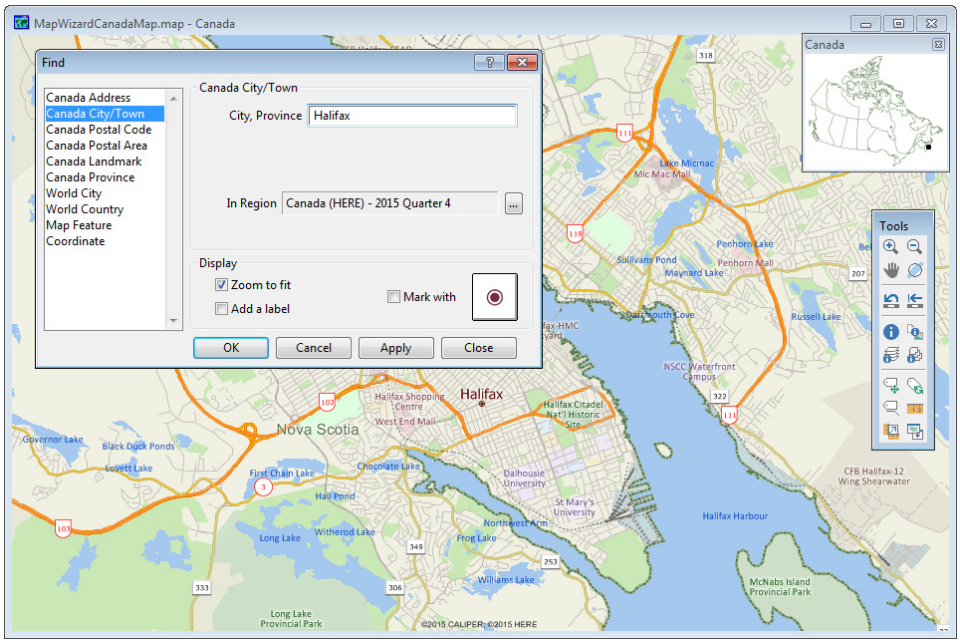
5. Click **OK**.

Maptitude launches a new instance of ArcMap, which displays the map.

CHAPTER 4:
Moving Around a Map

Unlike a paper map, a Maptitude map lets you change the area that is displayed and switch from one location to another with the click of a mouse. This is one of the major advantages of computerized maps – you can use them to display a neighborhood, a sales territory, a congressional district, or any other location, large or small, that you want to see.

Maptitude includes many tools and commands for changing the map location. You can use the Zoom In, Zoom Out, and Pan tools or an overview window to interactively move around a map. You can also use the ***Edit-Find*** command to find locations based on the region and world geographic files that come standard with Maptitude, based on your own data that you have located on a map, based on a value for an attribute, or just find a particular coordinate. You can also save locations that you use frequently to a bookmark.



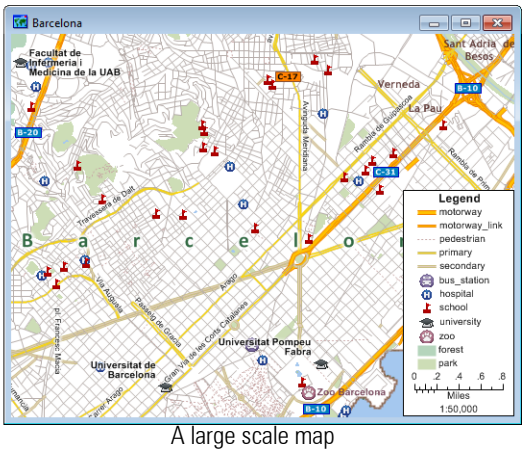
In this chapter:

Changing the Map Scale and Center

A Maptitude map is dynamic. You can focus in on any specific area you want, and change the map so that the features you want to see are shown at the size you want to see them.

The scale of a map is the relationship between the size of each feature on the map and its actual size on the surface of the Earth. Large scale maps make each feature look larger, and show a smaller geographic area. Small scale maps make each feature look smaller, and show a larger geographic area.

A small scale map



A large scale map

The center of a map is the location of the middle point of the map. Taken together, scale and center define the area that is included in a map, also known as its **extent**.

There are a number of ways that you can move around a Maptitude map:

- Click on a map using the Zoom In, Zoom Out, or Pan tools
- Use the ***Edit-Find*** command to have the map display a specific location such as an address, city, state/province, postal code, country, or coordinate
- Zoom to map features that you have highlighted in a dataview
- Use an overview window
- Set the scale to a specific number of miles/inch (or kilometers/cm) or a specific ratio
- Synchronize the scale of a map to another map

Each time you change zoom or pan, Maptitude remembers the previous settings. You can retrace each change all the way back to the extent that was used when the map was created or last saved.

▶ To Return a Map to the Previous Scale and Center

1. Choose ***Map-Zoom-Undo*** or click on the Tools toolbar.

Maptitude undoes the most recent zoom or pan action. You can repeat this step to continue to retrace each change.

▶ To Restore the Original Scale and Center

1. Choose ***Map-Zoom-Undo All*** or click on the Tools toolbar.

Maptitude draws the map with the scale and center that was used when the map was created or last saved.

Using the Zoom and Pan Tools

▶ To Zoom In on a Map (Make the Scale Larger)

1. Click on the Tools toolbar to activate the Zoom In tool.
2. Click on a location to double the size and make the point at which you clicked the center of the map or drag a rectangle around the part of the map you want to see enlarged.

—OR—

1. If your mouse has a scroll wheel, roll the scroll wheel away from you.

NOTE: When you click on a location with the Zoom In tool, Maptitude doubles the scale. To change this zoom factor, choose ***Edit-Preferences*** and enter a different value in the Zoom Factor text box on the Map tab.

▶ To Zoom Out on a Map (Make the Scale Smaller)

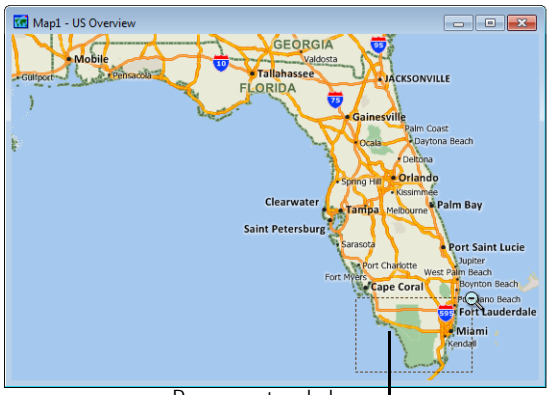
1. Click on the Tools toolbar to activate the Zoom Out tool.
2. Click on a location to halve the size and make the point at which you clicked the center of the map or drag a rectangle around the part of the map into which you want to reduce the current map.

—OR—

1. If your mouse has a scroll wheel, roll the scroll wheel toward you.

NOTE: When you click on a location with the Zoom Out tool, Maptitude halves the scale. To change this zoom factor, choose ***Edit-Preferences*** and enter a different value in the Zoom Factor text box on the Map tab.

If you dragged a rectangle, Maptitude redraws the map so that the current map extent is reduced to fit into the rectangle. The smaller the rectangle is, the more the map will be zoomed out and the smaller the scale will be. If the rectangle is off to one side of the map, more features will be displayed on the other side of the map. For example:



Drag a rectangle here...

...and Maptitude zooms out to where the extent of the map on the left fits inside the rectangle you dragged

▶ To Change the Center of the Map

1. Click on the Tools toolbar to activate the Pan tool.
2. Position the cursor anywhere on the map and hold down the mouse button.

3. Drag the map to a new location and release the mouse button.

—OR—

1. If your mouse has a scroll wheel, hold the scroll wheel down while dragging the mouse.

— OR —

1. Press and hold the Ctrl key while pressing an arrow key.

▶ To Show an Entire Layer

1. Choose a layer from the drop-down list on the Standard toolbar.
2. Right-click on the map and choose ***Zoom to Working Layer***.

▶ To Use the Magnifier

The magnifier tool acts like a magnifying glass as you move the cursor over the map. The magnified part of the map is displayed with all the settings appropriate at the magnified scale, including the autoscaling of layers and the labeling of features.

1. Click  on the Tools toolbar to activate the Magnifier tool.
2. Move the cursor over the map. The magnifier will appear and enlarge the area under the magnifier. If you move the cursor quickly, it may take a while to refresh the magnifier display.
3. When you are done with the Magnifier tool, choose another tool to turn it off.

NOTE: You can set the amount of magnification and the diameter of the magnifier (in pixels) by choosing Edit-Preferences and entering new values in the Amount and Diameter edit boxes on the Map tab.

Try It Yourself: Moving Around a Map

1. Choose ***File-Open*** or click  on the Standard toolbar, and open the map **locator.map** in the Tutorial folder.
2. Click  on the Tools toolbar to activate the Zoom In tool, then click anywhere on the map. The map is drawn so that all features are twice as large, and the map is centered at the point you clicked.
3. Drag a rectangle on any part of the map. The map is drawn so that the area inside the rectangle is drawn as large as possible inside the window.
4. Choose ***Map-Zoom-Undo*** or click  on the Tools toolbar to restore the map to the scale and center in step 2.
5. Click  on the Tools toolbar to activate the Zoom Out tool, then click anywhere on the map. The map is drawn so that all features are half as large, and the map is centered at the point you clicked.
6. Click  on the Tools toolbar to activate the Pan tool, then click anywhere on the map, drag it to a new location, and release the mouse button.
7. Choose ***Map-Zoom-Undo All*** or click  on the Tools toolbar to restore the map to the original scale.
8. Choose ***File-Close*** to close the map.

Finding Locations Using the Find Command

You can use the ***Edit-Find*** command to find locations based on the region and world geographic files that come standard with Maptitude. The types of locations that you can find will vary depending upon the regional data that you have installed. Typically you can find an address, a city, a state/province, or a postal area within the region, or a city, country, or coordinate anywhere in the world.

Simply choose the type of location you want to find and enter the requested information about it such as address or name. Maptitude searches for the location and, depending on the options you choose, zooms to the location, marks it with a symbol, and/or adds a label annotation. The symbol and label are freehand items that you can move, modify, or remove. To learn more about freehand items, see "Working with Freehand Items" on page 135.

NOTE: You can change the defaults including the symbol to display, whether to display a label, whether to zoom to the location, and what type of location to find, by choosing ***Edit-Preferences*** and changing the settings on the **Locating** tab. You can change the default font to use for labels by choosing ***Edit-Preferences*** and changing the settings in the **Freehand Font** frame on the **Freehand/Layout** tab. The color of the font will always match the color of the symbol.

Maptitude will find the location using one or more of the included geographic files. Maptitude may ask you where to find the geographic file so that it can perform the search. For more information on how Maptitude searches for geographic files, see "Locating Geographic and Other Data Files" on page 104.

Finding a Street Address within a Region

To find an address, you must enter the number, the street name, and either the postal code/ZIP Code or the city and state/province. For example, Maptitude can find any of these addresses within their respective regions:

1172 Beacon St 02461	1172 Beacon St Newton MA	6 Macquarie St 2000	6 Macquarie St Sydney NSW

If you are trying to locate an address that you know is visible in the map window, you can find that address simply by entering the number and street name and checking the **Search Only the Current Map** box.

Maptitude can often locate an address even if you provide information that is incomplete or incorrect. For example, you may be able to leave off the street type (St., Blvd., Rd. etc.) or have a minor misspelling.

You can also find street intersections such as **Beacon St. & Walnut St.** The valid intersection separators are:

And	&	/	At	@

Occasionally, Maptitude will find more than one address that matches the information you entered. When this occurs, the choices are displayed in a dialog box. You can pick the one you want from the list, or indicate that none of the choices is correct.

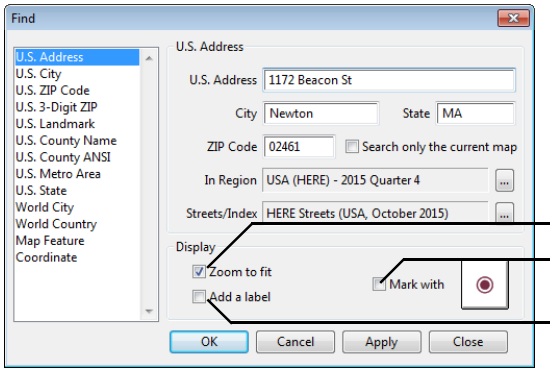
TIP: Use the Locate commands described in *Chapter 9: Geocoding: Locating Your Data on a Map* if you want to create a new layer from address information contained in your data.

▶ To Find a Street Address

1. Choose ***Edit-Find***, click on the Standard toolbar, or right-click on the map window and choose ***Find***, to display the Find dialog box.
2. If you have more than one region of data installed on your computer, verify that you are using the correct region for the address you want to find. If necessary, click ... and choose a different region from the Region Manager. See "Using the Region Manager" on page 117 for more information on choosing a region.
3. Choose **Address** in the scroll list.
4. Type the number and street name, or a street intersection, in the Address text box.
5. Enter additional information as follows:

If you know...	Do this...
The ZIP Code/Postal Code	Type it in the ZIP Code/Postal Code text box
The address is somewhere on the screen	Check the Search Only the Current Map box
The city and state/province/district name	Type them (e.g., Newton MA, Vancouver BC, or Sydney NSW) in the respective text boxes

6. Choose any display options as follows:



7. Click OK.

Maptitude finds the address and uses the display options to indicate the location. If the address cannot be found, Maptitude has several ways to help you find the location. See "Troubleshooting" later in this chapter for more information.

Try It Yourself: Finding an Address

1. Choose ***File-New Map*** or click on the Standard toolbar.
2. Choose **General Purpose Map** from the radio list, choose your country (e.g., Australia, Canada, Italy, United States, etc.) from the scroll list and click **Finish**. Maptitude displays a map of your country.
3. Choose ***Edit-Find*** or click on the Standard toolbar to display the Find dialog box.
4. Choose **(Country Name) Address** in the scroll list.
5. Type an address (e.g., "245 E 54th St" or "Via Milano 93") in the Address text box and type a postal code (e.g., "10022" or "M6H") in the Postal Code text box or other information such as city and state. Make sure the **Zoom to fit** box is checked.
6. Click **OK**. Maptitude finds the address and displays it on the map.
7. Choose ***File-Close*** and click **No** to close the map without saving any changes.

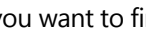
Finding Other Locations within a Region

Maptitude lets you find other types of locations such as city, state/province, postal code, etc. All you need to do is enter the name or number of the feature for which you are looking.

Maptitude does its best to find the location you want, even if the information you provide is incomplete. This means that you can enter partial names as well as full names for locations you want to find. For example, if you search for a state named "New," Maptitude will find New Hampshire, New Jersey, New Mexico, and New York in the U.S. region state file. When Maptitude finds more than one possible match, it lists up to the first 100 choices in a dialog box. You can pick the one you want from the list, or click Cancel to return to the Find dialog box and further refine your search.

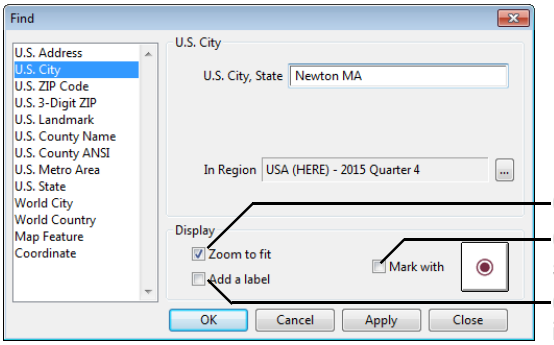
When you are searching for a city, you can make the search faster by including the state/province postal abbreviation. This also works for U.S. counties. For example, to find Monroe County, Alabama, type "Monroe, AL" as the county name. If you simply type "Monroe," Maptitude will find all 17 Monroe counties in the U.S. and you will need to choose the one you want from a list.

▶ To Find Other Locations

1. Choose ***Edit-Find***, click  on the Standard toolbar, or right click on the map window and choose Find, to display the Find dialog box.
2. If you have more than one region of data installed on your computer, verify that you are using the correct region for the location you want to find. If necessary, click  and choose a different region from the Region Manager. See "Using the Region Manager" on page 117 for more information on choosing a region.
3. Choose one of the region-specific location types (e.g., UK Town, Australia Suburb, Canada Province, U.S. Landmark) from the scroll list or choose World City, World Country, or Coordinate.
4. Enter the full or partial name, abbreviation, postal code, etc. of the feature you want to find in the edit box and any other information that may be required. For example:

To find...	Do this...
City/Town/Suburb	Type the name (e.g., Chicago, Paris, Perth) or the name and state/province/district name or abbreviation (e.g., Newton MA, Sydney NSW, Toronto ONT) in the edit box.
State/Province/District	Type the name or abbreviation in the edit box (e.g., California, NY, Distrito Federal, Victoria, ONT).
Postal Code	Type the ZIP Code, FSA, postal code, etc. in the edit box (e.g., 02461, K1N, 4000).
Landmark	Type some or all of the landmark name in the edit box. You can narrow your search to a specific state/province or to the visible portion of the map.
World City/Country	Type the name of the city or country.
Coordinate	Type a longitude and latitude either with a decimal point or with six implied decimal places (e.g., 43.25, 43250000). West longitude, such as in the United States, and south latitude, such as in Australia, are negative values. If the map is using a coordinate system you can also use an XY coordinate.

5. Choose any display options as follows:



6. Click OK.

Maptitude uses the display options to indicate the location. If there are several possible locations that correspond to the information that you entered, Maptitude lists all of the matching records in the Choose a Matching Record dialog box. Choose a record from the list and click OK. Maptitude shows the location that you chose on the map.

Finding a Particular Map Feature

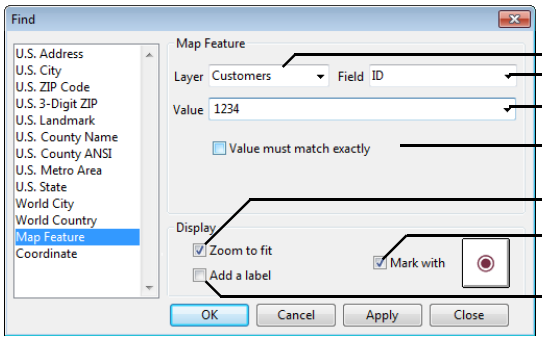
To find a particular feature in a map, you use the ***Edit-Find*** command and choose the layer to use, the field to use to identify the feature, and the name, ID, or other information about the features. For example, to locate a particular customer on a map, you could search the Customer Layer, using the Customer ID field, and entering the ID of the customer you want to see.

Maptitude does its best to find the location you want, even if the information you provide is incomplete. This means you can enter partial names as well as full names for locations you want to find. For example, if you search for a customer named "Smi," Maptitude will find all the customers whose name begins with those three letters. Using an option, you can make sure that whole phrases or values match exactly.

▶ To Find a Map Feature

1. Choose ***Edit-Find*** or click  on the Standard toolbar, or right-click on the map window and choose Find, to display the Find dialog box.

2. Choose **Map Feature** in the scroll list and make choices as follows:



3. Click OK.

Maptitude finds the feature and displays it on the map.

Try It Yourself: Finding a Map Feature

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nycity.map** in the Tutorial folder.
2. Choose ***Edit-Find*** or click on the Standard toolbar to display the Find dialog box.
3. Choose **Map Feature** in the scroll list.
4. Choose **School** from the Layer drop-down list and **Name** from the Field drop-down list.
5. Type "**Public School 84**" in the Value text box.
6. Make sure the **Zoom to fit** box is the only checked option and click **OK**. Maptitude draws the map to show the school.
7. Right-click on the school layer in the Display Manager and choose ***New Dataview***.
8. Right-click on any school in the dataview and choose ***Zoom***. Maptitude draws the map to show the school you chose.
9. Choose ***File-Close All*** to close the map and dataview.

Finding Two or More Locations

You can easily use the ***Edit-Find*** command to create a map that shows two or more locations at once. Simply use the Apply button (instead of the OK button) in the Find dialog box for each location you want to find. As you enter additional locations, Maptitude adjusts the scale and center of the map so that all of the locations are visible.

▶ To Find Two or More Locations

1. Choose ***Edit-Find*** or click on the Standard toolbar, or right-click on the map window and choose ***Find***. Maptitude displays the Find dialog box.
2. Enter information about the first location you want to find and click **Apply**. Maptitude shows the location on the map.
3. Enter information about the next location you want to find and click **Apply**. If necessary, Maptitude changes the map scale and center so that all the locations you have entered are shown.
4. Return to Step 3 to enter additional locations.
5. Click **OK** or **Close** to close the Find dialog box.

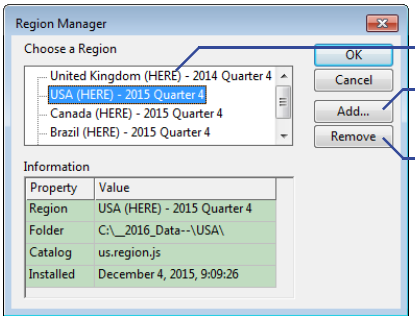
Using the Region Manager

When you install a region, it is automatically added to the Region Manager. If you have purchased and installed more than one region for your Maptitude license, then certain Maptitude tools, such as the Find dialog box, will need to know which region to use. For example, if you have the France and Italy regions and you want to find the Venice, Italy postal code 30121, you need to make sure to use the Italy region so as not to end up finding the 30121 postal code in Mus, France.

NOTE: You can choose the default region to use by choosing ***Edit-Preferences***, clicking ... on the Locating tab, and choosing a region from the Choose Default Data Region dialog box.

▶ To Specify a Region

1. Click ... in the Find dialog box to display the Region Manager dialog box and make choices as follows:



2. Click OK to make the highlighted region the active region to use.

Finding Features from a Dataview

You can use a dataview to find locations on a map using the context-sensitive Zoom and Browse commands.

▶ To Zoom to a Map Feature from a Dataview

1. Open a dataview for a map layer, or make a dataview for a map layer the current window.
2. Highlight a cell in the record you want to zoom to. You can also highlight a range of cells.
3. Right-click on a highlighted cell and choose ***Zoom***.

Maptitude zooms the map to display the features that you highlighted.

▶ To Browse Through Several Feature from a Dataview

1. Open a dataview for a map layer, or make a dataview for a map layer the current window.
2. Highlight a cell in the record you want to zoom to. You can also highlight a range of cells.
3. Right-click on a highlighted cell and choose ***Zoom Browse*** to activate the Browse option.

   Maptitude zooms the map to display the features that you highlighted.
4. Continue clicking on cells in the dataview to display the respective features
5. Right-click on a highlighted cell and choose ***Zoom Browse*** again to turn off the Browse option.

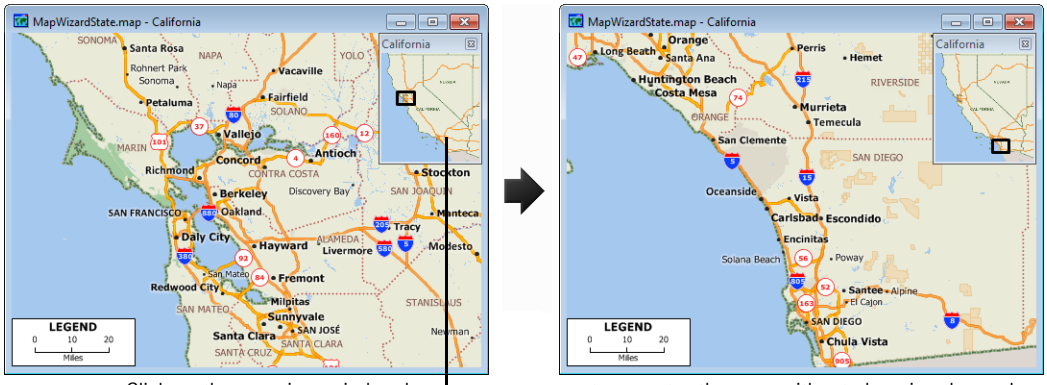
Using the Overview Window

The **overview window** is a toolbox that lets you see the extent of a map and lets you change its scale and center. Any map window can have its own overview window. When you create an overview window, you choose:

- What layers to show
- What scale to use
- How big it will be
- The color of the rectangle that indicates the map location

The overview window can display a reduced version of the current map, or any geographic file. There are several choices of scale for the overview window, based on which layers are being shown and whether there is an existing overview window. The size of the overview window is based on a percentage of the width of the map window.

You use the overview window as another way to change the scale and center of the map. If you click on the overview window, that point becomes the new map center and the map scale stays the same. If you click and drag a rectangle on the overview window, the area inside the rectangle becomes the new map extent, changing the map center and scale.



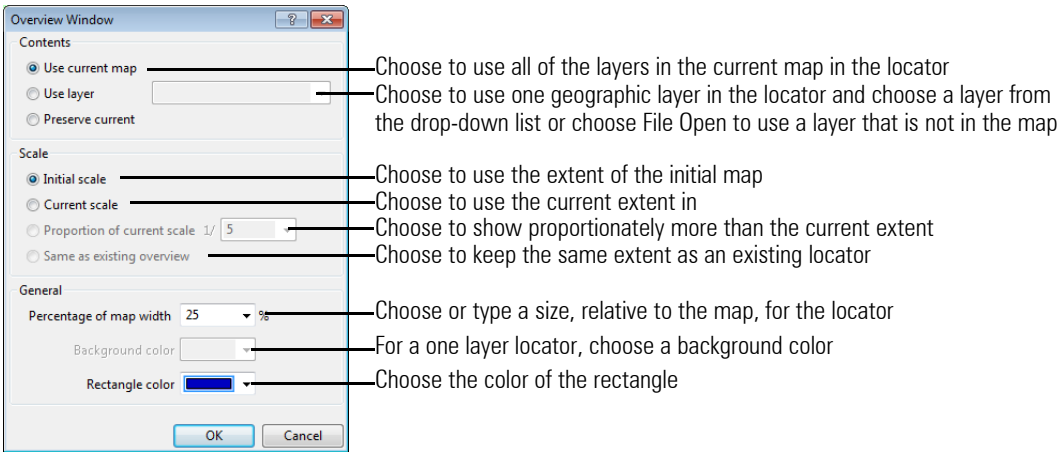
The map extent is shown by a bold rectangle on the overview window. The rectangle is updated whenever you change the center and scale of the map, such as by using the Zoom In tool, the Undo

Scale button, or the ***Map-Zoom-Scale*** command. You will not see the rectangle if the edges of the map are beyond the area shown on the overview window.

After a overview window is created for a map, you can change the overview window settings. When you save a map, the overview window settings are also saved. When you open a map, or make it the current map, its overview window is displayed. If a map is not the current map, its overview window is hidden.

▶ To Create or Modify an Overview Window

1. Choose ***Map-Zoom-Overview Window*** to display the Overview Window dialog box.



2. Click **OK**.

Maptitude creates the overview window. To remove a overview window, click its Close box in the upper-right corner of the toolbox.

▶ To Use the Overview Window to Move Around the Map

1. Click on the overview window to change the center of the map, or click and drag a rectangle on the overview window to change the extent of the map.

Maptitude draws the map and updates the bold rectangle in the overview window to show the map extent.

Try It Yourself: Using an Overview Window

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **locator.map** in the Tutorial folder.
2. Choose ***Map-Zoom-Overview Window*** to display the Overview Window dialog box.
3. Click **Use Current Map** under Contents, click **Initial Scale** under Scale, type "**35**" in the Percentage of Map Width box, and click **OK**. Maptitude displays an overview window.
4. Click and drag a rectangle on the overview window. Maptitude redraws the map at the new location.
5. Click at several locations on the overview window. Maptitude recenters the map at every location where you click.
6. Choose ***File-Close*** to close the map.

Setting the Scale to a Value

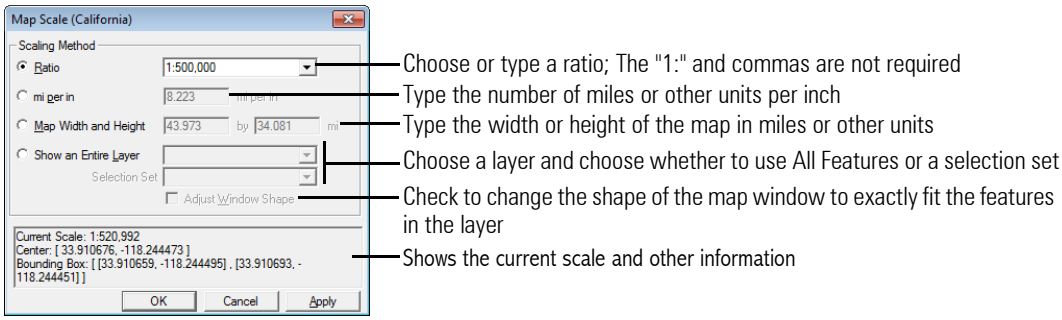
The map scale is displayed in the status bar at the bottom of the map window in two formats:

Method	Meaning
Ratio	A scale of 1:1,000 means that every feature on the map is shown at one thousandth of its actual size
Miles per Inch	A scale of one inch = 100 miles means that every inch on the map corresponds to 100 miles on the earth

You can set the scale using either of these formats, or specify the width or height of the map in miles. Maptitude can also choose to set the scale of a map so that it shows all of the features in a particular layer or selection set.

▶ To Set the Map Scale to a Value

1. Choose ***Map-Zoom-Scale*** or right-click on the map and choose ***Scale*** to display the Map Scale dialog box.
2. Choose a method for setting the scale from the scroll list and set the scale value as follows:



3. Click OK.

Maptitude draws the map with the new scale.

NOTE: You can choose to see the map scale in other units. Choose ***Edit-Preferences*** and choose the units from the Map Units drop-down list on the System tab.

Try It Yourself: Setting the Scale of a Map

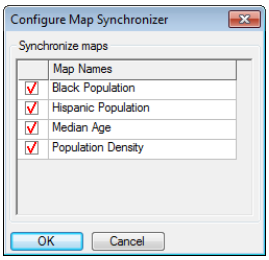
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **states.map** in the Tutorial folder.
2. Choose ***Map-Zoom-Scale*** to display the Map Scale dialog box.
3. Choose **mi per in** (or **km per cm**) from the radio list and type "**250**."
4. Click **OK** to see the map at the new scale. You can see only a part of the U.S.
5. Choose ***Map-Zoom-Scale*** again.
6. Choose **Ratio** from the radio list and choose "**1:100,000,000**."
7. Click **OK**. Now the U.S. is drawn much smaller than the window.
8. Choose ***File-Close*** to close the map.

Synchronizing the Scale of Maps

You can synchronize the scale of two or more maps so that when the scale of one map is changed, the other maps are automatically updated. As long as the maps are linked, if you use the Zoom In or Zoom Out tools, the Pan tools, or the ***Map-Zoom-Scale***, ***Map-Zoom-Undo*** or ***Map-Zoom-Undo All*** commands on one of the synchronized maps, the other synchronized maps will automatically update.

▶ To Synchronize Maps

1. Open the maps that you want to synchronize.
2. Choose ***Map-Synchronize*** to display the Configure Map Synchronizer dialog box.
3. Check the box next to the maps you want to synchronize.



4. Click **OK** to synchronize the maps and display the Synchronize toolbox.

   As long as the toolbox is open the maps are linked. If you change the scale of any of the synchronized maps, all of the others will automatically update.

   You can temporarily stop synchronizing the maps by clicking in the Synchronize toolbox. Click to resume synchronizing.

   Click if you want to change the synchronized maps in the Configure Map Synchronizer dialog box.

5. Click the Close box in the upper right corner of the toolbox to stop synchronizing the maps.

Saving and Using Bookmarks

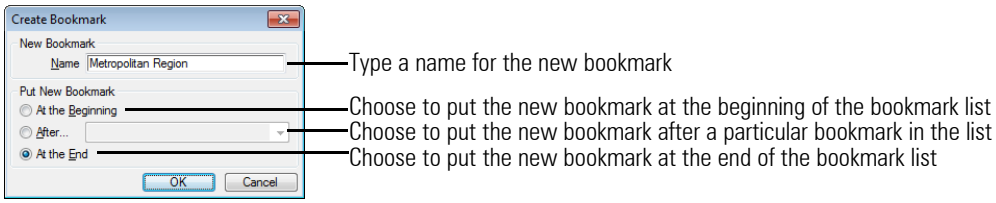
If you find that you often use one or more map extents, such as a sales territory or service region, you can save them by creating **bookmarks**. With a bookmark you can quickly redisplay that extent on any map.

The Bookmark Manager lets you manage your bookmarks. You can rearrange your bookmarks into the order that you want them to appear in the ***Map-Zoom-Bookmarks*** list. Maptitude also remembers and displays the eight most-recently-used bookmarks at the bottom of the ***Map-Zoom-Bookmarks*** submenu.

You can share bookmarks by exporting bookmarks to a file to give to others, and by importing bookmarks from files that you have gotten from others. If you import a bookmark that has the same name as an existing bookmark, the imported bookmark will be renamed with a suffix such as ":1."

▶ To Create a Bookmark

1. Choose ***Map-Zoom-Bookmarks-Create*** to display the Create Bookmark dialog box.
2. Make choices as follows:



3. Click OK.

Maptitude saves the extent of the current map as a bookmark, and adds it to the list of bookmarks.

▶ To Zoom to a Bookmark

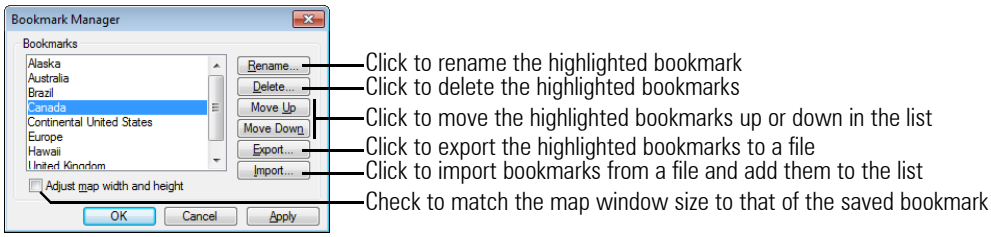
TIP: You can also zoom to a bookmark by choosing the bookmark in the Bookmark Manager and clicking Apply.

1. Make sure you have a map open.
2. Choose ***Map-Zoom-Bookmarks-Go To*** and choose a bookmark, or choose a bookmark from the most-recently-used list at the bottom of the ***Map-Zoom-Bookmarks*** submenu.

Maptitude zooms your map to the chosen bookmark. If you have checked Adjust Map Width and Height in the Bookmark Manager dialog box, Maptitude will resize the map window to the size of the bookmark.

▶ To Manage Bookmarks

1. Choose ***Map-Zoom-Bookmarks-Manager*** to display the Bookmark Manager dialog box.
2. Make changes as follows:



3. Click Apply to try out a bookmark.
4. When you are done, click OK to save your changes.

If you clicked Apply before clicking OK, Maptitude leaves the map at the extent of the bookmark. If you click Cancel then all of your changes, including applying a bookmark, are canceled.

Showing a Subset of Map Features

Each of the geographic files that come with Maptitude is nationwide in scope, so a geographic file of states will include all states. In some cases, you may want to make a map that includes only your area of interest, without features from surrounding areas. For example, you may want to create a map of Connecticut without features from neighboring states.

To create a map that includes only your area of interest, you have four options:

- Select the desired features in one or more layers using the selection tools, then hide all but the selected features in each layer. See *Chapter 8: Queries and Selection Sets* for more information.
- Select the desired features from an area layer using the selection tools, use the ***Tools-Editing-Clip Layers*** command to create a new geographic file for each of the other layers, then open the new file(s). See "Clipping Geographic Files by Area" on page 450 for more information.
- Create a mask layer that hides features outside of your area of interest. See "Creating Masks" on page 448 for more information.

Troubleshooting

Maptitude goes to great lengths to locate what you asked for, or something close to it, but in some cases Maptitude will display a message indicating a problem. This section explains those problems and ways that Maptitude can help you solve them.

If Your Map Is Empty...

If you change the extent of a map to a location where there are no features, your map will be empty. This can happen if you click in the wrong place with the Zoom In tool or the overview window. To correct this, change the map scale with the ***Map-Zoom-Undo*** or ***Map-Zoom-Undo All*** command.

Your map may also be empty if you zoom to a scale that is not within the autoscale range of any of the layers that make up the map. To correct this, change the map scale with the Zoom In or Zoom Out tools, or change the map scale with the ***Map-Zoom-Undo*** or ***Map-Zoom-Undo All*** commands. You can also change the autoscale settings; for more information, see "Controlling Layers Automatically with Autoscale" on page 64.

Problems Finding an Address

Maptitude offers several methods to help you to locate addresses, by providing methods to deal with incomplete or inconsistent information in the address. You benefit from these methods when you use the ***Edit-Find*** command, as well as with the Create-a-Map Wizard and the Routing toolbox.

Maptitude expects the street address to be either a street number and street name, or a pair of street names separated by And, &, At, or @. Maptitude will indicate if it is having trouble understanding what you typed.

If Maptitude cannot find the street address in the postal code that you typed, the street address may be listed under another postal code and Maptitude can help you find it. Maptitude uses the postal codes in your regional streets geographic file. Sometimes those postal codes can become out of date. For example, the U.S. Post Office is constantly adjusting the ZIP Codes assigned to addresses so that they can deliver the mail more efficiently.

If you type both a city and state AND a postal code, Maptitude first attempts to locate the address by matching the postal code. If no address can be found, Maptitude gives a choice of locating by using:

- A list of alternative, enclosing, or nearby postal codes, and postal codes in the same city as the postal code that you typed
- A list of postal codes for the city and state that you typed, if that city and state does not contain the postal code that you typed

If the address is still not found and you typed a valid postal code or a valid city and state/province, Maptitude gives you the option of locating based on postal code points using either the location of:

- The postal code that you typed
- The first postal code listed for the city and state that you typed

When you use the ***Edit-Find*** command or the Routing toolbox, you can also choose to search only the postal codes on the map.

Here are the dialog boxes that you may encounter, and what you can do:

Address Not Found Dialog Box

You will get this message if Maptitude could not find any possible locations, based on what you typed. This dialog box can show several different options for what you can do, based on what Maptitude found in what you typed. It may be that:

- The street number is missing
- Nothing similar to what you typed for the street name could be found
- The postal code or city and state names were not sufficient to focus in on a possible location

There are three possible solutions:

- Click one of the options and click OK
- Click Cancel and correct the street number or name
- Click Cancel and correct the postal code or city and state names

Please Choose a Matching Record Dialog Box

You will get this message if Maptitude found more than one possible location, based on what you typed. It may be that:

- More than one street segment contains the street number
- None of the street segments contain the street number
- One or more streets with similar names contains the street number

There are three possible solutions:

- Highlight the correct street segment in the scroll list and click OK
- Click None and correct the street number or name
- Click None and correct the postal code or city and state names

No Matching Address Found Dialog Box

You will get this message if Maptitude could not find any possible locations, based on what you typed. It may be that:

- The street name that you typed does not match the spelling of the street name in the Street geographic file
- The street number is on a new extension of the street
- The whole street is new

Click OK. Here are some possible solutions:

- Try other names for the street (such as "Boylston St" rather than "Route 9")
- Try finding an address or postal code in the general vicinity of the street address that you are trying to find.

You Must Specify a Postal Code or City/State Dialog Box

You will get this or a similar message if you enter an address but no city/state or postal code. There are three possible solutions:

- Type a postal code. Only that postal code will be searched to find the address.
- Type a city and state/province. All the postal codes for that city will be searched to find the address.
- Check the box labeled Search Only on the Map. All the postal codes that are wholly or partially within the map will be searched to find the address.

Unknown City and State Dialog Box

You will get this message if you enter an address and a city/state, but the state is missing, the state name or abbreviation does not exist, or that state does not have a post office with that city name. There are four possible solutions:

- Add the missing state name or postal abbreviation.
- Try a different city name. Many suburbs have as their post office the major city nearby.
- Find out the postal code and type that instead. The city/state entry is ignored if there is a valid postal code.
- Check the box labeled Search Only on the Map, if you know that the address is somewhere on the map.

Error Interpreting City/State Dialog Box

You may get this message if you enter a city and state in a way that Maptitude has trouble understanding. Use one of the four solutions above for an unknown city and state.

Problems Finding a Postal Code

When you search for postal codes, you may at times enter postal codes that are so new that they are not included in either the postal code boundaries or postal code centroids data files that are included with Maptitude. Maptitude looks through both of these files when it searches for a postal code. If Maptitude still finds that a postal code is too new, or is otherwise invalid, you will get a No Matching Records Found error message.

Note that Caliper also sells current U.S. ZIP Code boundaries, which you may find useful if you are interested in areas that are undergoing lots of ZIP Code changes.

Problems Finding Other Locations

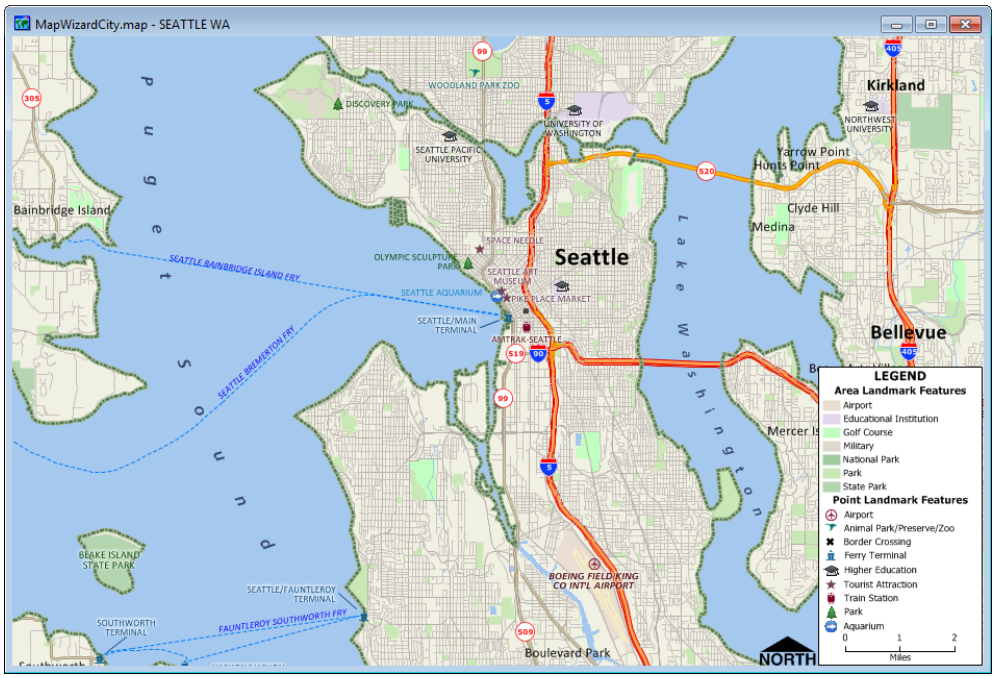
There is considerable room for spelling differences with U.S. city names, and even more for world city names. You may have typed the wrong abbreviation for a state, or just spelled a word wrong. In these cases you will get the following error message:

No matching records found
You will get this message if nothing has a spelling close enough to what you typed. There are two possibilities:

- What you are trying to find is there, but with a different spelling. Try typing the first few letters of the name. Maptitude will list up to 100 names that start with those letters so you can choose the right one. For world cities, try the local spelling.
- What you are trying to find is not in the Maptitude geographic file. Try finding something nearby, such as a neighboring city, or something bigger, such as the county that a city is in.

CHAPTER 5:
Changing and Customizing Maps

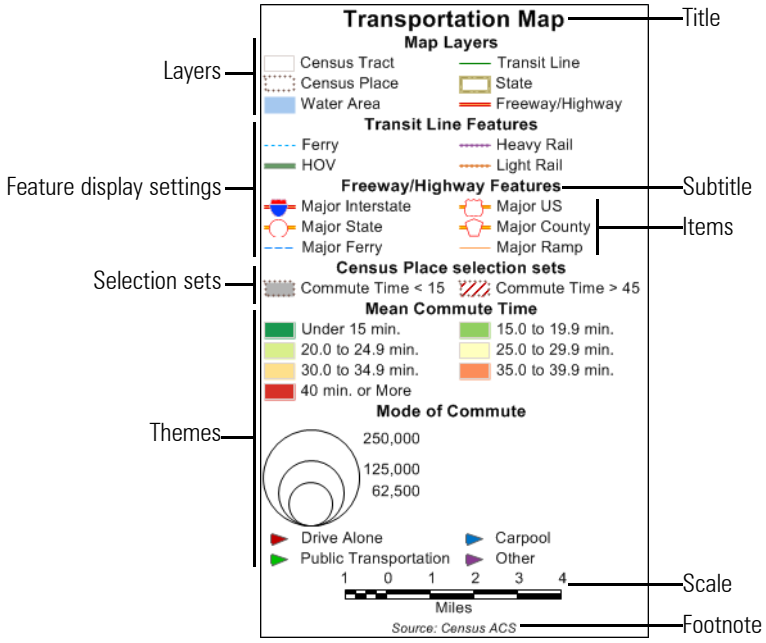
Maps convey information in many different ways. You can use legends, freehand annotations, and North arrows to enhance a map so that it communicates more effectively and looks more attractive.



In this chapter:

Using Legends

Maps use a legend to describe the symbols, colors, and styles used in a map. Legends have sections for the title, layers, selection sets, themes, feature display settings, scale, and footnote.



The layers, feature display settings, selection sets, and themes sections all contain a subtitle followed by items. You choose which sections to include in the legend, type the title and footnote, choose a border and background, and pick the fonts, styles, sizes, and colors you want. You also control which items in each section are displayed, in what order, and the number of columns in the legend. From then on, Maptitude creates and maintains the legend automatically.

Legends can be displayed either on the map or in a separate window. When a legend is on the map, it prints automatically when you print the map. If the legend is in a separate window, you must use a layout to print it.

Maptitude automatically displays a legend when you create a thematic map. For more information on legends and thematic maps, see *Chapter 6: Using Themes to Present Information*.

▶ To Display or Hide the Legend

1. Choose ***Map-Legend*** or click on the Standard toolbar.

   —OR—

1. Choose ***File-Properties***, or click on the Standard toolbar, or right-click on the map window and choose ***Properties***. Maptitude displays the Map Properties dialog box.
2. Check or remove the check from the Legend Enabled box.
3. Click OK.

Customizing the Legend

The Legend Settings dialog box lets you customize the appearance of your legend. You can:

- Add a title and footnote
- Change the style and color of the scale of miles symbol
- Control the legend's border and background, or even make the legend transparent and borderless so it fits seamlessly on your map
- Change the number of columns and the order of items within the columns
- Choose what will be displayed in your legend and in what order
- Change the names of subtitles and items
- Choose the font, size, style, and color

When you click Apply, Maptitude updates the legend so you can see the result. When you click OK, the new settings are saved. If you click Cancel, the legend returns to the original settings.

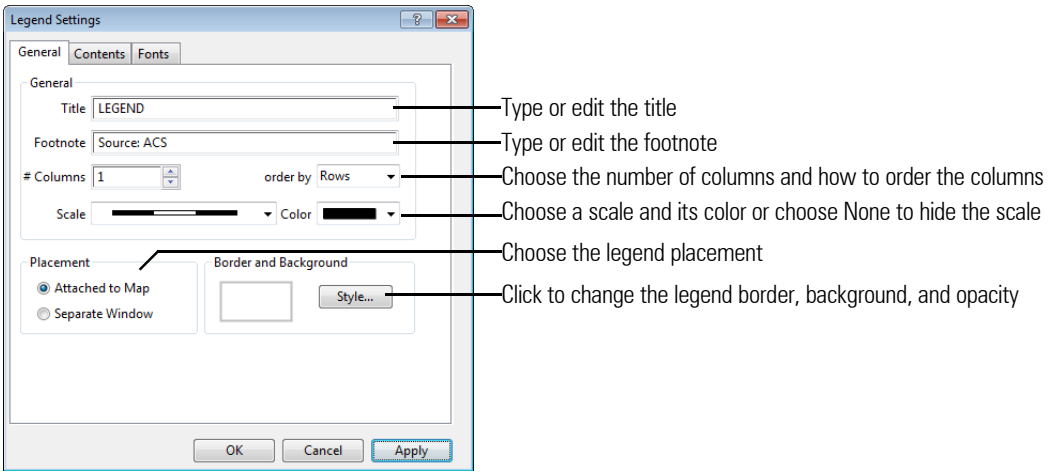
NOTE: You can change the language used for the legend scale (e.g., Kilometer, Kilometre, Kilómetros) by choosing ***Edit-Preferences*** and choosing a language on the System tab.

▶ To Customize the Legend

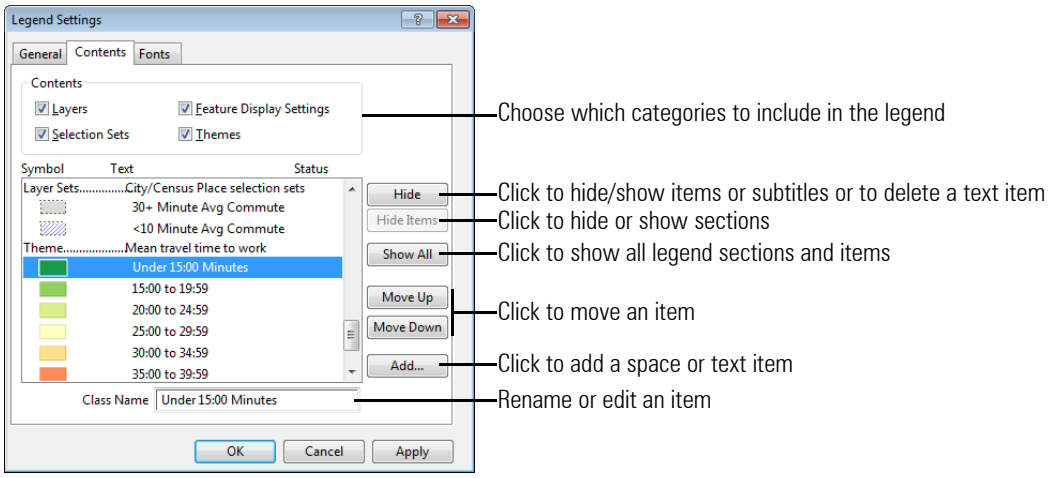
1. Display the Legend Settings dialog box using one of the following ways:

If...	Do this...
The legend is enabled	Right-click on the legend and choose ***Properties***
The legend is attached to the map	Choose the Pointer tool on the Drawing toolbar and double-click the legend
The legend is displayed in a separate window	Double-click on the legend with any tool
The map is the current window	Choose ***File-Properties*** or right-click on the map window and choose ***Properties*** to display the Map Properties dialog box, and click Legend Settings.

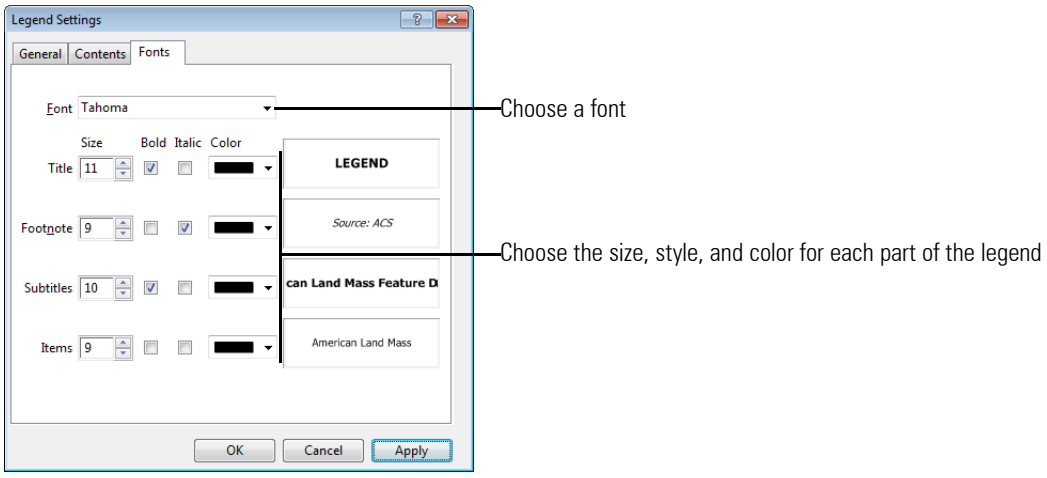
2. On the General page, make changes to the appearance of the legend as follow:



3. Click the Contents tab to display the Contents page and make changes as follows:



4. Click the Fonts tab to display the Fonts page and make changes as follows:



5. Click OK.

6. If you reached the Legend Settings dialog box from the Map Properties dialog box, click OK to close the Map Properties dialog box.

Maptitude draws your legend based on the current settings.

▶ To Modify Legend Font Size Only

1. If the legend is displayed in a separate window, right-click on the legend and choose ***Larger Font*** to increase the sizes by one point, or choose ***Smaller Font*** to decrease the sizes by one point.

▶ To Save a Legend Displayed in a Separate Window as an Image

1. If the legend is displayed in a separate window, right-click on the legend and choose ***Save Image*** to display the Save Legend as Image dialog box.
2. Enter a name for the file and choose an image file format.
3. Click **Options** to choose whether to include a border in the image file and, if you chose JPEG as the file format, to choose the quality of the image. Click **OK** when you are done.
4. Click **Save**.

Try It Yourself: Modifying Legends

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **legend.map** in the Tutorial folder. The map has a legend with many items.
2. Click on the Standard toolbar to turn the legend off.
3. Click again to turn the legend on.
4. Double-click on the legend to display the Legend Settings dialog box.
5. Type "**My Legend**" in the Title text box and "**Created by Me**" in the Footnote text box.
6. Choose a scale from the Scale drop-down list and click the **Attached to Map** radio button.
7. Click **Apply** to see these changes.
8. Click the Contents tab. Click on the **Place** item in the scroll list and click the **Hide** button, then click on the **100,000 to 600,000** theme item and type "**Over 100,000**" in the Class Name text box.
9. Click the Fonts tab. Choose a different font from the Fonts drop-down list, change the Footnote size to **10**, and change the Items size to **11**.
10. Click **OK**. The legend is updated.
11. Click to activate the Pointer tool. Click on the legend and drag it to the upper right of the map.
12. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Using the Drawing Tools

Maptitude lets you embellish your maps by adding text, symbols, lines, circles, rectangles, and other graphics. The items you draw on the map are called **freehand items**. Freehand items are saved as part of the map file.

Adding Freehand Items to a Map

The Drawing Toolbox includes drawing tools you use to add freehand items to a map. You turn on the Drawing Toolbox with the ***Edit-Drawing-Toolbar*** command. Here is a quick summary of the drawing tools and how they work:

Tool	Name	How to use it
	Text	Click where you want the text on the map to display the Freehand Text dialog box, type the text you want (press Enter to skip to another line), choose the font settings, and click OK. You can also drag a rectangle on the map, type the text you want (type a vertical bar "|" to skip to another line), and press Enter; the size of the font is set by the height of the rectangle.
	Curved Text	Click on each point along the curve, double-click to end it, type the text you want, and press Enter.
	Rectangle	Drag a rectangle on the map, or hold the Shift key to drag a square.
	Rounded Rectangle	Drag a rectangle on the map, or hold the Shift key to drag a square with rounded corners.
	Oval	Drag an oval on the map, or hold the Shift key to drag a circle, or click at the center of the circle to display the Enter Radius dialog box, type the radius, choose the units, and click OK.
	Shape	Click on each corner of the shape, and double-click to close it (the first and last points connect automatically).
	Radius	Drag a circle on the map, or click at the center of the circle to display the Enter Radius dialog box, type the radius, choose the units, and click OK.
	Line	Click on each point along the line, and double-click to end it.
	Arrow	Click on each point along the arrow, and double-click to end it.
	Curve	Click on each point along the curve, and double-click to end it.
	Great Circle Line	Click on the start and end points along the great circle line.
	Image	Drag a rectangle on the map, then choose a Windows Bitmap (.BMP), JPEG (.JPG), GIF (.GIF), Enhanced Metafile (.EMF), Icon file (.ICO), Portable Network Graphics (.PNG), or TIFF image (.TIF) file.
	Symbol	Click on the map. Hold the Shift key and click on the map to choose a symbol.
	North arrow	Drag a rectangle on the map, then choose a style and color.

When you are dragging a rectangle, rounded rectangle, or oval, you can press the space bar to drag from the opposite corner. You can hold the Ctrl key to drag a rectangle, rounded rectangle, or oval from its center.

When you are drawing a line or shape, you can press the scroll wheel on your mouse to pan the map.

A freehand circle or radius will be a true circle on the current projection. A freehand great circle line will follow the shortest distance between the start and end points, and will be a curve on most projections. Great circles that cross the 180/-180 degree meridian will be broken into two parts.

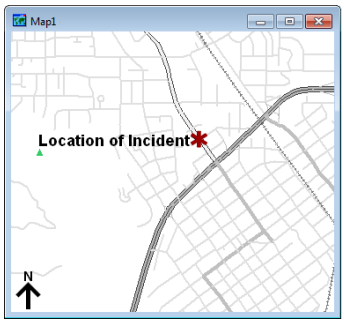
NOTE: You can change the default styles for freehand items by choosing the ***Edit-Preferences*** command and going to the Freehand/Layout tab in the User Preferences dialog box.

Working with Freehand Items

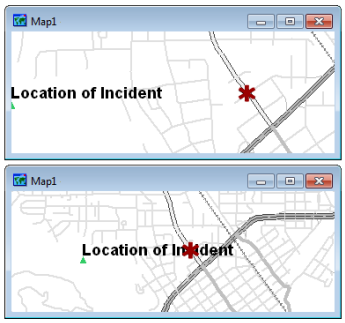
Once you add a freehand item to a map, you can edit, move, resize, or delete it. You can also align any number of freehand items either horizontally or vertically. To modify a freehand item, you must first select it with the Pointer tool. To align freehand items, you must first select all the items you want to align with the Pointer tool.

With the exception of freehand symbols and North arrows, freehand items scale with the map as you zoom in and out. You can change this behavior for freehand text, so that the text retains the point size you set when you placed it.

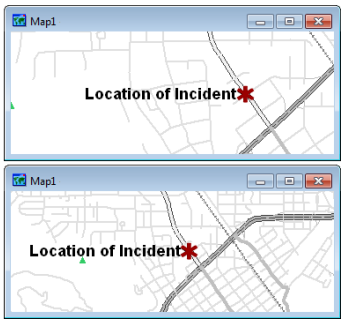
When you choose to keep the text size fixed, you can also choose a position for the text. If the position of text relative to a map feature is important, you should set that position to ensure that the label displays properly when you change the scale of the map. In the following example, the map on the left contains fixed-size text where the position has been incorrectly set to right. If you zoom in it will look like the center map. If you had set the position to left and zoomed in, however, you would get the map on the right.



If the text in this map is fixed size and you want it to the left of the point...



...your map will look like these when you zoom in and zoom out if the position is set to Right



...and your map will look like these when you zoom in and out if the position is set to Left

▶ To Select Freehand Items

TIP: You can also select items by clicking with the right mouse button. When you do, Maptitude displays a context-sensitive menu for working with the selected item(s).

1. Click in the Drawing toolbox to activate the Pointer tool.
2. Select freehand items as shown in the table:

To do this...	Do this...
Select one or more items	Click on a freehand item or click and drag around several items
Select more items	Hold the Shift key and click on an item or drag a rectangle around items
Remove items from the selected group	Hold the Ctrl key and click on an item or drag a rectangle around items
Select all freehand items	Choose ***Edit-Drawing-Select All***

When you select a freehand item, square blocks appear at the corners and sides of the item. These blocks are called editing handles. Text and symbol items also have a rotation handle, which you use to rotate the item.

▶ To Change the Size of a Freehand Item

1. Click in the Drawing toolbox to activate the Pointer tool, and select a freehand item.
2. Click and drag one of the editing handles to make the item the desired size. Hold the Shift key while dragging to keep the aspect ratio of width to height constant when resizing circles or rectangles.

▶ To Control the Size and Position of Freehand Text

1. Click in the Drawing toolbox to activate the Pointer tool, and double-click on a freehand text item to display the Freehand Text dialog box.

   —OR—

   Right-click on a freehand item and choose Properties to display the Freehand Text dialog box.
2. Click the **Size/Alignment** tab to display the Size/Alignment page.
3. Click the **Keep Text Size Fixed** radio button.
4. Choose a position for freehand text from the Position radio buttons.
5. Click **OK**.

From now on, Maptitude will retain the point size of the text when you zoom in and out. You cannot rotate a text item whose size is fixed.

▶ To Rotate a Text or Symbol Item With the Rotation Handle

Text and symbol items can be rotated to any desired angle. Rotated items normally align themselves to the nearest 5-degree angle. This makes it easy to place text vertically, horizontally, or diagonally. To rotate items more precisely, hold the Ctrl key while dragging the rotation handle. If the size is fixed for a text item, you cannot rotate it.

1. Click in the Drawing toolbox to activate the Pointer tool, and select a freehand item.
2. Click and drag the rotation handle to rotate the item.

▶ To Rotate Text

1. Click in the Drawing toolbox to activate the Pointer tool, and double-click on a freehand text item to display the Freehand Text dialog box.

   —OR—

   Right-click on a freehand item and choose ***Properties*** to display the Freehand Text dialog box.
2. Click the Size/Alignment tab to display the Size/Alignment page.
3. You cannot rotate fixed size text. If the text size is fixed, click the **Change text size when the map scale changes** radio button.
4. Use the spinners or enter an angle in the Angle edit box.

   Once you have changed the angle you can switch the text back to fixed size.
5. Click **OK**.

▶ To Move Freehand Items

Freehand items can be moved around the map individually or in groups.

1. Click in the Drawing toolbox to activate the Pointer tool, and select one or more freehand items.
2. Position the cursor over one of the selected items (but not on one of the handles).
3. Click and drag the items to a new location.

▶ To Edit Freehand Items

Most freehand items can be edited in place to change the style or other attributes of the item. To edit a freehand item:

1. Right-click on a freehand item and choose ***Properties*** to display a dialog box for editing the items.

   —OR—

   Click in the Drawing toolbar to activate the Pointer tool, select one or more freehand items, of similar type and double-click on any of the selected items to display a dialog box for editing the items. For example, you can edit the style of two rectangles and an oval in a single step, but you cannot edit the style of a text item and two rectangles in a single step.

2. Change settings as described in the table below. Note: The contents of the dialog box depend on the type of items that are selected.

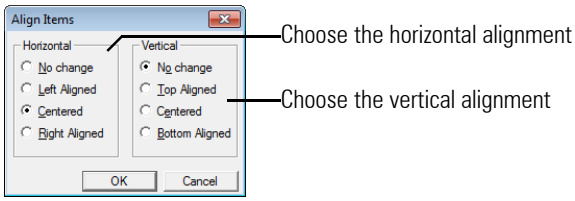
For this type of item...	You can change...
Text	The font, style, color, frame style, size, position, and the text to display
Curved Text	The font, style, color, and the text to display
Rectangle, Rounded Rectangle, Oval, Shape	The border pattern, width, and color, the fill pattern and color, transparency, and opacity
Radius	The border pattern, width, and color, the fill pattern and color, transparency, and opacity, whether or not to draw the radius line and radius label, and the font, size, and style of the radius label
Line or Great Circle Line	The line pattern, width, color, and opacity; you can also add direction arrows or a label with the length of the line
Curved Line	The line pattern, width, color, and opacity; you can also add direction arrows
Arrow	The line pattern, width, color, opacity, and to which ends to apply arrows; you can also add a label with the length of the line
Bitmap	The bitmap file
Symbol	The font, icon, size, color, style, and opacity
Image	The image file
North Arrow	The style and color

3. Click **OK**.

Maptitude draws the item with the changes.

▶ To Align Freehand Items

1. Click in the Drawing toolbox to activate the Pointer tool, and select two or more freehand items.
2. Choose ***Edit-Drawing-Align***, or right-click on a selected freehand item and choose ***Align***, to display the Align Items dialog box.



3. Choose the horizontal and vertical alignment using the Horizontal and Vertical radio buttons.
4. Click **OK**.

Maptitude aligns the items and draws them in their new location. The alignment is based on the first freehand item that you selected.

▶ To Change the Order of Freehand Items

1. Click in the Drawing toolbox to activate the Pointer tool, and select one or more freehand items.
2. Choose ***Edit-Drawing-Pull to Front*** to move the selected items in front of all the rest, or choose ***Edit-Drawing-Push to Back*** to move the selected items behind all the rest.

—OR—

1. Right-click on a freehand item and choose ***Pull to Front***, to move the selected items in front of all the rest, or ***Push to Back***, to move the freehand item behind all the rest.

Maptitude draws the freehand items in the new order.

▶ To Make Copies of Freehand Items

1. Click in the Drawing toolbox to activate the Pointer tool, and select one or more freehand items.
2. Choose ***Edit-Drawing-Duplicate***.

—OR—

1. Right-click on a freehand item and choose ***Duplicate***.

Maptitude makes a duplicate copy of the selected items, and selects the duplicate items.

▶ To Delete Freehand Items

1. Click in the Drawing toolbox to activate the Pointer tool, and select one or more freehand items.
2. Choose ***Edit-Drawing-Delete*** or press the Del key.
3. If you choose ***Edit-Drawing-Delete***, Maptitude will display a Confirm dialog box. Click **Yes** to delete the freehand item or items.

—OR—

1. Right-click on a freehand item and choose ***Delete***. Maptitude displays a dialog box to confirm the deletion.
2. Click **Yes** to delete the freehand item.

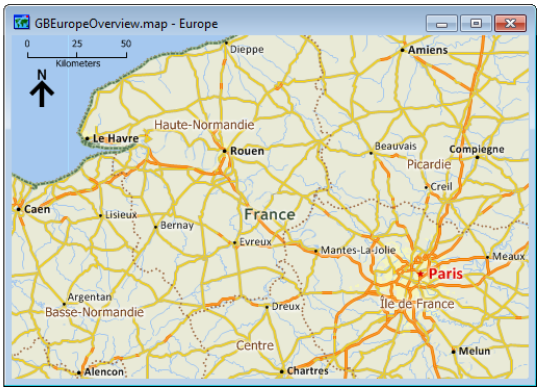
The selected freehand items are deleted from the map.

Try It Yourself: Embellishing a Map with Drawing Tools

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **nycdraw.map** in the Tutorial folder.
2. Click on the Drawing toolbar to activate the Freehand Text tool, then click and drag a rectangle to add freehand text. Type "**East River**" and press the Enter key.
3. Click on the Drawing toolbar to activate the Pointer tool.
4. Double-click on the text, change the style to italic, change the color to blue, and click **OK**.
5. Click on the text, then click and drag an editing handle to change the size of the text.
6. Click and drag the rotation handle to rotate the text to line up with the river.
7. Click on the text and drag it to the east of Manhattan, over the river.
8. Choose ***File-Close*** and click **No** to close the map without saving any changes.

North Arrows

North arrows differ from other freehand items. When you place a North arrow on a map, it stays the same size and in the same relative location in the map, even if you change the map scale or center. The angle of the North arrow may change so that it is pointing North at that location based on the map projection.

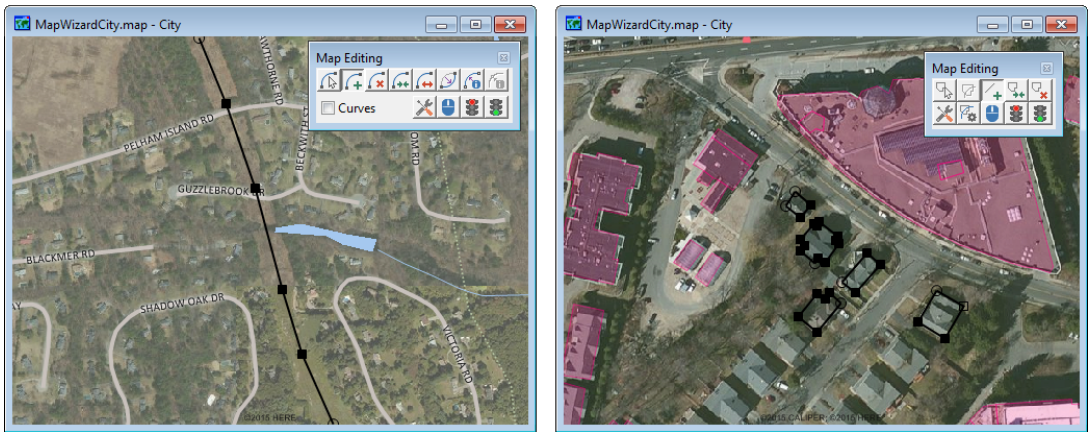


You can move or resize a North arrow like any other freehand item.

Using Images as Map Layers

Satellite and aerial images can improve the appearance of your maps, add to the depth of information displayed there, and provide a basis for editing and updating your map files. When you add images to a map, Maptitude adds the images to the list of layers in the map, making sure to display them on top of any area layers that have pattern or solid fills that might otherwise obscure the images. You can change the order in which layers are drawn using the Layers dialog box.

Images provide reference information you can use to edit other geographic files. For example, if you want to create a line layer of powerlines or create a new area file of building footprints, you can add an aerial photograph to your map and then use the map editing tools to trace over the features. See *Chapter 13: Creating and Editing Geographic Files* for more information on creating and geographic files.



When you use image files in a map, there are several restrictions:

- You cannot change the map projection while using image files in a map. The map projection always stays the same as the projection of the image.
- You can include any number of images in a map, but they should be based on the same map projection. If you choose to add an image with a different projection, Maptitude will ask you whether to copy the additional image to a new image, with the same projection as the map, or to continue with the image, even if it may display incorrectly.

If you have an internet connection, you can use the ***Map-Imagery*** command to display imagery from several web map services including:

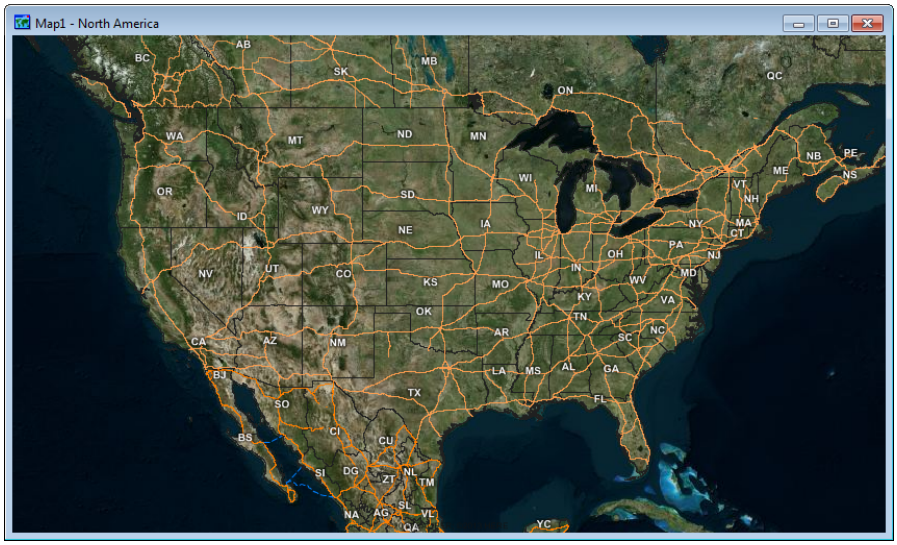
- Virtual Earth Map
- OpenStreetMap
- Google (map, satellite, hybrid, and terrain images)
- USGS (aerial and topographic map images)

Maptitude can also display images that you have stored on your computer including SPOT satellite images, digital orthophotos, MrSID files, TIFF files, PNG files, JPEG files, and ECW files. Most of these image formats have the information that Maptitude needs to display them at the correct location. Maptitude has tools for registering images without this information.

Adding Internet-Based Imagery to a Map

The easiest way to add imagery to your maps is by using the ***Map-Imagery*** command to access map and imagery layers offered by servers such as Microsoft (Virtual Earth), Google, and OpenStreetMap. Images accessed this way have the added benefit of automatically downloading as you pan or move around the map. Likewise, if you zoom in or out, imagery of a different resolution may be loaded. Imagery will also be cached locally for faster access. You can configure the cache folder by choosing ***Edit-Preferences*** and making changes on the System tab.

NOTE: An Internet connection is required and it is your responsibility to make sure you have the rights to any imagery that you access.



▶ To Add Internet-Based Imagery to a Map

1. Choose ***Map-Imagery***. A sub-menu lists available imagery layers that can be retrieved from the Internet.
2. Choose a layer from the sub-menu.

TIP: You can change the style and opacity of image layers. See "To Change the Style of an Image Layer" on page 147.

Maptitude adds the chosen imagery layer to the map. To remove the image layer from a map, choose it again from the ***Map-Imagery*** sub-menu.

Try It Yourself: Adding Internet Imagery to a Map

1. Choose ***File-New Map*** or click on the Standard toolbar, then use Create-a-Map Wizard to create a general purpose map of some area of interest.
2. Choose ***Map-Imagery-Virtual Earth Map***. Maptitude adds the image to the map. You may want to hide the landmark area and/or water area layers if they are visible.
3. Click to activate the Zoom In tool and zoom anywhere on the map.
4. Click to activate the Pan tool and pan the map.
5. Choose ***Map-Imagery-Virtual Earth Map***. Maptitude removes the image from the map.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Using Google Earth Images

If you have installed Version 4.0 or later of Google Earth on your computer and you have Internet access, you can use the ***Tools-Raster-Google Earth Toolbar*** command to get a black and white image from Google Earth to add as a new layer in your map. To install Google Earth, follow the instructions at (HTTP://EARTH.GOOGLE.COM/DOWNLOAD-EARTH.HTML).

NOTE: You must observe the license for Google Earth, which specifies that the software "is made available to you for your personal, non-commercial use only." You must also observe the proprietary data clause in the license for Maptitude, which specifies that "the Data may be used only with the Software."

Maptitude will warn you if there is a difference between the projection used for the Maptitude map and the projection of the Google Earth map. Before the Google Earth map is added to the Maptitude map, the Google Earth map is reset with north at the top and with no tilt. When the Maptitude map is added as a layer on the Google Earth map, Google Earth will automatically zoom to the extent of the Maptitude map.

You can also save a map to KML. Maptitude exports point, line, and area layers and also tries to apply as much styling and labeling as KML supports. For more information, see "Saving, Closing, and Opening Maps and Workspaces" on page 100.

▶ To Use a Google Earth Image

1. If necessary, change the scale of the map to get the area for which you want the Google Earth image.
2. Choose ***Tools-Raster-Google Earth Toolbar*** to display the Google Earth toolbar. If Google Earth is not running, Maptitude starts Google Earth.
3. Make choices as follows:

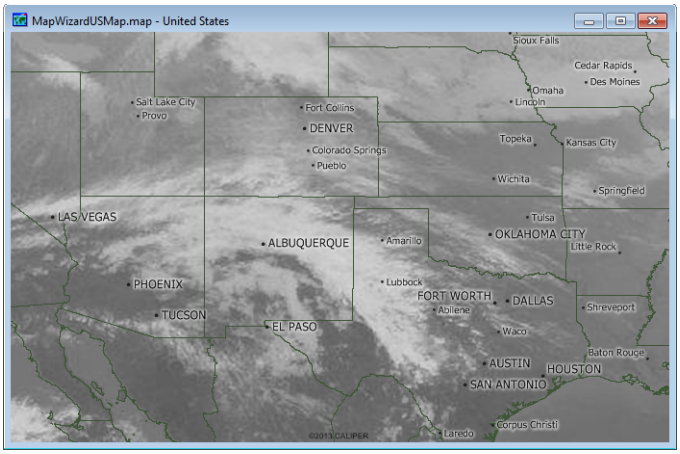
To do this...	Do this...
Get the Google Earth image	Click  . Maptitude sets the Google Earth map to the Maptitude map extent, and requests, receives, and displays the image.
Drop the Google Earth image	Click  . Maptitude drops the image from the map.
Save the Google Earth image	Click  . Maptitude displays the Save Image As dialog box. Choose a folder, type a file name, and click Save. Maptitude saves the image in the JPEG format in a .JPG file with an accompanying JPEG World (.JPW) file.
Add Maptitude map to Google Earth map	Click  . Maptitude creates an image of the map and switches to Google Earth, which shows the Maptitude map as a layer on the Google Earth map.
Set Google Earth to Maptitude map extent	Click  . Maptitude sets the Google Earth map to the Maptitude map extent, and switches you to Google Earth.
Set Maptitude to Google Earth map extent	Click  . Maptitude sets the map extent to be the same as the Google Earth map.

4. When you are done, choose ***Tools-Raster-Google Earth Toolbar*** or click the close button in the top right corner of the toolbar.

Maptitude closes the toolbox.

Using Web Mapping Service Images

The OpenGIS Web Map Service Interface Standard (WMS) provides a simple HTTP interface for requesting georegistered map images from one or more distributed geospatial databases. If you have Internet access, you can use the ***Tools-Raster-Web Map Services Toolbar*** command to add WMS images as layers in your map. There are many WMS servers that you can add, and each WMS server can have one or more layers. You can choose the layers that you want to have available to add to your map.



▶ To Use a WMS Image

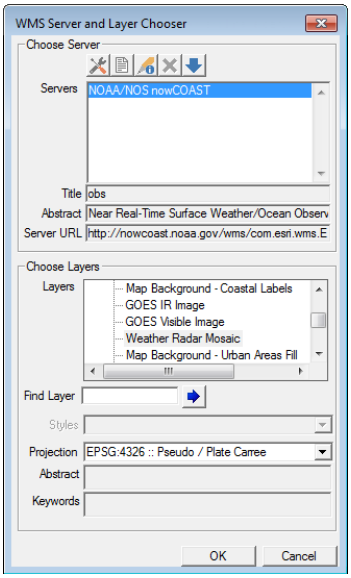
1. If necessary, change the scale of the map to get the area for which you want the WMS image.
2. Choose ***Tools-Raster-Web Map Services Toolbar*** to display the Web Map Services toolbar. If you have not yet set up any web map services, Maptitude will display the WMS Server and Layer Chooser dialog box. See "To Choose WMS Servers and Layers" below for more information. If you have already set up web map service, Maptitude displays the Web Map Services toolbar.
3. Make choices as follows:

To do this...	Do this...
Get the image	If necessary, choose a layer from the Layer drop-down list, then click . Maptitude requests, receives, and displays the image.
Drop the image	Click . Maptitude drops the image from the map.
Get information about the image	Click . Maptitude displays the Image Layer Information window, with the bounding box and other information returned from the service. Close the window when you are done.
Save the image	Click . Maptitude displays the Save Image As dialog box. Choose a folder, type a file name, and click Save. Maptitude saves the image in the JPEG format in a .JPG file with an accompanying JPEG World (.JPW) file.
Zoom the map to the image extent	Click . Maptitude redraws the map to show the whole image.
Remove a WMS layer from the layer list	Choose a layer from the Layer drop-down list and click . Maptitude displays a message to make sure you want to remove the layer. Click Yes. Maptitude removes the WMS layer from the layer list.
Add a WMS layer to the layer list	Click . Maptitude displays the WMS Server and Layer Chooser dialog box. For more information, see "To Choose WMS Servers and Layers" below.

4. When you are done, choose ***Tools-Raster-Web Map Services Toolbar*** or click the close button in the top right corner of the toolbox.

▶ To Choose WMS Servers and Layers

1. Click  in the WMS Image toolbox. Maptitude displays the WMS Server and Layer Chooser dialog box.



2. Make choices as follows in the Choose Server frame:

To do this...	Do this...
Add an available provider	Click  to display the Choose WMS Service Providers dialog box. To add providers, highlight one or more in the Available Providers scroll list and click Add>>. To find servers with a word or phrase in their names, enter text in the Filter edit box. To drop providers, highlight one or more in the Selected Providers scroll list and click <<Drop. To rearrange the selected providers, highlight one or more in the Selected Providers scroll list and click Move Up or Move Down. Click Clear to clear the Selected Providers scroll list. Click Select all to add all providers to the Selected Providers scroll list. Click OK when you are done. Maptitude updates the Servers scroll list.
Add a new provider	Click  to display the Add a New WMS Server dialog box. Type the URL for the GetCapabilities request of the server, the name and title of the server, and the abstract in the appropriate edit boxes. Click OK when you are done. Maptitude updates the Servers scroll list.
Edit a server	Highlight a server in the Servers scroll list and click  . Maptitude displays the Edit a WMS Server dialog box. Make the necessary changes and click OK when you are done. Maptitude updates the Servers scroll list.
Choose a server	Highlight a server in the Servers scroll list. Maptitude updates the Title, Abstract, and Server URL text boxes.
Delete a server	Highlight a server in the Servers scroll list and click  . Maptitude displays a dialog box asking if you are sure. Click Yes. Maptitude deletes the server from the Servers scroll list.
Refresh the layers for a server	Highlight a server in the Servers scroll list and click  . Maptitude refreshes the layers for the server.

3. Make choices as follows in the Choose Layers frame:

To do this...	Do this...
Choose a layer	If necessary, click in the Download Layer Info frame to get the layer information from the server. Open the tree of layers and highlight the layer. To find layers with a word or phrase in their names, type the word or phrase in the Find Layer edit box and click to move to the next matching layer. Maptitude updates the values in the Styles and Projection drop-down lists and the Abstract and Keywords text boxes.
Choose a style	If the layer has styles, choose a style from the Styles drop-down list.
Choose a projection	Choose a projection from the Projection drop-down list. They are in order by their EPSG number.

4. Click OK.

Maptitude adds the layer to the Layer drop-down list in the WMS Image toolbox.

Using Image Files

Maptitude can display the following types of images that you have stored on your computer. Except where noted, Maptitude can display these images without any preparation or setup work.

- **SPOTView and SPOT MetroView satellite images**.
- **Digital Orthophotos and Digital Orthophoto Quarter Quad (DOQQ) images**.
- **TIFF and GeoTIFF (geographically registered TIFF format files) format files**. To use your own TIFF files in a map you must tell Maptitude the correct location for the image. This process is called **registering** the image. Use the Register Image toolbox to register a picture or image stored in a TIFF file. For more information, see "Registering an Image" on page 546. Maptitude recognizes GeoTIFF images and treats them like any other registered TIFF file. You do not need to register a GeoTIFF file.
- **Enhanced Compressed Wavelet (ECW) compressed image files**. When an ECW file is displayed, the image resolution is appropriate for the scale of the map. As you zoom in, more detail is revealed.
- **Multiresolution Seamless Image Database (MrSID) files**. MrSID files provide seamless wavelet-based compression of very large images. As you zoom in, more detail is revealed. The image file (.sid) contains a header with registration and metadata information. Maptitude supports MrSID Generation 3 and 4 format. To use a MrSID file in a map with other geographic layers, it must be accompanied by a MrSID/World (.sdw) file. This file contains registration information for the MrSID image, and Caliper registration information is added at the end of the file. The first time that you open a .sid file and its .sdw file, they must be in a folder to which you have write access so that Maptitude can add the necessary registration information. For more information, see "Registering an Image" on page 546.
- **Joint Photographers Expert Group (JPEG) files**. To use a JPEG file in a map with other geographic layers, it must be accompanied by a JPEG/World (.jpw) file. This file contains registration information for the JPEG image, and Caliper registration information is added at the end of the file. The first time that you open a .jpg file and its .jpw file, they must be in a folder to which you have write access so that Maptitude can add the necessary registration information. For more information, see "Registering an Image" on page 546.

- **JPEG2000 files**. JPEG2000 a lossless format with wavelet-based compression and, like the ECW and MrSID formats, provides increasing levels of resolution as needed (to some limit) as you zoom to larger scales. JPEG2000 files can contain georeferencing information, but they are sometimes accompanied by a JPEG2000/World (.j2w) file. This file contains registration information for the JPEG2000 image. The .jp2 file and its .j2w file must be in the same folder.
- **Portable Network Graphics (PNG) files**. To use a PNG file in a map with other geographic layers, it must be accompanied by a PNG/World (.PGW) file. This file contains registration information for the PNG image, and Caliper registration information is added at the end of the file. The first time that you open a .PNG file and its .PGW file, they must be in a folder to which you have write access so that Maptitude can add the necessary registration information. For more information, see "Registering an Image" on page 546.

If you have a large group of images with the same map projection, such as a mosaic of aerial photos for a city or state, you can use the Image Librarian to create an Image Library. When you add an Image Library as a single map layer, any of the images listed in the Image Library can be displayed as necessary. An Image Library is much more efficient than having individual layers for each image, because the Image Library can be scanned quickly to find out which images to display at the current map scale. You also will have just a single entry in the layer list for each Image Library, rather than one for each image.

You can display images, including Image Libraries, in a new map window, or you can add them as new layers to existing maps. You can also change the style of an image layer.

▶ To Add an Image to a Map

1. Choose ***Map-Layers***, click  on the Standard toolbar, or right-click and choose ***Layers*** to display the Layers dialog box.
2. Click **Add Layer**. Maptitude displays the File Open dialog box.
3. Choose one of the supported image file types or image library.
4. Choose one or more files and click **Open**.

   If an image does not have the same projection as the map, Maptitude displays a dialog box asking whether to copy the image to a new image or to continue with the image, even if it may display incorrectly. Click the appropriate radio button and click **OK**.

   Maptitude adds the images to the list of layers in the map, making sure to display them on top of any area layers that have pattern or solid fills that might otherwise obscure the images.
5. Click **Close** in the Layers dialog box.

Maptitude refreshes the map with the image layers. If your image is not registered it will not align with other map layers. See "Registering an Image" on page 546 for more information on how to display an image at its true location.

Try It Yourself: Using an Image in a Map

1. Choose ***File-Open*** or click on the Standard toolbar, then open the file **tiffconn.map** in the Tutorial folder. Maptitude displays a map of Hartford.
2. Choose ***Map-Layers*** or click on the Standard toolbar. Maptitude displays the Layers dialog box.
3. Click **Add Layer** to display the File Open dialog box.
4. Choose **TIFF Image** as the file type, choose the file **hartford.tif** in the Tutorial folder, and click **Open**.
5. Click **Close** to close the Layers dialog box. The roads are now displayed on top of the scanned map.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

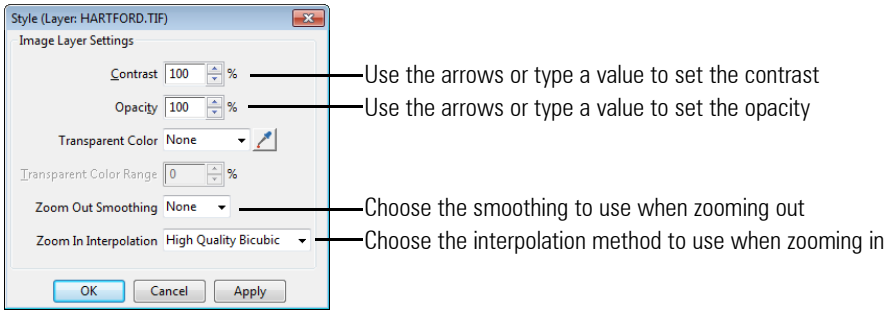
Changing the Style of an Image Layer

▶ To Change the Style of an Image Layer

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. In the Display Manger, click next to the image you want to modify to display the Style dialog box.

TIP: You can also get to the Style dialog box from the Layers dialog box.

3. Make changes as follows:

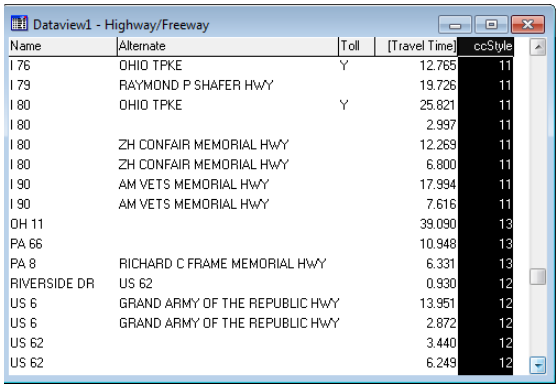


4. To make a particular color or range of colors transparent, do the following:
   - Click in the Style dialog box to display the Map Color Picker dialog box
   - Click on the color you want to make transparent and click OK
   - Use the arrows or type a value in the Transparent Color Range box to specify the color tolerance based on the color similarity. A value of 0 will make only the chosen color transparent and increasing the value will make similar hues transparent. A value of 100 will make the whole image transparent.
5. Click **OK**.

Maptitude draws the image layer with the new style setting.

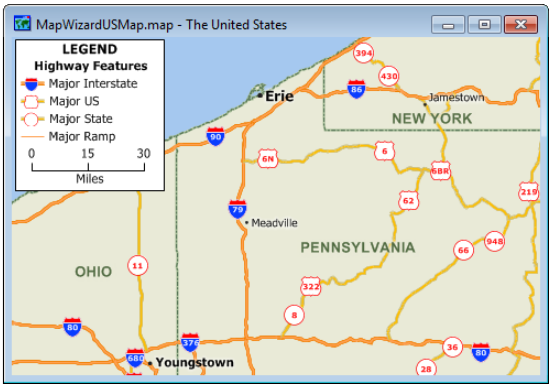
Using Feature Display Settings

Feature display settings are a way to design styles and labels for groups of features within a layer. For example, you can use feature display settings to show different classes of highways with different line styles and highways shields, or to show different types of landmarks with different symbols. You can autoscale feature display settings so that sets of features are shown only with a range of scales.



Name	Alternate	Toll	[Travel Time]	ccStyle
I 76	OHIO TPKE	Y	12.765	11
I 79	RAYMOND P SHAFER HWY		19.726	11
I 80	OHIO TPKE	Y	25.821	11
I 80			2.997	11
I 80	ZH CONFAIR MEMORIAL HWY		12.269	11
I 80	ZH CONFAIR MEMORIAL HWY		6.800	11
I 90	AM VETS MEMORIAL HWY		17.994	11
I 90	AM VETS MEMORIAL HWY		7.616	11
OH 11			39.090	13
PA 66			10.948	13
PA 8	RICHARD C FRAME MEMORIAL HWY		6.331	13
RIVERSIDE DR	US 62		0.930	12
US 6	GRAND ARMY OF THE REPUBLIC HWY		13.951	12
US 6	GRAND ARMY OF THE REPUBLIC HWY		2.872	12
US 62			3.440	12
US 62			6.249	12

Assign styles to the CCSTYLE field in a highway layer...



...to make the layer display like this

TIP: Most of the geographic files included with Maptitude use feature display settings to display classes of features. Use the Feature Display Settings dialog box or the Display Manager to see or modify the predefined feature settings.

Feature display settings are based on an integer field named CCSTYLE that can contain codes between 1 and 255 for a 1-byte integer or between 1 and 32,767 for a 2- or 4-byte integer. Each code can have a feature display setting. A feature display setting can be active (used when drawing the layer) or inactive. Line geographic files can have feature display settings for both the lines and the nodes.

The name for the CCSTYLE field can be upper, lower, or mixed case. The most efficient field to use is a 1-byte integer in a binary file. You could also use any integer field either named CCSTYLE or with a column heading of CCSTYLE. You can also use an integer field that has a lookup table, as long as you base your feature display settings on the codes, not the values.

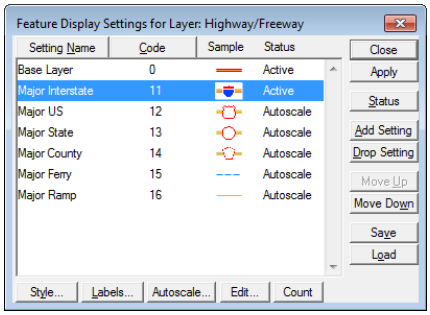
A code in the CCSTYLE field does not need to have a feature display setting; features with that code will be displayed using other settings for that layer. You can also assign feature display settings for codes that do not currently appear in the CCSTYLE field; once there are features with those codes, they will be shown with those feature display settings. If you do not see your feature display settings, remember that themes and selection sets override them in priority.

Feature display settings are data driven; if you change a code for a feature, the next time the map is redrawn the feature will be displayed using the new feature display setting. Unlike themes, feature display settings also control label settings.

Feature display settings are saved when you save a map. When you modify feature display settings, you can also save them in a feature display settings (.ST0, .ST1, or .ST2) file or in a style (.STY) file. For more information on saving settings in a style file, see "Saving Settings for a Geographic File" on page 418.

▶ To Manage Feature Display Settings

1. Choose a layer for which there is a CCSTYLE field from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Feature Display*** to display the Feature Display Settings dialog box.



3. Make changes to the feature display settings as follows:

To do this...	Do this...
Add a feature display setting	Highlight a feature display setting in the scroll list. Maptitude will base the new feature display setting on one that is highlighted. Click Add Setting. Maptitude displays the Edit Display Setting dialog box. Edit the code, the name for the setting, and an optional description in the edit boxes, and click OK. Maptitude adds the new feature display setting and highlights it.
Edit a feature display setting	Highlight the feature display setting and click Edit. Maptitude displays the Edit Display Setting dialog box. Edit the code, the name for the setting, and an optional description in the edit boxes, and click OK. Maptitude updates the feature display setting in the scroll list.
Load feature display settings	Click Load. The current feature display settings will be replaced by those in the feature display settings (.ST0, .ST1, or .ST2) file.
Change the style for a feature display setting	Highlight the feature display setting and click Style. For a full description of the Style dialog box, see "Using Styles" on page 81, Changing and Customizing Maps. Click OK to return to the Feature Display Settings dialog box.
Change the labels for a feature display setting	Highlight the feature display setting and click Labels. For a full description of the Labels dialog box, "Using Labels" on page 86, Changing and Customizing Maps. Click OK to return to the Feature Display Settings dialog box.
Display a feature display setting at certain scales	Highlight the feature display setting and click Autoscale. Enter a minimum and maximum scale at which to display the features in the feature display setting and click OK. For more information on autoscaling, see "Controlling Layers Automatically with Autoscale" on page 64.
Sort the feature display settings by name	Click Setting Name.
Sort the feature display settings by code	Click Code.
Change the order of feature display settings	Highlight one or more feature display settings, then click Move Up or Move Down to change their position in the list.
Change the status of feature display settings	Highlight one or more feature display settings, then click Status to change the display status between Active and Inactive.

To do this...	Do this...
Drop a feature display setting	Highlight the feature display setting and click Drop Setting. Maptitude displays the Confirm dialog box. Click Yes to drop the feature display setting or No to keep it.
Count the number of features with a code	Highlight the feature display setting and click Feature Count. Maptitude counts the features with the feature display setting's code and displays the results. Click OK to close the Note dialog box.
Try out the current feature display settings	Click Apply. Maptitude displays the map with the current feature display settings.
Save the settings to a feature display settings file	Click Save. The current feature display settings will be saved to a feature display settings (.ST0, .ST1, or .ST2) file.

4. Click Close.

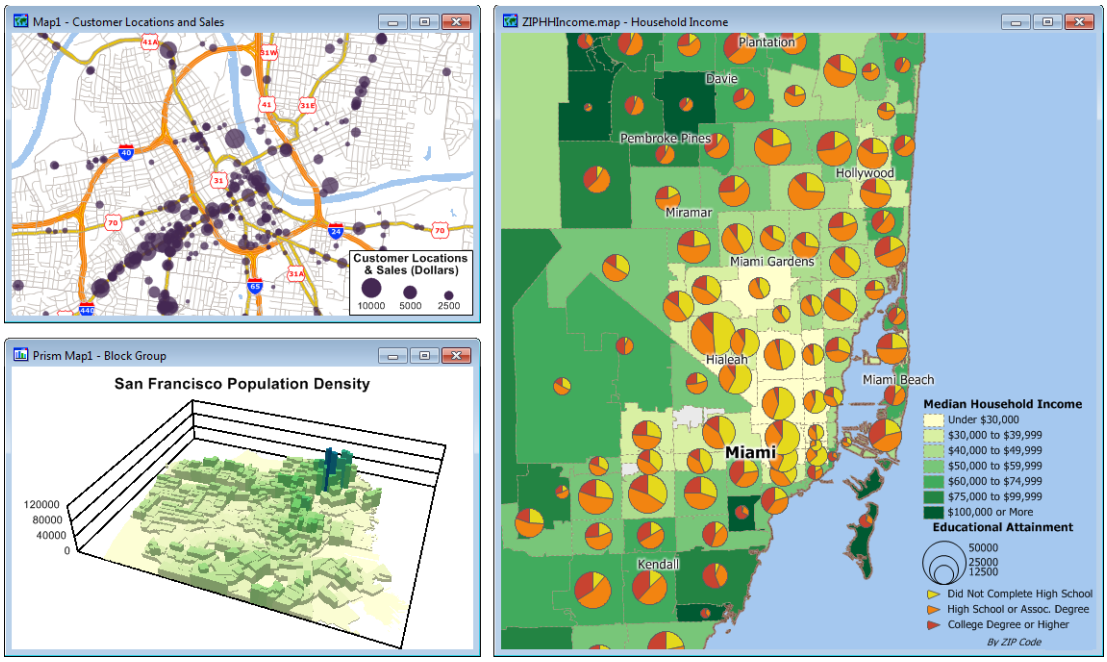
Maptitude displays the map using the active feature display settings.

CHAPTER 6:
Using Themes to Present Information

Maptitude can assemble information about map features to create a map that illustrates the patterns in the data. This is called a **thematic map**. Thematic maps use distinctive colors, symbols, and fill styles to portray data such as population, transit ridership, mode split, or income. The different styles highlight the similarities and differences among map features.

In some kinds of thematic maps, Maptitude changes the appearance of each feature based on its characteristics. In other types of thematic maps, Maptitude displays charts or symbols on each feature to illustrate comparative information. When data are portrayed in a thematic map, the information becomes easier to see, understand, and interpret.

If you would like to offer interactive thematic maps on your web site, contact Caliper Sales for information on licensing Maptitude for the Web.



In this chapter:

About Map Themes

Thematic maps illustrate the characteristics of map features, so that the characteristics are easy to see and understand. A map theme is a styling of map features according to the values of one or more data fields. Maptitude has six theme types:

- Color themes
- Pattern/Multiple Symbol themes
- Dot-density themes
- Pie and bar chart themes
- Size themes
- 3D themes

You create themes on a single map layer. A map can show any number of themes, and can even combine several types of themes on a single layer such as a sales territory layer with a color theme of total annual sales and a chart theme showing sales by quarter.

Deciding Which Type of Theme to Use

You choose the theme you want based on the number of fields of data you want to show and the types of data you wish to present:

- Most theme types can be used with any point, line, and area layer.
- Dot-density themes and 3D themes, however, can only be used with area layers.
- To illustrate the values of two or more fields, choose either a chart theme or a dot-density theme.
- To illustrate the values of a single field, you can choose from all of the theme types, using the following guidelines:

If your data contain...	For example...	Then you should...
Counts or amounts	Population, Sales	Use any kind of theme
Percentages, ratios, or averages	Mean Income, Percent Hispanic	Avoid dot-density themes
Negative numbers	Change in Population	Use color or pattern/symbol themes
Non-numeric information	Zoning, Sales Territory	Use color or pattern/symbol themes

MapWizard®

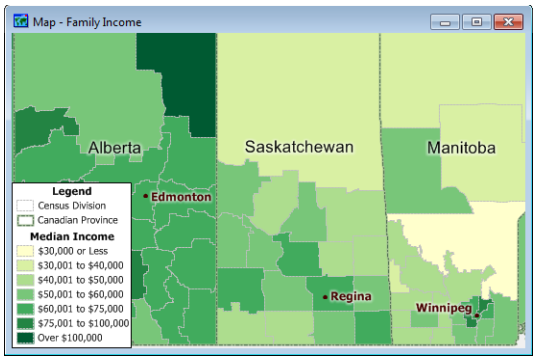
Maptitude offers unique MapWizard® instant mapping technology that looks over the data for a map layer and designs the theme to communicate the information most effectively.

You use MapWizard instant mapping by clicking on one of the MapWizard buttons on the Standard toolbar or by choosing one of the commands that create a theme. All you need to do is choose the type of theme you want to use and the field or fields you want to see. Maptitude reviews the data, creates the theme, and chooses colors, styles, and patterns that make your map clear and attractive.

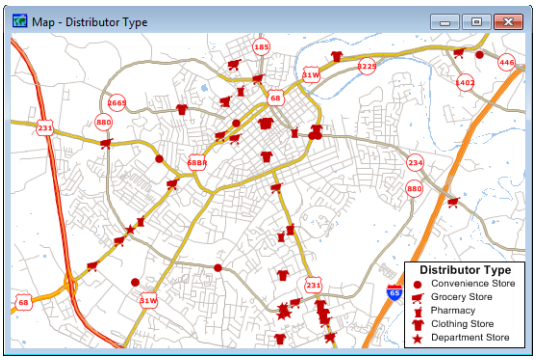
Once you create a theme using MapWizard, you can change or customize the theme settings in any way you like. If you'd like to preview how the theme will look, just click the Apply button at the bottom of the Theme dialog box. If you like the way the theme looks, click OK; if not, click Cancel.

Color and Pattern/Symbol Themes

Color themes and pattern/symbol themes work in the same way. They both group the features in a map layer into classes, based on the value of a data field. Each class contains all of the features with similar values for the chosen field. When the map is drawn, the classes are displayed using different colors, patterns (area and line layers), or symbols (point layers).



This color theme shows income classes



This symbol theme shows store type classes

Options for Color and Pattern/Symbol Themes

There are many options you can choose when creating a color or pattern/symbol theme.

Methods

Maptitude lets you set up the classes using any of several methods, described in the following table:

Method	Meaning
Equal number of features	Each class has the same number of features. If you ask for four classes, each one will contain one-fourth of the features.
Equal size intervals	Each class has the same range of numbers (for example, 0-1000, 1000-2000, and so on). Each class will probably have a different number of features.
Optimal breaks	Each class is a cluster of values that minimizes within-group variance using the Fisher-Jenks Algorithm version of the Optimal method of irregular class creation. This method is sometimes called Natural Breaks.
Equal feature area	The total land area of features in each class is about the same, so you see the same amount of each color or pattern on the map. It can only be used for area features.
Equal feature length	The total length of features in each class is about the same, so you see the same amount of each line style or line color on the map. It can only be used for line features.
List of values	Each value is assigned to a separate class. This and Manual are the only classification methods for character (string) fields, and is useful if there are only a few different numeric values.
Standard deviation	Features are split into classes for a specified number of standard deviations above and below the average value.
Nested averages	Features are split into two classes based on the average value. Each of those classes is split in two based on the average value for features in the class, and so on. This method creates either 2, 4, 8, 16, 32, 64, 128, 256, or 512 classes.
Manual	The minimum and maximum value for each class or the number or percentage of features in each class are set manually. See page 132 for more information.

Number of Classes

Maps communicate most effectively when there are only a small number of classes, about five or six. Maptitude lets you choose to create up to 512 classes in your themes.

The number of classes that appear in your theme may be higher or lower than you ask for. For example, Maptitude adds an extra class (called "Other") when there are features that have no data or that contain a value not assigned to any class. Also, if you ask for eight classes when there are only six features on the map, you will get fewer classes than you asked for.

NOTE: To choose the default number of classes to use, choose ***Edit-Preferences*** and click the Theme tab.

Ignore Values Above or Below

These options let you create a theme that ignores features with values higher or lower than some limit you set. For example, you could create a color theme showing the sales volume of all your large customers by ignoring the ones with a sales volume below a certain level. Features whose values are not within the range you choose are assigned to the "Other" class.

Std. Dev. Per Class

When you use the standard deviation method, Maptitude creates classes that are one standard deviation in size. To change the size of the classes, enter a different number here.

Break At

This option forces a separation between classes at the value you specify. Use the Break At option to make sure that features with values below zero are shown differently from those with values above zero. For example, if you are creating a theme to illustrate a field called Population Growth, this option makes sure that areas with positive population growth look different from areas with negative population growth. You can also use a number other than zero. For example, you could use the number 100 if your data were percentages and you wanted to distinguish features with values above or below 100 percent.

Treat Zeros as Missing Values

Some database programs, like dBASE, have no way of indicating that a particular piece of data is missing or unavailable. A zero value for Population in a dBASE file may mean the population is zero, or it may mean the population is unknown.

If this option is checked, Maptitude assumes that a value of zero means that the real value is not known. Features with a zero value will be placed in the "Other" class, and Maptitude will not take them into account when building the classes.

Round Off the Values in Each Class

If this option is checked, Maptitude rounds off the low and high values in each class to make the legend easier to read. Maptitude rounds off each number as much as it can without changing the assignment of features to classes.

Include Counts in Legend

If this option is checked, the legend will display the number of map features that fall within each class.

Styles

For any class in a color, pattern, or symbol theme, you can customize the style and change the text that describes it in the map legend. This lets you tailor every aspect of a thematic map.

Maptitude includes a collection of predefined color and pattern sets. If you choose one of these predefined color or pattern sets, Maptitude will update the appearance of all the classes in that theme. You can also update the style of each class individually.

NOTE: To choose the default colors or patterns for themes, choose ***Edit-Preferences*** and click the Theme tab.

Maptitude has a special color ramp feature you can use to set the colors for a color theme. The color ramp lets you pick a starting color and an ending color, and then fills in the rest of the colors to make a gradual transition from the first to the last. If you used the Break At option described on page 154, you can pick a starting color, a color for the break point, and an ending color, and let Maptitude fill in the rest.

Creating Color and Pattern Themes

You create color, pattern, and symbol themes in exactly the same way. You choose the layer you want to map, then pick the data field you want to see or create a formula field. MapWizard will take care of the rest, or you can customize the map settings to display the data any way you want.

When you create a theme using a formula field instead of an existing data field, Maptitude adds the formula field to the layer. You can then display that formula field in a dataview and use it to create more themes or to label map features.

If you update data for any records and they no longer fall within the theme classes, the features will be placed in the "Other" class. You can recalculate the classes, based on the current settings, by clicking **Recalculate**. This will not change the number or style of the classes, but may change the lower and upper bounds of the classes based on the up-to-date data.

If you create a color or pattern theme for non-topological areas, the theme is normally applied to the border rather than to the fill. A color theme will be displayed as a thin black line with the color for the class on the inside of the border. A pattern theme will be displayed as a line pattern for each class. Where areas share edges, the line pattern will be that of the last area to be drawn.

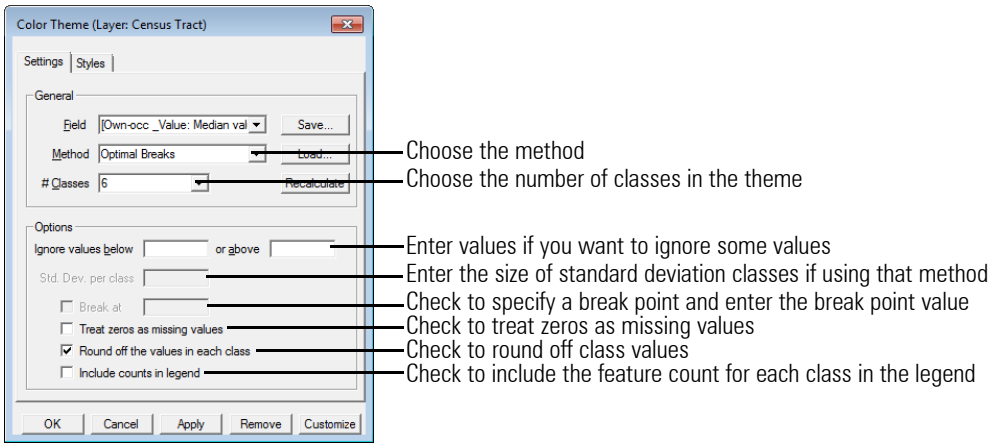
▶ To Add a Color, Pattern, or Symbol Theme to a Map

1. Choose the layer you want from the drop-down list on the Standard toolbar.
2. Choose ***Map-Thematic Mapping-Color*** or click  on the Standard toolbar to display the Color Theme dialog box (or to create a symbol theme on a point layer or a pattern theme on an area or line layer click  , choose ***Map-Thematic Mapping-Multiple Symbol***, or choose ***Map-Thematic Mapping-Pattern***).
3. Choose a field from the Field drop-down list, or choose Formula at the end of the list to create a formula field. Type several letters to limit the fields in the drop-down list to those containing the text you enter.

TIP: See "Creating a Formula Field" on page 195 for more information.

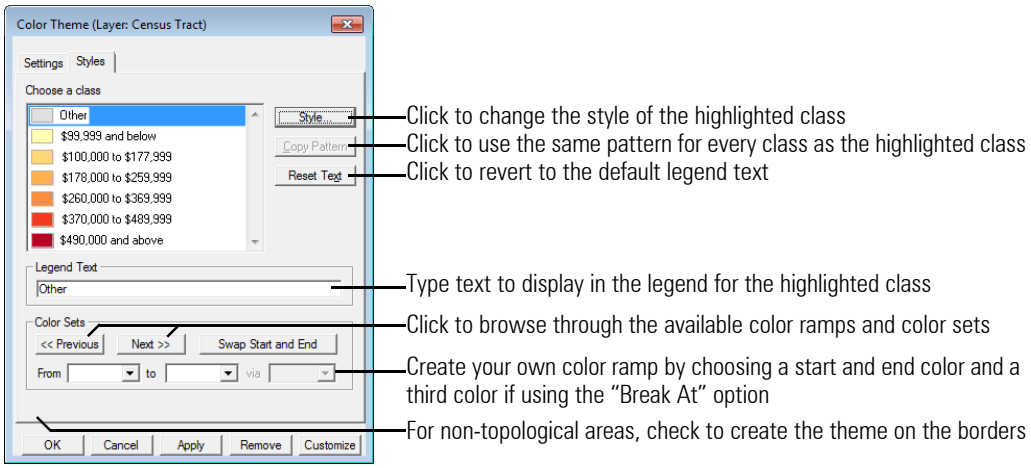
MapWizard fills in all the other settings in the dialog box.

4. Make choices as follows:



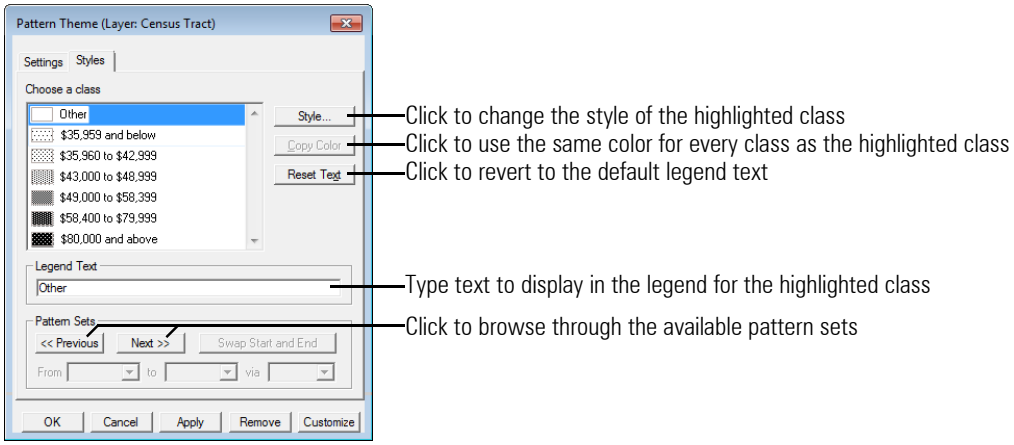
TIP: To learn about using the Save and Load buttons, see "Saving Theme Settings" on page 172.

5. Click the Styles tab and make choices as follows for color themes:



TIP: For more information on styles see "Using Styles" on page 81.

Make choices as follows for pattern/symbol themes:



6. Click OK.

Maptitude draws the map with the color or pattern theme and displays a legend.

▶ To Change a Color or Pattern Theme

1. Choose the appropriate command from the ***Map-Thematic Mapping*** submenu or click  or  on the Standard toolbar.
2. Change the field, method, number of classes, options, and styles as desired.

   If you just want to recalculate the classes, based on the current settings, to reflect changes to the data, click **Recalculate**. You can preview the changes by clicking **Apply**.
3. Click **OK**.

Maptitude draws the map with the modified theme.

▶ To Create a Color Theme from a Dataview

1. Select the data field you want to map by clicking on the column heading. Maptitude highlights the entire column.
2. Choose ***Map-Thematic Mapping-Color***.

Maptitude creates a new map that uses a color theme to illustrate the values of the chosen field.

NOTE: To create a theme from a dataview, the data must be connected to a map, otherwise the MapWizard buttons are disabled. To join data to a map see "Joining Your Data to a Map" on page 530.

▶ To Turn Off a Color, Pattern, or Symbol Theme

1. Choose the appropriate command from the ***Map-Thematic Mapping*** submenu or click  or  on the Standard toolbar.
2. Click **Remove** to clear the settings and close the dialog box.

Maptitude draws the map without the theme.

Try It Yourself: Creating Color Themes

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the map **nesouth.map** in the Tutorial folder. The map has two layers, County and Highway, for southern New England.
2. Choose the **County** layer from the drop-down list on the Standard toolbar.
3. Click  on the Standard toolbar.
4. Choose **Population** from the Field drop-down list and click **OK** to see a color thematic map of county population divided into eight classes.
5. Click  again.
6. Choose **6** from the # Classes drop-down list, click the Styles tab to display the Style page, and click **Next>>** until you find a color set you like.
7. Click **OK** to see the theme with six classes and your chosen color set.
8. Click  a third time, then click **Remove** to remove the color theme.
9. Choose the **Highway** layer from the drop-down list on the Standard toolbar.
10. Click  , choose **Lanes** from the Field drop-down list, choose **List of Values** from the Method drop-down list, and click **OK**. The highways are drawn showing different colors for different numbers of lanes.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Setting Up Classes Manually for a Color or Pattern Theme

When you create a color or pattern theme, you have the option to manually customize the classes. To do this, you choose the number of classes you want to create, and then enter one of the following for numeric fields:

- The low and high value for each class (Low & High Values and Steps methods)
- The number of features in each class (Counts method)
- The percentage of features in each class (Percents method)

For string fields, choose the number of classes you want to create and then enter the value for each class.

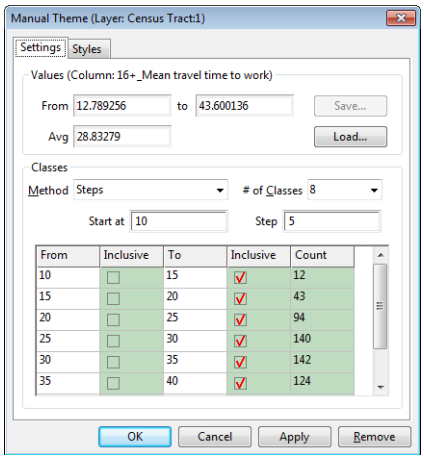
When you set the low and high values for each class, you are free to leave gaps between the classes. You could, for example, create a theme with some classes for very high values, and some classes for very low values, but no classes for values in the middle. This theme would not highlight the map features with middle or average values, but would highlight the highest and lowest.

When you choose the number or percentage of features in each class, you can choose whether you want to include features starting with the highest or the lowest values of the chosen data field. For example, suppose you have a tax parcel database that contains the property value for each parcel. You could create a theme with three bins, containing 5 percent, 10 percent, and 25 percent of the parcels, starting with the highest value. The theme would show the highest valued properties in three groups, and properties that are not in the top 40 percent would be placed in the Other class.

▶ To Create a Color or Pattern Theme with Manual Classes

1. Choose ***Map-Thematic Mapping-Color*** or click  on the Standard toolbar to display the Color Theme dialog box (or choose ***Map-Thematic Mapping-Multiple Symbol*** to display the Pattern Theme dialog box for a point layer, or choose ***Map-Thematic Mapping-Pattern*** to display the Pattern Theme dialog box for an area or line layer).
2. Choose a field from the Field drop-down list, or choose Formula at the end of the list to create a formula field. MapWizard fills in all the other settings in the dialog box.
3. Click **Customize** to display the Manual Theme dialog box.

TIP: For more information on formulas, "Creating a Formula Field" on page 195.



4. Choose a method and make choices as follows:

Method	How to use it...
Low & High Values	Type the low and high value for each class. Check Inclusive to include the value in the range.
Steps	Type the low value to use to start the first class and the type the step interval.
Counts	Type the number of features in each class. Check Highest Values or Lowest Values to start with the features with the highest or lowest values.
Percents	Type the percentage of features in each class. Check Highest Values or Lowest Values to start with the features with the highest or lowest values.
List of Values	Type the value for each class

5. Click OK.

Maptitude draws the map with the color or pattern theme and displays a legend.

Maptitude will never put features that have identical values into separate classes. As a result, a class may contain more features than you asked for.

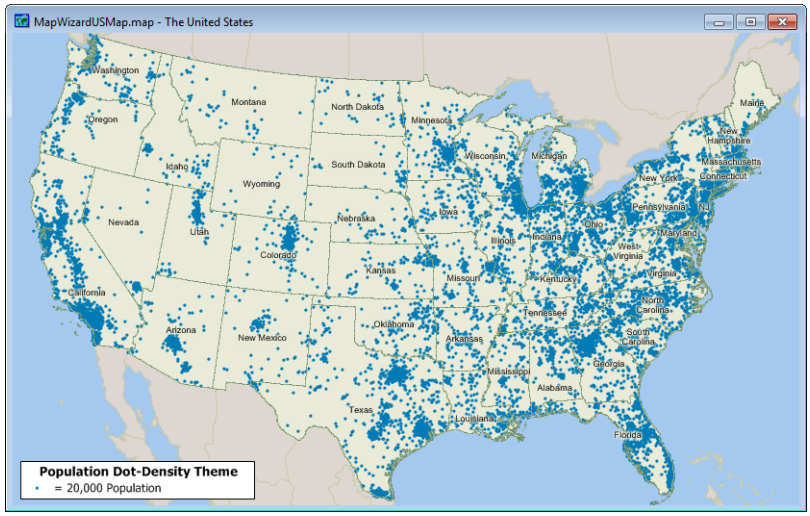
If the total of the counts or percents you enter is more than the number of features, Maptitude will create classes until it runs out of features, and then it will stop. If the total of the counts or percents you enter is less than the number of features, Maptitude will put the remaining features into the Other class.

Try It Yourself: Creating Manual Themes

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the map **nesouth.map** in the Tutorial folder.
2. Verify that the **County** layer is chosen in the drop-down list on the Standard toolbar.
3. Choose ***Map-Thematic Mapping-Color*** or click  on the Standard toolbar.
4. Choose **[Per Capita Income]** from the Field drop-down list and **4** from the # Classes drop-down list.
5. Click **Customize** to display the Manual Theme dialog box.
6. Highlight the first class in the scroll list and change the To value to **14999**.
7. Highlight the second class and change the From and To values to **15000** and **19999**.
8. Highlight the third class and change the From and To values to **20000** and **24999**
9. Highlight the last class and change the From value to **25000**.
10. Click **OK**. Maptitude draws the map with the a color theme showing your manual theme settings.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Dot-Density Themes

A dot-density theme uses dots or other symbols on the map to show the values of one or more numeric data fields for an area layer. Each dot on a dot-density map represents some amount of data. For example, in the following map, each dot represents 20,000 people. Densely populated urban areas have many dots and sparsely populated areas have few dots.



Creating Dot-Density Themes

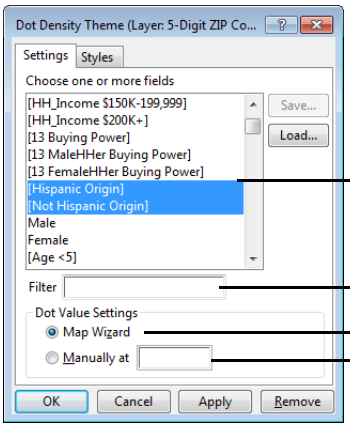
You create a dot-density theme by choosing the area layer you want to map and one or more data fields that you want to see. MapWizard takes care of the rest by picking a dot value that will provide not too many and not too few dots in each area. If you prefer, you can choose the dot value yourself by typing it into the dialog box. You can also choose the symbol you want and customize the text that appears in the map legend.

▶ To Add a Dot-Density Theme to a Map

1. Choose the area layer you want from the layer list on the Standard toolbar.
2. Choose ***Map-Thematic Mapping-Dot Density*** or click on the Standard toolbar to display the Dot-Density Theme dialog box.

TIP: To learn about using the Save and Load buttons, see "Saving Theme Settings" on page 172.

3. Make choices as follows:



Choose one or more fields from the scroll list

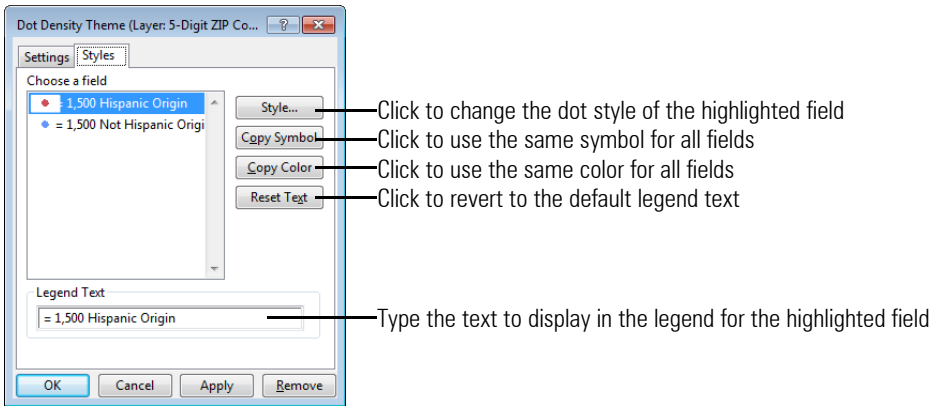
Optionally, enter text to use for filtering the fields in the scroll list

Choose to let MapWizard determine the dot value setting

Choose to manually set the dot value setting and enter a value

TIP: For more information on styles see "Using Styles" on page 81.

4. Click the Styles tab and make choices as follows:



5. Click **OK**.

Maptitude draws the map with the dot-density theme and displays a legend.

▶ To Create a Dot-Density Theme from a Dataview

1. Select the data field you want to map by clicking on the column heading. To use more than one field, shift-click on additional column headings to highlight them.
2. Choose ***Map-Thematic Mapping-Dot Density***.

Maptitude creates a new map using a dot-density theme to illustrate the values of the chosen field(s).

NOTE: To create a theme from a dataview, the data must be connected to a map, otherwise the MapWizard buttons are disabled. To join data to a map see "Joining Your Data to a Map" on page 530.

▶ To Turn Off a Dot-Density Theme

1. Choose ***Map-Thematic Mapping-Dot Density*** or click on the Standard toolbar to display the Dot-Density Theme dialog box.
2. Click **Remove**.

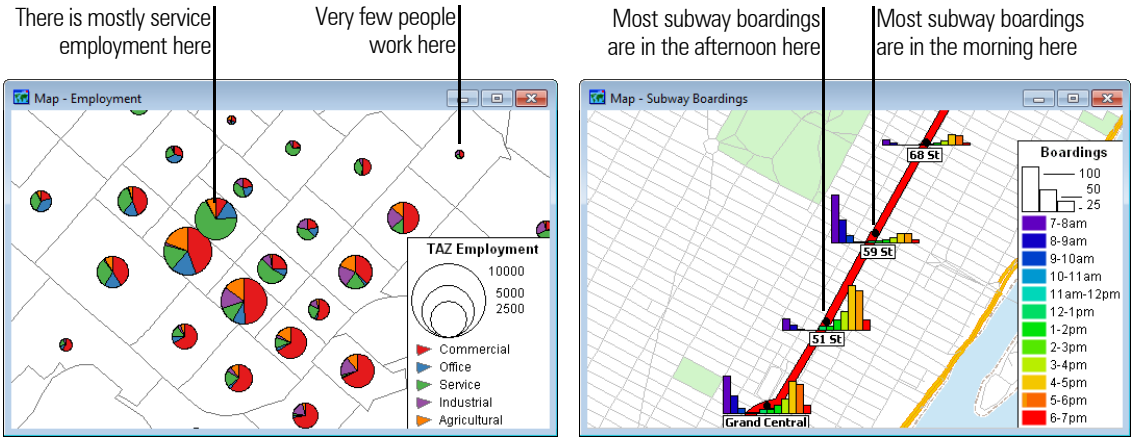
Maptitude draws the map without the dot-density theme.

Try It Yourself: Creating Dot-Density Themes

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **states.map** in the Tutorial folder.
2. Click on the Standard toolbar to display the Dot Density theme dialog box.
3. Choose **[Hispanic Origin]** and **[Not Hisp.]** in the Choose One or More Fields list scroll list and click **OK**. Maptitude displays a dot-density map showing the distribution of the Hispanic and Non-Hispanic population, with a dot for every 200,000 people.
4. Click again and type **100,000** in the Manually At text box.
5. Click the **Styles** tab to display the Styles page.
6. Click **Style** to display the Style dialog box, type **4** in the Size box, choose a darker blue from the Color drop-down list, and click **OK** to return to the Dot Density Theme dialog box.
7. Click **Copy Symbol** to copy the smaller symbol to both fields.
8. Click **OK** to see the theme with the new style of dots for every 100,000 people.
9. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Pie and Bar Chart Themes

Pie and bar chart themes place pie or bar charts on map features to illustrate the data that go with each feature.



Maptitude has 5 chart styles from which you can choose:

- Pie chart
- Vertical bar chart
- Stacked vertical bar chart
- Horizontal bar chart
- Stacked horizontal bar chart

All but pie charts have a 3D option. Stacked bar charts can only be used if you choose more than one data field.

Chart themes can be created on point, line, and area layers. When you display charts on a line layer, the chart is centered at the midpoint of the line. For point layers, the chart is centered at the location of the point. For area layers, the chart is displayed at the center of the area.

Creating Chart Themes

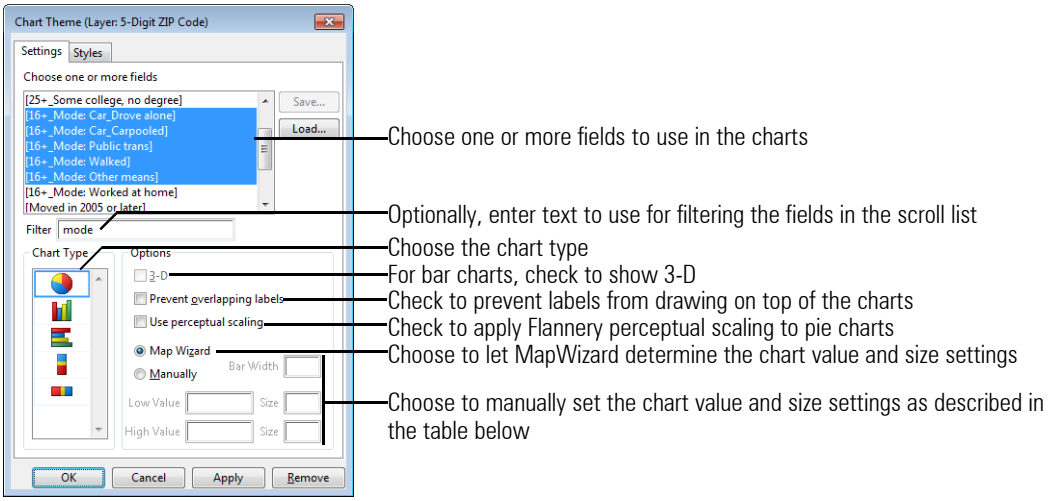
You create a chart theme by choosing the layer you want to map, one or more numeric data fields that you want to see, and the type of chart you want. MapWizard will take care of the rest. If you want, you can control the minimum and maximum size of the charts, and indicate the values to which these sizes should correspond. The size of a pie chart is its diameter, the size of a vertical bar chart is its height, and the size of a horizontal bar chart is its width. Chart sizes are set in points.

▶ To Add a Chart Theme to a Map

1. Choose the layer you want from the layer list on the Standard toolbar.
2. Choose ***Map-Thematic Mapping-Chart*** or click on the Standard toolbar to display the Chart Theme dialog box.

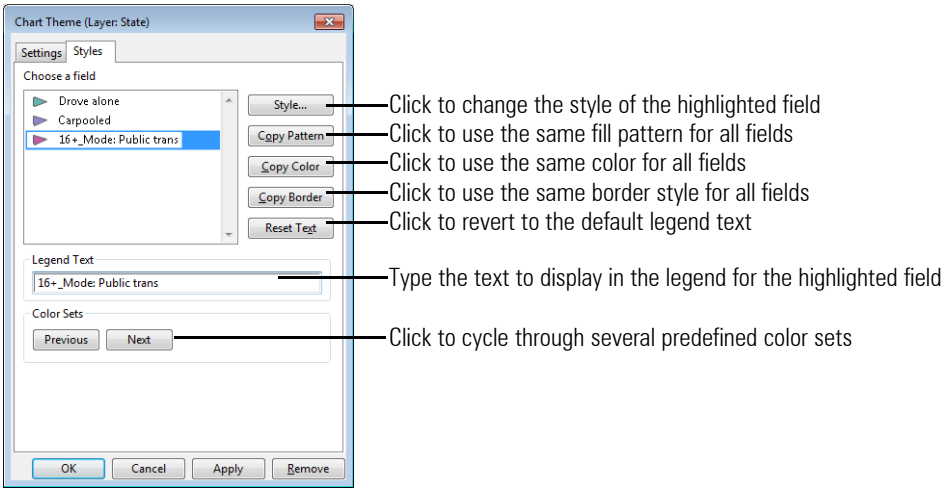
TIP: To learn about using the Save and Load buttons, see "Saving Theme Settings" on page 172.

3. Make choices as follows:



This entry...	Does this...
Low Value	Features with values below this level will not have a chart drawn
Low Size	Features with the low value will be this size
High Value	Features with values at or above this level will have a chart of maximum size
High Size	Features with values at or above the high value will be this size
Bar Width/Height	Sets the width of vertical bars or the height of horizontal bars

4. Click the Styles tab and make choices as follows:



5. Click **OK**.

▶ To Create a Chart Theme from a Dataview

1. Select the data field you want to map by clicking on the column heading. To use more than one field, shift-click on additional column headings. Maptitude highlights the selected columns.
2. Choose ***Map-Thematic Mapping-Chart***.

Maptitude creates a new map that uses a chart theme to illustrate the values of the chosen field. If you chose a single field, Maptitude creates a 3-D vertical bar chart. If you chose more than one field, Maptitude creates a pie chart.

NOTE: To create a theme from a dataview, the data must be connected to a map, otherwise the MapWizard buttons are disabled. To join data to a map see "Joining Your Data to a Map" on page 530.

▶ To Turn Off a Chart Theme

1. Choose ***Map-Thematic Mapping-Chart*** or click on the Standard toolbar to display the Chart Theme dialog box.
2. Click **Remove**.

Maptitude draws the map without the chart theme.

Try It Yourself: Creating Chart Themes

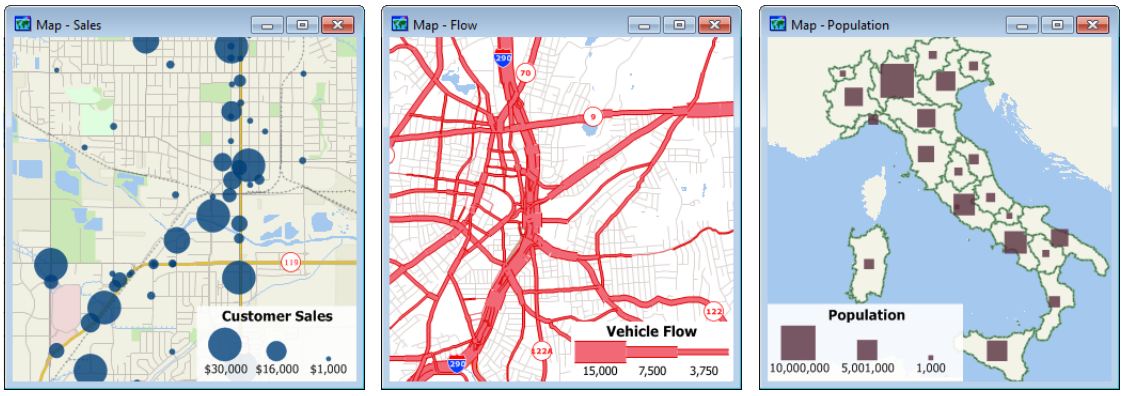
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **mncenter.map** in the Tutorial folder.
2. Verify that **5-digit ZIP** is the working layer and click on the Standard toolbar.
3. Choose **[HU Owner Occupied]** and **[HU Renter Occupied]** by clicking and dragging on the Choose One or More Fields list, and click **OK**. Maptitude displays a pie chart theme showing the ratio of owners to renters.
4. Click again, choose the stacked vertical bar from the Chart Type drop-down list, and click **OK** to see the same data shown with a bar chart for each ZIP Code.
5. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Size Themes

A size theme uses symbols of different sizes or lines of different widths to show the value of a data field. Size themes can be created on point, line, or area layers.

Creating Size Themes

You create a **size theme** by choosing the layer you want to map, then choosing the numeric data field that you want to see. MapWizard will take care of the rest. If you want, you can control the minimum and maximum size of the symbols or lines, and indicate the values to which these sizes should correspond. Symbol sizes and line widths are always set in points.



TIP: If your points are clustered close together, you may want to set the style of the layer to be semi-opaque so that overlapping symbols are clearer.

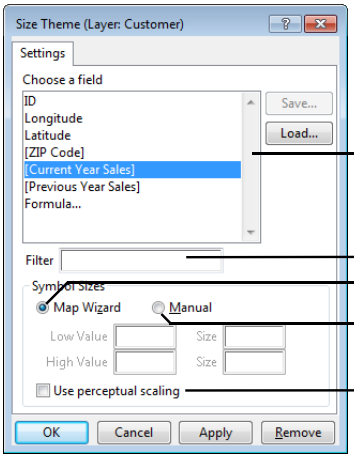
The style of a size theme depends on the type of layer. On a point layer, Maptitude uses the symbol and color you have chosen for the layer, and adjusts the size of the symbol based on the value of the field you choose. Similarly, on a line layer, Maptitude uses the line style and color you have chosen for the layer and adjusts the width of the lines based on the value of the field you choose. To change the appearance of a size theme on a point or line layer you must change the style of the layer. On an area layer, Maptitude displays a symbol at the center of the area, and adjusts the size of the symbol based on the value of the field you choose. You can customize the color and symbol that are used to show the size theme on an area layer.

▶ To Add a Size Theme to a Map

1. Choose the layer you want from the layer list on the Standard toolbar.
2. Choose ***Map-Thematic Mapping-Size*** or click on the Standard toolbar to display the Size Theme dialog box.

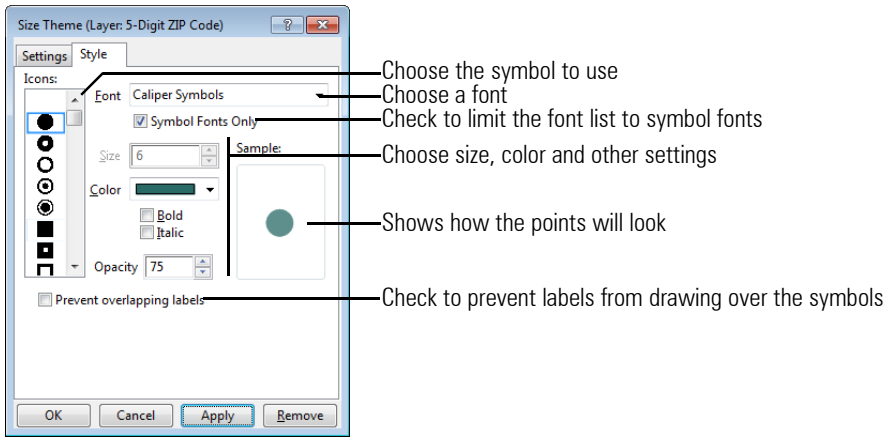
TIP: To learn about using the Save and Load buttons, see "Saving Theme Settings" on page 172.

3. Make choices as follows:



This entry...	Does this...
Low Value	Features with values below this level will not have a symbol drawn
Low Size	Features with the low value will be this size
High Value	Features with values at or above this level will have a symbol of maximum size
High Size	Features with values at or above the high value will be this size

4. If the current layer is an area layer, click the Style tab to display the Style page and make choices as follows:



5. Click OK.

Maptitude draws the map with the size theme, and displays a legend.

▶ To Create a Size Theme from a Dataview

1. Choose the numeric data field you want to map by clicking on the column heading. Maptitude highlights the selected column.
2. Choose ***Map-Thematic Mapping-Size***.

Maptitude creates a new map that uses a size theme to illustrate the values of the chosen field.

NOTE: To create a theme from a dataview, the data must be connected to a map, otherwise the MapWizard buttons are disabled. To join data to a map see "Joining Your Data to a Map" on page 530.

▶ To Turn Off a Size Theme

1. Choose ***Map-Thematic Mapping-Size*** or click on the Standard toolbar to display the Size Theme dialog box.
2. Click **Remove**.

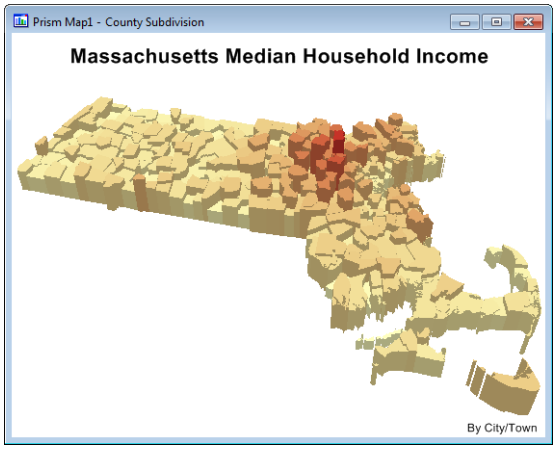
Maptitude draws the map without the size theme.

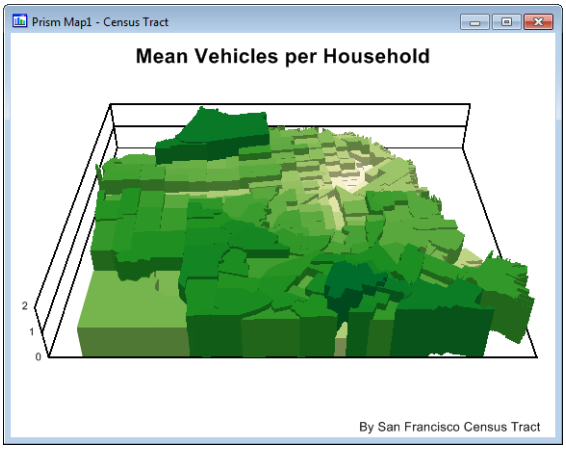
Try It Yourself: Creating Size Themes

1. Choose ***File-Open*** or click on the Standard toolbar, then open **rhodeis.map** in the Tutorial folder.
2. Choose the **Highway** layer from the drop-down list on the Standard toolbar.
3. Click on the Standard toolbar.
4. Choose **Lanes** from the scroll list and click **OK** to see a scaled symbol theme showing the number of lanes for each highway segment.
5. Choose the **Place** layer from the drop-down list on the Standard toolbar.
6. Click again.
7. Choose **Population** from the scroll list and click **OK** to see a size theme showing the relative population for the cities and towns in Rhode Island.
8. Choose ***File-Close*** and click **No** to close the map without saving any changes.

3D Themes

A 3D theme uses prisms and color to show the relative values of a single data field where the height of the prism indicates areas with higher values. 3D themes can only be created on an area layer, such as postal codes, states, or sales territories.





There are two important differences between 3D themes and the other types of themes:

- Maptitude creates a 3D themes in its own figure window alongside your current map.
- Maptitude reads the data for a 3D theme when the theme is created, so subsequent changes in the data are not reflected in the 3D theme. To have those changes reflected, you must recreate the 3D theme.

If you have elevation values and want to show the map on a surface, you can create a 3D map. For more information, see *Chapter 12: Surface Analysis Tools*.

Creating a 3D Theme

You create a 3D theme by choosing the area layer you want to map and the numeric data field you want to see. The theme can show all the visible features in the layer or a selection set. For more information on selection sets, see *Chapter 8: Queries and Selection Sets*.

Maptitude allows you to customize a 3D theme in a variety of ways:

- Add a title and/or footnote
- Display a legend
- Apply logarithmic scaling to your data
- Change the colors by selecting a predefined color set or by using the color ramp
- Adjust its orientation and height

You change the orientation of a 3D theme by adjusting the angles at which it is viewed. The **viewing angle** rotates the position of the map by degrees as if it were traveling around the face of a clock. The viewing angle can be set at any number between -180 and 180. The **vertical angle** tilts the map towards you or away from you at angles anywhere from 0 to 90 degrees, where 90 degrees is straight over it. You can also control the height of your 3D theme by setting a value between 1 and 100.

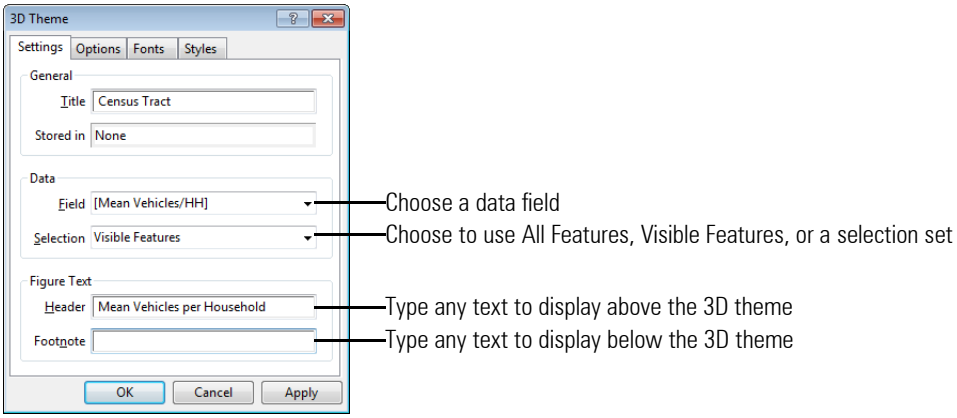
If your data set contains data with many similar low values and a few dramatically higher values, you may want to apply **logarithmic scaling** to your 3D theme. Logarithmic scaling will make the similar lower values easier to distinguish. It makes the higher values appear less dramatically different in size.

▶ To Create a 3D Theme

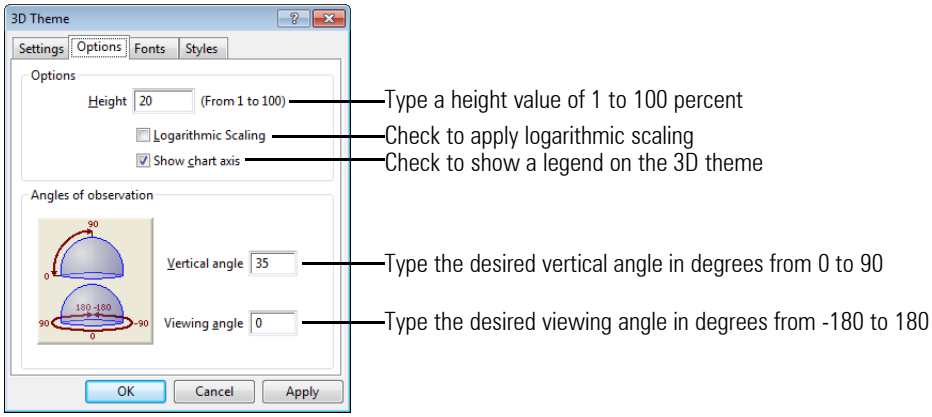
1. Choose the area layer you want from the drop-down list on the Standard toolbar.
2. Choose ***Map-Thematic Mapping-3D*** or click on the Standard toolbar to display the 3D Theme dialog box.

TIP: Type several letters to limit the fields in the Field drop-down list to those containing the text you enter.

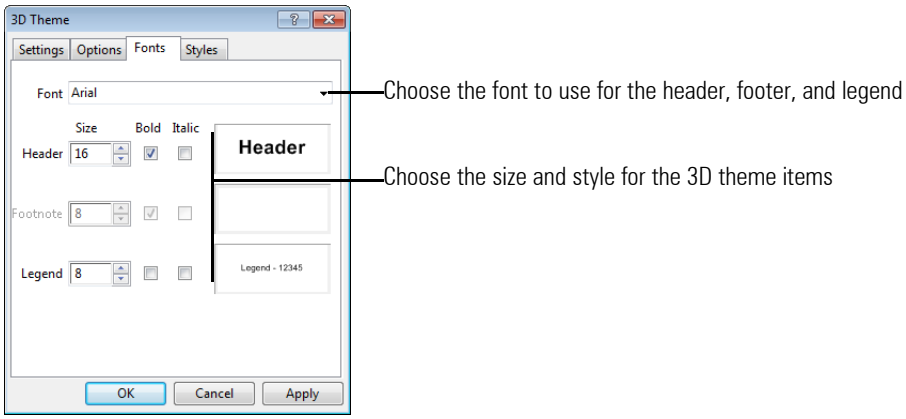
3. Make choices as follows:



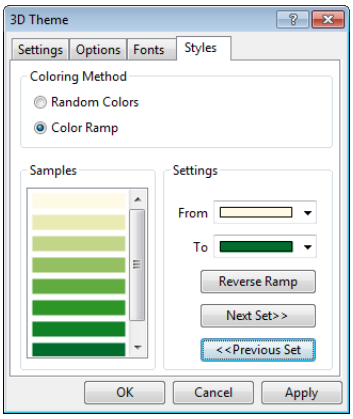
4. Click the Options tab to display the Options page and make choices as follows:



5. Click the Fonts tab to display the Fonts page and make choices as follows:



6. Click the Styles tab to display the Styles page and make choices as follows:



To do this...	Do this...
Choose a predefined color set	Choose **Random Colors** and click **<<Previous Set** or **Next Set>>** to browse through the available color sets
Use the color ramp	Choose **Color Ramp**, then choose a starting and ending color, or click **<<Previous Set** or **Next Set>>** to browse through the available color sets
Reverse the order of colors	Click **Reverse Ramp**

7. Click **OK**.

Maptitude draws the 3D theme with the settings you chose and displays the 3D Controls toolbox.

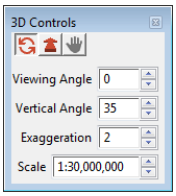
▶ To Customize a 3D Theme

1. Double-click on the 3D theme figure window, or right-click on the figure window and choose ***Properties***, to display the 3D Theme Properties dialog box.
2. Make changes to the 3D theme settings, options, fonts, or styles as described in steps 3 through 6 of the previous how-to.
3. Click **OK**.

Maptitude draws the 3D theme with the changes you made.

▶ To Use the 3D Controls to Customize a 3D Theme

1. If the 3D Controls toolbox is not visible, choose ***Tools-3D-3D Toolbar*** to display the 3D Controls toolbox.



2. Use the tools or spinners as follows:

To do this...	Do this...
Change the viewing angle	Click to activate the Rotate tool, click on the 3D theme, and drag left or right. When you release the mouse button, the Viewing Angle spinner will show the new angle. Alternatively you can type an angle (from -180 to 180) and press Tab or click the up or down buttons in the Viewing Angle spinner.
Change the vertical angle	Click to activate the Rotate tool, click on the 3D theme, and drag up or down. When you release the mouse button, the Vertical Angle spinner will show the new angle. Alternatively you can type an angle (from -180 to 180) and press Tab or click the up or down buttons in the Vertical Angle spinner.
Zoom in or out	Click to activate the Zoom tool, click on the 3D theme, and drag up or down. When you release the mouse button, the Scale spinner will show the new scale. Alternatively, you can type a scale (the "1:" and commas are optional) and press Tab or click the up or down buttons in the Scale spinner.
Pan the 3D theme	Click to activate the Pan tool, click on the 3D theme, and drag in any direction. Some part of the 3D theme must always be at the center of the window.
Exaggerate the elevation	Type a value (from 0.1 to 10) and press Tab or click the up or down buttons in the Exaggeration spinner.

Try It Yourself: Creating 3D Themes

1. Choose ***File-Open*** or click on the Standard toolbar, then open the geographic file **nesouth.cdf** in the Tutorial folder.
2. Choose ***Map-Thematic Mapping-3D*** or click on the Standard toolbar to display the 3D Theme dialog box.
3. Choose **Population** from the Field drop-down list and click **OK**. Maptitude displays a 3D theme of population by county.
4. Double-click on the 3D theme to display the 3D Theme Properties dialog box.
5. Click the Options tab, and change the height to **15**, the vertical angle to **50**, and the viewing angle to **-30**.
6. Click the Styles tab, and click the **Color Ramp** radio button. Choose a pale yellow color from the From drop-down list, and a red color from the To drop-down list.
7. Click **OK**. Maptitude updates the 3D theme with the new settings.
8. Click in the 3D Controls toolbox and click and drag on the 3D theme to change the viewing and vertical angles.
9. Choose ***File-Close All*** and click **No to All** to close the map and 3D theme without saving any changes.

Printing 3D Themes

Maptitude prints 3D themes to any installed printer. When Maptitude prints the 3D theme, it uses the same font size, styles, and settings that you see on the screen.

▶ To Print a 3D Theme

1. Choose ***File-Print***, click on the Standard toolbar, or right-click on the 3D theme figure window and choose ***Print*** to display the Print dialog box.
2. Choose the printer and other settings.

3. Click OK.

Maptitude prints the 3D theme. You can interrupt printing at any time by clicking the Cancel button.

NOTE: To change paper size, orientation, or source, or to change other printer settings, click Properties in the Print dialog box.

Saving and Opening a 3D Theme

You can save the settings necessary to recreate a 3D theme in a figure file on disk so that you can use the 3D theme again. When you close a 3D theme figure window or exit the program, Maptitude alerts you if the 3D theme has changed since you opened it and asks if you want to save it in its most current form.

▶ To Save a 3D Theme

1. Choose ***File-Save*** or click  on the Standard toolbar, or right-click on the 3D theme figure window and choose ***Save***.
2. If you are saving the 3D theme for the first time, Maptitude displays the Save As dialog box. Type a name for the file and click Save.

Maptitude saves the 3D theme to a file on disk. Maptitude 3D theme files always have the extension .FIG.

▶ To Save a 3D Theme with a New Name or as a Different File Type

1. Choose ***File-Save As*** or right-click on the 3D theme figure window and choose Save As to display the ***Save As*** dialog box.
2. Choose to save the 3D theme as a Maptitude .fig file or choose a graphic file fomat (BMP, PNG, JPG, GIF, or TIFF) from the Files of Type drop-down list.
3. Type a new name for the file.
4. Click **Save**.

Maptitude saves the 3D theme in the chosen file type.

▶ To Open a Saved 3D Theme

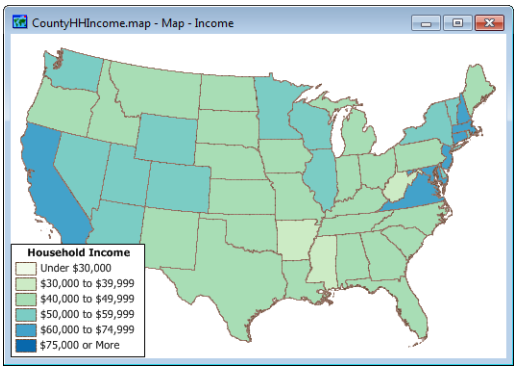
1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **Map, Dataview, Figure, Layout** from the Files of Type drop-down list.
3. Choose a figure file from the list.
4. Click **Open** to open the file and display the 3D theme.

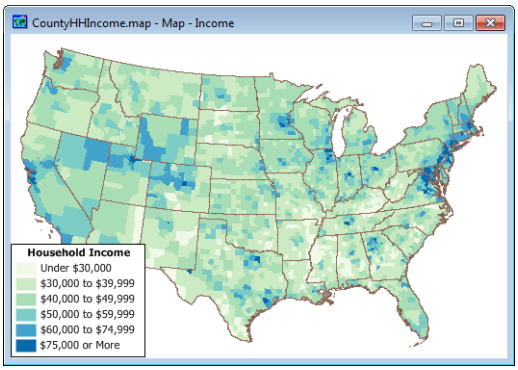
Saving Theme Settings

Maptitude lets you save the settings for a theme in a settings file that can then be used to apply the theme to different fields or different layers. You can save the settings for a color, pattern, dot-density, size, or chart theme. Here are some examples of when you might want to save a theme's settings:

- You want to create a number of maps that show vehicle flow and volume to capacity ratios and you want to use the same custom intervals in every map
- You need to create a number of maps with bar chart themes of transit stop boardings and alightings and you want to use the same custom colors for the bar charts in every map

If you have a map with a manual color theme of household income on states, you can quickly apply the same color theme with the same class breaks to another layer, such as counties (as shown below), or to another field, such as mean earnings.





You can also copy the settings from another thematic map in your workspace. For example, if you have a map with a color theme on the county layer, you can copy the settings from that theme to another layer in that map, or any other open map, without needing to first save the settings.

To save a theme's settings, you use the Save button in any of the theme dialog boxes. To use saved settings, or to copy settings from another open map, you use the Load button in any of the theme dialog boxes.

Settings are saved to a settings file. Settings files have the extension .STG.

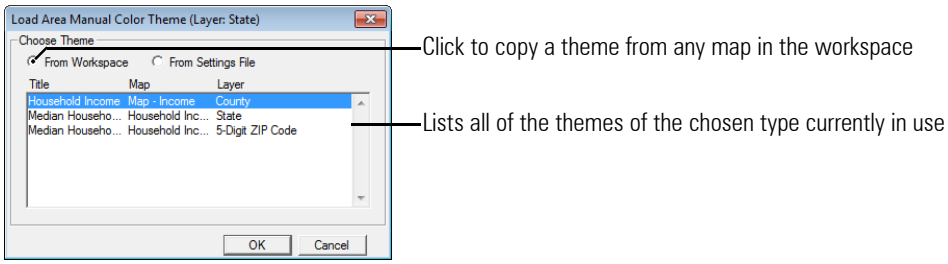
NOTE: To set the default settings file, choose ***Edit-Preferences*** and click ... on the Map tab.

If you have set up classes manually for a color or pattern theme and saved the settings, you can only load the settings from another manual map.

▶ To Copy Theme Settings from Another Map

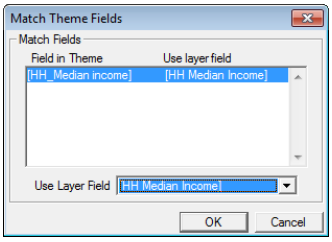
1. Create or open a map that contains the theme you want to copy.
2. Make the map to which you want to apply the theme the active map.
3. Choose the layer to which you want to apply the theme from the drop-down list on the Standard toolbar.

4. Choose the command or click the button to open the appropriate thematic map dialog box.
5. Click **Load**. Maptitude displays the Load Theme dialog box.



6. Click the **From Workspace** radio button.
7. Highlight a theme in the scroll list.
8. Click **OK** to close the Load Theme dialog box.

   If the layer you to which you are adding the theme does not contain the field on which the theme you are copying is based, Maptitude displays the Match Theme Fields dialog box.



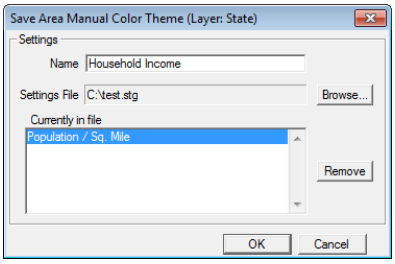
   The scroll list shows any fields that are used in the theme that are not in the current layer. For each field in the list, choose a corresponding field from the Use Layer Field drop-down list. Once every field has been assigned a matching field click **OK** to close the Match Theme Fields dialog box.

9. Click **OK**.

Maptitude adds a theme with the same general settings and styles to the chosen layer.

▶ To Save Theme Settings

1. Create a thematic map. Set all of the styles and legend text as you would like to have them saved.
2. Click **Apply** to apply the theme to the map. The Save button on the Settings page of the dialog box is enabled. If you are not on the Settings page, click the Settings tab.
3. Click **Save**. Maptitude displays the Save Theme dialog box.



4. Type a name for the theme in the Name edit box.

5. Click **OK** to return to the respective theme dialog box and click OK.

Maptitude saves the theme to the settings file.

▶ To Apply Saved Theme Settings to a Map

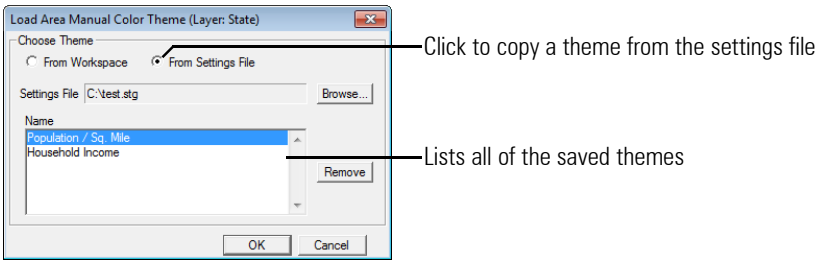
1. Choose the layer to which you want to apply a theme from the drop-down list on the Standard toolbar.
2. Choose the command or click the button to open the appropriate thematic map dialog box.
3. Load a theme as follows:

For this type of theme...	Do this...
Color, pattern, dot-density, chart, or size	Click Load.
Color or pattern theme with manual classes	Choose the field to which you want to apply the theme from the Field drop-down list in the Color Theme or Pattern Theme dialog box and click Manual. Maptitude displays the Manual theme dialog box. Click Load.

Maptitude displays the Load Theme dialog box.

TIP: Color and pattern themes with manual classes that are saved in a settings file can only be loaded from the Manual Theme dialog box.

4. Click the **From Settings File** radio button. All of the appropriate saved themes are listed in the scroll list.
5. Highlight a theme in the scroll list.
6. Click **OK**. Maptitude closes the Load Theme dialog box.



If the layer does not contain the field on which the theme you are copying is based, Maptitude displays the Match Theme Fields dialog box. For each field in the list, choose a corresponding field from the Use Layer Field drop-down list. Once every field has been assigned a matching field click **OK** to close the Match Theme Fields dialog box.

If you are using a theme that contains manual class settings, and you have chosen a field other than the one used when the theme settings were saved, Maptitude displays a confirmation dialog box. Click **Yes** to apply the theme class and style settings to the chosen field.

7. Click **OK**.

Maptitude adds the theme to the chosen layer.

▶ To Remove Themes from the Settings File

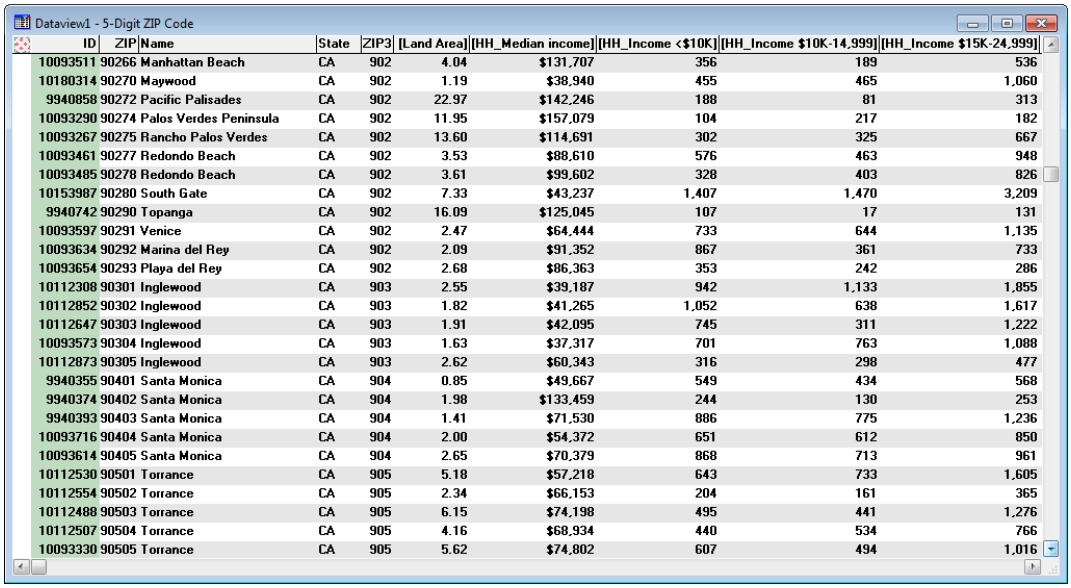
1. Choose the command or click the button to open the appropriate thematic map dialog box.
2. Click **Load** to display the Load Theme dialog box and click the From Settings File radio button or click **Save** to display the Save Theme dialog box.
3. Highlight the theme you want to delete in the scroll list.
4. Click **Remove**. Maptitude displays a Confirm dialog box.
5. Click **Yes**. Maptitude removes the chosen settings from the settings file.
6. Click **OK** to close the Load Theme or Save Theme dialog box.
7. Click **Cancel**.

Maptitude closes the thematic map dialog box.

CHAPTER 7:
Working with Tables, Databases, & Charts

Maptitude makes maps using data stored in geographic files, databases, and spreadsheets, including Oracle Spatial, Microsoft Access and Microsoft Excel.

When you are working with a map you can see the data associated with map features by using the Info or Hover tools. Alternatively, you can display the data in tabular form, using dataviews. **Dataviews** let you arrange the columns and rows of information any way you like and customize the appearance of the data. You can also edit data in dataviews, create **formula fields** to display calculated values, and compute statistics for records shown in a dataview.



Dataview1 - 5-Digit ZIP Code

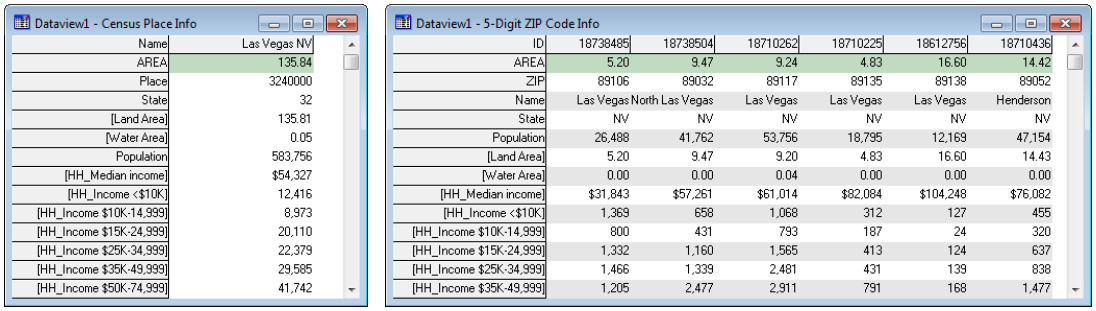
ID	ZIP	Name	State	ZIP3	[Land Area]	[HH_Median income]	[HH_Income <$10K]	[HH_Income $10K-14,999]	[HH_Income $15K-24,999]
10093511	90266	Manhattan Beach	CA	902	4.04	$131,707	356	189	536
10180314	90270	Maywood	CA	902	1.19	$38,940	455	465	1,060
9940858	90272	Pacific Palisades	CA	902	22.97	$142,246	188	81	313
10093290	90274	Palos Verdes Peninsula	CA	902	11.95	$157,079	104	217	182
10093267	90275	Rancho Palos Verdes	CA	902	13.60	$114,691	302	325	667
10093461	90277	Redondo Beach	CA	902	3.53	$88,610	576	463	948
10093485	90278	Redondo Beach	CA	902	3.61	$99,602	328	403	826
10153987	90280	South Gate	CA	902	7.33	$43,237	1,407	1,470	3,209
9940742	90290	Topanga	CA	902	16.09	$125,045	107	17	131
10093597	90291	Venice	CA	902	2.47	$64,444	733	644	1,135
10093634	90292	Marina del Rey	CA	902	2.09	$91,352	867	361	733
10093654	90293	Playa del Rey	CA	902	2.68	$86,363	353	242	286
10112308	90301	Inglewood	CA	903	2.55	$39,187	942	1,133	1,855
10112852	90302	Inglewood	CA	903	1.82	$41,265	1,052	638	1,617
10112647	90303	Inglewood	CA	903	1.91	$42,095	745	311	1,222
10093573	90304	Inglewood	CA	903	1.63	$37,317	701	763	1,088
10112873	90305	Inglewood	CA	903	2.62	$60,343	316	298	477
9940355	90401	Santa Monica	CA	904	0.85	$49,667	549	434	568
9940374	90402	Santa Monica	CA	904	1.98	$133,459	244	130	253
9940393	90403	Santa Monica	CA	904	1.41	$71,530	886	775	1,236
10093716	90404	Santa Monica	CA	904	2.00	$54,372	651	612	850
10093614	90405	Santa Monica	CA	904	2.65	$70,379	868	713	961
10112530	90501	Torrance	CA	905	5.18	$57,218	643	733	1,605
10112554	90502	Torrance	CA	905	2.34	$66,153	204	161	365
10112488	90503	Torrance	CA	905	6.15	$74,198	495	441	1,276
10112507	90504	Torrance	CA	905	4.16	$68,934	440	534	766
10093330	90505	Torrance	CA	905	5.62	$74,802	607	494	1,016

In this chapter:

Displaying Data for Map Features

Displaying Data with the Info Tool

Use the Info tool to see all of the data that are available for a single map feature in an Info window on the screen. When you click on the map with the Info tool, Maptitude shows data for the nearest visible map feature in the working layer of the map. The name of the working layer is displayed in the drop-down list on the Standard toolbar. You can also drag a circle on the map with the Info tool to display information on all the visible features contained within the circle. Features that are not visible because they are hidden or autoscaled off will not be displayed.



Dataview1 - Census Place Info

Name	Las Vegas NV
AREA	135.84
Place	3240000
State	32
[Land Area]	135.81
[Water Area]	0.05
Population	583,756
[HH_Median income]	$54,327
[HH_Income <$10K]	12,416
[HH_Income $10K-14,999]	8,973
[HH_Income $15K-24,999]	20,110
[HH_Income $25K-34,999]	22,379
[HH_Income $35K-49,999]	29,585
[HH_Income $50K-74,999]	41,742

Dataview1 - 5-Digit ZIP Code Info

ID	18738485	18738504	18710262	18710225	18612756	18710436
AREA	5.20	9.47	9.24	4.83	16.60	14.42
ZIP	89106	89032	89117	89135	89138	89052
Name	Las Vegas North	Las Vegas	Las Vegas	Las Vegas	Las Vegas	Henderson
State	NV	NV	NV	NV	NV	NV
Population	26,488	41,762	53,756	18,795	12,169	47,154
[Land Area]	5.20	9.47	9.20	4.83	16.60	14.43
[Water Area]	0.00	0.00	0.04	0.00	0.00	0.00
[HH_Median income]	$31,843	$57,261	$61,014	$82,084	$104,248	$76,082
[HH_Income <$10K]	1,369	658	1,068	312	127	455
[HH_Income $10K-14,999]	800	431	793	187	24	320
[HH_Income $15K-24,999]	1,332	1,160	1,565	413	124	637
[HH_Income $25K-34,999]	1,466	1,339	2,481	431	139	838
[HH_Income $35K-49,999]	1,205	2,477	2,911	791	168	1,477

The Info tool also lets you access links between map features and pictures, websites, multimedia files, text files, spreadsheets, and other types of documents. For more information, see "Linking Documents, Files, & Web Sites to Map Features" on page 506.

You can do many of the things in an Info window that can be done in a dataview. See "Working with Dataviews" on page 185 for more information.

▶ To See Information on Map Features

1. Choose the layer whose data you want to see from the layer list on the Standard toolbar or by right-clicking on the layer in the Display Manager and choosing ***Make Working Layer***.
2. Click on the Tools toolbar to activate the Info tool.
3. Click on a feature on the map or click and drag a circle around several map features. Maptitude marks each feature with an "i" and displays all available data for the feature(s) in the Info window.

   You can continue to click other features on the map to display the data for each one. You can press the Shift key and click on the map to add features to the Info window, or press the Ctrl key and click on a feature that is already marked with an "i" to remove a feature from the Info window.
4. You can leave the Info window on screen, or close it by clicking the close box in the upper right corner or choosing Close from the system menu in the upper left corner.

▶ To Print an Info Window

1. Right-click on the Info window and choose ***Print***, to display the Print Dataview dialog box.
2. Choose the printer and other settings.

3. Click **OK**.

Maptitude prints the Info window.

▶ To Save an Info Window with a New Name or as a Different File Type

1. Right-click on the Info window and choose ***Save As***, to display the Save As dialog box.
2. Choose a file type from the Files of Type drop-down list.
3. Type a new name for the info window file.
4. Click **Save**.

Maptitude saves the Info window into a file of the chosen type. For more information on file types, see "Saving and Opening Dataviews" on page 208.

Try It Yourself: Displaying Data with the Info Tool

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **rhodeis.map** in the Tutorial folder.
2. Choose **Highway** from the drop-down list on the Standard toolbar.
3. Click on the Tools toolbar and click on a highway segment. Maptitude displays data for the highway segment in the Info window. Click on other highway features to display data for them.
4. Choose **Place** from the drop-down list on the Standard toolbar.
5. Click on a city on the map. Maptitude displays data for the city in the Info window.
6. Choose ***File-Close All*** and click **No to All** to close the map and Info window.

Displaying Data for Multiple Layers

Maptitude has two tools for getting information on features in more than one layer in a map:

Tool	Description
	Multi-Layer Info tool: finds the points, lines, and areas at or near the location where you click, then displays all the fields for one feature at a time in the Multi-Layer Information toolbox
	Multi-Layer Area Info tool: finds the area feature in each area layer at the location where you click, then displays one field for each area feature in the Multi-Layer Area Information toolbox

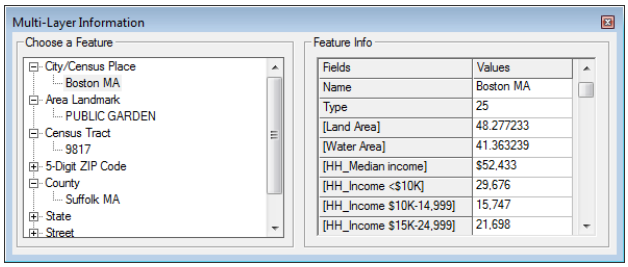
Once you start using a tool, you can click at other locations on the map to get information on other features. You can switch between the tools, and have both toolboxes open.

The Multi-Layer Info toolbox is similar to the Info window, since all of the data for a feature is in a column, and each row has the value for a field. Though you can only see the information for one feature at a time, it is very easy to switch among the features in the layers. A tree list contains an entry for each layer, and an entry can be expanded to show all of the features found in that layer.

The Multi-Layer Area Info toolbox lets you compare the areas at the location where you clicked. You can choose to show the value for one field for each area layer; usually it is the same or similar fields, such as Name or Population. You can add, drop, and rearrange the area layers to meet your needs. Maptitude keeps the current settings until you close the program.

▶ To Use the Multi-Layer Info Toolbox

1. Click  on the Tools toolbar to activate the Multi-Layer Info tool.
2. Click at a location on the map. Maptitude displays the Multi-Layer Information toolbox, and shows the information for the first feature in the first layer.



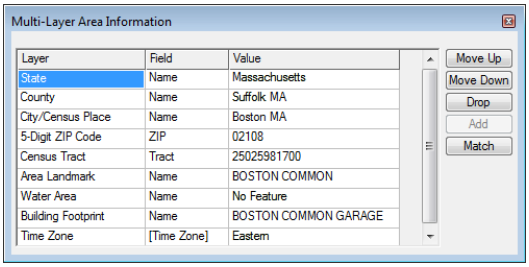
3. Make choices as follows:

To do this...	Do this...
Show the features for a layer	Click the plus (+) sign next to the name of the layer in the tree list
Show the information for a feature	Highlight the feature in the tree list
Hide the features for a layer	Click the minus (-) sign next to the name of the layer in the tree list

4. Continue clicking at locations on the map, and Maptitude will update the toolbox.
5. To edit values that are not read-only, click on a cell and type a new value or double-click on a cell and edit an existing value.
6. You can leave the Multi-Layer Information toolbox on the screen, or close it by clicking the Close box in the upper right corner of the toolbox.

▶ To Use the Multi-Layer Area Info Toolbox

1. Click  on the Tools toolbar to activate the Multi-Layer Area Info tool.
2. Click at a location on the map. Maptitude displays the Multi-Layer Area Information toolbox, and shows the information for the features in the chosen area layers.



3. Make choices as follows:

To do this...	Do this...
Change the field for an area layer	Click in the Field column for the layer and choose a field from the drop-down list. Maptitude will update the value for the layer.
Set the field for other layers to match the highlighted layer	Click on the row with the field you want to use and click Match. All layers that include a field with the same name will change.
Drop an area layer	Click on the row for the layer and click Drop. Maptitude removes the layer from the list.
Add an area layer	Click Add to display the Choose Layer to Add dialog box, highlight an area layer, and click OK. Maptitude adds the layer to the bottom of the list.
Rearrange the area layers	Click on a row for a layer and click Move Up or Move Down.

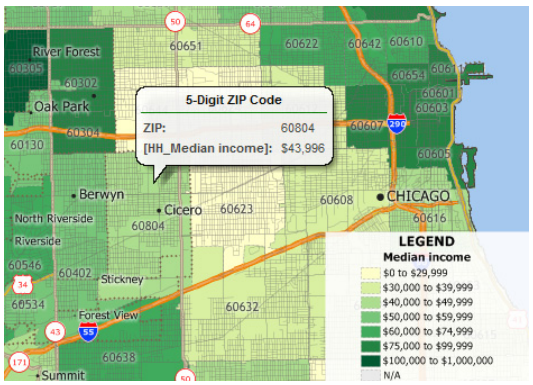
4. Continue clicking at locations on the map, and Maptitude will update the toolbox. Return to Step 3 to change the settings for the toolbox.
5. To edit values that are not read-only, click on a cell and type a new value or double-click on a cell and edit an existing value.
6. You can leave the Multi-Layer Area Information toolbox on the screen, or close it by clicking the Close box in the upper right corner of the toolbox.

Try It Yourself: Displaying Data for Multiple Layers

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the map file **NYC Info.map** in the Tutorial folder.
2. Click  on the Tools toolbar to activate the Multi-Layer Area Info tool.
3. Click on the map. Maptitude displays the Multi-Layer Area Information toolbox and shows the names of the County, ZIP Code, and State where you clicked.
4. Click on the 5-Digit ZIP Field cell to display a drop-down list of fields in the 5-Digit ZIP layer.
5. Choose **ZIP** from the drop-down list. Maptitude updates the value for the ZIP Code layer.
6. Click other locations on the map. Maptitude updates the Multi-Layer Area Information toolbox with information for the location where you clicked.
7. Highlight the **Name** field for either the County or State layers and click **Match**. Maptitude updates the ZIP Code layer with its Name field.
8. Click the Close button on the top right of the Multi-Layer Area Information toolbox to close it.
9. Choose ***File-Close*** to close the map window.

Displaying Data with the Hover Tool

You can choose to show information for map features in a popup hover bubble. When you pause the cursor on a map, information will be displayed about a feature near where you paused. You can choose up to ten fields to display in the popup hover bubble.



▶ To Set Up the Hover Tool

1. Choose ***Edit-Preferences*** and click the Hover tab.
2. Choose Hover tool settings as follows:

To do this...	Do this...
Set the font settings	Choose a font, size, style, and color settings in the Font Settings frame
Set the background color	Choose a color from the drop-down list and enter an opacity level between 0 and 100
Set the Hover tool shape	Choose Balloon or Rectangle from the radio list
Display data for the working layer	Choose the Over Working Layer radio button; the Hover tool will then only display information for the working layer
Display for multiple layers	Choose the Over All Layers radio button; the Hover tool will display information for the closest feature based on the layer priority set in the Hover Settings dialog box
Set the time before the Hover appears	Enter a value in the Delay box
Set the time until the Hover disappears	Check the Timeout box and enter a time in seconds
Specify the snap tolerance	Change the value in the Maximum Distance from Feature spinner

3. Click OK.

▶ To Enable the Hover Tool

1. Choose ***Map-Labels-Display Hover***.

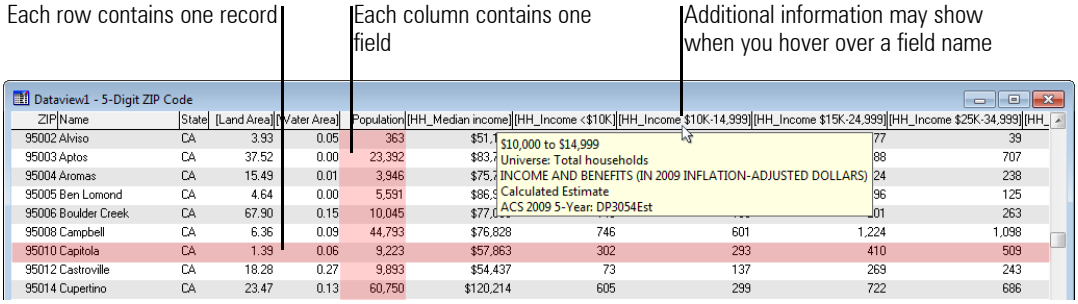
Maptitude will display the hover using the settings specified on the Hover tab of the User Preferences dialog box. Choose ***Map-Labels-Display Hover*** again to turn off the Hover tool.

▶ To Choose the Fields to Display in the Hover Tool

1. Choose ***Map-Labels-Hover Settings*** to display the Hover Settings dialog box.
2. Click on a layer in the grid and click Hover Fields.
3. Choose up to ten fields from the Available Fields scroll list to add to the Selected Fields scroll list and click OK.
4. Repeat steps 2-3 for any additional layers.
5. If you chose to have the Hover tool work over all layers, use the **Move Up** and **Move Down** buttons to choose the layer priority from lowest to highest.
6. Click **Close**.

Displaying Data for a Map Layer or a Table

A **dataview** is a window that displays data as a table, with information presented in rows and columns. Each row is called a **record** and represents one person, place, or thing. Each column is called a **field** and contains one piece of information about each record. At the top of each column is a heading that contains the name of the field.



ZIP	Name	State	[Land Area]	[Water Area]	Population	[HH_Median income]	[HH_Income <$10K]	[HH_Income $10K-14,999]	[HH_Income $15K-24,999]	[HH_Income $25K-34,999]
95002	Alviso	CA	3.93	0.05	363	$51,1			77	39
95003	Aptos	CA	37.52	0.00	23,392	$83,7			88	707
95004	Aromas	CA	15.49	0.01	3,946	$75,7			24	238
95005	Ben Lomond	CA	4.64	0.00	5,591	$86,9			96	125
95006	Boulder Creek	CA	67.90	0.15	10,045	$77,0			01	263
95008	Campbell	CA	6.36	0.09	44,793	$76,828	746	601	1,224	1,098
95010	Capitola	CA	1.39	0.06	9,223	$57,863	302	293	410	509
95012	Castroville	CA	18.28	0.27	9,893	$54,437	73	137	269	243
95014	Cupertino	CA	23.47	0.13	60,750	$120,214	605	299	722	686

A dataview is only a window onto an underlying database or spreadsheet. When you save a dataview, you save the fonts, column order, and other aspects of how the data are presented, but not the actual data values. When you edit a value in a dataview, the value is stored immediately in the underlying database, not as part of the dataview.

If the name of a field contains spaces or other special characters or starts with a digit, Maptitude puts square brackets around it in the dataview. For example, a field titled "City Name" will be displayed as [City Name].

Some fields in a dataview may include additional information, such as data source information. If there is additional information about a field in a dataview, positioning the cursor over the field heading displays a pop-up window that displays the information.

You can create and display any number of dataviews.

Creating a Dataview

You can create a dataview showing the data associated with any map layer. In addition, Maptitude directly supports Access, dBASE, Oracle, and SQL Server database formats, Excel spreadsheets, fixed-format text files, fixed-format binary files, and comma- and tab-separated text files.

Maptitude can also create dataviews from any ODBC source, ODBC SQL Query, Oracle Tables, Microsoft Access Tables, and Microsoft SQL Server Tables or you can create a new table in dBASE, comma-separated, fixed-format, and fixed-format binary files. For more information, see "Opening Dataviews from Other Sources" on page 213 and "Creating a New Table from Scratch" on page 220.

▶ To Display Data for any Map Layer

1. Right-click on a layer or selection set in the Display Manager and choose ***New Dataview***.

   —OR—

1. Choose the layer whose data you want to see from the drop-down list on the Standard toolbar and choose ***Dataview-New Dataview***.

▶ To Display Data for a Map Layer from a Dataview

1. Click  on the Standard toolbar to display the New Dataview dialog box.
2. Choose one or more layers from the scroll list and click OK.

Maptitude opens a dataview displaying data for the layers you chose.

▶ To Display Data from an Excel Worksheet

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Excel Worksheet** as the file type.
3. If you want to scan the entire Excel file for field sizes before opening the file, click **Options**, check the **Scan all records when importing** box and click OK.
4. Choose the file you want to open, and click **Open**. Maptitude displays the Choose an Excel Sheet or Range dialog box.
5. Highlight a worksheet or named range in the scroll list and click **OK**.

Maptitude opens the whole worksheet or the named range within a worksheet in a read-only dataview.

Since Excel has no concept of data fields when reading a sheet as a data table, the Jet engine has to infer a data type for each column. It does this by scanning the values first few rows and making a guess from the values it finds. If all the cells for a particular column in those first few rows are empty then the Jet engine gives the column the character type, even though there might only be numeric values in any of the later rows. The only way to change this behavior is to modify a setting in the registry which tells Jet how many rows to scan. The setting is:

HKEY_LOCAL_MACHINE\Software\Microsoft\Jet\4.0\Engines\Excel\TypeGuessRows

You can set the value either to a number or to 0 to scan all the rows.

▶ To Display Data from a Database or Data File

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose the file type and file you want to open.
3. Check **Open as read-only** if you want to protect the data from accidental changes. Some file formats, such as comma- and tab-delimited text files, can only be opened as read-only.
4. Check **Open for exclusive access** if you want to prevent others from opening the file at the same time.
5. Click **Open**.

Maptitude opens a new dataview and displays data from the file. For more information on read-only and exclusive access, see “Sharing Maptitude Data Files” on page 525.

Try It Yourself: Displaying Data in a Dataview

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **NYC Info.map** in the Tutorial folder.
2. Right-click on the **5-Digit ZIP** layer in the Display Manager and choose ***New Dataview*** to open a dataview for the ZIP Code layer.
3. Click on the Standard toolbar, choose the **New York Sts-Links** layer from the scroll list and click **OK** to open a dataview for the Streets layer.
4. Choose ***File-Open*** or click on the Standard toolbar, choose **dBASE** from the Files of Type drop-down list, and open the dBASE file **manheats.dbf** in the Tutorial folder.
5. Choose ***File-Close All*** to close the map and dataviews.

Working with Dataviews

The dataview window may not be big enough to display all of the fields and records in your data. As in most Windows products, you can use either use the mouse and click on the scroll bars or use the keyboard to see more. The following table describes how to use the keyboard to move around a dataview:

Use this key...	To do this...
Left Arrow	Move one field to the left
Right Arrow	Move one field to the right
Up Arrow	Move to the previous record
Down Arrow	Move to the next record
Page Up	Move up one page of records
Page Down	Move down one page of records
Home	Move to the first field in the current record (all the way to the left)
End	Move to the last field in the current record (all the way to the right)
Tab	Move one page of records to the right
Shift-Tab	Move one page of records to the left
Ctrl-Home	Move to the first record in the dataview
Ctrl-End	Move to the last record in the dataview

Finding Records

The ***Edit-Find*** command helps you find a record in a dataview. You choose the field you want to search and enter the text or numeric value you want to search for. The ***Edit-Find*** command also lets you look for a particular field, in a dataview.

When you search for a numeric value, you can search for the closest value or an exact match. If you search for an exact match, Maptitude will display the value if it exists. If the value does not exist, Maptitude will tell you that no record was found with the value you specified. If you search for the closest value, Maptitude will display the next higher value.

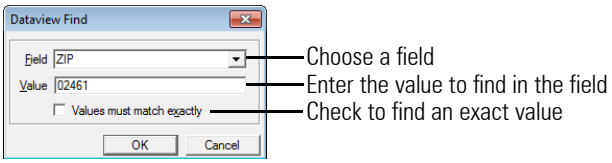
When you search for a text value, you can match the whole phrase or look for text that starts with what you typed. If you search for the whole phrase and the value does not exist, Maptitude will tell you that no record was found with the value you specified. If you do not search for whole phrase, Maptitude will display the next higher value.

The ***Edit-Find*** command is case sensitive when you search for text. For example, if you are searching for Sri Lanka and type "sri lanka" as the text value, Maptitude will not find the record. Lower case letters are found after upper case letters, so searching for text starting with "AZ" might find a record with text starting with "Aa." To make searching easier, you can convert a field to all lower case with a formula field using the Lower() function or to all upper case using the Upper() function. For more information on the Lower() and Upper() functions, see Appendix A, Formulas, Conditions, and Functions.

▶ To Find a Record in a Dataview

TIP: You may find it useful to sort the values in a column before you search for a value.

1. Choose ***Edit-Find***, click on the Standard toolbar, or right-click anywhere in a dataview and choose ***Find***. Maptitude displays the Dataview Find dialog box.
2. Make choices as follows:



3. Click **OK**.

   If there is a match, Maptitude highlights the record containing the first record with the value you wanted to find. If there is no match and:

   - You checked **Values Must Match Exactly** or **Match Whole Phrase** option, Maptitude reports that no matching record could be found.
   - You did not check the option, Maptitude highlights the first record with the next higher value.

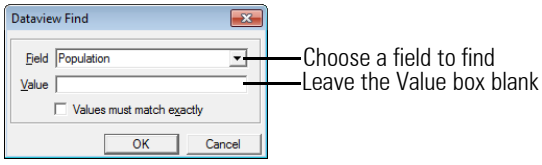
4. If you want to find the record on a map, right-click on the highlighted cell and choose ***Zoom***.

▶ To Find a Column in a Dataview

1. Choose ***Edit-Find***, click on the Standard toolbar, or right-click anywhere in a dataview and choose ***Find***. Maptitude displays the Dataview Find dialog box.

TIP: You can filter the field list by clicking on the drop-down list and typing several letters. Only fields containing the text you enter will be shown in the drop-down list.

2. Make choices as follows:



3. Click **OK**.

Maptitude highlights the column you wanted to find.

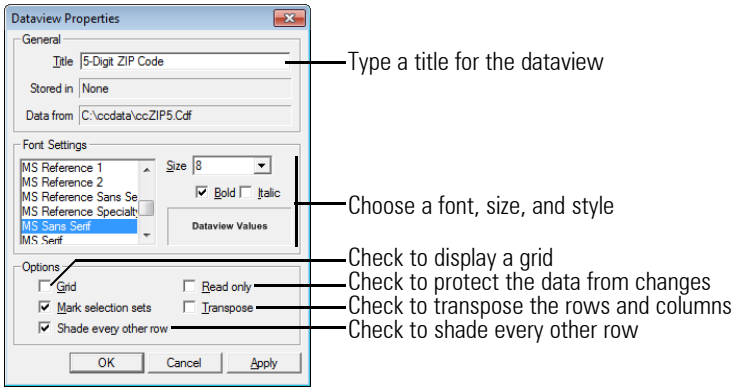
Changing the Way the Dataview Looks

The Dataview Properties dialog box is used for basic dataview display settings.

NOTE: When you first open a table in a dataview, Maptitude uses the default font and other settings. You can change the defaults for dataviews by choosing ***Edit-Preferences*** and choosing font settings and other options on the **Dataview** tab.

▶ To Change the Dataview Title, Font, and Grid Settings

1. Choose ***File-Properties***, click on the Standard toolbar, or right-click on the dataview window and choose ***Properties***. Maptitude displays the Dataview Properties dialog box.
2. Make choices as follow:



3. Click **OK**.

Maptitude displays the dataview with the new settings.

TIP: To transpose the underlying table, instead of the dataview, see "Transposing a Table" later in this chapter.

Changing the Column Headings and Display Format

You can change the column headings to make them easier to read, and apply formatting to the values so that commas, decimals, and dollar signs appear the way you want. A column heading can be:

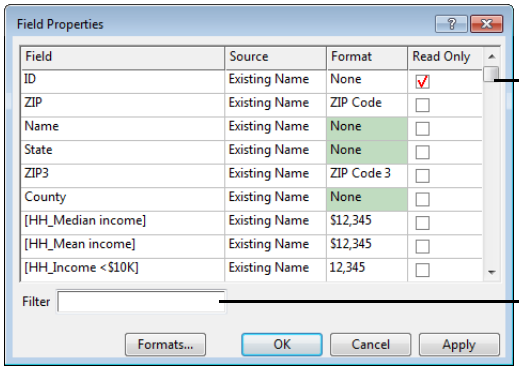
- The internal name for the field
- The display name stored in the dictionary
- A name that you type in the Column Settings dialog box

When you open a table, the column heading for a field will be the display name, if there is one, and otherwise it will be the internal name. When you open a dataview, the column heading for a field will be what you had set it to when the dataview was saved.

The display name or any name that you type in the Column Settings dialog box overrides the internal name as the column heading. You can easily change all the column headings back to the internal names or change them to the display names. For more information on display names, see "Creating a New Table from Scratch" on page 220 and "Modifying the Structure of a Table" on page 224.

▶ To Change Column Headings and Display Format

1. Choose ***Dataview-Fields-Properties***, click on the Standard toolbar, or right-click on the dataview and choose ***Field Properties***. Maptitude displays the Field Properties dialog box, which lists all column headings and display formats.



2. Make changes to one or more columns according to the following table:

To do this...	Do this...
Change the heading	Type a new name for the field heading in the first column of the grid view.
Change the heading to the internal name	Choose Internal Name from the drop-down list in the Source column of the grid view.
Change the heading to the display name	Choose Default Display Name from the drop-down list in the Source column of the grid view.
Change the heading to the existing name	Choose Existing Name from the drop-down list in the Source column of the grid view.
Change the format of number or date fields	Highlight one or more records in the Format column of the grid view and choose a number or date format from the drop-down list. You can also add new formats if you do not see the one you need. For more information see "Creating Custom Field Formats" below.
Protect data from changes	For each field that you want to protect, check the box in the Read Only column of the grid view. Uncheck the box to allow the field to be edited.

3. Click **OK**.

Maptitude displays the dataview with the new settings. Maptitude uses the new name and format in all dataviews and in any new themes you create.

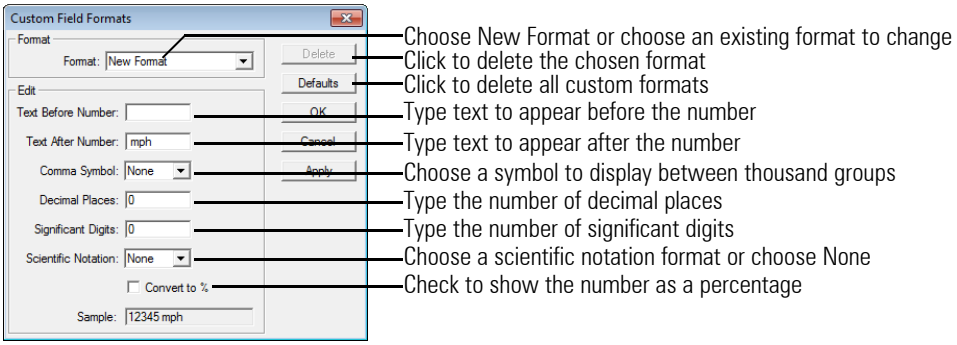
Creating Custom Field Formats

You can create your own formats to customize the way that dataview fields are displayed. Your custom formats are added to the formats in the Format drop-down list when you use the ***Dataview-Fields-Properties*** command. The formats will be used for displaying fields in a dataview and for using the field in labels on the map. With custom formats you can:

- Create text prefixes and suffixes around number fields
- Choose to use commas, periods, or no separator between thousand groups
- Choose the number of decimal places and significant digits
- Use scientific notation

▶ To Create Custom Field Formats

1. From the Field Properties dialog box, click **Formats** to display the Custom Field Formats dialog box.
2. Make choices as follows:



3. Click **OK**.

Maptitude closes the Custom Field Formats dialog box. Now any new or changed custom field formats are available for use.

Try It Yourself: Changing the Way a Dataview Looks

1. Choose ***File-Open*** or click on the Standard toolbar, then open the dataview file **toprint.dvw** in the Tutorial folder.
2. Choose ***File-Properties*** or click on the Standard toolbar to display the Dataview Properties dialog box.
3. Type "**Clients**" as the title of the dataview.
4. Change the font to **Tahoma**, the size to **9**, and remove the check from the **Bold** box.
5. Check the **Shade Every Other** row box.
6. Click **OK**. Maptitude displays the dataview with the new settings.
7. Choose ***Dataview-Fields-Properties*** or click on the Standard toolbar to display the Field Properties dialog box.
8. Click on **[Con Num]** in the grid view and type "**Contract Number**."
9. In the Format column of the grid view, click on **None** in the Sales row and drag down to **None** in the **[Sales Last Year]** row to highlight both cells, then choose **$12,345** from the drop-down list in the second highlighted cell.
10. Click **OK**. The dataview shows the new column heading and new format.
11. Choose ***File-Close*** and click **No** to close the dataview without saving any changes.

Arranging Columns in a Dataview

You can arrange columns in a dataview in many ways. You can move columns, hide columns, change the width of columns, and lock columns in place so that they remain visible when you scroll left and right in the dataview. If your dataview is for a Caliper geographic layer, you can define groups of fields for display using field sets. For more information, see "Creating and Using Field Sets" on page 229.

TIP: Pressing Ctrl-Space on the keyboard will highlight an entire column.

▶ To Move a Column to a Different Position

1. Highlight the column you want to move by clicking on the column heading.
2. Use the left or right arrow keys to move the column left or right.

▶ To Hide One or More Columns

1. Highlight the column you want to hide by clicking on the column heading. To highlight additional columns, press the Ctrl key while clicking on the column headings.
2. Click on the Standard toolbar.

— OR—

1. Right-click on a cell, column heading, or range of cells and choose Hide.

▶ To Change the Width of One or More Columns

1. Move the cursor to the right of the column heading so that it changes to a double arrow.
2. Click and drag to the left or right to make the column narrower or wider.

▶ To Lock One or More Columns

1. Click on a cell in, or the column heading of, the fields you want to lock.
2. Choose ***Dataview-Fields-Freeze***, click on the Standard toolbar, or right-click and choose ***Freeze***.

▶ To Unlock Locked Columns

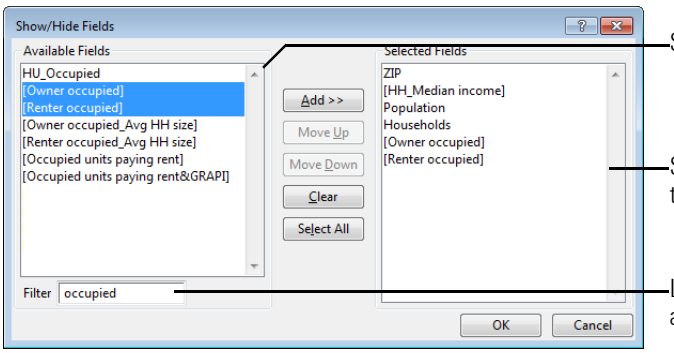
1. Choose ***Dataview-Fields-Freeze***, click on the Standard toolbar.

Maptitude unlocks any locked columns. The columns are left in the same order, but all of them now scroll left and right.

TIP: You can show all columns in a dataview in their original order by right-clicking on a cell or column heading and choosing ***Show All***.

▶ To Rearrange the Columns in a Dataview

1. Choose ***Dataview-Fields-Show/Hide*** or click on the Standard toolbar. Maptitude displays the Show/Hide Fields dialog box, which shows all available fields and selected fields in the order they will display.



2. Choose the fields you want in the dataview as follows:

To do this...	Do this...
Add a field to the dataview	Choose one or more fields in the Available Fields list, and click Add. To find a particular field, type part of the field name in the Filter edit box to display just those fields that contain the text you entered.
Add all of the available fields	Click Select All.
Drop a field from the dataview	Choose one or more fields in the Selected Fields list, and click Drop.
Drop all fields from the dataview	Click Clear.
Change the order of fields	Choose one or more fields in the Selected Fields list, and click Move Up or Move Down.

3. Click **OK**.

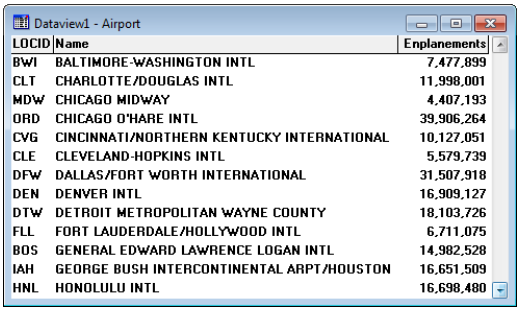
Maptitude displays the dataview with the columns arranged in the order you chose.

Try It Yourself: Arranging Columns in a Dataview

1. Choose ***File-Open*** or click on the Standard toolbar, then open the dataview file **nesouthv.dvw** in the Tutorial folder.
2. Click on the heading **[County Name]** and use the right arrow key to move the column to the right, past the heading **Population**.
3. Click on the heading **[AREA]**, shift-click on the heading **[ID]**, then click on the Standard toolbar to hide those columns.
4. Click between the headings **[County Name]** and **Families** and drag the vertical line to the left to narrow the **[County Name]** column.
5. Shift-click on the headings **[County Name]** and **Population**, then click on the Standard toolbar to lock those columns on the left side of the dataview.
6. Choose ***Dataview-Fields-Show/Hide*** or click on the Standard toolbar to display the Show/Hide Fields dialog box.
7. Click **Clear** to remove all fields from the Selected Fields scroll list.
8. Type "**mode**" in the Filter edit box to see all of the fields with "mode" in their name.
9. Click **Select All** to add all of the "mode" fields to the dataview and click **OK**.
10. Choose ***File-Close*** and click **No** to close the dataview without saving any changes.

Sorting Rows in a Dataview

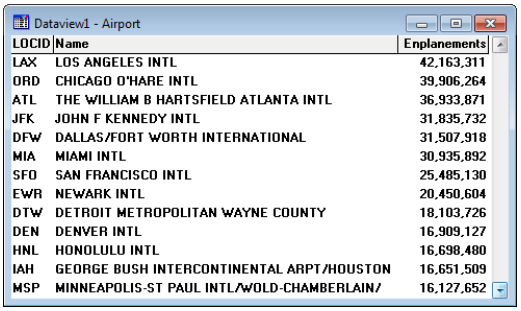
When you create a dataview, the records are displayed in the order in which they are stored. You can sort the records in a dataview to make it easy to find records with the highest and lowest values, or to produce a ranked list.



Dataview1 - Airport

LOCID	Name	Enplanements
BWI	BALTIMORE-WASHINGTON INTL	7,477,899
CLT	CHARLOTTE/DOUGLAS INTL	11,998,001
MDW	CHICAGO MIDWAY	4,407,193
ORD	CHICAGO O'HARE INTL	39,906,264
CVG	CINCINNATI/NORTHERN KENTUCKY INTERNATIONAL	10,127,051
CLE	CLEVELAND-HOPKINS INTL	5,579,739
DFW	DALLAS/FORT WORTH INTERNATIONAL	31,507,918
DEN	DENVER INTL	16,909,127
DTW	DETROIT METROPOLITAN WAYNE COUNTY	18,103,726
FLL	FORT LAUDERDALE/HOLLYWOOD INTL	6,711,075
BOS	GENERAL EDWARD LAWRENCE LOGAN INTL	14,982,528
IAH	GEORGE BUSH INTERCONTINENTAL ARPT/HOUSTON	16,651,509
HNL	HONOLULU INTL	16,698,480

Unsorted dataview



Dataview1 - Airport

LOCID	Name	Enplanements
LAX	LOS ANGELES INTL	42,163,311
ORD	CHICAGO O'HARE INTL	39,906,264
ATL	THE WILLIAM B HARTSFIELD ATLANTA INTL	36,933,871
JFK	JOHN F KENNEDY INTL	31,835,732
DFW	DALLAS/FORT WORTH INTERNATIONAL	31,507,918
MIA	MIAMI INTL	30,935,892
SFO	SAN FRANCISCO INTL	25,485,130
EWR	NEWARK INTL	20,450,604
DTW	DETROIT METROPOLITAN WAYNE COUNTY	18,103,726
DEN	DENVER INTL	16,909,127
HNL	HONOLULU INTL	16,698,480
IAH	GEORGE BUSH INTERCONTINENTAL ARPT/HOUSTON	16,651,509
MSP	MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN/	16,127,652

Dataview sorted by decreasing enplanements

You can sort a dataview based on a single field or on several fields. For example, you could sort customers by state, then by last name, and then by first name.

You can also use the Sort Manager to create and use sort sets, which are stored sort orders using one or more fields, with dataviews for layers from Caliper Standard (.DBD) and compact (.CDF) geographic files.

▶ To Sort Records Based on a Single Column

1. Click on a cell in, or the column heading of, the field you want to sort.
2. Choose how to sort as follows:

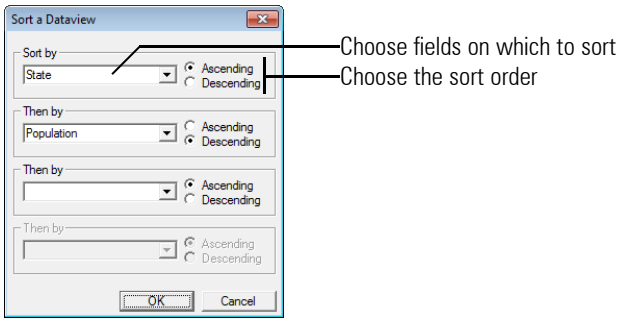
To sort records in...	Do this...
Increasing order	Click on the Standard toolbar or right-click on the cell or heading and choose ***Sort Increasing*** to sort the records in increasing.
Decreasing order	Click on the Standard toolbar or right-click on the cell or heading and choose ***Sort Decreasing*** to sort the records in decreasing order.

Maptitude sorts the records and displays the dataview with the rows in the new order.

▶ To Sort Records Based on Several Fields

1. If you want, select one or more columns by clicking on the column headings. Maptitude highlights the selected columns.
2. Choose ***Dataview-Fields-Sort*** to display the Sort a Dataview dialog box.

3. Choose the fields on which to sort and the sort order.

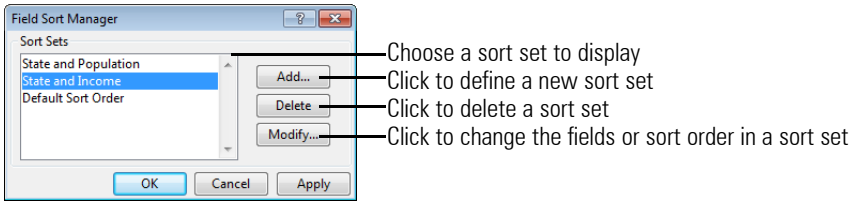


4. Click **OK**.

Maptitude sorts the data based on the fields you chose and displays the data in the new order.

▶ To Use Sort Sets

1. Choose a dataview for a layer from a Caliper Standard or compact geographic file.
2. Choose ***Dataview-Fields-Sort Manager***. Maptitude displays the Field Sort Manager dialog box.



3. Make a choice as follows:

To do this...	Do this...
Use an existing sort set	Highlight the sort set in the scroll list.
Create a new sort set	Click **Add** to display the Define Sort Set dialog box. The initial fields in the Selected Fields DataGrid will be those of the sort set that was highlighted when you clicked Add. Highlight fields in the Available Fields scroll list and click **Add>>** to add them to the Selected Fields DataGrid. To drop fields, highlight them in the Selected Fields DataGrid and click **<<Drop**. To change the sort order, click on a cell in the Sort column and choose **Ascending** or **Descending**. Click **OK** when you are done and enter a name for the sort set.

4. Click **OK**.

Maptitude orders the records in the dataview based on the sort set.

▶ To Display Records in Their Original Order

1. Choose ***Dataview-Fields-Sort*** to display the Sort a Dataview dialog box.
2. Choose **Natural Order** from the top of the Sort By drop-down list.
3. Click **OK**.

— OR—

1. Right-click on a cell, range, or column heading and choose ***Sort Undo All***.

Maptitude displays the data in the original order.

Try It Yourself: Arranging Rows in a Dataview

1. Choose ***File-Open*** or click on the Standard toolbar, then open the dataview file **nesouthv.dvw** in the Tutorial folder. The counties are in alphabetic order by state.
2. Click on the heading **Population** and click on the Standard toolbar to sort the counties in descending order by population.
3. Click on the heading **State** and Ctrl-click on the heading **[HH Median Income]** to highlight both columns.
4. Choose ***Dataview-Fields-Sort*** and click **OK** to sort the counties by ascending median household income within each state.
5. Choose ***File-Close*** and click **No** to close the dataview without saving any changes.

Doing Calculations with Data

To compute new data based on data you already have, you can add, subtract, multiply, or divide the existing data. You can have Maptitude do these calculations for you by creating a **formula**.

Data you have...	Data you want...
Quarterly sales	Annual sales
2015 home values and 2010 home values	Change in home values
Total population and population over age 65	Percent of population over age 65
Sales and operating expenses	Profit

In all of these cases, you want to create a new piece of information by adding, subtracting, multiplying, or dividing other data you already have available. Formulas can contain field names; arithmetic operators like +, -, *, and /; relational operators like <, >, <=, >=, and <>; and many different types of numeric and string functions. For more details on the exact syntax of formulas, see Appendix A, Formulas, Conditions, and Functions.

You use formulas in one of two ways:

- Store the formula itself, so Maptitude can compute the result on the fly. To do so, you use the ***Dataview-Formula Fields*** command.
- Store the result of the formula in an existing column of a dataview. To do so, you use the ***Edit-Fill*** command, and choose Formula as the method. (For more information, see "Filling a Range of Cells or Groups of Columns with Data" on page 199.)

If you use the ***Dataview-Formula Fields*** command, Maptitude remembers the formula. Every time it needs a value from the formula field (say, to make a thematic map, or to display a dataview), it computes the value the moment it is needed. This means that if someone updates any of the fields used in the formula, the formula field will always be correct and up-to-the-minute.

If you use the ***Edit-Fill*** command, Maptitude computes formula for every record in the dataview, and stores the result in the geographic file or database. From then on, Maptitude can access and display the change the formula results very quickly. However, if you or someone else updates any of the

fields that were used in the formula, the values you computed will no longer be correct and will also need to be updated.

Whichever method you choose, you enter a formula using the Formula dialog box. Here are some sample formulas:

To answer this question...	Use this formula...
What is the aggregate income of a population?	Population * PerCapitaIncome
What is the total number of commuters?	Drive + Carpool + [Public Transportation] + Walk + [Other Means]
What is the one year percent change in sales?	([Sales This Year] - [Sales Last Year]) / [Sales Last Year] * 100
What is the percentage of senior citizens in a population?	[Age 65+] / Population * 100

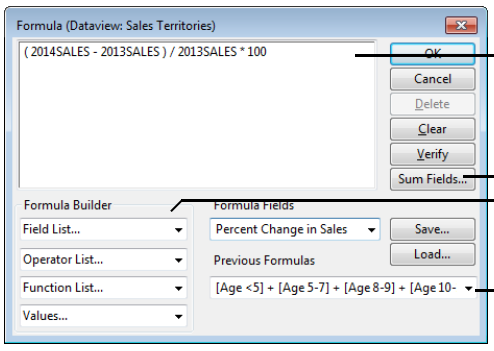
There is a Sum Fields option that lets you quickly create a formula field that is the sum of two or more fields. This is particularly useful when working with some of the demographic data provided with Maptitude. For example, the Brazil Country Package includes age fields in 1-year increments (e.g., [Age 0], [Age 1], [Age 2], etc.). If you want to create a formula field that has the total population under age 20, you can use the Sum Fields option to add the 20 fields to the formula all at once rather than entering the 20 fields individually in the Formula dialog box. You also have the option to add a scaling factor to any of the fields you sum.

Creating a Formula Field

Maptitude stores a formula in a **formula field** which you create using the ***Dataview-Formula Fields*** command. Once you create a formula field, you can use it like any other field. For example, you can sort a dataview based on a formula field, create additional formula fields based on a formula field, or, if the dataview contains data that are linked to a map layer, you can use the formula field to make thematic maps or to label map features.

▶ To Create a Formula Field

1. Choose ***Dataview-Formula Fields*** or, if a dataview is the current window, click on the Standard toolbar to display the Formula dialog box.



2. Create a formula using any of the following methods:

   • Type a formula in the Formula box.
   • Use the Formula Builder to create a formula by picking the fields, operators, and functions you want from the drop-down lists.

TIP: You can filter the field list in the Formula Builder by clicking on the drop-down list and typing several letters. Only fields containing the text you enter will be shown in the drop-down list.

- Choose a formula from the Previous Formulas drop-down list and type any edits to the formula.
- Click Sum Fields to display the Choose Formula Fields dialog box. Choose the fields you want to add from the Available Fields scroll list, click Add, and click OK. Maptitude displays the Sum Fields dialog box. To scale any of the fields, enter a value in the Multiply By column of the grid view. Click OK when you are done to return to the Formula dialog box.

3. Click Verify if you want to check the formula. Maptitude indicates whether the formula is correct. Return to step 2 if you need to correct the formula.
4. Type a name for the formula field in the Formula Fields editable drop-down list.
5. Click **OK**.

Maptitude creates the formula field. If you are looking at a dataview, Maptitude displays the formula field as the last column in the dataview. If you are looking at a map, Maptitude adds the formula field to the list of fields you can use in labeling and thematic mapping.

▶ To Delete a Formula Field

1. Choose ***Dataview-Formula Fields*** or, if a dataview is the current window, click fx on the Standard toolbar to display the Formula dialog box.
2. Choose an existing formula field from the Formula Fields drop-down list. Maptitude displays the formula in the formula box.
3. Click **Delete**. Maptitude asks you to confirm the operation.
4. Click **Yes**.

Maptitude deletes the formula field and removes the formula field from any dataviews in which it is displayed.

▶ To Save Formulas to a File

1. Choose ***Dataview-Formula Fields*** or, if a dataview is the current window, click fx on the Standard toolbar to display the Formula dialog box.
2. Click **Save** to display the Save Formulas As dialog box.
3. Type a file name and click **Save**.

▶ To Load Formulas from a File

1. Choose ***Dataview-Formula Fields*** or, if a dataview is the current window, click fx on the Standard toolbar to display the Formula dialog box.
2. Click **Load** to display the File Open dialog box.
3. Choose the file containing the formulas and click **Open**.

Maptitude reads the formulas from the file and updates the Previous Formulas drop-down list.

Try It Yourself: Doing Calculations with Data

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the dataview **toprint.dvw** in the Tutorial folder.
2. Choose ***Dataview-Formula Fields*** or click  on the Standard toolbar to display the Formula dialog box.
3. Choose **Sales** from the Field List drop-down list.
4. Choose **–** from the Operator List drop-down list.
5. Choose **[Sales Last Year]** from the Field List drop-down list.
6. Type "**Change in Sales**" as the new formula field name in the Formula Fields editable drop-down list.
7. Click **OK**. Maptitude puts the new formula field on the right side of the dataview.
8. Choose ***File-Close*** and click **No** to close the dataview without saving any changes.

Editing and Updating Data

When you change a value in a dataview, the change is stored immediately in the geographic file or database. You do not need to save the dataview to save changes to your data.

Maptitude lets you edit data in several different ways:

- Edit the data in the dataview directly
- Fill a range of cells or a column using commands
- Clear a range of cells or a column
- Add and delete records
- Transpose the records in the table

There are some cases where you cannot edit the data you see in a dataview. For example, you cannot edit data if you check Read Only when you open a file, if the data are in an Excel worksheet or a comma- or tab-separated text file, or if the data are stored in a protected file or folder on a network. Data that cannot be changed are shaded in green in the dataview.

Maptitude allows many users to share data on a computer network. This arrangement means that any change you make to data stored on a file server is immediately available to all users. The reverse is also true — if someone else changes a value in a file stored on a file server, the data is immediately available to your maps, dataviews, and formula fields. While the data are updated immediately, the change may not be visible until the next time your dataview or map is drawn on the screen. Use the ***Window-Refresh*** command to update a map or dataview.

You also can control how files are shared. When you open a table, you have the option to make it available for your exclusive use. The table cannot be accessed or edited by other users when you exclusively open it. You can change the default sharing settings by choosing ***Edit-Preferences*** command and going to the File Sharing tab.

When creating shared file-based temporary indices when two users are sharing a file with write access, the default is to create these files in the new format. Since this means the indices cannot be read by users with older versions of Maptitude, you can choose ***Edit-Preferences***, click the File Sharing tab of the dialog, and check Use Old-Format Shared Temporary Indices to use only the older format.

You can also use the ***Edit-Preferences*** command to set the shared directories for ODBC tables. Maptitude uses the native ODBC indices when you are working with the whole table, but uses internal indices with selection sets. By setting the shared directory, these indices will be updated correctly if other users modify the data. For more information, see "Sharing Maptitude Data Files" on page 525.

Editing Data in a Dataview

You edit data in a dataview just the way you would expect — by clicking on a cell and typing a new value or by double-clicking on a cell and editing the current contents.

▶ To Edit Data in a Dataview

TIP: For date fields, you can click the drop-down in the cell and choose a date from the calendar. For time fields you can use the spinners to choose an hour, minute, and second.

1. Click on the cell containing the data you want to edit.
2. Type a new value.
3. Press Enter.

— OR —

1. Double-click on the cell containing the data you want to edit.
2. Make changes to the current value.
3. Press Enter.

— OR —

1. Click on the cell containing the data you want to edit and press F2. Maptitude activates the cell for editing at the end of the text.
2. Make changes to the current value.
3. Press Enter.

Note that if you change data that is used in a map for a theme or for labels, you will need to choose ***Window-Refresh*** in order to see the changes on the map. Selection sets are not updated when you edit the data upon which they are based.

Copying and Pasting Cells in a Dataview

With the ***Edit-Copy*** command you can save highlighted cells in a dataview window (including an Info window) to the Windows clipboard. You can then paste the data into other Windows programs, or use the ***Edit-Paste*** command to paste the data into a Maptitude dataview. In a text-handling program such as Microsoft Word, there will be one row of data for each row of cells in the highlighted area, and the data in a row will be separated by tabs. In a table-handling program such as Microsoft Excel, the data will go into separate cells in the table.

With the ***Edit-Paste*** command you can paste data from the Windows clipboard into one or more highlighted cells. If you highlight one cell, you can paste data into one cell or a range of cells to the right and/or below the one cell. If you highlight a range of cells, the range must be the same size as the data in the Windows clipboard.

TIP: You can use the copy shortcut (Ctrl+C) to copy cell values and the paste shortcut (Ctrl-V) to edit cell values with data that has been copied.

▶ To Copy Cells in a Dataview

1. Highlight one or more cells in the dataview.
2. Choose ***Edit-Copy*** or right-click the mouse and choose ***Copy***.

Maptitude copies the data in the highlighted cells. You can paste the data into other Windows programs.

▶ To Paste Cells in a Dataview

1. Highlight one or more cells in the dataview.
2. Choose ***Edit-Paste*** or right-click the mouse and choose ***Paste***.

Maptitude pastes the data from the Windows clipboard into the highlighted cells. If you highlight a range of cells, the range must be the same size as the data in the Windows clipboard.

Filling a Range of Cells or Groups of Columns with Data

TIP: You may want to create a new blank field to fill with data. To create a new field you must modify the underlying table. See "Modifying the Structure of a Table" on page 224.

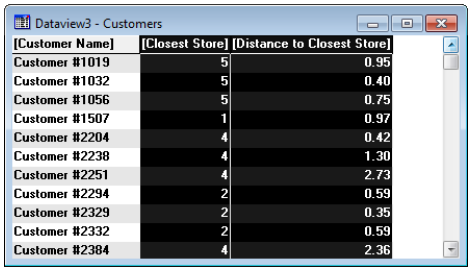
Maptitude lets you fill a range of cells or one or more columns of a dataview with data by using the ***Edit-Fill*** command. There are several methods for filling data:

Single Value: You can fill a column or range of cells with a single constant value. If the fields are set up to hold only numeric data, you must fill them with a number.

Sequence of Numbers: You can fill a column or range of cells with a sequence of numbers, with any starting number and increment you want. Maptitude fills in the first cell with the starting number, and then adds the increment before filling in the next cell. Most often, you start with 1 and use an increment of 1. If the selected range of cells includes more than one column, the cells are filled left to right and then down, except if you select the right-hand column first, then the cells are filled right to left and then down.

Formula: You can store the result of a formula. You can add, subtract, multiply, or divide other data. Formulas can contain field names; arithmetic operators like +,-, *, and /; relational operators like <, >, <=, >=, and <>; and many different types of numeric and string functions. When you store the results of a formula, the range you select must be entirely within a single column of the dataview. For more information on formulas see "Doing Calculations with Data" on page 194 and see Appendix A, *Formulas, Conditions, and Functions*.

Tag: If the dataview contains data for features in a map, you can fill in a column with the name of the nearest feature in another map layer or with the distance to the nearest feature in another map layer. This is called tagging. For example, suppose you are looking at a dataview of subway riders. You could fill in one column in the dataview with the distance to the nearest subway station and a second column with the name of the nearest subway


Dataview3 - Customers

[Customer Name]	[Closest Store]	[Distance to Closest Store]
Customer #1019	5	0.95
Customer #1032	5	0.40
Customer #1056	5	0.75
Customer #1507	1	0.97
Customer #2204	4	0.42
Customer #2238	4	1.30
Customer #2251	4	2.73
Customer #2294	2	0.59
Customer #2329	2	0.35
Customer #2332	2	0.59
Customer #2384	4	2.36

station. How a layer is tagged depends on the type of layer. The following table explains how different types of layers are tagged:

Layer to be tagged (Destination)	Layer tagged from (Source)		
	Point	**Line**	**Area**
Point	Closest point	Closest line	Area that the point is in
Line	Point that is closest to the line	Line that is closest to a shape point on the line	Area that the midpoint of the lines is in
Area	Point that is closest to the area centroid	Line that is closest to the area centroid	Area that the centroid of the area is in

To use this method, you must choose to fill a single column in the dataview, and the field type must match the type of data you are filling in.

Aggregate: You can fill in records with the aggregate data from another layer. For example, you could fill in fields for a city boundary layer with the number of customers or the total street mileage within each city.

You can use this only if the dataview contains data for a map layer. To use this method, you must choose to fill a single column in the dataview.

Dataview1 - Cities with Aggregated Data

Name	[Miles of Road]	[Subway Stations]
Boston MA	994	92
Braintree MA	161	1
Brookline MA	109	17
Cambridge MA	150	6
Malden MA	115	2
Medford MA	145	1
Newton MA	319	8
Quincy MA	248	4
Revere MA	119	3
Somerville MA	111	1
Watertown MA	83	0

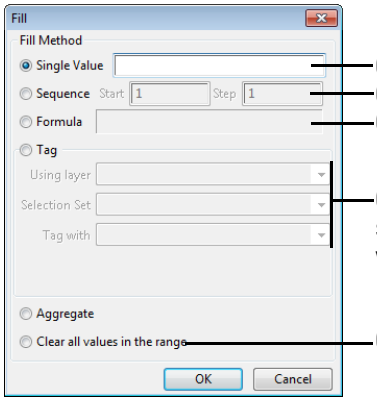
Clear: You can clear the values in a column or range of cells.

▶ To Fill a Range of Cells or a Column with Data

1. Highlight the range to fill by dragging a rectangle over the cells, by clicking in one corner of the range and shift-clicking in the other corner, or by clicking on the name of a field to select a column and shift-clicking to select more columns.
2. Choose ***Edit-Fill*** or right-click on a column heading or range and choose Fill. Maptitude displays the ***Fill*** dialog box.

TIP: You can also clear cells by right-clicking on a highlighted range of cells and choosing ***Clear***.

3. Make choices as follows:



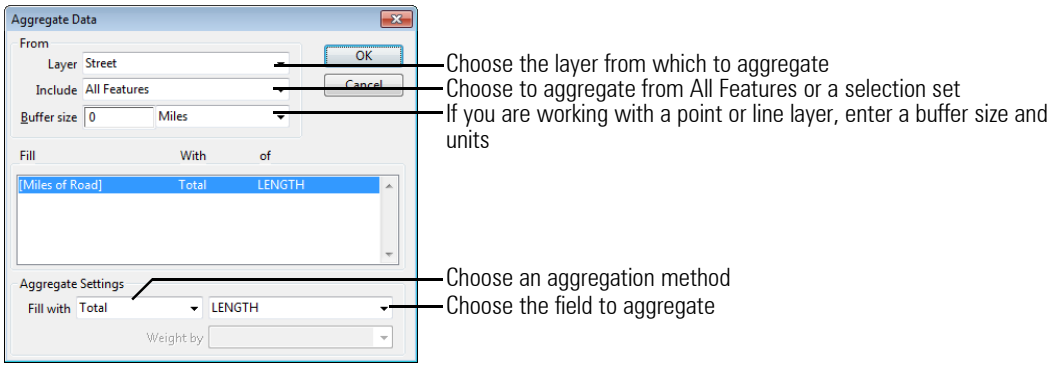
Choose to fill cells with the same value and enter the value
Choose to fill cells with a sequence and enter the start and increment values
Choose to fill with a formula and enter a formula in the Formula dialog box
Choose to fill with information from a map layer, choose the layer and selection set to use, and choose whether to tag with the name, ID, or other value, or with the distance to the nearest feature
Choose to clear the cells

4. Click **OK**.

Maptitude fills the highlighted columns or range of cells with data.

▶ To Fill a Field with Aggregate Data

1. Select the field to fill by clicking on the name of the field.
2. Choose ***Edit-Fill*** or right-click on a column heading or range and choose ***Fill***. Maptitude displays the Fill dialog box.
3. Click the **Aggregate** radio button. Maptitude displays the Aggregate Data dialog box.
4. Make choices as follows:



The following table outlines the aggregation methods:

Method	What it does
Total	Maptitude adds the values for all of the individual features that are within the area specified.
Average of	Maptitude computes a weighted average of the values from the individual features.
Low Value of	Maptitude uses the lowest value from the individual features.
High Value of	Maptitude uses the highest value from the individual features.
Count	Maptitude counts the number of individual feature.

5. Click **OK** to return to the Fill dialog box.
6. Click **OK**.

Maptitude fills the highlighted column with the aggregate data.

Adding and Deleting Records

You can use a dataview to add records to or delete records from a table or from a standard (.DBD) point geographic file. When you add point features to a geographic file from a dataview, the longitude and latitude of the point are left blank. You can then type in a longitude and latitude, or use one of the locate commands to fill in the correct location. For more information, see *Chapter 9: Geocoding: Locating Your Data on a Map*. You can also use the geographic editing tools to add point features as described in *Chapter 13: Creating and Editing Geographic Files*.

You cannot add line or area features to a geographic file from a dataview. Instead, you must use the geographic editing tools, which are described in *Chapter 13: Creating and Editing Geographic Files*.

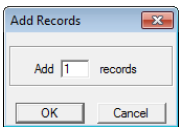
▶ To Add a Record

1. Click  on the Standard toolbar.

Maptitude adds a record to the file, and highlights it in the dataview.

▶ To Add Multiple Records

1. Choose ***Edit-Add Records*** to display the Add Records dialog box.



2. Type the number of records to add and click **OK**.

Maptitude adds the records to the file.

▶ To Delete One or More Records

1. Click on any cell in a record you want to delete or click and drag to highlight several records.
2. Choose ***Edit-Delete Records*** or click on the Standard toolbar and click **Yes** to confirm that you want to delete the records.

—OR—

1. Click on a locked cell to select an entire row, and shift-click to select more rows.
2. Right-click on a locked cell, choose ***Delete Records***, and click **Yes** to confirm that you want to delete the records.

▶ To Delete Selected Records

You can delete a group of records at once by selecting them. When you use this method, the records you delete must be in the selection set named "Selection." Select the records you want to delete using one of the selection commands or tools.

1. Choose ***Edit-Delete Selected Records*** and click **Yes** to confirm that you want to delete the records.

Maptitude deletes the records. For more information on Selection Sets, see *Chapter 8: Queries and Selection Sets*.

Undoing and Redoing Dataview Edits

You can undo and redo edits in a dataview, including an Info window. Maptitude lets you undo dataview edits using the ***Edit-Undo data editing*** command or the Undo button on the Standard toolbar. You can also redo the most recently undone dataview edits using the ***Edit-Redo data editing*** command or the Redo button on the Standard toolbar.

NOTE: You can undo and redo dataview edits provided that you have enabled the Undo/Redo option. Choose ***Edit-Preferences*** and check the Remember Edit Actions box and set the maximum undo file size on the System Page to enable this option.

When you undo or redo a dataview edit, Maptitude displays a dialog box with a description of what type of dataview edit will be undone or redone.

You can also undo and redo edits done with the ***Edit-Fill*** and other commands. The names of the ***Undo*** and ***Redo*** commands on the ***Edit*** menu will reflect the edit actions that can be undone and redone, such as ***Edit-Undo Add Record*** or ***Edit-Redo Delete Record***.

There is one series of edit actions, including geographic edits, which can be undone and redone in order. If you are doing a complex series of edits in different windows, the next action that can be undone or redone may be in a different window. If necessary, Maptitude will change the current window and the location within that window to show the modification caused by undoing or redoing.

Maptitude will warn you if an edit action will not fit into the undo file. You can clear the undo file to make room for new edit actions with the ***Edit-Clear Undo*** command.

▶ To Undo Dataview Edits

1. Choose ***Edit-Undo [edit action]***, click on the Standard toolbar, or use the shortcut Ctrl+Z. Maptitude displays a Confirm dialog box with a description of the edit action that will be undone.
2. Click **Yes**.

Maptitude undoes the most recent edit action.

▶ To Redo Dataview Edits

1. Choose ***Edit-Redo [edit action]***, click on the Standard toolbar, or use the shortcut Ctrl+Y. Maptitude displays a Confirm dialog box with a description of the edit action that will be redone.
2. Click **Yes**.

Maptitude redoes the most recently undone edit action.

Try It Yourself: Editing Data in a Dataview

1. Choose ***File-Open Workspace*** then open the workspace **editdata.wrk** in the Tutorial folder.
2. Click on any cell in the **[ZIP Code]** column of the School dataview, type "**10001**," and press Enter.
3. Click and drag to highlight several cells in the [ZIP Code] column.
4. Choose ***Edit-Fill***, then click the **Sequence** radio button. Type "**10001**" for the start value, type "**2**" for the step value, and click **OK**. Maptitude fills the [ZIP Code] cells in the sequence 10001, 10003, 10005, etc.
5. Click on the **[ZIP Code]** heading to select the column.
6. Choose ***Edit-Fill***, then click the **Tag** radio button. Choose **5-Digit ZIP Code** from the Using Layer drop down list, choose **ZIP** from the Tag With drop-down list, and click **OK**. Maptitude fills the [ZIP Code] cells with the ZIP Code in which each school is located.
7. Click on the map or choose ***Window-Map1-Manhattan Schools*** to make the map the active window.
8. Choose **School** from the drop-down list on the Standard toolbar.
9. Click in the Tools toolbar to activate the Info tool and click on several schools on the map. Notice that the ZIP Codes have been correctly tagged to the schools.
10. Click on the dataview or choose ***Window-Dataview1-School*** to make the dataview the active window again. The [ZIP Code] field should still be highlighted.
11. Choose ***Edit-Fill*** again, then click the **Clear All Values in the Range** radio button, and click **OK**. The [ZIP Code] column now has missing values.
12. Choose ***Edit-Undo Data Editing*** or click on the Standard toolbar, and click **Yes** in the Confirm dialog box. Maptitude restores the values to the [ZIP Code] column.
13. Choose ***File-Close All*** and click **No to All** to close the map, dataview, and Info window without saving any changes.

Dataview Tools

Transposing a Table

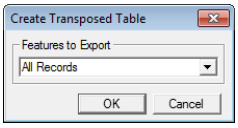
When you transpose a table with the ***Dataview-Tools-Transpose*** command, Maptitude writes a new table file where the rows become columns and vice versa. The first column is called Field and contains the field names. The rest of the columns are called [Record 1], [Record 2], etc. and contain the values for the fields; in a dBASE file, they are called RECORD_1, RECORD_2, etc.

You can choose which records to save to the transposed table using a selection set. There is a limit of 255 records to ensure rapid execution and to prevent exceeding the maximum field limit for dBASE (.DBF) files.

TIP: You can also transpose a dataview without creating a new table. See "Changing the Way the Dataview Looks" on page 187.

▶ To Transpose a Table

1. Open or choose a dataview to transpose. Make sure there is a selection set if you want to transpose selected records.
2. Choose ***Dataview-Tools-Transpose*** to display the Create Transposed Table dialog box.



3. Choose whether to transpose All Records or a selection set from the drop-down list.
4. Click **OK**. Maptitude displays the Save As dialog box.
5. Choose a file type from the Files of Type drop-down list, choose a folder, type a name for the table file, and click **Save**.

Maptitude transposes the records and writes them to a table file.

Doing Frequency Analyses

Maptitude has two commands that let you identify the frequency of duplicate records in a table:

- The ***Dataview-Tools-Group By*** command lets you create a table with unique values for a chosen field. The resulting table will include the count of duplicate features and, optionally, other aggregated attributes. For more information on aggregation methods, see "Aggregation Methods" on page 321.
- The ***Dataview-Tools-Duplicates*** command lets you tag each record in a table with the count of records with duplicate values of a particular field.

For example, suppose you have the following dataview of street segments in a city:

Dataview - Street

NAME	LENGTH	[Travel Time]	CLASS
ALTA RD	0.12	0.296	A41
BROOKDALE RD	0.08	0.199	A41
BROOKDALE RD	0.04	0.085	A41
BROOKDALE RD	0.16	0.376	A41
CLIFFORD RD	0.13	0.305	A41
EDDY ST	0.22	0.533	A41
EDDY ST	0.10	0.248	A41
JASON DR	0.11	0.266	A41
KAY ST	0.29	0.702	A41
LANDHAM RD	0.07	0.115	A31
LANDHAM RD	0.07	0.110	A31
LANDHAM RD	0.09	0.154	A31
LANDHAM RD	0.08	0.127	A31
LANDHAM RD	0.02	0.036	A31

You could use the ***Group By*** command to create a table that lists the unique street names in the city, the total length of each street, and its class (below left). Alternatively, you could use the ***Duplicates*** command to add a new field that has the count of segments with matching names for each record (below right).

Dataview - Street grouped by NAME

[GroupedBy(NAME)]	[Count(NAME)]	LENGTH	[Travel Time]	CLASS
ALTA RD	1	0.12	0.296	A41
BROOKDALE RD	3	0.28	0.660	A41
CLIFFORD RD	1	0.13	0.305	A41
EDDY ST	2	0.33	0.781	A41
JASON DR	1	0.11	0.266	A41
KAY ST	1	0.29	0.702	A41
LANDHAM RD	5	0.33	0.543	A31
PATRICIA RD	1	0.31	0.733	A41
PINEWOOD AVE	3	0.39	0.942	A41
SPRING ST	1	0.15	0.358	A41
STATION RD	1	0.23	0.563	A41
SUMMER ST	2	0.22	0.525	A41
UNION AVE	3	0.64	1.265	A31
WAGONWHEEL RD	1	0.32	0.757	A41

Dataview - Street + Duplicates

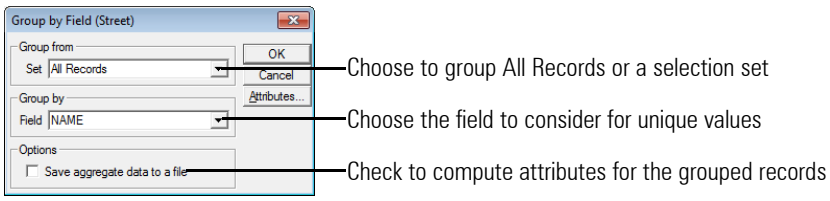
NAME	LENGTH	[Travel Time]	CLASS	[Count(NAME)]
ALTA RD	0.12	0.296	A41	1
BROOKDALE RD	0.08	0.199	A41	3
BROOKDALE RD	0.04	0.085	A41	3
BROOKDALE RD	0.16	0.376	A41	3
CLIFFORD RD	0.13	0.305	A41	1
EDDY ST	0.22	0.533	A41	2
EDDY ST	0.10	0.248	A41	2
JASON DR	0.11	0.266	A41	1
KAY ST	0.29	0.702	A41	1
LANDHAM RD	0.07	0.115	A31	6
LANDHAM RD	0.07	0.110	A31	6
LANDHAM RD	0.09	0.154	A31	6
LANDHAM RD	0.08	0.127	A31	6
LANDHAM RD	0.02	0.036	A31	6

▶ To Group Duplicate Records

1. Choose ***Dataview-Tools-Group By*** to display the Group by Field dialog box.

TIP: To learn about using the Attribute button, see "Aggregation Methods" on page 321.

2. Make choices as follows:

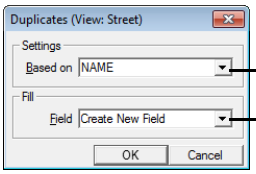


3. Click **OK**. Maptitude displays the Save As dialog box.
4. Type a file name for the new table, and click **Save**.

Maptitude creates a table of the unique values in the chosen field and displays it in a dataview.

▶ To Count Records with Duplicate Values

1. Choose ***Dataview-Tools-Duplicates*** to display the Duplicates dialog box.
2. Make choices as follows:



Choose the field on which to base the duplicate count

Choose Create New Field or choose an existing field to store the results

3. Click **OK**.

Maptitude fills the chosen field with the frequency counts, or if you chose Create New Field, displays a joined view with the frequency counts.

Try It Yourself: Grouping Duplicate Records

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **locator.map** in the Tutorial folder.
2. Right-click on the **County** layer in the Display Manager and choose ***New Dataview*** to open a dataview of the counties in Southern New England.
3. Click on the **State** column heading to highlight the column. You want to group the county data to see the aggregate values for the states.
4. Choose ***Dataview-Tools-Group By*** to display the Group by Field dialog box.
5. Verify that **State** is chosen in the Field drop-down list.
6. Click **OK**. Maptitude displays a dataview with the data grouped by state. The **[Count(State)]** field shows the number of counties in each state, the **Population** field shows the total population of each state, the **[Avg Population]** field shows the average county population in each state, and so forth.
7. Choose ***File-Close All*** to close the map and dataviews.

Merging Records by Value

The ***Tools-Editing-Merge by Value*** command can be used with any table. If the table is associated with an area layer, not only can you merge the records in the table to create a new table, but also you can merge the areas to create a new area geographic file; for more information, see "Tagging Points by Area" on page 298.

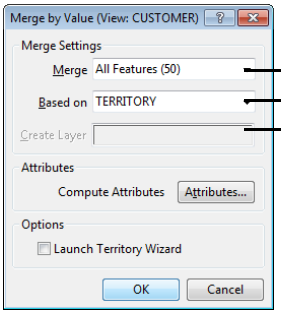
If the table is associated with a point or line layer, or is not associated with any layer, you can still use the ***Tools-Editing-Merge by Value*** command to summarize records that have common values in a field. For example, if you have a table of data by county with a field containing the state, you could merge the records to get statewide totals. The new table will have one record for each common value. You can control how the numeric fields are summarized.

The Merge by Value dialog box will have two differences when you are not creating territories:

- The **Create Layer** edit box will be disabled, because you will not be creating a new area geographic file
- The **Compute Attributes** box will be checked and disabled, because you will want to summarize the data

▶ To Merge Records by Value

1. Choose a layer from the drop-down list on the Standard toolbar when a map is the active window, or make a dataview active for a table not associated with a geographic layer.
2. Choose ***Tools-Editing-Merge by Value*** to display the Merge by Value dialog box.
3. Make choices as follow:



Choose whether to merge All Records or those in a selection set
Choose the field containing the common name or value to use for merging records
If you are merging features in an area layer, type a name for the new layer

4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the new table, and click **Save**.

Maptitude merges the records, stores them in a binary (.BIN) file, and displays the results in a new dataview.

TIP: To learn about using the Attribute button, see "To Change the Aggregation Method when Calculating Demographics" on page 322.

Try It Yourself: Merging Records by Value

1. Choose ***File-Open*** or click on the Standard toolbar, then open the dBASE file **customer.dbf** in the Tutorial folder. Maptitude displays a dataview of customers that includes the amount of sales for each customer and the sales territory that they are in. You are going to merge the table by territory to see the sales data by territory.
2. Choose ***Tools-Editing-Merge by Value*** to display the Merge by Value dialog box.
3. Choose **TERRITORY** from the Based On drop-down list.
4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type "**My Merged Territories**" as the file name and click **Save**. Maptitude merges the records and displays the results in a new dataview.
6. Choose ***File-Close All*** to close the dataviews.

Saving and Opening Dataviews

You save a dataview into a .DVW file when you want to save the arrangement, formatting, and formula fields. Once you save a dataview, you can open it again later to see the same data arranged and formatted in the same way. Saving a dataview is not the same as saving the data, because all the data you see in a dataview are stored elsewhere, in geographic files, spreadsheets, or databases. Those files can be edited and updated using any number of different software packages. Saving a dataview into a .DVW file only saves the way the data are presented, not the data themselves. To learn how to change the data, see "Editing and Updating Data" on page 197.

You can save the data in a dataview into a new data file of a different file type, with the rows and columns just as you see them in the dataview. This can be a handy way to manage your data, by producing a new table with just the rows and columns that you want, in the desired order. The values in any formula fields can also be included when you save a dataview to a different file type. For more information see "Creating a Table from a Dataview" on page 229.

You can also save a dataview as a graphic file that can, for example, be added to a document or a web page. Supported graphic formats include:

- Windows bitmap file (.BMP)
- JPEG compressed image file (.JPG)
- Portable Network Graphics file (.PNG)
- GIF image file (.GIF)
- TIFF image file (.TIF)

▶ To Save a Dataview

1. Choose ***File-Save*** or click  on the Standard toolbar.
2. If you are saving the dataview for the first time, Maptitude displays the Save As dialog box. Enter a name for the file and click Save.

Maptitude saves the dataview to a file on disk. Maptitude dataview files always have the extension .DVW. If you are saving the dataview for the first time, you can also choose other file types; see "To Save a Dataview with a New Name or as a Different File Type" below for details.

▶ To Save a Dataview With a New Name or as a Different File Type

1. Choose ***File-Save As*** to display the Save As dialog box.
2. Choose a file type from the Files of Type drop-down list.

   If the file type is Comma-delimited Text you can click Options to display the CSV Options dialog box. Check the Save Field Name Header box if you want to save the field names as a header record (this is the default; the data will start in the second record), and check the Rename ID to RecordID box if you want to use "RecordID" rather than "ID" as the name for that field (for compatibility with Microsoft Excel). When you are done, click OK.
3. Type a new name for the dataview file.
4. Click **Save**.

Maptitude saves the dataview into a file of the chosen type.

TIP: You can quickly open recently used dataviews by choosing ***File-Recent Files*** and choosing the dataview from the submenu.

▶ To Open a Saved Dataview

1. Choose ***File-Open***, click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose Map, Dataview, Figure, Layout as the file type.
3. Choose a dataview file from the list.
4. Click **Open**.

Maptitude opens the file and displays the dataview you selected.

Printing a Dataview

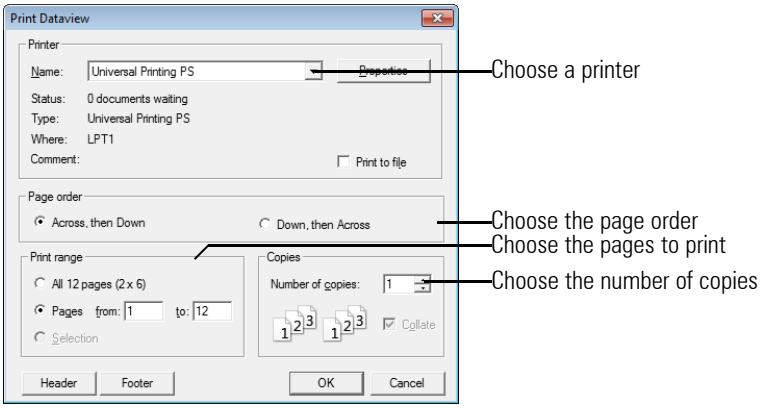
Maptitude prints dataviews to any installed printer. When you print a dataview, Maptitude prints all of the rows and columns in your dataview with the same font size, grid settings, field names, and formats that you see on the screen. Before printing, Maptitude figures out exactly how many pages are needed to print all of the data. It automatically takes into account the current page margins, the font size, and the number of locked columns (if any) that appear in your dataview. When you print, you can choose which pages you want. If you have columns locked in place in the dataview, these columns will appear on the left side of every page you print.

If you want to print several dataviews on a page, add titles to your dataviews, or print a dataview and a map on the same page, see *Chapter 15: Creating and Using Layouts*.

NOTE: To change the paper margins, choose ***Edit-Preferences*** and enter new values for the margins on the System tab.

▶ To Print a Dataview

1. Choose ***File-Print*** or click on the Standard toolbar to display the Print Dataview dialog box.
2. Choose the printer and other settings:



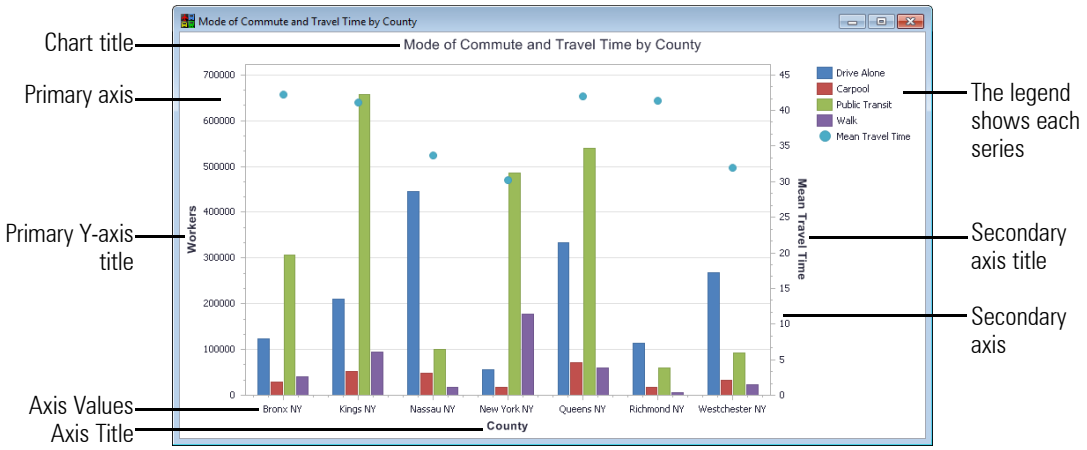
3. Click **OK**.

Maptitude prints the dataview. You can interrupt printing of the dataview at any time by clicking Cancel.

NOTE: To change paper size, orientation, or source, or to change other printer settings, click Properties in the Print Dataview dialog box.

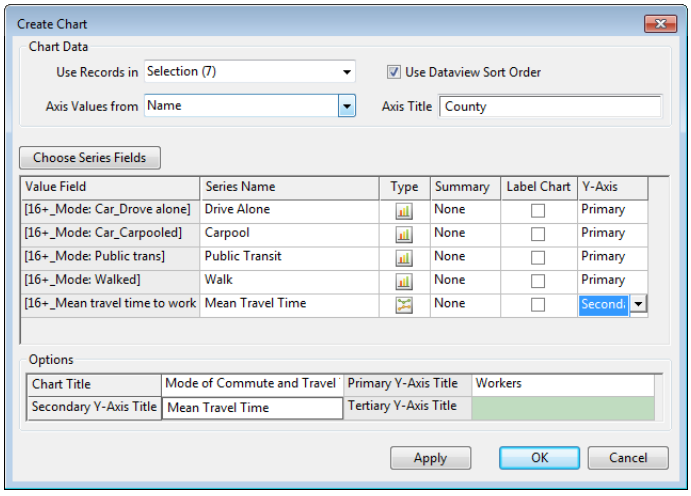
Creating and Working with Charts

You can create a chart at any time by clicking on the Standard toolbar and then specify the records to use and the series fields, the type of chart, and other settings. If you are charting more than one series, you can choose to have separate data ranges for the left and right Y-axis by designating a secondary Y-axis.



▶ To Create a Chart

1. Create a selection set of the records you want to chart or highlight the cells in the dataview of the records and fields you want to chart.
2. Click on the Standard toolbar to display the Create Chart dialog box.



3. If you highlighted cells in a dataview, the chart will automatically use the chosen records, otherwise choose to use a selection set or All Features from the Use Records In drop-down list.
4. To use the dataview sorting order on the chart data, check the **Use Dataview Sort Order** box.
5. Choose a field to use for the X-axis values from the Axis Values From drop-down list and type a title for the X-axis in the Axis Title edit box.
6. If you highlighted cells in a dataview, the highlighted fields will already be chosen in the grid view, otherwise click **Choose Series Fields**. In the Choose Series Fields dialog box, highlight the fields you want to chart in the Available fields list, click **Add>>** to select them, and click **OK**.

7. For each series do the following:
   - In the Series Name column, enter a name for the series to display in the chart legend
   - In the Type column, choose the type of chart to use
   - If there are multiple records in your data for the Axis Values field, choose whether to chart the Count, Sum, Maximum, Minimum, or Average value to be displayed in the chart
   - In the Label Chart column, check the box if you want to display values for the series in the chart
   - In the Y-Axis column, choose whether to use the primary axis, secondary axis, or tertiary axis for the series
8. Optionally enter a title to display at the top of the chart in the Chart Title edit box and a title for each axis.
9. Click **OK**.

Maptitude creates a chart and displays it in a new window.

▶ To Customize a Chart

1. Right-click on a chart and choose Edit to display the Chart Wizard.
2. Click Next to guide your way through the Chart Wizard or use the links on the left side of the Chart Wizard to go to a specific topic. The following table outlines the types of changes you can make with each topic:

Topic	What you can do...
Chart Type	Choose the chart type you want to use
Appearance	Choose a palette to color series and a style
Series	Change the type or name of a series or drop a series on the General tab; Change the X-axis sort order on the Series Options tab
Chart	Change the background colors on the General tab; Change the border and padding on the respective tabs
Panes	Change the color of the chart pane background on the Appearance tab; and change the border or shadow on the respective tabs
Axes	Choose an axis to modify from the drop-down list and change its visibility, position, and range on the General tab; Change the grid spacing on the Scale Options tab; Change the axis label on the Elements tab; Change the tic labels on the Labels tab; Change the appearance, constant lines, and scale breaks on the respective tabs
Series Views	Choose a series to modify from the drop-down list and change its color and style on the Appearance tab; Change its border and shadow on the respective tabs
Point Labels	Choose a series to label on the chart from the drop-down list and make changes to the label settings and appearance on the various tabs
Chart Titles	Click Add to add a title; Enter the title text on the Text tab; Change its appearance and location on the General tab
Legend	Change visibility, location, and margin settings on the General tab; Change the color and style on the Appearance tab; Change the spacing on the Interior tab; Change the marker, text, border, and shadow on the respective tabs

3. Click **Finish** when you are done.

Saving and Opening Charts

You can save a map to a .CHART file that can be opened again in Maptitude. You can also save charts as graphics files (.JPG, .PNG, .EMF, .WMF) that you can use in other programs or place into Maptitude layouts.

▶ To Save a Chart

1. Choose ***File-Save***, click on the Standard toolbar, or right-click on the chart window and choose ***Export***. Maptitude displays the Save Chart As dialog box.
2. Choose the type of file to save from the Save As Type drop-down list.
3. Type a name for the file and click **Save**.

Maptitude saves the chart to a file on disk in the format you chose.

▶ To Open a Saved Chart

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose Chart (.CHART) as the file type.
3. Choose a chart file from the list.
4. Click **Open**.

Maptitude opens the chart file.

Printing a Chart

Maptitude prints charts to any installed printer.

▶ To Print a Chart

1. Choose ***File-Print***, click on the Standard toolbar, or right-click on the chart window and choose ***Print Preview***. Maptitude displays the Print Preview window.
2. Use the buttons in the Print Preview as follows:

To do this...	Do this...
Print the chart to the Windows default printer	Click
Print to another printer	Click , choose the printer settings and click **Print**
Change the page settings	Click , specify the paper size, page orientation, and page margin, and click **OK**.
Adjust the chart size on the page	Click , choose a scaling method and size, and click **OK**.

Try It Yourself: Creating and Customizing Charts

1. Choose ***File-Open*** or click on the Standard toolbar, then open the dataview **chart.dvw** in the tutorial folder. Maptitude displays a dataview of selected Rhode Island counties.
2. Click on the column heading **Population** to highlight the entire column.
3. Click on the Standard toolbar to display the Chart Data dialog box.
4. Verify that **[County Name]** is chosen in the Axis Values From drop-down list.
5. Click the cell in the **Type** column to display the Chart dialog box, choose a Pie chart, and click **OK**.
6. Check the box in the **Label Chart** column.
7. Click **OK**. Maptitude displays a pie chart showing the population distribution.
8. Close the chart window.
9. Ctrl-click on the **[Mode: Drove Alone]**, **[Mode: Carpool]**, and **[Mode: Bus]** column headings to highlight the three fields.
10. Click on the Standard toolbar to display the Chart Data dialog box and click **OK**. Maptitude displays a bar chart with the mode share by county.
11. Right-click on the chart and choose ***Edit***.
12. Click the Bar 3D Stacked chart type and click **Finish**. Maptitude updates the chart with the new style.
13. Choose ***File-Close All*** close the chart and dataview without saving any changes.

Dataview Advanced Topics

In addition to displaying data for native Maptitude geographic files and Excel files, you can view data from a number of additional sources in a dataview or create new tables from scratch or modify your existing tables. Maptitude dataviews can also handle codes and field sets, and can be used to determine summary statistics for an entire table or a selection set.

Opening Dataviews from Other Sources

You can display data from many sources in a Maptitude dataview including:

- ODBC tables
- ODBC SQL Query
- Oracle tables
- Microsoft Access tables
- Microsoft SQL Server tables

Creating a Dataview Using ODBC

ODBC drivers let Maptitude access data stored in many different formats. If you have the appropriate ODBC drivers, you can display and work with data from Access, DB2, Excel, Informix, Oracle, SAS, Sybase, and other database files within a dataview. Each ODBC driver is written for a specific data source file format. Most database manufacturers provide or offer ODBC drivers for their databases.

If you want to be able to edit the data, the ODBC table must have a unique field. This field should be indexed to improve performance. Maptitude can also handle large tables faster if there is an indexed

unique field. Maptitude will look for a key field in the ODBC table and, if found, suggest it as the unique field and show whether it is indexed and whether it is a primary key.

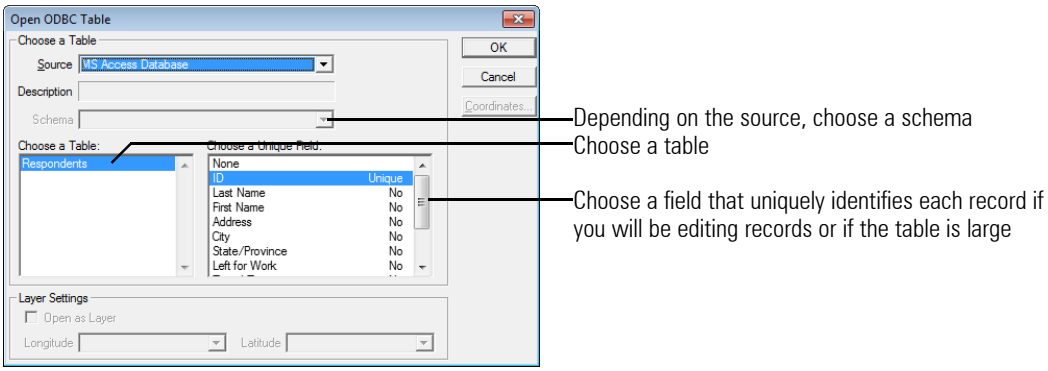
You can also create a map layer from an ODBC table that has fields that contain a coordinate. For more information, see "Creating a Map Layer from an ODBC Table" on page 66.

▶ To Set Up Your Computer to Use ODBC

First you must install and configure one or more ODBC drivers. For installation instructions, refer to the documentation provided by the manufacturer of your ODBC driver. To configure an ODBC data source, use the ODBC Setup program in the Windows Control Panel, and follow the directions provided by the manufacturer of your ODBC driver. Your System Administrator can assist you in installing and configuring ODBC for use on your computer.

▶ To Display Data from an ODBC Table

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **ODBC Table** from the Files of Type drop-down list. Maptitude displays the Open ODBC Table dialog box.
3. Choose a source from the Source drop-down list. If the source is generic, such as MS Access, Maptitude will display the Select Database dialog box. Choose a database, and click **OK**.
4. Make choices as follows:



5. Click **OK**.

What happens next will depend upon the type of file you are opening and the ODBC driver you are using. Some products do not require a password or any supplemental information. In this case, Maptitude simply displays the data in a dataview. Other products require a password or other supplemental information. See your System Administrator about obtaining access. Once you have met the requirements of your data source, Maptitude displays the data in a dataview.

To edit data using ODBC, there must be a data field that contains a unique value for each record in the table. Choose this field from the Unique Field drop-down list. For example, if you open a customer file using ODBC, choose the Customer ID as the unique field. If you do not identify a unique field, the ODBC table will be read-only, and you will not be able to edit values in the table.

If a unique field is specified, it is used as a key field for finding records with the Edit-Find command. The field you choose should be indexed in the source table, or performance will be slow.

Once the dataview is displayed, you can use the dataview exactly like any other dataview. With the support for ODBC 3.0, you can add and delete records. Some databases, however, may have restrictions on editing or updating the data. Also, note that traffic on your local area network and the load on your file server may affect response time.

NOTE: If you use a generic ODBC source, you may be limited in what you can open with that source to just the tables in the database or the directory that you choose. To use multiple sources of the same database type, you can configure additional sources with the ODBC setup program.

Creating a Dataview Using an ODBC SQL Query

You can use an SQL query to select data from an ODBC table to view in a dataview. An SQL query allows you to view all or some of the fields from one or more tables. An SQL query can specify such things as which records to select, what sort order to use, and how to group records.

Maptitude helps you build SQL queries by providing the names of tables within the ODBC source and of fields within a table, and providing keywords that can be used in an SQL query. Different drivers have different SQL capabilities, so an SQL statement that works with one ODBC driver may not work with another. Maptitude does not check the syntax of the Select statement. The following is a brief overview of building a Select statement.

The default query when you open the dialog box is "SELECT * FROM" You only need to add a table name. The asterisk in the SELECT section means to include all fields in the dataview; you can replace it with a list of fields. Fields and tables in lists must be separated by commas. Field and table names that have spaces or special characters must be surrounded by quotes. If you are using two or more tables with field names in common, put the table name and a period before the field name to specify which field you mean. For example:

- SELECT * FROM Customers
- SELECT ClientID, 'Last Name' FROM Clients
- SELECT Route.ID, Stop.ID FROM Route, Stop WHERE Route.ID='Route Number'

The WHERE keyword is for selecting records and for joining two or more tables, and must be followed by a condition. Here are some examples, with keywords that can be used in WHERE clauses:

Example	Selects records...
WHERE Type = 'Commercial'	That have 'Commercial' in the Type field
WHERE 'Sales' BETWEEN 10000 AND 25000	With a Sales field value between 10,000 and 25,000
WHERE LastName LIKE 'Cal%'	That start with "Cal" in the LastName field
WHERE Customer.ID = Sales.CustID DISTINCT	Where the IDs match, but ignores additional matches into Sales table

The ORDER BY keyword sorts the records on one or more fields.

The GROUP BY keyword lets you summarize records by the values in one or more fields. Use the function keywords in the field list in the SELECT section to get the desired summary values:

Function	Description
SUM()	Totals a field for the group of records
AVG()	Gets the mean of the group of records
MIN()	Gets the lowest value in the group of records
MAX()	Gets the highest value in the group of records
COUNT()	Counts the number of records in the group

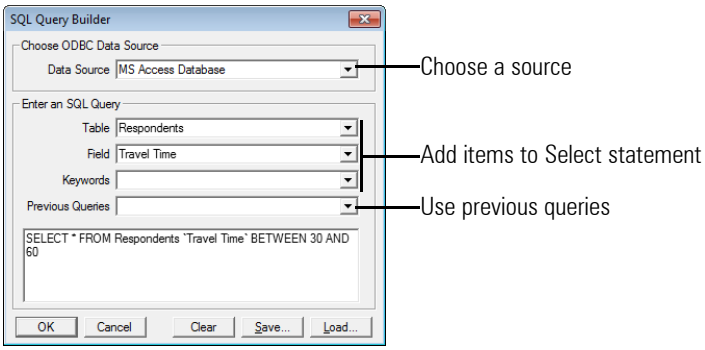
A field name can appear more than once; for example "SELECT SUM(Sales), AVG(Sales) FROM Qtr4 GROUP BY State" would display the total and mean of the Sales field for each state. You can add the DISTINCT keyword before a field name when using COUNT() to count only unique values. The HAVING keyword is used with the GROUP BY keyword to only include groups that meet a condition; for example, "HAVING COUNT(*)>2" would make sure the groups have at least two records.

You can reuse previous queries, which Maptitude keeps track of until you exit the program. To reuse queries later, you can save the previous queries to a query file, and then load queries from one or more query files. A query file is a text file that saves the SQL Select statement and the name of the source for each previous query.

▶ To Display Data from an ODBC SQL Query

1. Choose ***File-Open***, click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.

2. Choose **ODBC SQL Query** from the Files of Type drop-down list. Maptitude displays the SQL Query dialog box.



3. Choose an ODBC data source from the Data Source drop-down list.

   If the source is generic, such as MS Access, Maptitude will display the Select Database dialog box. Choose a database, and click OK.

4. Make choices as follows to build the Select statement:

To do this...	Do this...
Choose the fields to include	Replace the asterisk (*) in the Select statement with the names of one or more fields.
Add a field	Choose a field from the Field drop-down list. If you choose more than one field, separate the field names with commas.
Add a table	Choose a table from the Table drop-down list. If you choose more than one table, separate the table names with commas
Add a keyword	Choose the keyword from the Keywords drop-down list.
Use a previous SQL query	Choose a query from the Previous Queries drop-down list. If necessary, Maptitude will change the source, then will replace the Select statement with the chosen query.
Clear the Select statement	Click Clear. The Select statement returns to the default "SELECT * FROM"

When adding items to the Select statement, make sure that the insertion bar is in the place where you want to make the addition, and that there will be spaces between words. You can save and load previous queries:

To do this...	Do this...
Load previous SQL queries	Click Load to display the File Open dialog box. Choose a query file and click Open. The previous queries will be added to the Previous Queries drop-down list. You can load additional queries from other query files.
Save previous SQL queries	Click Save to display the Save As dialog box. Type a file name and click Save. Maptitude saves the queries that are in the Previous Queries drop-down list.

5. Click **OK**.

Maptitude opens a new dataview and displays the data requested in the Select statement.

Creating a Dataview from an Oracle Table

Maptitude provides direct access to data stored in Oracle tables. You can display and work with them within a dataview. The Oracle client software lets you set up Oracle services, which are like ODBC sources. An Oracle service gives you access to one or more Oracle tables.

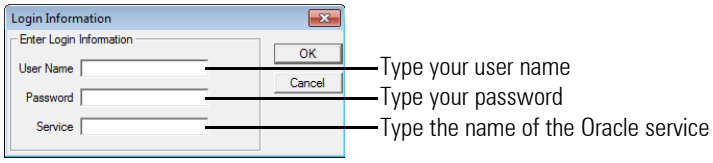
If you want to be able to edit the data, the Oracle table will need to have a unique field. Having a unique field will also improve the performance for large tables. This field should be indexed. Maptitude will look for a key field in the Oracle table and, if found, suggest it as the unique field and show whether it is indexed and whether it is a primary key.

▶ To Set Up Your Computer to Use Oracle Tables

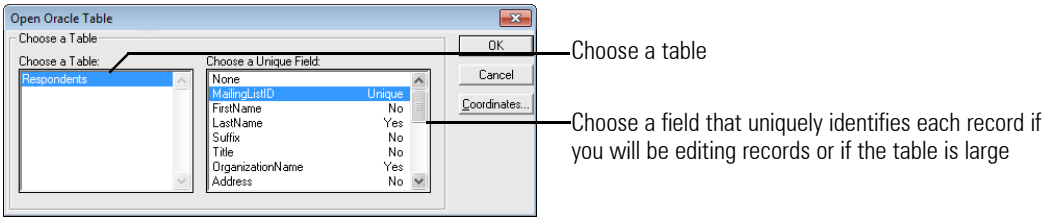
First you must install and set up the Oracle client software. For installation instructions, refer to the documentation provided by Oracle. To configure an Oracle service, use Oracle client software and follow the directions provided by Oracle. Your System Administrator can assist you in installing and configuring Oracle for use on your computer.

▶ To Display Data from an Oracle Table

1. Choose ***File-Open***, click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **Oracle Table** from the Files of Type drop-down list. Maptitude displays the Login Information dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude connects to the Oracle service and displays the Open Oracle Table dialog box.
5. Make choices as follows:



6. Click **OK**.

Maptitude opens a new dataview and displays data from the Oracle table.

Creating a Dataview from a Microsoft Access Table

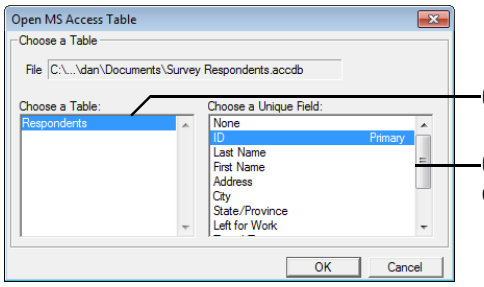
Maptitude provides direct access to data stored in tables in Microsoft Access files. You can display and work with a Microsoft Access table within a dataview. If you want to be able to edit the data, the Microsoft Access table will need to have a unique field. Having a unique field will also improve the performance for large tables. This field should be indexed. Maptitude will look for a key field in the Microsoft Access table and, if found, suggest it as the unique field.

Maptitude recognizes Microsoft Access files that contain Esri personal geodatabases, and displays a Confirm dialog box asking if you want to open a table as a map layer. Click No to open the table as a dataview, or Yes to open the table as a layer in a new map. For more information on opening a table as a map layer, see "Creating a Map Layer from an Esri Personal Geodatabase" on page 75.

▶ To Display Data from a Microsoft Access Table

1. Choose ***File-Open***, click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **MS Access Table** from the Files of Type drop-down list.
3. Choose a Microsoft Access file and click **Open**. If Maptitude displays a Confirm dialog box, click **No**. Maptitude displays the Open MS Access Table dialog box.

4. Make choices as follows:



5. Click OK.

Maptitude opens a new dataview and displays data from the Microsoft Access table.

Creating a Dataview from a Microsoft SQL Server Table

Maptitude provides direct access to data stored in tables in Microsoft SQL Server databases. You can display and work with a Microsoft SQL Server table within a dataview.

If you want to be able to edit the data, the Microsoft SQL Server table will need to have a unique field. Having a unique field will also improve the performance for large tables. This field should be indexed. Maptitude will look for a key field in the Microsoft SQL Server table and, if found, suggest it as the unique field.

▶ To Create a Dataview from a Microsoft SQL Server Table

1. Choose ***File-Open***, click on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **SQL Server Table** as the file type. Maptitude displays the Connect to SQL Server dialog box.
3. Type the server name in the Server Name edit box and choose Windows or SQL Server authentication from the Authentication drop-down list.

   For SQL Server authentication, type your user name in the Login edit box and, if necessary, type your password in the Password edit box
4. Click **OK**. Maptitude connects to the SQL Server service and displays the Open SQL Server Table dialog box.
5. Choose a database from the Database drop-down list and choose a schema from the Schema drop-down list.
6. Choose a table from the Choose a Table scroll list. Maptitude displays the fields that are in the table.
7. Choose a field that uniquely identifies each record from the Choose a Unique Field scroll list.
8. Click **OK**.

Maptitude opens a new dataview and displays data from the Microsoft SQL Server table.

Creating a New Table from Scratch

To create a new table, you choose a format and then create a list of data fields, picking a field name, field type, and display width for each one. You can indicate which fields should have indexes so that sorting, searching, and selection can be performed quickly.

You can store several more values for a field for tables with dictionaries. These values are stored after the field description in the dictionary file:

- Default Value: when a new record is added, the field will be filled with this value
- Join/Split Methods: the update methods for a field when splitting or joining map features
- Display Name: the label to use in the column heading of the dataview, instead of the field name

You can set the default value and display name when you create a new table or modify an existing table. For more information on how to use display names, see "Changing the Column Headings and Display Format" on page 187. The join/split methods can be set when you are editing map features; they are stored for you in the dictionary file. See "Updating Tabular Data" on page 407.

Data Fields

Tables can contain the following types of fields:

Type	Contents	Examples
Integer	Whole numbers between -2,147,483,646 and 2,147,483,647	1, -400, 32000, 0
Real Number	Numbers (with decimals) ranging from -1.7E+308 to 1.7E+308; the smallest absolute value being 2.3E-308	-0.00001, 492452.4
Character (String)	Letters, symbols, and numbers (up to 254 characters wide in dBASE and FoxPro)	"FY17.Q1", "New York"
Date/Time	Day, month, year, hour, minute, second compound variable	"1/1/2017 12:34:56AM"

Date fields in dBASE tables and date/time fields in Excel, ODBC, Oracle, and SQL Server tables are read as date/time variables. Other formats, such as logical fields, are displayed as character (string) fields.

Fixed-format binary files can contain the following types of fields:

Type	Contents
Real (8 bytes)	Numbers (with decimals) ranging from -1.7E+308 to 1.7E+308; the smallest absolute value being 2.3E-308
Real (4 bytes)	Numbers (with decimals) ranging from -3.4E+38 to 3.4E+38; the smallest absolute value being 1.2E-38
Integer (4 bytes)	Whole numbers between -2,147,483,646 and 2,147,483,647
Integer (2 bytes)	Whole numbers between -32,766 and 32,767
Integer (1 byte)	Whole numbers between 0 and 254
Character (String)	Letters, symbols, and numbers
Date	Day, month, and year
Time	Hour, minute, and second
Date & Time	Day, month, year, hour, minute, and second

Table Limits

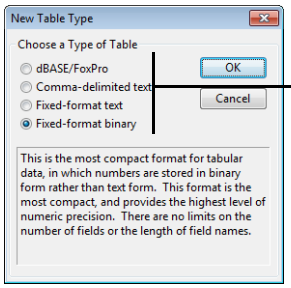
Different table formats can hold different quantities of information. The table below summarizes the limits that apply to the different table formats:

File Format	Max. # of Fields	Max. # of Records	Max. Record Length
dBASE and FoxPro	1024	1 billion	32,767 characters
Excel 2007	16,384	1 million	Unlimited
Fixed-format text	32,767	1 billion	Unlimited
Fixed-format binary	32,767	1 billion	Unlimited
Comma or tab-separated text	32,767	1 billion	Unlimited

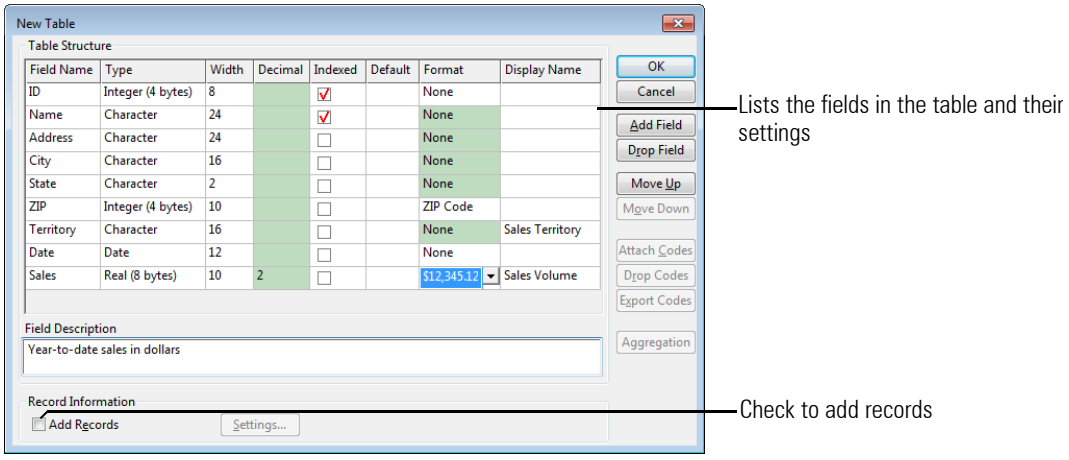
Some programs cannot handle more than 255 fields in a dBASE file. FoxPro and dBASE limit the width of character fields to 254 characters and the length of numeric fields to 20 characters. Fixed-format binary tables limit their numeric field widths to 1-8 bytes, but allow arbitrary character field widths. Comma- or tab-separated text formats and fixed-format text files place no limits on field widths.

▶ To Create a New Table

1. Choose ***Dataview-Table-New*** to display the New Table Type dialog box.



2. Choose the type of table from the radio buttons.
3. Click **OK**. Maptitude displays the New Table dialog box.



4. Set up your new table according to the following instructions:

To do this...	Do this...
Add a field	Click Add Field to add a new field to the list.
Delete a field	Click on any cell in the field you want to delete, then click Drop Field.
Change the field order	Click on any cell in a field, then click Move Up or Move Down.
Change a field name	Click on the cell in the Field Name column and type a new name.
Use a display name	Click on the cell in the Display Name column and type a display name.
Change a field type	Click on the cell in the Type column and choose a type from the drop-down list.
Change a field width	Click on the cell in the Width column and type a new width.
Change the number of decimals	Click on the cell in the Decimal column and type the number of decimal places.
Set a default value in new records	Click on the cell in the Default column and type a value in the Default box.
Change a field format	Click on the cell in the Format column and choose a format from the drop-down list.
Add new formats	Click on the cell in the Format column and choose "New Format" from the drop-down list to display the Custom Field Formats dialog box. For more information, see "Creating Custom Field Formats" on page 188.
Change a field description	Click on any cell in the field, then type a description in the Field Description box.
Index a field	Check the box in the Indexed column.

5. To automatically add records to the new table, check the **Add Records** box and choose an option from the radio list in the Add Records dialog box:

Option...	What it means...
Fixed Number	Add a fixed number of records to the table
Matching Records	Add a record for every record in an existing dataview
Unique Value	Add a record for each unique value in a field in a dataview

   See "Adding Records to a New Table" below for more information on adding records.

   Click **OK** to close the Add Records dialog box.

6. Click **OK** to close the New Table dialog box. Maptitude displays the Save As dialog box.
7. Type a file name, and click **Save**.

Maptitude creates the new table file, and adds new records according to your choices.

Adding Records to a New Table

When you create a new table, Maptitude can help you fill it with information. Maptitude offers three ways to do so: by adding a specified number of records, adding records that match those in an existing table, and adding records for each unique value of a field.

Adding a Fixed Number of Records

If you know how many records you want to store in the new table, you can tell Maptitude to add that number of blank records to the table.

For example, suppose you want to create a new table to hold information on ten different sales regions. Choose the Fixed Number option and enter 10 as the number of records, and Maptitude will create a table with ten empty records.

NOTE: You can always add records to a table or delete records from a table after it is created using the ***Edit-Add Records*** and ***Edit-Delete Records*** commands.

Adding Matching Records

Use this option when you want to store additional columns of information about records or map features in a new table. The Matching Records option automatically adds one matching record for each record or feature in the original dataview.

For example, suppose you have a sales region layer that has columns containing sales by month for the current year. When next year comes around, you want to build a new table to store the monthly sales for that year.

To use this option, you must choose:

- The map layer or dataview for which you want to create matching records.
- Whether to create a new record for every record in the map layer or dataview or only for the records in a selection set.
- The field that identifies each record. Maptitude adds this field to the new table and fills it in with the correct values.

When you create the new table, Maptitude adds one record to the new table for each of the areas you specified. Instead of displaying the new table in its own dataview, Maptitude displays a joined view that shows the new and old data side by side.

Adding a Record for Each Unique Value of a Field

Use this option when you want to create a lookup table that adds new information to a map layer or dataview. Suppose you have a map layer of highways and know the classification of each one (Interstate, U.S. Route, State Route). You want to add average speed data, where you know that the average speed is different for each road classification. You can create a new table that will contain the average speed for each type of road, and join it to the original table.

To use this option, you must choose:

- The map layer or dataview you want to examine.
- The field whose values you want to use. Maptitude adds this field to the new table.

When you create the new table, Maptitude adds one record to the new table for each unique value of the field you specified. Instead of displaying the new table in its own dataview, Maptitude displays a joined view that shows the new and old data side by side.

Try It Yourself: Creating a Table

1. Choose ***File-Open Workspace*** then open the workspace **newtable.wrk** in the Tutorial folder. Maptitude displays a map of Connecticut sales territories and a dataview with the associated data. You will create a new table with sales data for the territories.
2. Choose ***Dataview-Table-New***. Maptitude displays the New Table Type dialog box.
3. Choose **dBASE/FoxPro** from the list of table types, then click **OK**. Maptitude displays the New Table dialog box.
4. Click **Add Field**.
5. Type "**SALES**" in the cell in the Field Name column.
6. Click on the cell in the Type column and choose **Real Number** from the drop-down list.
7. Check the **Add Records** box. Maptitude displays the Add Records dialog box.
8. Click the **Add Matching Records** radio button. All of the settings are correct.
9. Click **OK** to close the Add Records dialog box, and click **OK** again to close the New Table dialog box. Maptitude displays the Save As dialog box.
10. Type "**My Table**" as the file name and click **Save**. Maptitude creates a new dBASE table with one record for every sales territory, and displays a dataview of the new table joined to the sales territory data.
11. Click on a cell in the SALES field, type "**1234.50**" and press Enter. Maptitude stores that value in the new table.
12. Choose ***File-Close All*** to close the map and dataviews.

Modifying the Structure of a Table

As you combine your own data with Maptitude maps, you may find that you want to restructure your data tables to add information, speed up performance, and so on. You can easily do so using the powerful built-in Maptitude relational database management capabilities. For most table formats you can:

- Expand a table to hold more information by adding fields
- Change the order of fields
- Change the field names
- Change the type, width, number of decimals, and format for any field
- Add or remove indexes for any field
- Change the description of each field
- Indicate how data should be aggregated
- Attach or drop lookup codes

The ***Dataview-Table-Modify*** command can also be used to change the structure of a table in a geographic file. For example, you can use this command to add fields to a ZIP Code layer, or to reorganize the fields in a State layer. When you modify a table, Maptitude preserves the data that are currently stored in the table.

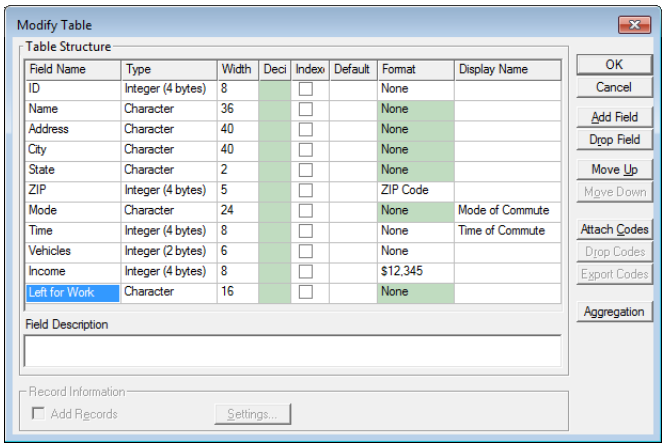
Changing the type of a field can affect your data. The following table shows what happens when you change a field from one type to another:

Convert from...	To...	Here's what happens...
Real number	Integer	The number is truncated to the decimal point (for example, 11.7 is changed to 11)
Integer	Real number	No change
Character (String)	Integer or real	Alphabetic characters are lost, and leading numeric characters are converted to numbers (for example, "123A" is changed to 123 and "A123" is changed to 0)
Integer or real	Character	The numbers are converted into characters that look just like the numbers (for example, 1.25 is changed to "1.25")

You cannot modify a table while the table is part of a joined view.

▶ To Modify the Structure of a Table

1. Choose ***Dataview-Table-Modify*** or click  on the Standard toolbar to display the Modify Table dialog box.



2. Make the changes you want according to the following instructions:

To do this...	Do this...
Add a field	Click Add Field to add a new field to the list.
Delete a field	Click on any cell in the field you want to delete, then click Drop Field.
Change the order	Click on any cell in a field, then click Move Up or Move Down.
Change a display name	Click on the cell in the Display Name column and type a display name.
Change a field name	Click on the cell in the Field Name column and type a new name.
Change a field type	Click on the cell in the Type column and choose a type from the drop-down list.
Change a field width	Click on the cell in the Width column and type a new width.
Change the number of decimals	Click on the cell in the Decimal column and type the number of decimal places.
Change the default value for new records	Click on the cell in the Default column and type a value in the Default box.
Change a field format	Click on the cell in the Format column and choose a format from the drop-down list.
Add new formats	Click on the cell in the Format column and choose "New Format" from the drop-down list to display the Custom Field Formats dialog box. For more information, see "Creating Custom Field Formats" on page 188.

To do this...	Do this...
Change a field description	Click on any cell in the field, then type a description in the Field Description box.
Index a field	Check the box in the Indexed column.
Change the aggregation method	Click Aggregation to display the Default Aggregation dialog box. See "Aggregation Methods" on page 321 for more information.

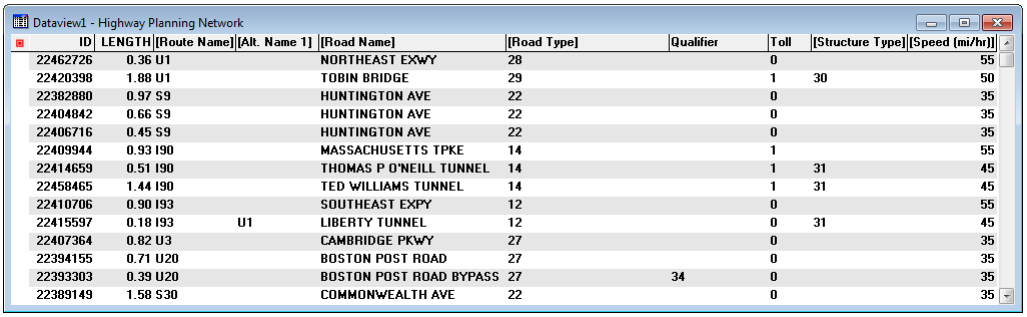
Note that the Field Display settings are disabled if you are using a dBASE file. Also, you cannot change the aggregation method or set default values or the display name for dBASE or comma- or tab-separated text files.

3. Click **OK**. Maptitude displays the Confirm dialog box.
4. Click **Yes** to save the modifications.

Maptitude modifies the table as you requested.

Working with Codes

Often a database will contain shorthand codes that have a particular meaning. Using codes saves space because long character strings are replaced with shorter codes. For example, look at the table shown below, which contains information on highways:

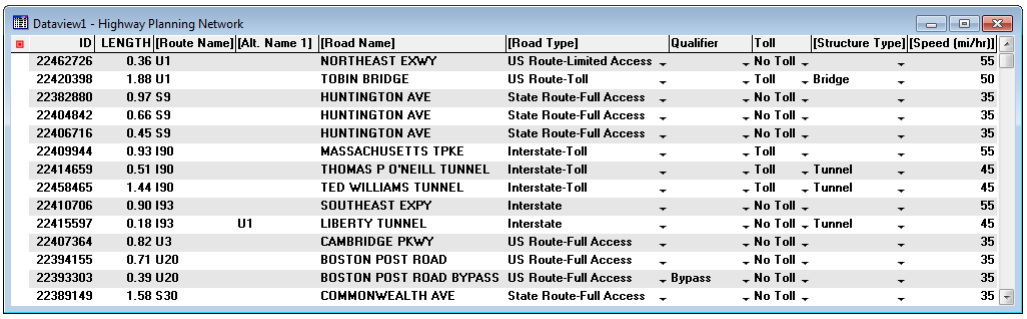


Dataview1 - Highway Planning Network

ID	LENGTH	[Route Name]	[Alt. Name 1]	[Road Name]	[Road Type]	Qualifier	Toll	[Structure Type]	[Speed (mi/hr)]
22462726	0.36	U1		NORTHEAST EXWY	28		0		55
22420398	1.88	U1		TOBIN BRIDGE	29		1	30	50
22382880	0.97	S9		HUNTINGTON AVE	22		0		35
22404842	0.66	S9		HUNTINGTON AVE	22		0		35
22406716	0.45	S9		HUNTINGTON AVE	22		0		35
22409944	0.93	I90		MASSACHUSETTS TPKE	14		1		55
22414659	0.51	I90		THOMAS P O'NEILL TUNNEL	14		1	31	45
22458465	1.44	I90		TED WILLIAMS TUNNEL	14		1	31	45
22410706	0.90	I93		SOUTHEAST EXPY	12		0		55
22415597	0.18	I93	U1	LIBERTY TUNNEL	12		0	31	45
22407364	0.82	U3		CAMBRIDGE PKWY	27		0		35
22394155	0.71	U20		BOSTON POST ROAD	27		0		35
22393303	0.39	U20		BOSTON POST ROAD BYPASS	27	34	0		35
22389149	1.58	S30		COMMONWEALTH AVE	22		0		35

Several of the fields use codes to indicate something about each highway. For example, in the Road Type field, a code of "12" indicates that the highway segment is an Interstate and a code of "27" indicates a US Route. A Toll code of 0 indicates that there is no toll, while a Toll code of 1 indicates that there is a toll.

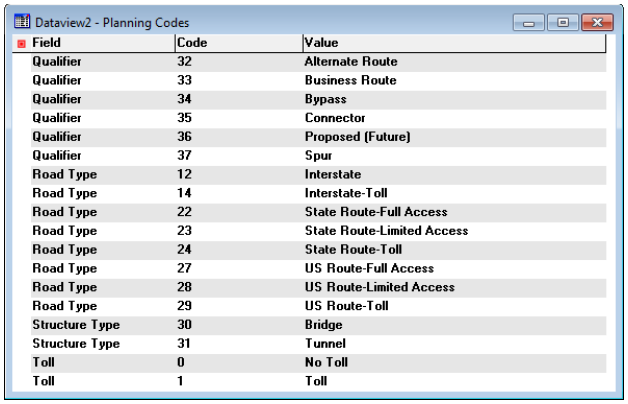
Maptitude can automatically replace these shorthand codes with more accurate, descriptive text, as shown in the dataview below. Fields with a coded value include a ▾ symbol.



Dataview1 - Highway Planning Network

ID	LENGTH	[Route Name]	[Alt. Name 1]	[Road Name]	[Road Type]	Qualifier	Toll	[Structure Type]	[Speed (mi/hr)]
22462726	0.36	U1		NORTHEAST EXWY	US Route-Limited Access		No Toll		55
22420398	1.88	U1		TOBIN BRIDGE	US Route-Toll		Toll	Bridge	50
22382880	0.97	S9		HUNTINGTON AVE	State Route-Full Access		No Toll		35
22404842	0.66	S9		HUNTINGTON AVE	State Route-Full Access		No Toll		35
22406716	0.45	S9		HUNTINGTON AVE	State Route-Full Access		No Toll		35
22409944	0.93	I90		MASSACHUSETTS TPKE	Interstate-Toll		Toll		55
22414659	0.51	I90		THOMAS P O'NEILL TUNNEL	Interstate-Toll		Toll	Tunnel	45
22458465	1.44	I90		TED WILLIAMS TUNNEL	Interstate-Toll		Toll	Tunnel	45
22410706	0.90	I93		SOUTHEAST EXPY	Interstate		No Toll		55
22415597	0.18	I93	U1	LIBERTY TUNNEL	Interstate		No Toll	Tunnel	45
22407364	0.82	U3		CAMBRIDGE PKWY	US Route-Full Access		No Toll		35
22394155	0.71	U20		BOSTON POST ROAD	US Route-Full Access		No Toll		35
22393303	0.39	U20		BOSTON POST ROAD BYPASS	US Route-Full Access	Bypass	No Toll		35
22389149	1.58	S30		COMMONWEALTH AVE	State Route-Full Access		No Toll		35

To replace shorthand codes with descriptive text, you create a **lookup table** and attach it to the original table. A lookup table is simply a table that contains the field names, the shorthand codes, and the descriptive text you want to see displayed. The lookup table that follows contains all the information for the highway example above:



Field	Code	Value
Qualifier	32	Alternate Route
Qualifier	33	Business Route
Qualifier	34	Bypass
Qualifier	35	Connector
Qualifier	36	Proposed (Future)
Qualifier	37	Spur
Road Type	12	Interstate
Road Type	14	Interstate-Toll
Road Type	22	State Route-Full Access
Road Type	23	State Route-Limited Access
Road Type	24	State Route-Toll
Road Type	27	US Route-Full Access
Road Type	28	US Route-Limited Access
Road Type	29	US Route-Toll
Structure Type	30	Bridge
Structure Type	31	Tunnel
Toll	0	No Toll
Toll	1	Toll

The lookup table must contain at least three fields:

Field	What it contains
Field	The name of the field to which this code applies
Code	The actual code that is used in the table
Value	The descriptive text you want to see displayed in place of the code

Each field in the lookup table must be a character field. While the field names do not need to match the ones shown above, using these names makes it simpler to attach the lookup table. If the field that contains the shorthand codes in the original table is a numeric field, the text in the value field must be numeric; if the field is a character field, the text can be any characters. When you attach the lookup table, Maptitude stores the codes and descriptive text in a file with the same name as the table to which they are attached, with the following extensions:

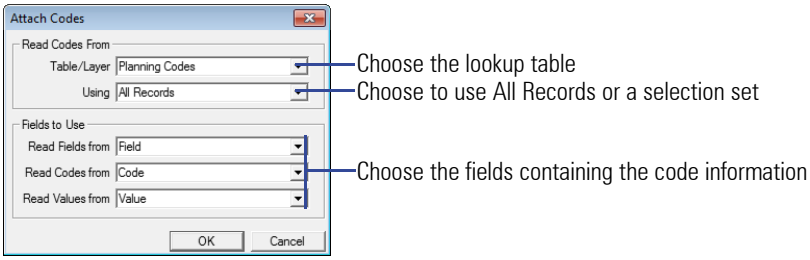
File type	Lookup table file extension
dBASE	.dxl
FoxPro	.dxl
Fixed-format text	.axl
Fixed-format binary	.bxl
Comma- or tab-separated text	.cxl

You can choose to attach all the records in the lookup table, or only the records in a particular selection set.

Once the codes are attached, you do not need to save the original lookup table. If some codes are missing from the lookup table, Maptitude will simply display the shorthand code, without any descriptive text. To help you build a lookup table with a record for each unique value of a field, see "Adding a Record for Each Unique Value of a Field" on page 223.

▶ To Attach Codes

1. Make sure both the table containing the shorthand codes and the lookup table are open and displayed in a dataview.
2. Make the table containing the shorthand codes the active window.
3. Choose ***Dataview-Table-Modify*** or click on the Standard toolbar to display the Modify Table dialog box.
4. Click **Attach Codes** to display the Attach Codes dialog box.
5. Make choices as follows:



6. Click **OK**. Maptitude permanently attaches the codes and displays a Note dialog box.
7. Click **OK** to close the Note dialog box.

Note that although Maptitude returns you to the Modify Table dialog box where you can continue to make changes, the Cancel button will not affect the attached codes.

▶ To Edit Fields with Codes

1. Click on a coded field cell (shown with a ▾ symbol) to highlight it, then double-click on the cell. Maptitude displays a drop-down list with the descriptive text for the codes for that field.
2. Choose an item from the drop-down list.

Maptitude updates the code stored in the cell and displays its descriptive text.

▶ To Remove Codes

1. Choose ***Dataview-Table-Modify*** or click on the Standard toolbar to display the Modify Table dialog box.
2. Click **Drop Codes**. Maptitude displays the Confirm dialog box.
3. Click **Yes**.

Maptitude stops using the lookup table. Note that although Maptitude returns you to the Modify Table dialog box where you can continue to make changes, the Cancel button will not affect the removed codes.

▶ To Create a Lookup Table from a Dataview

1. Choose ***Dataview-Table-Modify*** or click on the Standard toolbar to display the Modify Table dialog box.
2. Click **Export Codes**. Maptitude displays the Save As dialog box.
3. Type a file name for the new table and click **Save**.

Maptitude creates a lookup table. To display it in a dataview, complete the changes to your table and click OK to close the Modify Table dialog box, then use the ***File-Open*** command to open the new table.

Creating a Table from a Dataview

You can create a new table, in any of the formats that Maptitude supports, from the data displayed in a Maptitude dataview. When you save a dataview as a new table, the new table file stores the dataview rows in their screen order and converts any formula fields to stored data. When the dataview you save is a joined view, Maptitude writes the information from all its different sources into a single, new table file. Displaying this new table is much faster than viewing the original joined view.

When you save data in a dataview to a new table, you can choose fields to be permanently indexed in the new table. To do so, you highlight the columns in your dataview that contain the data fields you want indexed before you save the data to a new table file.

When you create a table from a dataview, Maptitude uses the widths of each column to determine the size of each field in the table.

▶ To Create a New Table from a Dataview

1. Click on the dataview you want to save as a new table.
2. Select any columns you want to index, as described below:

To do this...	Do this...
Select a single column	Click on the column heading (the name of the field at the top of the column).
Select an additional column	Hold down the Shift key and click on the column heading.
Remove a column from the selection	Hold down the Ctrl key and click on the column heading.

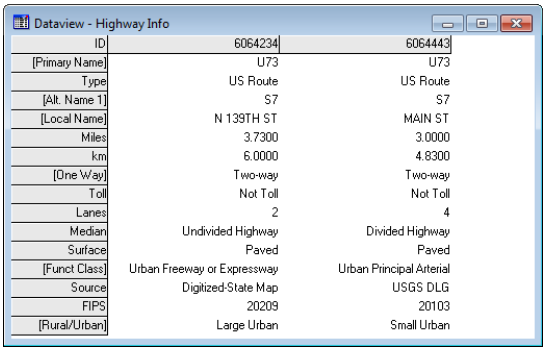
3. Choose ***File-Save As*** to display the Save As dialog box.
4. Choose the type of table you want to create from the drop-down list.
5. Enter a name for the file.
6. Click **Save**.

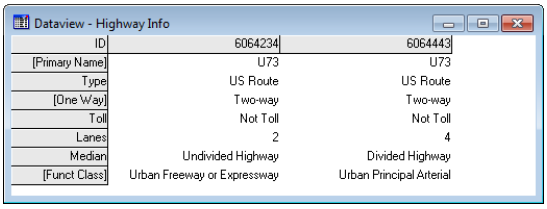
Maptitude creates a new table and writes all the information from the dataview to the file. To use the new table, open it with the ***File-Open*** command.

Creating and Using Field Sets

You can define groups of fields in a table for display in **field sets**. Field sets are available in dataviews, Edit Attributes windows, and Info windows for Caliper compact (.CDF) and standard (.DBD) geographic file layers. With field sets you can very quickly focus on certain fields and hide the rest of the fields.

This can make data entry easier, because you can choose which fields are shown, and in which order.



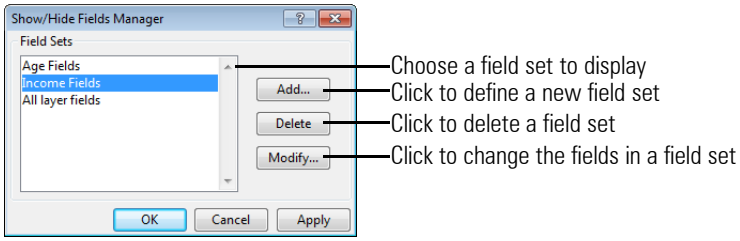


You can create any number of field sets, modify the fields in a field set, and delete field sets. The All Layer Fields set, which contains all of the fields in their natural order, is automatically created and cannot be deleted or modified. If the dataview is a joined view, only the fields in the table for the layer are displayed when you choose the All Layer Fields set.

Field sets are saved with the geographic file, in a file with the same file name and the extension .RFS for standard (.DBD) geographic files or .CFS for compact (.CDF) geographic files. Each geographic file can have its own field sets, including the line and node tables for a line geographic file.

▶ To Manage Field Sets

1. Choose ***Dataview-Fields-Show/Hide Manager*** to display the Show/Hide Fields Manager dialog box.



2. Make choices as follows:

To do this...	Do this...
Add a field set	Click **Add** to display the Define Field Set dialog box. The fields in the Selected Fields scroll list are those currently displayed. Use the buttons to add, drop, or move fields, then click **OK**. Maptitude displays the Enter Field Set Name dialog box. Type a new name and click **OK**. Maptitude returns to the Define Field Set dialog box and adds the new field set before the currently highlighted field set in the Field Sets scroll list.
Choose a field set	Highlight the field set in the Field Sets scroll list.
Modify a field set	Highlight the field set in the Field Sets scroll list and click Modify to display the Define Field Set dialog box. The fields in the Selected Fields scroll list are those currently in the field set. Use the buttons to add, drop, or move fields, then click **OK**.
Delete a field set	Highlight the field set in the Field Sets scroll list and click **Delete**. Maptitude removes the field set.
Show all layer fields	Highlight All Layer Fields in the Field Sets scroll list.

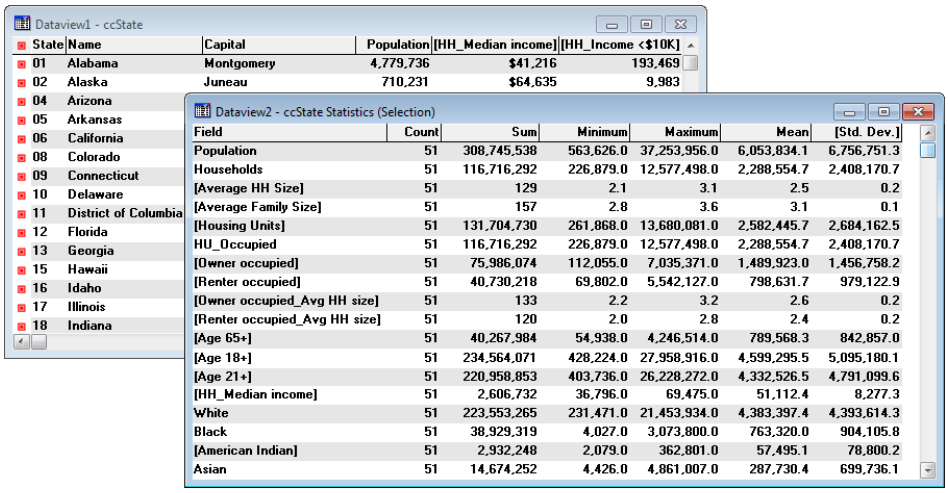
3. Click **OK**.

Maptitude updates the field sets, and shows the highlighted field set in the Edit Attributes window.

Computing Statistics

The ***Dataview-Statistics-Summary*** command computes summary statistics for the records in a dataview. For each numeric field in the dataview, Maptitude finds:

- The number of records with a value for the field
- The sum of all the values
- The minimum and maximum values
- The mean and standard deviation



Dataview1 - ccState

State	Name	Capital	Population	[HH_Median income]	[HH_Income <$10K]
01	Alabama	Montgomery	4,779,736	$41,216	193,469
02	Alaska	Juneau	710,231	$64,635	9,983
04	Arizona				
05	Arkansas				
06	California				
08	Colorado				
09	Connecticut				
10	Delaware				
11	District of Columbia				
12	Florida				
13	Georgia				
15	Hawaii				
16	Idaho				
17	Illinois				
18	Indiana				

Dataview2 - ccState Statistics (Selection)

Field	Count	Sum	Minimum	Maximum	Mean	[Std. Dev.]
Population	51	308,745,538	563,626.0	37,253,956.0	6,053,834.1	6,756,751.3
Households	51	116,716,292	226,879.0	12,577,498.0	2,288,554.7	2,408,170.7
[Average HH Size]	51	129	2.1	3.1	2.5	0.2
[Average Family Size]	51	157	2.8	3.6	3.1	0.1
[Housing Units]	51	131,704,730	261,868.0	13,680,081.0	2,582,445.7	2,684,162.5
HU_Occupied	51	116,716,292	226,879.0	12,577,498.0	2,288,554.7	2,408,170.7
[Owner occupied]	51	75,986,074	112,055.0	7,035,371.0	1,489,923.0	1,456,758.2
[Renter occupied]	51	40,730,218	69,802.0	5,542,127.0	798,631.7	979,122.9
[Owner occupied_Avg HH size]	51	133	2.2	3.2	2.6	0.2
[Renter occupied_Avg HH size]	51	120	2.0	2.8	2.4	0.2
[Age 65+]	51	40,267,984	54,938.0	4,246,514.0	789,568.3	842,857.0
[Age 18+]	51	234,564,071	428,224.0	27,958,916.0	4,599,295.5	5,095,180.1
[Age 21+]	51	220,958,853	403,736.0	26,228,272.0	4,332,526.5	4,791,099.6
[HH_Median income]	51	2,606,732	36,796.0	69,475.0	51,112.4	8,277.3
White	51	223,553,265	231,471.0	21,453,934.0	4,383,397.4	4,393,614.3
Black	51	38,929,319	4,027.0	3,073,800.0	763,320.0	904,105.8
[American Indian]	51	2,932,248	2,079.0	362,801.0	57,495.1	78,800.2
Asian	51	14,674,252	4,426.0	4,861,007.0	287,730.4	699,736.1

The statistics are computed for all the records that are shown in the dataview. This means you can compute statistics for all the records in a table or map layer, or just for the records in a selection set. See "Showing Selection Sets in a Dataview" on page 256 to learn how to choose the records that are shown in a dataview.

▶ To Compute Statistics

1. Choose **All Records** or a selection set from the drop-down list on the Standard toolbar.
2. Choose ***Dataview-Statistics-Summary*** or click ... on the Standard toolbar.

Maptitude computes the statistics and displays the results in a new dataview. If you want to save the statistics, see "To Save a Dataview With a New Name or as a Different File Type" on page 208.

Estimating and Evaluating Models

Maptitude has two commands for estimating and evaluating models:

- ***Dataview-Statistics-Model Estimation*** estimates a model on any map layer or dataview by defining the dependent variable, one or more independent variables, and the set of records on which the model should be estimated.
- ***Dataview-Statistics-Model Evaluation*** evaluates a model on any map layer or dataview by filling a field with the predicted dependent variable

Estimating a Model

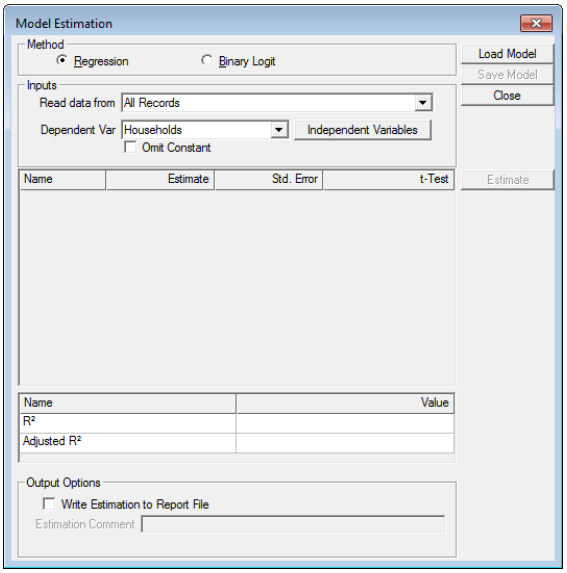
To estimate a model, you choose the dependent variable, one or more independent variables, and the set of records on which the model should be estimated. You can use Regression or Binary Logit as the method.

Models can be estimated on any map layer or dataview. You can choose to estimate the model parameters using all of the records in the layer or dataview, or only those records in a selection set. You can select the records using any of the selection commands and tools, as described in *Chapter 8: Queries and Selection Sets*.

The model estimation procedure produces two output files: a formatted report of the estimation results including all goodness-of-fit and importance measures, and a file containing the values of the estimated model parameters. The model parameter file can be used to evaluate the model for other sets of data, as described in "Evaluating a Model" on page 233.

▶ To Estimate a Model File

1. Choose the layer or dataview you want to use by choosing the layer from the drop-down list on the Standard toolbar or by clicking in the dataview window.
2. Choose ***Dataview-Statistics-Model Estimation*** to display the Model Estimation dialog box.



3. If you have an existing model, click **Load Model** to display the Open Model File dialog box, choose the model file, and click **Open**.

4. Choose the type of model from the Method radio list.
5. Choose the records to use from the Read Data From drop-down list.
6. Choose the dependent variable from the Dependent Var drop-down list.
7. Click the Independent Variables button to display the Choose Independent Variable Fields dialog box.
8. Choose the independent variables as follows:

To do this...	Do this...
Add a field	Choose one or more fields from the Available Fields list and click **Add>>**
Drop a field	Choose one or more fields from the Estimation Fields list and click **<<Drop**
Drop all fields	Click Clear

   Click OK when you are done.

9. Make choices as follows:

To do this...	Do this...
Omit the constant from the model	Choose one or more fields from the Available Fields list and click **Add>>**
Write the estimation to a report file	Check **Write Estimation to Report File**; you can enter a comment in the Estimation Comment edit box

10. Click **Estimate**. Maptitude estimates the model.

    If you checked **Write Estimation to Report File**, Maptitude displays the Results Summary dialog box.

To do this...	Do this...
View any warnings	Click Show Warnings to display any warnings with your browser program
View the report	Click Show Report to display the report with your browser program
Close the dialog box	Click Close

11. Click **Save model** to display the Save Model As dialog box, type a file name for the model, and click **Save**. Maptitude saves the model.
12. To change the model, return to Step 4. When you are done, click **Close**.

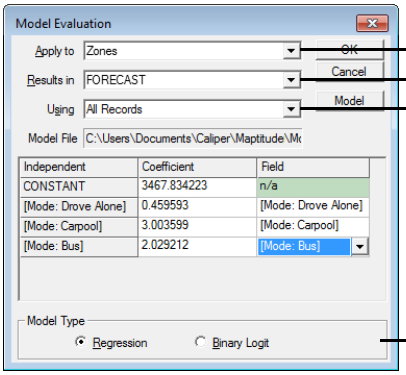
Maptitude closes the Model Estimation dialog box.

Evaluating a Model

The model estimation command produces a text file with information that can be used to evaluate the model on a data set having similar fields. To use the evaluation procedure, you choose the subset of records to be evaluated and the field that will receive the predicted dependent variable. You can also choose the fields that contain the values of the independent variables, and make adjustments to the model parameters. The procedure will calculate the new value based on the model type and the parameters stored in the model file, and will fill in the designated field.

▶ To Evaluate a Model

1. Click in the dataview you want to use to apply the model.
2. Choose ***Dataview-Statistics-Model Evaluation*** to display the Open Model File dialog box.
3. Choose the file containing the model you want to evaluate and click **Open**. Maptitude displays the Model Evaluation dialog box.
4. Make choices as follows:



Choose the dataview that will store the results

Choose the field to store the results

Choose to apply the model to all records or only those in a selection set

Choose the model type

5. Choose the fields containing the values of the independent variables from the drop-down lists in the Field column.
6. Adjust the model parameters by entering a new coefficient in the cell in the Coefficient column.
7. Click **OK**.

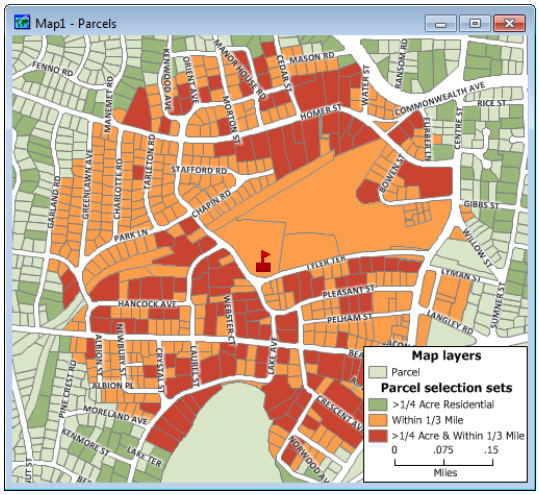
Maptitude evaluates the model and stores the results in the selected field.

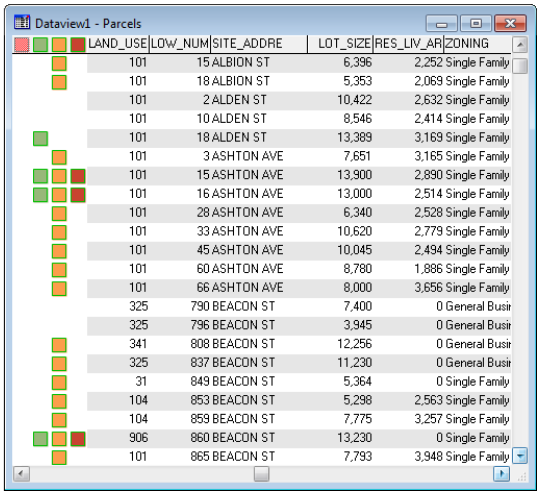
CHAPTER 8:
Queries and Selection Sets

Maptitude provides many tools for asking and answering questions about the features in a map and the data in a dataview. These filter tools answer three types of queries:

- Location questions: "Which customers live within five miles of a store?"
- Attribute questions: "Which ZIP Codes have a median household income over $75,000?"
- Combination questions: "Which parcels are over 1/4 acre and located within 1/3 mile of a school?"

Maptitude stores the filtered answers to your questions in a selection set, and illustrates the answer by highlighting features in the selection set on the map and in the dataview as shown here:





In this chapter:

Asking Questions

Maptitude lets you ask many types of questions about the features in a map and the data in a dataview. When you ask a question, Maptitude answers it by creating a selection set, which is simply a filtered list of records in a single map layer or dataview.

There are six ways to create selection sets:

- Use tools to select features from a map or dataview
- Select features in one layer based on the location of features in other layers
- Create a condition to select records based on the values of one or more fields
- Create selection sets from a theme
- Select features in one layer based on the level of adjacency to other features in the layer
- Select features by combining other selection sets

Displaying Answers on a Map

There are four ways to illustrate the answer to a question on a map:

- Highlight selected features on a map by displaying them in a different color or with a different style
- Hide all the features in the layer that are not in the selection set, so the selected features stand out
- Label selected features differently from features that are not in the selection set
- Zoom in on the features in the selection set

Unless you indicate differently, Maptitude highlights features in a selection set using a distinctive style or color. Whenever you select features in a map layer, any map or dataview containing that layer is updated automatically. For more information, see "Showing Selection Sets on a Map" on page 254.

Displaying Answers in a Dataview

There are two ways to illustrate the answer to a question in a dataview:

- Mark all the records in a selection set with a symbol
- Change the dataview so it shows only the records in a selection set

Unless you indicate differently, Maptitude highlights selected features in a dataview by marking the selected records with a symbol of a distinctive style or color. These symbols match the ones that are used to show the selected features on the map. Whenever you select records, any dataview containing those records is updated automatically to show the selected records. For more information, see "Showing Selection Sets in a Dataview" on page 256.

Saving Selection Sets

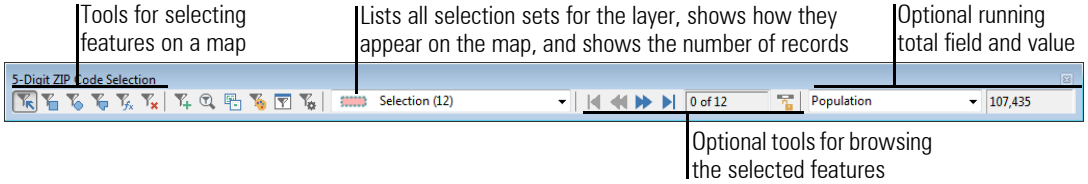
You don't need to do anything special to save a selection set. When you save a map, dataview, or workspace that includes one or more selection sets, the selection sets are stored in the file so you can use them again when the file is opened.

Selection Set Basics

When you use the selection tools or commands, the results are normally placed in a selection set named "Selection." However, you are not limited to a single selection set. In fact, Maptitude lets you create any number of selection sets for each layer or dataview, and give each one a distinctive name. You can choose which selection set to use when using any of the selection tools or commands and you can choose whether to allow selection sets to overlap.

You use the Selection menu commands, the Selection toolbar, and the Selection Sets dialog box to create, maintain, and delete selection sets.

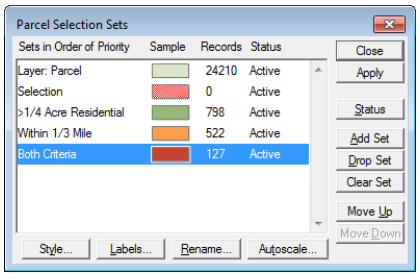
The Selection toolbar looks like this:



You use the Selection toolbar to:

- Choose a selection set to use with the selection tools (page 238)
- Clear a selection set (page 238)
- Create a new selection set (page 238)
- Open the Selection Sets dialog box (page 238)
- Select features with the selection tools and optionally see data for the selected features (page 239)
- Select features by condition (page 244)
- Change the appearance of features in a selection set (page 254)
- Zoom to a selection set (page 255)
- Zoom to individual features in a selection set (page 255)
- Display only selected features (page 255)

The Selection Sets dialog box looks like this:



You use the Selection Sets dialog box to:

- Create a new selection set (page 238)
- Rename a selection set (page 238)
- Clear a selection set (page 238)

- Rearrange selection sets (page 239)
- Delete a selection set (page 239)
- Change the display status of selection sets (page 254)
- Change the appearance of features in a selection set (page 254)
- Autoscale and clear autoscale from a selection set (page 254)
- Add labels to and remove labels from a selection set (page 254)

▶ To Display or Hide the Selection Toolbar

1. Choose ***Selection-Toolbar*** or click  on the Standard toolbar.

Maptitude displays the Selection toolbar, or hides the toolbar if it is already displayed.

▶ To Choose a Selection Set to Use with the Selection Tools

1. Choose the selection set you want to use from the drop-down list on the Selection toolbar.

From now on, the selection tools on the Selection toolbar work on the chosen selection set.

▶ To Create a Selection Set

1. Click  on the Standard toolbar.

   — OR —

1. Choose ***Selection-Settings***, or click  on the Selection toolbar to display the Selection Sets dialog box.
2. Click **Add Set**.

Maptitude creates a new, empty selection set. The new selection set is given a name (Selection:1, Selection:2, etc.) that is based on the number of selection sets you already have on this layer or data-view.

▶ To Rename a Selection Set

1. Choose ***Selection-Settings***, or click  on the Selection toolbar to display the Selection Sets dialog box.
2. Choose the selection set you want to rename from the scroll list.
3. Click **Rename** to display the Rename Selection Set dialog box.
4. Type a new name in the New Name text box.
5. Click **OK**.

   Maptitude renames the selection set and updates the Selection toolbar and map legend accordingly. You cannot rename the selection set named "Selection."
6. Click **Close** to close the Selection Sets dialog box.

TIP: You can also display the Rename Selection Set dialog box by right-clicking on a selection set in the Display Manager and choosing ***Rename***.

▶ To Clear a Selection Set

1. Choose the selection set you want to clear from the drop-down list on the Selection toolbar.
2. Click  on the Selection toolbar.

   — OR —

1. Choose ***Selection-Settings***, or click on the Selection toolbar to display the Selection Sets dialog box.
2. Choose one or more selection sets to clear from the scroll list.
3. Click **Clear Set**.

   If you choose more than one selection set, Maptitude displays a Confirm dialog box. Click **Yes**.

   Maptitude clears the selection set or sets and updates the number of records.
4. Click **Close** to close the Selection Sets dialog box.

TIP: You can also delete a selection set by right-clicking on a selection set in the Display Manager and choosing ***Remove***.

▶ To Rearrange or Delete Selection Sets

1. Choose ***Selection-Settings***, or click on the Selection toolbar to display the Selection Sets dialog box.
2. Choose one or more selection sets to move from the scroll list.
3. Make choices as follows:

To do this...	Do this...
Rearrange the order of sets	Click **Move Up** or **Move Down**. When a map feature is in more than one selection set, selection sets later in the list have priority over selection sets earlier in the list when Maptitude determines the style and label for that map feature. The selection set named "Selection" cannot be moved.
Delete the sets	Click **Drop Set**. Click Yes when Maptitude asks you to confirm that you want to drop the selection set.

4. Click **Close** to close the Selection Sets dialog box.

Selecting Features with the Selection Tools

You select features directly from the map using the selection tools on the Selection toolbar. You can select features that are within a circle, rectangle, or shape that you draw, or by clicking on individual features. You can also choose whether features that you select with the rectangle, circle, or shape tools should be wholly or partially contained within the areas you define.

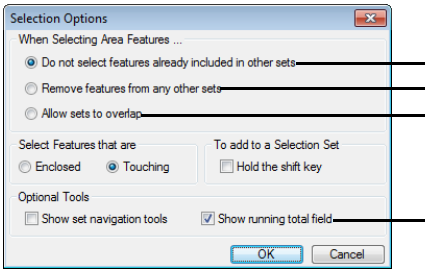
When you use the selection tools on an area layer you can choose to restrict features from being in more than one selection set or allow them to be in multiple sets.

You also have the option of displaying a running total for a field of your choice in the Selection toolbar. For example, if you have a postal code layer that contains a field with sales data, you could see the total sales for all of the postal code features in a selection set. As you add and remove features from the selection set, the total sales is adjusted accordingly on the toolbar.

▶ To Select Features Directly from the Map

1. Choose the layer whose features you want to select from the drop-down list on the Standard toolbar.
2. Choose the selection set to use from the drop-down list on the Selection toolbar.

3. To set the behavior of the selection tools, click  to display the Selection Options dialog box and make choices as follows:



If you are going to select by rectangle, circle, or shape, choose whether or not you want to include features that are only partially within the shape you define as follows:

Choose this...	To do this...
Enclosed	Select features that are only completely contained within the shape
Touching	Select features that are partially and completely contained within the shape

By default, when you use the select by rectangle, circle, or shape tools, features that you select are added to the selection set. If you want, you can choose to have Maptitude clear the selection set every time that you use the selection tools unless you hold the Shift key while using the selection tools by checking the **Hold the Shift Key** box.

Click **OK** to close the Selection Options dialog box.

4. If you chose the **Show Running Total Field** option, choose the field to total from the Field drop-down list on the Selection toolbar.

5. Click on one of the selection tools to activate it, and use it as described in the table below:

Tool	Name	How to use it
	Select by Pointing	Click on a single feature to select it. Click on a selected feature to remove it from the selection set.
	Select by Rectangle	Drag a rectangle to select all features inside the rectangle or click on a single feature to select it. Hold the Ctrl key while using the tool to remove features from the selection set.
	Select by Circle	Drag a circle to select all features inside the circle, or click at the center of the circle and type the radius in the Enter Selection Radius dialog box. Hold the Ctrl key while using the tool to remove features from the selection set.
	Select by Shape	Draw an area to select all features located inside the area. Click on each corner of the area, and double-click to close it. Hold the Ctrl key while using the tool to remove features from the selection set.

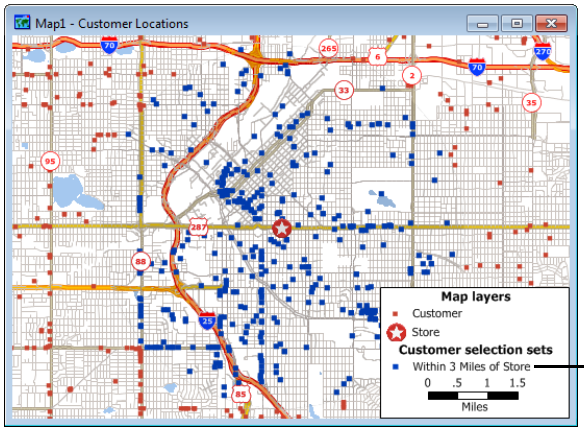
Maptitude selects the features, and highlights the result on the map.

Try It Yourself: Selecting Features with the Selection Tools

1. Choose ***File-Open Workspace***, then open the workspace **lower48.wrk** in the Tutorial folder.
2. Click on the Selection toolbar, choose the **Touching** option, and click **OK**.
3. Click on the Selection toolbar to activate the Select by Circle tool, then click at the center of Kansas (KS). Maptitude displays the Enter Selection Radius dialog box.
4. Type **500**, choose **Miles** for the units and click **OK**. Maptitude selects and highlights and states that are at least partially within 500 miles of the location you clicked, both on the map and in the dataview.
5. Click on the Selection toolbar, choose the **Enclosed** option, and click **OK**.
6. Click on the Selection toolbar to activate the Select by Shape tool.
7. Click a shape in the northeast around the outside of Maine (ME), New Hampshire (NH), and Vermont (VT) and double-click to close the shape. Those states are also selected and highlighted.
8. Click on the Selection toolbar to activate the Select by Pointing tool and click on Kansas. That state is no longer selected or highlighted. Click on Kansas again to select it.
9. Click on the Selection toolbar to clear the selection.
10. Choose ***File-Close All*** and click **No** to close the map and dataview without saving any change

Selecting Features by Location

A location question is used to find map features that are located in a particular area. For example, which customers live within 5 miles of a store? Maptitude lets you select features in one layer (the **working layer**) based on how close they are to, or how far they are from, features in another layer (the **reference layer**).



A selection set of customers within 3 miles of a store

TIP: The endpoint layer is normally hidden. You can show the layer by using the ***Map-Layers*** command. See "To Change the Layers in a Map" on page 63 for more information

Maptitude also lets you select lines and endpoints of lines based on how they are connected. A line geographic file has two layers, one for the lines themselves and one for endpoints of the lines. You can select the lines that begin or end at selected endpoints, or the endpoints that are at the ends of selected lines.

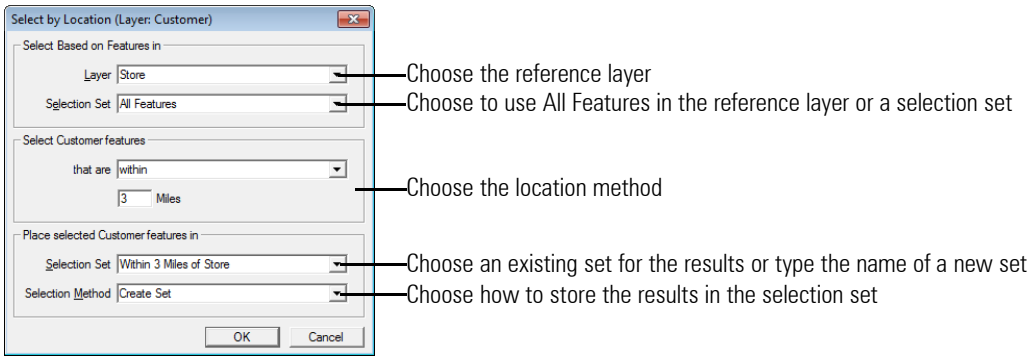
If the reference layer is a non-topological area layer, you have options for dealing with overlapping portions of those areas. For more information on non-topological area layers, see "Using the Non-Topological Area Editing Tools" on page 405.

Selecting features from one layer based on the location of features in another has many uses, for example:

If you want to...	Select from the reference layer...	And then select...
Find airports near an Interstate highway	Interstate highways	Airports within 5 miles of the selected highways
Find customers in a sales territory	The sales territory of interest	Customers inside the selected territory
Find stores far from a distribution outlet	Distribution outlets	Stores not within 50 miles of the selected outlets
Find homes near schools	Schools	Homes within 0.5 miles of the selected schools

▶ To Select Features by Location

1. Select one or more features in the reference layer, using any of the selection tools or selection commands.
2. From the drop-down list on the Standard toolbar, choose the working layer — the layer whose features you want to select.
3. Choose ***Selection-Select by Location*** to display the Select by Location dialog box.



4. Choose the reference layer from the Layer drop-down list and the selection set from the first Selection Set drop-down list.
5. Choose a selection method, and type a distance if the method requires it. The options you see will vary depending on whether you are working with points, lines, or areas:

Option	Use it to...
touching or contained	Select features that are contained within or touch features in the reference layer
inside	Select features that are inside features in the reference layer
not inside	Select features that are not inside features in the reference layer
within	Select features within the specified distance of features in the reference layer
not within	Select features that are not within the specified distance of features in the reference layer
closest and within	Select, for each feature in the reference layer, the closest feature, as long as it is within a specified distance of the features in the reference layer
connected	Select line features that begin or end at the endpoints selected in the reference layer, or select endpoint features that are at the ends of the lines selected in the reference layer

Option	Use it to...
select whether or not areas overlap	Select features that are inside any features in a reference layer of non-topological areas
select only in areas that do not overlap	Select features that are inside a single feature in a reference layer of non-topological areas
select only in overlapping areas	Select features that are in two or more features in a reference layer of non-topological areas

6. Choose an existing selection set from, or type the name of a new selection set in, the Selection Set editable drop-down list.
7. Choose how to store the results:

Method	Meaning
Create a set	Creates a new selection set with the name you type
Add to set	Adds records to an existing selection set
Remove from set	Removes records from an existing selection set
Subset	Selects only from those records that are already in an existing selection set

8. Click OK.

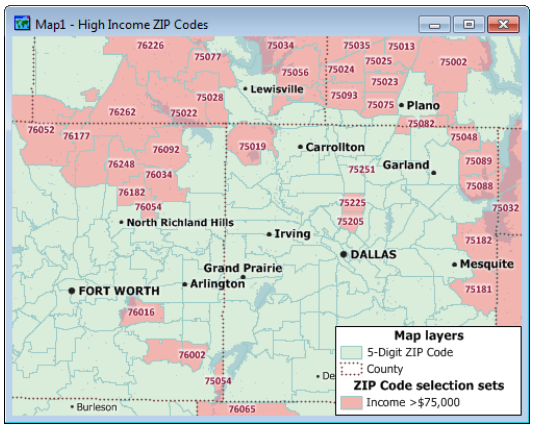
Maptitude selects records according to your settings, and highlights the result.

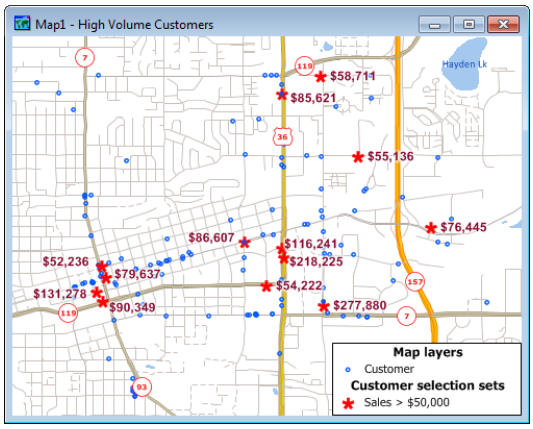
Try It Yourself: Selecting Features Using Another Layer

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **ctselect.map** in the Tutorial folder. The counties in Connecticut are already selected.
2. Choose the **Place** layer from the drop-down list on the Standard toolbar.
3. Choose ***Selection-Select by Location*** to display the Select by Location dialog box.
4. Verify that **County** and **Selection** are chosen in the first two drop-down lists. Choose **inside** from the third drop-down list.
5. Click **OK**. Maptitude selects the places within the selected Connecticut counties.
6. Choose ***Selection-Select by Location*** again and choose **not inside** from the third drop-down list.
7. Click **OK**. Maptitude selects the places outside Connecticut.
8. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Selecting Features Based on Attributes

A question about attributes is used to find records that meet a certain condition. For example: Which ZIP Codes have a household income of over $75,000 per year or which customers spend more than $5,000 per year?





You use the ***Selection-Select by Condition*** command to select records and map features whose values meet a condition. You can choose this command from either a map or a dataview. Conditions can contain field names, arithmetic operators like +, -, *, and /, relational operators like <, >, <=, >=, and <>, and many different types of numeric and string functions. For more details on the exact syntax of conditions, see *Appendix A, Formulas, Conditions, and Functions*. Here are some samples of conditions:

To answer this question...	Use this condition...
Which ZIPs have a high average income?	Income > 75000
Which customer names start with Z?	Last_Name like "Z*"
Which sales territories increased their revenue by over 10%?	Revenue2017 > 1.10 * Revenue2016

Maptitude keeps a list of all of the conditions you use while Maptitude is running. If you want to make a slight change in a condition, or if some of your data have changed and you want to repeat a selection based on a condition, you can choose the previous condition from a drop-down list. For example, if you selected sales districts using the condition **Revenue2017 > 1.1 * Revenue2016**, you could change this condition to **Revenue2017 > 1.25 * Revenue2016**, by choosing the previous condition and editing it, without having to enter the whole condition.

You can also save the list of previously used conditions to a text file with one condition on each line. You can display, edit, or print the contents of one of these files using any text editor or word processor. You can then load the conditions every time that you use Maptitude. This can save you a lot of time and reduce the likelihood of making errors when you enter a condition.

If you are working in a map window, you can restrict a query to find only those records that are among the features that are visible on your map. For example, if you zoom a map to New York City and you want to select all the street segments that make up "BROADWAY" in Manhattan, you could select from just the streets visible on the screen. This will be much faster than selecting every street segment called "BROADWAY" from over 30,000,000 street segments in the entire U.S.

The ***Selection-Select by List*** command lets you select records and features based on the list of values in a field. For example, a "Sales Rep" field could have the name of the representative for each customer. You can easily create a selection set for each representative by using the ***Selection-Select by List*** command. Each selection set will be named based on the Representative used to create it and assigned a unique color.

The ***Selection-Select by Related Values*** command lets you select features in a **working layer** based on a value in a field for another layer, the **reference layer**. Selecting features in one layer based on the attributes of features in another layer has many uses. If you want to find:

- The workers whose workplace is in one of several ZIP Codes, select those ZIP Codes and then select the workers based on the ZIP Code of their workplace.
- The counties in a state, select the state and then select the counties with that state's name or code.

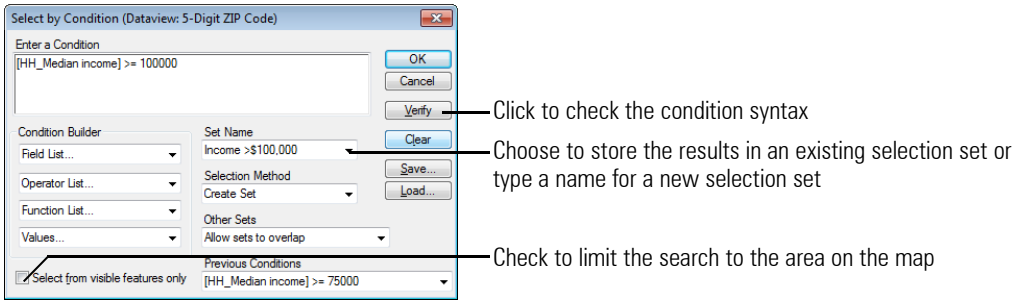
You can also select records in a dataview based on values in another dataview, or select based on any layer and dataview combination.

▶ To Select Based on a Condition

1. Choose the layer whose features you want to select from the drop-down list on the Standard toolbar, or choose the dataview from which you want to select records.
2. Choose ***Selection-Select by Condition*** or click  on the Selection toolbar to display the Select by Condition dialog box.
3. Enter a condition. You can also use the **Condition Builder** to create a condition by picking the fields, operators, functions, and values you want, or choose a previous condition from the Previous Conditions drop-down list. If you use the Condition Builder or a previous condition, you can also use the keyboard to edit the condition.

TIP: You can filter the field list in the Condition Builder by clicking on the drop-down list and typing several letters. Only fields containing the text you enter will display in the drop-down list.

4. Make additional choices as follows:



5. Choose how to store the results:

Method	Meaning
Create a set	Creates a new selection set with the name you type
Add to set	Adds records to an existing selection set
Remove from set	Removes records from an existing selection set
Subset	Selects only from those records that are already in an existing selection set

6. If the working layer is an area layer, choose how to handle features that meet the condition but are already in other sets:

Option	Meaning
Allow sets to overlap	Features that meet the condition will be added to the new selection set regardless of whether they are in additional sets
Skip records in other sets	Features that meet the condition will only be added to the new selection set if they are not already in another set
Remove records from other sets	Features that meet the condition will be added to the new selection set and removed from any other sets

7. Click **OK**.

Maptitude selects records according to your settings, and highlights the result.

Try It Yourself: Selecting Records Based on a Condition

1. Choose ***File-Open Workspace***, then open the workspace **lower48.wrk** in the Tutorial folder.
2. Choose ***Selection-Select by Condition*** or click on the Selection toolbar to display the Select by Condition dialog box.
3. Type "**Population > 5000000**" in the Enter a Condition box.
4. Type "**Over 5 Million**" in the Set Name editable drop-down list.
5. Click **OK**. Maptitude highlights the selected states, both on the map and in the dataview.
6. Choose ***Selection-Select by Condition*** or click on the Selection toolbar to again display the Select by Condition dialog box.
7. Type "**Population > 1000000**" in the Enter a Condition box, type "**Over 1 Million**" in the Set Name editable drop-down list, and choose **Skip records in other sets** from the Other Sets drop-down list.
8. Click **OK**. Maptitude highlights the selected states with populations over 1 million (but excludes the features in the Over 5 Million set), both on the map and in the dataview.
9. Choose ***File-Close All*** and click **No to All** to close the map and dataview without saving any changes.

▶ To Save Conditions to a File

1. Choose ***Selection-Select by Condition*** or click on the Selection toolbar to display the Select by Condition dialog box.
2. Click **Save** to display the Save As dialog box.
3. Type a file name and click **Save**.

Maptitude saves all of the previous conditions to the text (.TXT) file.

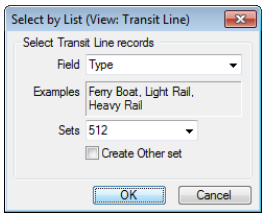
▶ To Load Conditions from a File

1. Choose ***Selection-Select by Condition*** or click on the Selection toolbar to display the Select by Condition dialog box.
2. Click **Load** to display the File Open dialog box.
3. Choose the file containing the conditions and click **Open**.

Maptitude reads the conditions from the file and updates the Previous Conditions drop-down list.

▶ To Select Based on a List

1. Choose the layer whose features you want to select from the drop-down list on the Standard toolbar, or choose the dataview from which you want to select records.
2. Choose ***Selection-Select by List*** to display the Select by List dialog box.
3. Make choices as follows:



4. Click **OK**.

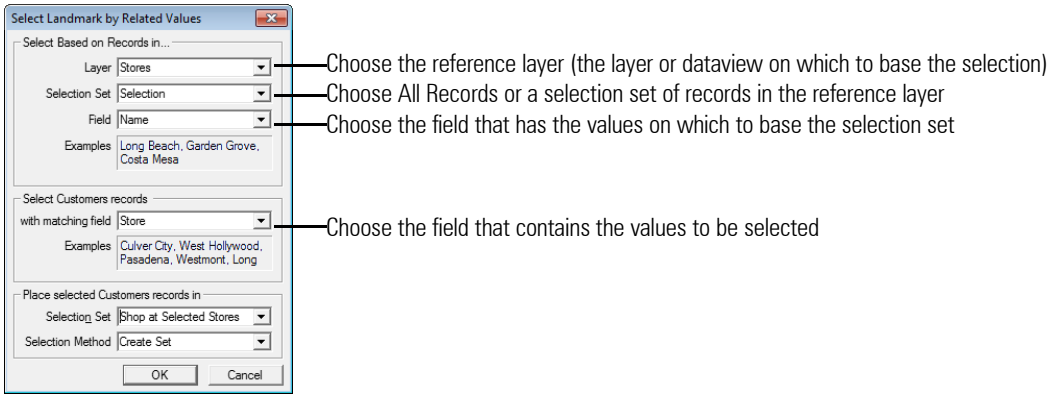
Maptitude creates the selection sets for the list of values. Depending on the choice you made, if there are more values than the number of sets, Maptitude either ignores the rest or groups them in a selection set called "Other."

Try It Yourself: Selecting Records Based on a List

1. Choose ***File-Open Workspace***, then open the workspace **street classes.wrk** in the Tutorial folder. You are going to create selection sets based on the class of street.
2. Choose ***Selection-Select by List*** to display the Select by List dialog box.
3. Choose **CLASS** from the Field drop-down list.
4. Click **OK**. Maptitude creates selection sets for each class.
5. Choose ***File-Close All*** and click **No to All** to close the map and dataview without saving any changes.

▶ To Select Based on a Value

1. Choose the layer whose features you want to select (the working layer) from the drop-down list on the Standard toolbar, or choose the dataview from which you want to select records.
2. Choose ***Selection-Select by Related Values*** to display the Select by Related Values dialog box.
3. Make choices as follows:



4. Choose an existing selection set from, or type the name of a new selection set in, the Selection Set editable drop-down list.

5. Choose how to store the results:

Method	Meaning
Create a set	Creates a new selection set with the name you type
Add to set	Adds records to an existing selection set
Remove from set	Removes records from an existing selection set
Subset	Selects only from those records that are already in an existing selection set

6. Click **OK**.

Maptitude selects records based on the values found in the reference layer, and highlights the selection set.

Creating Selection Sets from a Theme

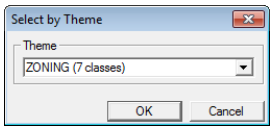
Maptitude allows you to create several selection sets in a single step by converting a color or pattern theme to a group of selection sets. You may want to convert a theme to selection sets for any number of reasons, for example:

- You want to set different label styles for sales districts where revenue declined
- You want to classify clients by type (active, prospect, etc.) and display each group separately in a dataview

When you convert a theme to a group of selection sets, a selection set is created for each class in the theme. The color and style settings for each class are automatically copied to the selection set, and the original theme is removed. Note that in most cases the map will look exactly the same. However, you can now modify the display settings, labeling, and other attributes of each class independently.

▶ To Create Selection Sets from a Theme

1. Create a color or pattern theme with two or more classes.
2. Choose ***Selection-Select by Theme*** to display the Select by Theme dialog box.

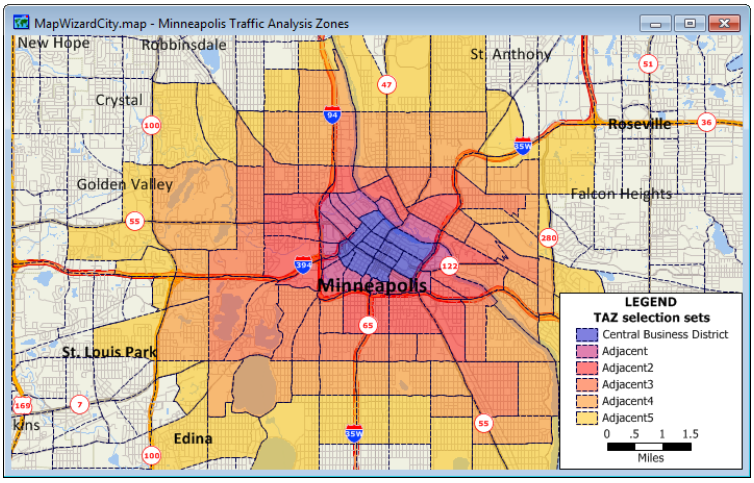


3. Choose the theme to use to create selection sets from the Theme drop-down list.
4. Click **OK**. Maptitude asks you to confirm that you want to create the sets.
5. Click **Yes**.

Maptitude creates one selection set for each class in the theme.

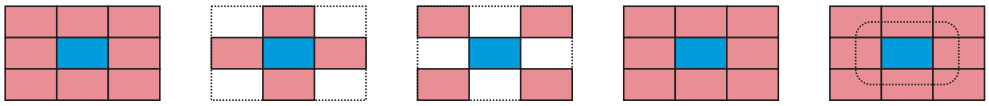
Selecting Features Based on Adjacency

The Select by Adjacency dialog box provides several methods for selecting the neighbors of the one or more areas in your area of interest. This has many potential uses, especially for topological querying, territory adjacency, and disease mapping.



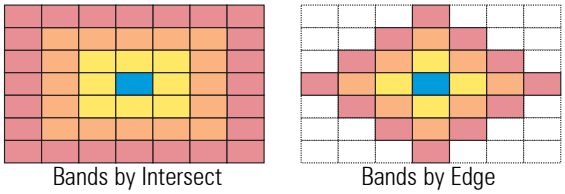
To compute adjacency, you need to create a map that has the area layer that you will use to analyze neighbor adjacency. You can use any selection set in the layer to define your area of interest. The methods for selecting neighbors are:

- **Intersecting:** selects neighbors that touch along area edges or at the nodes that bound the edges
- **Edge:** selects neighbors that touch only along area edges
- **Only Node:** selects neighbors that touch only at the nodes that bound the edges
- **All Nodes:** selects neighbors that touch any node (not shape point) around the boundaries of your area of interest
- **Within:** selects neighbors based on a distance you specify, rather than actual adjacency; if an area is at least partially within the distance from any boundary of your area of interest, it will be selected



There are two more methods for creating bands of neighbors, each of which is saved in a separate selection set:

- **Bands by Intersect:** using the Intersecting method, selects immediate neighbors of your area of interest, then neighbors of those areas, etc. for the number of bands you specify
- **Bands by Edge:** using the Edge method, selects immediate neighbors of your area of interest, then neighbors of those areas, etc. for the number of bands you specify



Bands by Intersect Bands by Edge

For both Bands methods you can choose to create univariate statistics for the neighbors, as if you were to choose ***Dataview-Statistics-Summary*** for the selection set for each band. When you choose to create statistics, Maptitude creates a temporary table file for each band and displays each in a new dataview window.

There is one final method that uses the Bands by Edge method to select neighbors, then uses one of the bands to create tables:

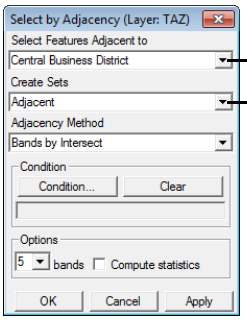
- Adjacency Tables: Distance and IDs: creates two tables for the chosen band, each with one record for each area in your area of interest; one table has the IDs of the areas in the band, sorted by distance from the area in your area of interest, and the other has the distances between the centroids of those areas, also sorted by distance

The tables are saved to files and displayed in a joined view. You can also use the tables for further analysis with Maptitude or with statistical packages.

For non-topological layers, the methods available are Intersecting, All Nodes, Within, and Bands by Intersect.

▶ To Select Features Based on Adjacency

1. Choose an area layer from the drop-down list on the toolbar, and select the features that define your area of interest.
2. Choose ***Selection-Select by Adjacency*** to display the Select by Adjacency dialog box.
3. Make choices as follows:



4. Choose the adjacency method you want to use from the Adjacency Method drop-down list:

To do this...	Do this...
Select areas touching by edge or node	Choose the Intersecting method
Select areas touching by edge only	Choose the Edge method
Select areas touching by node only	Choose the Only Node method
Select areas touching any node	Choose the All Nodes method
Select areas within a distance	Choose the Within method and type a distance in the edit box in the Options frame
Select incremental bands	Choose the Bands by Intersect or Bands by Edge method, choose the number of bands from the Bands drop-down list, and check **Compute Statistics** if you want univariate statistics computed
Produce tables for a band	Choose Adjacency Tables: Distance & IDs and choose the order number of the band from the Order drop-down list

5. If you want to determine adjacency for only those areas that meet a specific condition, click **Condition** to display the Select by Condition dialog box. Use the Condition Builder or type a condition in the Enter a Condition edit box and click **OK** to return to the Adjacency dialog box. Maptitude displays the condition in a text box. To determine adjacency without a condition, click **Clear** to remove the condition from the text box.

   For more information on conditions, see "Selecting Features Based on Attributes" on page 244.

6. Click **OK**.

   If you are producing tables for a band, Maptitude displays the Save As dialog box for each table file. Choose a folder to store the results, type a file name, and click **Save**.

Maptitude runs your adjacency method and displays the results.

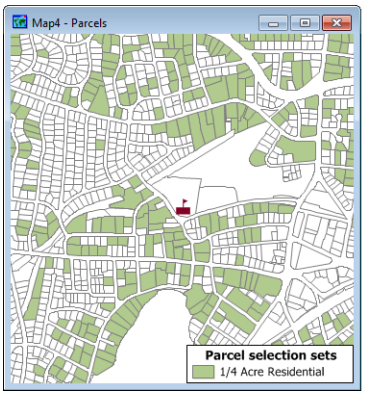
NOTE: If you choose to compute statistics or create adjacency tables, the Apply button functions the same as the OK button.

Try It Yourself: Computing Adjacency

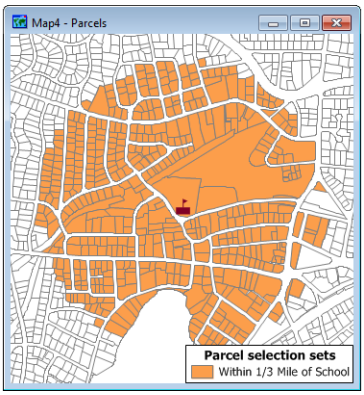
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **ComputeAdjacency.map** in the Tutorial folder to open a map of the United States with Colorado highlighted.
2. Choose ***Selection-Select by Adjacency*** to display the Adjacency dialog box.
3. Verify that **Colorado** is displayed in the Select Features Adjacent To drop-down list.
4. Choose **Intersecting** from the Adjacency Method drop-down list and click **Apply**. Maptitude highlights the states that touch along the edges or nodes of Colorado.
5. Choose **Edge** from the Adjacency Method drop-down list and click **Apply**. Maptitude highlights the states that touch only along the edges of Colorado; Arizona is no longer highlighted.
6. Choose **Only Node** from the Adjacency Method drop-down list and click **Apply**. Maptitude highlights the states that touch only at the nodes of Colorado; only Arizona is highlighted.
7. Choose **Within** from the Adjacency Method drop-down list, type "**100**" in the Options edit box, and click **Apply**. Maptitude highlights the states that are at least partially within 100 miles of Colorado.
8. Choose **Bands by Edge** from the Adjacency Method drop-down list, choose **5** from the bands drop-down list, and click **OK**. Maptitude redraws the map with the five levels of adjacency bands.
9. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Copying, Combining, and Transposing Selection Sets

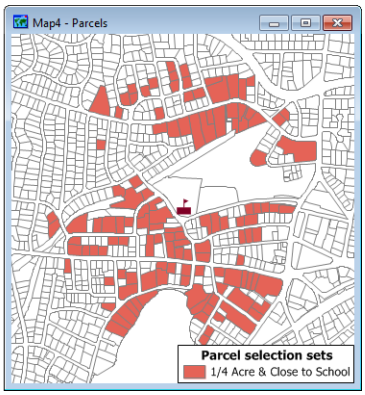
Sometimes you want to combine a location question with an attribute question. For example, "Which parcels are near a school and also on residential lots over 1/4 acre?" To answer this kind of question, you can combine two other selection sets.



Parcels that are 1/4 acre residential



Parcels within 1/3 mile of a school



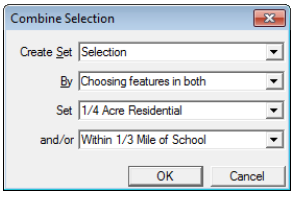
The answer to your question

There are four ways of combining selection sets. In the above example, you wanted to find all the tracts that were in both of the other selection sets. In some cases you might want to find the features that are in either of two selection sets. For example, "Which sales territories either increased their sales volume by 15 percent, or sold over $10M worth of goods?" In other cases, you might want to find features that are in either one selection set or the other, but not in both. In the final case, you might want to remove features in one set that are in the other.

Maptitude also gives you two ways of creating a selection set based on the records contained in other sets. You can create a selection set containing all the records that are not in another selection set, or you can create a selection set by copying the records in another selection set.

▶ To Copy, Combine, or Transpose Selection Sets

1. Choose ***Selection-Combine Selection*** to display the Combine Selection dialog box.



2. Choose the method you want to use from the By drop-down list:

Method...	What it does...
Copying	Selects features that are in an input selection set
Choosing all features	Selects all features in a layer
Choosing features not in	Selects features that are not in an input selection set
Choose features in both	Selects features that are in both of the two input selection sets
Choose features in either	Selects features that are in either of the two input selection sets

Method...	What it does...
Choose features in one	Selects features that are in only one of the two input selection sets
Removing features in	Removes features from an input selection set that are in another input selection set

3. Choose the input selection set(s) you want to combine from the Set drop-down list and the And/Or or From drop-down lists.
4. Type a name or edit the suggested name for the new selection set in the Create Set box.
5. Click **OK**.

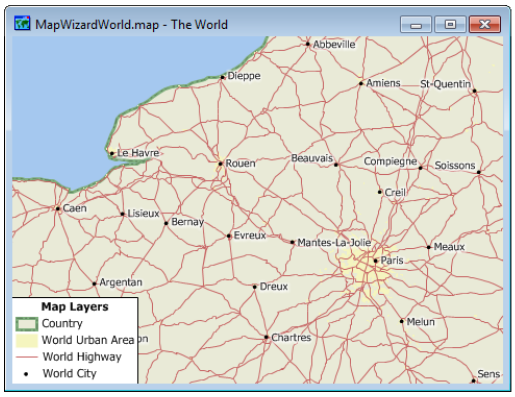
Maptitude selects the features, and highlights the result on the map or in the dataview.

Try It Yourself: Combining Selection Sets

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **hivalue.map** in the Tutorial folder. There is already a selection set, **Value>30000**. You want to see the parcels within a 0.1 mile radius that have land values over $30,000.
2. Verify that the **Nearby** selection set is displayed in the drop-down list on the Selection toolbar. This will be the selection set that you will modify.
3. Click on the Selection toolbar, choose the **Allow Sets to Overlap** option, and click **OK**.
4. Click on the Selection toolbar to activate the Select by Circle tool and click on the map near the center. Maptitude displays the Enter Selection Radius dialog box.
5. Type "**0.1**" in the Radius box and click **OK**. Parcels within 0.1 miles are added to the Nearby selection set.
6. Choose ***Selection-Combine Selection*** to display the Combine Selection dialog box.
7. Choose **Choosing Features in Both** from the By drop-down list, **Value>30000** from the Set drop-down list, and **Nearby** from the And/Or drop-down list.
8. Click **OK**. Maptitude creates a new selection set of parcels that are both within the selection circle and have land values over $30,000.
9. Choose ***Selection-Settings*** or click on the Selection toolbar to display the Selection Sets dialog box.
10. Click on **Selection** and drag to **Nearby** in the scroll list to highlight three selection sets, then click **Status** to make the sets inactive.
11. Click **Close**. Just the new selection set of nearby parcels with a value over $30,000 is highlighted.
12. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Showing Selection Sets on a Map

When you select map features, Maptitude automatically shows features in each selection set in a distinctive style or color. You can further enhance the way a map looks by customizing the way selected features are displayed.



In this map all cities look the same and highways look the same.

In this map larger cities have different symbols and labels and different highway types stand out.

There are a number of ways that you can customize how selection sets are displayed on a map. You can:

- Change the style that is used to display them
- Change the color, font, or style of the labels
- Hide the features in the selection set
- Hide the layer so that only features in a selection set are visible
- Autoscale a selection set to display only at certain scales
- Zoom the map to show all of the features in a selection set
- Zoom to individual features in a selection set

▶ To Change the Appearance of Selection Sets

1. Choose ***Selection-Settings***, or click on the Selection toolbar to display the Selection Sets dialog box.
2. Choose the selection set you want to change from the Selection Sets list.
3. Choose how to display the selection set as follows:

To do this...	Do this...
Highlight the selection set	Click **Status** until the selection set status is "Active."
Not highlight the selection set	Click **Status** until the selection set status is "Inactive."
Hide the selection set	Click **Status** until the selection set status is "Invisible."
Hide features not in the selection set	Choose the layer from the top of the Selection Sets scroll list and click **Status** until the status is "Invisible."
Change the style of a selection set	Click Style to display the Style dialog box. Choose the settings you want and click OK. See "Using Styles" on page 81 for more information.

To do this...	Do this...
Change the labels of a selection set	Click Labels to display the Labels dialog box. Choose the settings you want and click OK. See "Using Labels" on page 86 for more information.
To autoscale a selection set	Click Autoscale to display the Autoscale dialog box. Choose the largest and smallest scales at which to display the selection set and click OK. Note: The autoscale settings for a layer will override the autoscale settings for its selection sets, and you cannot autoscale the selection set named "Selection."

4. Click Close to close the Selection Sets dialog box.

Maptitude draws the map with your changes. If a selection set is not active (that is, the status setting is Inactive or Invisible), changing the style or labels has no visible effect. When you make the set active again, however, the changes take effect.

▶ To See Only Selected Features

1. Click  on the Selection toolbar. Click  again to make all features visible.

▶ To Zoom to a Selection Set

1. Choose the selection set you want to zoom to from the drop-down list on the Selection toolbar.
2. Click  on the Selection toolbar.

   — OR —

1. Right-click on the selection set you want to zoom to in the Display Manager and choose ***Zoom***.

Maptitude draws the map, changing the scale and center so that the map neatly shows all the features in the selection set.

▶ To Zoom to the Individual Features in a Selection Set

1. Choose the selection set from the drop-down list on the Selection toolbar.
2. Choose whether to keep the scale constant or to display each feature at a scale that fits it exactly in the map window:

Choose...	To do this...
	To adjust the scale as you scroll through the features
	To keep the current scale as you scroll through the features

3. Use the buttons on the Selection toolbar to zoom to individual features as follows:

Click...	To do this...
	Zoom to the next feature in the selection set
	Zoom to the previous feature in the selection set
	Zoom to the first feature in the selection set
	Zoom to the last feature in the selection set

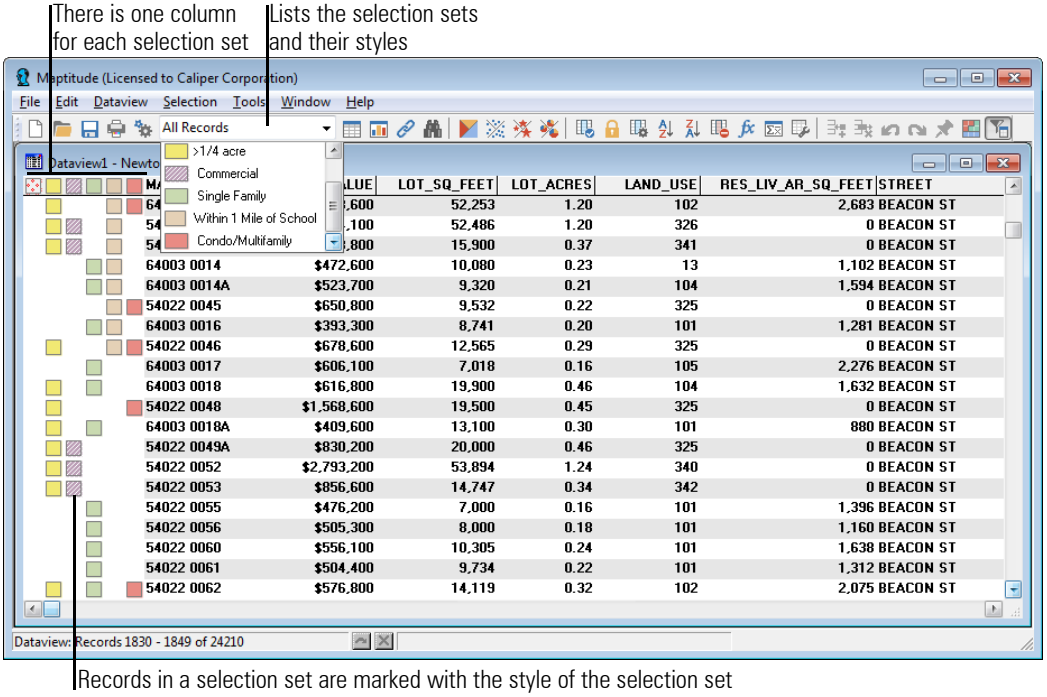
Try It Yourself: Showing Selection Sets on a Map

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **hidense.map** in the Tutorial folder. You are going to emphasize counties in southern New England with high population densities.
2. Verify that **High Pop Density** is displayed in the drop-down list on the Selection toolbar.
3. Click on the Selection toolbar. Maptitude zooms the map to focus on the high population density counties.
4. Choose ***Selection-Settings*** or click on the Selection toolbar, choose **High Pop Density** from the scroll list, and click the **Style** button.
5. Choose **Solid** from the top of the Fill Style drop-down list, choose a light green color from the Fill Color drop-down list, and click **OK**.
6. Click the **Labels** button.
7. Choose **[County Name]** from the Field drop-down list and click **OK**.
8. Click **Close**. The high population density counties have the new style and labels.
9. Click on the Selection toolbar, choose **Layer: County** from the list, and click the **Status** button to make the status of the layer Invisible.
10. Click **Close**. Maptitude will show only the high population density counties.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Showing Selection Sets in a Dataview

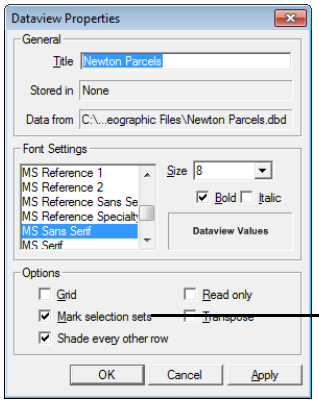
There are two ways to illustrate the answer to a question in a dataview:

- Mark all the records in a selection set with a symbol; the symbols match the ones that are used to show the selected features on the map
- Change the dataview so it shows only the records in a selection set



▶ To Mark Selected Records in a Dataview

1. Choose ***File-Properties*** or click on the Standard toolbar to display the Dataview Properties dialog box.



Check to mark selected records in a selection set column

2. Check **Mark selection sets**.
3. Click **OK**.

Maptitude displays the dataview and marks selected records in the selection columns. You can remove the check from the **Mark Selection Sets** box to hide the selection set columns.

▶ To Choose Which Records to Show in the Dataview

1. Choose the selection set whose records you want to display from the drop-down list on the Standard toolbar, or choose "All Records" to show all records in the dataview.

▶ To Select Records in a Dataview

1. Click in a selection set column on the left of the dataview and next to the record you want to select.

Maptitude marks the record with the symbol of the selection set and adds it to the selection set. Any dataview or map containing those records is updated automatically to show the selected records.

▶ To Select a Range of Records in a Dataview

1. Click and drag to highlight several records in the dataview.
2. If the Selection toolbar is not visible, choose ***Selection-Toolbar*** to display it.
3. Choose the selection set that you want to add the records to from the drop-down list on the Selection toolbar.
4. Choose ***Selection-Select by Highlight***.

Maptitude marks the records in the dataview and adds them to the chosen selection set.

▶ To Remove Records from a Selection Set

1. Click on the mark in a selection set column on the left of the dataview and next to the record you want to remove from the selection set.

Maptitude removes the mark and removes the record from the selection set. The record is not deleted, just removed from the selection set.

Try It Yourself: Showing Selection Sets in a Dataview

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **density.map** in the Tutorial folder. The counties with high and low population densities are already in selection sets.
2. Right-click on the County layer in the Display Manager and choose ***New Dataview***.
3. Choose the **Low Pop Density** selection set from the drop-down list on the Standard toolbar. Now Maptitude shows only the low population density counties.
4. Choose the **High Pop Density** selection set from the drop-down list on the Standard toolbar. Only the high population density counties are displayed.
5. Click on the highlight next to ESSEX MA to remove Essex County from the High Pop Density selection set.
6. Choose **All Records** from the drop-down list on the Standard toolbar. Maptitude displays all of the counties again.
7. Click on a cell in the **[County Name]** column and click to sort the counties by name.
8. Click on the High Pop Density selection set column (it is the middle of the three selection set columns) next to Essex County to add it back to the High Pop Density selection set.
9. Choose ***File-Close All*** and click **No to All** to close the map and dataview without saving any changes.

Creating New Files from Selection Sets

You select records from a geographic file because you want to highlight them in a map or produce a tabular report showing records that meet some condition. Maptitude also lets you take the records in a selection set and create new tables or new geographic files that contain only those records.

From a selection set, you can save a:

- Dataview to a new file on disk that stores information only for the records in a selection set. When you create a table from a selection set, you can store the table in any of the file formats supported by Maptitude.
- Geographic file that contains only the selected map features. The new geographic file is smaller than the original, of course, and contains fewer features.

You cannot create new files from the HERE geographic layers included with Maptitude.

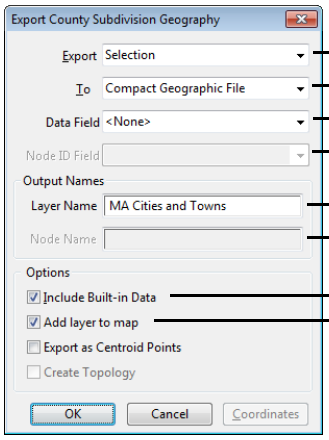
▶ To Create a New Table from a Selection Set

1. In the dataview, choose the selection set you want from the drop-down list on the Standard toolbar.
2. Use the dataview tools and commands to arrange the columns the way you want.
3. Choose ***File-Save As*** to display the Save As dialog box.
4. Choose the file type you want to create from the Save as Type drop-down list.
5. Type a file name.
6. Click **Save**.

Maptitude saves the data for the selected records in a new table. To open the new table and display it in a dataview, use the ***File-Open*** command.

▶ To Create a New Geographic File from a Selection Set

1. Choose the map layer whose features you want to extract from the drop-down list on the Standard toolbar.
2. Choose ***File-Export-Geography*** to display the Export Geography dialog box.
3. Make choices as follows:



4. Click **OK** to display the Save As dialog box.
5. Type a name for the new geographic file.
6. Click **Save**.

Maptitude creates a new geographic file containing the features you want. For more information on geographic file formats, see "Geographic File Formats" on page 380.

Use the ***File-Open*** command or the ***Map-Layers*** command to open the new file or add it to a map.

TIP: You can also export portions of one or more layers by clipping. For more information see "Clipping Geographic Files by Area" on page 450.

Try It Yourself: Creating Geographic Files from a Selection

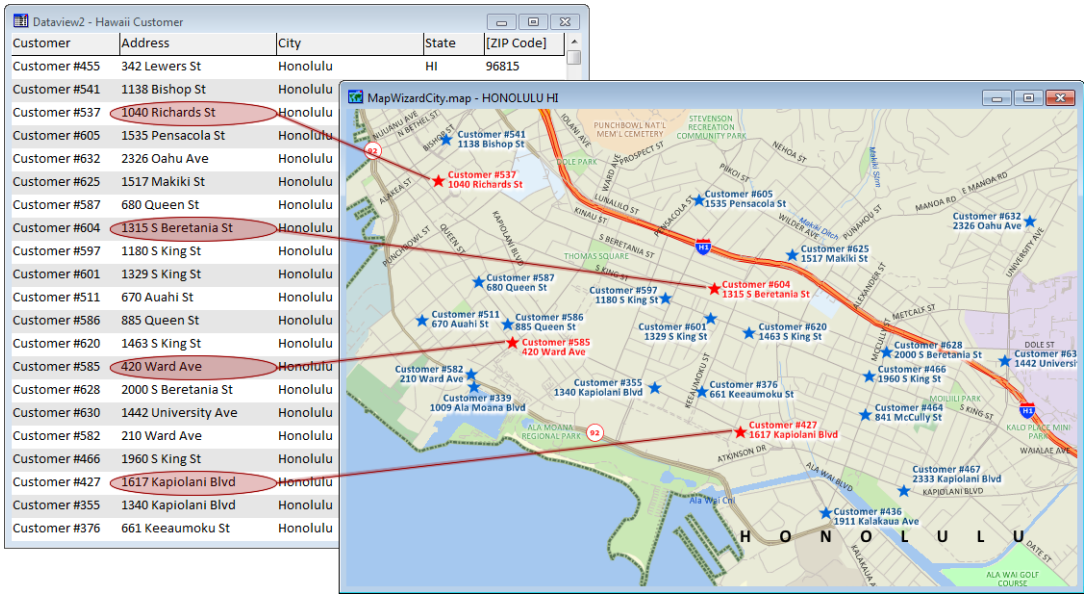
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **locator.map** in the Tutorial folder. You want to make a new geographic file of just the counties in Rhode Island.
2. Choose **County** from the layer list on the Standard toolbar.
3. Choose ***Selection-Select by Condition*** or click on the Selection toolbar to display the Select by Condition dialog box.
4. In the Condition Builder, choose **State** from the Field List drop-down list, choose **=** from the Operator drop-down list, choose "**44**" from the Values of State drop-down list, and click **OK** (44 is the FIPS code for Rhode Island). Maptitude selects the counties in Rhode Island.
5. Choose ***File-Export-Geography*** to display the Export Geography dialog box, and verify that **Selection** is chosen in the Export drop-down list. The other settings are correct.
6. Click **OK** to display the Save As dialog box.
7. Choose a folder on your computer in which to save the new files (you will need to remember this folder for step 8), then type "**my counties**" as the file name, and click **Save**. Maptitude exports the selected counties to the new geographic file.
8. Choose ***File-Open*** or click on the Standard toolbar, choose the folder to which you just saved the counties, choose **Geographic File** as the file type, click on the file **my counties.cdf**, and click **Open**. Maptitude creates a map with the new file.
9. Choose ***File-Close All*** and click **No to All** to close the maps without saving any changes.

CHAPTER 9:
Geocoding: Locating Your Data on a Map

Many of the databases you use in your work contain information on facilities, customers, survey respondents, and so on. One way you can use your data with Maptitude is to locate your data on a map by creating a new geographic file that contains a point feature for every record in your database. This is sometimes known as pin mapping, because it is like hanging a paper map on the wall and marking the locations of interest with pushpins. Maptitude offers six different commands for locating your data on a map.

Once you have located your data, you can create themes to show the characteristics of each feature, label features on the map with information from your database, or filter the features based on location or attributes.

Maptitude can also read geotags from the images in a folder and create points in a geographic file based on the coordinate information in the images.



In this chapter:

Locate Commands

Maptitude offers you several ways to locate your data:

- Create-a-Map Wizard helps you by examining your data and suggesting possible ways to join your data to a map or to locate each record as a point on the map. Create-a-Map Wizard looks for fields with recognizable names, and gives you some choices of ways to display your data on a map. It is good for quick or simple tasks, such as locating most of your records by address. For more information, see "Using Create-a-Map Wizard" on page 56.
- The Locate commands give you more options when locating your data, so that you can handle more complex tasks and fine tune the way the records are located. The Locate commands are described in this chapter.

Maptitude has many commands that automatically locate points. Each command uses a different method to identify the location where points should be placed on the map, with varying degrees of precision. In addition, you can manually locate points.

The commands that are available will vary somewhat depending on the regional data that you have installed. For example, the ***Locate by Postal Code*** command that is available in most regions is called ***Locate by ZIP Code*** if you are using the United States country package. For information on all of the specific locate commands available with your country package, see "Locating Your Data on a Map" in the Regional Help.

Here is a summary of the most common locate commands and how they work:

TIP: You can use the Locate Wizard to run several passes at once and locate your data using the best possible method.

Locate by...	What it does
Address	Uses street address fields in your data to set the locations based on a reference file of streets or a location index for addresses
ZIP Code/Postal Code	Uses ZIP/Postal Codes in your data to set the locations scattered inside ZIP/Postal Code areas, or at or near ZIP/Postal Code points
City/Town/Suburb	Uses city and state/province/district fields in your data to set the locations at or near city points for records within your installed region data
World City	Uses city and country fields in your data to set the locations at or near points in the World Gazetteer geographic file
Value	Uses one or more fields from your data, such as sales territory or store, to look up corresponding map features and set the locations
Coordinate	Uses coordinate information that is stored in your data to set the locations
Pointing	Allows you to manually place or reposition records on your map

All of these commands create or add to a point geographic file, shown as a map layer, with one point for each record in your file. The point layer will include all of your data from the original source. Records that Maptitude successfully locates will have a coordinate (longitude and latitude). When Maptitude is finished locating your records, it displays them in a map so that you can see where they are located, and displays a dataview that shows the location of each point. Maptitude also creates a selection set for any records that were not found. You can choose to see this selection set in the dataview, and you can use this selection set to locate just the records that were not found using a different method.

Choosing Which Locate Command to Use

There are a number of factors to consider when you are deciding which command to use:

- If your database contains a coordinate for each record, use ***Locate by Coordinate***.
- If your database has street address information and you have a Street file for that country, use ***Locate by Address***.
- If your database does not have street addresses but does have postal codes, use ***Locate by ZIP Code/Postal Code***. You can also use this method if you do not require street-level accuracy because you will be creating maps at a state or national scale.
- If the database has cities and states/provinces/districts within your installed data region, use ***Locate by City/Suburb/Town***.
- If your database can be located based on other geographic files, use ***Locate by Value***.
- If you know where a record should be placed or repositioned on the map, use ***Locate by Pointing***.

Depending on the type of data you have in your file, using one Locate command may not be enough to locate all the records. In that case, you can use the same Locate command with other settings, or another Locate command, to locate records that were not found. For example:

- Use ***Locate by Address*** for all the records that have address information
- Use ***Locate by ZIP Code/Postal Code*** for records that have no address but do have postal code information (e.g., post office box addresses)
- Use ***Locate by City/Suburb/Town*** for records that have city and state/province/district information and are within your installed geographic region
- Use ***Locate by World City*** for records that have city and country information and are located outside your installed geographic region
- Use ***Locate by Value*** for remaining records that are located outside of your region or that have neither address nor postal code fields
- Use ***Locate by Pointing*** for the remaining records whose location you know

The ***Tools-Locate-Locate Wizard*** command can speed this process up for you. When you use the Locate Wizard, it will automatically parse your data and locate by address, postal code, and/or city for you. When complete, the located data will indicate the method used to locate the records. Then you can locate any remaining records using another method.

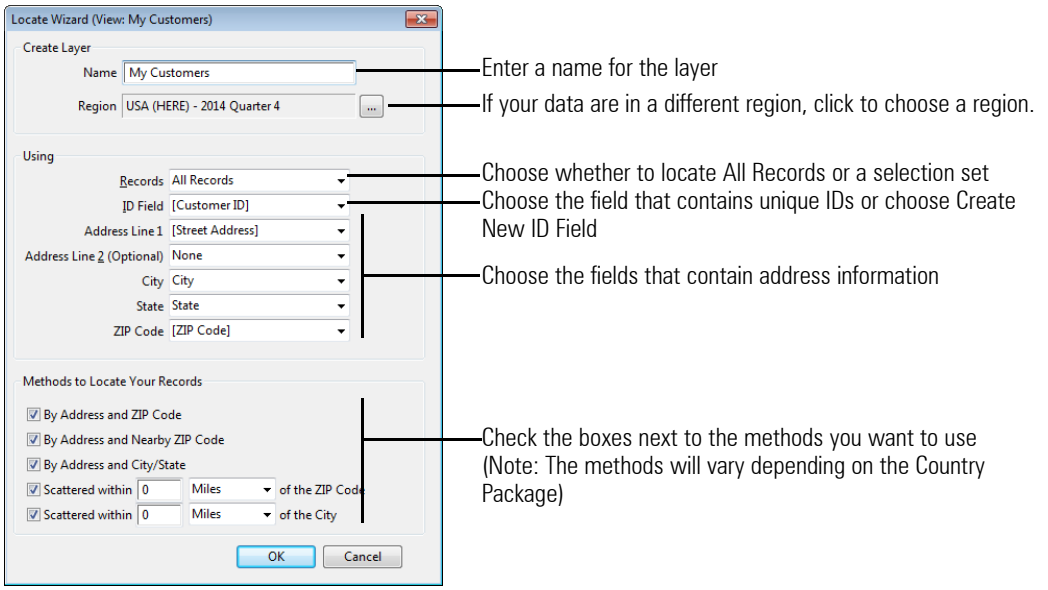
Locating Records with the Locate Wizard

Frequently when you are locating your data by address, there will be records that cannot be found and require you to use alternate methods. For example if an address is a Post Office box or building name, it may be necessary for you to locate the unmatched records by postal code or city and state. The Locate Wizard simplifies this task by running several passes through your data and finding the best possible location method. Once the data are located, your point layer will include a field indicating the method used to locate each record.

The methods that the Locate Wizard uses will vary based on the Country Package you are using. For example, the Locate Wizard for the United States will first locate records using the address and ZIP Code, then locate records by address and city, then by ZIP Code, and finally by city.

▶ To Locate Records with the Locate Wizard

1. Open a dataview of the records that you want to locate.
2. Choose ***Tools-Locate-Locate Wizard*** or click on the Standard toolbar to display the Locate Wizard dialog box and make choices as follows:



3. Click **OK**. Maptitude displays the Save Output Geographic Database As dialog box.
4. Type a name for the file and click **Save**. Maptitude locates the records using the chosen methods and displays a report with the number of records located for each method.
5. Click **OK** to close the report.

Maptitude locates the records in your data using the chosen methods. If you open a dataview of the new layer you can see the [Geocoding Precision] field that indicates how each record was located.

Try It Yourself: Using the Locate Wizard

1. Choose ***File-Open*** or click on the Standard toolbar, choose **Excel Worksheet** as the file type, and open the sample customer file for your region in the tutorial folder.
2. Click **OK** in the Choose Excel Sheet dialog box to display the Save Excel Sheet As dialog box.
3. Enter "**My Locate**" as the file name and click **Save**.
4. Click to display the Locate Wizard.
5. Choose **[Customer ID]** from the ID Field drop-down list. The address, city, and postal fields should be automatically filled in.
6. Click **OK** to display the Save As dialog box and click **Save**. Maptitude locates the records and displays the match statistics where you can see how many records were located with each method.
7. Click **OK** to continue.
8. Click on the Standard toolbar, choose **[Geocoding Precision]** from the Field drop-down list and click **OK**. Maptitude adds a color theme to the map showing how each record was located. Notice that the vast majority were located with the highest precision.
9. Click on the Tools toolbar, then click on any of the located customers to see their information.
10. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Locating Records by Address

The ***Locate by Address*** command can locate your data based on street address and postal/ZIP Code fields. A street address is a combination of a street number and a street name. Maptitude can find the right location for a street address even if the street name isn't spelled correctly, the street type (St., Ave., etc.) is missing, or the street address has other information such as apartment numbers. Maptitude can also find the right location for intersections as long as the two street names are separated by And, &, At or @. Here are some examples of street addresses that Maptitude can locate:

- 1172 Beacon Street
- 134-12 Archer Ave.
- 45 E. 3rd St., Apt #6
- Beacon St. at Walnut St.
- 40 Seventh St., SW
- Hollywood & Vine

By default, Maptitude locates addresses using the provided regional street file, which is a geographic file containing nearly all of the streets in a country. This file has a line feature for each segment of each street, with information on the street name and on the address ranges and postal codes that are along each segment.

NOTE: You can specify a default region or street file to use by choosing ***Edit-Preferences*** and choosing a region or street/index file to use on the Locating tab.

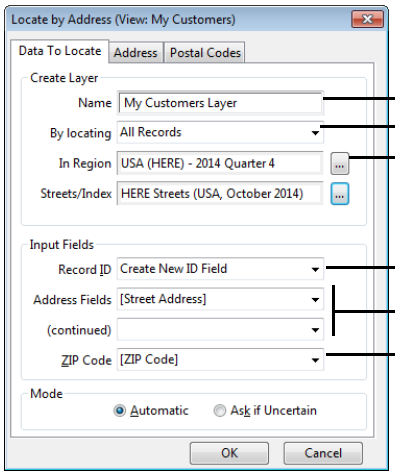
The first time you locate by address you should be able to locate most of your records using the normal settings. The procedure "To Locate Records by Address in a New Point Geographic File" below shows you how to use the normal settings. The ***Locate by Address*** command has other settings to help you deal with situations that you may encounter that are described in "Using Other Settings for Locating Records by Address" on page 266.

There is also an option to use your own street file or a location index with your own custom street layers or other files. For more information, see "Using a Different Street Layer" on page 280 or "Creating Location Indexes" on page 540..

▶ To Locate Records by Address in a New Point Geographic File

1. Open a dataview of the records that you want to locate.
2. Choose ***Tools-Locate-Locate by Address*** to display the Locate by Address dialog box.
3. Make choices as follows:

TIP: For a description of the other settings that you can use when locating records by address, see "Using Other Settings for Locating Records by Address" on page 266.



Type a name for the new layer
Choose to locate All Records or a selection set
If your data are in a different region, click to choose from among your installed regions.
Choose the field that contains unique IDs or choose Create New ID Field
Choose the field(s) that contain address data
Choose the field that contains the ZIP Codes or postal codes

4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the geographic file to store the new point features, and click **Save**. Maptitude locates the records and displays a message summarizing the results.
6. Click **OK**.

Maptitude displays the locations in a new point layer and creates a new selection set called "Address Not Found" for any records that could not be located. See "Deciding Which Other Settings to Use" on page 270 for suggestions on what to do with the addresses that were not found.

Try It Yourself: Locating Data That Have an Address

1. Choose ***File-Open*** or click on the Standard toolbar, choose **Excel Worksheet** as the file type, and open the sample customer file for your region in the tutorial folder.
2. Click **OK** in the Choose Excel Sheet dialog box to display the Save Excel Sheet As dialog box.
3. Enter "**My Addresses**" as the file name and click **Save**.
4. Choose ***Tools-Locate-Locate By Address*** to display the Locate by Address dialog box.
5. Choose **[Customer ID]** from the Record ID drop-down list and verify that the address and postal fields are correct.
6. Click **OK** to display the Save As dialog box.
7. Enter "**My Sample Customers**" as the file name and click **Save**. Maptitude locates the records and displays the match statistics. Click **OK** to continue.
8. Choose ***File-Close All*** and click **No to All** to close the dataview and map without saving any changes.

Using Other Settings for Locating Records by Address

You might need to use the ***Locate by Address*** command several times with different settings, or some of the other Locate commands, to deal with records that were not found. Maptitude provides many ways to deal with records that could not be located with the normal settings. Below are some situations and how to solve them, using the other settings or the other Locate commands.

- **To locate just some of the records:** Create and use a selection set. See *Chapter 8: Queries and Selection Sets*. You can also use the Address Not Found selection set created the last time you located records by address. Choose the selection set from the By Locating drop-down list.
- **To use streets in more than one region:** Make selection sets of the records to locate based on which region they are in, then choose the appropriate region from the Region Manager before locating each selection set.
- **To use your own Streets file:** Open a map with your Streets file as a layer, and click ... next to Streets/Index to display the Choose Street Layer or Location Index dialog box. Choose the street layer or index, address format, and city format and click OK. See "Using a Different Street Layer" on page 280.
- **To use a Location index:** Choose the Location index from the Using Layer or Index drop-down list. See "Creating Location Indexes" on page 540.
- **The addresses are not in the normal region format:** Maptitude can recognize several ways for showing street numbers and names, both in your data and in your Streets file. Click the Addresses tab and choose a format from the Streets & Numbers drop-down list. See "Accepting Different Address Formats" on page 281.

- **There are more than three street address fields:** Create a formula field to group the fields, with spaces in between, then use Locate by Address and choose the new formula field from the Number & Street drop-down list. For example, the formula STNUM+" "+STNAME would make sure there is a space between those street number and street name fields. See "Creating a Formula Field" on page 195.
- **The postal code could be in one of several fields:** This happens with the mailing label style of address fields. Create a formula field to group the fields, with spaces in between, then use Locate by Address and choose the new formula field from the Postal Code drop-down list. For example, the formula ADDR3 + " " + ADDR4 would make sure there is a space between a third and fourth address line fields. See "Creating a Formula Field" on page 195.
- **A different ZIP Code/Postal Code might be needed:** Click the Postal Codes tab and click the Use Postal Codes Near the One in the Postal Code Field radio button to try alternate postal codes. See "Checking Nearby Postal Codes for Possible Matches" on page 282.
- **The postal code is missing:** You can supply a list of postal codes to try, or indicate the city and state whose ZIP/Postal Codes are to be tried. Choose None from the Postal Code drop-down list, click the Postal Codes tab, click the Use Postal Codes in this List or Use Postal Codes For radio buttons, and fill in the necessary information. See "Locating Records without Postal Codes" on page 282.
- **To change the rating for matching records:** You can set the rating necessary to declare a match to be higher or lower than the normal setting. Click the Addresses tab and make a choice from the Matching method drop-down list. See "Changing the Rating That Is Required for a Match" on page 283.
- **To choose when the match is uncertain:** If there are several possible places to locate a record, you can review the list and make a choice. Click the Ask If Uncertain radio button. See "Reviewing Uncertain Matches" on page 283.
- **To change the offset from the street:** Maptitude has three ways to offset the location from a point along the street segment. Click the Addresses tab, click one of the Display Offset from Street radio buttons, and fill in the necessary information. See "Changing How Locations Are Offset from the Street" on page 284.
- **Some of the locations are not quite right:** Select the records that you would like to reposition, then use Locate Records by Pointing; see "Locating Records by Pointing" on page 278.
- **Some addresses still were not found:** Use one of the other Locate commands. If there is a Postal Code field, see "Locating Records by Postal Code" on page 271. If there are city and state fields, see "Locating Records by City" on page 272. If you can point to the right location, see "Locating Records by Pointing" on page 278.
- **To report how each record was matched:** Maptitude can save the standardized version of the addresses and the results of the match in a report file. Click the Addresses tab, check Save Standardization, and type a file name. See "Creating a Report File" on page 284.

▶ To Locate More Records by Address Using Other Settings

1. Choose the layer with the records that still need to be located, either from the drop-down list on the Standard toolbar or by making its dataview the current window.
2. Choose ***Tools-Locate-Locate by Address*** to display the Locate by Address dialog box.
3. Choose to locate **All Records** again, just the **Address Not found** selection set, or just your own selection set, from the By Locating drop-down list.

4. If you have more than one region of data installed on your computer, verify that you are using the correct region for the address you want to find. If necessary, click ... and choose a different region from the Region Manager. See "Using the Region Manager" on page 117 for more information.

5. To use a different layer or index, click ... and make choices from the dialog box as follows:

   - Choose whether to use the region street file, another layer in the map, or a location index from the Streets/Index drop-down list.
   - Choose a format from the Address Format drop-down list and from the City & State Format drop-down list.

6. Maptitude looks for the fields that contain address information. Verify that Maptitude has correctly identified the fields in the dataview that contain the following information:

Field	Contains this information
Number & Street	The address or first portion of the address
(Continued)	The rest of the address (if any)
Postal Code	The postal code, the 5-digit ZIP Code, or the 9-digit ZIP+4 Code

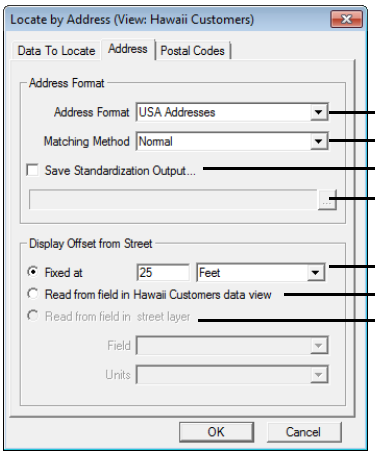
   If you have created formula fields for the street address, the postal code, or both, make sure that these fields are chosen.

7. Choose how to handle uncertain matches from the Mode radio list:

To do this...	Do this...
Automatically handle uncertain matches	Click Automatic
Review uncertain matches	Click Ask If Uncertain

   For more information on uncertain matches, see "Reviewing Uncertain Matches" on page 283.

8. Click the Addresses tab and make choices as follows:



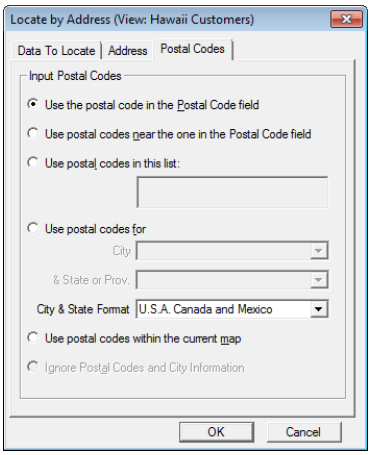
TIP: For more about address formats see page 281.

TIP: For more about matching methods see page 283.

TIP: For more about report files see page 284.

TIP: For more about offsets see page 284.

9. Click the Postal Codes tab.



TIP: To learn more about the postal code options, see "Checking Nearby Postal Codes for Possible Matches" on page 282 or "Locating Records without Postal Codes" on page 282.

To do this...	Do this...
Use the postal code in the chosen field	Click the Use the Postal Code in the Postal Code Field radio button.
Check the nearby postal codes	Click the Use Postal Codes Near the One in the Postal Code Field radio button.
Use postal codes typed into a list	Click the Use Postal Codes in This List radio button and type the postal codes to search in the text box (e.g., 11001, 11431-11436, 12041).
Use city and state names	Click the Use Postal Codes For radio button and choose the field or fields containing the city and state names from the City and State editable drop-down lists, or type the city and state names in the City and State editable drop-down lists. If you are using a location index, choose a format from the Format drop-down list, otherwise use the default format for your region.
Use postal codes on the current map	Click the Use Any Postal Codes Within the Current Map radio button.

If you are using a Location index, you can ignore postal codes in a Location index by clicking the Ignore Postal Codes and City Information radio button.

10. Click OK. Maptitude starts locating records by address. If you clicked Ask If Uncertain, Maptitude displays the Choose a Matching Record dialog box when it encounters a record with several possible matches. Choose one of the following options:

To do this...	Do this...
Accept one of the possible matches	Highlight the match in the list and click OK
Reject all of the possible matches	Click None
Stop locating by address	Click Cancel

During the process of locating records by address, Maptitude does the following:

- Makes one pass through the records to do a careful cleanup, making sure that the addresses are formatted correctly and that common abbreviations are used, then sorts the records by postal code or by city and state.
- Makes a second pass through the records to locate based on street number and street name.
- Makes a third pass to locate any records with street intersections.
- Adds or updates the point for each record in the geographic file. The points are offset from the even or odd side of the street, as appropriate, or placed at the intersection.

- Draws the map at a scale that shows the locations of all the points.
- Displays a message telling you the number of records that were processed and the number that were successfully located.
- Updates the Address Not Found selection set.
- Optionally, creates a detailed report on what happened with each record, and displays the report file.

NOTE: You can set the default method for matching by choosing Edit-Preferences and choosing a method from the Method drop-down list on the Locating tab. You can also set the default offset distance and units on the Locating tab.

Deciding Which Other Settings to Use

Because Maptitude has a number of settings for locating addresses, it is sometimes difficult to figure out which settings to use, and in what order. Here is one way to proceed:

1. Locate by address with all the normal settings. Maptitude will match as many records as it can without asking for assistance.
2. Locate the Address Not Found selection set by address using nearby postal codes. To choose this option, click Postal Codes and click Located Near the Ones Indicated by the Postal Code Field.
3. Locate by address again with the Address Not Found selection set to review uncertain matches while using the less strict matching method. To choose these options, click Ask If Uncertain, then click Street Options, choose the Not Strict from the Matching Method drop-down list, check Save Standardization, and type a file name for the report file. Maptitude will show you the records it is unsure about. Accept any matches that look reasonable to you.
4. Review the report file and see why the unmatched records aren't matching. Look carefully to see if the addresses and postal codes of unmatched records are complete and make sense. If not, edit them in the dataview and start over again with Step 1, using the normal settings with the Address Not Found selection set. Otherwise, continue with Step 5.
5. If the records are in your region, use ***Locate by ZIP/Postal Code*** or ***Locate by City/Town/Suburb*** for the remaining records in the Address Not Found selection set.
6. If the records are outside of your region, use ***Locate by World City***.
7. If there are any further unfound records in a selection set but you know their location, use ***Locate by Pointing*** to manually place them on the map.

After you have tried these steps, stop where you are. You have probably located about as many records as you can.

Locating Records by Postal Code

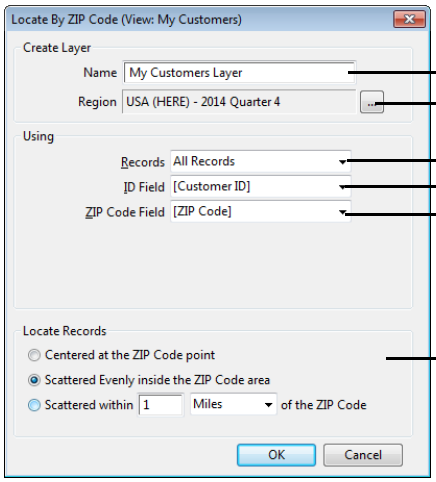
The ***Tools-Locate-Locate by ZIP Code*** (or ***Locate by Postal Code***) command locates the records in your data using the postal code of each record. Maptitude locates the records by using the postal code area and/or centroid files included with your region.

To locate records by postal code, Maptitude needs to know which column in the dataview contains the postal code value. Usually, Maptitude can figure this out automatically. If the column has a name that Maptitude does not recognize, you will need to choose the correct column from a drop-down list. If the column contains more than just the postal code (for example, street address and postal code, or city, state, and postal code), Maptitude will pick out the postal code automatically and ignore the rest of the information.

When you locate records by postal code, you can choose to place each record at or around the matching post office or point location, or to locate each record scattered within the corresponding postal area. If your database has records that share a common postal code, spreading them out lets you see each individual point on the map.

▶ To Locate Records by ZIP Code or Postal Code

1. Open a dataview of the records that you want to locate.
2. Choose ***Tools-Locate-Locate by ZIP Code*** (or ***Tools-Locate-Locate by Postal Code*** for non-U.S. regions) to display the Locate by ZIP Code (or Locate by Postal Code) dialog box and make choices as follows:



If this is the first time you are locating data, enter a name for the layer

If your data are in a different region, click to choose a region

Choose whether to locate All Records or a selection set

Choose the field containing unique IDs

Choose the field with postal code information

Choose whether to locate records that are in the same postal code at the same point on top of one another, scattered within the entire postal code area, or scattered within some distance of the centroid

3. Click OK.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save.

   Maptitude does the following:

   - Sorts your data by postal code, reads through your data, and locates each feature based on its postal code.
   - Creates a new geographic file with one point for each record, or adds a point for each record to the existing geographic file.

- Displays a message telling you the number of records that were processed and the number that were successfully located.
- Adds the new point layer to an existing map or creates a new map containing the point layer.
- Draws the map at a scale that shows the locations of all the points.
- Creates a new selection with any postal codes that were not found and shows the selection set in the dataview. You can use this selection set when you use another Locate command to locate the remaining records.

Try It Yourself: Locating Data That Have a ZIP Code

1. Choose ***File-Open*** or click on the Standard toolbar, choose **Excel Worksheet** as the file type, and open the sample customer file for your region in the tutorial folder. NOTE: This tutorial may have slight variations with some Country Packages and may not work with all Country Packages.
2. Click **OK** in the Choose Excel Sheet dialog box to display the Save Excel Sheet As dialog box.
3. Enter "**My ZIP Locate**" as the file name and click **Save**.
4. Choose ***Tools-Locate-Locate By ZIP Code (Postal Code)*** to display the Locate by ZIP Code/Postal Code dialog box.
5. Type "**Sample Customers**" in the Name edit box.
6. Choose the **Scattered within 1 Mile/Kilometer of the Postal Code Point** option from the radio list.
7. Click **OK** to display the Save As dialog box.
8. Type "**My Customers Postal**" as the file name and click **Save**. Maptitude locates the records around their respective postal locations and displays the match statistics.
9. Click **OK** to continue.
10. Choose ***File-Close All*** and click **No to All** to close the dataview and map without saving any changes.

Locating Records by City

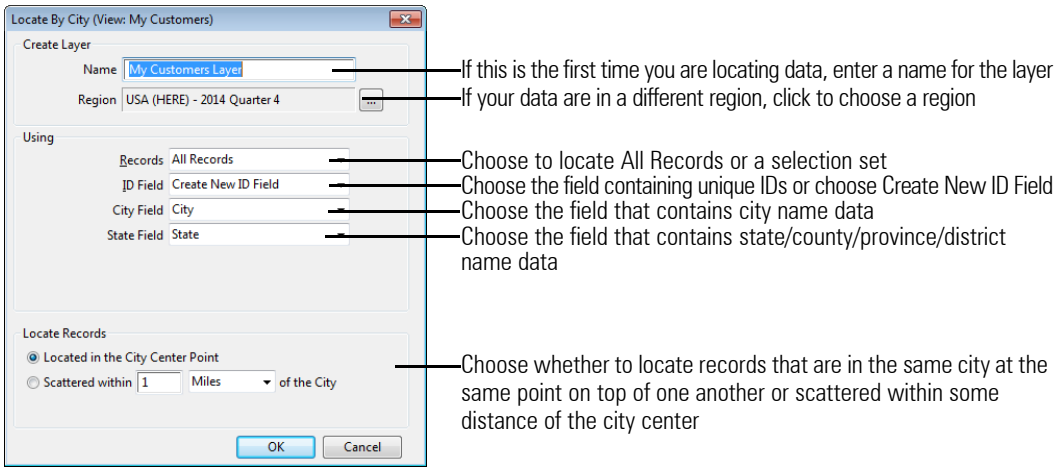
There are two commands for locating records by city. The ***Locate by City*** (or ***Locate by Suburb*** or ***Locate by Town***) command uses geographic files in your installed data region to locate the records. The ***Locate by World City*** command uses the included World Gazetteer geographic file to locate records anywhere in the world.

To locate records using the ***Locate by City*** (or ***Locate by Suburb*** or ***Locate by Town***) command, Maptitude needs to know which fields contain the city name and the state/province/district name or abbreviation. To locate records using the ***Locate by World City*** command, Maptitude needs to know which fields contain the city name, province/state/district name or code, and country name or code. When you are locating world cities, at least one of the fields in your data must be exactly the same as the values of fields in the World Gazetteer layer. Other fields in your data can be matched even if the values are slightly different because Maptitude can use fuzzy matching to locate values that are slightly different. For example, "Barford Saint Martin" and "Barford St. Martin" would match using fuzzy matching.

▶ To Locate Records by City

1. Open a dataview of the records that you want to locate.

2. Choose ***Tools-Locate-Locate by City*** (or ***Locate by Suburb*** or ***Locate by Town*** depending on the region) to display the Locate by City dialog box and make choices as follows:



3. Click **OK**.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save.

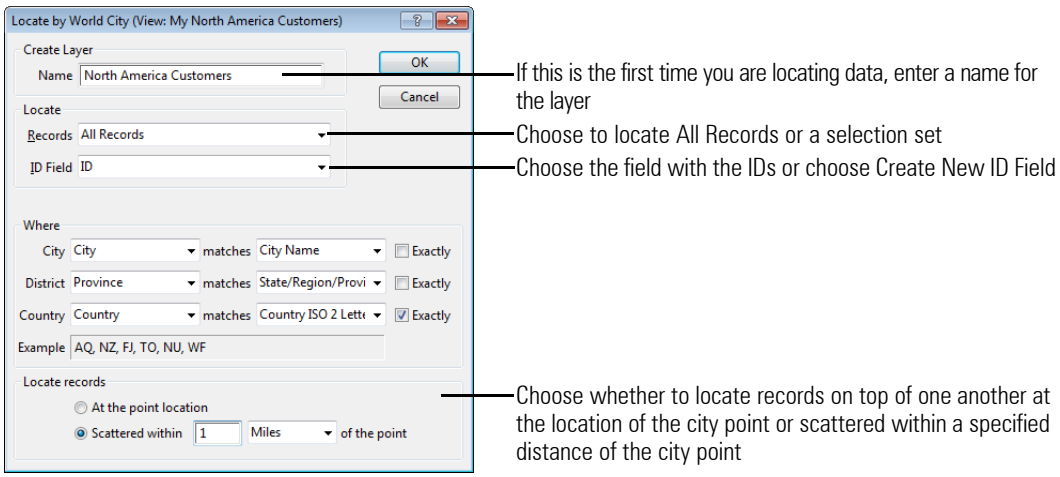
   Maptitude does the following:

   - Creates a new geographic file with one point for each record, or adds a point for each record to the existing geographic file.
   - Displays a message telling you the number of records that were processed and the number that were successfully located.
   - Adds the new point layer to an existing map (if there is one) or creates a new map containing the point layer.
   - Draws the map at a scale that shows the locations of all the points.
   - Creates a new selection set called "City Not Found" for records that were not found and shows the selection set in the dataview.

▶ To Locate Records by World City

1. Open a dataview of the records that you want to locate.

2. Choose ***Tools-Locate-Locate by World City*** to display the Locate by City dialog box and make choices as follows:



3. Choose the field that contains the city name from the City drop-down list. This field must contain the English spelling of the city name (e.g., "Rome" instead of "Roma").
4. Choose the field that contains the province/state/district name from the District drop-down list and choose whether the field is the province name or abbreviation from the respective Matches drop-down list. You can also choose None from the District drop-down list if you want to locate internationally without province information, but you will get better results for some countries if you do specify a province. For example this will help Maptitude determine whether to locate a record in Perth, Western Australia versus Perth, Tasmania or a record in Portland, Maine versus Portland, Oregon.
5. Choose the field that contains the country name or code from the Country drop-down list, and choose whether the country field is the country name, 2-letter ISO code, or 3-letter ISO code from the respective Matches drop-down list.
6. Choose at least one field that must match the World Gazetteer layer exactly by checking the appropriate **Exactly** box.
7. Click **OK**.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save.

   Maptitude does the following:

   - Creates a new geographic file with one point for each record, or adds a point for each record to the existing geographic file.
   - Displays a message telling you the number of records that were processed and the number that were successfully located.
   - Adds the new point layer to an existing map (if there is one) or creates a new map containing the point layer.
   - Draws the map at a scale that shows the locations of all the points.
   - Creates a new selection set called "City Not Found" for records that were not found and shows the selection set in the dataview.

Locating Records by Value

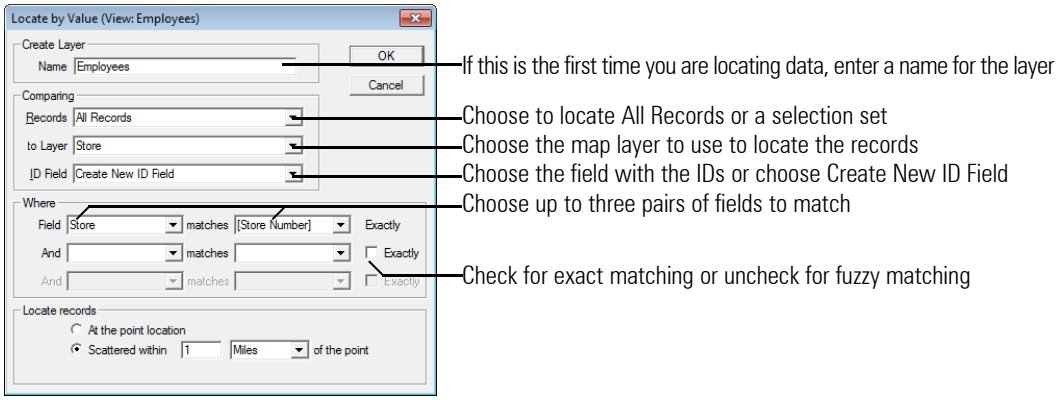
The ***Tools-Locate-Locate by Value*** command lets you match records in your database to features in any map layer, based on the values in one or more fields. For each record in your database, Maptitude tries to find a map feature with matching values. If a matching feature is found, Maptitude locates the record based on that feature's location. For example, if you have a table of employees that contains a field with the store ID in which they work, you could locate it to the store layer; or you could locate members of congress or parliament to a district layer based on the district name or ID.

The ***Locate by Value*** command has two methods for comparing the values in fields in your data with the values in fields in the map layer:

- **Exact matching** means that the values of the fields in your data must be exactly the same as the values of fields in the map layer. For example, "Newton" and "NEWTON" would not match using exact matching. The first pair of fields must match exactly. You can use a formula field with the Upper(), Lower(), or Proper() functions to get one field to have the same capitalization as the other. For more information, see *Appendix A, Formulas, Conditions, and Functions*.
- **Fuzzy matching** will match the values of the fields in your database to the values of fields in the map layer even if the values are slightly different. For example, "Newton Centre" and "Newton Center" would match using fuzzy matching. The second and third pairs of fields can be matched this way.

▶ To Locate Records by Value

1. Open a map with the layer that you will use to locate the records.
2. Open a dataview of the records that you want to locate.
3. Choose ***Tools-Locate-Locate by Value*** to display the Locate by Value dialog box.
4. Make choices as follows:



5. Choose how to locate the records as described in table below:

Layer Type	Option	What it does...
Point	At the point	Places all records on top of one another at the location of the point.
Point	Scattered within...	Scatters the records within a specified distance of the map feature.
Line	At the middle...	Places all records on top of one another at the midpoint of the line.
Line	Scattered...	Scatters the records along the length of the line.

Layer Type	Option	What it does...
Area	At the center...	Places all records on top of one another at the center of the area.
Area	Scattered inside...	Scatters the records around the interior of the area.
Area	Scattered near...	Scatters the records around the center of the area.

6. Click **OK**.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save.

   Maptitude does the following:

   - Sorts your data by one or more fields and then reads through your data, locating each feature based on the values of the chosen fields.
   - Creates a new geographic file with one point for each record, or adds a point for each record to the existing geographic file.
   - Displays a message telling you the number of records that were processed and successfully located.
   - Adds the new point layer to an existing map or creates a new map containing the point layer.
   - Draws the map at a scale that shows the locations of all the points.
   - Creates a new selection set called "Not Found" and shows the selection set in the dataview. You can use this selection set when you use another Locate command to locate the remaining records.

Try It Yourself: Locating Data With a Feature Name

1. Choose ***File-Open Workspace***, then open the workspace **customer.wrk** in the tutorial folder. You will be locating a list of customers, using city and state names.
2. If the dataview is not the active window, click on it or choose ***Window-Dataview 1-NES_CUST*** to make it the active window.
3. Choose ***Tools-Locate-Locate By Value*** to display the Locate by Value dialog box.
4. Choose **Place** from the To Layer drop-down list.
5. Choose **[Customer ID]** from the ID Field drop-down list.
6. Choose **City** and **City** from the first pair of Matching drop-down lists and choose **State** and **State** from the second pair of drop-down lists.
7. Choose the **Scattered Within** radio button, type "**2**" in the text box, and choose **miles** as the units.
8. Click **OK**. Type "**My City**" as the name and click **Save**. Maptitude locates the points by value and displays the match statistics.
9. Click **OK** to continue. The map and dataview show the customer locations.
10. Click on the map, click  on the Tools toolbar, then click any of the symbols to see information about the customers.
11. Choose ***File-Close All*** and click **No to All** to close the dataview and map without saving any changes.

Locating Records by Coordinate

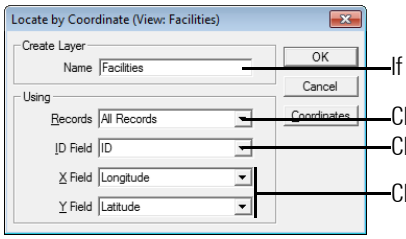
The ***Tools-Locate-Locate by Coordinate*** command creates points in a geographic file based on coordinate information stored in your data. The coordinates can be in degrees of longitude and latitude or in many other coordinate systems. To use the ***Locate by Coordinate*** command, your data file must include one field containing longitude or X-values and another field containing latitude or Y-values.

If your data file has fields with names such as Longitude and Latitude or X and Y, Maptitude displays the Locate by Coordinate dialog box automatically when you open the file. To learn more about longitude and latitude and other coordinate systems, see *Appendix E: Projections and Coordinate Systems*.

If your data file is a table with coordinate information in a database that can be accessed via Open Database Connectivity (ODBC), you can display that table as a point layer in a map. For more information, see "Changing the Contents of a Map" on page 60.

▶ To Locate Records by Coordinate

1. Open a dataview of records to locate.
2. Choose ***Tools-Locate-Locate by Coordinate*** to display the Locate by Coordinate dialog box.



3. If coordinate data are in a coordinate system other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box. Choose the appropriate settings, and click OK to return to the Locate by Coordinate dialog box.
4. Click **OK**.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save.

   Maptitude does the following:

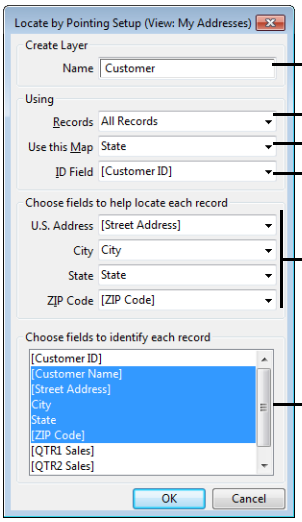
   - Creates a new geographic file with one point for each record, or adds a point for each record to the existing geographic file.
   - Adds the point layer to an existing map or creates a new map containing the point layer.
   - Draws the map at a scale that shows the locations of all the points.

Locating Records by Pointing

The ***Tools-Locate-Locate by Pointing*** command provides another way to locate records in your data. You can indicate the location for records that have not been located, or move records to a different location, by pointing to the correct location on a map. After you choose a record to locate from the toolbox, you click on the map at the place where the record belongs and Maptitude updates the geographic file.

▶ To Locate Records by Pointing

1. Open the map you will use to point to the record locations.
2. Open the dataview of records to locate, or choose the layer with the records to locate from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Locate-Locate by Pointing*** to display the Locate by Pointing Setup dialog box and make choices as follows:



If this is the first time you are locating data, enter a name for the layer

Choose to locate All Records or a selection set

Choose the map to use

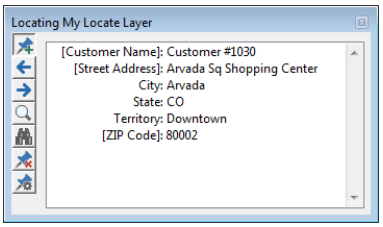
Choose the field with the IDs or choose Create New ID Field if this is the first time locating

Choose any fields to help find records

Choose one or more fields to identify each record

4. Click **OK**.

   If this is the first time you are locating records in your data, Maptitude displays the Save As dialog box. Type a name for the geographic file to store the new point features, and click Save. Maptitude adds the geographic file as a new map layer and displays the Locating toolbox.



5. Update your geographic file as follows:

Button	Name	How to Use It
	Locate	Click on this tool, then click on the map where the record belongs. Maptitude displays the record at the new location.
	Previous	Click to move to the previous record.
	Next	Click to move to the next record.
	Zoom	Click to zoom to the location of the current record.
	Find	Launches the Find dialog box. If you chose fields to help locate each record address information for the record will already be filled in. Click OK to have Maptitude attempt to find the location where you can then relocate the record with the Locate tool.
	Delete Location	Click to delete the location.
	Return to Setup	Opens the Locate by Pointing Setup dialog box.

6. When you are done, click the Close box in the upper right corner of the toolbox.

Maptitude closes the toolbox.

Try It Yourself: Locating Data by Pointing

1. Choose ***File-Open Workspace***, then open the workspace **ptlocate.wrk** in the tutorial folder. You want to locate the clients in the dataview by pointing to the appropriate locations on the map.
2. If the dataview is not the active window, click on it or choose ***Window-Dataview 1-Point Locate*** to make it the active window.
3. Choose ***Tools-Locate-Locate by Pointing*** to display the Locate by Pointing Setup dialog box.
4. Type "**My Clients**" in the Name box. Choose the fields **Client**, **Address**, **City**, and **State** from the scroll list.
5. Click **OK** to display the Save As dialog box.
6. Type "**My Clients**" as the file name and click Save. Maptitude displays the Locating toolbox; the first record is displayed.
7. Click in the Locating toolbox and click on the map at the location of the record displayed in the tool-box. Maptitude places a symbol at that location.
8. Click . Maptitude displays the next record in the toolbox.
9. Continue to locate the records shown in the toolbox. After you locate the final record, click the Close button in the upper right corner of the toolbox to close it.
10. Choose ***File-Close All*** and click **No to All** to close the map and dataview without saving any changes.

More About Locating Addresses

Maptitude locates records by address by taking each record and trying to find a matching record in a street layer or location index. For this reason, locating records by their addresses is sometimes known as "address matching" or "geocoding." Maptitude indexes streets by postal code in a Streets file to locate the streets more quickly.

Maptitude locates addresses by rating how close the address in your data is to the addresses on each street feature. If the rating is high enough, a new point is added along the matching street. Sometimes no potential matches have a high enough rating, and the record in your database cannot be located on the map. Sometimes several potential matches have a similar rating, and Maptitude cannot be certain which to choose. Maptitude has settings you can use to handle some of these situations. For example, you can:

- Use a different street layer (page 280)
- Accept different address formats (page 281)
- Check nearby postal codes for possible matches (page 282)
- Locate records without postal codes (page 282)
- Change the rating that is required for a match (page 283)
- Change how far locations are offset from the street (page 284)
- Create a report file (page 284)

Using a Different Street Layer

The ***Locate by Address*** command can be used with any Streets file stored in a compact (.CDF) or standard (.DBD) format geographic file. For example, you can use the ***File-Export-Geography*** command to create a small Streets file from a portion of the national file, and use that file for locating addresses just as you would use included Streets file. You can also create and edit your own line geographic files from scratch and use them for locating addresses.

A CDF line geographic file that you use with the ***Locate by Address*** command can be either a regular CDF or a Streets CDF file. The advantage of using a regular CDF is that the attributes such as Name, Left ZIP, Right ZIP, and street ranges can be edited.

The only requirements for using a line geographic file with the ***Locate by Address*** command are that it must be a layer in a map and the layer must contain the following fields:

Field	Format	Contents
Name	Indexed Character	The name of the street, including the type and any prefix or suffix
Alternative Name	Character	An optional field with an alternative name to use for the street
Left ZIP	Indexed Numeric	The ZIP Code or numeric postal code on the left side of the street
Right ZIP	Numeric	The ZIP Code or numeric postal code on the right side of the street
Start Left	Numeric	The starting address number on the left side of the street
End Left	Numeric	The ending address number of the left side of the street

Field	Format	Contents
Start Right	Numeric	The starting address number on the right side of the street
End Right	Numeric	The ending address number of the right side of the street
Parity	Numeric	A flag for streets with addresses on only one side. A value of one indicates that both odd and even addresses appear on the same side of the street. A value of zero indicates that odd and even addresses are not mixed.

You will always get the best results when the Left ZIP and Right ZIP columns are filled. If the layer does not have Parity or Alternate Name columns you can create them and leave the values empty.

You can use the ***Dataview-Table-Modify*** command to change the field names and formats, and to index the necessary fields. See "Modifying the Structure of a Table" on page 224 for more information on changing a field's name, format, or index.

When you create your own file and enter your own street names and other information, you must be careful to use the same standard abbreviations and punctuation used in the included Streets file. For example, names must be capitalized, Street is abbreviated "ST," and Avenue is "AVE." You can display your regional street layer in a dataview to see the conventions that are used.

When you export your file it is better to create a regular CDF file rather than a Streets CDF, so that you can add and edit the fields. Unless the street layer is extremely large (e.g., more than one state), locating addresses with a regular CDF is as fast as with a Streets CDF.

Alternatively, you can use any point, line, or area geographic files without these required fields to locate addresses by creating a location index. For more information, see "Creating Location Indexes" on page 540.

Accepting Different Address Formats

There are four options for standardizing addresses, which recognize different ways to show street numbers and street names. These options are:

Option	Example
US Addresses	123 Main St
US Addresses (Hyphenated Numbers)	123-45 Main St
Street Name followed by Number	Camino Real, 123
Number followed by Street Name	Via XXX Nazionale 123

The second choice handles addresses where the number has two parts, a block number and a house number, such as in Queens NY. The example would be read as house number 45 after the intersection with 123rd Street.

The last two choices are for handling addresses that cannot to be analyzed with the rules used for U.S. addresses. Instead, they are separated into the number portion and the name portion.

Checking Nearby Postal Codes for Possible Matches

Sometimes the postal codes in your data are different from those in the region street file. For example:

- A postal code has been renumbered or a portion has been split off into a new postal code
- Some postal codes are for businesses and post office boxes, and are enclosed by other postal codes
- A postal code has other postal code nearby which may have been used instead

Maptitude has lists that keep track of these relationships, to help locate an address when it is not found based on the specified postal code. If Maptitude cannot find a match for the specified postal code, you can use the option to check nearby postal codes instead. You should use this option only after using the normal setting, which uses the postal code in the postal code field.

Locating Records without Postal Codes

Maptitude indexes street names by postal code in the street geographic file, so a postal code is required to locate records by address. If your data do not have postal codes for each record, you may still be able to use the ***Locate by Address*** command.

When you choose None from the Postal Code drop-down list in the Locate by Address dialog box, you have the following options available when you click the Postal Codes tab:

- **Use Postal Codes in this List** – You can type a list of possible postal codes, and Maptitude will look for each address in all the postal codes in the list.
- **Use Postal Codes for** – You can type city and state names or choose fields from your database that contain the name of the city and state for each record. Maptitude will get the list of postal codes in the specified cities and use it to look for each address. This option may take a long time in large cities with many postal codes such as New York or Los Angeles.
- **Use Postal Codes within the Current Map** – You can have Maptitude look for each address in each of the postal codes visible on the current map.

When you choose one of these methods, you should use the Very Strict matching method for your first round of address matching. This will improve the quality of the matches. See "Changing the Rating That Is Required for a Match" below for more information.

If the address is not in your region, you can use a Location index. For more information, see "Creating Location Indexes" on page 540. Additional regions are also available from Caliper and are available for purchase for use with a single copy of Maptitude.

Changing the Rating That Is Required for a Match

You can choose from three different matching methods that affect the rating required for Maptitude to automatically match a record to a street feature:

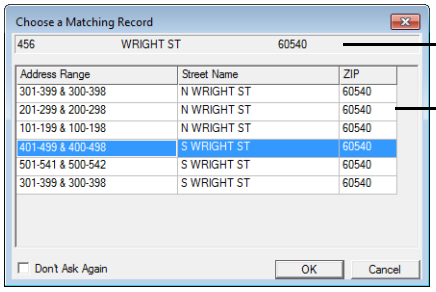
Method	What it does...	What you do...
Very Strict	Automatically matches a record only if the rating is very high	You make more decisions because Maptitude will be a bit more conservative
Normal	Accepts a good match for a record	Maptitude makes some decisions and you make the rest
Not Strict	Relaxes the normal method and accepts matches with lower ratings	You make fewer decisions because Maptitude accepts more matches automatically

These methods affect the number of matches that Maptitude makes without your assistance and the number you have to consider yourself if you use the Ask If Uncertain setting. For more information, see "Reviewing Uncertain Matches" below.

NOTE: You can set the default method for matching by choosing ***Edit-Preferences*** and choosing a method from the Method drop-down list on the Locating tab.

Reviewing Uncertain Matches

The Ask If Uncertain option tells Maptitude to ask you what to do when it encounters several possible matches for an address. When this setting is chosen and Maptitude comes across a record with several possible matches, Maptitude displays the Choose a Matching Record dialog box.



The listing of possible matches shows the name of each street segment and the ranges of addresses that appear on either side of each segment. You can browse through this list and pick the feature that you think is the best match, or indicate that none of the choices is acceptable.

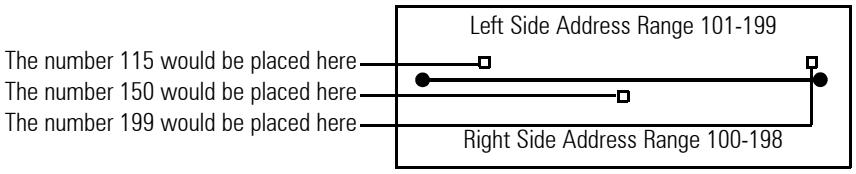
You can choose from two basic strategies for address matching:

- Use ***Locate by Address*** with the Automatic option. Maptitude will locate as many features as it can automatically. When it finds several possible matches, it will choose the best one automatically.
- Use ***Locate by Address*** with the Ask If Uncertain option. Maptitude will locate all the features it can without your assistance, but from time to time will stop to ask you about an uncertain match.

If you are matching many hundreds of records, the first method will be faster, since you don't need to sit by your computer to answer questions along the way. The second method is useful when you are dealing with unmatched records by using some of the other settings, and want to make sure that the best match is made.

Changing How Locations Are Offset from the Street

When a record in your data is matched to a street feature, Maptitude places the new point along the street based on the street number from your file and the range of address numbers on the matching street segment.



Maptitude figures out on which side of the street the point should be located, and lets you control how far to offset the location from the street. There are three options for the offset:

- Place all points the same distance to the left or right of the street. For example, all points could be located 25 feet from the center of the street. This is the normal method.
- Choose the distance based on information from your data. For example, you might have a data field that indicates how far each house is from the street.
- Determine the offset based on information in the street layer. For example, points could be located 25 feet from the center of local streets, but 40 feet from the center of major streets, based on a field that indicates a distance for each street type.

You could use a different offset for each class of street. Use the ***File-New*** command to create a new table with street classifications and offsets, and join it to the Streets file before you choose the ***Locate by Address*** command. For more information, see "Adding a Record for Each Unique Value of a Field" on page 223.

NOTE: You can set the default offset distance by choosing ***Edit-Preferences*** and typing a distance in the Offset from Street edit box and choosing units from the drop-down list on the Locating tab.

Creating a Report File

The street file for your region has been **standardized**, or "cleaned up" so that streets are named in a consistent way. For example, "Ave" is always used as the abbreviation for "Avenue," and "2nd Ave" is used instead of "Second Avenue." When you locate features by address, Maptitude standardizes your addresses the same way and then attempts to match records in your data to features in the Streets file.

Maptitude can create a report file containing the standardized addresses and the results of the match. The report is organized as a table and contains the following information for each record:

Field	Contents	Meaning
ID	ID of the record	The ID matches the one in your input file
STDNUMBER	Street Number	The standardized street number
POSTNUMBER	Extra Numbers	Apartment numbers and other miscellaneous information
STDNAME	Street Name	The standardized street name for an address
STDSTRT1	Street Name	The first street name for an intersection location
STDSTRT2	Street Name	The intersecting street name for an intersection location
ZIPCODE	ZIP Code	The standardized ZIP Code or postal code
STDPLACE	City/state name	The standardized city and state name
Street_ID	Street feature ID	The ID of the street segment in the Streets file that was matched to your record
Left_Right	Side of street	Zero means your record was placed on the right side of the street; one means it was placed on the left side of the street
Result	A special code	Indicates what happened when the match was attempted

You can create a new report file each time you use the ***Locate by Address*** command. The report file may not include all of the fields shown:

- If none of the addresses in your file look like intersection locations, the STDSTRT1 and STDSTRT2 fields are not included.
- If all of the addresses in your file are intersections, the STDNUMBER, POSTNUMBER, and STD-NAME fields will be omitted.

Also, records without a Result value are missing some of the information (such as street address or ZIP Code) required to use the ***Locate by Address*** command.

Each record in the file may have one or more match codes, all of which are next to one another in the Result field. Here is what each match code means:

Code	What it means...
A	The record was located successfully, without asking you for help
R	The record was not located automatically
U	Maptitude offered you several possible matches, and you chose one
X	Maptitude offered you several possible matches, and you rejected them all
I	The input address was identified as an intersection
S	The street name or alternate name did not match exactly
N	The street number did not match exactly
Z	The input ZIP Code or postal code was not found in the Streets file

Here are some examples of match results and what they mean:

Match Result	What it means...
A	The record matched a street feature perfectly and was located automatically
AS	The record was located successfully, even though the street name did not match perfectly
US	The street name did not match perfectly, Maptitude offered you several choices, and you accepted one of them
RSN	The record was not located because neither the street name nor the street number matched
RSSN	The record was not located because the street name, the alternate street name, and the street number did not match
AI	The address was interpreted as an intersection, and was located automatically

The report file will be displayed in a new dataview when the ***Locate by Address*** command has finished locating the records.

When you use a Location Index, the report file contains slightly different information for each record:

Field	Contents	Meaning
ID	ID of the record	The ID matches the one in your input file
STDNUMBER	Address Number	The standardized address number
STDNAME	Address Name	The actual address name stored in the matching feature
ZIPCODE	ZIP or Postal Code	The actual ZIP Code or postal code stored in the matching feature
STREETID	Feature ID	The ID of the matching feature
LEFT_RIGHT	Side of street	0 if the address number is in the range of addresses for the right side of the feature, or 1 if it is in the left range
RESULT	A special code	Indicates what happened when the match was attempted
STDLON	Longitude	The computed longitude, with six implied decimal digits
STDLAT	Latitude	The computed latitude, with six implied decimal digits

Each record will have a match code in the Result field. Here is what the match codes mean:

Code	What it means...
A1	The record was located successfully with a high score. If the Matching Method is Very Strict only records with A1 codes will be located successfully.
A2	The record was located successfully with a medium score. If the Matching Method is Normal only records with A2 codes or higher will be located successfully.
A3 to A5	The record was located successfully with a lower score. If the Matching Method is Not Strict only records with A5 codes or higher will be located successfully.
R	The record was not located automatically.
U	You chose one of the possible matches using the Ask If Uncertain mode.
X	You rejected all of the possible matches using the Ask If Uncertain mode.

Locating Images by Geotagging

Geotagging refers to the attaching of geographic coordinate information to images, video, and other media recorded by smartphones or GPS-enabled electronic devices. Geotagged photographs, for example, contain geospatial metadata such as latitude and longitude coordinates, altitude, bearing, and more. The ***Tools-Locate-Locate Images by Geotagging*** command marries the ***Tools-Locate-Locate by Coordinate*** command with link fields, which allow you to link documents, programs, web sites, and more to map features (for more information, see "Linking Documents, Files, & Web Sites to Map Features" on page 506).

When you locate images by geotagging, Maptitude reads geotags from images and creates points in a geographic file based on the coordinate information in the images. Fields in the geographic file are populated with the image file name and other location information read from the geotags.

▶ To Locate Images by Geotagging

1. Choose ***Tools-Locate-Locate Images by Geotagging***. Maptitude displays the Choose Images Folder dialog box.
2. Choose a folder where the images are located and click Select Folder. Maptitude displays the Choose a File Name dialog box.
3. Type a name for the new geographic file in the File Name text box and click **Save**. Maptitude locates the images and displays the Locate by Coordinate dialog box to show the numbers of records located.
4. Click **OK**.

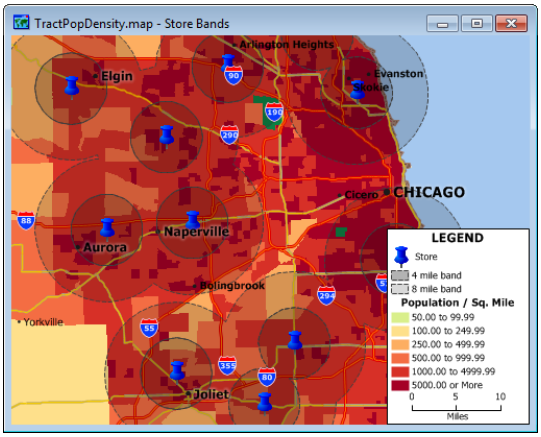
Maptitude opens the geographic file in a new map.

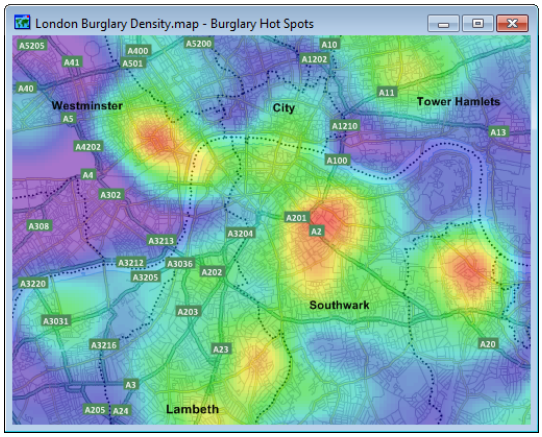
CHAPTER 10:
Geographic Analysis Tools

One of the best reasons to use a GIS is that you can perform geographic computations that help you in your work. For example, you can use Maptitude to:

- Measure the distance between locations on a map
- Estimate the attributes of features by overlaying them on another layer
- Create buffers (bands) around map features
- Define areas of influence for a set of points
- Create territories or districts by combining smaller areas
- Visualize point data on a regular grid
- Create desire lines to show flows from point to point
- Add temporary features to a map and create buffers around them
- Create a circular service area based on a set of points and locate its weighted center
- Calculate the attributes of map features based on features in another layer

Data created with these processes can also be used for further analysis and decision making.





In this chapter:

Measuring Distance and Size

You can look at a map and tell very quickly which features are close to each other and which ones are far away. You can also tell which features are large and which are small. Sometimes, however, you want more exact measurements of the distance between points on a map or of the size of a certain region. For example, you might want to measure the distance between two stores or estimate the size of a park, shopping center, or granite quarry.

Maptitude knows the length of any line feature and the size of any area feature in a map layer. You can see those values using the Info tool or a dataview.

Maptitude also has specialized tools for measuring distance and area:

- Use the Distance tool to draw a line on the screen and report the total length of that line.
- Use the Size tool to draw an area on the screen and report the total size of the area and the length of its perimeter.

Maptitude can also tell you the distance between points using roads, highways, railroads, or other line features. See *Chapter 11: Routing, Directions, and GPS*, for more information.

NOTE: Maptitude normally reports distances in miles and size in square miles. You can change the map units by choosing Edit-Preferences and choosing a unit of measure from the Map Units drop-down list on the System tab.

▶ To Measure the Distance Between Points

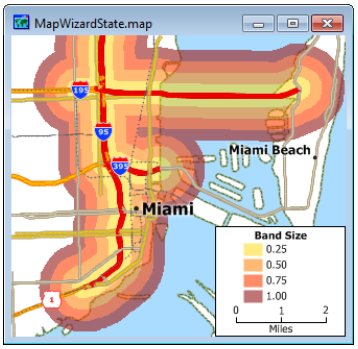
1. Click  on the Tools toolbar to activate the Distance tool.
2. Click on the map at the starting point. Maptitude starts a line at the point you marked. Maptitude displays the elapsed length of the line in the status bar at the bottom of the screen.
3. If the line is not straight, click on one or more shape points. Maptitude continues the line through each one.
4. Double-click on the last point to end the line. Maptitude displays the total length of the line in the Measured Distance dialog box. You can choose different units from the drop-down list to see the values for those units.
5. Click **OK** to close the dialog box.

▶ To Measure the Size of an Area

1. Click  on the Tools toolbar to activate the Size tool.
2. Click on the map at the starting point of the area. Maptitude starts a line at the point you marked.
3. Click on the corners of the area. Maptitude continues the line through each one.
4. Double-click to end the area. Maptitude connects the first and last point automatically. Maptitude displays the size and perimeter of the area in the Area and Perimeter dialog box. You can choose different units from the drop-down lists to see the values for those units.
5. Click **OK** to close the dialog box.

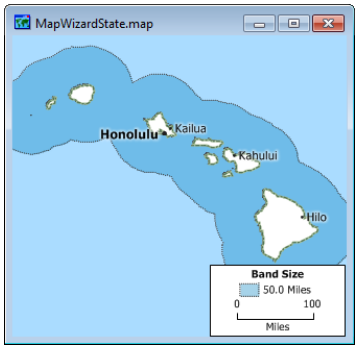
Creating Buffers

A **buffer** (also known as a band) is an area of a specified width that surrounds one or more map features. You create bands using the ***Tools-Analysis-Buffers*** command. This command lets you create any number of buffers around any number of map features. To use it, you choose the map features around which the buffers should be built, and enter the information about the size of the buffers you want to create.



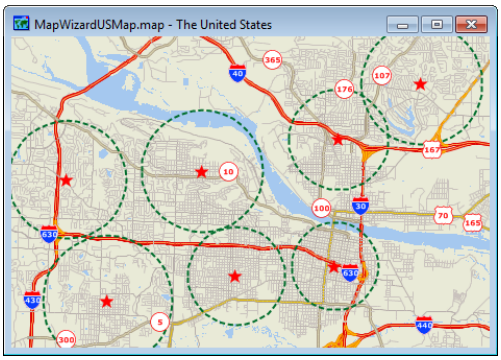
¼, ½, ¾, & 1 mile buffers from highways

5, 10, & 20 mile buffers from an airport

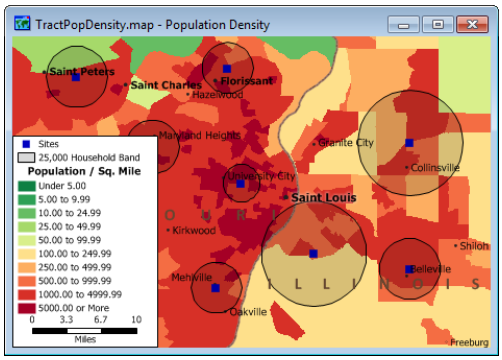


50 mile buffer from the shoreline

In the preceding examples the buffers were built to a particular width or set of widths. Maptitude can also figure out how to create buffers so that their sizes reach a particular target:



Each buffer includes 100 total miles of roads



Each of these buffers contains 25000 households

The ***Buffers*** command creates a new map layer containing the buffers and saves the features in a new geographic file. Maptitude also adds the new area layer to the map and creates a color theme so that the buffers are easy to see. You can change the way buffers are displayed, add labels, or compute overlays to estimate the attributes of the areas.

Setting Buffer Size

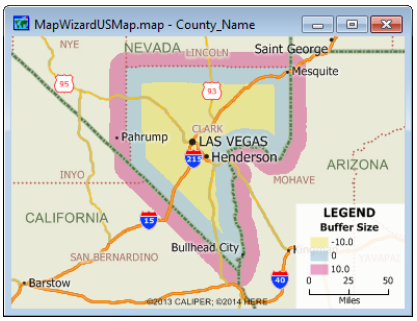
You can set the size of the buffers in four different ways:

- Create evenly-spaced buffers by entering a low value, a high value, and a step size. For example, build buffers from 0 miles to 50 miles with a band width of 10 miles, and you get five evenly spaced buffers around each feature.
- Type a list of sizes to create one buffer of each size. For example, ask for bands at 2.5 miles, 5 miles, 10 miles, 25 miles, and 50 miles, and you get 5 buffers of varying width around each feature.

- Create buffers of variable sizes around each feature, where the size of each band is determined by the value of some attribute of each feature. For example, build buffers based on transmitter range around towers in a point layer where the range is stored in a field in the point layer.
- Create buffers so that they contain a particular value of an attribute such as population, income, or area. The width of each buffer is computed by Maptitude on the fly.

Using Buffers Inside Areas

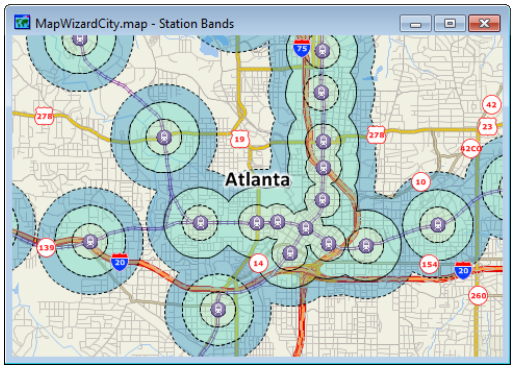
Buffers can also be created inside the boundary of an area. For example, you might want to see the buffer that is within five miles of a state boundary, to look at how an increase in the gasoline tax might affect gas stations within five miles of the border.



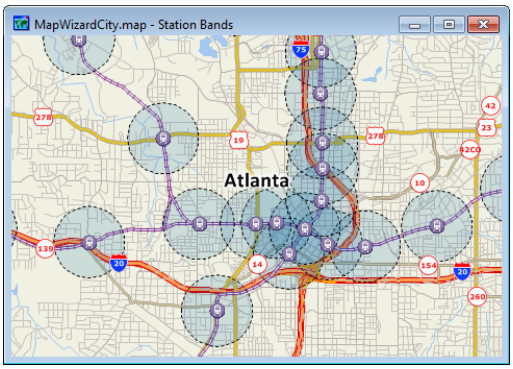
To create buffers inside an area feature, enter buffer sizes that are less than zero instead of greater than zero. For example, if you asked for buffers around Clark County in sizes -10 miles, 0 miles, and 10 miles, you would get this result shown on the right.

Buffers - Merged or Separate

When you build buffers around a single feature, Maptitude creates one area for each buffer you request. When you build buffers around two or more features, you have a choice of whether the buffers should be separate or joined. Maptitude normally creates buffers joined together. When you create variable-sized bands, Maptitude always creates a separate buffer for each feature.



These are merged buffers. You could compare the characteristics of the buffers to compare the population that lives close to a station with those that live farther away.



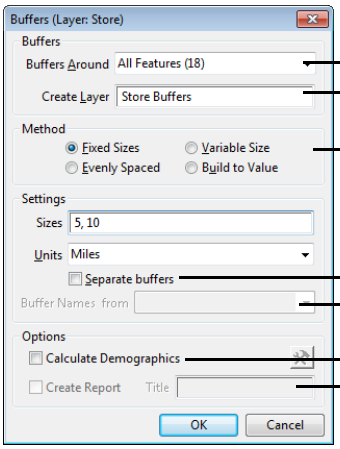
These are separate buffers. You could compare the characteristics of the buffers to compare the population that lives close to one station with those that live close to another station.

▶ To Create Buffers

1. Choose the layer to use in creating the buffers from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Analysis-Buffers*** or click on the Standard toolbar to display the Buffers dialog box.

TIP: You can customize a report with your company name by choosing ***Edit-Preferences*** and making changes on the Reporting tab.

3. Make choices as follows:



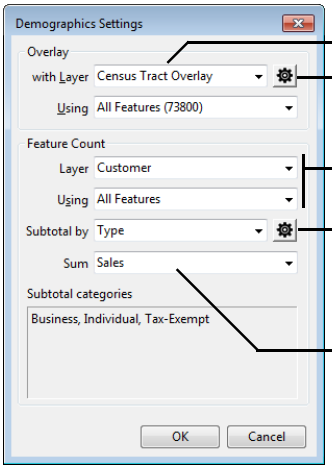
- Choose whether to build buffers around All Features or a selection set
- Type a name for the new buffers layer
- Choose a method for creating the buffers
- Check if you want each feature to have its own separate buffer
- If you want to identify the feature around which separate buffers are built, choose a field that contains the name; otherwise choose None.
- Check to calculate demographics for the buffers
- Check to create a report with the map and calculated attributes and optionally enter a title for the report

4. Choose the size of the buffers you want to build, according to the table:

For this method...	Do this...
Fixed Sizes	Type the sizes of the buffers you want, separated by spaces or commas, and choose the units
Evenly Spaced	Type a low value, a high value, and the spacing you want, and choose the units
Variable Size	Choose the field containing the buffer size from the drop-down list and choose the units
Build to Value	Choose the source layer and field from the drop-down lists, and type the target values you want, separated by spaces or commas

TIP: Regardless of whether you choose to calculate demographics, you can export demographic overlay data and other information to Excel by making the resulting buffer layer the working layer and clicking on the Standard toolbar. "Exporting to Excel" on page 446.

5. If you checked the Calculate Demographics box, you can specify the attributes to calculate and/or count features in the buffers. Click to display the Demographic Settings dialog box and make choices as follows:



- Choose the reference layer and features to use
- Click to change the aggregation method or fields. See "To Change the Aggregation Method when Calculating Demographics" on page 322 for more information
- To count features in each buffer, choose the layer whose features you want to count and whether to use All Features or a selection set
- To subtotal the counted features, choose a field to use for grouping and the category types to group (e.g., You could use the Type field in the landmark layer and choose to find the number of Restaurants and Schools within the buffers), or choose None to get the total count of features without subtotaling
- Choose a field from the feature count layer to aggregate (e.g., You could calculate the total revenue of customers within the buffers)

Click OK to return to the Buffers dialog box.

6. Click OK. Maptitude displays the Save As dialog box.
7. Type a file name for the new geographic file, and click Save.

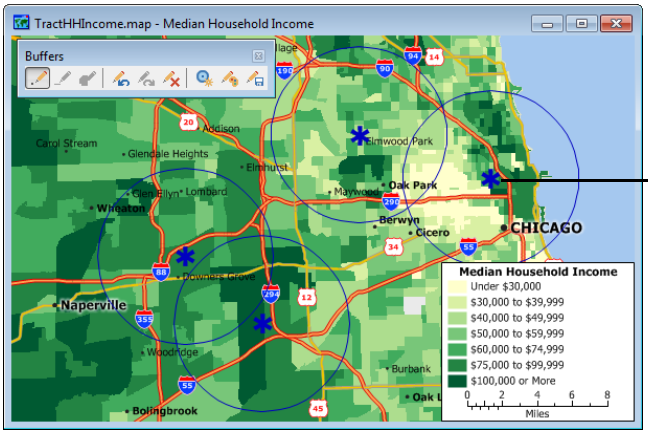
Maptitude creates a new layer containing the buffers and adds the new layer to the map. If you chose to produce an overlay, Maptitude creates the table and displays the results in a joined view. If you chose to create a report, Maptitude generates the report and displays it in a new window. Reports can be printed, saved, exported, and emailed. Close the report window when you are done.

Try It Yourself: Building Buffers

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **gaps.map** in the Tutorial folder. You want to show where there are gaps in the service areas of your chain of restaurants. In-store surveys have shown that people will drive 5 and sometimes 10 miles to eat at your restaurants.
2. Choose **Store** from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Buffers*** or click on the Standard toolbar to display the Buffers dialog box.
4. Click the **Fixed Sizes** radio button and type "**5, 10**" in the Sizes edit box.
5. Click **OK** to display the Save As dialog box.
6. Type "**My Buffers**" as the file name and click **Save**. Maptitude creates the buffers and adds them to the map, showing the gaps in the service areas.
7. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Using the Buffers Toolbar

The Buffers toolbar makes it very easy to temporarily add points, lines, or areas to your map and then create buffers around them, for fast analysis of the characteristics around places of interest.



Use the tools to quickly add points, lines, or areas and then build buffers around the features you add

Once you start adding points, lines, or areas, the tools for the other types are disabled. After you remove all the temporary features or create buffers, you can switch to adding another type.

The temporary features are deleted when you close the Buffers toolbar, create buffers, or use the toolbox with a different map. Saving the temporary features to a geographic file saves them permanently, and adds the geographic file as a map layer so you can do further analysis. You can still create buffers from the temporary features after you save them but, once you create the buffers, the temporary features are deleted.

▶ To Use the Buffers Toolbar

1. Open or create the map you want to use with the Buffers toolbar.
2. Choose ***Tools-Analysis-Buffers Toolbar*** to display the Buffers toolbar.

3. Make choices as follows:

To do this...	Do this...
Add temporary points	Click to activate the Add Temporary Points tool, and click on one or more places on the map.
Add temporary lines	Click to activate the Add Temporary Lines tool, and add lines to the map by clicking at each point along a line, and double-clicking to end it.
Add temporary areas	Click to activate the Add Temporary Areas tool, and add areas to the map by clicking at each corner of an area, and double-clicking to close it. The first and last points of an area will connect automatically.
Undo adding a temporary feature	Click . The most recently added temporary feature is removed.
Redo adding a temporary feature	Click . The most recently removed temporary feature is added back.
Remove all temporary features	Click . All temporary features are removed.
Undo removing all temporary features	Click right after clicking . All of the temporary features just removed are added back.
Change the temporary feature style	Click to display the Point, Line, or Area Style dialog box, make the appropriate changes, and click OK. For more information, see "Using Styles" on page 81.
Save the temporary features	Click to display the Save As dialog box, choose a folder and type a file name, and click Save. The temporary features are saved with their current style, and Maptitude adds the geographic file as a map layer.
Create temporary feature buffers	Click to display the Buffers dialog box, and follow the procedure "To Create Buffers" on page 292, starting with Step 3. Maptitude removes the temporary features and adds the buffers as a layer in the map.

4. If you have removed all the temporary features or created buffers around the temporary features, you can return to Step 3 and begin adding temporary points, lines or areas again.
5. When you are done with the toolbox, click the Close button in the upper right corner of the toolbox.

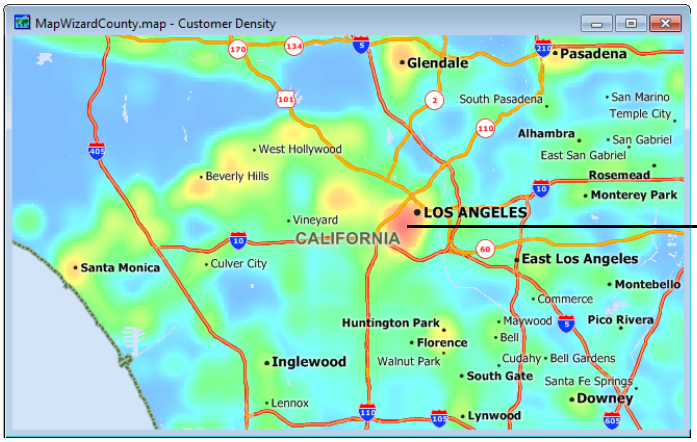
Maptitude closes the toolbox.

Try It Yourself: Using the Buffers Toolbar

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **ClickBuffers.map** in the Tutorial folder.
2. Choose ***Tools-Analysis-Buffers Toolbar*** to display the Buffers toolbar.
3. Click on the Buffers toolbar.
4. Click on the map to add several locations around which you want to create bands.
5. Click on the Buffers toolbar. Click **No** as we are not going to permanently save the points to a layer.
6. Click the Fixed Sizes radio button and type "**1, 2**" in the Sizes edit box. Make sure that the Units are **Miles** in the Units drop-down list.
7. Click **OK** to display the Save As dialog box.
8. Type "**My Click Buffers**" as the file name and click **Save**. Maptitude creates the buffers and adds them to the map, showing what areas are within one and two miles of the temporary points you added.
9. Choose ***File-Close*** and click **No** to close the map without saving changes.

Creating Density Grids/Heat Layers

Density/heat layers are a way to visualize and analyze point data by transforming the points into a regular grid. Each resulting grid cell is assigned a value that is determined by the density of nearby points, optionally weighting each point using a weighting value.



Density/heat layers are useful for:

- Mapping crimes to show hot spots, weighted by a measure of crime severity
- Mapping vehicle miles traveled to show hot spots for congestion and air pollution
- Showing the distribution of real estate sales, weighted by the sale price
- Analyzing the pattern of clients around a store, weighted by the cost of their purchases

You can choose from among four methods for creating the layer. Three methods calculate a value for each grid cell by applying factors to the weighting values for the points within the search radius:

- **Quartic** is the default method, and uses a quartic approximation of a normal (Gaussian) distribution to apply factors to the weighting values, and provides the most smoothing; this is sometimes called kernel density
- **Triangular** uses a conical distribution to apply factors to the weighting values, and provides some smoothing
- **Uniform** uses a flat distribution to apply factors to the weighting values, and provides little smoothing; this is sometimes called simple density

The fourth method, **Count**, only assigns points to the cell that they lie in and applies no weighting and no smoothing.

You can create the density/heat layer based on all the features in a layer, a selection set, or the visible features in the map. In each case, the grid will be slightly larger than the extent of the features used to create the grid, so that the density can be computed more accurately.

The search radius and the grid cell width are expressed in the current map units for a projection, or the display units for a coordinate system. The grid cell width is chosen to create the density grid quickly and with a reasonable resolution. You can use a finer grid, but it will take longer to create.

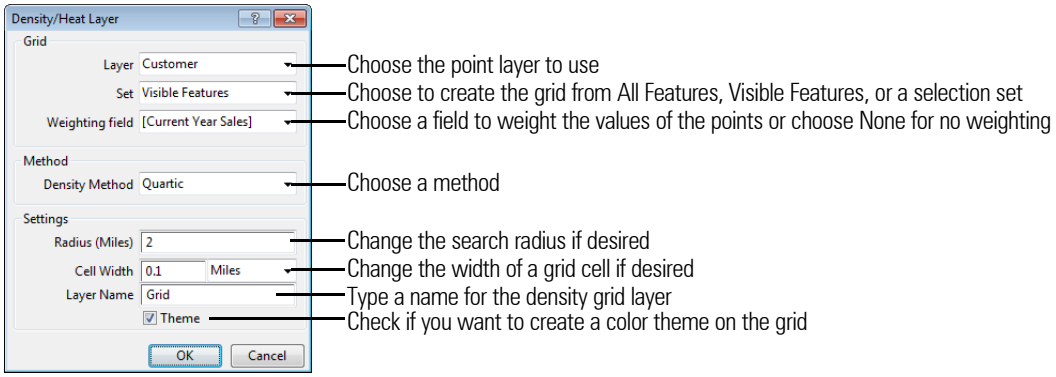
The quality of the density grid is directly related to the choice of the search radius. If the search radius is too large, important point concentrations will be missed, as they are smoothed over a large search area. The default search radius is the larger of:

- The width or height of the layer or the selection set, whichever is smaller, divided by the square root of the number of source points
- Twice the grid cell width

Maptitude saves the results in a compact (.cdf) area geographic file. You can automatically create a color theme for the density grid, to show the variations in the density surface.

▶ To Create a Density Grid/Heat Layer

1. Open or create a map with at least one point layer and, if necessary, create a selection set for the point layer you will use.
2. Choose a point layer from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Density/Heat Layer*** or click on the Standard toolbar to display the Density/Heat Layer dialog box.
4. Make choices as follows:



5. Click **OK**. Maptitude displays the Choose a Geographic File Name for the Density Grid Layer dialog box.
6. Choose a folder and type a file name, and click **Save**.

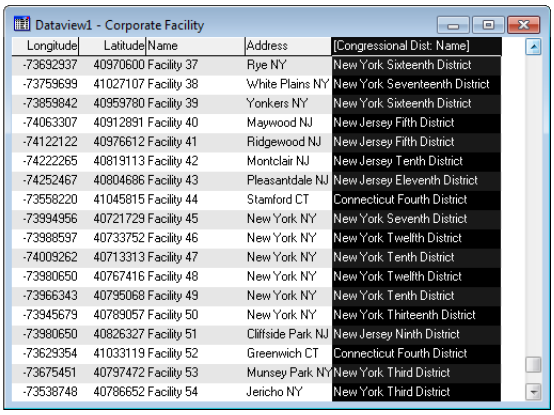
Maptitude creates the density grid and adds it as a map layer.

Try It Yourself: Creating a Density Grid

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map ***DensityGrid.map*** in the Tutorial folder to open a map of Rhode Island with store locations.
2. Choose **Store** from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Density/Heat Layer*** to display the Density/Heat Layer dialog box.
4. Verify that **Store** is chosen in the Layer drop-down list. The other settings are correct.
5. Click **OK** to display the Choose a Geographic File Name for the Density Grid Layer dialog box.
6. Type "**My Density**" as the file name and click **Save**. Maptitude creates the density grid and theme, and adds it to the map.
7. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Tagging Points by Area

You can tag a point layer with a value from a field in an area layer. This command creates a new field with the tag results. The name of the field is a combination of the area layer and field that were used for tagging. For example, the highlighted field in the dataview below shows the results of tagging a point layer of facilities with the name of the Congressional District that they are in.

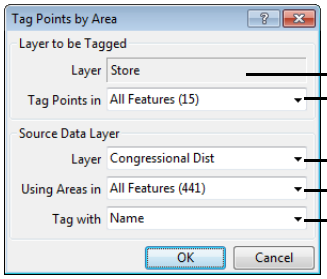


Dataview1 - Corporate Facility

Longitude	Latitude	Name	Address	[Congressional Dist: Name]
-73692937	40970600	Facility 37	Rye NY	New York Sixteenth District
-73759699	41027107	Facility 38	White Plains NY	New York Seventeenth District
-73859842	40959780	Facility 39	Yonkers NY	New York Sixteenth District
-74063307	40912891	Facility 40	Maywood NJ	New Jersey Fifth District
-74122122	40976612	Facility 41	Ridgewood NJ	New Jersey Fifth District
-74222265	40819113	Facility 42	Montclair NJ	New Jersey Tenth District
-74252467	40804686	Facility 43	Pleasantdale NJ	New Jersey Eleventh District
-73558220	41045815	Facility 44	Stamford CT	Connecticut Fourth District
-73994956	40721729	Facility 45	New York NY	New York Seventh District
-73988597	40733752	Facility 46	New York NY	New York Twelfth District
-74009262	40713313	Facility 47	New York NY	New York Tenth District
-73980650	40767416	Facility 48	New York NY	New York Twelfth District
-73966343	40795068	Facility 49	New York NY	New York Tenth District
-73945679	40789057	Facility 50	New York NY	New York Thirteenth District
-73980650	40826327	Facility 51	Cliffside Park NJ	New Jersey Ninth District
-73629354	41033119	Facility 52	Greenwich CT	Connecticut Fourth District
-73675451	40797472	Facility 53	Munsey Park NY	New York Third District
-73538748	40786652	Facility 54	Jericho NY	New York Third District

▶ To Tag Points by Area

1. Open or create a map with at least one point layer and one area layer.
2. Choose the point layer to tag from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Tag Points by Area*** to display the Tag Points by Area dialog box.
4. Make choices as follows:



Shows the point layer you are tagging
Choose to tag All Features or only those in a selection set
Choose the area layer that contains the field with which you want to tag
Choose whether to use All Features or a selection set for tagging
Choose the field to use for tagging

5. Click **OK**.

Maptitude adds a new field and fills it with the value from the area that each point is within.

Try It Yourself: Assigning Customers

1. Choose ***File-Open Workspace*** then open the file **TagCustomers.wrk** in the Tutorial folder. Maptitude opens a map with ZIP Codes and Stores. You will tag the stores with their respective ZIP Codes.
2. Verify that **Stores** is the working layer in the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Tag Points by Area*** to display the Tag Points by Area dialog box.
4. Choose **ZIP** from the Tag With drop-down list. The rest of the settings are correct.
5. Click **OK**. Maptitude tags each store with the ZIP Code, placing the values in a new field in the dataview. If necessary, scroll to the right in the dataview to see the new field.
6. Choose ***File-Close All*** to close the dataview and map without saving any changes.

Creating Territories

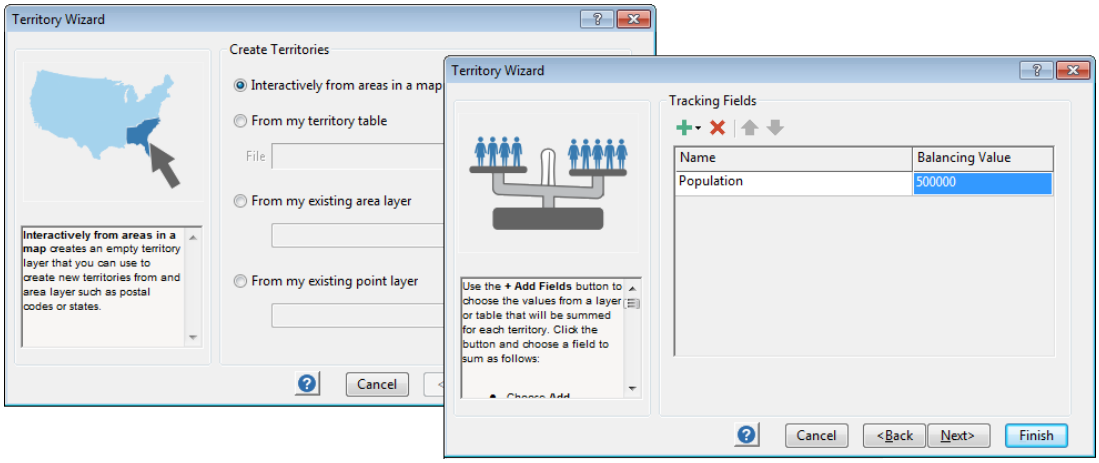
A **territory** is an area that is made up of several smaller areas, all joined together. For example, sales territories or market areas might be made up of groups of ZIP Code areas, counties, or states. Maptitude can build the territories for you and compute the attributes of each one.

The primary way to create territories is with the Territory Wizard. You can then manage the territories with the Territory Manager. You can also use the ***Tools-Editing-Merge by Selection Sets*** command to use selection sets to create territories, with one named after each selection set, or use the ***Tools-Editing-Merge by Value*** command to use a field as the basis for creating the territories.

Maptitude also has two other commands that create new areas: ***Tools-Routing & Directions-Drive-Time Influence Areas*** (see "Partitioning a Network" on page 334) and ***Tools-Analysis-Straight Line Influence Areas*** (see "Creating Areas of Influence" on page 313).

Using the Territory Wizard

With the **Territory Wizard** you can create territories either interactively from areas in a map, or by using your territory table or your point or area layer. The territories are stored in a **territory layer** in the map, and are created from the chosen geographic layer, such as postal codes, ZIP Codes, or Census Tracts. It is best to start with the smallest geographical areas that will be represented within your territories. For instance, if some of your territories are built from ZIP Codes and some are built from counties, then choose ZIP Codes as the geographic layer.



You can choose one or more fields to track if you want to balance the sizes of the territories. Maptitude will sum these fields for each territory and show you the numerical and percent deviations from the balancing values, so you can adjust your territories to be more balanced. Tracking fields can come from:

- The base geographic layer used to build the territories. For example, if you were building territories from the ZIP Code geographic layer and you wanted to know the population of each territory, you would choose the Population field from the ZIP Code layer.
- Your territory table. For example, if you were using a table showing sales by ZIP Code, and you wanted to know the sales of each territory, you would choose your sales field from your table.

- Any table that contains the name or identifier of the geographic layer used to build the territories. For example, if you had a table showing previous year sales by ZIP Code, and you wanted to know the previous year sales of each territory, you would choose your sales field from your table.

Creating Territories Interactively from Areas in a Map

With this option you can create a territory layer by clicking on a map to select the areas to add to the territories. Then you can use the Territory Manager to make changes to the territories.

▶ To Create Territories Interactively from Areas in a Map

1. Choose ***Map-New Territory Layer*** to display the Territory Wizard.
2. Choose **Interactively from Areas in a Map** in the radio list and click **Next>**. Maptitude displays the Map Settings page of the Territory Wizard.

TIP: Choose the smallest geographic areas that will be represented in your territories for the Geography Layer.

3. Make map settings choices as follows:

To do this...	Do this...
Use an open map	Choose the map from the Map drop-down list, the layer in that map that will be used to build the territories from the Geography Layer drop-down list, and the name or code field from the Geography Field drop-down list.
Create a new map	Choose New Default Map from the Map drop-down list, the layer in that map that will be used to build the territories from the Geography Layer drop-down list, and the name or code field from the Geography Field drop-down list.

4. Click **Next>**. Maptitude displays the Tracking Fields page of the Territory Wizard dialog box.
5. Make tracking fields choices as follows:

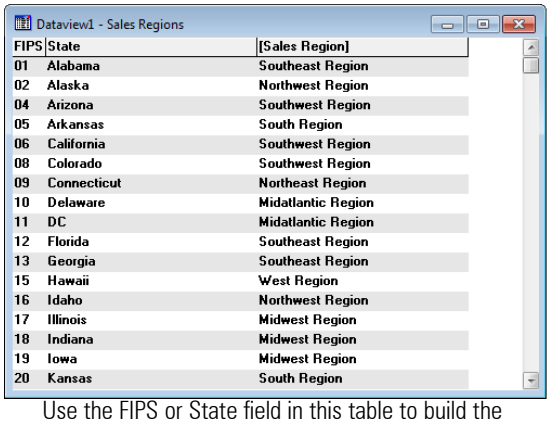
To do this...	Do this...
Add tracking fields from the geographic layer	Click  and choose Add Geographic Layer Fields. Choose one or more fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Import tracking fields from a file	Click  and choose Import Fields from File. Choose the file to open from the dialog box and click Open. If opening an Excel workbook, choose the sheet to use and click OK. Choose the geographic field from the next dialog box and click OK, then choose one or more tracking fields from the next dialog box and click OK. Maptitude adds the fields in the Name column.
Drop tracking fields	Highlight one or more tracking field names, and click  .
Rearrange tracking fields	Highlight one or more tracking field names, and click or  .
Set a balancing value	Click in a cell in the Balancing Value column, and type a value.

6. Click **Finish**. Maptitude displays the Save Territory Layer As dialog box.
7. Type a file name, and click **Save**.

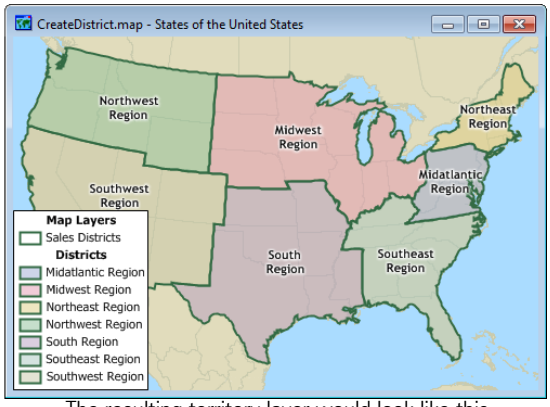
Maptitude adds a territory layer to the open map or creates a new map with the territory layer, and opens the Territory Manager. You can now use the tools in the Territory Manager to interactively select the features to put in each territory. For more information, see "To Change the Map Features in a Territory" on page 306.

Creating Territories from My Table

With this option you can create a Territory Layer from territories that you have defined in a table or spreadsheet. This option requires a field of names or identifiers for the areas (e.g., postal code, state name/abbreviation) and a field of names or identifiers for the territories to which the areas belong (e.g., sales representative name, territory name/code). You can choose the map layer to use for creating the territories and the field that identifies features in that layer. Then you can use the Territory Manager to make changes to the territories.



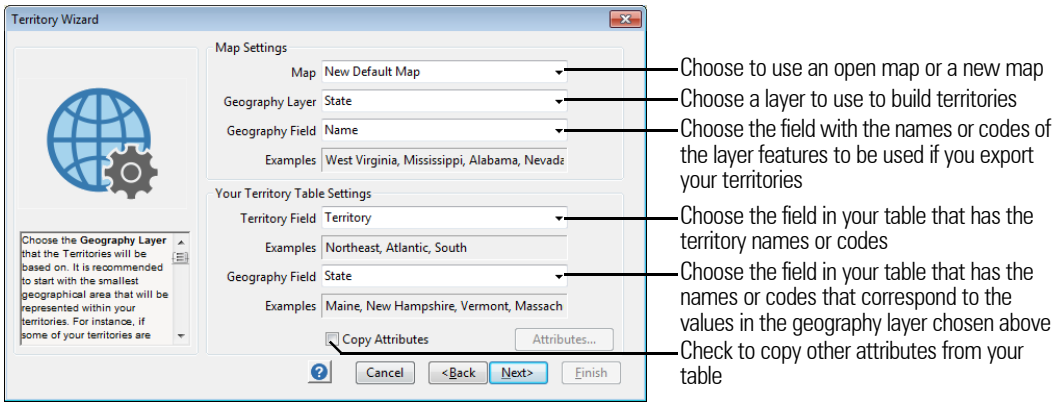
Use the FIPS or State field in this table to build the territories defined in the [Sales Region] field



The resulting territory layer would look like this

▶ To Create Territories from My Table

1. Choose ***Map-New Territory Layer*** to display the Territory Wizard.
2. Click **From My Territory Table** in the radio list. Maptitude displays the Choose File to Import dialog box.
3. Chose the file type and the file that contains the territory assignments, and click **Open**. If you are opening an Excel workbook, choose the sheet to use and click **OK**.
4. Click **Next>**. Maptitude displays the Map Settings page of the Territory Wizard dialog box.
5. Make map settings choices as follows:



6. Click **Next>**. Maptitude displays the Tracking Fields page of the Territory Wizard dialog box.

7. Make tracking fields choices as follows:

To do this...	Do this...
Add tracking fields from the geographic layer	Click and choose Add Geographic Layer Fields. Choose one or more fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Add tracking fields from the territory table	Click and choose Import Territory Table Fields. Choose one or more tracking fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Import tracking fields from a file	Click and choose Import Fields from File. Choose the file to open from the dialog box and click Open. If opening an Excel workbook, choose the sheet to use and click OK. Choose the geographic field from the next dialog box and click OK, then choose one or more tracking fields from the next dialog box and click OK. Maptitude adds the fields in the Name column.
Drop tracking fields	Highlight one or more tracking field names, and click .
Rearrange tracking fields	Highlight one or more tracking field names, and click or .
Set a balancing value	Click in a cell in the Balancing Value column, and type a value.

8. Click **Finish**. Maptitude displays the Save Territory Layer As dialog box.
9. Type a file name, and click **Save**.

Maptitude creates the territories from the table, adds the territory layer to the open map or creates a new map with the territory layer, and opens the Territory Manager. For more information, see "Using the Territory Manager" on page 305.

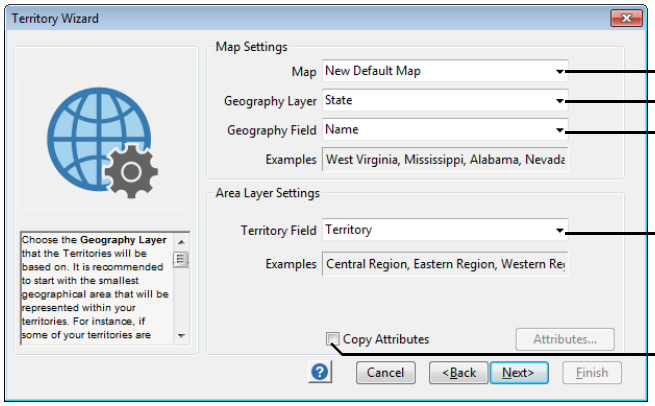
Creating Territories from My Area Layer

With this option you can create a territory layer from a standard (.DBD) area layer in an open map. This is a good choice if you have an area layer that you want to use with the Territory Manager. Maptitude overlays your area layer on a map layer of your choice, and transfers the territories. Typically, you will want to use areas of the same type, such as states, counties, or ZIP Codes, that were used to create your original area layer.

▶ To Create Territories from My Area Layer

1. Make sure you have a map open that has your own area layer.
2. Choose ***Map-New Territory Layer*** to display the Territory Wizard.
3. Click **From My Existing Area Layer** in the radio list and choose your area layer from the drop-down list. Layers that are HERE map layers will not be listed.
4. Click **Next>**. Maptitude displays the Map Settings page of the Territory Wizard dialog box.

5. Make map settings choices as follows:



6. Click **Next>**. Maptitude displays the Tracking Fields page of the Territory Wizard dialog box.

7. Make tracking fields choices as follows:

To do this...	Do this...
Add tracking fields from the geographic layer	Click and choose Add Geographic Layer Fields. Choose one or more fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Import tracking fields from a file	Click and choose Import Fields from File. Choose the file to open from the dialog box and click Open. If opening an Excel workbook, choose the sheet to use and click OK. Choose the geographic field from the next dialog box and click OK, then choose one or more tracking fields from the next dialog box and click OK. Maptitude adds the fields in the Name column.
Drop tracking fields	Highlight one or more tracking field names, and click .
Rearrange tracking fields	Highlight one or more tracking field names, and click or .
Set a balancing value	Click in a cell in the Balancing Value column, and type a value.

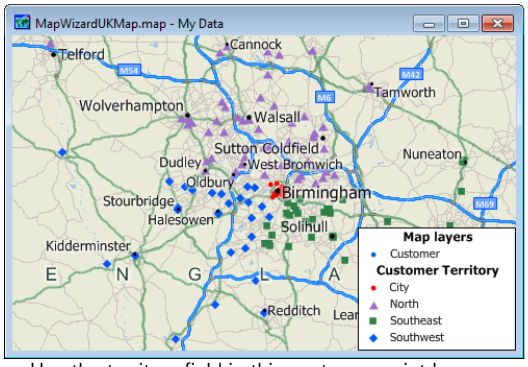
8. Click **Finish**. Maptitude displays the Save Territory Layer As dialog box.

9. Type a file name, and click **Save**.

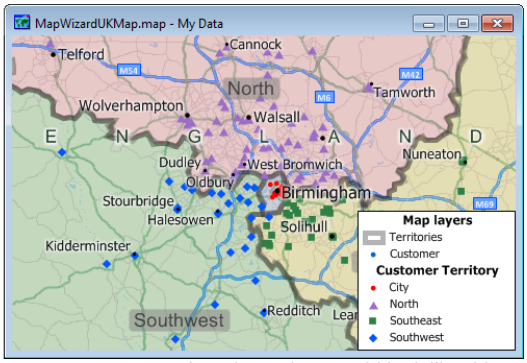
Maptitude creates the territories from the area layer, adds the territory layer to the open map or creates a new map with the territory layer, and opens the Territory Manager. For more information, see "Using the Territory Manager" on page 305.

Creating Territories from My Point Layer

With this option you can create a Territory Layer from a point layer such as your customer locations. This option requires that your point layer has a field that identifies the territories to which the features belong (e.g., a field with sales representative name or territory name/code). Maptitude builds the territories from an area layer of your choosing while accounting for the point feature locations and their territory identifiers.



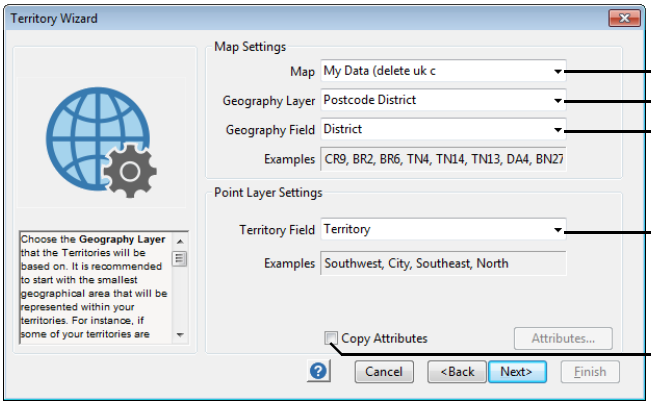
Use the territory field in this customer point layer...



...to create a territory layer that would look like this

▶ To Create Territories from My Point Layer

1. Make sure you have a map open that has your own point layer.
2. Choose ***Map-New Territory Layer*** to display the Territory Wizard.
3. Click **From My Existing Point Layer** in the radio list and choose your point layer from the drop-down list. Layers that are HERE map layers will not be listed.
4. Click **Next>**. Maptitude displays the Map Settings page of the Territory Wizard dialog box.



Choose to use an open map or a new map

Choose the layer to use to build territories

Choose the field with the names or codes of the layer features to be used if you export your territories

Choose the field in your point layer that has the territory names or codes

Check to copy other attributes from your table

5. Click **Next>**. Maptitude displays the Tracking Fields page of the Territory Wizard dialog box.

6. Make tracking fields choices as follows:

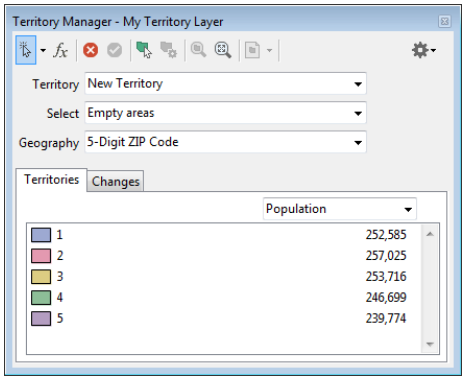
To do this...	Do this...
Add tracking fields from the geographic layer	Click and choose Add Geographic Layer Fields. Choose one or more fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Import tracking fields from a file	Click and choose Import Fields from File. Choose the file to open from the dialog box and click Open. If opening an Excel workbook, choose the sheet to use and click OK. Choose the geographic field from the next dialog box and click OK, then choose one or more tracking fields from the next dialog box and click OK. Maptitude adds the fields in the Name column.
Drop tracking fields	Highlight one or more tracking field names, and click .
Rearrange tracking fields	Highlight one or more tracking field names, and click or .
Set a balancing value	Click in a cell in the Balancing Value column, and type a value.

7. Click **Finish**. Maptitude displays the Save Territory Layer As dialog box.
8. Type a file name, and click **Save**.

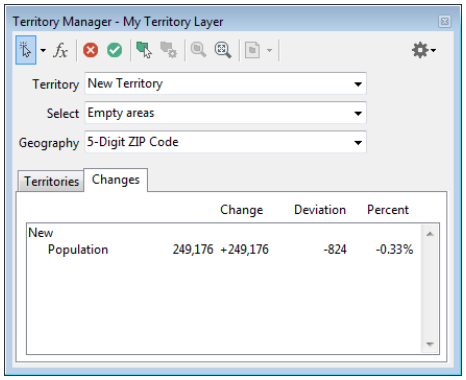
Maptitude uses the point layer to build areas of influence, creates territories from the area layer you chose based on those areas of influence, adds the territory layer to the open map or creates a new map with the territory layer, and opens the Territory Manager. For more information, see "Using the Territory Manager" on page 305.

Using the Territory Manager

Once your map has a territory layer, Maptitude will display the Territory Manager. You use the Territory Manager to choose or modify an existing territory or to create a new territory.



The Territories tab lists the territories in the layer and the totals for the tracking fields you chose



The Changes tab shows you how close the tracking fields are to your target balancing value

With the Territory Manager you can also change territory layer settings, export territory layer data to Excel, check the territory layer for errors, and create layouts and tables from the territory layer.

▶ To Choose a Territory with which to Work

1. Choose a territory from the Territory drop-down list or choose New Territory to create a new territory.

   — OR —

1. Click  and click on the territory on the map.

   — OR —

1. Right-click on a territory in the Territories scroll list and choose ***Make Working Territory***.

▶ To Find a Territory on the Map

1. Choose the territory you want to find as described above.
2. Click  .

   — OR —

1. Right-click on a territory in the Territories scroll list and choose ***Zoom to Territory***.

▶ To Show All of the Territories on the Map

1. Click  .

▶ To Change the Map Features in a Territory

1. Choose the territory you want to modify as described above or choose New Territory.
2. Choose how to select the map features from the Select drop-down list as follows:

Choose...	To do this...
Empty areas	To choose from map features that are unassigned to any territories
Any area & prevent overlapping territories	To choose from any map feature, and if already assigned to a territory, remove it from the other territory
Any area & allow overlapping territories	To choose from any map feature, and if already assigned to a territory, assign it to an additional territory
Areas to remove	To choose from map features that are in the chosen territory and unassign them from the territory

3. Choose the layer to use for choosing features from the Geography drop-down list. In most cases you will use the geography layer you originally chose to build the territory layer. You can, however, choose a larger area so that you can select multiple features at once. For example, if you built the territory layer from the county layer, you could choose the State layer so that you can highlight all of the counties in a state at once as you choose features to add to/remove from the territory.
4. Choose a selection tool from the drop-down list and use it to select features as described below:

Tool...	How to use it...
	Click on a map feature to select it. Clicking a selected feature will deselect it.
	Drag a rectangle to select all map features inside or touching the rectangle.
	Drag a circle, or click at the center of the circle and type the radius in the Enter Selection Radius dialog box, to select all map features inside or touching the circle.

TIP: You can view the tracking fields and their deviation from the balancing values on the Changes tab of the Territory Manager.

Tool...	How to use it...
	Draw an area to select all map features located inside or touching the area. Click on each corner of the area, and double-click to close the area.
	Click a line through one or more map features, and double-click to end the line to select all features that the line intersects.

You can also select map features with a condition by clicking f_x and entering a condition, or using the Condition Builder to create a condition by picking fields, operators, functions, and values you want from the Condition Builder drop-down lists.

If you want to clear the highlights and start this step over again, click .

5. Click .

   If you chose to create a new territory, Maptitude displays the New Territory Settings dialog box. Enter a name for the new territory and click OK.

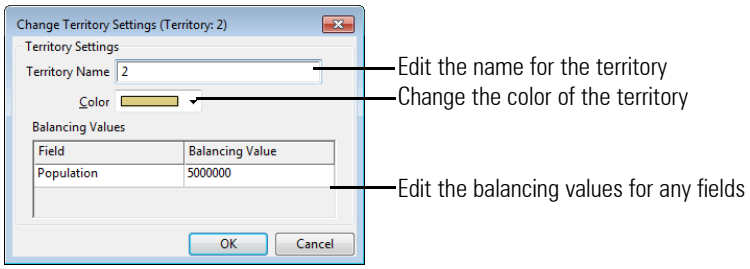
Maptitude adds the new territory or modifies the existing territory and updates the map. To undo the changes, click on the Standard toolbar.

Try It Yourself: Creating Territories

1. Choose ***Map-New Territory Layer*** to display the Territory Wizard.
2. Choose **Interactively from areas in a map** from the radio list and click Next.
3. Choose **New Default Map** from the Map drop-down list, **5-Digit ZIP Code** (or a similar postal area layer if you are using a Country Package other than the United States) from the Geography Layer drop-down list, and click **Next**.
4. Click and choose **Add Geography Layer Fields** to display the Choose Tracking Fields dialog box. Choose **Population** from the scroll list and click OK.
5. Enter a Balancing Value of "**250000**", and click **Finish**.
6. Enter "**My Territory Layer**" as the file name and click **Save**. Maptitude opens a map that includes the ZIP-Code area layer.
7. Use the Zoom In tool to zoom to any city.
8. Click the **Changes** tab in the Territory Manager.
9. Click in the Territory Manager to activate the Select by Pointing tool.
10. Click on a ZIP Code to highlight it. Continue to click on adjacent ZIP Codes and notice the population values in the Changes tab in the Territory Manager. Continue to add ZIP Codes until the population is close to 250,000.
11. When you are satisfied with the territory, click , enter "**1**" for the territory name, and click **OK**.
12. Choose **New Territory** from the Territory drop-down list.
13. Use the tool to select more ZIP Codes with a population close to 250,000, click , enter "**2**" for the territory name, and click **OK**.
14. Choose **1** from the Territory drop-down list to modify the first territory you made.
15. Choose **Areas to remove** from the Select drop-down list, click on a ZIP Code in the first territory, and click . Maptitude removes the ZIP Code from the territory.
16. Choose ***File-Close*** and click **No** to close the map without saving any changes.

▶ To Change Settings for a Territory

1. Choose a territory from the drop-down list and click or right click on a territory in the Territories scroll list and choose ***Edit Settings***. Maptitude displays the Change Territory Settings dialog box.
2. Make changes as follows:
3. Click OK.



Maptitude saves the changes to the territory.

▶ To Change the Territory Layer Settings

1. Click and choose ***Territory Layer Settings*** to display the Territory Layer Settings dialog box.
2. To change the name of the territory layer, click the General tab and edit the name in the Territories Name edit box.
3. To change the tracking fields, click the Fields tab and make changes as follows:

To do this...	Do this...
Add tracking fields from the geographic layer	Click and choose Add Geographic Layer Fields. Choose one or more fields from the dialog box and click OK. Maptitude adds the fields in the Name column.
Import tracking fields from a file	Click and choose Import Fields from File. Choose the file to open from the dialog box and click Open. If opening an Excel workbook, choose the sheet to use and click OK. Choose the geographic field from the next dialog box and click OK, then choose one or more tracking fields from the next dialog box and click OK. Maptitude adds the fields in the Name column.
Drop tracking fields	Highlight one or more tracking field names, and click .
Rearrange tracking fields	Highlight one or more tracking field names, and click or .
Set a balancing value	Click in a cell in the Balancing Value column, and type a value.

4. To change the display styles for the territories, click the Map tab and make changes as follows:

To change...	Do this...
The way territories are displayed	Choose Fill Coloring, Border Coloring, or None from the drop-down list.
The fill coloring style	Click the Territories sample to display the Territory Style dialog box. Choose a fill style and a fill opacity. If the fill style is not solid, you can check Transparent to make the fill style transparent. Click OK when you are done.
The border coloring style	Click the Territories sample to display the Territory Style dialog box. Choose a border style, a border width, and a border opacity. Click OK when you are done.
The selected area style	Click the Selected Area sample to display the Selected Area Style dialog box. Choose border and fill styles. Click OK when you are done.

5. Click OK.

Maptitude saves the changes to the territory layer settings.

▶ To Export a List of Map Features and the Territories to Which They Belong

You can create an Excel file that contains a list of all of the base geography layer features and the territory to which each belongs. For example, if your territories are created from postal codes, the sheet will list every postal code that is assigned to a territory and its respective territory.

1. Click on the Standard toolbar, choose ***Tools-Reports-Export to Excel***, or right-click on any territory in the Territories scroll list and choose ***Export Territories List to Excel***.
2. Choose a folder and enter a name for the Excel file in the Save As dialog box.
3. Click **Save**.

Maptitude exports the territory layer into an Excel file that contains columns for the name or code field from the geographic layer and the territory name for every territory in the territory layer. If you have Microsoft Excel on your computer, the spreadsheet will be opened in Excel.

▶ To Export Territory Data to Excel

You can create an Excel file with detailed information about one or more territories. The resulting file will contain one sheet that contains a list of the chosen territories and their tracking field values, a second sheet that contains the list of base layer geography features that the territory comprises, and a third sheet with demographic overlay data for the chosen territories.

1. Right-click on a territory in the Territories scroll list, or shift-click to highlight several territories in the Territories scroll list and then right-click, and choose ***Export Territories to Excel***.

   —OR—

   Select one or more territories with the Selection tools and click on the Selection toolbar.
2. Choose a folder and enter a name for the Excel file in the Save As dialog box.
3. Click **Save**.

Maptitude exports the territory data into an Excel file. If you have Microsoft Excel on your computer, the spreadsheet will be opened in Excel.

Note, the computed demographic data will vary depending upon what Country Package you have installed. For example, if you are using the U.S. Country Package, the demographics will include income, population, gender, age, race, households, and housing units for the territory.

▶ To Check for Errors in the Territory Layer

You can check for errors and updates that effect your territory layers. For example, if your underlying layer or table has changes to the values in the tracking fields, you can run an error check and choose whether to update the calculated tracking values. Similarly, if the underlying area layer's boundaries have changed you can choose whether to update the territory boundaries.

1. Click and choose ***Check for Errors*** to display the Confirm dialog box.
2. Click **Yes**. Maptitude checks the territory layer for any errors. More complicated geographic files, such as ZIP Codes, will take more time to check.

3. Make choices as follows:

   • If no errors are found, Maptitude displays a Note dialog box. Click OK.
   • If attribute totals are inconsistent, Maptitude displays a Confirm dialog box. Choose whether or not to correct them.
   • If boundaries are inconsistent, Maptitude displays the Rebuild Territories dialog box. To update the territory boundaries to agree with the territory definitions, click the first radio button. To keep the territory boundaries and update the area assignments, choose the second radio button. Otherwise, choose the third radio button to make no changes. Click OK. These changes cannot be undone so it is recommended that you save your territory layer to a backup archive when prompted.

Maptitude makes any changes you requested, fixing any errors.

▶ To Print Territory Layouts

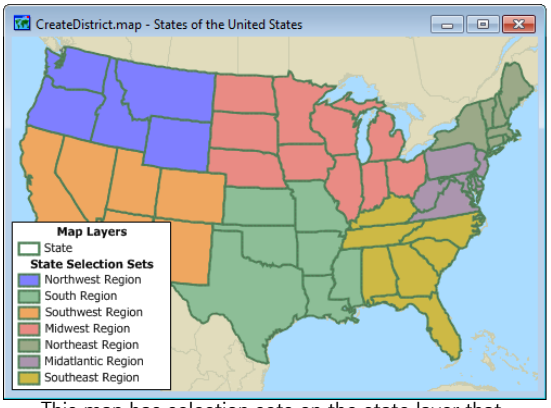
1. Choose the territory you want to print from the Territory drop-down list.
2. Choose the type of layout you want by clicking the Layout drop-down arrow and choose the type of layout you want:

   • ***Territory Layout*** will create a layout of just the territory and everything around it masked
   • ***Territory and Touching Territory Layout*** will create a layout of the territory and its immediate neighboring territories
   • ***Highlighted Territory and Touching Territory Layout*** will create a layout of the territory and its immediate neighbors with cross-hatching on the neighbors

3. Click , , or . Maptitude creates a layout for the chosen territory using your default Windows printer. To change the printer choose File-Properties or click on the Standard toolbar, choose a different printer, and click OK.
4. Click on the Standard toolbar to print the layout.

Creating Territories by Merging Sets

If you have created selection sets on an area layer then you can create a new area geographic file with territories created from some or all of the selection sets with the ***Tools-Editing-Merge by Selection Sets*** command. The territories will be named based on the selection set names.



This map has selection sets on the state layer that correspond to the territories.

The resulting layer created by merging selection sets would look like this

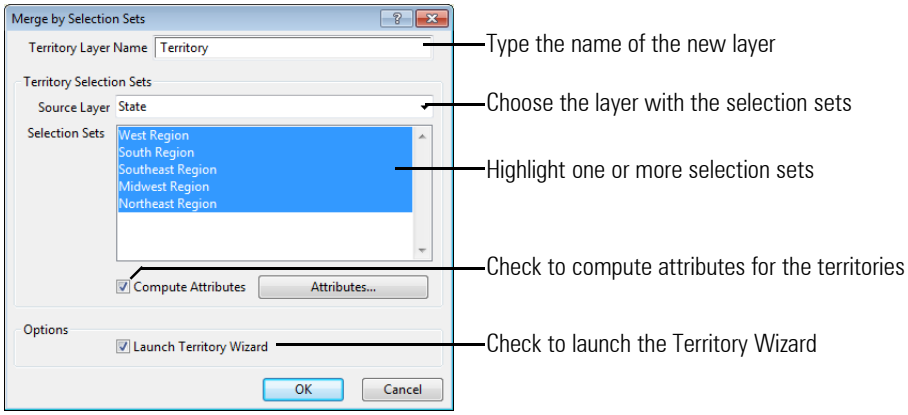
Features can be in more than one selection set. This will create overlapping territories, and they will be stored in a non-topological area geographic file. If no territories overlap, they will be stored in a regular area geographic file, which does not allow overlaps. For more information on non-topological area geographic files, see "Creating New Geographic Files" on page 381. For more information editing non-topological area geographic files, see "Editing Area Features" on page 399.

Once you have created areas from the selection sets you can then create a Territory Layer with the Territory Wizard; for more information, see "Using the Territory Wizard" on page 299.

The ***Merge by Sets*** command can automatically compute the attributes of the new areas, based on the data in your table; for more information, see "Combining Attributes" on page 320.

▶ To Create Territories Using Selection Sets on an Area Layer

1. Choose the area layer, create a selection set for each territory and, if necessary, rename each selection set to the name or number of the territory.
2. Choose ***Tools-Editing-Merge by Selection Sets*** to display the Merge by Selection Sets dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Create Territories As dialog box.
5. Type a file name for the new geographic file, and click **Save**.

TIP: To learn about using the Attributes button, see "To Change the Aggregation Method when Calculating Demographics" on page 322.

Maptitude creates are area layer of the territories, adds it to the map, and, if you chose, launches the Territory Manager. For more information see, "Using the Territory Wizard" on page 299 and "Creating Territories from My Area Layer" on page 302.

Regardless of whether you chose to calculate demographics, you can export demographic overlay data and other information to Excel by making the resulting area layer the working layer and clicking on the Standard toolbar.

Try It Yourself: Building Territories from Selection Sets

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **CreateDistrict.map** in the Tutorial folder. You want to create territories from the selection sets.
2. If the Selection toolbar is not visible, click on the Standard toolbar.
3. Choose **Western Region** from the drop-down list on the Selection toolbar.
4. Click on the Selection toolbar to activate the Select by Pointing tool, then click on the two states that are not yet selected to add them to the "Western Region" set.
5. Choose ***Tools-Editing-Merge by Selection Sets*** to display the Merge by Selection Sets dialog box.
6. Click on the first selection set in the scroll list and drag to highlight all three selection sets.
7. Uncheck the **Launch Territory Wizard** box.
8. Click **OK**. Maptitude displays the Create Territories As dialog box.
9. Type "**My Regional Territories**" as the file name and click **Save**. Maptitude redraws the map with the new territory layer.
10. Choose ***File-Close*** and click **No** to close the map without saving any changes.

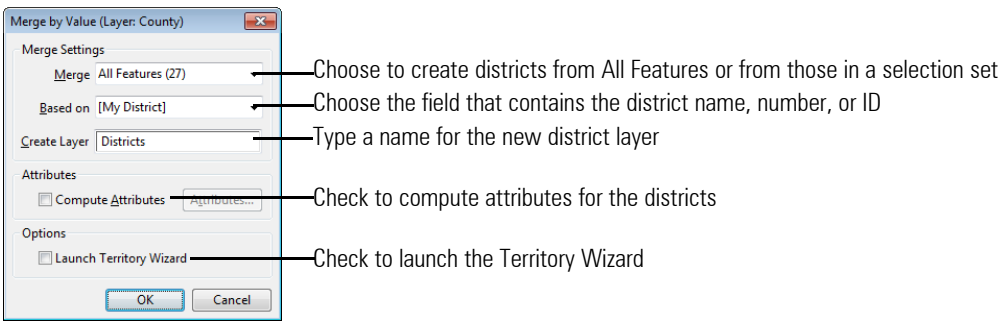
Creating Territories Using the Merge by Value Command

The ***Tools-Editing-Merge by Value*** command creates a new area layer, where each feature is created by grouping one or more features from a different layer of smaller areas. The features will be grouped based on a field that contains the territory name or number to which each of the smaller areas belongs. For example, you could add a field to the U.S. State layer, fill it with the name of the territory to which each state belongs, and then merge the states using this field.

The ***Merge by Value*** command automatically computes the attributes of the new areas based on the data that go with the working layer. Maptitude follows certain rules when estimating attributes for the districts. To learn more, and to learn how to change the way the calculations are performed, see "Combining Attributes" on page 320.

▶ To Create Territories Using the Merge by Value Command

1. Choose the layer whose features you want to merge from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Merge by Value*** to display the Merge by Value dialog box.
3. Make choices as follows:



TIP: To learn about using the Attributes button, see "To Change the Aggregation Method when Calculating Demographics" on page 322.

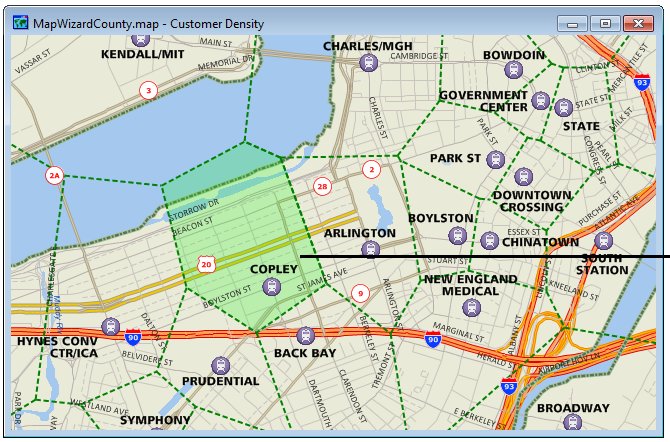
4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the new geographic file, and click **Save**.

Maptitude creates are area layer of the territories, adds it to the map, and, if you chose, launches the Territory Manager. For more information see, "Using the Territory Wizard" on page 299 and "Creating Territories from My Area Layer" on page 302.

Regardless of whether you chose to calculate demographics, you can export demographic overlay data and other information to Excel by making the resulting area layer the working layer and clicking on the Standard toolbar.

Creating Areas of Influence

The map below shows the location of subway stations. The area that is closest to each station is called its **area of influence** (also called **Thiessen Polygons** or a **Voronoi Diagram**). Maptitude can automatically create straight-line areas of influence around any number of points in a layer.



To create straight-line areas of influence, you simply choose the set of point features you want to use. Maptitude creates the areas of influence, and saves them in a geographic file. When Maptitude creates straight-line areas of influence, it starts by building a large circle containing all the points of interest. Then it divides the circle into areas, with one area for every input point. As a result, the areas that are built around the points on the edge can be much larger than those in the middle.

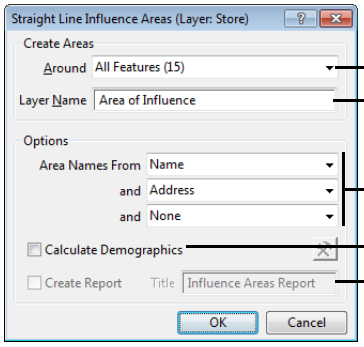
As an option, Maptitude will use an overlay to estimate the attributes for each area based on data stored in some other layer in the map. If you use an overlay to estimate the attributes of areas of influence, remember that the ones around the edge are larger than the others.

You can also build areas of influence that are drive-time based, using the ***Tools-Routing & Directions-Drive-Time Influence Areas*** command. See "Partitioning a Network" on page 334 to learn more.

▶ To Build Straight-Line Areas of Influence

1. Choose the point layer you want to use from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Analysis-Straight Line Influence Areas*** to display the Straight Line Influence Areas dialog box.

3. Make choices as follows:



Choose to build areas around All Features or in a selection set

Type a name for the new area of influence layer

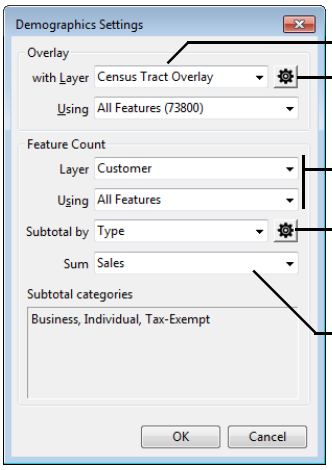
Choose up to three fields to identify the feature to which the areas belong

Check to calculate demographics for the areas

Check to create a report with the map and calculated attributes and optionally enter a title for the report

TIP: Regardless of whether you choose to calculate demographics, you can export demographic overlay data and other information to Excel by making the resulting area of influence layer the working layer and clicking on the Standard toolbar.

4. If you checked the **Calculate Demographics** box, you can specify the attributes to calculate and/or count features in the buffers. Click to display the Demographic Settings dialog box and make choices as follows:



Choose the reference layer and features to use

Click to change the aggregation method or fields. See page ??? for more information

To count features in each buffer, choose the layer whose features you want to count and whether to use All Features or a selection set

To subtotal the counted features, choose a field to use for grouping and the category types to group (e.g., You could use the Type field in the landmark layer and choose to find the number of Banks, Restaurants, and Schools within the buffers), or choose None to get the total count of features without subtotaling

Choose a field from the feature count layer to aggregate (e.g., You could calculate the total revenue of customers within the buffers)

Click **OK** to return to the Straight Line Influence Areas dialog box.

5. Click **OK**. Maptitude displays the Save As dialog box.

6. Type a file name for the new geographic file, and click **Save**.

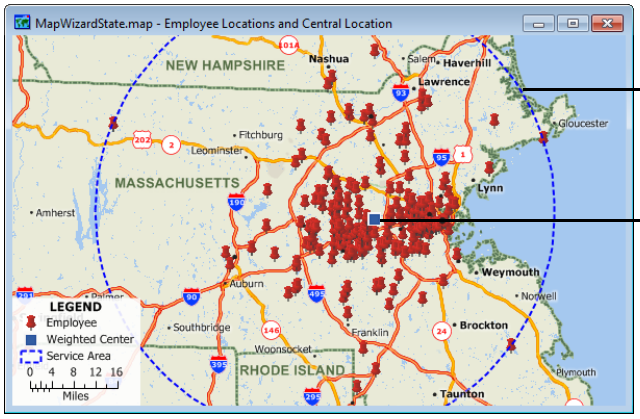
Maptitude creates a new layer containing the areas of influence and adds the new layer to the map. If you chose to produce an overlay, Maptitude creates the table and displays the results in a joined view. If you chose to create a report, Maptitude generates the report and displays it in a new window. Reports can be printed, saved, exported, and emailed. Close the report window when you are done.

Try It Yourself: Building Areas of Influence

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **influnce.map** in the Tutorial folder. You want to see the areas of influence for restaurants in Manhattan.
2. Choose **Restaurant** from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Straight Line Influence Areas***.
4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type "**My Influence**" as the file name and click **Save**. Maptitude creates the areas of influence and adds them to the map.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Locating Weighted Centers and Service Areas

The ***Tools-Analysis-Weighted Center*** command determines from a set of points, such as customers, a circular service area that encompasses all of the points and its center. Optionally, the center can be placed at the average of the coordinates of the set of points or can be weighted by any field in your point layer. The results can be either freehand items or geographic layers.

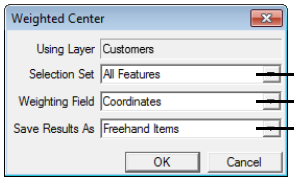


The circle encompasses all of the points

You can locate the geographic center, the average of the coordinates of all of the locations, or a weighted center based on any field in the point layer

▶ To Locate a Weighted Center and Service Area

1. Choose the point layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Analysis-Weighted Center*** to display the Weighted Center dialog box.
3. Make choices as follows:



Choose to use All Features or a selection set

Choose None, Coordinates, or a field from the point layer to use for weighting

Choose whether to save the results as freehand items on the map or as new layers

4. Click **OK**.

   If you chose to save the results as geographic layers, Maptitude displays the Save Weighted Centers As dialog box. Type a name for the weighted center layer and click **Save**. Maptitude then displays the Save Service Area As dialog box. Type a name for the service area layer and click **Save**. Maptitude adds the two new layers to the map.

   If you chose to save the results as freehand items, Maptitude adds them to the map.

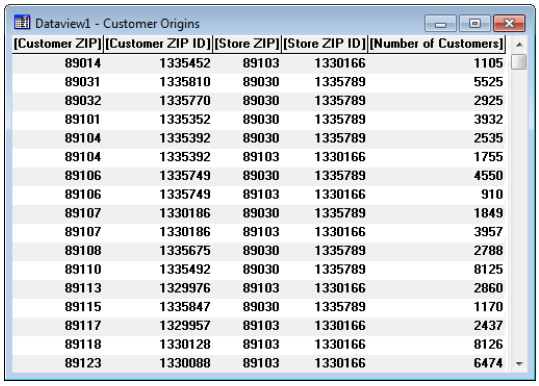
TIP: You can export demographic overlay data and other information to Excel by making the resulting service area layer the working layer and clicking on the Standard toolbar.

Try It Yourself: Locating a Facility and Service Area

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **LocateStore.map** in the Tutorial folder to open a map of Connecticut with customer locations.
2. Choose **Customers** from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Analysis-Weighted Center*** to display the Weighted Center dialog box.
4. Choose **All Features** from the Selection Set drop-down list, **Sales** from the Weighting Field drop-down list, and **Freehand Items** from the Save Results As drop-down list.
5. Click **OK**. Maptitude adds a circle that encompasses the trade area and a symbol at the weighted center.
6. Choose ***File-Close*** and click **No** to close the map without saving any changes.

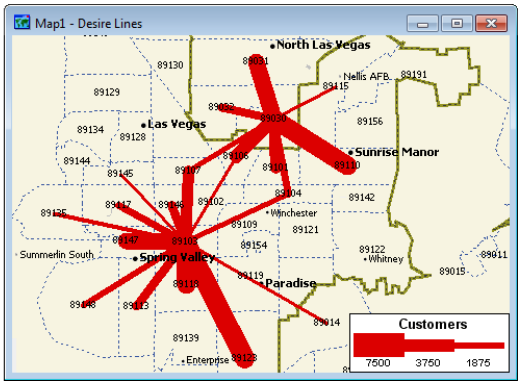
Creating Desire Lines

Maptitude uses **desire lines** to illustrate on a map the flows of people or goods from point to point based on the values from a dataview. For example, a dataview could show the number of customers traveling to a store from their home ZIP Codes. The width of each of the desire lines would indicate the volume of flow.



Dataview1 - Customer Origins

[Customer ZIP]	[Customer ZIP ID]	[Store ZIP]	[Store ZIP ID]	[Number of Customers]
89014	1335452	89103	1330166	1105
89031	1335810	89030	1335789	5525
89032	1335770	89030	1335789	2925
89101	1335352	89030	1335789	3932
89104	1335392	89030	1335789	2535
89104	1335392	89103	1330166	1755
89106	1335749	89030	1335789	4550
89106	1335749	89103	1330166	910
89107	1330186	89030	1335789	1849
89107	1330186	89103	1330166	3957
89108	1335675	89030	1335789	2788
89110	1335492	89030	1335789	8125
89113	1329976	89103	1330166	2860
89115	1335847	89030	1335789	1170
89117	1329957	89103	1330166	2437
89118	1330128	89103	1330166	8126
89123	1330088	89103	1330166	6474

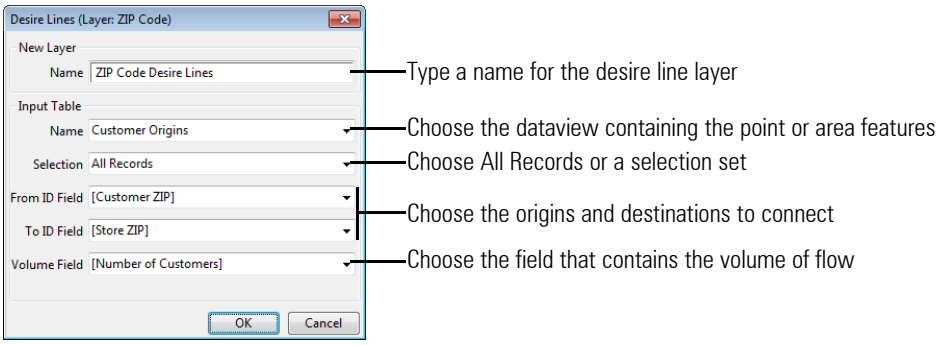


Maptitude displays desire lines by creating a new geographic file with lines that connect each origin and destination in the dataview. The layer is automatically displayed on a map using a size theme. For more information on size themes, see "Size Themes" on page 164.

In order to create the new line geographic file, Maptitude associates each From ID and To ID in the dataview with a point or area feature. You can create desire lines from all the rows and columns that are displayed in the dataview, or just a selection set.

▶ To Create Desire Lines

1. Choose the point or area layer being used to create the desire lines as the working layer.
2. Choose ***Tools-Analysis-Desire Lines*** to display the Desire Lines dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save Flow Layer As dialog box.
5. Type a name for the geographic file and click **Save**.

Maptitude creates a geographic file containing the desire lines, and adds them to the map. If you chose a volume field, the desire lines are displayed with a size theme.

Try It Yourself: Creating Desire Lines

1. Choose ***File-Open Workspace***, then open the workspace **desire.wrk** in the Tutorial folder. You want to create desire lines illustrating the daily trips data contained in the dataview.
2. Choose ***Tools-Analysis-Desire Lines*** to display the Desire Lines dialog box.
3. Verify that **County Flows** is chosen in the Name drop-down list, **All Records** is chosen in the Selection drop-down list, **[From County ID]** is chosen in the From ID Field drop-down list, and **[To County ID]** is chosen in the To ID Field drop-down list.
4. Choose **[Daily Trips to Work]** from the Volume Field drop-down list.
5. Click **OK** to display the Save Flow Layer As dialog box.
6. Type "**My Desire Lines**" as the file name and click **Save**. Maptitude adds the desire lines to the map with a size theme showing the flows.
7. Choose ***File-Close All*** and click **No** to close the map and dataview without saving any changes.

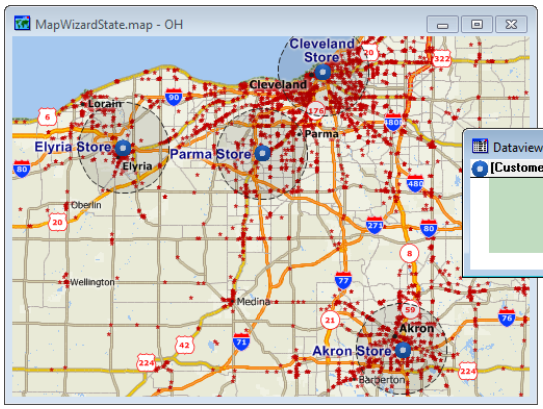
Using Overlays

Overlay is a procedure that estimates the attributes of one or more features by superimposing them over other features, and figuring out the extent to which they overlap. You use overlays to estimate the attributes of features in a layer based on data in another map layer. For example, you can use overlays to:

TIP: To compute overlays using several different sizes at once, see "Creating Buffers" on page 291.

- Compute the total length of all streets inside one or more ZIP Codes
- Estimate the population and average income around potential retail store sites
- Count the number of hospital beds, trauma centers, and medical resources around an earthquake fault
- Count the number of customers and total volume of sales in each sales region

Some overlays are easy to compute. For example, you could use an overlay to count the number of customers within five miles of each store:



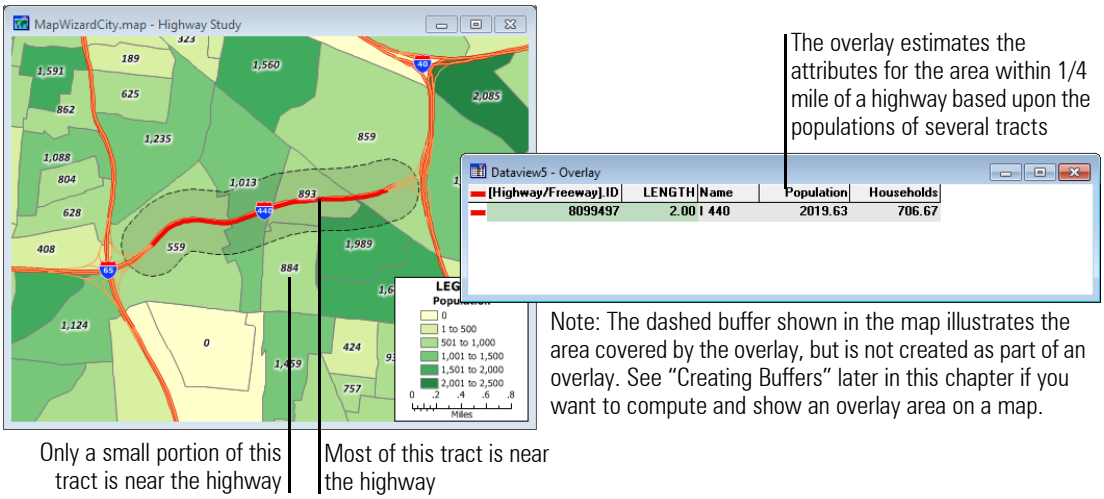
The overlay counts the customers within five miles of each store and aggregates the sales data for those customers

Dataview4 - Overlay

[Customer Data].ID	Name	[N Customer]	Sales	[Avg Sales/Customer]
1	Cleveland Store	581	280250.00	482.36
2	Parma Store	253	132550.00	523.91
3	Elyria Store	157	91500.00	582.80
4	Akron Store	394	212150.00	538.45

Note: The dashed buffers shown in the map illustrate the area covered by the overlay, but are not created as part of an overlay. See "Creating Buffers" later in this chapter if you want to compute and show an overlay area on a map.

Other overlays are more complicated. For example, you could use an overlay to compute the number of people within a quarter-mile of a highway where noise and pollution are most severe. Maptitude has to figure out the percentage of each Census tract that is inside the quarter-mile buffer in order to make the estimate.



You compute overlays using the ***Tools-Analysis-Overlay*** command by following three steps:

- Choose the features for which you want to calculate the data (in the working layer)
- Choose the features whose data you want to tally (in the reference layer)
- Choose options such as the buffer size and attribute settings

The ***Tools-Analysis-Overlay*** command creates a new table that contains the attributes of the features in the working layer, and joins the table to the map layer. Overlay can also count the number of features in the reference layer that are at least partly contained within each feature in the working layer. The features in the working and reference layers can be points, lines, or areas. If the features in the working layer are points or lines, you must use a buffer size other than zero.

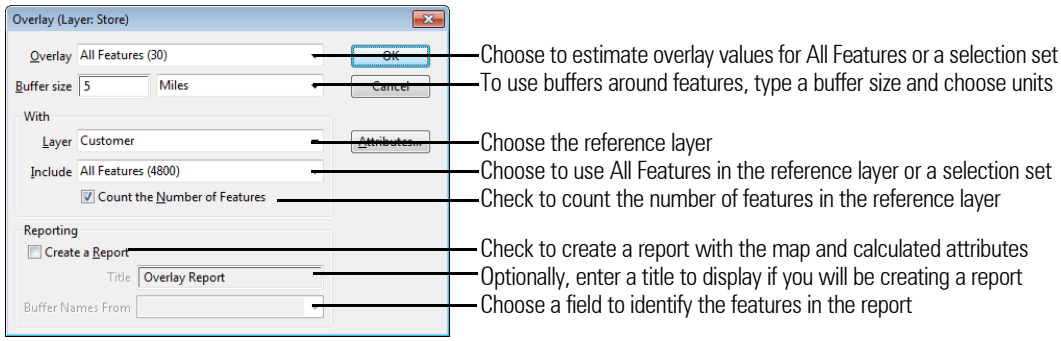
Maptitude follows certain rules when estimating attributes for the features in the working layer. Maptitude estimates the attributes of area features by adding together the attribute values from features in the reference layer, based on the percentage that they overlap. Some types of data, however, should not be added together. For example, data on Income by ZIP Code should be averaged together rather than added together. To learn more, and to learn how to change the way the calculations are performed, see "Combining Attributes" on page 320.

▶ To Create an Overlay

1. Choose the layer whose attributes you want to estimate (the working layer) from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Analysis-Overlay*** to display the Overlay dialog box.

TIP: To learn about using the Attributes button, see "To Change the Aggregation Method when Calculating Demographics" on page 322.

3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the new table file, and click **Save**.

Maptitude creates the overlay, computes the attributes of features in the working layer, writes the results to a new table, and links it to the working layer in a joined view. If you chose to create a report, Maptitude generates the report and displays it in a new window. Reports can be printed, saved, exported, and emailed. Close the report window when you are done.

Try It Yourself: Using Overlays

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **overlay.map** in the Tutorial folder. You are studying a one mile radius around a potential store location in Times Square.
2. Choose ***Tools-Analysis-Overlay*** to display the Overlay dialog box.
3. Type "**1**" in the Buffer Size edit box and choose Miles.
4. Choose **5-Digit Zip** from the Layer drop-down list.
5. Remove the check from the **Create Report** box.
6. Click **OK** to display the Save As dialog box.
7. Type "**My Overlay**" as the file name and click **Save**. Maptitude displays the dataview with the attributes of the overlay computed from the ZIP Codes. Scroll across the dataview to see the demographic attributes within one mile of the store location. Note that the median income field shows a sum. See the tutorial on page 324 to learn how to compute the weighted median income when doing an overlay.
8. Choose ***File-Close All*** and click **No** to close the dataview and map without saving changes.

Combining Attributes

When you create overlays, areas of influence, or districts, use geographic editing, or create one-to-many joined views, Maptitude often needs to combine the attributes of two or more map features. For example, when you join two areas together, Maptitude needs to add the population of the two areas to get the population of the new, combined area.

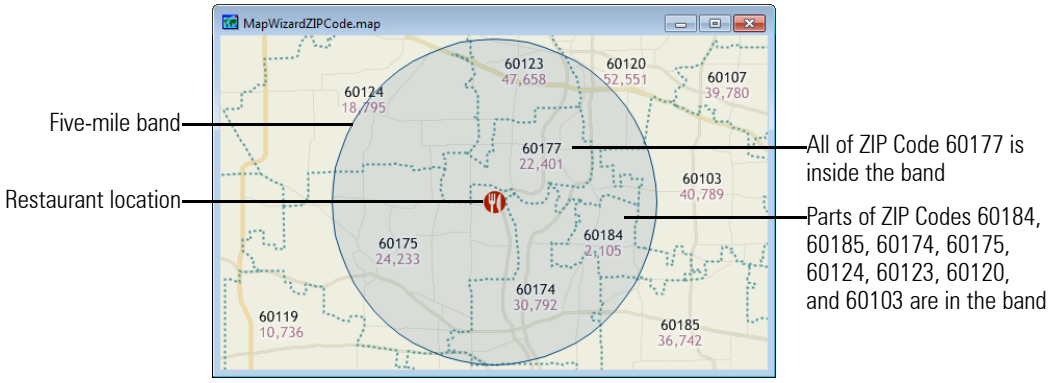
There are two things that can make this a bit tricky:

- Some actions involve only a part of some feature instead of the whole thing
- Some data fields should be added together, while others should be averaged together or handled in some other way

Partial Features

When you compute an overlay, Maptitude estimates the attributes for the working layer in one of several ways. If the reference layer is a point layer, Maptitude finds all the points in a working layer area and combines data for these points together in ways that are described below. If the reference layer is a line or area layer, Maptitude figures out what percentage of each feature is inside a working layer area, and applies that percentage to the attributes when combining the data together.

For example, suppose you wanted to compute the population of a 5-mile band around a potential restaurant location, based on 5-digit ZIP Code boundaries. In the following example, the 5-digit ZIP Code layer contains the population of each ZIP Code. In computing the overlay, Maptitude automatically accounts for the fact that only a portion of some ZIP Codes is included in the overlay.

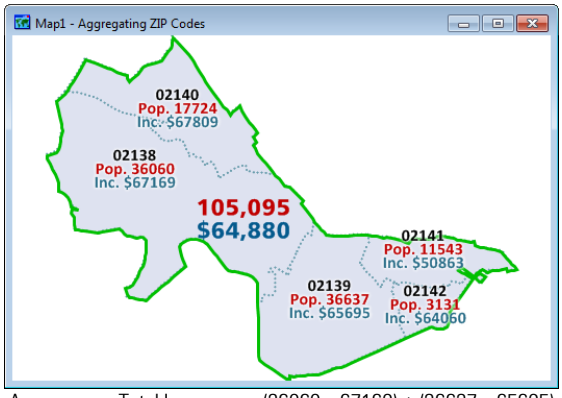


When you use the geographic editing tools (described in ***CHAPTER 10:*** *Geographic Analysis Tools*) to split line or area features, Maptitude uses similar methods to split the attribute data. For example, if you use the editing tools to split an area in half, Maptitude estimates the population of each new area to be one-half the population of the original area. If you split an area into two unequal parts, Maptitude divides up the population based on the size of each area.

Adding Versus Averaging

Suppose you knew the population and average income for five ZIP Codes in a town and wanted to compute the population and average income for the town as a whole. To get the town population, you'd need to add together the population of the five ZIP Codes. To get the average income for the

town, however, you wouldn't add together the average income of the ZIP Codes. Instead, you compute an average of the income for the five ZIP Codes. This average has to take into account not only the average income of each ZIP, but also the number of persons who live in each one. This is sometimes called a weighted average.



ZIP Code	Population	Income
02138	36,060	$67,169
02139	36,637	$65,695
02140	17,724	$67,809
02141	11,543	$50,863
02142	3,131	$64,060

$$\text{Population} = 36060 + 36637 + 17724 + 11543 + 3131 = 105{,}095$$

$$\text{Average Income} = \frac{\text{Total Income}}{\text{Total Population}} = \frac{(36060 \times 67169) + (36637 \times 65695) + (17724 \times 67809) + (11543 \times 50863) + (3131 \times 64060)}{36060 + 36637 + 17724 + 11543 + 3131} = 64{,}880$$

Aggregation Methods

The method used to combine attribute data is known as the **aggregation method**. All the data that come with Maptitude include information on the correct aggregation method. Whenever you perform overlays, use geographic editing, or create one-to-many joined views, Maptitude uses this aggregation method automatically.

When you create your own tables, you can choose a default aggregation method for each field. The default aggregation method is stored as part of the dictionary file. As a result, you can only specify default aggregation methods for tables stored in fixed-format text, fixed-format binary, and tab- or comma-delimited data files. You cannot define default aggregation methods for tables stored in dBASE format. Here is a summary of the aggregation methods and how they work:

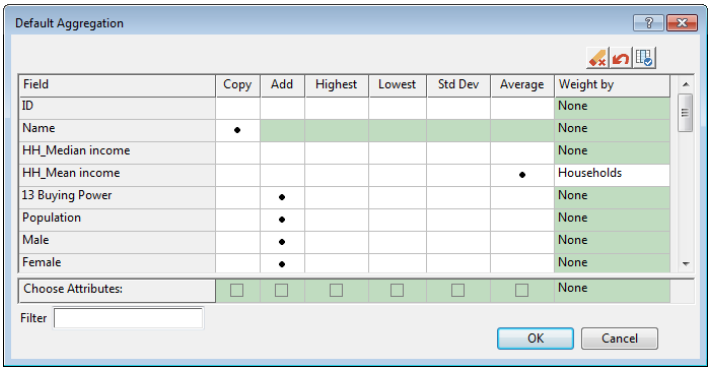
Method...	When features are joined/merged...	When features are split...
None (Blank)	Maptitude leaves the field blank	Maptitude leaves the field blank
Copy	Maptitude uses the value for one of the features (whichever one it encounters first) for the combined feature	Maptitude copies the value to all of the pieces
Add	Maptitude adds the values for the individual features, or the proportional values for parts of the individual features	Maptitude splits the value into parts, based on the length or area of the parts
Lowest	Maptitude uses the lowest individual feature's value	Maptitude copies the value to all of the pieces
Highest	Maptitude uses the highest individual's value	Maptitude copies the value to all of the pieces
Average	Maptitude computes a weighted average of the values from the individual features	Maptitude copies the value to all of the pieces
Std Deviation	Maptitude computes the standard deviation of the values from the individual features	Maptitude copies the value to all of the pieces

Whenever you create overlays, areas of influence, or territories, use geographic editing, or create one-to-many joined views, Maptitude will use the default aggregation method for every data field. You

also have the option to change the aggregation method for any field or fields. For some operations you can choose more than one aggregation method. However, you can use only a single aggregation method when using the geographic editing functions.

▶ To Change the Default Aggregation Method

1. Choose ***Dataview-Table-Modify*** to display the Modify Table dialog box.
2. Click Aggregation to display the Default Aggregation dialog box.



3. The grid shows the aggregation methods for all of the fields. If you want, you can click in the Default Aggregation dialog box to choose a subset of fields or you can enter text into the Filter box to limit the list to fields containing the entered text.
4. Change the default aggregation method as follows:

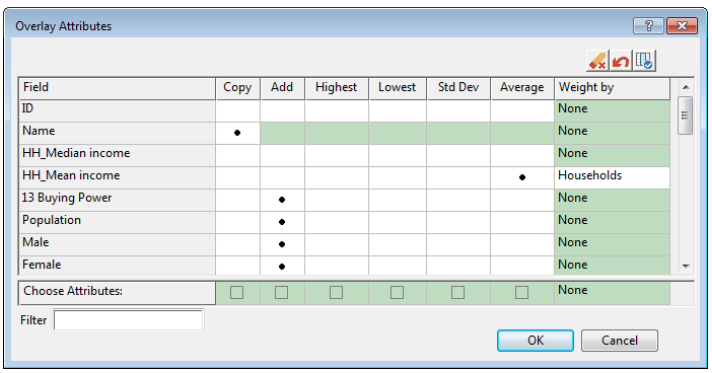
To do this...	Do this...
Change the default aggregation method for a field	Click on one or more fields in the Fields list and check the desired aggregation options below each respective column. A • symbol indicates a method that will be calculated.
Turn off all aggregation methods for all fields	Click

5. Click **OK** to save these settings as part of the table.

From now on, the methods you chose will be used any time attribute data for several features are combined.

▶ To Change the Aggregation Method when Calculating Demographics

1. Open the Overlay Attributes, Territory Attributes, or Attribute Settings dialog box as described in the how-tos in this chapter.



2. The grid shows the aggregation methods for all of the fields. If you want, you can click in the Overlay Attributes dialog box to choose a subset of fields or you can enter text into the Filter box to limit the list to fields containing the entered text.

3. Change the aggregation method as follows:

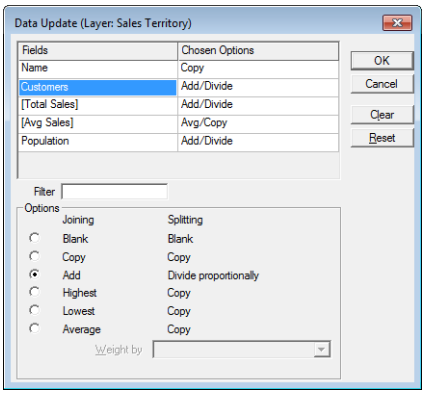
To do this...	Do this...
Change the default aggregation method for a field	Click on one or more fields in the Fields list and check the desired aggregation options below each respective column. A • symbol indicates a method that will be calculated.
Turn off all aggregation methods for all fields	Click

4. Click **OK**. Maptitude returns to the appropriate dialog box. Continue as described in the respective how-tos.

After the overlay is created, the aggregation methods will return to their defaults.

▶ To Change the Aggregation Method when Editing Map Features

1. Click in the Layer Editing Toolbar to display the Configure Geographic Editing dialog box.
2. Click Update to display the Data Update dialog box.



3. Change the joining and splitting methods as follows:

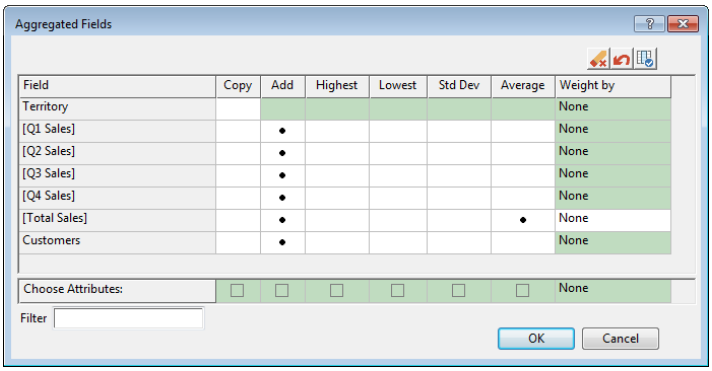
To do this...	Do this...
Change the methods for a field	Click on the field in the Fields list and click the desired options; Click Reset to undo your changes
Turn off all methods for all fields	Click Clear

4. Click **OK**.

The settings you chose will be used when you split or join map features.

▶ To Change the Aggregation Method when Creating a One-to-Many Join

1. Click the Options tab in the Join dialog box and choose the One To Many Join type.
2. Click Aggregation to display the Aggregated Fields dialog box.



3. The grid shows the aggregation methods for all of the fields. If you want, you can click in the Aggregated fields dialog box to choose a subset of fields or you can enter text into the Filter box to limit the list to fields containing the entered text.
4. Change the aggregation method as follows:

To do this...	Do this...
Change the default aggregation method for a field	Click on one or more fields in the Fields list and check the desired aggregation options below each respective column. A • symbol indicates a method that will be calculated.
Turn off all aggregation methods for all fields	Click

5. Click OK to return to the Join dialog box and continue creating the join as described in "To Specify the Type of Joined View" on page 536.

Attributes for the join will use the aggregation methods you chose.

Try It Yourself: Customizing Data Handling

1. Choose ***File-Open*** or click on the Standard toolbar and open the map **overlay.map** in the Tutorial folder.
2. Choose ***Tools-Analysis-Overlay*** to display the Overlay dialog box.
3. Type "**1**" in the Buffer Size edit box and choose **Miles**.
4. Choose **5-Digit Zip** from the Layer drop-down list.
5. Remove the check from the **Create a Report** box.
6. Click **Attributes** to display the Overlay Attributes dialog box.
7. Click on the field **[HH Median Income]** near the bottom of the scroll list to highlight it.
8. Uncheck the **Add** box, check the **Average** box, and choose **Population** from the Weight By drop-down list.
9. Click **OK** to close the Overlay Attributes dialog box.
10. Click **OK** to display the Save As dialog box.
11. Type "**My Attributes**" as the file name and click Save. Maptitude displays a dataview with the attributes of the overlay computed from the ZIP Codes. Scroll to the right to see the attributes within one mile of the store including the [Avg HH Median Income] field.
12. Choose ***File-Close All*** to close the map and dataview without saving any changes.

CHAPTER 11:
Routing, Directions, and GPS

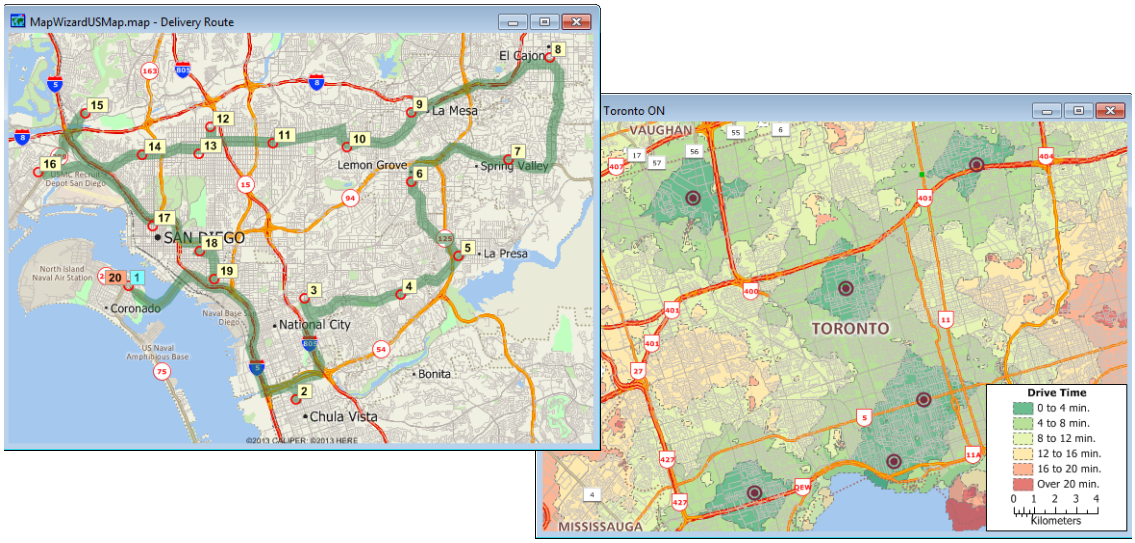
The routing tools in Maptitude identify good routes for travel, calculate the distances between points, and produce driving directions. When a trip involves many different stops, Maptitude can even help you decide the best order in which to visit them.

The network analysis tools allow you to determine network cost (distance, time, or other measure) from selected points. For example, you can:

- Create drive-time rings, such as for showing the drive time to the closest store
- Partition lines, such as for showing the streets that are within the maximum walk distance of an elementary school

For more advanced network capabilities, consider Caliper Corporation's TransCAD® Transportation GIS Software. Contact Caliper Sales for more information.

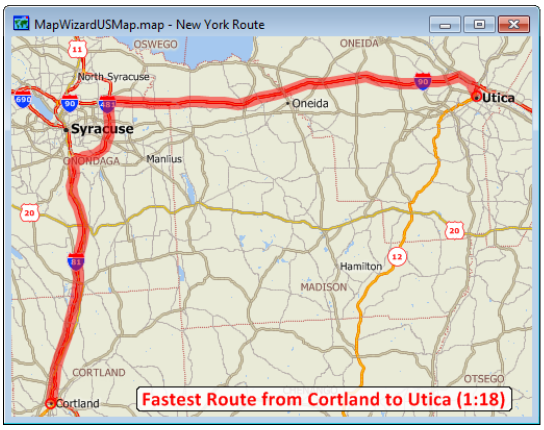
NOTE: The provided travel times are not recommended for navigation. The travel times are not accurate enough to be suitable for navigation nor are they reflective of current road conditions.



In this chapter:

Finding Routes

The best route can mean different things to different people. To some people, the best route is the one that is shortest in terms of mileage. To others, the best route is the fastest route, or the most scenic route. A salesperson who spends time on the road might want to set up an itinerary for less driving time and more time with customers. To a chemical company transporting hazardous chemicals, the best route is one that uses the safest roads (less risk of an accident) and avoids areas where lots of people live or work (in case of an accident, the consequences are less severe).



If your version of Maptitude includes the HERE® street layer, you can use it to find shortest and fastest routes. You also can find routes on other types of line layers, such as railroads or bicycle paths.

NOTE: Your use of any routing features is subject to the following disclaimer:

- Directions are not to be used for navigation
- Directions may be inaccurate, incomplete, dangerous, not suitable, or prohibited
- Data are not real-time, and location accuracy cannot be guaranteed

Finding Your Best Route

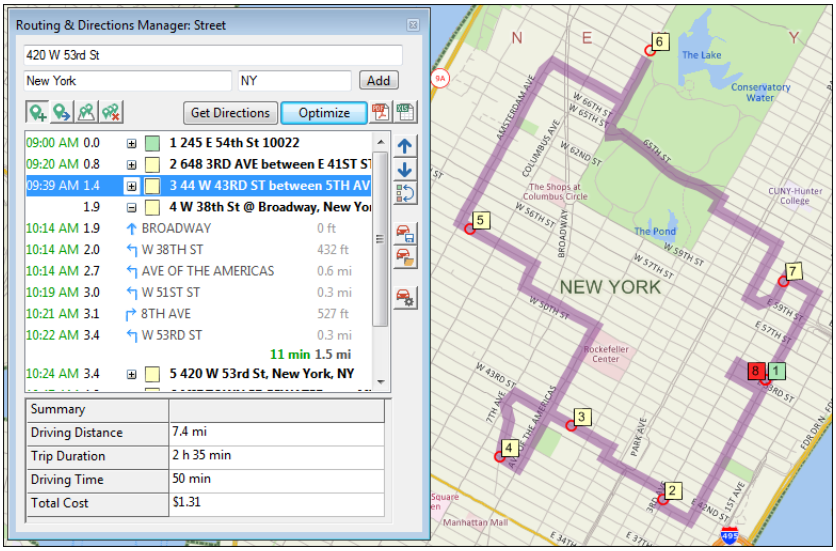
Finding your best route first involves first choosing the stops that are to be included. Use any combination of the following three methods to choose the stops (up to 200):

- Manually click on the map at the stop locations.
- Type an address in the fields at the top of the Routing and Directions Manager. You can type a street number and street name or the names of intersecting streets, plus the city and state and/or postal code.
- Choose a point layer and selection set (e.g., using a point layer of your customer locations, create a selection set of the customers you want to visit).

If you want to put stops at a lot of addresses, rather than typing them all in individually using the second method above, it will probably be better to first create a table with a record for each address and use Create-a-Map Wizard or the Locating tools to create a point layer from the table. Then use the third method to choose the stops using the resulting point layer.

Once you have placed the stops you can find a route to service them. You have several options for finding the route:

- You can choose whether to base the routes on the fastest or shortest route.
- You can choose to add the first stop to the end if you want a route that returns to the origin.
- You can keep the stops in the order that you chose them and find the fastest or shortest route.
- You can manually rearrange the stops and find the fastest or shortest route for the order you chose.
- You can have Maptitude optimize the order to visit the stops to cut down on the amount of travel among the stops. When you choose this method, you also have the option of preserving the first and/or last stops.



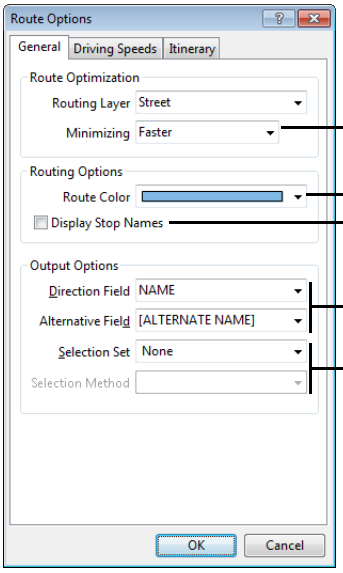
Once Maptitude has found your route, you can:

- Click ⊞ in the Routing and Directions Manager to see the directions from one stop to the next.
- Go back and change the order of one or more stops and recalculate the route.
- Create a PDF report with a route summary and directions.
- Save the route to a file that can be loaded into Maptitude later.
- Print the map or add it to a layout.

▶ To Find Your Best Route

1. Maptitude uses the supplied street layer for finding routes. If your map does not contain the street layer, then choose the line layer on which you want to route from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Routing & Directions-Routing & Directions Manager*** or click on the Standard toolbar to display the Routing and Directions Manager.
3. In the Routing and Directions Manager, click to display the Route Options dialog box.

4. Click the General tab and make choices as follows:



Choose whether to optimize the route on time (Faster) or distance (Shorter)

Choose a color to use to display the route

Check to show stop names on the map or uncheck to only show stop numbers

Choose the fields containing the street name and alternative street name to use for generating driving directions

If you want to create a selection set of the links in the route, choose or type a selection set name and choose a selection method

5. If you want, you can set additional options as follows:

To do this...	Do this...
Adjust speeds for the street layer	Click the Driving Speeds tab and use the sliders to make the speeds faster or slower for the different road classes. Driving speeds can only be adjusted when using the 2016 or later version of the HERE street file.
Set a driving schedule	Click the Itinerary tab and choose a start and end time. If you want you can prevent Maptitude from creating an automatic overnight stop just before what could reasonably be the last stop of the day by choosing an amount of time you are willing to continue driving each day from the Flexibility drop-down list.
Set a fixed time to spend at each stop	Click the Itinerary tab, check the **Stay at each stop for** box, and specify the stop duration.
Build in rest time	Click the Itinerary tab, check the **Automatic Rest** box, and specify the length and frequency of rests.
Change the cost variables	Enter values for city and highway fuel consumption and choose whether to calculate driving costs based on fuel price or a flat rate.

6. Click **OK** to return to the Routing and Directions Manager.

7. Add stops using any combination of the following methods:

TIP: If you do not plan to have Maptitude optimize your stop order and you want to return to the first stop, you will have to add it again after adding all of your other stops.

To add stops...	Do this...
By clicking them	Click  and then click on the map at each desired stop location.
By typing an address	In the fields at the top of the Routing and Directions Manager enter the street address or the names of intersecting streets, and enter a city and state and/or postal code. Click **Add**.
Based on a point layer	Click  to display the Add Stops dialog box. Choose a layer and selection set from the drop-down lists. If the layer contains a field with the order in which to visit the stops, choose it from the Order By drop-down list. If the layer contains a field with the duration of each stop, check the **Stop for** box and choose the field and units from the drop-down lists. Choose a field from the Stop Name drop-down list if you want directions to include the names of the stop features. Click **OK**.

8. To make changes to stops:

To do this...	Do this...
Schedule a stop arrival time, duration, or departure time	Right-click on a stop in the stop list in the Routing and Directions Manager and choose ***Schedule Stop*** to display the Stop Schedule dialog box. You can choose a Depart At time for the first stop, an Arrive By time for the last stop, and those choices plus a Stop For time for all other stops. Click **OK** when you are done.
Rename a stop	Right-click on a stop in the stop list in the Routing and Directions Manager and choose ***Rename*** to display the Rename Stop dialog box. Type a new name in the New Name edit box and click **OK**.
Choose the starting stop	Right-click on a stop in the stop list in the Routing and Directions Manager and choose ***Choose as Start***. Maptitude moves the stop to the start of the list. To have the route return to the starting stop, right-click on the starting stop and choose ***Choose as End***. Click Yes to confirm that you want the first stop to also be the last stop. Maptitude adds a duplicate of the stop at the end of the list of stops and marks it as the ending stop.
Choose the ending stop	Right-click on a stop in the stop list in the Routing and Directions Manager and choose ***Choose as End***. Maptitude moves the stop to the end of the list. If the stop you chose was the starting stop, Maptitude displays a Confirm dialog box. Click No to make it the last stop or click Yes to make a duplicate of the first stop so your route can return to the starting stop.
Move a stop up the list	Highlight any stop but the first and click  .
Move a stop down the list	Highlight any stop but the last and click  .
Reverse the order of the stops	Click  .
Remove a stop	Right-click on a stop in the stop list in the Routing and Directions Manager and choose ***Remove Stop***. Maptitude removes the stop from the list.
Remove all of the stops	Click  to display the Confirm dialog box, then click OK. Return to Step 7 to begin adding new stops.

9. Choose how to have Maptitude calculate the route:

Click...	To do this...
Get Directions	Maptitude finds a route that visits the stops in the order they appear in the Routing and Directions Manager.
Optimize	Maptitude determines the best order to visit the stops to minimize travel time or distance.

Maptitude draws the route on the map and displays in the Routing and Directions Manager the itinerary for the route along with a summary of the driving time, distance, duration (including rest time), and cost.

Click ⊞ in the Routing and Directions Manager to see the directions from one stop to the next. Click on a stop or on a step in the directions to see it labeled on the map. Click again to remove the label.

Click  in the Routing and Directions Manager to create a PDF report with maps and driving directions. Click  in the Routing and Directions Manager to create an Excel report with the stop order, times, and distances.

If you want, you can modify the stops some more as described in step 8 or by clicking and then clicking a stop and dragging it to a new location. Click **Get Directions** again to update the route based on the changes you made.

▶ To Save a Route

1. Click in the Routing and Directions Manager to display the Save Path As dialog box.
2. Choose a folder, enter a file name, and click **Save**.

Maptitude saves the route with its stops in a file with the extension ROUTEFILE.

▶ To Load a Route

1. Click in the Routing and Directions Manager to display the Open Route from File dialog box.
2. Choose a saved route file and click **Open**.

Maptitude removes any current route and its stops, and loads the saved route and its stops.

▶ To Clear the Routes and Stops

1. Click the clear button in the Routing and Directions Manager or close the Routing and Directions Manager by choosing ***Tools-Routing & Directions-Routing & Directions Manager***, clicking on the Standard toolbar, or clicking the Close button in the upper right corner of the Routing and Directions Manager.
2. Confirm that you want to clear the routes and stops.

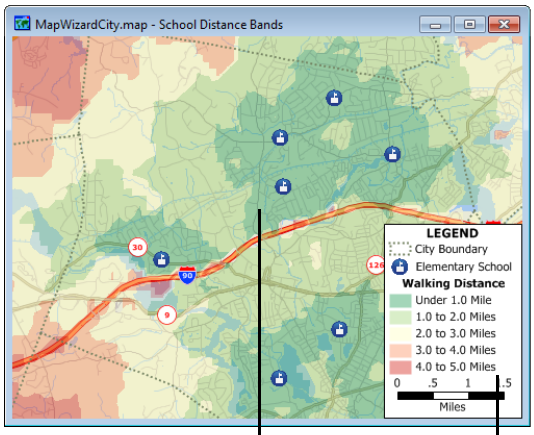
Maptitude clears the stops and routes from the map.

Try It Yourself: Finding the Best Route

1. Choose ***File-New*** and use Create-a-Map Wizard to create a general purpose map of the city where you live.
2. Click on the Standard toolbar to display the Routing and Directions Manager.
3. Enter your address in the boxes at the top of the Routing and Directions Manager and click **Add**.
4. Click in the Routing and Directions Manager and then click at a location somewhere north of your first stop, then click somewhere south, west, and east of your first stop for a total of five stops.
5. Click **Get Directions**. Maptitude finds the fastest route from your home address to the four stops, keeping the stops in the order that you chose them, and displays the route on the map. Notice the total driving time and driving distance for the route shown at the bottom of the Routing and Directions Manager.
6. Click **Optimize**. Maptitude finds the best order to visit the stops and displays the route on the map. Notice that the total driving time and driving distance have decreased.
7. Right-click on the first stop at your address and choose ***Choose as End***.
8. Click **Yes** to make a duplicate stop at your home address for the last stop.
9. Click **Optimize** again. Maptitude finds the best order to visit the stops and return to your home.
10. Click in the Routing and Directions Manager next to one or more stops to see the directions.
11. Click on the Standard toolbar to close the Routing and Directions Manager and click **Drop** when prompted.
12. Choose ***File-Close*** and click **No** to close the map without saving any changes.

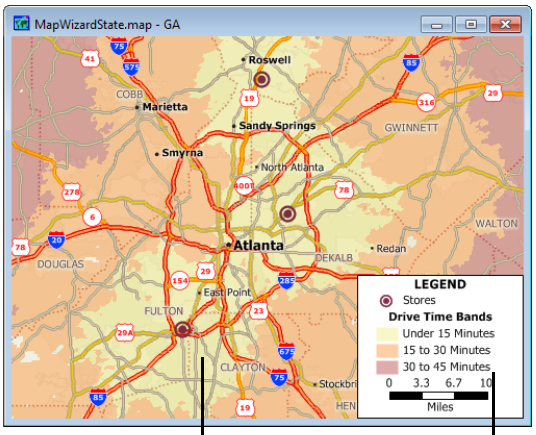
Creating Drive-Time Rings/Network Bands

A drive-time ring or network band encloses an area in which all or selected links or nodes in a line layer are within a certain **cost**, or value limit, of one or more origins. You can create drive-time rings that show the locations that are within a certain amount of time from the origins, or you can create distance rings that show the locations that are within a walking/driving distance of the origins.



The area inside this band is within a one mile walk of an elementary school

The maximum distance for these bands is 5 miles and the interval is 1 mile



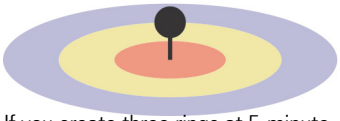
The area inside this band is within a 15 minute drive of a store

The maximum time for these bands is 45 minutes and the interval is 15 minutes

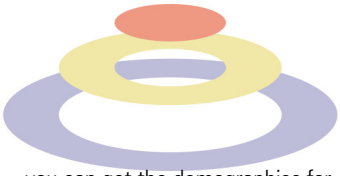
You choose the origins for the rings by clicking on the map or by using features in a point layer. You then choose the number of rings and the interval. Drive-time rings are specified in minutes and distance rings use the map units.

NOTE: You can choose to see the map scale in other units. Choose ***Edit-Preferences*** and choose the units from the Map Units drop-down list on the System tab.

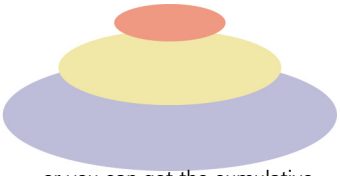
When you create drive-time rings, you can choose to calculate demographics for the rings. You can choose whether the demographics are for the individual rings or cumulative as illustrated here:



If you create three rings at 5-minute intervals like these...

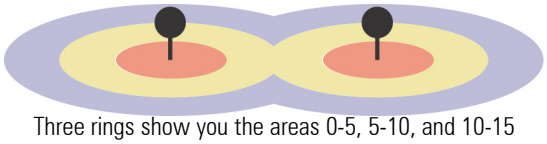


...you can get the demographics for the population in each ring (i.e., within 0-5, 5-10, and 10-15 minutes)

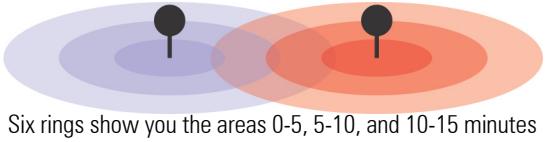


...or you can get the cumulative demographics for the rings (i.e., within 0-5, 0-10, and 0-15 minutes)

When you have more than one origin, you can choose whether the rings are merged or separate. For example:



Three rings show you the areas 0-5, 5-10, and 10-15 minutes from any origin



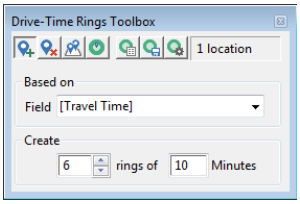
Six rings show you the areas 0-5, 5-10, and 10-15 minutes from each of the two origins

You can create up to 40 rings to a maximum extent of 500 miles or 240 minutes. Once you create your rings, you can save them to a file for use later or in other maps. You can also create a formatted report with the resulting map and demographics.

NOTE: You can change the minimum and maximum ring size and maximum number of rings by choosing ***Edit-Preferences*** and making changes on the Routing tab.

▶ To Create Drive-Time Rings

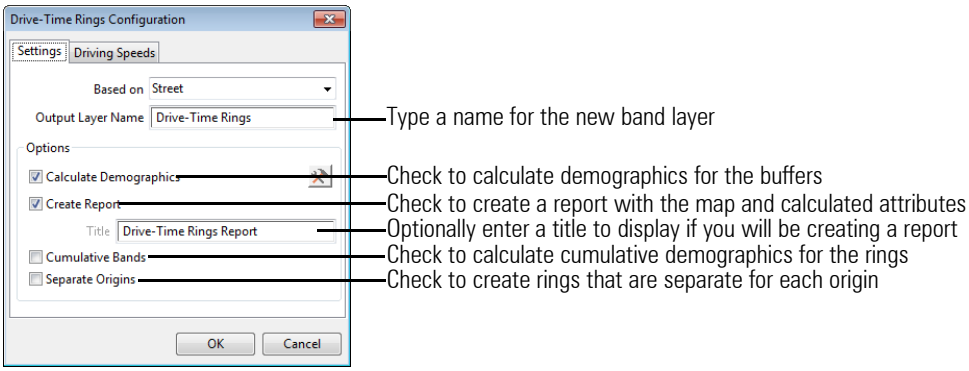
1. Choose ***Tools-Routing & Directions-Drive-Time Rings*** or click on the Standard toolbar to display the Drive-Time Rings toolbox.



2. Choose whether to minimize travel time or distance from the Based on Field drop-down list.
3. Choose how you want to define your origins as follows:

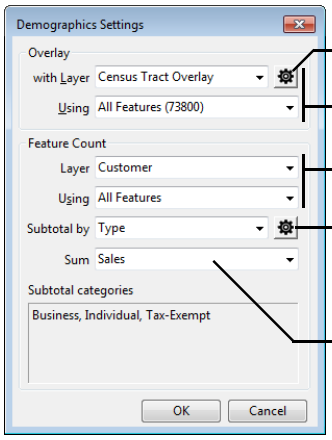
To do this...	Do this...
Choose the origins by clicking on the map	Click in the Drive-Time Rings Toolbox and click on one or more locations on the map. Click if you want to clear the locations and start over.
Choose the origins from features in a point layer	Click in the Drive-Time Rings Toolbox, choose the point layer that contains the origins from the Layer drop-down list, and choose whether to use all records in the point layer or a selection set from the Using drop-down list.

4. Click in the Drive-Time Rings Toolbox to display the Drive-Time Rings Configuration dialog box and make choices as follows:



TIP: Regardless of whether you choose to calculate demographics, you can export demographic overlay data and other information to Excel by making the resulting drive-time rings layer the working layer and clicking on the Standard toolbar.

To specify the attributes to calculate and/or the features to count in the bands, click to display the Demographic Settings dialog box and make choices as follows:



Click to change the aggregation method or fields. See page 322 for more information

Choose the reference layer and features to use

To count features in each band, choose the layer whose features you want to count and whether to use All Features or a selection set

To subtotal the counted features, choose a field to use for grouping and the category types to group (e.g., You could use the Type field in the landmark layer and choose to find the number of Banks, Restaurants, and Schools within the bands), or choose None to get the total count of features without subtotaling

Choose a field from the feature count layer to aggregate (e.g., You could calculate the total revenue of customers within the bands)

Click **OK** to close the Demographic Settings dialog box.

To adjust speeds for the street layer, click the Driving Speeds tab and use the sliders to make the speeds faster or slower for the different road classes. Driving speeds can only be adjusted when using the 2016 or later version of the HERE street file.

Click **OK** again to close the Drive-Time Rings Configuration dialog box.

5. Specify the number and size of the bands to create.
6. Click in the Drive-Time Rings toolbox.

   Maptitude creates the rings and displays them with a color theme so that they are easy to see.
7. If you want to save the rings layer to use later, click in the Drive-Time Rings toolbox to display the Save Drive-Time Rings dialog box, type a name for the file, and click **Save**.

NOTE: The ring layer is stored in a temporary file. In order to open the map again later with the drive-time rings, or to use the drive-time rings in another map, you must save the rings layer to a geographic file.

8. If you want to compute the demographics for the rings, click in the Drive-Time Rings toolbox. Maptitude calculates the overlay and displays the results in a dataview. If you checked the **Create Report** box, Maptitude also generates the report and displays it in a new window. Reports can be printed, saved, exported, and emailed. Close the report window when you are done.

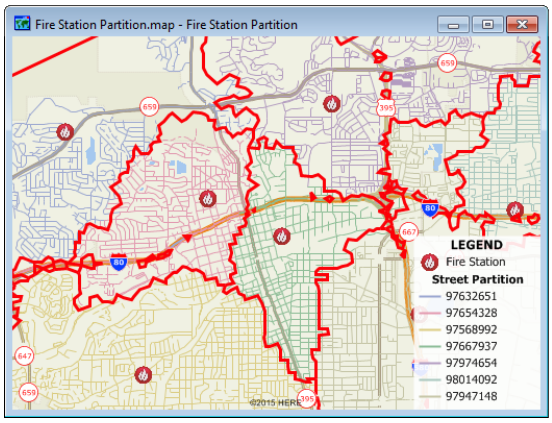
Try It Yourself: Creating Drive-Time Rings

1. Choose ***File-New*** and create a general purpose map of the city where you live.
2. Click on the Standard toolbar to display the Drive-Time Rings toolbox.
3. Click in the Drive-Time Rings toolbox to activate the Click Locations tool.
4. Click on your location on the map.
5. Verify that **[Travel Time]** is chosen from the Field drop-down list, change the number of rings to **3**, and change the size of the rings to **10** minutes.
6. Click in the Drive-Time Rings toolbox, verify that the **Calculate Demographics** and **Create Report** boxes are checked, and click **OK**.
7. Click in the Drive-Time Rings toolbox. Maptitude creates the rings and adds them to the map along with a color theme to illustrate the driving times. Now you can see the areas that are 0-10, 10-20, and 20-30 minutes from the location you clicked. Any portion of the map that is not covered by a ring is greater than 30 minutes from your location.
8. Click in the Drive-Time Rings toolbox. Maptitude computes the demographics, displays then in a dataview, and opens a Report showing the results.
9. Scroll down the report to see a map of the drive-time rings on the first page and demographic information on the second page. The demographics will vary depending on the Country Package you are using.
10. Close the report window and choose ***File-Close All*** to close the map and dataview. Choose **No to All** to close them without saving the changes.

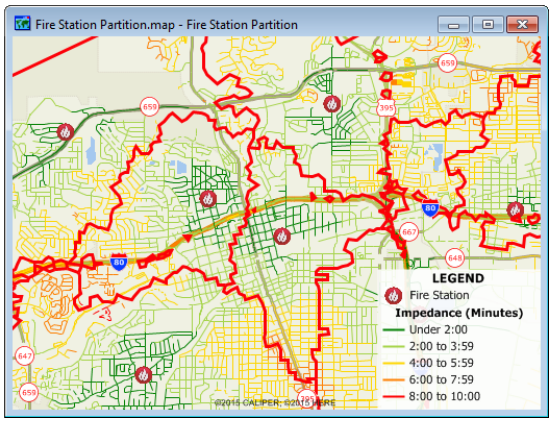
Partitioning a Network

Maptitude can **partition** a line layer into zones or territories, such that each link is assigned to the closest or least cost **service location**, based on a service value, such as driving distance or time. When you partition a network, Maptitude does not attempt to balance the size or amount of work involved in serving each partition.

The results are stored in a table that Maptitude joins to the line (or node) layer. In addition to the ID of the nearest service location, the partition table contains the impedance (time or distance) from that service location to the feature. You can choose to create a color theme that illustrates the partition results using either of these values as illustrated below.



The streets in this map are partitioned based on the travel times to the nearest fire station. They are displayed with a color theme based upon the ID of the closest station



You can create a different color theme on the cost of service that illustrates the time it takes to service any street from its nearest fire station.

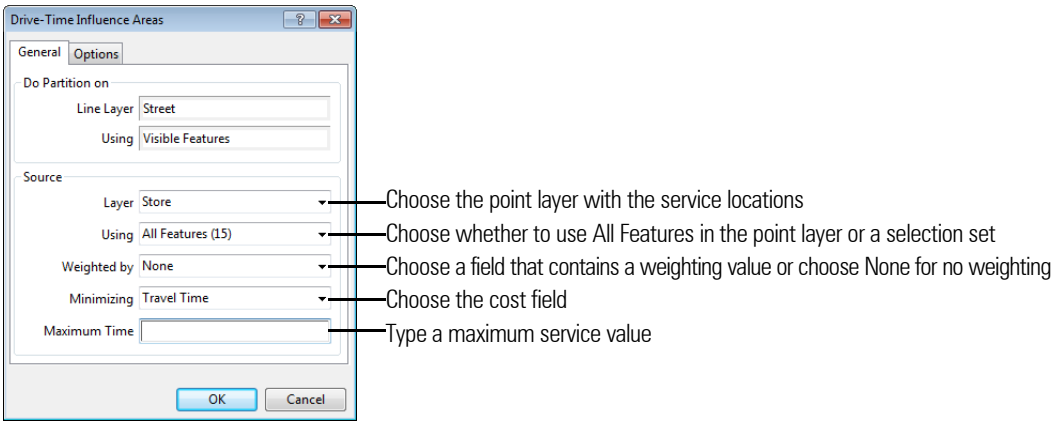
You can set a maximum value of the cost of service to any feature in a partition. When you use this option, the links and nodes that are above the maximum service value are not included in any of the partitions. In the link partition table, the service location and value fields will be left blank. For example, if you set a maximum service value of 10 minutes in building partitions, any link or node that is more than 10 minutes from any service location will remain unassigned. This option helps you find "holes" in a service network. **Note, the partition will only work on the features visible in the map window, so you should set the map scale to show the maximum region you want to partition before running the partitioning procedure.**

You can weight the partitions to create proportional partitioning. For example, if the network has a straight series of links between two service locations, the first location has a weight of 1, and second location has a weight of 2, then one third of the line is assigned to the first location and two thirds is assigned to the second location.

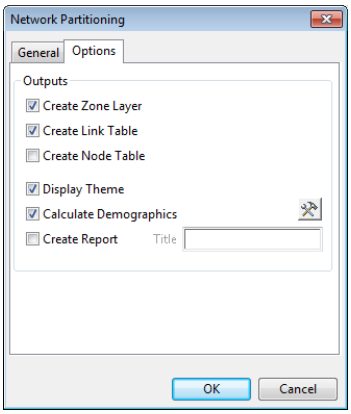
You also have the option of creating an area layer of zones around the partitions. The zones are areas that enclose all of the links in the same partition. When you create zones, you can also choose to calculate demographics for the zones.

▶ To Partition a Network

1. If necessary, select the service locations from a point layer and set the map scale to show the region you want to partition.
2. Choose the line layer with the service value from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Routing & Directions-Drive-Time Influence Areas*** to display the Drive-Time Influence Areas dialog box.
4. Make choices as follows:

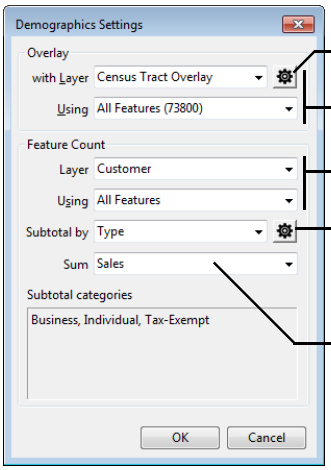


5. Click the Options tab and choose output options:



Option	What it does
Create Zone Layer	Creates an area layer that encompasses the partitioned links
Create Link Table	Joins the line partition table to the line layer
Create Node Table	Joins the node partition table to the node layer
Display Theme	Creates a color theme of the partition on the links
Calculate Demographics	Check to calculate demographics for the areas
Create Report	Check to create a report with the map and calculated attributes and optionally enter a title for the report

6. If you checked the **Calculate Demographics** box, you can specify the attributes to calculate and/or count features in the zones. Click  to display the Demographic Settings dialog box and make choices as follows:



Click to change the aggregation method or fields. See page 322 for more information

Choose the reference layer and features to use

To count features in each band, choose the layer whose features you want to count and whether to use All Features or a selection set

To subtotal the counted features, choose a field to use for grouping and the category types to group (e.g., You could use the Type field in the landmark layer and choose to find the number of Banks, Restaurants, and Schools within the bands), or choose None to get the total count of features without subtotaling

Choose a field from the feature count layer to aggregate (e.g., You could calculate the total revenue of customers within the bands)

Click **OK** to return to the Drive-Time Influence Areas dialog box.

7. Click **OK** to display the Output File Settings dialog box and save the link and/or node tables as follows:

   - Click in the Output File Settings dialog box if you want to browse for a different folder in which to store the link and/or node partition tables.
   - Type a name for the output file(s) in the Short File Name column. Files that exist and are in use must be renamed and are identified with an icon. Files that you are overwriting are identified with an icon.
   - Click OK to save the files.

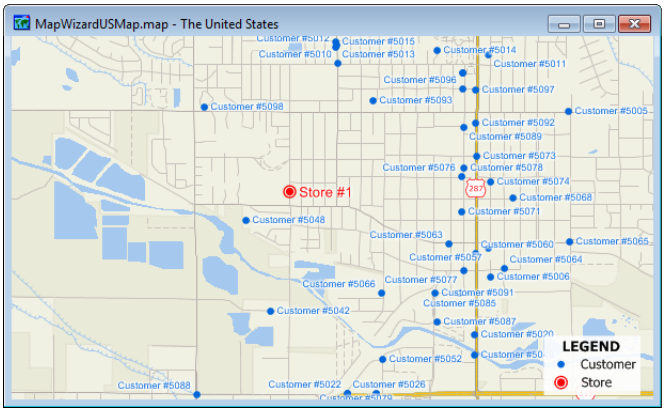
   Maptitude partitions the network, creates the link and/or node partition table, and displays the results.

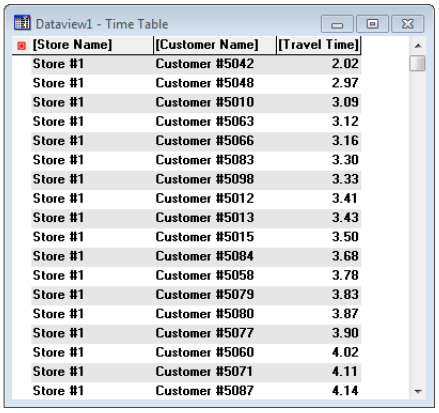
Try It Yourself: Partitioning a Network

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **NetworkBands.map** in the Tutorial folder. There is a selection set of intersections that are near high schools. You want to identify which school is closest to each street segment.
2. Choose ***Tools-Routing & Directions-Drive-Time Influence Areas*** to display the Drive-Time Influence Areas dialog box.
3. Choose **Intersection** from the Layer drop-down list, choose **Selection** from the Using drop-down list, choose **None** from the Weighted by drop-down list, and choose **LENGTH** from the Minimizing drop-down list.
4. Type "**10**" in the Maximum Distance edit box.
5. Click the **Options** tab.
6. Check the **Create Zone Layer** box, the **Create Link Table** box, and the **Display Theme** box.
7. Click **OK**. Maptitude displays the Output File Settings dialog box.
8. Type "**My Network Partition**" as the file name for the link table in the Short File Name cell of the grid, type "**My Partition Zones**" as the file name for the zones, and click **OK**. Maptitude partitions the network and displays the streets with a color theme and a new zone layer.
9. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Creating Distance and Travel Time Tables

You can create a table that shows the drive time or distance of features from one or more origins in a point layer to destination features in the same layer or another point layer. You can choose to see the resulting table with records for each origin-destination pair or as a matrix.





Dataview1 - Time Table

[Store Name]	[Customer Name]	[Travel Time]
Store #1	Customer #5042	2.02
Store #1	Customer #5048	2.97
Store #1	Customer #5010	3.09
Store #1	Customer #5063	3.12
Store #1	Customer #5066	3.16
Store #1	Customer #5083	3.30
Store #1	Customer #5098	3.33
Store #1	Customer #5012	3.41
Store #1	Customer #5013	3.43
Store #1	Customer #5015	3.50
Store #1	Customer #5084	3.68
Store #1	Customer #5058	3.78
Store #1	Customer #5079	3.83
Store #1	Customer #5080	3.87
Store #1	Customer #5077	3.90
Store #1	Customer #5060	4.02
Store #1	Customer #5071	4.11
Store #1	Customer #5087	4.14

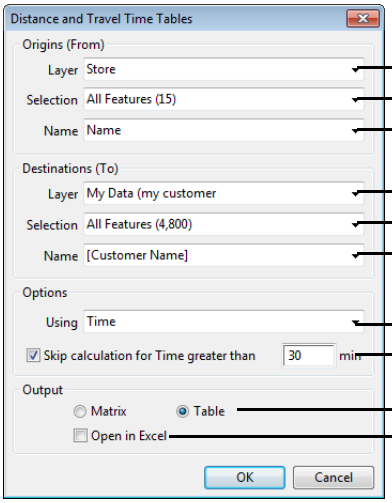
Dataview7 - Time Table:2

[Customer Name]	[Customer #1250]	[Customer #1251]	[Customer #1252]	[Customer #1253]	[Customer #1254]	[Customer #1255]	[Customer #1256]	[Custom
Store 1	62.38	62.39	59.42	56.90	57.01	58.35	57.87	
Store 2	39.88	39.89	36.93	34.40	34.51	35.85	35.38	
Store 3	26.17	26.15	27.91	25.80	25.91	26.70	25.48	
Store 4	25.55	25.56	24.90	22.38	22.49	23.83	23.35	
Store 5	48.07	48.08	45.11	42.59	42.70	44.04	43.57	
Store 6	32.10	32.09	32.26	31.38	31.49	31.05	29.83	
Store 7	25.06	25.05	23.77	22.89	23.00	22.56	21.34	
Store 8	20.11	20.10	19.40	18.53	18.64	18.20	16.98	

You also have the option of specifying a maximum drive time or distance. For example, you can find all of your customers within a 30-minute drive of your stores and save the results in a table that shows the drive-time to the nearest store for each of those customers.

▶ To Create Distance or Travel Time Tables

1. Open a map that contains either a point layer with origin and destination selection sets or two point layers.
2. Choose ***Tools-Routing & Directions-Distance and Travel Time Tables*** and make choices as follows:



- Choose the point layer that contains the origins
- Choose whether to use All Features or a selection set of origins
- Choose the field that contains the Name or other ID for the origins
- Choose the point layer that contains the destinations
- Choose whether to use All Features or a selection set of destinations
- Choose the field that contains the Name or other ID for the destinations
- Choose whether to create a table based on time or distance
- Enter a maximum time or distance
- Choose how to layout the results
- Check to display the results in Excel

3. Click **OK**. If you chose to create an Excel file, Maptitude launches Excel and displays the results. If you chose to create a table, Maptitude prompts you for a file name. Enter a file name and click **Save**. Maptitude displays the resulting table in a new dataview.

Using a GPS Receiver

With Maptitude and a GPS receiver you can:

- Track your own location with a portable computer
- Perform field data collection
- Create new or updated geographic files that mark map features
- Animate track data that contain the locations of vehicles or other objects over time

For example, salespeople who travel can mark the location of customers as they visit them, and line workers for the telephone company can mark the location of telephone poles as they find them.

Maptitude GPS System Requirements

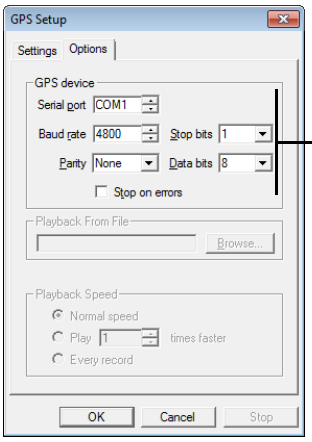
When you connect a GPS receiver to your personal computer, you can use this information with Maptitude to track your location or to create or update geographic files. To use a GPS receiver with Maptitude, you must have Maptitude installed on your computer, and you must have a GPS device with a serial port output in the NMEA 0183 format correctly installed and configured.

Setting Up a GPS Receiver

All GPS receivers with serial port output come with complete instructions on how to set up and configure the GPS receiver to interface with your computer. Before you use Maptitude with a GPS receiver, make sure that your GPS device is installed and configured correctly.

▶ To Change the GPS Port Configuration

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** to display the GPS Setup dialog box.
2. Click the Options tab to display the Options page and change settings as necessary:



3. Click **OK**.

Maptitude will use the new settings.

Using Maptitude with a GPS Receiver

You typically use GPS to track the location of the receiver in real time, or to record (log) the position of the receiver as a series of points to a geographic file for later display or analysis. The GPS receiver continuously monitors its location, reporting the location in degrees of longitude and latitude. Most GPS devices also report the following:

Item	Meaning
Altitude	Estimated altitude of the GPS receiver (distance above or below sea level)
Course (T)	Compass direction in which the GPS receiver is moving with respect to True North (Degrees clockwise from North)
Course (M)	Compass direction in which the GPS receiver is moving with respect to Magnetic North (Degrees clockwise from North)
Speed	Speed at which the GPS receiver is moving
Date/Time	The current date and time, GMT (Greenwich Mean Time)
DGPS	A differential GPS indicator. If the number is 1, a correction signal was received from ground stations to overcome distortions in satellite signal readings. If the number is 0, no correction signal was received.
HDOP	The horizontal dilution of precision, represented by a number that indicates the level of accuracy of the computed position of the GPS receiver. The position of the receiver is computed from the geometrical configuration of satellites. In an ideal configuration, the number is 1, but numbers less than 2 are considered good, and numbers less than 6 are often considered acceptable.

If your map units are miles, Maptitude reports the altitude and speed in feet and miles per hour. If your map units are kilometers, the altitude and speed are in meters and kilometers per hour.

NOTE: To change the map units, choose ***Edit-Preferences*** and pick a unit of measurement from the Map Units drop-down list on the System tab.

Maptitude can obtain updated information from the GPS receiver at any interval you choose. This interval, known as the sample interval, can be set to as little as 2 seconds or to as long an interval as you like. When you choose continuous tracking, the receiver position is updated on the Maptitude screen at the interval you specify. If you choose continuous logging, the position of the receiver is recorded to a geographic file at the same interval.

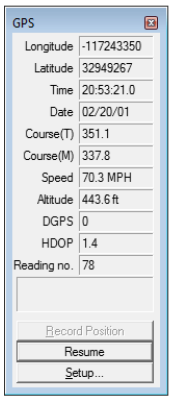
Maptitude provides two tracking options and three logging options. You can use up to four of these options at one time, combining continuous tracking and on-call logging in many different ways.

GPS Accuracy

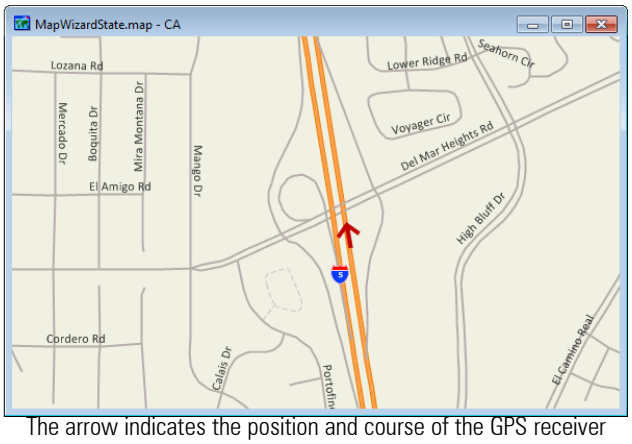
The accuracy of GPS readings must be considered along with the accuracy of geographic files that will be used as reference layers in a map. Typical GPS accuracy is about +/- 20 ft (6 meters). Expensive, high-end survey GPS equipment using differential GPS and ground stations can achieve even higher accuracy, to within a fraction of an inch. Geographic files also have varying levels of accuracy. The net result is that tracking of GPS positions on a map may show inaccurate registration between the actual position of the GPS unit and the underlying base map. This problem exists only in some large-scale mapping applications of GPS, and generally does not affect small-scale applications.

Tracking the Location of the GPS Receiver

You can choose to track position and other GPS data in a toolbox or you can display the GPS position and heading on any open map.



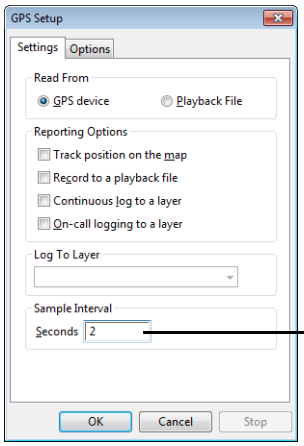
The GPS toolbox shows the position and other data



The arrow indicates the position and course of the GPS receiver

▶ To Track Your Location in the GPS Toolbox

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS Toolbox to display the GPS Setup dialog box and make choices as follows:



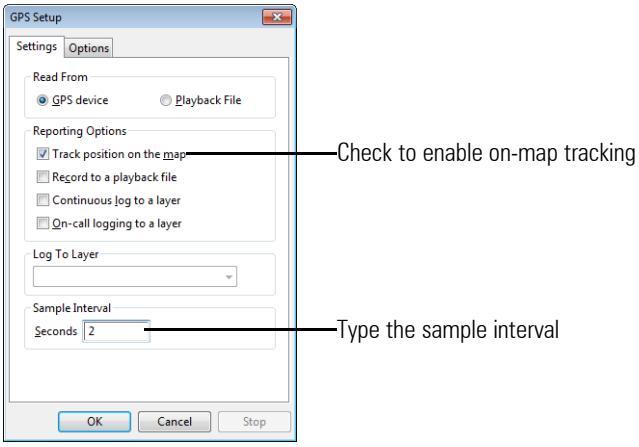
Type the sample interval

2. Click **OK**.

Maptitude initiates location tracking in the GPS toolbox.

▶ To Track Your Location on a Map

1. Click on the map on which you wish to track location.
2. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box and make choices as follows:



3. Click **OK**.

Maptitude shows the position and heading of the GPS receiver on the map. When your location gets close to the edge of the map, Maptitude redraws the map with your location at the center.

▶ To Stop On-Map Tracking

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click Stop, or clear the check from the **Track Position on the Map** box, and click **OK**.

Maptitude disables on-map location tracking.

Logging GPS Data

When you record GPS data to a geographic file, Maptitude adds point features to the file indicating the location of the GPS receiver.

Maptitude lets you automatically record GPS position data to a map layer or to a **playback file**. A playback file records the data logged by the GPS receiver so the data can be played back at a later time. Playback files can be used with Maptitude or other applications.

Logging GPS Data to a Layer

You can add data to a map layer in two ways: **continuous logging** or **on-call logging**.

When you use continuous logging, the position of the GPS receiver is automatically recorded to the layer at set time intervals. You use continuous logging when you want to record the entire sequence of points visited by the GPS receiver. For example, you may want to:

- Create a digital road map by driving an automobile equipped with a GPS receiver
- Record the coordinates that define a rail line from a railcar-mounted GPS receiver

- Record and review the position of a pickup-and-delivery vehicle at various times through the work day
- Record the position of a vehicle at certain intervals so you can calculate average speed during rush hour on a certain highway

When you record to a layer using on-call logging, the position of the GPS receiver is recorded to the layer only when you indicate that you want to save the current receiver position. You use on-call logging when you want to record the coordinates of specific locations. For example, you may want to:

- Record the position of manholes, telephone poles, or other fixed infrastructure locations
- Mark the location of bridges, guard rails, or signposts along a road or highway

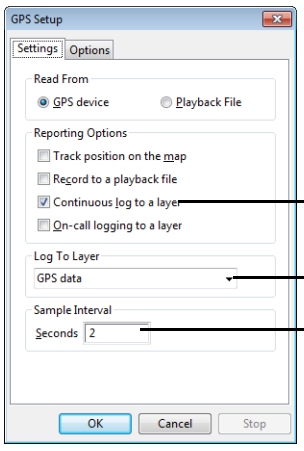
Data logged using continuous or on-call logging are stored in a standard format geographic file as a series of points. In addition to the longitude and latitude fields, the geographic file can contain any of the following fields: Elevation, Velocity, Heading, Date, Time, DGPS, and HDOP. Maptitude fills in whichever of these fields is present, and does not record the other information. For example, if the geographic file you choose does not contain fields for Heading and Date, then all but the Heading and Date information will be stored.

You can choose to log GPS data to an existing layer or to a new layer. When you choose to log GPS information to a new layer, Maptitude creates a new standard format geographic file with all the available fields. You can also add your own fields to the layer, for entering data about the points that are being recorded.

When you log to a layer, you can optionally include the layer as part of any open map. Note, however, that the map does not redraw automatically each time a new record is added to the file. If you want to see the location information updated continuously on the screen, use both the Track Position On the Map and the Continuous Log to a Layer options.

▶ To Log GPS Information to an Existing Layer on a Continuous Basis

1. Choose the layer you want to log to from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box and make choices as follows:

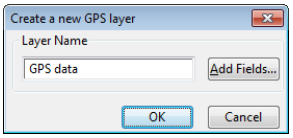


3. Click **OK**.

Maptitude adds points indicating the location of the GPS receiver at the sample interval you chose.

▶ To Log GPS Information to a New Layer on a Continuous Basis

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click the Settings tab, then check the **Continuous Log to a Layer** box.
3. Choose **New Layer** from the Log To Layer drop-down list. Maptitude displays the Create a New GPS Layer dialog box.



4. Use the default layer name or type a new layer name.
5. To add additional fields for entering data about the points being recorded:
   - Click **Add Fields**.
   - Add fields for your own data. For more information see "To Modify the Structure of a Table" on page 225.
   - Click **OK** to return to the Create a New GPS Layer dialog box.
6. Click **OK**. Maptitude displays the Save New Layer As dialog box.
7. Type the file name of the new geographic file and click Save.
8. Type the desired sample interval in the Seconds box.
9. Click **OK** to close the GPS Set Up dialog box.

Maptitude adds points indicating the location of the GPS receiver at the sample interval you chose.

▶ To Stop Continuous Logging

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click Stop, or clear the check from the **Continuous Log to a Layer** box, and click **OK**.

Maptitude disables continuous logging. If all output options are disabled, the GPS toolbox is closed.

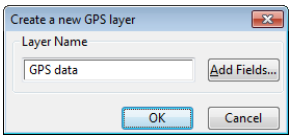
▶ To Set Up On-Call Logging to an Existing Layer

1. Choose the layer you want to log to from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
3. Click the Settings tab, then check the **On-call Logging to a Layer** box.
4. Click **OK**.

Maptitude will add points indicating the location of the GPS receiver when you click the Record Position button in the GPS toolbox.

▶ To Set Up On-Call Logging to a New Layer

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click the Settings tab, then check the **On-call Logging to a Layer** box.
3. Choose **New Layer** from the Log To Layer drop-down list. Maptitude displays the Create a New GPS layer dialog box.



4. Use the default layer name or type a new layer name.
5. To add additional fields for entering data about the points being recorded:
   - Click **Add Fields**.
   - Add fields for your own data. For more information see "To Modify the Structure of a Table" on page 225.
   - Click **OK** to return to the Create a New GPS Layer dialog box.
6. Click **OK**. Maptitude displays the Save New Layer As dialog box.
7. Type the file name of the new geographic file and click Save.
8. Click **OK** to close the Create a New GPS layer dialog box.

Maptitude will add points indicating the location of the GPS receiver when you click the Record Position button in the GPS toolbox.

▶ To Log a Position to the File

1. Click **Record Position** in the GPS toolbox. Maptitude adds a new point feature to the file.

▶ To Stop On-Call Logging

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click **Stop**, or clear the check from the **On-call Logging to a Layer** box, and click **OK**.

Maptitude disables on-call logging. If all output options are disabled, the GPS toolbox is closed.

Logging Raw Data to a Playback File

A playback file is a text file containing information produced by the GPS receiver in raw, unprocessed form. Playback files contain the data in a standard format, called NMEA 0183. You record data to a playback file when you want to:

- Illustrate tracking at a later date when no GPS receiver is available
- Go over the data later and log selected points to a geographic file
- Use the raw data in another program

When you use a playback file, you can choose continuous logging to a layer to log every record, or you can choose to log only selected points. To log selected points, you disable continuous logging to a layer. Then you play back the file, and select those points you want included in your map with the Record Position button in the GPS toolbox. Doing so can help you reduce the size of your GPS data files.

You can play back the file at normal speed, so that each record is displayed at the same speed it was recorded. You can also play back the file at a faster speed. If you choose to play the file back at two times normal speed, two records will be displayed in the time it took to log one record. This can save you time if the playback file contains data recorded over several hours.

If you want to play back records logged at fractions of a second, choose to play back every record.

▶ To Create a New Playback File for Raw Data Logging

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click the Settings tab and check the **Create a New Playback File** box. Maptitude displays the Create a New GPS Playback File dialog box.
3. Type a file name for the GPS file and click **Save**.
4. Type the desired sample interval in the Seconds box.
5. Click **OK**.

Maptitude is now set up to log raw data in the playback file.

▶ To Stop Raw Data Logging

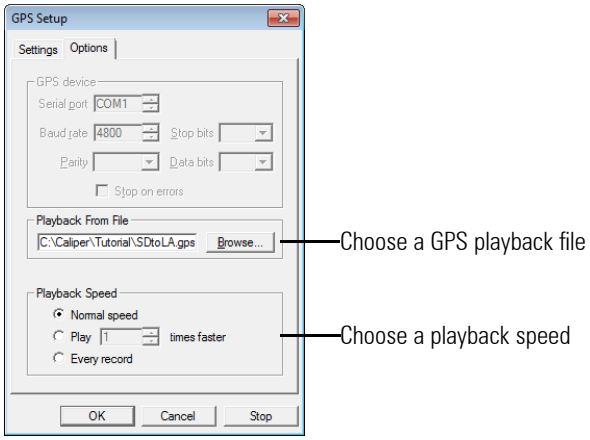
1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click **Stop**, or clear the check from the **Create a New Playback File** box, and click **OK**.

Maptitude disables on-call logging. If all output options are disabled, the GPS toolbox is closed.

▶ To Play Back Raw Data

1. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** or click Setup in the GPS toolbox to display the GPS Setup dialog box.
2. Click the Settings tab and click the **Playback File** radio button.
3. Check the boxes for the desired tracking and logging options.

4. Click the Options tab.



5. Type the location of the playback file in the text box, or click **Browse** to search for a playback file.
6. Choose the playback speed you want and whether to play back every record.
7. Click **OK**.

Maptitude initiates tracking and/or logging from the GPS file.

Try It Yourself: Playing a GPS Playback File

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **gps.map** in the Tutorial folder.
2. Choose ***Tools-Routing & Directions-GPS-Read GPS Data*** to display the GPS Setup dialog box.
3. Check the **Track Position on the Map** box.
4. Click the **Playback File** radio button. Maptitude displays the File Containing GPS Data dialog box.
5. Choose the **san diego to la.gps** file in the Tutorial folder and click **Open**.
6. Click the Options tab to display the Options page.
7. Click the **Play** radio button and type "**60**" in the Times Faster editable scroll list.
8. Click **OK**. Maptitude displays the GPS toolbox and displays the starting location on the map and in the toolbox. The map and toolbox update automatically as the file plays. You can close the toolbox to stop the file from playing at any time, or click OK when you reach the end of the file.
9. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Importing GPS Playback Data

You can import GPS playback data directly into a point geographic file, without using the GPS toolbox, using the ***File-Open*** or the ***Tools-Routing & Directions-GPS-Import GPS Playback Data*** command.

If you have a map open with a point layer, with the ***Tools-Routing & Directions-GPS-Import GPS Playback Data*** command you can add the GPS points to that layer. With both commands you can also add the GPS points to a new point geographic file.

If the points are along lines, you can connect the points; see "Connecting Points" on page 455.

▶ To Import GPS, GDB, or GPX Data

1. Choose ***File-Open*** or click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose **GPS Data** as the file type.
3. Choose the .GPS, .GDB, or .GPX file you want to open.
4. Click **Open**. Maptitude displays the Save Imported GPS Data As dialog box.
5. Type a name for the point geographic file, and click **Save**.

Maptitude imports the GPS playback file into the point geographic file.

▶ To Import GPS Playback Data

1. If you want to add points to an existing point geographic file, make sure it is an editable (.DBD) point layer in a map window.
2. Choose ***Tools-Routing & Directions-GPS-Import GPS Playback Data*** to display the Import GPS Playback Data dialog box.
3. Click and browse for the GPS playback file. Maptitude displays date, time, and size information for the file.
4. Make a choice as follows:

To do this...	Do this...
Use a point layer	Choose a point layer from the Layer drop-down list and click OK.
Create a new point geographic file	Choose New Database from the Layer drop-down list and click OK. Maptitude displays the Create a New GPS Layer dialog box. Type a layer name in the Layer Name text edit box. If you want to add fields, click Add Fields to display the New Table dialog box and add fields (see "To Create a New Table" on page 221 for more information), and click OK to return to the Create a New GPS Layer dialog box. Click OK to display the Save New Layer As dialog box. Choose a folder, type a file name, and click Save.

Maptitude imports the GPS playback file into the point geographic file.

Animating Track Data

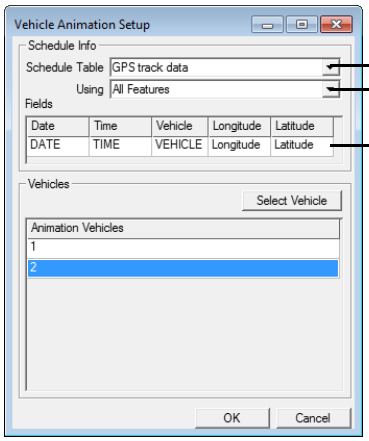
You can animate **track data**, which are tables containing records that track the locations of vehicles (or other moving objects) over time. Track data often come from GPS devices. You can show all or selected vehicles on the map as labels that Maptitude moves based on timestamps. You can also use a selection set to animate just some of the records in the track data.

A track data table has, at minimum, fields for the vehicle or object ID, the time stamp (date and time), and the location (longitude and latitude). Maptitude reads the locations, places a label (the ID) for each vehicle on the map, and moves the labels to new locations using the time stamps.

The Vehicle Animation toolbox has controls for choosing the date, the start and stop times, and the refresh rate.

▶ To Animate Track Data

1. If you want to animate a selection set of records, create a selection set of the track data table records, then make the map the active window.
2. Choose ***Tools-Routing & Directions-GPS-Animate GPS Data*** to display the Vehicle Animation Setup dialog box.
3. Make choices as follows:



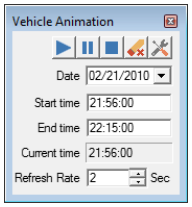
Choose a table; only tables that have the necessary fields will be listed

Choose All Records or a selection set

Choose the fields containing the date, time, vehicle or object ID, longitude, and latitude

By default, all vehicles will be animated. To change the vehicles, click Select Vehicles to display the Animation Vehicles dialog box. Use the Add/Drop button to choose the vehicles you want to display in the Selected Vehicles scroll list. Click **OK** when you are done to return to the Vehicle Animation Setup dialog box.

4. Click **OK** when you are done to display the Vehicle Animation toolbox.



5. Make choices as follows:

To do this...	Do this...
Start the animation	Click ▶.
Pause the animation	Click ⏸. Click ⏸ again to restart the animation.
Stop the animation	Click ■.
Clear the labels	After you have stopped the animation, click 🧹.
Change the date	Make a choice from the Date drop-down list.
Change the start time	Type a time in the Start Time edit box in the form HH:MM:SS.

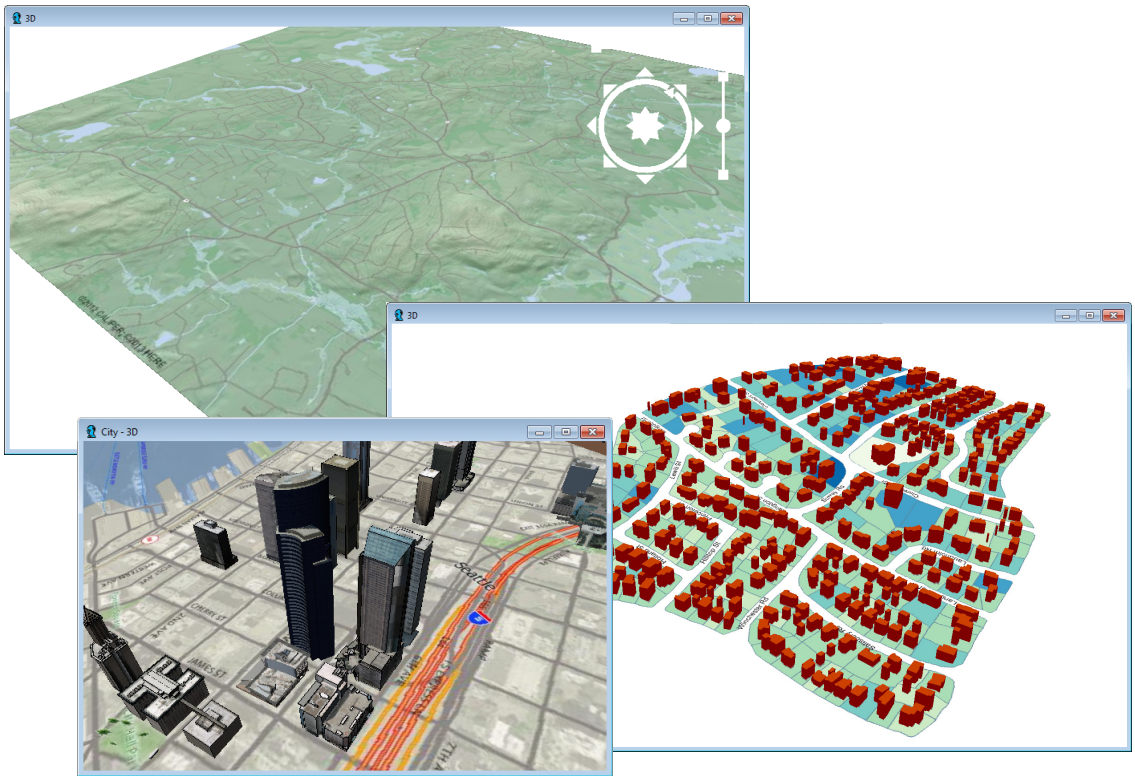
To do this...	Do this...
Change the end time	Type a time in the End Time edit box in the form HH:MM:SS that is after the start time.
Change the refresh rate	Make a choice from or type a value in the Refresh Rate editable drop-down list.
Change the configuration	Click  to display the Vehicle Animation Setup dialog box and return to Step 3.

6. When you are done, choose ***Tools-Routing & Directions-GPS-Animate GPS Data*** or click the close box in the upper-right corner of the toolbox.

CHAPTER 12:
Surface Analysis Tools

With Maptitude you can analyze and display terrains on a two-dimensional map in a map window or as a 3D map in a 3D View. You can prepare the terrain from a regular or irregular set of points in a point layer, or from a regular set of points in a grid layer.

For each point there is an elevation value, typically measured in feet or meters above sea level. Maptitude can also create terrains that represent data values such as a measure of air pollution or levels of radon gas over a geographic region. These models may be used to generate contours or to interpolate data values at specific locations.



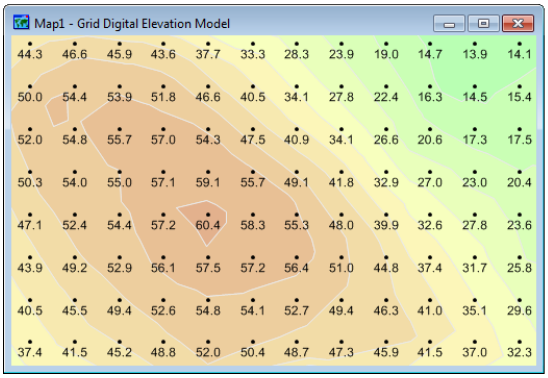
In this chapter:

Digital Elevation Models (DEM)

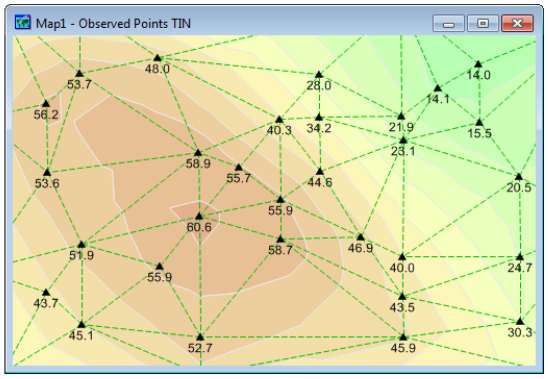
A Digital Elevation Model (DEM) is a specialized database that represents the relief of a surface between points of known elevation. Similar to other geographic data sets, DEMs are referenced to a known coordinate system. The coordinate values are stored as degrees of longitude and latitude.

Creation of a DEM begins with the capture of an irregular array of elevations. These points, commonly referred to as the "original observations," are used as input to an interpolation routine that will approximate the nature of the terrain between sample points.

Original elevation observations may be derived from any one or a combination of sources such as ground surveys, photogrammetric data capture, and cartographic data sources. For example, The United States Geological Survey (USGS) provides topographic data for the US as a series of rectangular grid DEM products that are derived from photogrammetric data sources and USGS topographic maps. The process of interpolation typically results in the creation of one of two commonly used DEM data structures: a rectangular grid of elevations, or a triangulated irregular network (TIN).



A gridded DEM



A TIN

Rectangular grids provide a simple data structure in which data values are interpolated to create an evenly spaced grid across a geographic region. Rectangular grids can be stored in a grid geographic file and displayed as a grid layer.

TIN structures are based on triangular elements with vertices at sample elevations, and are derived through a form of interpolation that assumes that the surface between three points is a plane. The elevations for the points are stored in a point geographic file, and you can create a TIN from all or selected points in a point layer. Although TINs are a more complex data structure than rectangular grids, they are suited to the modeling of irregularities in a surface, and handling variations in the density of sample points.

Maptitude uses triangulation to interpolate terrains between sample data points (observations) and generate a TIN data structure. The TIN can be used as an input to a variety of terrain visualization and analysis functions, including elevation calculation, visibility analysis, and contour generation. You can also create a grid geographic file from a TIN.

Grid Layers

A grid layer stores a set of values for a regular array of cells; the cells are usually square. Grid layers are another type of map layer that Maptitude can use, in addition to point layers, for terrain analysis and 3D maps. Grid layers allow you to store any regular array of values. A common type of grid layer is a digital elevation model with regularly-spaced heights for a terrain.

A grid layer is stored in a grid geographic file. A grid geographic file stores just a value for each cell in the grid. The coordinates of the corners of the grid cells do not need to be stored, because they can be computed from the origin of the grid and the height and width of each cell, which are also stored in the grid geographic file.

The grid is assumed to be aligned with the projection or coordinate system. If you have gridded data that are at an angle to the projection or coordinate system, you will need to use other software to rotate the grid into alignment before using the grid with Maptitude.

A grid geographic file is much smaller and draws much faster than a point geographic file. However, point geographic files are necessary for storing scattered rather than regular spot values. Maptitude allows you to use either a grid layer or a point layer when you do terrain analysis or create a 3D map.

Performing Terrain Analysis

To do terrain analysis you must first prepare the terrain with the ***Tools-3D-Terrain Analysis Toolbar*** command. A grid layer requires very little preparation, but for a point layer Maptitude must create the triangulated irregular network (TIN). After the terrain is prepared, you can:

- Calculate the elevation at a point
- Do visibility analysis
- Draw an elevation profile between two points
- Create contours as a line or area geographic file
- Create a 3D map
- Find the shortest path over terrain (on a Grid layer only)

You can also export the TIN for a point layer into two different formats:

- A rectangular grid DEM as a grid geographic file
- TIN facets as an area geographic file

Preparing for Terrain Analysis

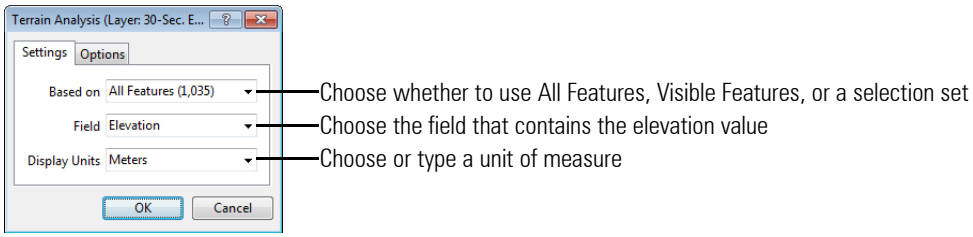
To analyze a terrain based on a point layer, Maptitude must create the triangulated irregular network (TIN). Maptitude can support multiple levels of interpolation during the creation of a TIN to smooth contour lines during contour generation. Interpolation creates new "height" values between sample points. Level 0 does no contour smoothing, while levels 1, 2, and 3 provide increasing levels of interpolation and smoothing. You can also choose to outline the TIN so that you can see the extent of the terrain.

To analyze a terrain based on a grid layer, you just need to tell Maptitude what field to use as the elevation values. Once the terrain is prepared, Maptitude displays the Terrain Analysis toolbar. After closing the toolbar, Maptitude must prepare the terrain again before you can use the toolbar.

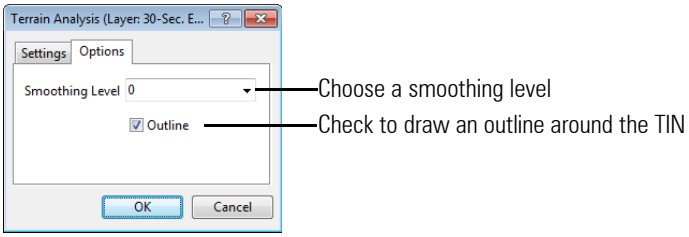
You can only do terrain analysis on one layer at a time in a single map. If you want to do terrain analysis on another layer or with another map, first close the Terrain Analysis toolbar, then make the other layer the working layer and choose the ***Tools-3D-Terrain Analysis Toolbar*** command.

▶ To Prepare for Terrain Analysis Using a Point Layer

1. Open a point geographic file, or choose a point layer in the current map.
2. Choose ***Tools-3D-Terrain Analysis Toolbar*** to display the Terrain Analysis dialog box and make choices as follows:



3. Click the Options tab to display the Options page and make choices as follows:

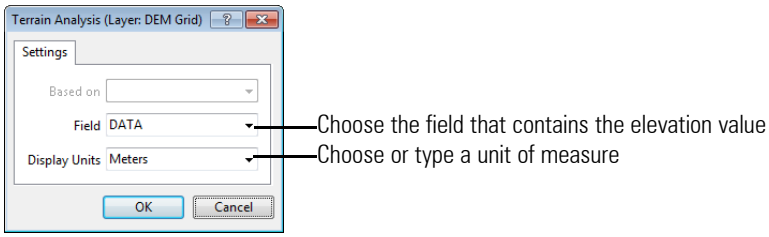


4. Click **OK**.

Maptitude creates a TIN data structure and displays the Terrain Analysis toolbar.

▶ To Prepare for Terrain Analysis Using a Grid Layer

1. Open a grid geographic file, or choose a grid layer in the current map.
2. Choose ***Tools-3D-Terrain Analysis Toolbar*** to display the Terrain Analysis dialog box and make choices as follows:



3. Click **OK**.

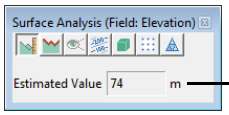
Maptitude displays the Terrain Analysis toolbar.

Calculating a Spot Elevation

You can use the elevation tool in the Terrain Analysis toolbar to determine the elevation at a specific geographic location. Maptitude uses the grid layer or the TIN to estimate the height at that location.

▶ To Calculate a Spot Elevation

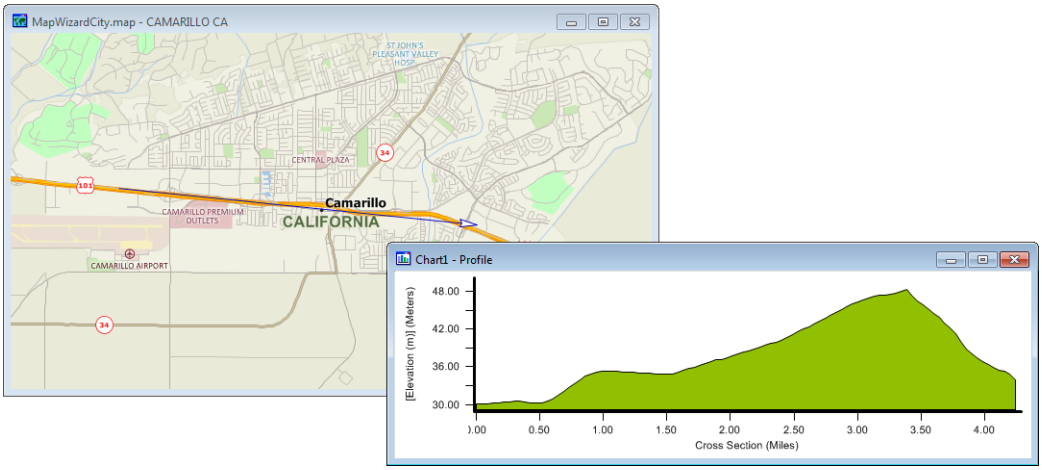
1. Prepare your data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click  in the Terrain Analysis toolbar to activate the Calculate Spot Data tool.
3. Click on a location within the grid layer or TIN.



Maptitude displays the estimated elevation in the text box in the Terrain Analysis toolbar.

Creating a Profile Drawing

The elevation of the landscape may vary between any two points on the earth's surface. The terrain can be shown by graphing the elevation at intervals between these two points. Such a graph is usually called a surface profile drawing or profile chart. Using Maptitude you can generate a profile drawing by defining the endpoints of the profile. Maptitude calculates elevation at regular intervals between these two points and displays the profile in a new figure window.



▶ To Create a Profile Drawing

1. Prepare your data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click  in the Terrain Analysis toolbar to activate the Show Profile tool.
3. Click on the map at the beginning of the profile line, move the cursor to the end of the profile line, and click again.

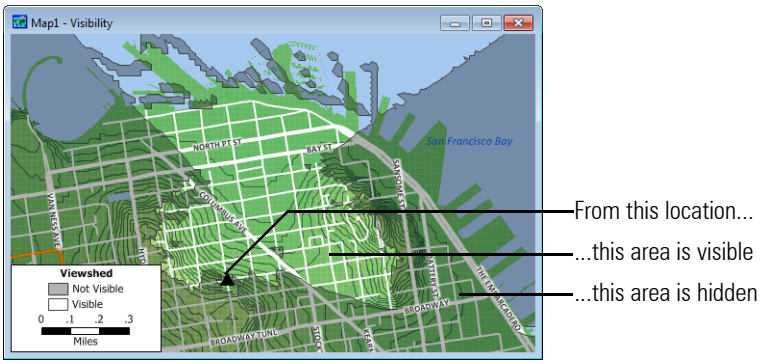
Maptitude creates a new area chart in a figure window showing the profile and adds a line annotation to the map to show the location and direction of the profile. If any portion of the profile line is

outside the TIN or the grid layer, no profile can be created for that portion of the line, and that portion of the area chart will be blank. You can save the figure window or add it to a layout. You can use the Pointer tool to edit or delete the line annotation.

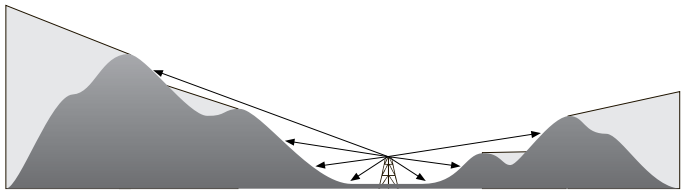
You can repeat step 2 to create other profiles. If you create another profile, the line annotation for the first profile is deleted.

Doing Visibility Analysis

If a terrain is flat, you can see all the way to the horizon. If a terrain has hills and valleys, you can see some parts of the terrain (the viewshed) and other parts are hidden. Maptitude can calculate the areas that you can and cannot see from a specific location. This is called visibility analysis.



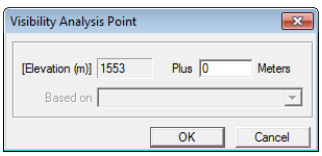
If you are evaluating a site for a transmission tower or a similar structure, you need to analyze the visibility from a vantage point above the surface. Maptitude lets you define a height increment to be added to the elevation at that location.



Visibility analysis creates a geographic file that contains two area features, one made up of all the areas that can be seen from your viewpoint (the viewshed) and the other made up of all the areas that are hidden.

▶ To Do Visibility Analysis from a TIN

1. Prepare your TIN data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click  in the Terrain Analysis toolbar to activate the Create a Visibility Map tool.
3. Click at a location. Maptitude displays the Visibility Analysis Point dialog box.

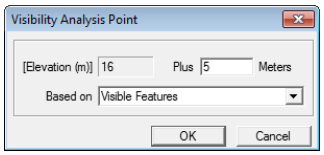


4. If you want the viewpoint to be above the surface, type a value in the Plus edit box.
5. Click **OK**. Maptitude displays the Save Visibility Map File As dialog box.
6. Type a name for the new area geographic file and click **Save**.

Maptitude adds a new area layer to the map showing the viewshed, with a color theme that fills the area outside the viewshed with a crosshatch pattern to indicate that it is not visible.

▶ To Do Visibility Analysis from a Grid DEM

1. Prepare your grid data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click  in the Terrain Analysis toolbar to activate the Create a Visibility Map tool.
3. Click at a location. Maptitude displays the Visibility Analysis Point dialog box.



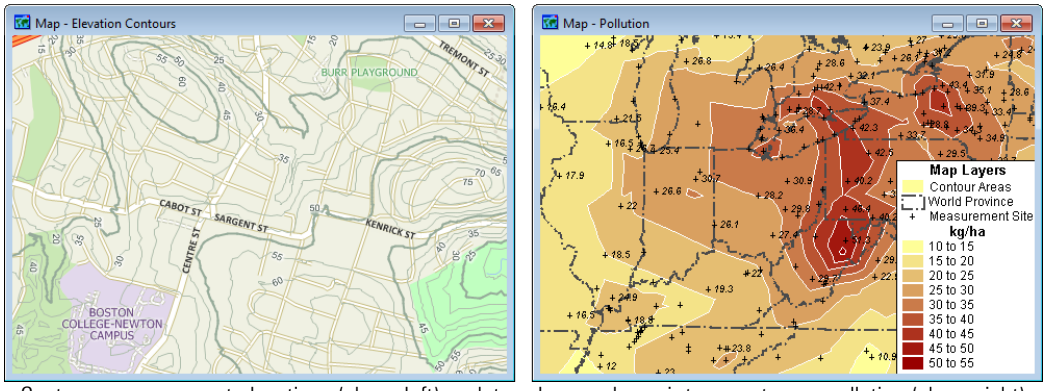
4. If you want the viewpoint to be above the surface, type a value in the Plus edit box.
5. Choose the features to use from the Based On drop-down list.
6. Click **OK**. Maptitude displays the Save Visibility Map File As dialog box.
7. Type a name for the new area geographic file and click **Save**.

Maptitude adds a new area layer to the map showing the viewshed, with a color theme that fills the area outside the viewshed with a crosshatch pattern to indicate that it is not visible.

Generating Contours

A map may be marked by lines that represent the elevation or height of a data value. These lines, known as **contour lines**, are imaginary lines that pass though points of equal elevation or height. A contour map typically shows multiple contour lines.

Maptitude supports the creation of contours as either area features or line features. If you create contours as areas, Maptitude will add a color theme to emphasize the contours.



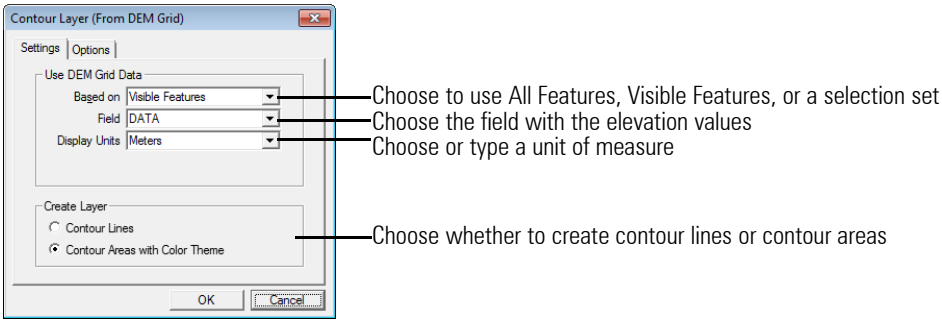
Contours can represent elevations (above left) or data values such as air temperature or pollution (above right)

Contours are separated by a regular height difference known as the **contour interval**. Maptitude allows you to choose between automatic and manual definition of the contour interval. If you choose manual definition, you specify the contour interval. The contour interval that is used to display elevation data should be chosen according to the scale of the map and the nature of the terrain being represented.

For line intervals, you can also define a major and minor contour interval. For example, major contour lines may be separated by an interval of 500 feet and, between these lines, minor contour lines may be drawn with an interval of 100 feet. The major contour interval is always a multiple of the minor interval. If you indicate a major contour interval, Maptitude creates a color theme with a bolder line style for major contours, based on the Major field. You can also use the Value field to label the contours with their elevation, and you can use selection sets to further distinguish major and minor contour lines.

▶ To Generate Contours from a Grid DEM

1. Prepare your grid data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click  in the Terrain Analysis toolbar to display the Contour Layer dialog box.
3. Make choices as follows:



4. Click the Options tab.
5. Choose Automatic or Manual from the Contour Intervals radio buttons.
6. If you chose manual contour intervals, enter the contour intervals as follows:

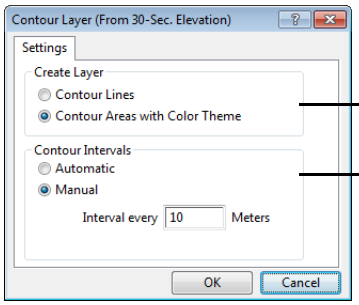
To create...	Do this...
Lines	Type a value for the interval in the Minor Interval edit box
Lines with major and minor intervals	Type a value for the minor interval in the Minor Interval edit box and a larger value for the major interval in the Major Interval Every edit box
Areas	Type a value for the interval in the Interval Every edit box

7. Click **OK**. Maptitude displays the Save Contour Layer File As dialog box.
8. Type a name for the geographic file and click **Save**.

Maptitude creates a contour layer and redraws the map to display the contour layer.

▶ To Generate Contours from a TIN

1. Prepare your TIN data for terrain analysis as described in "Preparing for Terrain Analysis" on page 353.
2. Click in the Terrain Analysis toolbar to display the Contour Layer dialog box.
3. Make choices as follows:



4. If you chose manual contour intervals, enter the contour intervals as follows:

To create...	Do this...
Lines	Type a value for the interval in the Minor Interval edit box
Lines with major and minor intervals	Type a value for the minor interval in the Minor Interval edit box and a larger value for the major interval in the Major Interval Every edit box
Areas	Type a value for the interval in the Interval Every edit box

5. Click **OK**. Maptitude displays the Save Contour Layer File As dialog box.
6. Type a name for the geographic file and click **Save**.

Maptitude creates a contour layer and redraws the map to display the contour layer.

Try It Yourself: Performing Terrain Analysis

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **contour.map** in the Tutorial folder.
2. Choose ***Tools-3D-Terrain Analysis Toolbar*** to display the Terrain Analysis dialog box.
3. Choose **All Features** from the Based On drop-down list, **Elevation** from the Field drop-down list, and **Meters** from the Display Units drop-down list.
4. Click **OK**. Maptitude displays the Terrain Analysis toolbar.
5. Click in the Terrain Analysis toolbar to display the Contour Layer dialog box.
6. Click the **Contour Areas with Color Theme** radio button and click **OK**. Maptitude displays the Save Contour Layer File As dialog box.
7. Type "**My Contours**" as the file name and click **Save**. Maptitude creates an area contour layer and displays it on the map with a color theme.
8. Click in the Terrain Analysis toolbar to activate the Calculate Spot Data tool, and click anywhere on the contours. The estimated elevation for the point where you click is shown in the toolbox.
9. Click in the Terrain Analysis toolbar to activate the Show Profile tool, and click on two locations on the contours. Maptitude adds a line annotation to the map and creates a new figure window showing the profile along the line as an area chart.
10. Choose ***File-Close All*** and click **No to All** to close the map and figure windows.

Showing 3D Terrain

You can create a 3D map from a terrain. For more information on 3D maps, see "Working with Three-Dimensional Maps" on page 361.

▶ To Show 3D Terrain

1. Click in the Terrain Analysis toolbar.

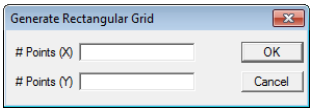
Maptitude creates a 3D Surface layer of the visible map, displays it in a 3D View, and displays the 3D Tools toolbar.

Creating a Rectangular Grid DEM from a TIN

Maptitude can create a rectangular grid DEM from a triangulated irregular network (TIN) data structure and save it into a grid geographic file. The number of points that will make up the grid is defined by entering the number of points to be placed on the x and y axis.

▶ To Create a Rectangular Grid DEM from a TIN

1. Click in the Terrain Analysis toolbar to display the Generate Rectangular Grid dialog box.

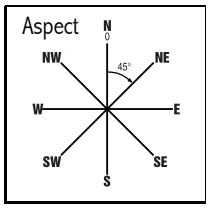


2. Type the number of points that will make up the grid in the # Points (X) and # Points (Y) edit boxes.
3. Click **OK**. Maptitude displays the Save As dialog box.
4. Type a name for the geographic file and click **Save**.

Maptitude creates a rectangular grid that covers the same geographic area as the existing TIN and redraws the map to display the grid.

Creating an Area Geographic File from a TIN

A triangulated irregular network (TIN) is a transient data structure that is created "in the background" to support terrain analysis. When you close the Terrain Analysis toolbar the TIN is deleted. Maptitude allows you to save the TIN as triangular facets in an area geographic file and to display the TIN as a map layer.



In addition, Maptitude generates a data table that stores the gradient and aspect of each facet in the TIN. Aspect is defined according to the diagram to the right, and describes the compass direction that a triangular plane faces. Gradient and aspect may be used to create effective themes that illustrate the characteristics of a terrain.

▶ To Create an Area Geographic File from a TIN

1. Click  in the Terrain Analysis toolbar to display the Save As dialog box.
2. Type a name for the geographic file and click Save.

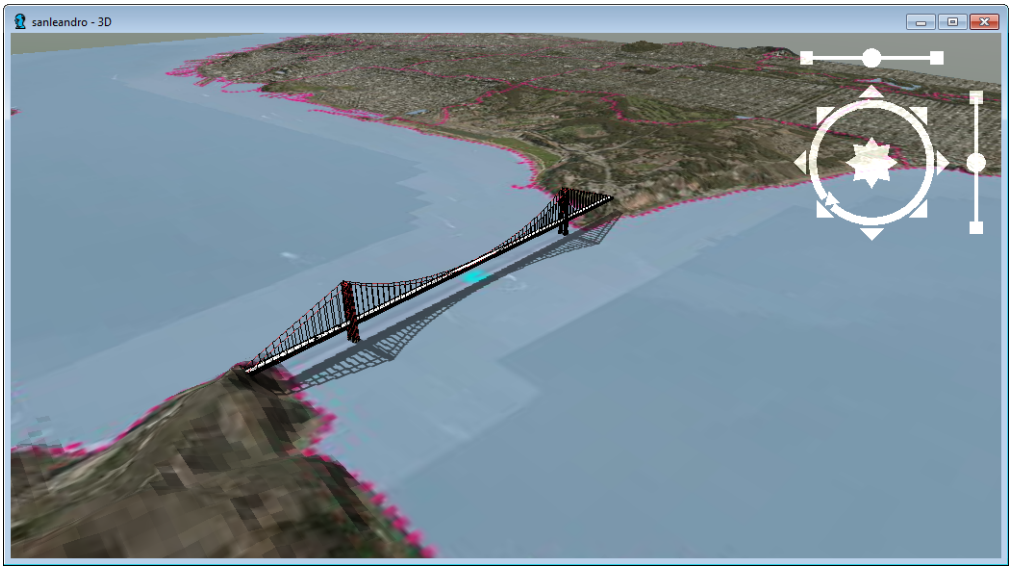
Maptitude saves the TIN as an area geographic file and displays the TIN as a map layer.

Working with Three-Dimensional Maps

Maptitude can create a three-dimensional (3D) map in a 3D View. 3D Views can be comprised of one or more of the following types of 3D layers:

- **Surface Layers** which are generated from a map or image draped over a 3D surface that is defined by a grid layer, such as a digital elevation model (DEM), or a point layer that has a field containing elevation values. These are similar to 3D maps in previous versions of Maptitude.
- **Footprint Layers** which are extruded from an area layer such as building footprints. Footprints Layers are a simple way to represent buildings in a 3D view where they display as prisms with height defined in an attribute field in the area layer. These are similar to 3D map prisms in previous versions of Maptitude.
- **Model Layers** which are point layers with information about model files, where each model would be a building, bridge, or other structure. Model files can be stored in various 3D formats.

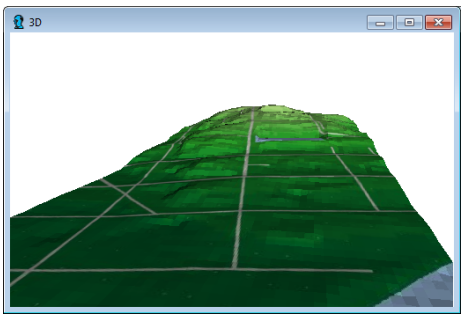
Maptitude uses the information in the 3D layers to create a 3D view. You can have any number of 3D layers in a 3D View and you can control which ones are visible. For example, the 3D view below has a surface layer made from a map of San Francisco and a model layer that contains a model of the Golden Gate Bridge.



Once you have created a 3D view, you can view it from various angles using tools in the 3D Tools toolbar. You can also move through your 3D view and visit particular viewpoints automatically using a flight path.

About Surface Layers

Surface layers in a 3D view require a point or grid layer in the map with a field containing elevation data. When you add a surface layer to a 3D view, you can specify the elevation units and apply an optional offset value.



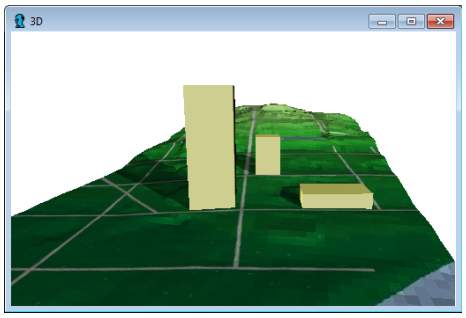
For example, the 3D View to the right shows a map with a color theme on elevation and some roads. The 3D View uses elevation data in a hidden digital elevation model layer to drape the map over the surface elevation.

About Footprint Layers

A footprint layers is created from an area layer in a map and is displayed in the 3D View as prisms. The area layer you use to create the footprint prisms requires two fields with the following data:

- **Base Elevation:** A field that contains the ground level elevation (i.e., the base of the prism)
- **Building Height:** A field that contains the height of the building (i.e., the height of the prism)

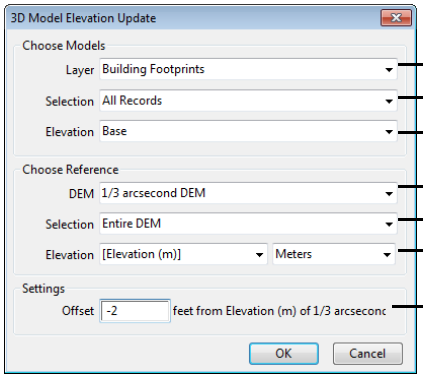
For example, the 3D View to the right shows a surface layer with an additional footprint layer. The base elevation value insures that each prism in the footprint layer is properly displayed on the surface, and not under or over it. The building height value determines the height of each prism.



If your area layer does not contain base elevation values, you can use the ***Tools-3D-3D Model Elevation Update*** command to automatically fill a field with elevation data from a point layer or digital elevation model.

▶ To Fill a 3D Footprint Area Layer Field with Base Elevation Values

1. Open a map that contains the area layer to be used as a 3D Footprint Layer and a point layer that contains elevation data.
2. Make the area layer the working layer.
3. Choose ***Tools-3D-3D Model Elevation Update*** to display the 3D Model Elevation Update dialog box and make choices as follows:

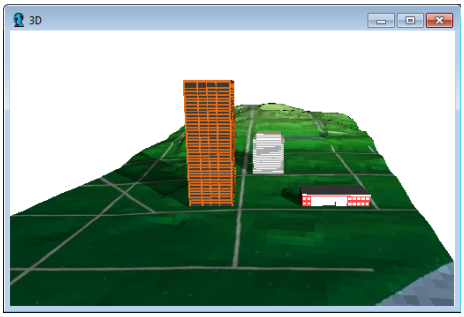


Choose the area layer that contains the footprints
Choose whether to fill All Records or a selection set
Choose the field to fill with base elevation data
Choose the layer that contains elevation data
Choose what features to use
Choose the field that contains elevation data and the units
Enter an optional offset value (for example, a negative number to extend the prism somewhat below the surface)

4. Click **OK**.

Maptitude fills the chosen field with base elevation values.

About Model Layers



Model layers are point layers with information about model files, where each model would be a building, bridge, or other structure. Maptitude supports models in several 3D formats:

- WRL: the format of the Virtual Reality Modeling Language (VRML)
- 3DS: the format of AutoDesk 3D Studio Graphics
- IV: the format of AutoDesk Inventor 3D
- SKP: the format of Trimble Sketchup

Model layers can have any number of data fields containing any data that you may have. In general, the fields in these layers and their contents are managed by Maptitude. When you use Maptitude to create a new model, the requisite model fields are created for you automatically. As you use the editing tools to add, move, scale, and rotate models, Maptitude automatically populates the fields with the data it needs to render the models as you have specified. Model layers will contain the following fields:

Field	Description
Model File	The file name of the file containing the model
X Scale	The scale in the X dimension
Y Scale	The scale in the Y dimension
Z Scale	The scale in the Z dimension
X Rotation	The rotation in the X dimension
Y Rotation	The rotation in the Y dimension
Z Rotation	The rotation in the Z dimension
Rotation Angle	The angle of rotation
Center	A value of zero means the model coordinates are used as-is, a value of 1 means the coordinates are translated so the model is centered around the location where it is placed
Elevation	The elevation of the feature
Low Res. Model File	The optional file name of the file containing a low resolution version of the model
Low Res. Transition	The area in pixels at which to transition to the low resolution version of the model
Hide Transition	The area in pixels at which to hide the model

Unless you already have a geographic file conveniently containing the point geographic locations of buildings, utilities or other objects that you wish to adapt and use as a model layer, you will typically not create or modify these fields on your own. If you do have such a geographic file, you will need to modify the attribute table to include the fields listed above.

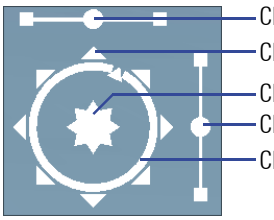
About the 3D Tools Toolbar

The 3D Tools toolbar is a dockable toolbar that contains tools for moving around the scene in the 3D view window and for working with 3D models. You can toggle the toolbox on or off with the ***Tools-3D-3D Toolbar*** command. The controls are:

Tool	Description
	Tool to drag in any direction to see a different portion of the scene; you can also press the scroll wheel on the mouse to drag the scene when any tool is active
	Tool to drag up (away) to zoom out to a smaller scale, or drag down (toward) to zoom in to a larger scale; you can also use the scroll wheel on the mouse to zoom in and out when any tool is active
	Tool to tilt the scene up or down
	Tool to rotate the scene clockwise or counter-clockwise
	Button to return the 3D view to the initial scale; you can also right-click on the 3D view and choose Initial Scale when any tool is active
	Button to save the current viewpoint in the 3D view as a bookmark or to change the viewpoint in the 3D view to that of a previously saved bookmark
	Button to change the perspective in the 3D view to a viewpoint that matches a map window extent
	Button to change the extent of a map window to match the current viewpoint in the 3D view
	Tool to add a model
	Tool to get information on a model
	Tool to delete a model
	Tool to move or scale a model
	Tool to rotate a model
	Button to choose the model to be added

You can also use the controls that overlay the 3D view in the upper-right corner of the 3D window to move around the 3D view:

To do this...	Do this...
Pan in one of the eight cardinal directions	Click the arrow in the direction that you want to pan the scene, or click and hold on the arrow to pan continuously.
Pan in any direction	Click and drag the eight-pointed shape in the middle of the circle in the direction that you want to pan the scene. Click and hold on the shape to pan continuously.
Rotate the 3D map	Click and drag the circle clockwise or counter-clockwise. The arrow on the circle indicates north.
Zoom into or out from the 3D map	Click and drag the dot on slider on the right side of the controls. Drag up to zoom in and drag down to zoom out. Zoom faster by dragging the dot farther up or down.
Tilt the 3D map up or down	Click and drag the dot on slider on top of the controls. Drag left to tilt up and drag right to tilt down. Tilt faster by dragging the dot farther left or right.



The 3D window tries to maintain a viewpoint above the surface, although you can tilt the scene and view below the surface. It is important to keep in mind that models may have a base elevation that places them partially or fully below the surface, such as tunnels or other subsurface structures.

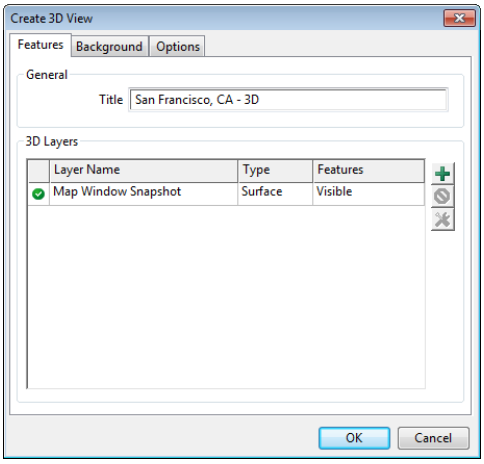
Creating a 3D View

A 3D View can contain one or more 3D layers. A simple 3D View may contain a single layer, such as a surface layer. A more complex one could also contain one or more footprint or model layers.

▶ To Create a 3D View

1. If your 3D View will contain a surface layer, open a map that contains a layer with elevation data. If your map will contain a footprint layer, open a map that contains an area layer of building footprints and a layer with elevation data.
2. Choose ***Tools-3D-3D Map*** to display the Create 3D View dialog box.

   If Maptitude detects a DEM layer in the map, it automatically adds a 3D Surface Layer that will display a snapshot of the map window. If Maptitude detects a DEM layer and an image layer, it automatically adds a 3D Surface Layer of the image file.



3. Type a title for the 3D View in the Title box.
4. To modify the 3D layers to display in the 3D View, make choices as follows:

To do this...	Do this...
Add another 3D layer	Click ➕. Maptitude displays the Add a 3D Layer dialog box. To add a 3D Surface Layer, see the "Adding and Editing 3D Surface Layers" below. To add a 3D Footprint Layer, see "Adding and Editing 3D Footprint Layers" below. To add a 3D Model Layer, see "Adding and Editing 3D Models" below.
Remove a 3D layer	Highlight one or more layers in the DataGrid and click 🚫.
Make layers hidden or visible	Click the symbol in the first column of the DataGrid. ✅ indicates that a layer is visible and ❌ indicates a hidden layer.
Change the properties of a layer	Highlight the layer in the DataGrid and click 🔧 to display the 3D Layer Properties dialog box. Make changes to the properties and click OK. For more information on 3D Layer properties, see "Adding and Editing 3D Surface Layers," "Adding and Editing 3D Footprint Layers," or "Adding and Editing 3D Models" below.

5. To choose a sky and surface background, click the Background tab and choose one from the scroll list.
6. Click the Options tab and make changes as follows:

To do this...	Do this...
Change the position of the sun	Enter a date and time of day in the Based on Date, Time Zone, and Time of Day edit boxes.
Display shadows	Check the Shadows box.
Display fog or haze effects	Check the Fog box, choose a type (i.e., Fog, Haze, or Smoke) from the Type drop-down list, choose a color from the Color drop-down list, and enter a visibility in meters or feet in the Visibility Distance edit box. The visibility distance will control the thickness of the fog, haze, or smoke.
Exaggerate the elevations	Type a scaling value or use the arrows in the Exaggeration Factor spinner.

7. Click OK.

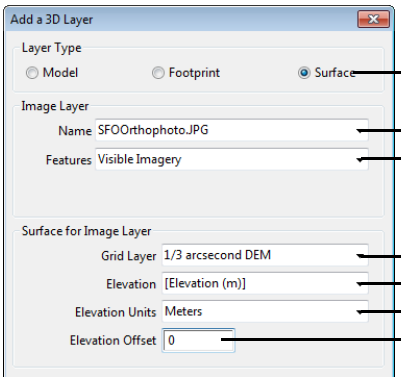
Maptitude displays the 3D view window with your chosen 3D layers. Maptitude also displays the 3D Tools toolbar. For more information on the 3D Tools toolbar, see "About the 3D Tools Toolbar" on page 364.

Adding and Editing 3D Surface Layers

When you add or edit a 3D Surface Layer, you choose what portion of the surface to display and where the elevation data are stored.

▶ To Add or Modify a 3D Surface Layer

1. In the Create 3D View dialog box, click  to add a Surface Layer or highlight a Surface Layer in the grid and click  and make choices as follows:



2. Click OK.

Maptitude adds the surface layer to the view or modifies the chosen surface layer.

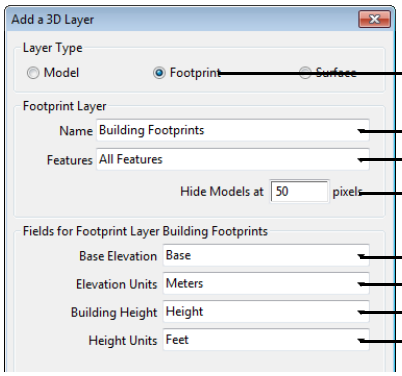
Adding and Editing 3D Footprint Layers

When you add or edit a 3D Footprint Layer, you choose what layer to use to generate prisms in the 3D View and what fields contain the base elevation of the prisms and the prism height.

▶ To Add or Modify a 3D Footprint Layer

TIP: Maptitude can automatically fill in a base elevation field for you if you do not already have base elevation data. See "To Fill a 3D Footprint Area Layer Field with Base Elevation Values" on page 362 for more information.

1. In the Create 3D View dialog box, click ➕ to add a Footprint Layer or highlight a Footprint Layer in the grid and click 🔧 and make choices as follows:



Choose Footprint from the radio list
Choose an area layer that contains the footprints from which to build prisms
Choose whether to use All Features or a selection set
Type a minimum size, in pixels, at which to display prisms. Prisms below this value will not display in the 3D View
Choose a field in the area layer that has the base elevation of the prism
Choose the base elevation units
Choose a field in the area layer that has the height of the prism
Choose the height units

2. Click **OK**.

Maptitude adds the footprint layer to the view or modifies the chosen footprint layer.

Adding and Editing 3D Models

Generally, the 3D models that you use to build a 3D scene in Maptitude will be developed in another 3D modeling software package such as Trimble Sketchup or AutoDesk 3D Studio and exported or saved to one of the formats that Maptitude supports (e.g. .WRL, .3DS, .IV, .SKP). You may create the models yourself or download them for free or purchase them over the web. The Trimble 3D Warehouse might be a useful resource for downloading models.

You add 3D models to a model layer in a 3D View and edit them using tools in the 3D Tools toolbar. When you add or move models in the 3D view, the point geography and attributes of the underlying model layer are simultaneously changed. When you scale or rotate a model, you may notice that the Scale and Rotation fields in the record of the corresponding point feature in the map are populated or adjusted. You will likely never have cause to review or modify any of these attributes directly, but in some rare cases, as discussed below, it may be useful to do so.

Note that manual updates in the model layer dataview are not reflected in an opened 3D view, but will take effect the next time a 3D view is opened or created.

About the Low Resolution and Hide Parameters

Very detailed models can overburden your video card, particularly when many detailed models are displayed in the scene at once. If you wish to work with highly detailed models or very large numbers of moderately detailed models, you may want to consider upgrading your video card. To improve performance, you can configure the low resolution and hide parameters for each model that you add. If you choose a low resolution model, it will appear in place of the more detailed, primary model

when the primary model is far enough in the background that its pixel size drops below some threshold. Further, you can configure the model to be hidden when the model size in pixels drops below another threshold.

When you add a model to a model layer, the file name of the primary model is saved in the Model File field. If you also choose a low resolution model, its file name is saved in the Low Res. Model File field. If, in the opening or creation of a 3D view, you receive warning messages that a model file was not found, you should first confirm that the model file does exist, and then ensure that the model file name is correct. If the 3D View file was moved or the model files were moved such that the file names are no longer correct, you will need to update the file names in the dataview.

The pixel size threshold at which a model transitions to the low resolution model is saved in the Low Res. Transition field. The threshold at which the model is hidden is saved in the Hide Transition field. You might find it useful to adjust the values in these fields in the model layer dataview manually in order to refine these settings.

About Model Rotation

When you scale or move a model, you will notice that it is outlined in a rectangular bounding box that encloses the entire model. The orientation of this bounding box is dependent on how the model was created. Different 3D modeling software packages have different conventions, and may consider any one of the X, Y, or Z axes as pointing up or down. For this reason, when you add a model, you may find it is "rotated" on its side, upside down, or right side up, as expected. Unfortunately, there is no fixed standard to which all 3D modeling software adheres, so you may find that some models you have to rotate to make them upright after adding while others you do not. More commonly, for 3D models of buildings and other objects, you will probably need to rotate the model in the XY plane so that its footprint is aligned according to its true orientation.

The X Rotation, Y Rotation, Z Rotation, and Rotation Angle fields in the model layer are updated when you rotate a model. These fields are best left managed by the 3D Tools toolbar.

About Model Scale

As with the initial orientation of a model, its initial scale upon being added to a 3D view is dependent on the units of length in the model's internal components. These could be any length unit. If you did not create the model yourself, you may need to consult the model's author or the user manual of the software with which it was created in order to determine its model units. Often, however, the model units can be inferred based on the size of its bounding box. When you choose a model, Maptitude will display the size of this bounding box. Based on those dimensions, you may be able to easily determine the appropriate units. Note that the model units will determine the scale of the model when it is first added to a 3D view. You can then resize the model with the tools on the 3D Tools toolbar. Only one set of model units can be chosen. Thus, if you are using a low resolution model, you must ensure that its model units are the same as those of the primary model.

When you resize a model in a 3D view, the values in the X Scale, Y Scale, and Z Scale fields are updated. It is easiest to adjust a model's size by scaling it with the 3D Tools toolbar, but on occasion you may find it useful to adjust the values in this field. The values store the ratio of the model's internal dimensions to the 3D view dimensions in meters along the X, Y, and Z axes. For example, when a model whose model units are inches is added to a scene, the initial values in these fields is 0.0254, the conversion factor from inches to meters.

About Model Elevation

When you add a new 3D model to a model layer, it uses the position on the "ground" (zero elevation) where you click as a reference and places the model at some initial elevation, which you can specify when you choose the 3D model.

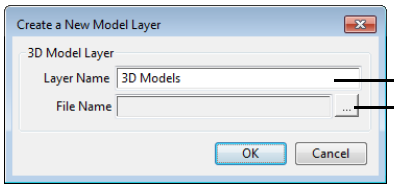
When you move a model with the 3D Tools toolbar, its elevation, saved in the Elevation field, may change. It is not possible to navigate beneath the ground surface in a 3D view. Thus, if you have models whose elevations are less than zero, they may appear partly buried in the ground or they may be hidden entirely beneath the surface. When this happens, it may be useful to manually change the value in the Elevation field in order to raise or lower the model appropriately. The units of the Elevation field are meters.

About Model Orientation

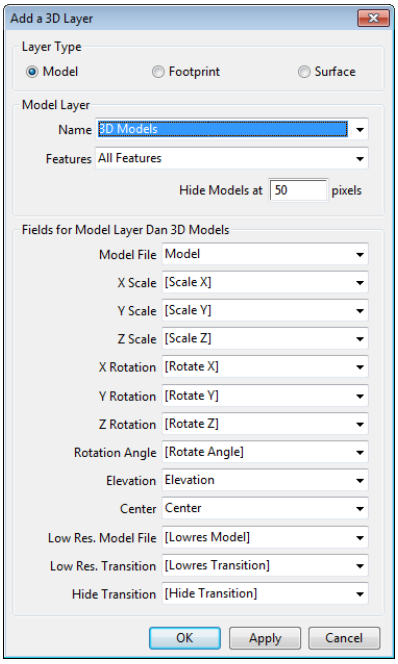
In some 3D software packages you may typically build the 3D object around the vertical axis such that the center of the model is positioned at (0, 0) in the horizontal plane. In other packages, you may build the model adjacent to the vertical axis such that one edge or corner of the model is at (0, 0) in the horizontal plane. Maptitude expects models to be centered around the vertical axis, and thus will place the model's center at the position where you click in the 3D view. If the model is not centered at the vertical axis, then where you click in the 3D view is where the edge or corner of the model will be located. If you would like to have the model automatically centered when you place them in the 3D scene, you can indicate this preference.

▶ To Create a New 3D Model Layer

1. In the Create 3D View dialog box, click  to add a Model Layer.
2. Choose Model from the Layer Type radio list.
3. Choose **Create a New Model Layer** from the Name drop-down list. Maptitude displays the Create a New Model Layer dialog box. Make choices as follows:



4. Click **OK**. Maptitude creates a point layer with the necessary fields for storing model data.

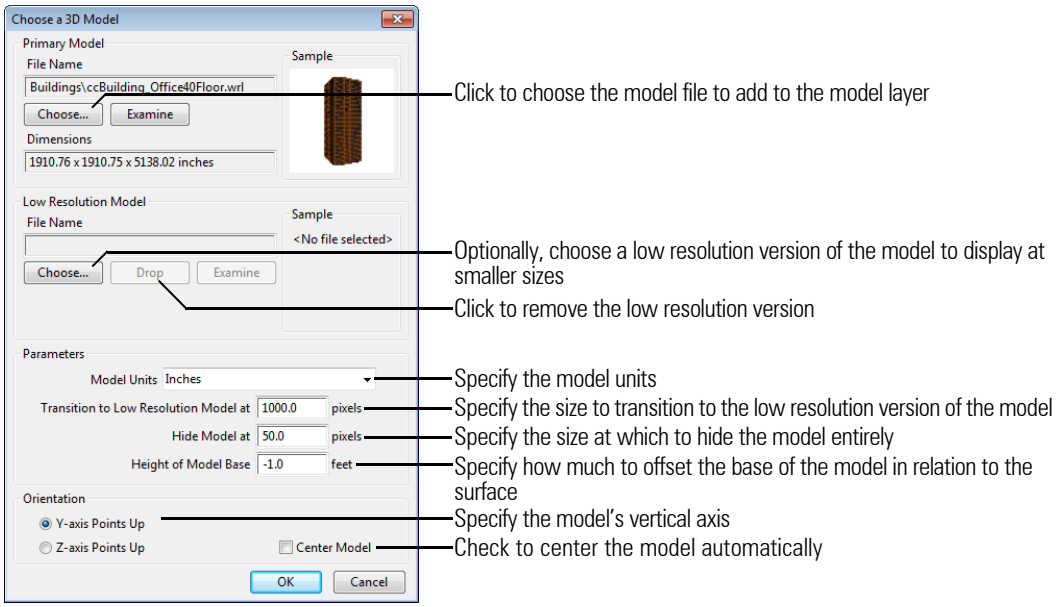


5. Click OK.

Once you create the 3D View, you can use the tools in the 3D Toolbox to add models to the model layer.

▶ To Add Models to a 3D Model Layer

1. Create a 3D View that contains a model layer. If more than one model layer is in the 3D View, choose the model layer to use from the drop-down list on the Standard toolbar.
2. If necessary, zoom, pan, or rotate the 3D View to display the location where you want to add a model.
3. Click  in the 3D Tools toolbar to choose the model to add. Make choices as follows:



4. Click OK.
5. Click in the 3D Tools toolbar and click on the 3D View where you want to place the model.

   Maptitude adds the model to the 3D view. Note that if the model units that were selected when the model was chosen are incorrect, the added model may be either too small to see or far too large. If this is the case, you may want to delete the model, click in the 3D Tools toolbar to reconfigure the units, and try again. If the scale of the model is close but not exactly correct, you may need to rescale it with move-and-scale tool (see below).
6. Repeat steps 2-5 to add additional models to the 3D View.

▶ To Scale and Move a 3D Model

TIP: To move a model directly up or down parallel with the vertical edges of its bounding box, or to move it laterally parallel with one of the horizontal edges of its bounding box, hold the Shift key, then click between the edit handles on any side of the model having an edge parallel with the direction you want to move and drag parallel to that edge.

1. Click in the 3D Tools toolbar to activate the Scale and Move Model tool.
2. Click on a model on the 3D View. Maptitude displays edit handles.
3. Make choices as follows:

To do this...	Do this...
Make the model taller or shorter	Click and drag a top or bottom middle edit handle up or down
Make the model thicker or thinner	Click and drag a middle side edit handle left or right
Make the model wider or narrower	Click and drag a middle front edit handle left or right
Make the model taller or shorter and thicker or thinner	Click and drag a top or bottom front corner edit handle
Make the model taller or shorter and wider or narrower	Click and drag a top or bottom side corner edit handle
Move the model around the 3D map	Click on a side between edit handles and drag the model to a new location

   If you drag the model so that all or part of the model is below an opaque surface, the lower part is hidden.

   If you press Esc, you can undo all the scaling and moving done since you selected the model.
4. Click away from the model when you are done.

▶ To Rotate a 3D Model

1. Click in the 3D Tools toolbar to activate the Rotate Model tool.
2. Click on a model on the 3D View. Maptitude displays X, Y, and Z rotation rings.
3. Click and drag a rotation ring to rotate the model in the desired direction; the rotation ring that you are using turns yellow when you click on it.

   If you press Esc, you can undo all the rotating done since you selected the model.
4. Click away from the model when you are done.

▶ To Get Information on a 3D Model

1. Click in the 3D Tools toolbar to activate the Model Info tool.
2. Click on a model on the 3D View. Maptitude displays the 3D Model Info dialog box.
3. Click **Close** when you are done.

▶ To Delete a 3D Model

1. Click  in the 3D Tools toolbar to activate the Delete Model tool.
2. Click on a model on the 3D View.

   Maptitude displays a Confirm dialog box.
3. Click **Yes**.

Maptitude deletes the model.

Try It Yourself: Creating a 3-D Map

1. Choose ***File-Open*** or click  on the Standard toolbar, then open the map **San Francisco 3D.map** in the Tutorial folder. The map contains a digital elevation model, a JPEG image layer, and a point layer of 3D models.
2. Choose ***Tools-3D-3D Map*** to display the Create 3D View dialog box. Maptitude finds and lists the 3D Model Layer and a 3D Surface Layer that uses the image layer.
3. Click the first column in the 3D Buildings model layer to make the layer hidden.
4. Click the Background tab and choose **Partly Cloudy** from the scroll list.
5. Click **OK**. Maptitude creates a 3D view of the image layer draped on the elevations indicated in the digital elevation model and displays the 3D Tools toolbar.
6. Click  in the toolbox and click and drag on the map to rotate the view. Notice the control in the upper right shows the direction of the view. Click and drag on the circle in the control to rotate the view some more.
7. Right-click on the 3D View and choose ***Properties***.
8. Click the Features tab, click the first column in the 3D Buildings model layer to make the layer visible, and click **OK**. Maptitude adds the 3D model layer to the 3D View.
9. Click  in the toolbox and click and drag on the 3D View to zoom in.
10. Click  in the toolbox and click and drag on the 3D View to tilt the scene up or down.
11. Choose **3D Buildings** from the drop-down list on the Standard toolbar.
12. Click  in the toolbox then click on one of the models. Click and drag any of the editing handles to change the scale of the model. Click Esc when you are done to restore the original scale.
13. Click  in the toolbox then click on one of the models. Click and drag one of the rings to rotate the model. Click Esc when you are done to restore the original position.
14. Choose ***File-Close All*** and click **No to All** to close the map and 3D View.

Managing 3D Views

After you have created a 3D View you can change most of its properties. You can also save a 3D view into a 3D View (S3D) file, close a 3D View window, and open a 3D View file into a window.

▶ To Change the Properties of a 3D View

1. Choose ***File-Properties***, click  on the standard toolbar, or right-click on the 3D View window and choose Properties to display the 3D View Properties dialog box.
2. Make changes on the Features, Appearance, Background, and Lighting tabs. See "Creating a 3D View" on page 365.

3. Click **OK**.

Maptitude updates the 3D View.

▶ To Save a 3D View

1. Choose ***File-Save***, click  on the Standard toolbar, or right-click on the 3D View and choose ***Save***.
2. If you are saving the 3D View for the first time, Maptitude displays the Save As dialog box. Type a name for the file and click **Save**.

Maptitude saves the 3D View to a file with the extension .S3D.

▶ To Save a 3D View with a New Name

1. Choose ***File-Save As*** or right-click on the 3D View and choose ***Save As***.
2. Type a new name for the 3D View file.
3. Click **Save**.

Maptitude saves the 3D View to a new file with the extension .S3D.

▶ To Close a 3D View

1. Choose ***File-Close***, right-click and choose ***Close***, or click the close box in the upper right corner of the window.

▶ To Open a Saved 3D View

1. Choose ***File-Open***, click  on the Standard toolbar, or right-click anywhere inside the Maptitude frame except on a window and choose ***Open***. Maptitude displays the File Open dialog box.
2. Choose 3D View from the Files of Type drop-down list.
3. Choose a file from the list.
4. Click **Open**.

Tips for Developing 3D Models

Consider the tips below before you start creating complex, densely populated 3D Views.

A Single Model vs. Many Models

3D models do not necessarily represent singular, independent objects, such as a single building or bridge or park bench. They can be collections of objects, related or unrelated, near or far. For example, one 3D model file might contain an entire city block of buildings.

It is conceivable that you could put together the entire 3D scene in a 3D software package, and use that single model file in Maptitude. The smaller the area your 3D scene covers, the more attractive this approach may be. However, as your 3D area becomes larger, positioning a single 3D model containing a large number of objects spanning a large geographic area may become increasingly difficult. You lose the ability to shift or rotate independent buildings or other objects relative to others,

and you may find it difficult to find exactly the right positioning, scale, and rotation that aligns accurately with the boundaries of your road segments.

Conversely, a separate model file for every single independent object in your 3D scene can be tedious to create, edit, and maintain. Thus, some balance between these two extremes is desirable. You may want to work with 3D models as logical and geographical clusters of objects located near one another.

A Single Layer vs. Many Layers

Recall that the 3D View is, like a map, a collection of geographic layers displayed together in the same window. You can hide and show layers in a 3D View just as you can in a map. This can be an incredibly powerful feature if you take advantage of it. When developing a 3D View, you may find it helpful to put like objects in the same layer. For instance, you may have a layer for building models, another for bridges, one for trees and plants, and so on. This way, you can hide and show layers selectively so that you can reduce the complexity of the 3D scene and navigate through it more easily as you add and edit models in each layer.

About 3D Model Complexity

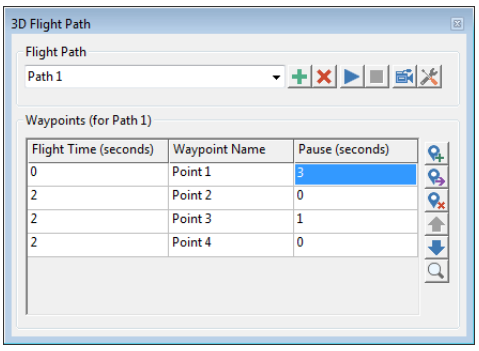
It is important to keep model complexity in mind as you create 3D Views in Maptitude. Hugely detailed and complex models often offer no substantial visual benefit in a 3D View over lesser equivalents and can cause your 3D Views to become unmanageable. Consider a video card upgrade for your computer if you plan to do a lot of 3D modeling. Affordable video cards designed for gaming are widely available. A fast graphics processing unit (GPU) and ample video memory are desirable.

Using Flight Paths

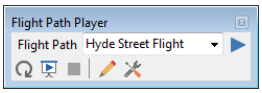
You can move through your 3D view and visit particular viewpoints automatically using a flight path. You can create new flight paths and use existing flight paths. Each flight path is defined by a series of waypoints, each of which is a view of the 3D scene based on the current pan, zoom, and tilt settings. You can specify the desired point of view at each waypoint, how long the flight path should pause at that waypoint, and how long it should take to travel to it from the previous waypoint.

Once you have created one or more flight paths, you can save them in a flight path file so that you can load them again in the future. You can have one or more flight paths in a flight path file, and you can use multiple flight path files.

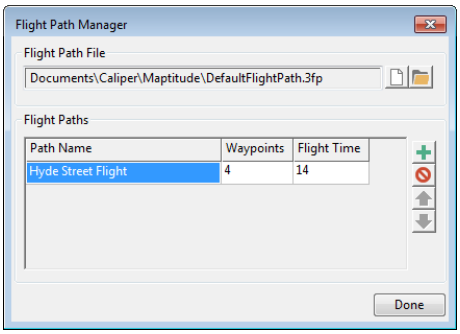
You create and manage flight paths with the 3D Flight Path toolbar:



The Flight Path Player, opened from the Flight Path toolbox, is a trimmed version of the 3D Flight Path toolbar. It occupies less space, is dockable, and is dedicated primarily to playing flight paths:



The Flight Path Manager is used for creating a new flight path file, opening an existing flight path file, and adding, deleting, and arranging flight paths within a flight path file.



▶ To Create a Flight Path

1. Choose ***Tools-3D-3D Flight Path Toolbar*** to display the 3D Flight Path toolbar.
2. Click , enter a name for the path in the dialog box, and click **OK**.
3. Use the pan, zoom, and rotate tools to set the 3D View at the starting location for the flight path and click to add the waypoint.
4. Use the pan, zoom, and rotate tools to set additional waypoints and click for each waypoint you want to add to the flight path.
5. Manage the waypoints as follows:

To do this...	Do this...
Set the flight time	In the Flight Time (seconds) column, enter the amount of time to get to the waypoint.
Set a pause time	In the Pause (seconds) column, enter the amount of time to wait at a waypoint before flying to the next.
Rename a waypoint	In the Waypoint Name column, type a name for a waypoint.
Delete a waypoint	Highlight a cell in one or more rows of the grid and click .
Replace a waypoint	Set the 3D View to the position of the new waypoint, highlight a cell in the grid, and click .
Reorganize waypoints	Highlight a cell in one or more rows of the grid and click to move the waypoints up or to move the waypoints down.

6. Click to play the flight path. Stop the flight path by clicking .
7. Repeat steps 2-6 to create additional flight paths.

▶ To Use the Flight Path Player Toolbar

1. Choose ***Tools-3D-3D Flight Path Toolbar*** to display the 3D Flight Path toolbar.
2. Click to close the Flight Path toolbox and open the Flight Path Player.
3. Choose the flight path to play and other options as follows:

To do this...	Do this...
Choose a flight path	Make a choice from the Flight Path drop-down list.
Loop when playing the flight path	Click . Maptitude depresses the button. As long as the button is pressed, Maptitude will continuously loop the flight path when you click . Click again to stop looping the playback.
Play the flight path as a slide show	Click . Maptitude depresses the button. As long as the button is pressed, Maptitude will show the flight path as a slide show of the waypoints when you click . Click again to stop playing the flight path as a slide show.
Start playing the flight path	Click . Maptitude plays the flight path with the current loop and slide show settings.
Stop playing the flight path	Click .
Switch back to the Flight Path toolbox	Click .

When you are finished, click the Close box in the upper-right corner of the toolbox.

▶ To Delete a Flight Path

1. In the 3D Flight Path toolbar, choose a flight path and click .

— OR —

1. In the 3D Flight Path toolbar, click to display the Flight Path Manager.
2. Highlight a flight path in the grid and click .

▶ To Manage Flight Path Files

1. Choose ***Tools-3D-3D Flight Path Toolbar*** to display the 3D Flight Path toolbar.
2. Click . Maptitude displays the Flight Path Manager dialog box.
3. Make choices as follows:

To do this...	Do this...
Create a new flight path file	Click to display the Save Flight Path File As dialog box. Choose a folder, type a file name, and click Save. Maptitude creates the new flight path file.
Open an existing flight path file	Click to display the Load Flight Path File dialog box. Choose a file name and click Open. Maptitude opens the flight path file.

4. Manage flight paths within the flight path file as follows:

To do this...	Do this...
Add a new flight path	Click . Maptitude adds a new row to the grid.
Change the flight path name	Enter a name in the Path Name column of the grid.

To do this...	Do this...
Delete one or more flight paths	Highlight a cell in one or more rows of the grid and click . Maptitude deletes the paths.
Reorganize the flight paths	Highlight a cell in one or more rows of the grid and click to move them up or to move them down.

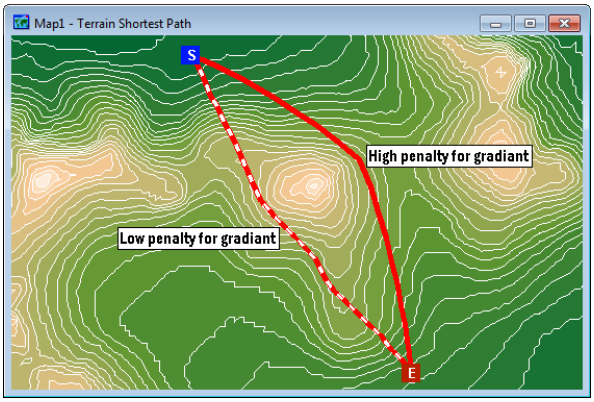
5. When you are finished, click **Done**.

Maptitude closes the Flight Path Manager dialog box and returns to the 3D Flight Path toolbar.

Finding the Shortest Path over Terrain from a Grid Layer

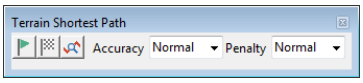
You can use Maptitude to find shortest paths over terrain from a grid layer. To find a shortest path over terrain, you use the Terrain Shortest Path toolbox to define an origin and destination and to choose how accurately to compute the shortest path and how much to penalize changes in elevation.

The map below shows two different paths between a pair of points. The dashed route has a low penalty for gradient and is steeper and straighter than the solid route which has a high penalty for gradient.



▶ To Find a Shortest Path over Terrain from a Grid Layer

1. Open a grid geographic file, or choose a grid layer in the current map.
2. Choose ***Tools-3D-Terrain Shortest Path*** to open the Terrain Shortest Path toolbox.



3. Click to activate the Define Origin Point tool.
4. Click on the map where the path should start. Maptitude places a marker where you clicked.
5. Click to activate the Define Destination Point tool.
6. Click on the map where the path should end. Maptitude places a marker where you clicked.

7. Choose a level of accuracy:

Option	What it does
Low	Maptitude uses less processing time and the route is less detailed
Normal	Maptitude balances the processing time and the detail of the route
High	Maptitude uses more processing time and the route is more detailed

8. Choose the penalty to apply to gradient:

Option	What it does
Low	Maptitude weighs distance more than changes in elevation when finding the shortest path. Paths will be shorter and hillier.
Normal	Maptitude weighs distance and changes in elevation equally when finding the shortest path.
High	Maptitude weighs changes in elevation more than distance when finding the shortest path. Paths will be longer and flatter.

9. Click  .

Maptitude calculates the shortest path over the terrain and displays the path on the map as a free-hand line. You can return to step 3 to change the settings and calculate another shortest path.

CHAPTER 13:
Creating and Editing Geographic Files

Maptitude uses a **geographic file** to store the locations and shapes of features in a map layer. You can add, delete, or change the features in a geographic file using editing tools and the mouse. You can also create new, empty geographic files to store point, line, or area features, and then use the editing tools and the mouse to add new features to them. When you edit geographic features, you draw or adjust the way the features look on the screen, and Maptitude figures out how to store the information. You can edit with your mouse or with a digitizing tablet.

Maptitude supports editing of Esri Shapefiles, as long as they do not have a native Esri index. Maptitude for Redistricting, with ArcGIS installed, does support editing of Esri Shapefiles with a native Esri indices, as well as editing of features in Esri personal geodatabases, file geodatabases, and databases accessed via ArcSDE.

Maptitude lets you export geographic files into formats that can be used with many other programs. Maptitude also imports data from many other programs and published data files. For a complete description of these capabilities, see *Chapter 14: Managing Geographic Files*.

You can also use aerial photographs, satellite images, or scanned versions of paper maps, including those available over the internet from USGS, Virtual Earth, and Google Maps, to assist you in editing. For more information, see "Using Images as Map Layers" on page 140.

Freehand items created with the drawing tools cannot be edited with the geographic editing tools. Freehand items are stored in the map file, not a geographic file. To edit freehand items, see *Chapter 5: Changing and Customizing Maps*.

In this chapter:

Geographic File Formats

Maptitude geographic files come in two formats, with two file extensions:

- A compact, read-only format (.CDF) that displays very quickly
- A standard, editable format (.DBD) that takes more disk space and displays less quickly

When you create new geographic files, they are in the standard, editable format, so you can modify them right away. When you complete your edits, you may want to convert the geographic file back to the compact, read-only format, since it takes up less space and displays more quickly.

Converting Between Standard and Compact Geographic File Formats

Maptitude lets you convert a compact format file (.CDF) to a standard format file (.DBD) when you want to edit the features in the file using the geographic editing tools.

Both standard and compact format files contain a field that you can use to store information that identifies each record, such as a customer ID or a FIPS code. In a standard format file, this field is called ID, and must contain a unique, numeric value. In a compact format file, this field is called DATA, and it can contain either numeric or string data. You can also omit the DATA field to create an even more compact file. Compact format files also have a field called ID that Maptitude uses to keep track of individual records. The contents of this field are generated automatically and do not take up any disk space.

When you export to a standard format file, Maptitude fills the ID field with the unique identifier of the geographic file you are exporting. If you would like to fill the ID field with different information, you can change this default by choosing from the list of available numeric fields, but you must make sure that the values in the field you choose are unique within the geographic file.

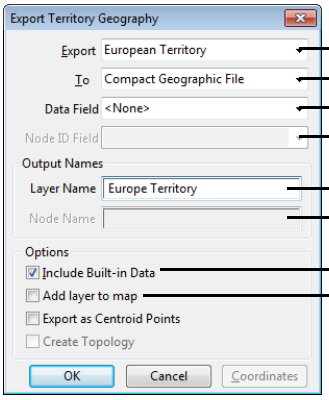
When you export to a compact format file, Maptitude fills the DATA field with the unique identifier of the geographic file you are exporting. You can change this default by choosing from the list of all available fields. You can fill the DATA field with numeric or string values and the values you choose do not need to be unique within the geographic file. You can also choose "None" to omit the DATA field from the file you are creating.

When you export features in a line layer, you can also choose the field that identifies each endpoint in the node layer.

▶ To Convert Between Geographic File Formats

1. Choose the layer to convert from the drop-down list on the toolbar.
2. Choose ***File-Export-Geography*** to display the Export Geography dialog box.

3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.

5. Type the file name and click **Save**.

Maptitude creates a new geographic file, in the format you selected, containing the features in the chosen layer. To export areas as centroid points, see "To Create a Geographic File of Centroids" on page 404.

Creating New Geographic Files

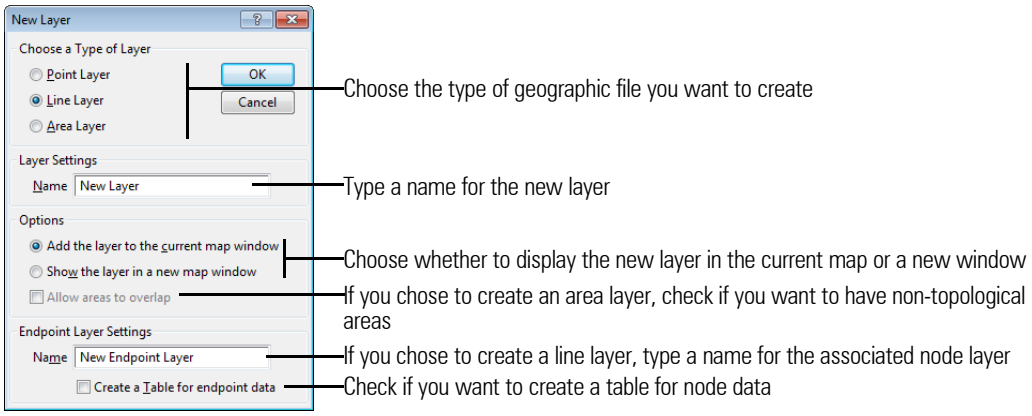
You create a new geographic file when you want to use a mouse or digitizer to add features to a completely new map layer. Creating a new geographic file is similar to creating a new document in a word processor. You start out with a clean slate, and enter the information you want from scratch. When you create a new geographic file, it is always created in the standard, editable format (.DBD), so you can add features to it right away.

Area geographic files can be topological, meaning that adjacent areas share common boundaries, or non-topological, meaning that areas can overlap. A boundary between two areas in a topological area layer is a single line so if you modify it, both areas are updated. In a non-topological area layer, you would need to make the changes to the boundary for both areas if you want to update both areas.

When you create a new geographic file, you can design the table that goes with the layer, indicating what types of data you want to store with each feature. When you create a line geographic file, you also have the option to save attributes for the endpoints in a table. For more information on working with tabular data, see "Creating a New Table from Scratch" on page 220.

▶ To Create a New Geographic File

1. Choose ***Tools-Editing-New Layer*** to display the New Layer dialog box.
2. Make choices as follows:



3. Click **OK**. Maptitude displays the Attributes for New Layer dialog box.
4. Click **OK** to create a new geographic file with no associated data table, or design a table as described in step 5 of "To Create a New Table" on page 221 and click **OK**.

   If you chose to create a table for endpoint data, Maptitude displays the Attributes for New Endpoint Layer dialog box. Design a table and click **OK**.

   Maptitude displays the Save As dialog box.
5. Type a file name for the new geographic file and click **Save**.

Maptitude creates an empty geographic file for the map layer. You are now ready to use the editing tools to add features to the layer.

Before You Start Editing

Before you start editing a geographic file, there are a few things you need to know. This section provides a brief overview of some editing basics.

Seeing and Saving Your Edits

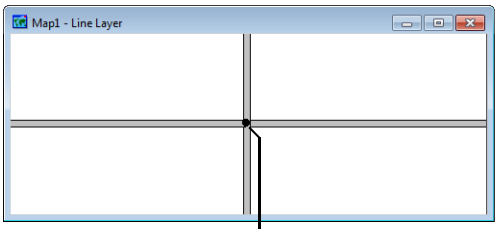
While you are editing, features on the map are shown in different colors:

- Black is used for features you have added or modified
- Red is used for features you have deleted

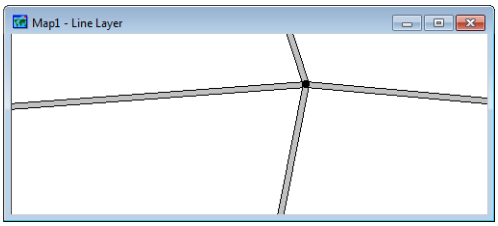
The edits you make are not saved in the geographic file until you click the  in the Layer Editing toolbar. If you do not like the edits you made, or if you made a mistake, you can cancel the edits by clicking the  . When you click  to save your edits, Maptitude draws the map with the changes, using the normal colors.

Intuitive Editing

Maptitude has Active Topology™ map editing, a feature that helps you get the result you want when you edit a map. For example, suppose you are editing a road layer and move an intersection. As shown below, Maptitude automatically adjusts all of the streets that meet at the intersection.



Move this intersection...



...Maptitude updates all of the streets

Feature IDs

All map features have a unique identification number, or ID. Feature IDs are important because they are frequently used to join map features in a geographic file to tabular data stored in a database or spreadsheet.

Whenever you create a new feature, either by adding one or splitting an existing one into parts, Maptitude assigns each new feature a unique ID number. When you join features together, Maptitude keeps the ID of the first feature you picked.

Length and Area

When you edit line features, Maptitude always computes and stores the length of lines that you modify. The same is true with the area of an area feature. Whenever you add, modify, split, or join lines or areas, Maptitude automatically computes the lengths or areas of the features that have changed.

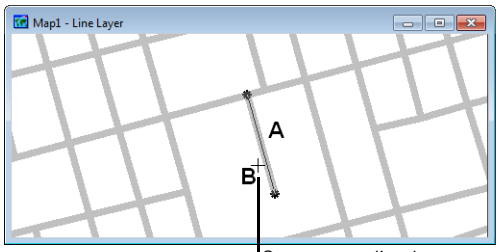
Tabular Data

Most geographic files include tabular data that describe the map features. When you edit a geographic file, the tabular data are also affected. When you delete a feature, any data for that feature are deleted. When you add a feature, the data will be the default field values of the table. For information on how to modify the default values, see "To Modify the Structure of a Table" on page 225.

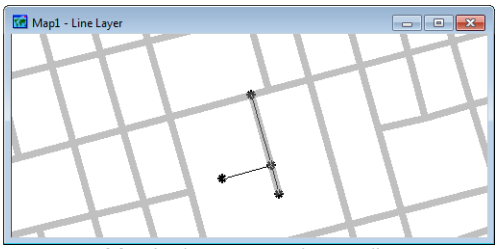
When you split or join area features, Maptitude estimates the tabular data for the new features by using data for the original features. You can customize how these estimates are made. For more information, see "Updating Tabular Data" on page 407. If, however, you have data stored in a separate table that is linked to the map in a joined view, the data are not affected in any way by map editing.

Snapping

When you add line or area features using the geographic editing tools, Maptitude uses a feature called **snapping** to make sure that features meet up with each other the way you want. Whenever you mark a point on the map with the editing tools, Maptitude searches a small distance around the point to see if there are other features in the same layer. This distance is known as the snap tolerance. If there are other features, Maptitude snaps the features together. For example, suppose that you use the editing tools to add the line labeled A. When you click on point B to start adding a new line, Maptitude finds line A and makes sure that the two lines meet.



Start a new line here...



...Maptitude connects the two lines

NOTE: The default snap tolerance is 7 pixels. To change the snap tolerance, choose ***Edit-Preferences*** and enter new values on the System tab. You can set the snap tolerance based on a screen distance (in pixels) or based on a distance on the map (in any map units you choose).

Here are two additional facts about snapping:

- Snapping only works with features that are being edited. If you want to snap to features that are already saved in a geographic file, simply select them with the modify tool before you begin editing.
- Snapping only works with features that are in the same layer. You cannot snap automatically to features in a different layer.

Backing Up Your Work

When you edit a geographic file, it is wise to back up your work from time to time. Maptitude has commands that let you create and restore archives of geographic files. See "Archiving Geographic Files" on page 419 for more information.

Undoing and Redoing Map Edits

Maptitude saves map edits in groups called transactions. Whenever you click  in a Layer Editing toolbar, all of the pending edits are saved as a transaction. You can undo the most recent transaction using the ***Edit-Undo geographic editing*** command. You can continue to undo transactions until the command is disabled and reads ***Edit-Can't undo***. You can also redo the most recently undone transaction using the ***Edit-Redo geographic editing*** command, and you can continue until the command is disabled and reads ***Edit-Can't redo***.

NOTE: You can undo and redo map edits provided that you have enabled the Undo/Redo option. Choose ***Edit-Preferences***, check the Remember Edit Actions box, and set the maximum undo file size on the System Page to enable this option.

When you undo or redo a transaction, Maptitude displays a dialog box with a description of what type of transaction will be undone or redone. If necessary, Maptitude changes the working layer to the layer being modified, and changes the scale and center of the map to show the modifications. You cannot undo or redo edits when there are pending edits; you have to be between transactions to use these commands. In Layer Editing toolbars where you can perform a series of edits, you can discard the pending edits by clicking  .

There is one series of edit actions, including edits in dataviews, which can be undone and redone in order. If you are doing a complex series of edits in different windows, the next action that can be undone or redone may be in a different window. If necessary, Maptitude will change the current window and the location within that window to show the modification caused by undoing or redoing. For a map window, Maptitude changes the working layer if necessary to the layer being modified, and changes the extent of the map if necessary to show the modifications.

Maptitude will warn you if an edit action will not fit into the undo file. You can clear the undo file to make room for new edit actions with the ***Edit-Clear Undo*** command.

▶ To Undo Map Edits

1. Choose ***Edit-Undo [edit action]***, click  on the Standard toolbar, or use the shortcut Ctrl+Z. Maptitude displays a Confirm dialog box with a description of the edit action that will be undone.
2. Click **Yes**.

Maptitude undoes the most recent edit action.

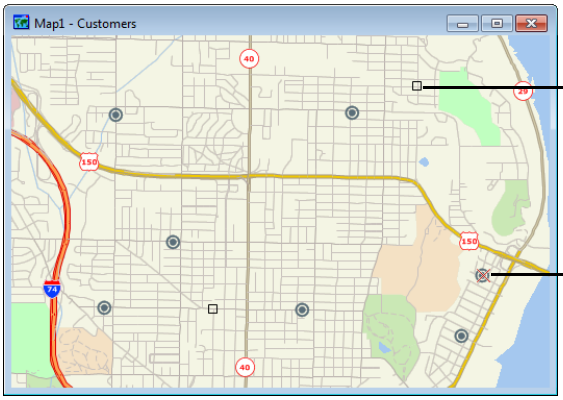
▶ To Redo Map Edits

1. Choose ***Edit-Redo [edit action]***, click  on the Standard toolbar, or use the shortcut Ctrl+Y. Maptitude displays a Confirm dialog box with a description of the edit action that will be redone.
2. Click **Yes**.

Maptitude redoes the most recently undone edit action.

Editing Point Features

Point features are normally drawn on the map using a symbol, color, and size that you choose. However, while you are editing point features, they are displayed as black squares for points that you are adding or editing and with a red X through them for points that you are deleting.



If you have set up a digitizer, you can switch to editing on the digitizer by clicking in the Layer Editing toolbar. The button will change to to show that the digitizing tablet is now active. For more information on digitizers, see "Using a Digitizer" at the end of this chapter.

▶ To Display the Layer Editing Toolbar for Editing Point Features

1. Choose an editable point layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Layer Editing Toolbar*** to display the Layer Editing toolbar.
3. When you are done editing features, choose ***Tools-Editing-Layer Editing Toolbar*** or click the Close button in the Layer Editing toolbar to close the toolbox.

▶ To Add, Delete, or Move Points

1. Use the tools in the Layer Editing toolbar as follows:

To do this...	Do this...
Add point features	Click in the Layer Editing toolbar to activate the Add tool, and click on the map where you want to add a new point. Maptitude displays a point symbol on the map.
Delete point features	Click in the Layer Editing toolbar to activate the Delete tool, and click on each point you want to delete. Maptitude marks each deleted point with a red X.
Move point features	Click in the Layer Editing toolbar to activate the Modify tool, position the cursor over the point you want to move, click and drag the point to a new location, and release the mouse button. Maptitude displays the point at its new location.

2. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the changes to the points.

▶ To Edit Point Attributes

1. Click  in the Layer Editing toolbar to activate the Edit Point Attributes tool.
2. Select the point or points to display in an Edit Attributes window as follows:

To do this...	Do this...
Select one point	Click on the point. Maptitude displays the point in the Edit Attributes window.
Select more points	Hold the Shift key and click on the points. Maptitude adds the points to the Edit Attributes window.
Deselect points	Hold the Ctrl key and click on the points. Maptitude removes the points from the Edit Attributes window.

   The last point selected has its ID field highlighted in the Edit Attributes window. To make sure you are about to edit the correct point, hold the Shift key and click on that point.

3. Make changes as follows:

To do this...	Do this...
Replace a value in a cell	Click on the cell and type a new value.
Edit a value in a cell	Double click on the cell and change the value.
Choose a field set	Right-click and choose Field Sets to display the Field Sets dialog box. Highlight an existing field set or create a new field set, and click OK.
Replace values in a range of cells	Click in one cell with the right mouse button, drag to another cell to highlight a range of cells, and choose ***Fill*** to display the Fill dialog box. Choose a fill method, enter the necessary values, and click OK.
Copy values to other selected records	Right-click on a column heading or a cell in a record and choose ***Copy Values*** to display the Confirm dialog box. Click OK to copy the values from the highlighted record to the other selected records.

4. To edit attributes for other points, return to Step 2.
5. Click  to save your edits, or click  to cancel.

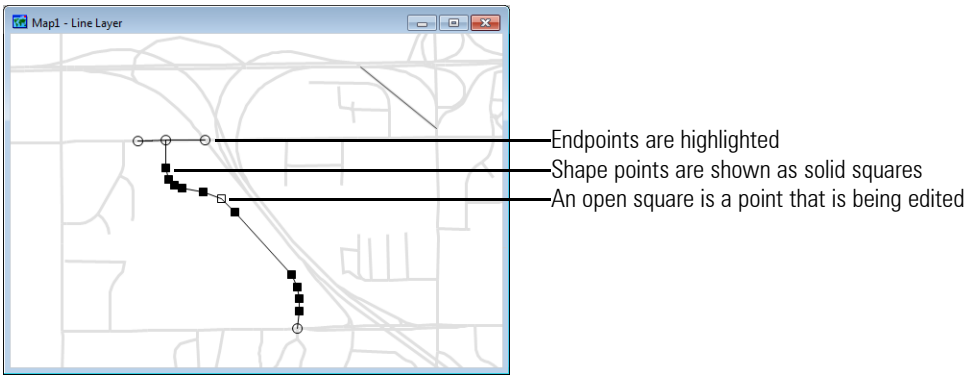
Maptitude updates the attributes for the points and displays the map with any changes.

Try It Yourself: Editing Point Features

1. Choose ***Tools-Editing-New Layer***. Maptitude displays the New Layer dialog box.
2. Click the **Point Layer** radio button, type "**My Points**" as the layer name, and click **OK**.
3. Click **OK** again to close the Attributes dialog box without making changes.
4. Type "**My Points**" as the file name and click **Save**. Maptitude displays a new map with the point layer.
5. Choose ***Tools-Editing-Layer Editing Toolbar*** to open the Layer Editing toolbar.
6. Click  in the toolbar to activate the Add Point tool, then click several spots on the map.
7. Click  in the toolbar to save the edits. Maptitude draws them in the style for the layer.
8. Click  in the toolbar to activate the Delete Point tool, then click on one of the points. Maptitude puts a red X through the point.
9. Click  in the toolbar to activate the Move Point tool, then drag one of the other points to a new spot.
10. Click  to cancel the edits. Neither of the points is changed.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

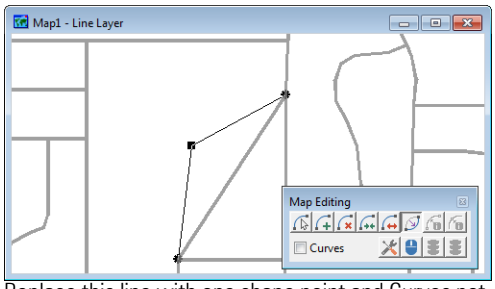
Editing Line Features

Lines have a starting point and an ending point, and they may also have any number of shape points in between. While you are adding or editing a line, the line is displayed with **editing handles**, like this:

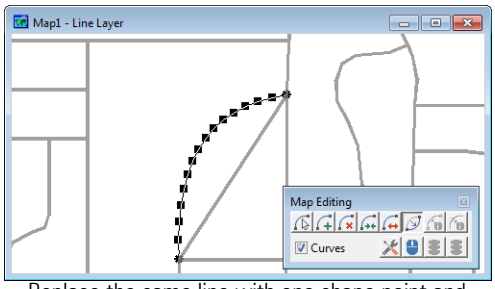


A geographic file containing a line layer always has a second layer for the endpoints of the lines. You do not edit the endpoints directly. When you edit the lines, Maptitude keeps the endpoint layer up to date.

When you add or replace a line, you have the option of manually placing all of the shape points or using the Curves option. When you use the Curves option, Maptitude automatically inserts extra shape points between the points where you click. Here is an example:

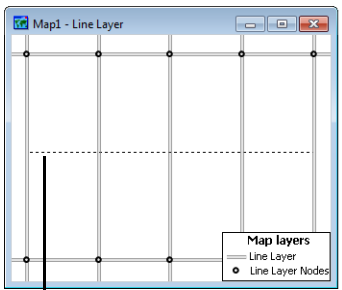


Replace this line with one shape point and Curves not checked

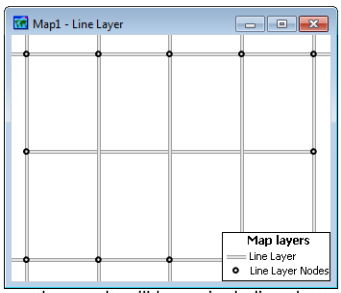


Replace the same line with one shape point and Curves checked

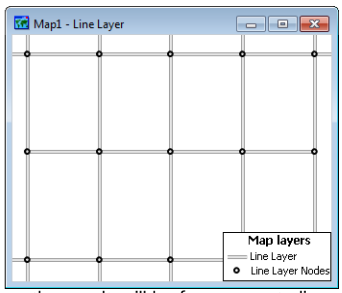
When you add a line, you can choose whether or not to intersect it with any lines it crosses. If you choose to intersect new lines with existing lines, a new node will be added at every intersection, otherwise the intersections will be considered to be overpasses. Here is an example:



If you add a line like this that crosses several existing lines...



...the result will be a single line that looks like this if you choose not to intersect overlapping lines



...the result will be four separate line segments that look like this if you choose to intersect overlapping lines

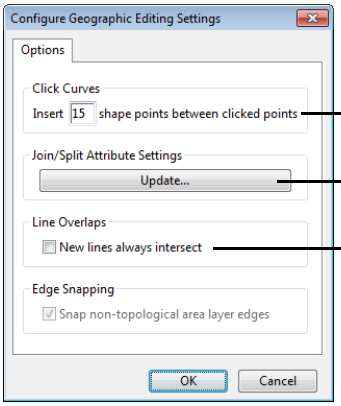
If you have set up a digitizer, you can switch to editing on the digitizer by clicking in the Layer Editing toolbar. The button will change to to show that the digitizing tablet is now active. For more information on digitizers, see "Using a Digitizer" on page 409.

▶ To Display the Layer Editing Toolbar for Editing Line Features

1. Choose an editable line layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Layer Editing Toolbar*** to display the Layer Editing toolbar.
3. When you are done editing features, choose ***Tools-Editing-Layer Editing Toolbar*** or click the Close button in the Layer Editing toolbar to close the toolbox.

▶ To Configure Line Editing

1. Click in the Layer Editing toolbar to display the Configure Geographic Editing dialog box.
2. Make choices as follows:



Enter the number of shape points to be added when using the curves option

Click to display the Data Update dialog box; See "To Change the Aggregation Method when Editing Map Features" on page 323 for more information

Check to make new lines intersect with existing lines or remove the check to prevent new lines from intersecting with existing ones

3. Click OK.

Maptitude closes the Configure Geographic Editing dialog box.

▶ To Add Lines

1. Choose how to handle shape points:

To do this...	Do this...
Have shape points lie along curves	Check Curves
Add each shape point without curves	Remove the check from Curves

2. Activate the Add tool in the Layer Editing toolbar by clicking on it.
3. Click at the starting point of the line.
4. To add one or more shape points, move the mouse to the next point and click. Right-click to back up.
5. To end the line, press Enter or double-click on the endpoint. Maptitude displays the line with editing handles at the endpoints and shape points.
6. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the added lines. If you start or end a line near the starting or ending point of any other line in the layer, Maptitude makes sure that the lines meet.

▶ To Delete Lines

1. Click  in the Layer Editing toolbar to activate the Delete tool.
2. Click on each line you want to delete. Maptitude marks each deleted line in red.
3. Click  to save your edits, or click  to cancel.

If you saved your edits, Maptitude draws the map without the deleted lines.

▶ To Change the Shape of Lines

1. Click  in the Layer Editing toolbar to activate the Modify tool.
2. Click on a line you want to modify. Maptitude displays editing handles at the endpoints and shape points.
3. Edit the line according to the table:

To do this...	Do this...
Move an endpoint	Drag it to a new location
Add a shape point	Click anywhere on the line
Delete a shape point	Click on a shape point and press the Delete key or drag the shape point onto an adjacent shape point

4. Click  to save your edits, or click  to cancel.

If you saved your edits, Maptitude draws the map with the lines in their new shapes. If you move the endpoint of a line, other lines that end at the same place will be changed automatically. Maptitude will display these lines with editing handles, too, so you can tell that you've changed them.

▶ To Replace the Shape Points of a Line

1. Choose how the shape points will be replaced:

To do this...	Do this...
Have shape points lie along curves	Check Curves
Add each shape point without curves	Remove the check from Curves

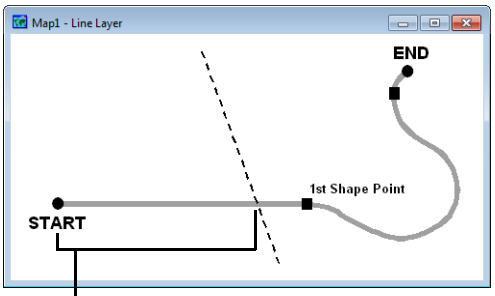
2. Click  in the Layer Editing toolbar and click on a line. All existing shape points are deleted.
3. Add more shape points as follows:

To do this...	Do this...
Add shape points	Click at the points
Remove the previous shape point	Click the right mouse button
Add the last shape point	Double-click on the last (or only) shape point

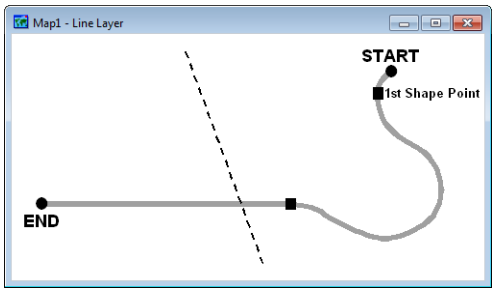
4. To replace other lines, return to Step 2.
5. Click  to save your edits, or click  to cancel.

If you saved your edits, Maptitude draws the map with the replaced lines.

The Replace Line tool assumes a start and an end point. The start point is automatically chosen when you click on the line, and it is the node closest to where you clicked. The first shape point is connected to the start point. For example:



Click anywhere on this portion of the line and the start node and first shape point are like this



Click anywhere else on the line and the other node is closest and becomes the start and the shape points are reversed

Try It Yourself: Editing Line Features, Part 1

1. Choose ***Tools-Editing-New Layer***. Maptitude displays the New Layer dialog box.
2. Choose the **Line Layer** radio button, type "**My Lines**" as the layer name, and click **OK**.
3. Click **OK** again to close the Attributes dialog box without making changes.
4. Type "**My Lines**" as the file name, and click **Save**. Maptitude displays a new map with the line layer.
5. Choose ***Tools-Editing-Layer Editing Toolbar*** to open the Layer Editing toolbar.
6. Click in the toolbar to activate the Add Line tool, then click at several points on the map. Maptitude displays a dashed line.
7. Click the right mouse button. The last shape point is deleted.
8. Double-click to end the line. Draw several more lines, including some that start where other lines end.
9. Click in the toolbar to save the lines. Maptitude draws them in the style for the layer.
10. Click in the toolbar to activate the Delete Line tool and click on one of the lines. The line turns red to indicate that it will be deleted.
11. Click to cancel the edit. The line is not deleted.
12. Click in the toolbar to activate the Modify Line tool and drag some endpoints and shape points to new spots.
13. Click on a line away from any existing points to add a new shape point, and drag it to a new spot.
14. Click on a shape point to choose it. Press the Delete key to delete that shape point.
15. Click to save the edits. Maptitude redraws the lines with the changes.
16. Leave the map as it is for Part 2 of this tutorial.

▶ To Split a Line in Two

1. Click in the Layer Editing toolbar to activate the Split tool.
2. Click on the line where it is to be split. Maptitude splits the line into two separate lines and adds an endpoint, or if you clicked at a shape point, Maptitude changes the shape point to an endpoint.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the updated map.

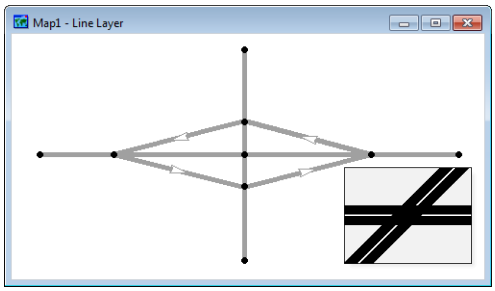
▶ To Split Lines Apart Where They Meet

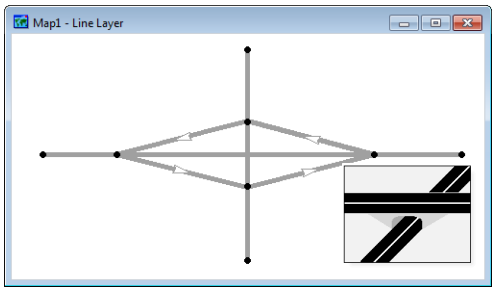
When several lines meet at a common endpoint, you can use the Split tool to separate them so they don't end at the same location.

1. Click in the Layer Editing toolbar to activate the Split tool.
2. Click on an endpoint where two or more lines meet. Maptitude displays editing handles on the lines and splits the endpoint into a separate endpoint for each line, so the lines no longer meet.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the updated map.

You can use this feature, along with the Join tool described below, to change an intersection to an overpass. Split the lines at the common endpoint in the center, then join the two North-South lines and the two East-West lines.





▶ To Join Two Lines Together

1. Click in the Layer Editing toolbar to activate the Join tool.
2. Click on an endpoint where two lines meet. Maptitude changes the endpoint to a shape point and joins the two lines. Editing handles are displayed on the new line.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the lines joined together.

▶ To Make Sure Two Lines Meet at a Common Point

Two lines meet only when they have a common endpoint. To make sure they meet, follow the steps below:

1. Click in the Layer Editing toolbar to activate the Modify tool.
2. Select two or more lines by clicking on them. Editing handles are displayed at the endpoints and shape points of all the lines you select.
3. If the lines cross each other, click on the point where they cross to add an endpoint and split both lines in two. If the lines don't cross, drag any point of one line so it is on top of any point on the other line, and drop it there. Maptitude changes that point to an endpoint and splits both lines in two.
4. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the lines updated.

Try It Yourself: Editing Line Features, Part 2

1. If you did not do Part 1 of this tutorial, go back and do it now.
2. Click in the toolbar, then add two new lines, with the second line starting where the first line ends.
3. Click then click on the endpoint where the two lines meet. Maptitude joins the two lines, changing the endpoint to a shape point. Click to save the edits.
4. Click then click on the line. Maptitude splits the line in two with a new endpoint where you clicked.
5. Click again on the same point. Maptitude moves the endpoints of the two lines apart so they no longer meet.
6. Click then pick up either endpoint and place it on the other. Maptitude connects the two lines. Click to save the changes.
7. Click then add two new lines that cross in the middle in the shape of an X.
8. Click and then click on the point where the two lines cross. Maptitude splits the lines. Drag the new endpoint to see how the lines are connected.
9. Click and click on the new endpoint. Maptitude splits the lines apart. Click to save the changes.
10. Click in the toolbar to activate the Replace Line tool and make sure the **Curves** box is not checked.
11. Click on one of the lines, click several times to add shape points to the line, and double-click at the last point. Click to save the changes.
12. Check the Curves box and click on the same line. Move the cursor to display a curved dashed line and double-click. Maptitude creates a curve with several shape points. Click to save the changes.
13. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Editing Line Attributes

The Edit Line Attributes and Edit Node Attributes tools help you to display and edit attributes for one or more lines or nodes. The attributes are displayed in an Edit Attributes window. You can choose which fields are displayed by creating field sets, and you can edit and copy values from the highlighted features to other features in the Edit Attributes window.

The edits to line attributes are stored in the map editing buffer and are not saved until you click to save edits. If you click to cancel edits, all pending attribute (and geographic) edits will be discarded. Clicking either button will also close the Edit Attributes window.

▶ To Edit Line Attributes

1. Click in the Layer Editing toolbar to activate the Edit Line Attributes tool.
2. Select the line or lines to display in an Edit Attributes window as follows:

To do this...	Do this...
Select one line	Click on the line. Maptitude displays the line in the Edit Attributes window.
Select more lines	Hold the Shift key and click on the lines. Maptitude adds the lines to the Edit Attributes window.
Deselect lines	Hold the Ctrl key and click on the lines. Maptitude removes the lines from the Edit Attributes window.

The last line selected has its ID field highlighted in the Edit Attributes window. To make sure you are about to edit the correct line, hold the Shift key and click on that line.

3. Make changes as follows:

To do this...	Do this...
Replace a value in a cell	Click on the cell and type a new value.
Edit a value in a cell	Double-click on the cell and change the value.
Choose a field set	Right-click and choose ***Field Sets*** to display the Field Sets dialog box. Highlight an existing field set or create a new field set, and click OK.
Replace values in a range of cells	Right-click in one cell, drag to another cell to highlight a range of cells, and choose ***Fill*** to display the Fill dialog box. Choose a fill method, enter the necessary values, and click OK.
Copy values to other selected records	Right-click on a column heading or a cell in a record and choose ***Copy Values*** to display the Confirm dialog box. Click OK to copy the values from the highlighted record to the other selected records.

4. To edit attributes for other lines, return to Step 2.
5. Click  to save your edits, or click  to cancel.

Maptitude updates the attributes for the lines and displays the map with any changes.

▶ To Edit Node Attributes

If the node layer for a line geographic file has attributes, the Edit Node Attributes tool  will be enabled. If the node layer is hidden, the tool will still be able to select nodes. If the node layer has been dropped from the map, Maptitude will prompt you to add the layer to the map.

1. Click  in the Layer Editing toolbar to activate the Edit Node Attributes tool.
2. Select the node or nodes to display in an Edit Attributes window as follows:

To do this...	Do this...
Select one node	Click on the node. Maptitude displays the node in the Edit Attributes window.
Select more nodes	Hold the Shift key and click on the nodes. Maptitude adds the nodes to the Edit Attributes window.
Deselect nodes	Hold the Ctrl key and click on the nodes. Maptitude removes the nodes from the Edit Attributes window.

The last node selected has its ID field highlighted in the Edit Attributes window. To make sure you are about to edit the correct node, hold the Shift key and click on that node.

3. Make changes as follows:

To do this...	Do this...
Replace a value in a cell	Click on the cell and type a new value.
Edit a value in a cell	Double-click on the cell and change the value.
Choose a field set	Right-click and choose ***Field Sets*** to display the Field Sets dialog box. Highlight an existing field set or create a new field set, and click OK.
Replace values in a range of cells	Right-click in one cell, drag to another cell to highlight a range of cells, and choose ***Fill*** to display the Fill dialog box. Choose a fill method, enter the necessary values, and click OK.

To do this...	Do this...
Copy values to other selected records	Right-click on a column heading or a cell in a record and choose ***Copy Values*** to display the Confirm dialog box. Click OK to copy the values from the highlighted record to the other selected records.

4. To edit attributes for other nodes, return to Step 2.
5. Click  to save your edits, or click  to cancel.

Maptitude updates the attributes for the nodes and displays the map with any changes.

Copying Values

When you are using the Edit Attributes window, you can copy values from one record to all other records displayed in the Edit Attributes window. You can copy values for all fields, or just those in the chosen field set.

▶ To Copy Values

1. Choose the record from which you are copying values, and the records to which you want to copy values, with the Edit Line Attributes tool  or Edit Node Attributes tool  .
2. If you want to copy values from only certain fields, use field sets as described in "Creating and Using Field Sets" on page 229.
3. Right-click on a cell, a range, or a column heading in the Edit Attributes window to highlight the record that will be the source for the values, and choose ***Copy Values***. Maptitude displays a Confirm dialog box, indicating the number of records that will be filled with new values.
4. Choose **Yes** to fill the other records with the values from the highlighted record, or **No** to leave the values unchanged.

Copying and Pasting Segments

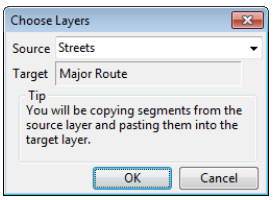
You can copy segments from one line layer and paste them into another with the tools in the Copy & Paste toolbox. If you have a line layer that needs updating, you can get the missing segments from another line layer. You paste the segments into the target layer, which must be an editable geographic file. You copy the segments from the source layer, which can be a compact geographic file.

You can move data from the source layer to the target layer, by indicating the source field to use for each target field. For handling new endpoints, you have considerable control over:

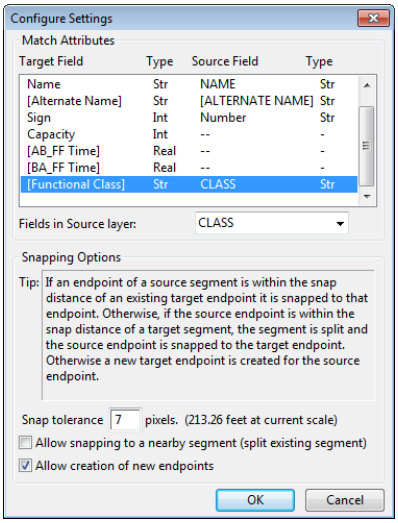
- The distance within which an endpoint of a source segment will be snapped to an existing target endpoint
- Whether an existing target segment should be split if an endpoint of a pasted segment is within the snap distance of the target segment, but not within the snap distance of a target endpoint
- Whether a new target endpoint should be created if it is not within the snap distance of an existing target segment or endpoint

▶ To Copy and Paste Segments

1. Choose or create a map that has at least two line layers.
2. Choose the target layer from the drop-down list on the Standard toolbar. The geographic file for the target layer must be editable.
3. Choose ***Tools-Editing-Copy & Paste Lines***. Maptitude displays the Choose Layers dialog box.



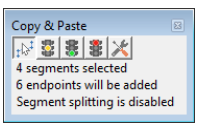
4. Choose the source layer from the Source drop-down list.
5. Click **OK** to display the Configure Settings dialog box.



6. Make changes to the settings as follows:

To do this...	Do this...
Copy data to the target line layer	Highlight a target field in the Match Attributes scroll list and choose a field from the Fields in Source Layer drop-down list. Choose None to not copy data into a target field.
Set the snap tolerance	Type a value in the Snap Tolerance edit box. Once you press Tab or use another control the new distance will be displayed in map units.
Allow the splitting of existing segments	Check the Allow Snapping to a Nearby Segment box or uncheck to prevent splitting.
Create new endpoints	Check the Allow Creation of New Endpoints box or uncheck to prevent the creation of new endpoints.

7. Click **OK**. Maptitude displays the Copy & Paste Lines toolbox.



8. Use the tools in the toolbox as follows:

To do this...	Do this...
Select source segments to be copied	Click the Select Source Segments tool to activate it and click on the first segment. Press the Shift key and click on any additional segments. Press the Ctrl key and click on selected segments to deselect them. The number of selected segments is displayed in the toolbox. Once at least one segment is selected the Find Target Placement button is enabled.
Check to see how the segments will be pasted	Click Find Target Placement. The numbers of endpoints that will be added and segments that will be split are displayed in the toolbox. If the paste can be done, Paste New Segments and Cancel New Segments are enabled.
Change the settings that will be used	Click Configure and return to step 5 to change the settings. If you change any settings, Find Target Placement will be disabled and you will need to recheck to see how the segments will be pasted.

9. Click Paste New Segments to paste the segments, or Cancel New Segments to cancel pasting the segments. Both buttons clear the selected segments. Return to step 7 to select additional segments to paste.
10. Choose ***Tools-Editing-Copy & Paste Lines*** or click the close button in the top right corner of the toolbox.

Maptitude closes the toolbox. Any pending changes are ignored.

Working with One-Way Streets

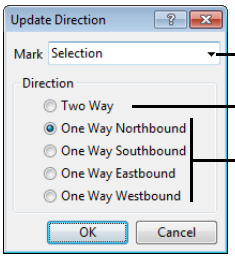
If your line layer contains one-way streets, Maptitude uses this information automatically in its analysis. For example, the HERE street layer included with your Country Package includes information on one-way streets that Maptitude will consider when finding shortest routes, solving traveling salesman problems, or determining drive-time rings.

Marking One-Way Streets

If you are working with your own street file or other line layer in a standard (.DBD) format, you can easily mark streets as one-way or two-way. Simply select the streets you want to mark using any of the selection tools or commands, and then use the ***Tools-Editing-One Way Line Segments*** command to designate streets as one-way in any compass direction, or as two-way. You cannot mark one-way streets in a compact, read-only geographic file (.CDF). For more information, see "Geographic File Formats" on page 380.

▶ To Mark Streets as One-Way or Two Way

1. Select the streets you want to mark using any of the selection tools or commands.
2. Choose ***Tools-Editing-One Way Line Segments*** and make choices as follows:



Choose the selection set that contains the streets you want to change

Choose to mark the streets as two-way

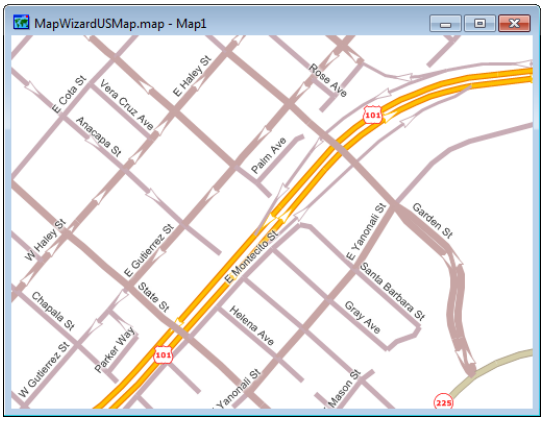
Choose the compass direction that best indicates the permitted direction of travel to mark streets as one-way

3. Click OK.

Maptitude updates the streets.

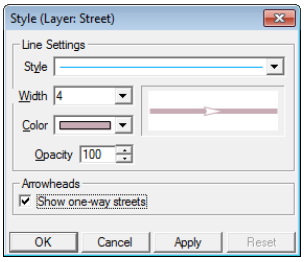
Displaying One-Way Streets

Maptitude uses arrowheads displayed on each line feature to show the location of one-way streets. For example, the map below shows one way streets and highway ramps with arrowheads indicating the direction of travel.



▶ To Display Arrowheads

1. If the Display Manager is not visible, choose ***Map-Display Manager Toolbar***.
2. Click the style sample of the line feature you want to modify to display the Style dialog box.



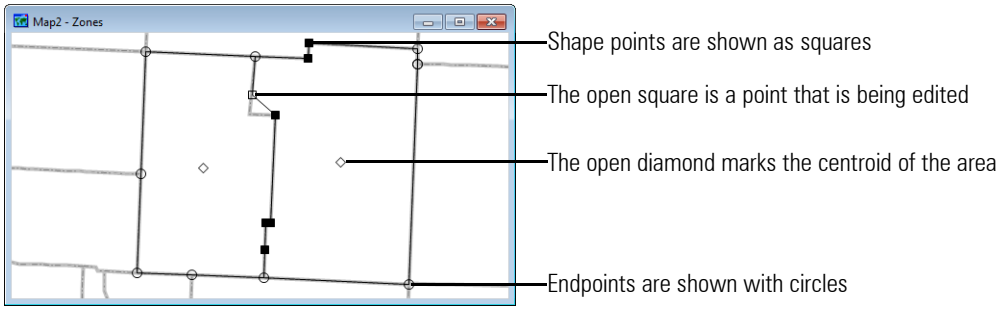
3. Check the **Show One-Way Streets** box.
4. Click **OK**.

From now on, Maptitude shows arrowheads on one-way streets.

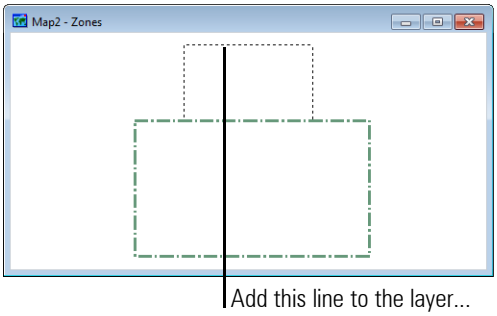
NOTE: The street layer that is included with Maptitude uses feature display settings to display different types of streets with different styles. To see one way streets on the streets layer, you will need to change the feature display setting styles instead of the layer style. For more information, see "Using Feature Display Settings" on page 148.

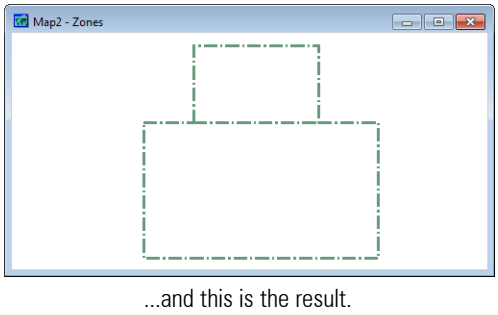
Editing Area Features

Areas are defined by a series of boundary lines. Each boundary line has two endpoints and any number of shape points. When you edit an area, the boundary lines are displayed with **editing handles**. Endpoints are shown as circles, shape points are shown as solid squares, an open square is a point that is being edited, and an open diamond marks the centroid of the area.

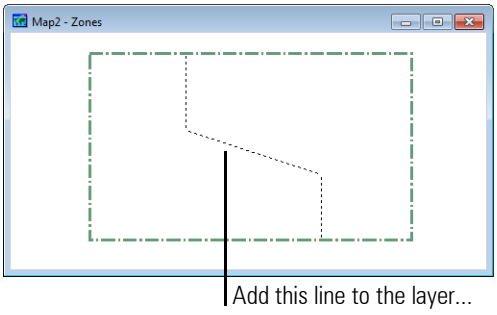


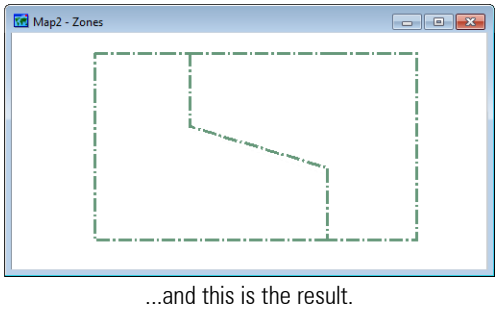
You can add areas to a layer, or split existing areas, by adding boundary lines with the Add tool. Here are two examples:





In this second example, an area is split into parts by the boundary line you have drawn:





If you add boundary lines that do not close off an area, Maptitude ignores them. If you add boundary lines that are a little too long, Maptitude trims them neatly, just where you would expect.

You can also add and edit areas using segments from a line layer so that the areas align with the segments in the line layers. You can use segments from any number of line layers in the map, such as roads, railroads, or rivers.

You can also edit areas in non-topological geographic files, including Esri Shapefiles and SQL Server Spatial. See "Using the Non-Topological Area Editing Tools" on page 405 for more information.

If you have set up a digitizer, you can switch to editing on the digitizer by clicking in the Layer Editing toolbar. The button will change to to show that the digitizing tablet is now active. For more information on digitizers, see "Using a Digitizer" on page 409.

▶ To Display the Layer Editing Toolbar for Editing Area Features

1. Choose an editable area layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Layer Editing Toolbar*** to display the Layer Editing toolbar.
3. When you are done editing features, choose ***Tools-Editing-Layer Editing Toolbar*** or click the Close button in the Layer Editing toolbar to close the toolbox.

▶ To Add Areas or Split Areas into Parts

1. Activate the Add tool in the Layer Editing toolbar by clicking on it.
2. Click at the starting point of the boundary line.
3. To add one or more shape points, move the mouse to the next point and click. Right-click to back up.
4. To end the line, press Enter or double-click on the endpoint. Maptitude displays the boundary line in black, with editing handles at the endpoints and shape points. Maptitude also displays editing handles on nearby areas. To add more boundary lines, return to step 2.
5. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude creates new areas that are defined by the lines you have drawn and draws the map with the revised areas.

▶ To Add or Split Areas Using Line Segments

1. Click in the Layer Editing toolbar to display the Line Layer dialog box.
2. Choose a line layer and click OK.
3. Activate the Select Segments tool by clicking on it, and select one or more segments from the line layer.
4. To choose another line layer, return to Step 1.
5. Click to save your edits, or click to cancel.

Maptitude creates new areas defined by the existing area boundary lines and the segments that you selected, and draws the map with the revised areas.

▶ To Modify Area Boundaries

1. Activate the Modify tool in the Layer Editing toolbar by clicking on it.
2. Click on an area you want to modify. Maptitude displays editing handles at the endpoints and shape points of all the boundary lines.

3. Edit the boundary lines according to the table:

To do this...	Do this...
Move a point	Drag it to a new location.
Add a shape point	Click anywhere on the line.
Delete a shape point	Click on a shape point and press the Delete key, or drag the shape point onto an adjacent shape point.

   If the change affects other areas, Maptitude draws them with editing handles.

4. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the modified boundaries.

▶ To Delete Areas

1. Activate the Delete tool in the Layer Editing toolbar by clicking on it.
2. Click on each area you want to delete. Maptitude marks the deleted areas in red.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map without the deleted areas. When you save your edits, Maptitude removes from the geographic file any boundary lines that are no longer in use.

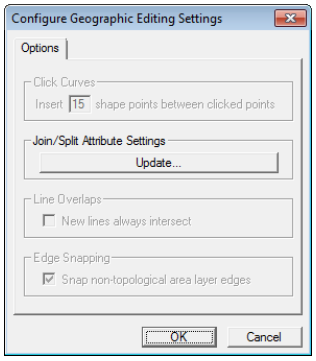
▶ To Join Two or More Areas into One

1. Activate the Join tool in the Layer Editing toolbar by clicking on it.
2. Click on the first area you want to join. Maptitude displays editing handles on the boundary.
3. Click on one or more areas that you want to join with the first one. Maptitude displays editing handles on the boundary and marks in red any boundary line that separates the areas to be joined.
4. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the joined areas.

▶ To Configure Area Editing

1. Click in the Layer Editing toolbar to display the Configure Geographic Editing dialog box.



2. Click Update to display the Data Update dialog box. See "To Change the Aggregation Method when Editing Map Features" on page 323 for more information.

3. Click **OK**.

Maptitude closes the Configure Geographic Editing dialog box.

Try It Yourself: Editing Area Features

1. Choose ***Tools-Editing-New Layer***. Maptitude displays the New Layer dialog box.
2. Choose the **Area Layer** radio button, type "**My Areas**" as the layer name, and click **OK**.
3. Click **OK** again to close the Attributes dialog box without making changes.
4. Type "**My Areas**" as the file name and click **Save**. Maptitude displays a new map with the area layer.
5. Choose ***Tools-Editing-Layer Editing Toolbar*** to open the Layer Editing toolbar.
6. Click in the toolbar, then draw three parallel horizontal lines, and draw three vertical lines that cross the horizontal lines.
7. Click to save the edits. Maptitude creates four area features, removing the portions of the lines that did not enclose an area.
8. Click in the toolbox, then click on the upper left area. The border of the area turns red to indicate that it will be deleted.
9. Click to delete the area.
10. Click in toolbox, then click on a corner of the upper right area and drag it to a new spot. Click along a side of the area and drag a new shape point to another spot.
11. Click to cancel the edits. The area returns to its original shape.
12. Click in the toolbox, then click on the two lower areas. Maptitude turns the common border red to show that it will be deleted.
13. Click to save the edits. Maptitude joins the two areas into one area.
14. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Some Special Cases - Islands and Holes

Some areas have holes in them, such as when a large lake is located inside an area. Other areas consist of many different parts. The State of Hawaii, for example, is made up of several islands. You can use the area editing tools to create and modify areas that have islands and holes.

▶ To Cut a Hole in an Area

1. Use the Add tool in the Layer Editing toolbar to draw boundary lines that outline the hole.
2. Click to split the area in two. The hole becomes one area, and the region surrounding the hole becomes the other area.
3. Use the Delete tool to delete the inner area and create a hole.
4. Click to save the changes.

Holes and areas are hard to distinguish from one another. The distinction is most obvious when you use a fill style or use the selection tools. With a fill style, only the area features will be filled, and when you select an area, it will be highlighted, while a hole cannot be selected.

▶ To Change a Hole into an Area

A hole is not recognized as an enclosed area. To change a hole into an area, you must add another boundary line to form two enclosed areas that can be joined.

1. Use the Add tool in the Layer Editing toolbar to add a line that splits the hole in half.
2. Click to create two new areas where the hole used to be.
3. Activate the Join tool by clicking on it.
4. Click on the two newly formed areas.
5. Click to save the changes.

The two new areas are joined to form a single area where the hole used to be.

▶ To Remove a Hole

You can join a hole to the surrounding area to make the hole "disappear."

1. Follow the procedure above to change the hole into an area.
2. Activate the Join tool in the Layer Editing toolbar by clicking on it.
3. Click on the surrounding area and then on the area that used to be the hole.
4. Click to save the changes.

The hole "disappears" leaving one solid area.

▶ To Create an Area with Islands

1. Use the Join tool in the Layer Editing toolbar to join any islands together into a single area.
2. Click to save the changes.

Even though the islands still look separate, Maptitude has linked all of them together as a single feature. The link is most obvious when you make a thematic map or use the selection tools. All the islands are drawn together in the same color or style, and when you select any part of the area, all the islands are highlighted.

▶ To Split Off One Island into a Separate Area

When an area contains many islands, you will occasionally want to split one island away from the rest. As with holes, the inner boundary lines for joined islands are not recognized as separate features. To split off an island you must make the island into two new areas and join them.

1. Use the Add tool in the Layer Editing toolbar to draw a line that splits the island in half.
2. Click , and Maptitude creates two new areas, one for each half of the island. The remainder of the area is left intact.
3. Use the Join tool to join the two halves back into a single, separate area.
4. Click to save the changes.

Working with Area Centroids

Every area in a geographic file has an associated point location called the centroid. The centroid is a point located near the geographic center of an area, and it is used for several things:

- Labels of area features are positioned based on the centroid
- Distance calculations involving areas are based on the centroid location

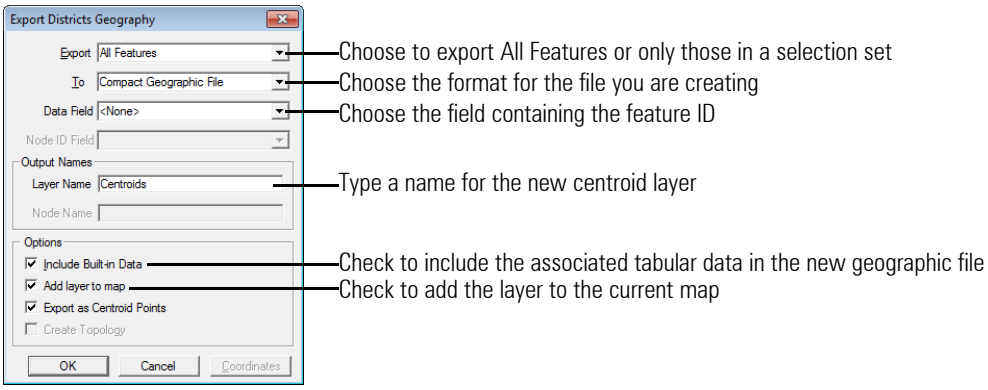
Maptitude lets you edit the location of an area centroid, and save the centroid locations from one or more area features as a separate geographic file.

▶ To Move an Area Centroid

1. Activate the Modify tool in the Layer Editing toolbar by clicking on it.
2. Click on the area whose centroid you want to move. Maptitude displays editing handles around the boundary of the area. A small open diamond identifies the centroid of the area.
3. Click on the centroid and drag it to the desired location.
4. Click to save your edits, or click to cancel.

▶ To Create a Geographic File of Centroids

1. Choose an area layer to convert from the drop-down list on the Standard toolbar.
2. Choose ***File-Export-Geography*** to display the Export Geography dialog box.
3. Make choices as follows:



4. Check the **Export as Centroid Points** box.
5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a file name and click **Save**.

Maptitude creates a new point geographic file containing the centroid locations. For more information about ID fields or about exporting tabular data, see "Geographic File Formats" on page 380.

Using the Non-Topological Area Editing Tools

You can edit non-topological areas such as Esri Shapefiles and SQL Server Spatial. These areas have a single boundary line around each polygon that makes up an area, and can overlap. Because they do not share common boundary lines, these areas can also have underlaps, so they do not match exactly. You can choose to snap non-topological area edges as you add areas, to avoid overlaps and underlaps. You can move whole non-topological areas, and you can create new areas by drawing a line that would split a non-topological area into parts.

▶ To Display the Layer Editing Toolbar for Non-Topological Area Features

1. Choose a non-topological editable area layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Layer Editing Toolbar*** to display the Layer Editing toolbar.
3. When you are done editing features, choose ***Tools-Editing-Layer Editing Toolbar*** or click the Close button in the Layer Editing toolbar to close the toolbox.

▶ To Add a Non-Topological Area by Drawing a Boundary

1. Activate the Add new area tool by clicking on it.
2. Click at the starting point of the boundary line.
3. To add one or more shape points, move the mouse to the next point and click. Right-click to back up.
4. To end the line, press Enter or double-click on the endpoint. Maptitude displays the boundary line in black, with editing handles at the endpoints and shape points. Maptitude also fills the area with a color, so you can see any overlaps. To add more boundary lines, return to step 2.
5. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude creates the new area that is defined by the line you have drawn and draws the map with the new area.

▶ To Add a Non-Topological Area by Picking a Boundary from a Line layer

1. Click to display the Line Layer dialog box.
2. Choose a line layer and click OK.
3. Activate the Pick a boundary from a line layer tool by clicking on it, and select one or more segments from the line layer.
4. To choose another line layer, return to Step 1.
5. Click to save your edits, or click to cancel.

Maptitude creates a new area defined by the existing area boundary lines that you selected, and draws the map with the new area.

▶ To Split Non-Topological Areas into Parts

1. Activate the Modify area tool by clicking on it.
2. Click on an area you want to split. Maptitude displays editing handles at the endpoints and shape points of the boundary line.
3. Activate the Add Boundary Edge tool in the Layer Editing toolbar by clicking on it.
4. Click at the starting point of the boundary line.
5. To add one or more shape points, move the mouse to the next point and click. Right-click to back up.
6. To end the line, press Enter or double-click on the endpoint. Maptitude displays the boundary line in black, with editing handles at the endpoints and shape points. Maptitude also displays editing handles on nearby areas. To add more boundary lines, return to step 2.
7. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude creates new areas that are defined by the lines you have drawn and draws the map with the revised areas.

▶ To Modify Non-Topological Area Boundaries

1. Activate the Modify area tool by clicking on it.
2. Click on an area you want to modify. Maptitude displays editing handles at the endpoints and shape points of the boundary line.
3. Edit the boundary line as follows:

To do this...	Do this...
Move a point	Drag it to a new location
Add a shape point	Click anywhere on the line
Delete a shape point	Click on a shape point and press the Delete key, or drag the shape point onto an adjacent shape point

4. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the modified boundary.

▶ To Delete Non-Topological Areas

1. Activate the Delete area tool by clicking on it.
2. Click on each area you want to delete. Maptitude marks the deleted areas in red.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map without the deleted areas. When you save your edits, Maptitude removes from the geographic file any boundary lines that are no longer in use.

▶ To Move a Non-Topological Area

1. Activate the Move an area tool by clicking on it.
2. Click on the area you want to move and drag it to a new location. Maptitude displays editing handles on the boundary.
3. Click to save your edits, or click to cancel.

If you saved your edits, Maptitude draws the map with the moved area.

▶ To Configure Non-Topological Area Editing

1. Click to display the Configure Geographic Editing dialog box.
2. Make choices as follows:

To do this...	Do this...
Change the number of shape points between clicked points	Type the number of shape points in the edit box in the Click Curves frame
Change the join/split attribute settings	Click Update to display the Data Update dialog box; for more information, see "Combining Attributes" on page 320
Snap edges when adding a new area	Check the Snap non-topological area layer edges box

3. Click **OK**.

Maptitude closes the Configure Geographic Editing dialog box.

Updating Tabular Data

Maptitude makes estimates of the correct values of tabular data when you join or split line or area features with the editing tools. When you split features into parts, Maptitude compares the length or area of the new features with the length or area of the original feature, and uses the ratio to estimate the new values. For example, if you split an area into two parts of equal size, the data from the original feature would be divided 50-50 between the two new features. When you join two features, Maptitude adds up the data from the original features to determine a value for the new feature. For example, if you joined three counties together, Maptitude would add the population of the three counties to estimate the population of the new county.

Fields with character data are handled differently. When you split a feature into parts, Maptitude copies the value of the field to all the new features. For example, if you take a highway whose Route Name is I-70 and split it into four smaller segments, I-70 will be used as the Route Name for all four segments. When you combine two or more features, Maptitude uses the value of the field from the first feature you choose for the new feature.

You can change the way that Maptitude updates tabular data. For more information, see "Aggregation Methods" on page 321 and "To Change the Aggregation Method when Editing Map Features" on page 323.

Setting Up Multi-User Geographic Editing

Geographic editing by multiple users of standard format (.dbd) geographic files requires special handling. However, tabular data files may be shared and edited with multiple users simply by opening them for writing in shared mode. For more information, see "Sharing Tabular Data Files" on page 525.

Multi-user editing for standard format geographic files is controlled through a standalone database management program, also known as the Lock Manager. This program is run on one, and only one, computer and communicates with other computers using TCP/IP. It can be run either on a separate computer or on one of the computers that will be used for multi-user editing. The computer running the Lock Manager must be as fast as, or faster than, any of the computers being used for editing. To communicate with the Lock Manager, several environment variables must be set on each computer that will be used to do multi-user editing. In addition, Maptitude must be launched with the command line parameter –mt.

Please note that every user who will be doing multi-user editing must have write access to the standard format geographic file. So, for example, testing using tutorial files in the program Tutorial folder would fail because only the user logged in to that machine has write access to the user Documents folder in which the Tutorial folder is found.

▶ To Set Up Multi-User Geographic Editing

1. Choose ***Tools-Editing-Advanced-Multi-User Setup*** to display the Set Up Multi-User Geographic Editing dialog box.
2. Click ... and choose the folder where shared multi-user configuration files will be stored.
3. Choose the computer where the Lock Manager will run as follows:

To do this...	Do this...
Run locally	Click the Run locally radio button. Maptitude shows the IP address of the local computer.
Run on a remote computer	Click the Run on remote computer radio button and type the IP address (e.g., 10.1.1.10) or, if using domain name services, the hostname of the remote computer.

4. Type your 8-character user ID in the User ID (Alphanumeric) text edit box.
5. If you chose to run locally, you can start the Lock Manager by checking **Launch the database sharing Lock Manager**.
6. If you want a desktop icon for the multi-user version of Maptitude, check the **Create a Maptitude Multi-user Desktop Icon** box.
7. Click **OK**.

Maptitude saves your settings and, if you chose to do so, launches the Lock Manager.

Using a Digitizer

You can use a digitizing tablet to add or edit features in a map layer by tracing over a paper map or other drawing. Once you set up your digitizer, you can add and edit geographic features the same way you do with a mouse.

To add or edit features from a digitizer, you must follow these steps:

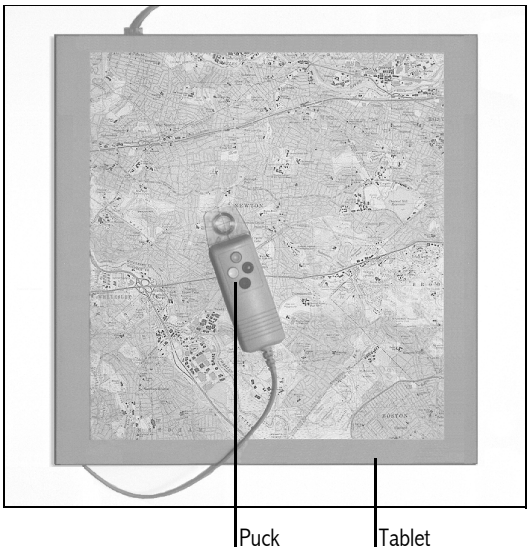
- Create or open a map window
- Set up the digitizer
- Prepare and register the paper map
- Choose the editing tool you want to use
- Click in the Layer Editing toolbar or press the F2 key to enter data from the tablet instead of from the screen

Once your digitizer is ready and your map is registered, you can switch back and forth as often as you like between editing features on the screen and editing them on the tablet.

Setting Up a Digitizer

All digitizers come with setup programs and complete instructions on how to install, configure, and test them. Most setup programs let you program the buttons on the puck to act like the buttons on your mouse. Be sure that you know how to click, double click, and drag using the buttons on your digitizer.

The Maptitude digitizing interface supports all digitizing tablets with Wintab compliant drivers. This includes virtually all tablets currently manufactured for use with PCs. Consult your tablet vendor if you are unsure whether the tablet you own or wish to buy for use with Maptitude has a Wintab driver.

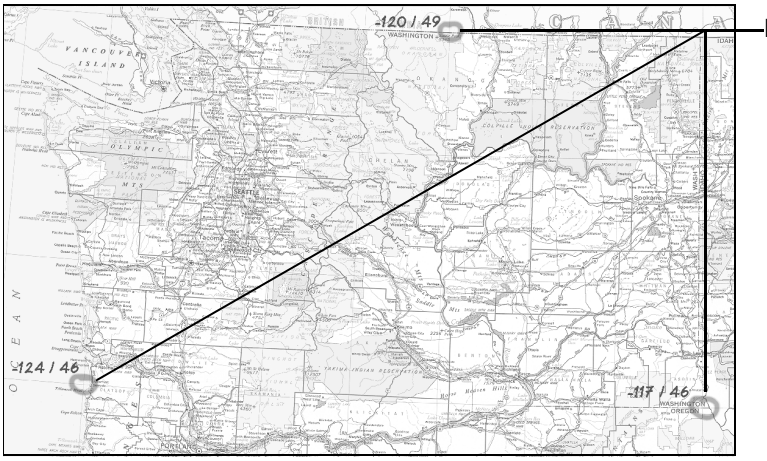


If the puck on your digitizer has extra buttons that you haven't already programmed, program one of the extra buttons to act like a double-click. Then you can use the button to switch from the tablet back to the screen without having to use your computer keyboard.

Registering a Map

To digitize features from a printed map, you must tell Maptitude what part of the world the map covers. You do so by marking three or more points on the paper map, and telling Maptitude the true location of each of these points. This process is called **registering** the map, and the points you mark are called **control points**. You use the Digitizer Registration toolbox to register a map on a digitizing tablet.

Maptitude needs three or more control points to register a map. If you provide four or more control points, Maptitude can determine if the true coordinates are correct for each one.



If the true coordinates are not correct, Maptitude acts according to the following table:

If the accuracy of...	Maptitude...
All control points are OK	Registers the map using all control points
One control point is far off	Registers the map with the other control points
Several control points are far off	Does not register the map

You can correct registration errors by:

- Adding additional control points
- Changing the true location of a control point
- Deleting a control point that is far off

You can type the true locations of control points in units other than longitude and latitude. This capability is useful if your map has a grid based on some other coordinate system. Use the Projection dialog box to set the units to meters, feet, or other units. To learn how to work with other coordinate systems, see *Appendix E: Projections and Coordinate Systems*.

▶ To Prepare Your Paper Map

1. Place your map on the tablet and attach it carefully using drafting tape.
2. Note the name of the projection that is used in the printed map. This information is usually listed in the legend of the map.
3. Mark three or more control points on the map, numbering them in order (1, 2, 3,...) Marking these points now will save you time if you want to digitize from the map in the future.

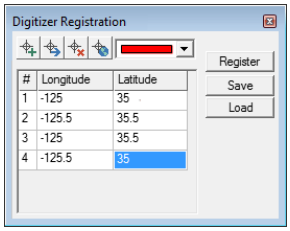
You get better results with more control points (say, between five and ten) and you can improve the registration by spreading them out across the tablet. For example, you might choose one point in each corner of the tablet, plus a few others in the middle.

If your map has a grid or a set of tick marks that identify the actual coordinates of several points, use these as your control points. If your map doesn't have a grid or tick marks, choose points that are dis-

tinctive, so you can match them with points on a map on the screen. Good choices include corners of area boundaries, major intersections, and coastline or waterway boundaries.

▶ To Register a Map

1. Make sure a map is open, then choose ***Tools-Editing-Advanced-Digitizer Setup***. Maptitude displays the Map Projection dialog box.
2. Choose the projection used in the paper map, and click **OK**. Maptitude displays the Digitizer Registration toolbox.



3. Click  to activate the Add Control Point tool. Maptitude switches to digitizer mode so you can work on the tablet. The cursor freezes over the tool while you add control points.
4. Using the digitizer puck, click on each of the numbered control points on the paper map.
5. Press the Esc key when you are done. Maptitude adds the control points to the list.
6. Enter the true location of each of the control points. First, click on the list to highlight the control point you are going to locate. Then, do one of the following:

   • Activate the  tool, and click on any map at the true location that matches the control point.
   • Type the coordinates for the control point directly into the respective Longitude and Latitude cells.

   Maptitude displays a numbered symbol at the true location.
7. To delete a control point, click on the control point in the list and click  . Maptitude renumbers the remaining control points.
8. To save the true locations of the control points to a file for future use, click **Save**, type a file name in the File Save As dialog box, and click **Save**.
9. Click **Register**.

Maptitude tries to register the map. If several control points are far off, Maptitude cannot register the map. Return to step 6 to correct the true location of control points or to step 3 to add additional control points. Otherwise, you are now ready to use the digitizer to add or edit map features.

Using a Registered Map

Once you register a map, you can continue digitizing as long as Maptitude is running and as long as the paper map stays in the same place on the tablet.

If you exit the program or remove the map from the tablet, you need to reregister the map before you can digitize more information. Registration is easier the second time around if you saved the control point registration information to a file.

▶ To Reregister a Map

1. Prepare your map on the tablet. The marked control points must be located within the borders of the tablet.
2. Open the map, then choose ***Tools-Editing-Advanced-Digitizer Setup***. Maptitude displays the Map Projection dialog box.
3. Choose the projection used in the paper map, and click **OK**. Maptitude displays the Digitizer Registration toolbox.
4. Click  to activate the control point tool. Maptitude switches to digitizer mode so you can work on the tablet.
5. Using the digitizer puck, click on each of the numbered control points on the paper map.
6. Press the Esc key when you are done. Maptitude adds the control points to the list.
7. Click **Load**, choose the control point file containing the control points for the map from the Load Digitizer Registration From dialog box, and click **Open**. Maptitude displays the true locations of the control points in the control point list.
8. Click **Register**.

Maptitude tries to register the map. If several control points are far off, Maptitude cannot register the map. Correct the control points by starting with step 6 of the procedure "To Register a Map" on page 411. Otherwise, you are now ready to use the digitizer to add or edit map features.

Editing Geographic Files

Once you register a map, you can edit geographic files from the tablet or on the screen. You switch from the screen to the tablet by pressing the F2 key or by clicking the  button in the Layer Editing toolbar. The button will change to  to show that the digitizing tablet is now active. You switch from the tablet to the screen by pressing the F2 key. If you set up one of the buttons on the puck to act as a middle button double-click, you can also use this button to switch from the tablet back to the screen.

When the tablet is active, the on-screen cursor is locked into the map window and cannot be used to click on any menus or tools.

▶ To Edit Geographic Files from the Tablet

Edit the features on a tablet the same way as you would on the screen. The only difference when you are using a digitizer is that you must switch back to screen mode to change tools. For example:

1. From the Layer Editing toolbar, start out in screen mode. If you are in tablet mode, press F2 to switch back to screen mode.
2. Click the Add tool in the Layer Editing toolbar to make it active.
3. Click  or press F2 to switch to the tablet.
4. Add features by clicking buttons on the puck while tracing over the map on the tablet.
5. To move points, press F2 to switch to the screen, click the Modify tool in the Layer Editing toolbar to make it active, and click  or press F2 to return to the tablet. Move points as usual.
6. To delete points, press F2 to switch to the screen, click the Delete tool in the Layer Editing toolbar to make it active, and click  or press F2 to return to the tablet. Delete points as usual.
7. To save your edits, press F2 to switch to the screen, and click  . To cancel your edits, press F2 to switch to the screen, and click  .

CHAPTER 14:
Managing Geographic Files

Maptitude includes dozens of geographic files, as well as tools for managing these files and the geographic files you create yourself. The Maptitude geographic utility tools enable you to:

- Copy, rename, archive, and restore geographic files
- Create and use metadata
- Import and export geographic files among many CAD, desktop mapping, and geographic information system (GIS) software packages
- Clip geographic files so that they contain just a particular region
- Create mask files that hide portions of the map
- Merge geographic files
- Create lines from a series of points such as GPS input
- Convert lines to areas and areas to lines
- Create grids
- Use other coordinate systems and datums
- Adjust geographic files by rubbersheeting

This chapter describes all of these Maptitude tools. For details on editing geographic files and creating new ones from scratch, see *Chapter 13: Creating and Editing Geographic Files*.

In this chapter:

Maptitude Geographic Files

Your Maptitude package contains an extensive collection of geographic files for a region and countries and cities of the world. For a complete description of these files and their contents, see "Maptitude Data Files" in the Maptitude help system (***Help-Maptitude Help***) and "Regional Data Files" in your Country Package's help system (***Help-Regional Data Help***).

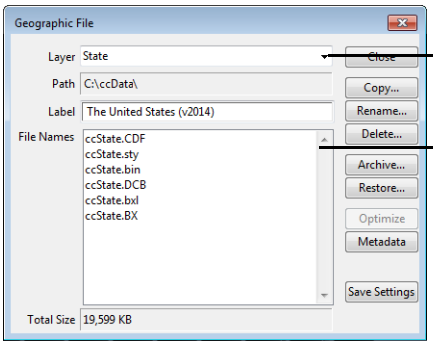
Maintaining Geographic Files

A geographic layer is really a collection of several files stored on your computer, network, DVD, or other storage device. These geographic files contain all the information needed to display features on a map, and tabular data that describe each map feature.

The ***Tools-Editing-Layer Manager*** command displays the Geographic File dialog box, which shows you the names and total size of all the files on disk that make up a single geographic file or map layer. From the Geographic File dialog box, you can change the label for a geographic file, and copy, rename, and delete geographic files.

Copying, Renaming, and Deleting Geographic Files

A compact format geographic file has up to seven files with the same name but different file extensions. Standard format files contain additional information so you can add, delete, or modify features in the file. A standard format geographic file may have a dozen or more files with the same name but different file extensions, so it is best not to use the Windows Explorer Copy or Rename commands with geographic files. Instead, use the ***Tools-Editing-Layer Manager*** command to copy or rename geographic files.



▶ To Change the Label for a Geographic File

1. Open the geographic file whose label you wish to change, or a map that contains the file.
2. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
3. Choose the layer whose label you wish to change from the Layer drop-down list.
4. Edit the label in the Label edit box. If the edit box is disabled, you do not have write permission for the geographic file.
5. Choose another layer from the Layer drop-down list, or click **Close**.

Maptitude changes the label.

▶ To Copy a Geographic File

1. Open the geographic file you wish to copy, or a map that contains the file.
2. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
3. Choose the layer to copy from the Layer drop-down list.
4. Click **Copy**. Maptitude displays the Save Copy As dialog box.
5. Type a file name for the copy of the geographic file and click **Save**.

   Maptitude copies all of the files and creates a complete copy of the map layer in a new geographic file.
6. Click **Close** to close the Geographic File dialog box.

To use the new file, use the ***File-Open*** command to create a new map, or choose ***Map-Layers***, click the Add Layer button, and add the new geographic file to an existing map.

TIP: Be careful when you rename a geographic file. Any maps, dataviews, or layouts that refer to the file under its old name may no longer be usable.

▶ To Rename a Geographic File

1. Open the geographic file you wish to rename, or a map that contains the file.
2. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
3. Choose the layer to rename from the Layer drop-down list.
4. Click **Rename**. Maptitude displays the File Rename As dialog box.
5. Type a file name for the geographic file and click Save.

   Maptitude renames all of the files in the geographic file with the name you typed. The file extensions for all of the files remain the same. All open maps, dataviews, and layouts are updated to use the geographic file under its new name.
6. Click **Close** to close the Geographic File dialog box.

TIP: Be careful when you delete a geographic file. Any maps, dataviews, or layouts that refer to the file will no longer be usable.

▶ To Delete a Geographic File

1. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
2. Click **Delete**. Maptitude displays the Delete File dialog box.
3. Choose the geographic file to delete and click **Open**. Maptitude asks you to confirm that you want to delete the geographic file.
4. Click **Yes** to delete the geographic file or **No** to cancel. If you click Yes, Maptitude deletes all the files that are part of the geographic file.
5. Click **Close** to close the Geographic File dialog box.

Saving Settings for a Geographic File

When a map layer is displayed in the map window, you have the option of permanently saving the settings associated with that layer in a style (.STY) file. The settings associated with a layer can include the display style for points, lines, nodes, or areas in a map layer, as well as styles for selection sets, themes, feature display settings, and labels. When you save the settings for a layer, it will display with those default settings every time the layer is opened or added to a map.

▶ To Save Settings for a Geographic File

1. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
2. Choose the layer whose settings you want to save from the Layer drop-down list. When the geographic file contains both lines and endpoints for the lines, you will see both layers listed.
3. Click **Save Settings** to save styles with the layer. This will save any styles you set up for the layer, selection sets, themes, feature display settings, and labels. Maptitude asks you to confirm this option.
4. Click **Yes** to save the settings or **No** to cancel. If you click Yes, Maptitude saves the map layer settings.
5. Click **Close** to close the Geographic File dialog box.

The next time you add the layer to a map, it will automatically display with the saved settings.

Reorganizing a Geographic File

Maptitude stores information in geographic files so that it can be displayed quickly. When a large number of features are added to or deleted from a standard format geographic file, the information is stored less efficiently. The result is that maps will not draw as fast. To correct this, you **optimize** the geographic file. When you optimize the file, Maptitude rearranges the information to save space and increase the speed of drawing.

For even faster drawing, convert standard format geographic files to compact, read-only files. These files display up to ten times faster than standard format files. For more information, see "Geographic File Formats" on page 380.

▶ To Optimize a Geographic File

1. Open the geographic file you wish to optimize, or a map that contains the file.
2. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
3. Choose the layer whose files you want to optimize from the Layer drop-down list.
4. Click **Optimize**.

   Maptitude reads and optimizes the geographic file.
5. Click **Close** to close the Geographic File dialog box.

Archiving Geographic Files

Maptitude also includes tools you can use to create and use archives of geographic files. An **archive** is a compressed version of the file you can use for backup purposes.

It is a good idea to create archives of geographic files once in a while when you use the geographic editing tools. That way, you always have a backup copy available. Maptitude archives are in industry-standard PKZIP format. This means you can restore archives of geographic files using other programs that read or write this format.

▶ To Archive a Geographic File

1. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
2. Choose the geographic file to archive as follows:

If...	Then...
No geographic files are open	Click Archive. Maptitude displays the Archive File dialog box. Choose the geographic file to archive and click Open to display the Save As dialog box.
A geographic file is open in a map or dataview	Choose the layer to archive from the Layer drop-down list and click Archive to display the Save As dialog box.

3. Type a file name for the archive file and click **Save**.

   Maptitude creates an industry-standard PKZIP format archive of the geographic file.

4. Click **Close** to close the Geographic File dialog box.

▶ To Restore a Geographic File from an Archive

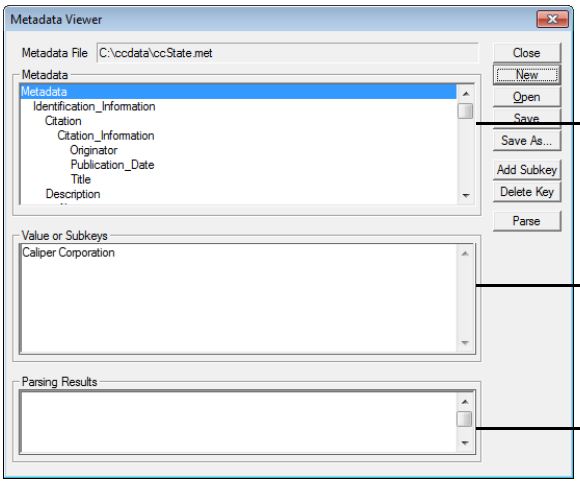
1. Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box.
2. Click **Restore**. Maptitude displays the Archive File dialog box.
3. Choose the archive file containing the archive of the layer you want to restore, and click **Open**. Maptitude displays the Browse for Folder dialog box.
4. Choose where to restore the file and click **OK**.

   Maptitude restores the archived file.

5. Click **Close** to close the Geographic File dialog box.

Creating and Using Metadata for a Geographic File

Metadata are data about data. Maptitude lets you view, create, and edit metadata associated with geographic files. The metadata are stored in a file with the same name as the geographic file and the extension .MET. The file contains text that can be viewed with any text editor, or with the Metadata Viewer, which lets you create, edit, and view metadata. You can display the Metadata Viewer from the Layers dialog box or from the Geographic File dialog box.



The metadata are structured using the Federal Geographic Data Committee (FGDC) standard. For more information, see Content Standard for Digital Geospatial Metadata, Publication FGDC-STD-001-1998, available on the FGDC website (WWW.FGDC.GOV). The structure has keys, subkeys, and values. Each key either has a value or has one or more subkeys. The subkeys themselves are keys which can have values or subkeys.

The root key is Metadata, and it can have up to seven predefined subkeys:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

In turn, the Identification_Information key can have up to 14 predefined subkeys, such as Originators. Some subkeys can be repeated if there are multiple values, such as two Originators. Notice that keys have no spaces in their names.

There is a minimum set of values that are recommended in the FGDC metadata standard. If a geographic file does not have a metadata file, Maptitude will help you create it from scratch, from a template, or from the geographic file itself. Any Maptitude metadata file can be used as a template for creating a new metadata file.

After you add subkeys, delete keys, and edit values, Maptitude can parse your metadata to see if there are missing values or errors.

Viewing Metadata for a Geographic File

Maptitude displays metadata in the Metadata Viewer dialog box, which you can open from the Layers dialog box, using the ***Map-Layers*** command, or from the Geographic File dialog box, using the ***Tools-Editing-Layer Manager*** command. Since the metadata file only contains ASCII text, it can also be viewed with any text editor or other program that can display a text file.

With the Metadata Viewer you can browse the keys and their subkeys or values. When you highlight a key that has one or more subkeys, the subkeys are listed in the Value or Subkey scrolling edit box. When you highlight a key that has a value, the value is shown in that scrolling edit box.

▶ To View Metadata for a Geographic File

1. Choose the layer whose metadata you want to see from the drop-down list on the Standard toolbar.
2. Choose ***Map-Layers***, click  on the Standard toolbar, or right-click on the map and choose ***Layers*** to display the Layers dialog box. The chosen layer will be highlighted.

   — OR —

   Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box. The chosen layer will be shown in the Layer drop-down list.

TIP: You can also open the Metadata Viewer dialog box by right-clicking on a layer in the Display Manager and choosing ***Metadata***.

3. Click **Metadata** to display the Metadata Viewer dialog box. The file name for the metadata file is shown in the Metadata File text box. If the layer does not have metadata, <No File> will be shown in the Metadata File text box.
4. Highlight a key in the Metadata scroll list. Maptitude displays either the subkeys or the value for that key.
5. Return to Step 4 to display other subkeys or values.
6. Click **Close** to return to the Layers or Geographic File dialog box.
7. Click **Close** to close the Layers or Geographic File dialog box.

Creating Metadata for a Geographic File

You can create a new metadata file from scratch. Maptitude knows the rules for building metadata using the FGDC standard, and will assist you with lists of the valid subkeys for a key, including those that can and cannot be repeated. Maptitude can also assist you in two ways, by:

- Opening an existing metadata file to use as a template for creating the new metadata file
- Scanning the geographic file to get values such as the bounding coordinates

If you combine these two ways, Maptitude makes it much easier to document a set of files with similar metadata values. You can always add additional subkeys and values to meet the particular needs of a geographic file.

Any metadata file can be used as a template. You can also prepare a metadata template file by removing values that will be filled in for a specific geographic file, such as bounding coordinates, or subkeys that will be added for a specific geographic file, such as the Detailed_Description subkey

under the Entity_and_Attribute_Information key. Then you can use both the template and the geographic file as sources of metadata to fill in most of the values.

When Maptitude scans a geographic file to get values, it tries to fill in the following values:

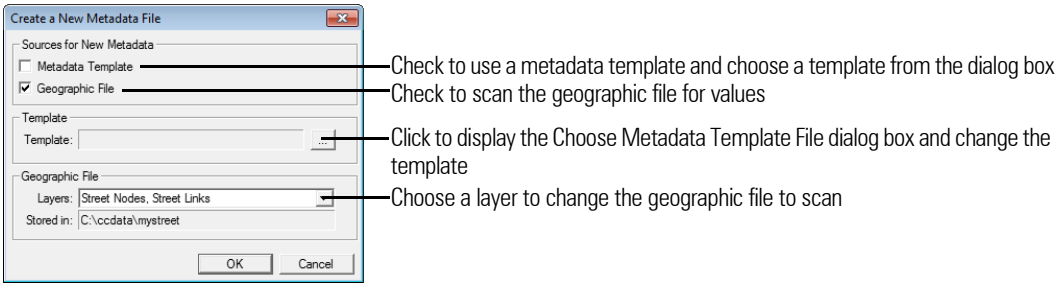
Under key...	Values for subkeys...
Identification_Information\Citation\Citation_Information	Title
Identification_Information\Spatial_Domain\Bounding_Coordinates	West_Bounding_Coordinate, East_Bounding_Coordinate, North_Bounding_Coordinate, South_Bounding_Coordinate
Spatial_Reference_Information\Horizontal_Coordinate_System_Definition\Geographic	Latitude_Resolution, Longitude_Resolution, Geographic_Coordinate_Units
Entity_and_Attribute_Information\Detailed_Description	Entity_Type subkeys plus one set of Attribute subkeys for each field

▶ To Create Metadata for a Geographic File

1. Choose the layer whose metadata you want to create from the drop-down list on the Standard toolbar.
2. Choose ***Map-Layers***, click on the Standard toolbar, or right-click on the map and choose ***Layers*** to display the Layers dialog box. The chosen layer will be highlighted.

   — OR —

   Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box. The chosen layer will be shown in the Layer drop-down list.
3. Click **Metadata** to display the Metadata Viewer dialog box. If the layer already has metadata, the file name will be shown in the Metadata File text box.
4. Click **New** to display the Create a New Metadata File dialog box.
5. Make choices as follows:



6. Click **OK**. Maptitude creates the new metadata file, parses it, and shows the results in the Parsing Results scroll list
7. Click **Close** to return to the Layers or Geographic File dialog box.
8. Click **Close** to close the Layers or Geographic File dialog box.

Editing Metadata for a Geographic File

You can edit an existing metadata file by adding subkeys, deleting keys, and editing values. You can also check to see if the metadata meet the FGDC standard by parsing the metadata to look for errors. Some subkeys can be repeated, so that you can have multiple values; Maptitude will only let you add more than one copy of subkeys that can be repeated. You can only delete a key if it does not have subkeys under it.

You can edit a metadata file to use it as a template, and save it as a new metadata template file.

▶ To Edit Metadata for a Geographic File

1. Choose the layer whose metadata you want to edit from the drop-down list on the Standard toolbar.
2. Choose ***Map-Layers***, click  on the Standard toolbar, or right-click on the map and choose ***Layers*** to display the Layers dialog box. The chosen layer will be highlighted.

   — OR —

   Choose ***Tools-Editing-Layer Manager*** to display the Geographic File dialog box. The chosen layer will be shown in the Layer drop-down list.
3. Click **Metadata** to display the Metadata Viewer dialog box. The file name for the metadata file is shown in the Metadata File text box. If the layer does not have metadata, <No File> will be shown in the Metadata File text box.
4. Make choices as follows:

To do this...	Do this...
Add a subkey	Highlight the key to which you are adding a new subkey in the Metadata scroll list, then click Add Subkey to display the Add Subkey dialog box. Choose a subkey from the Subkey drop-down list and click OK.
Delete a key	Highlight the key to delete in the Metadata scroll list, then click Delete Key to display a Confirm dialog box. Click Yes to delete the key or No to keep the key. Maptitude will display a message if the key still has subkeys under it and cannot be deleted.
Parse the metadata for errors	Click Parse. Maptitude parses the metadata and shows the results in the Parsing Results scroll list.
Edit a value	Highlight a key with a value in the Metadata scroll list, and edit the value in the Value or Subkeys scroll list.
Save the changes	Click Save.
Save the changes to a new file	Click Save As to display the Save Metadata File As dialog box. Choose the drive and folder, type the file name and click Save.
Open a different metadata file	Click Open to display the Open a Metadata File dialog box. Choose the metadata file and click Open.

5. Click **Close** to return to the Layers or Geographic File dialog box.
6. Click **Close** to close the Layers or Geographic File dialog box.

Importing Geographic Files

Maptitude can import geographic data from many other file formats, including:

When you import files from these other formats, Maptitude creates a new standard format geographic file and creates a new map layer from the features in the file. You can export features from a map layer to the formats marked with an asterisk (*). When you export, you can choose to export all the features in the layer or only the features in a selection set.

Some types of files contain a mixture of points, lines, areas, and other types of features. When you import a file, you choose the types of features you want to create when the file is imported, and Maptitude automatically decides what parts of the import file to use and what parts to ignore.

Certain types of area layers are not stored topologically, so they may have duplicate boundaries. The Eliminate Duplicate Boundary Lines option allows you to import these files without duplicate boundaries, but requires more memory. If you are importing particularly large files, you may run into memory limitations that require you turn this option off. Maptitude will build the area file but will not detect and eliminate common boundaries. For example, the coordinates of the boundary between Massachusetts and Connecticut would be stored twice – once as part of the Massachusetts boundary, and once as part of the Connecticut boundary. This option requires almost no memory, so you can import very large files without difficulty.

Your import files may store the locations of features in longitude and latitude coordinates, just as Maptitude does, or in some other coordinate system such as State Plane Coordinates or Universal Transverse Mercator (UTM). If the data you want to import are not in longitude and latitude coordinates, see "Using Data in Other Coordinate Systems" on page 463.

Importing ArcInfo Ungenerate and Export Files

Esri's ArcInfo product imports and exports geographic data using several different file formats. Maptitude imports data from both Export format (E00) files and Ungenerate format files, as well as Esri Shapefile format. These two formats are named after the ArcInfo EXPORT and UNGENERATE commands, respectively, which are used to produce the files.

In the Export format, geographic and tabular data for features in an ArcInfo coverage are stored in a series of one or more files with extensions of .E00, .E01, and so on. To import an Export format file, you choose the first file in the series, and specify the type of layer you want to build. The ArcInfo EXPORT command can produce files in either single or double precision, and in either compressed or uncompressed format. Maptitude can read files in either precision, but cannot read the compressed format Export files.

In the Ungenerate format, points are stored in a single file with the extension .PTS, while lines are stored in a single file with the extension .LIN. Areas are stored in two files, one with each of these file extensions. To import an Ungenerate format file, you choose the file you want to import, and specify the type of layer you want to build. If you want to import areas, choose one of the two files, and Maptitude will find the other one automatically.

▶ To Import ArcInfo Export Format or Ungenerate Format Files

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **Esri Export** or **Esri Ungenerate** as the file type, choose the file to import, and click **Open**. Maptitude displays the Import Esri Export (E00) File dialog box or Import Esri Ungenerate File dialog box.
3. Type a name for the layer in the Layer Name edit box and choose the type of layer from the radio list.
4. If your input file uses coordinates other than longitude and latitude, click Coordinates to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click OK. For more information, see "Using Data in Other Coordinate Systems" on page 463.
5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file, and displays the map layer in a new map window.

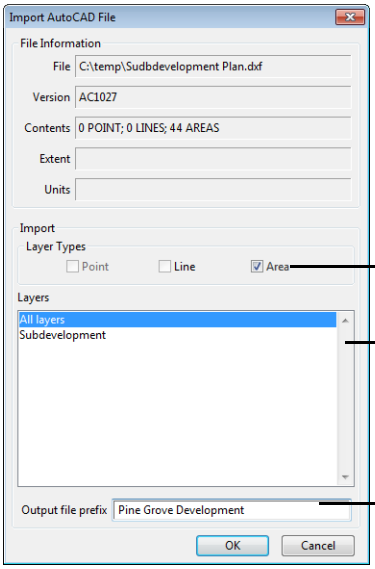
Importing AutoCAD DXF and DWG Files

AutoCAD is a computer-aided design (CAD) package that is used primarily for making technical drawings, but also for making maps. Maptitude can import AutoCAD DWG and DXF files Since many other software packages also import and export AutoCAD files, this format can be used to exchange data with dozens of other software packages.

When you import an AutoCAD file, you have several options for georeferencing the data. You can choose the coordinate system to use, you can open a map of the location where the data are located and use the Register AutoCAD Database toolbox to mark the true location of the data, or you can choose no georeferencing (center the data at 0,0 longitude/latitude).

▶ To Import a DXF or DWG File

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **AutoCAD File** as the file type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import AutoCAD File dialog box.
3. Make choices as follows:



Choose the layer type

Choose the layers to import

Because you can import more than one layer type, enter a prefix for the file names to import which will be appended with .point, .line, and/or .area

4. Click **OK**. Maptitude displays the Geographic Location dialog box for determining the correct location of your file. Choose how to locate your data as follows:

To do this...	Do this...
Use a known coordinate system to locate the AutoCAD file	Choose **Let Me Choose the XY Coordinate System** and click OK to display the Import Coordinates dialog box. Choose the appropriate coordinate system and click OK. For more information, see "Using Data in Other Coordinate Systems" on page 463.
Use a map to register the AutoCAD file	Choose **Let Me Choose the Location on a Map** and click OK. Maptitude displays Create-a-Map Wizard. • Create a general purpose map of the area where the data you are importing are located. Maptitude displays it side-by-side with the imported AutoCAD file and opens the Register AutoCAD Database toolbox. • Click and click on several control points on your imported AutoCAD layer. • Click on the map to make it active and then click and click on the corresponding locations on the general purpose map to mark the true longitude and latitude of the control points. • Click Continue in the Register AutoCAD Database toolbox.
Import the AutoCAD data centered at 0,0 longitude/latitude	Choose **I Don't Want to Georeference the Data** and click OK.

5. Maptitude displays the Choose a Folder dialog box. Choose a folder to store the imported layer(s) and click Select Folder.

Maptitude imports the data from the AutoCAD file into one or more Maptitude geographic files and displays the map layer(s) in a new map window.

Importing Esri Shapefiles

Esri's ArcGIS and ArcView 3.x products can store geographic data in a file format called a Shapefile. Shapefiles contain the locations of point, line, or area features, and are linked to dBASE files that contain tabular data for each of the features. To ensure that tabular data for each feature match location information for features in the Shapefile, Esri requires that the order of features in the dBASE file match the order of features in the Shapefile. Maptitude, however, organizes information with geographic IDs. When you import a Shapefile, Maptitude makes sure it can link properly to the data in the Shapefile by generating a new .BIN tabular file that contains all original tabular data from the dBASE format file, along with each feature's geographic ID.

Shapefiles support so-called multi-point and multi-line features, in which a group of features share a common ID. When you import these features, Maptitude assigns new, unique IDs to all features in the new file, and automatically generates a column of data containing the original multi-point or multi-line feature ID. You can then use the ***Dataview-Table-Join*** command to link the new geographic file to the attribute data.

Shapefiles support Z values and measures. Each coordinate in a point, line, or area can have, in addition to the X and Y values, a height (Z) value and another value (a measure, such as a time stamp). Maptitude puts Z values and measures for point and multi-point features into attribute fields, and ignores Z values and measures for other features.

TIP: Shapefiles can be opened in Maptitude without importing. See "Using Esri Shapefiles as Map Layers" on page 71.

▶ To Import Esri Shapefiles

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Esri Shapefile** as the file type, choose the file to import, and click **Open**. Maptitude displays the Esri Shapefile dialog box.
3. Type a name for the layer in the Layer Name edit box.
4. Check the **Import Layer** box.
5. If you are importing an area layer, check the **Eliminate Duplicate Boundary Lines** box to make the layer topological and choose how to handle overlaps from the radio list. Leave the box unchecked to keep the area layer non-topological.
6. If your input file uses coordinates other than longitude and latitude, Maptitude attempts to format the coordinate system automatically. If this fails to work correctly, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
7. Click **OK**. Maptitude displays the Save As dialog box.
8. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file, and displays the map layer in a new map window.

Importing ETAK MapBase Files

ETAK, now part of Tele Atlas, produced detailed street map files in their own MapBase format. Maptitude can import street features from these files. Simply choose the file you want to open.

▶ To Import Streets from an ETAK MapBase File

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Etak Streets** as the file type, choose the file to import, and click **Open**. Maptitude displays the Save As dialog box.
3. Type a name for the new geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file, and displays the map layer in a new map window.

Importing Google Earth KML and KMZ Files

Maptitude can import map features stored in Google Earth KML and KMZ files. Google Earth files can contain a mixture of points, lines, and areas. You can choose to keep the Google Earth folder structure if more than one layer of the same type are contained in the file, or you can merge layers of a similar type.

▶ To Import a Google Earth KML or KMZ File

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Google Earth Document** as the file type, choose the file to import, and click **Open**. Maptitude displays the Import Google Earth File dialog box.

3. Check the boxes for the types of layers to import.
4. Check the **Keep Folder Structure** box to preserve the original folder file structure or leave it unchecked to combine layers of similar types into a single layer.
5. Click **OK** to display the Choose a Directory dialog box.
6. Choose a folder to store the imported files and click Select Folder.

Maptitude imports the layer(s) using the folder structure option you chose and displays the imported layer(s) in a new map.

Importing Intergraph Design (DGN) Files

The Intergraph Design (DGN) file is the standard data format used by Intergraph Corporation and Bentley Systems to natively store drawings. It is also known as the Intergraph Standard File Format.

When you import a DGN file, you choose the DGN level or levels you want to import. The level for each feature that you import is put into the Level field in the geographic file. Maptitude can import points and lines, but cannot directly import areas. Areas are imported as lines, and the lines can be converted to areas using the ***Tools-Line/Area Conversion*** command.

DGN files do not contain attribute data, but features have zero or more pointers to records in external databases. You can choose to use the first pointer for a feature, or choose a pointer for a particular database (entity number). The pointer value, which is always an integer, is put into the MSLink field in the geographic file.

There are three sets of units in a DGN file: raw, master, and sub units. Longitude and latitude coordinates are very rarely used as units, so you will normally need to specify a coordinate system. The master and sub units are indicated with an abbreviation, such as "ft" for feet. The default abbreviations are "MU" for the master units and "SU" for the sub units. It may be necessary to apply a scaling to convert to standard units, such as multiplying by 1000 to convert "KF" (thousands of feet) to feet. For example, if the DGN file has 1927 State Plane Coordinates, you would choose "ft" as the units, then click Coordinates, choose the appropriate State Plane Coordinate zone, and choose Feet as the coordinate units. See "Using Data in Other Coordinate Systems" on page 463 for more information.

▶ To Import an Intergraph Design (DGN) File

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **Intergraph DGN** as the file type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import Intergraph Design File dialog box.
3. Choose the units from the Units drop-down list. These units must be consistent with the units chosen when you click Coordinates to set the coordinate system. It may be necessary to apply a scaling to convert to consistent units.
4. If the file has pointers to attribute data, choose Any or a particular entity number from the Entity Number drop-down list. Maptitude will use this to fill the MSLink field.
5. Choose All Levels or any combination of levels to import. Maptitude will put the level number of each feature into the Level field.

6. Type a name for the new layer in the Layer Name edit box and choose the layer type from the radio list.
7. If your input file uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
8. Click **OK**. Maptitude displays the Save As dialog box.
9. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

Importing MapInfo Interchange Format (MIF) Files

The MapInfo Interchange Format (MIF) is a geographic data format that was created by Pitney Bowes Business Insight (formerly MapInfo Corporation) as part of their MapInfo mapping products. Maptitude can easily import these files and their associated attribute (MID) files, complete with both geographic and tabular data.

TIP: MapInfo TAB files can be opened in Maptitude without importing. See "Using MapInfo TAB Files as Map Layers" on page 76.

▶ To Import a MapInfo Interchange Format (MIF) File

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **MapInfo Interchange** as the file type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import MapInfo Interchange File dialog box.
3. Type a name for the layer in the Layer Name edit box.
4. If you are importing an area layer, check the **Eliminate Duplicate Boundary Lines** box to make the layer topological and choose how to handle overlaps from the radio list. Leave the box unchecked to keep the area layer non-topological.
5. If your input file uses coordinates other than longitude and latitude, Maptitude attempts to format the coordinate system automatically. If this fails to work correctly, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
6. Click **OK**. Maptitude displays the Save As dialog box.
7. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file, and displays the map layer in a new map window. If the MapInfo file contains any tabular data, they are also imported and displayed in a new dataview.

Importing MapPoint PTM Files, AutoRoute AXE Files, and Streets & Trips EST Files

You can import point and territory data from Microsoft MapPoint PTM files, AutoRoute AXE files, and Streets & Trips EST files provided that you have the respective program installed on the same computer. When you import point data, Maptitude creates a new point layer with the associated data fields. When you import territories, Maptitude imports the territory data and stores it in a Maptitude tabular format. Maptitude also launches the Territory Wizard which you can use to create a territory layer based on the geographic files provided with Maptitude.

▶ To Import a Microsoft MapPoint, AutoRoute, or Streets & Trips File

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **MapPoint Map File** or **Microsoft Streets & Trips/AutoRoute File** as the file type, choose the file to import, and click **Open**. Maptitude displays a dialog box with a grid view showing all of the layers it found in the file, the number of records in each layer, and the number of fields in each layer.
3. Check the box in the Import column for each layer you want to import or click Select All to import all layers in the file.
4. Click **OK** to display the Choose a Folder dialog box.
5. Choose a folder and click **Save**.

   If you chose to import point data, Maptitude creates a separate point database for each point layer in the folder you specified and displays a map with all of the imported layers.

   If you chose to import territory data, Maptitude imports the data and displays the Territory Wizard which you can use to build territories from the provided Maptitude geographic data files. For more information, see "Tagging Points by Area" on page 298.
6. Maptitude displays the results of the import. Click **OK**.

Importing Interim Terrain Data (ITD) Files

Interim Terrain Data (ITD) and Planning Interim Terrain Data (PITD) are digital geographic data products from the National Geospatial-Intelligence Agency (NGA), formerly the U.S. National Imagery and Mapping Agency. Many of the ITD and PITD datasets are produced and shipped using the Standard Linear Format (SLF). Maptitude can easily import these files, complete with geographic and tabular data.

▶ To Import an ITD or PITD SLF File

1. If the file does not have the .SLF extension, rename it so that it does.
2. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
3. Choose **Interim Terrain Data** as the File Type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import (Planning) Interim Terrain Data File dialog box.
4. Type a name for the new layer in the Layer Name edit box and choose the layer type from the radio list.

5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a file name for the geographic file and click **Save**.

Maptitude imports the geographic and tabular data from the file into a Maptitude geographic file, and displays the map layer in a new map window.

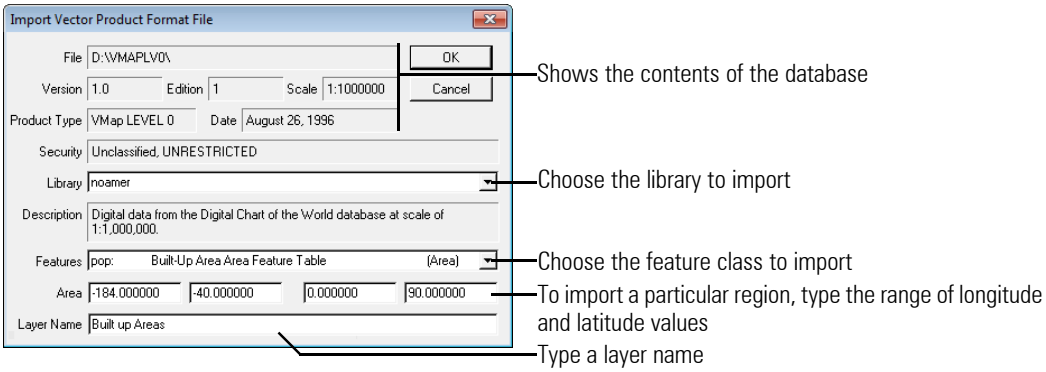
Importing Vector Product Format (VPF) Files

Vector Product Format (VPF) is a U.S. military standard for storing digital geographic data. The National Geospatial-Intelligence Agency (NGA), formerly the U.S. National Imagery and Mapping Agency, has produced many datasets using this format, including the Digital Chart of the World. The format is also used as the Vector Relational Format (VRF) of the NATO Digital Geographic Information Exchange Standard (DIGEST). Maptitude can easily import these files, complete with geographic and tabular data.

To import a VPF format file, you open the database header table file, which is always named DHT with no file extension, and specify the geographic region you want to import. You can choose to import the entire file, or specify the region you want by entering a range of longitude and latitude values. When you import area features, the resulting geographic file may have holes (missing regions) due to topological errors in the original VPF database.

▶ To Import a VPF File

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Vector Product Format** as the file type, choose the DHT file of the VPF database to import, and click **Open**. Maptitude scans the database and displays the Import Vector Product Format File dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the geographic file and click **Save**.

Maptitude imports the geographic and tabular data from the file into a Maptitude geographic file, and displays the map layer in a new map window.

Importing Bureau of Transportation Statistics National Transportation Atlas Dataset Files

The National Transportation Atlas Dataset Format is a standard format for geographic data that was created by the Bureau of Transportation Statistics (BTS). The NTAD format was first used with the 1996 National Transportation Atlas CD-ROM. Some inconsistencies have been found between the published standard and the CD-ROM, which prevent some datasets from translating correctly. Updated versions of the datasets are available from the BTS web site (HTTP://WWW.BTS.GOV/GIS/NTATLAS/NTAD.HTML).

The NTAD format supports geographic databases for point, line, and area features. The geographic features are stored in one file for points (.PNT), three files for lines (.LNK, .NOD and .GEO) and two files for areas (.ARE and .GEO). Maptitude can easily import these files and join them to their associated attribute files in dBASE (.DBF) format. Maptitude attempts to join your geographic files to their associated DBF attribute files, but you may have to manually join attributes using the FEATURID fields if the result is not satisfactory. For line layers, both link and node attributes can be present. Maptitude optionally allows just the node layer to be built.

Maptitude does not import attributes stored in fixed-format text files (.T??) because the standard does not specify any data dictionaries. The only field definitions available are in the Metadata (.MET) file.

▶ To Import NTAD Files

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **BTS Nat. Trans. Atlas** as the file type, choose one of the files you want to import, and click **Open**. Maptitude displays the Import BTS National Transportation Atlas dialog box.
3. Type a name for the layer in the Layer Name edit box and choose the layer type from the radio list.
4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

Importing OpenStreetMap (OSM) files

Maptitude can easily import OpenStreetMap (.OSM) files, complete with geographic and tabular data.

▶ To Import OSM Files

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **OpenStreetMap** as the file type, choose a file to import, and click **Open**. Maptitude displays the Import OpenStreetMap Roads dialog box.
3. Type a name for the new layer and click **OK**. Maptitude displays the Save As dialog box.
4. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

Importing Ordnance Survey NTF Files

Ordnance Survey sells digital map data for Great Britain (England, Scotland, and Wales). Maptitude imports both geographic and tabular data for many of the Ordnance Survey data products, which are provided in the NTF format and have a file extension of .NTF. The following NTF data products are supported:

Product	Feature Type
ADDRESS-POINT	Point
BaseData.GB	Point and line
Boundary-Line	Area
Land-Line	Point and line
Land-Form PROFILE Contours	Point and line
Land-Form PROFILE DTM	Point
Land-Form PANORAMA Contours	Point and line
Land-Form PANORAMA DTM	Point
Meridian	Point and line
OSCAR Asset-Manager	Point and line
OSCAR Network-Manager	Line
OSCAR Route-Manager	Line
Strategi	Point and line
Urban-Areas.91	Area

Note that the following non-NTF Ordnance Survey products can also be used with Maptitude, using the British National Grid coordinate system:

Product	Feature Type
1:10,000 Scale Black and White Raster	TIFF image
1:50,000 Scale Color Raster	TIFF image
1:50,000 Scale Gazetteer	Fixed-format ASCII text
ADDRESS-POINT	Comma-separated text
Land-Line	DXF

The following coverages can be built from a Boundary-Line data set:

- Civil Parishes
- Counties
- District Wards
- Districts
- Electoral Divisions
- European Constituencies
- Foreshore
- Sea and Non-England
- Westminster Constituencies

For point and line databases, multiple NTF tiles can be combined into a single database. For area databases, only a single tile can be translated.

When a line database is built from any of the OSCAR data products, a node attribute table (file name + N.BIN) is also built. This table can be manually linked to the node geography using the ID field.

Separate files are shipped with the Urban-Area.91 product for the 1981 and 1991 boundaries.

All data sets distributed as multiple volumes (diskettes or tapes) must first be copied onto a hard disk with a different file name for each volume before they can be imported. The file names must be in

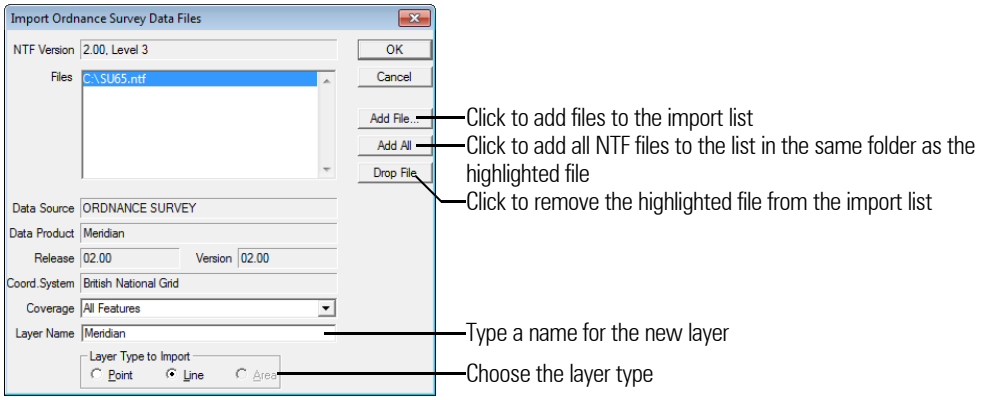
increasing lexicographic order, such as: T2105_1.NTF, T2105_2.NTF,..., T2105_7.NTF. All volumes of the data set must be selected or the import will fail.

When more than one file is selected, the list of files will be sorted automatically. This will order the volumes of a multi-volume data set correctly assuming the naming convention was followed.

All the files selected to be imported should be from the same product, otherwise only files with the same product type as the first file will be imported.

▶ To Import Ordnance Survey NTF Files

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Ordnance Survey** as the file type, choose the first volume (file) of the data set to import, and click **Open**. Maptitude displays the Import Ordnance Survey Data Files dialog box.
3. Make choices as follows:



4. For the Boundary-Line product, choose the coverage you want from the Coverage drop-down list.
5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a file name for the new geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file, and displays the map layer in a new map window.

Importing Spatial Data Transfer Standard (SDTS) Files

The purpose of the Spatial Data Transfer Standard (SDTS) is to promote and facilitate the transfer of digital spatial data between dissimilar computer systems, while preserving information meaning and minimizing the need for information external to the transfer. The SDTS provides a framework for creating profiles for transferring vector or raster geographic data. Maptitude imports data from three of the vector profiles:

- Topological Vector Profile: used to define points, lines, and areas as a planar graph (i.e., all lines intersect)
- Point Profile: a simpler format than the Topological Vector Profile, which transfers point data with more accuracy

- Transportation Network Profile: a 1997 draft used for transferring non-planar line data, especially for highway and other transportation networks

All SDTS files have a .DDF extension. The first four characters of the file name is the dataset name, and the remaining four characters give the module name. An SDTS file may have one or more themes; you will need to import each theme separately. The Topological Vector Profile does not specify whether the SDTS file contains points, lines, or areas; you will need to choose which type of layer to import. When importing lines you may need to import lines and nodes separately.

When you import from the Raster Profile, most image data are used natively, and grid data are saved into a grid geographic file.

You will not need to specify a coordinate system, but you can change the datum among NAD27, NAD83 and NAD83hp. The datum of the SDTS file is shown in the Import Spatial Data Transfer Standard dialog box.

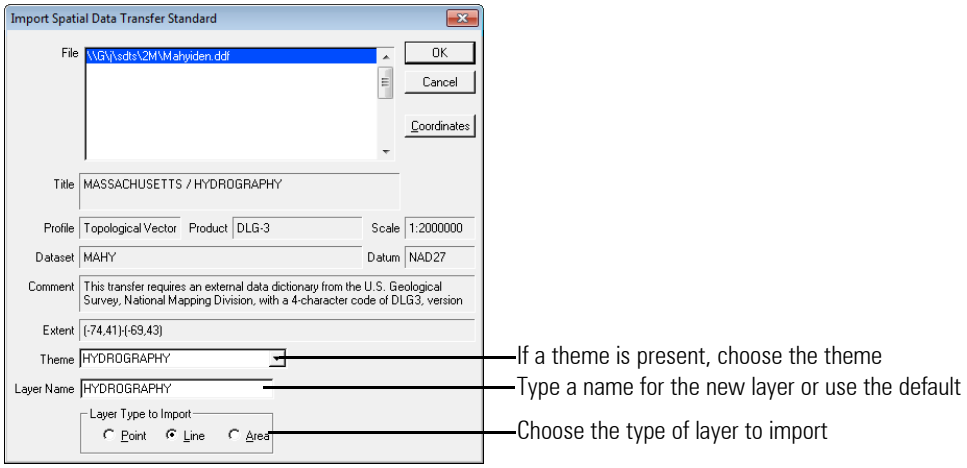
The profiles can include primary and secondary attribute data in one or more files, including tables with metadata to describe the transfer and tables with codes and their descriptions. The metadata will be put into a .MET file that can be displayed in Maptitude.

SDTS does not require a catalog to show how the attribute data files relate to the point, line, or area features, or to groupings of those features. Maptitude puts all of the attribute data into .BIN files, named by adding the four characters of the module name to the file name that you specify for the geographic file. You can then open these tables into dataviews and join them to the appropriate geographic files.

Some groups of SDTS files, such as USGS DLGs, use an external master data dictionary in common. You will need to have a copy of the appropriate files to import those data. Maptitude will prompt you to locate the external data dictionary.

▶ To Import Vector Spatial Data Transfer Standard Files

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Spatial Data Transfer Standard** as the file type, choose a vector SDTS file to import, and click **Open**. Maptitude displays the Import Spatial Data Transfer Standard dialog box. Make choices as follows:



Click **Coordinates** to display the Import Coordinates dialog box. Choose the datum conversion from Datum Conversion drop-down list. Click **OK** to close the Import Coordinates dialog box.

3. Click **OK**. Maptitude displays the Save As dialog box.
4. Type a file name and click **OK**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window. Maptitude also creates tabular data files for all of the attribute files in the SDTS file.

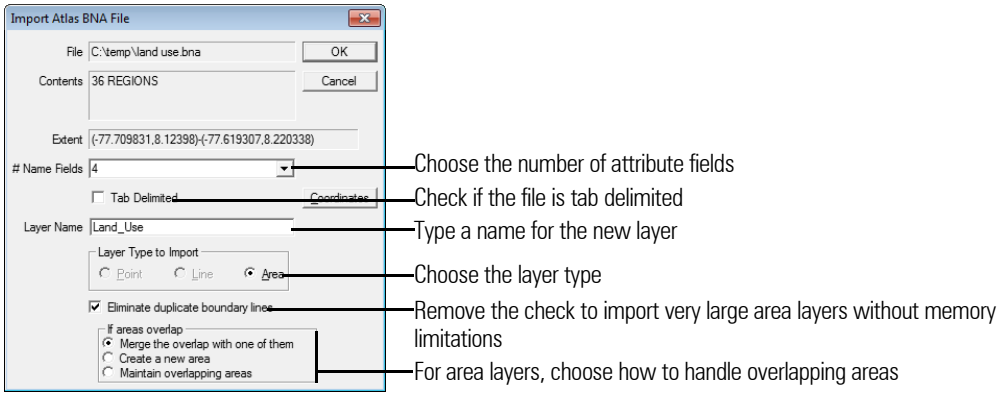
Importing Strategic Mapping (Atlas) BNA Files

Strategic Mapping's Atlas GIS software (later distributed by Esri) used Boundary ASCII (BNA) format files for importing and exporting geographic data. Maptitude can easily import these files, complete with both geographic and tabular data.

BNA files are either tab-delimited or comma-delimited and contain between one and four attribute fields. You choose the delimiter and number of fields when you create the BNA file from a Strategic Mapping software product. When importing a BNA file, you must indicate the delimiter that was used and the number of attribute fields contained in the file.

▶ To Import an Atlas BNA File

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Atlas BNA** as the file type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import Atlas BNA File dialog box.
3. Make choices as follows:



4. If your input file uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a file name for the geographic file and click **Save**.

Maptitude imports the data from the file into a Maptitude geographic file and displays the map layer in a new map window. Any tabular data in the BNA file are also imported and displayed in a new dataview.

Importing Text Files

Maptitude imports geographic data from comma-separated text files. These files, which contain the location and shape of map features, can be created using a text editor, word processor, or the ***File-Export-Geography*** command. Text files normally contain coordinates in degrees of longitude and latitude, but they can also have data stored in other coordinate systems. Maptitude can store up to six decimal places of longitude and latitude.

Text files for points have one row for each feature. The row contains the feature ID, the longitude, and the latitude.

```
52,-72.3673,41.8834
53,-101.378255,32.12337
54,-118.0902,39.3242
```

Text files for lines have one row for each feature. The row contains the feature ID, the number of points that make up the line, and the longitude and latitude of each point.

```
48,3,-82.8004,32.9364,-82.6068,32.9346,-82.5544,32.9363
49,4,-82.5544,32.9363,-82.5254,32.9356,-18.5210,32.9357,-82.1167,32.9266
50,3,-82.1167,32.9266,-82.9691,32.7703,-81.9544,32.7277
```

Optionally, text files for lines can contain a direction flag and the IDs of the from and to nodes. When importing lines, you can click Options to indicate whether the text file has these fields, what positions they are in, and where the coordinates start. For example, these lines have a direction flag in position 4, from and to nodes starting in position 2, and coordinates (starting with the number of points that make up the line) in starting in position 5:

```
48,121,254,0,3,-82.8004,32.9364,-82.6068,32.9346,-82.5544,32.9363
49,121,174,1,4,-82.5544,32.9363,-82.5254,32.9356,-18.5210,32.9357,-82.1167,32.9266
50,157,254,-1,3,-82.1167,32.9266,-82.9691,32.7703,-81.9544,32.7277
```

Text files for areas have one row for every boundary edge. The row contains the ID of the feature to the left of the boundary edge, the ID of the feature to the right of the boundary edge, the number of points that make up the edge, and the longitude and latitude of each point. Use "0" (zero) as the ID on sides where there is no feature.

```
48107,48303,4,-91.5630,33.8304,-91.5573,33.4636,-91.5572,33.4563,-91.5562,33.3950
48303,0,2,-92.0751,33.3888,-91.5562,33.3950
0,48303,3,-92.0751,33.3888,-92.0810,33.6348,-92.0855,33.8243
48189,48303,3,-92.0855,33.8243,-91.7319,33.8285,-91.5630,33.8304
```

▶ To Import Geographic Data from a Text File

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **Text/Geography** as the file type, choose the file to import, and click **Open**. Maptitude scans the file and displays the Import Text/Geography File dialog box.
3. Type a name for the layer in the Layer Name edit box and choose the layer type from the radio list.

4. If your input file contains lines with a direction flag and/or the IDs of the from and to nodes that you want to import, click **Options** to display the Line Options dialog box. If you import either the direction flag or the node IDs, you must also specify the position for the coordinates. Make choices as follows:

To do this...	Do this...
Import a direction flag	Check the **Direction** box and choose the field position from its Position spinner
Import node IDs	Check the **Node ID** box and choose the field position from its Position spinner
Specify the coordinates position	Choose the position of the field that contains the number of points from the Coordinates Position spinner

When you have made your choices, click **OK** to return to the Import Text/Geography File dialog box.

5. If your input file uses coordinates other than longitude and latitude, click **Coordinates** to display the Import Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.
6. Click **OK**. Maptitude displays the Save As dialog box.
7. Type a file name for the geographic file and click **Save**.

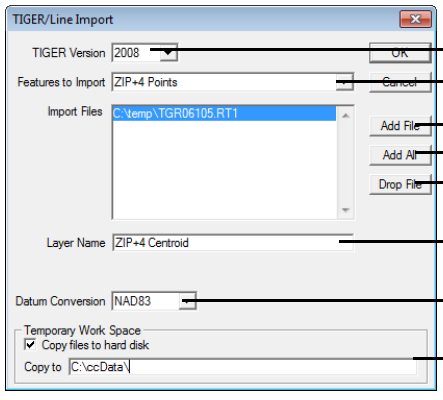
Maptitude imports the data from the text file into a Maptitude geographic file and displays the map layer in a new map window.

Importing U.S. Census Bureau TIGER/Line® Files

TIGER/Line files, produced by the U.S. Census Bureau, contain streets of the U.S., boundaries of states, counties, census tracts, block groups, and blocks, and other geographic features and areas.

▶ To Import TIGER/Line Files

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **TIGER/Line** as the file type and choose one or more files to import. If you are going to import all the files in the folder, just choose one now and use the Add All button later.
3. Click **Open**. Maptitude displays the TIGER/Line Import dialog box.
4. Make choices as follows:



5. Make additional choices:

For this type of layer...	Do this...
Line	Type a name for the node layer in the Node Layer Name text box
Area	Check the Drop Water Polygons box to import the area with holes where there are water blocks or remove the check to leave water blocks as part of the areas

6. Click **OK**. Maptitude displays the Save As dialog box.
7. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

Importing U.S. Geological Survey Digital Elevation Model (DEM) Files

The Digital Elevation Model (DEM) format is a standard format developed by the U.S. Geological Survey (USGS) to store vertical elevation data for points located on a regular grid. Each file contains all the elevations for one tile and overlaps each of its neighbors by either one row or column. Maptitude easily converts one or more DEM files into a point or grid geographic file. USGS provides five different DEM products:

- 7.5-Minute DEM, using a 30- x 30-meter data spacing on a Universal Transverse Mercator (UTM) grid at the 1:24,000 map scale for the conterminous United States and Hawaii and the 1:20,000 map scale for Puerto Rico. Coverage is currently incomplete. Each file provides the same coverage as a standard 7.5-minute quadrangle.
- 7.5-Minute Alaska DEM, using a 2- x 1-arc-second data spacing on a longitude-latitude grid for Alaska. Coverage is currently incomplete. The longitudinal cell limits vary from 10 minutes at the southernmost latitude to 18 minutes at the northernmost latitude.
- 15-Minute DEM, using a 2- x 2-arc-second data spacing on a longitude-latitude grid at the 1:100,000 map scale for the conterminous United States and Hawaii. Coverage is currently incomplete. Each file provides the same coverage as an eighth of a standard 1:100,000-scale quadrangle.
- 15-Minute Alaska DEM, using a 3- x 2-arc-second data spacing on a longitude-latitude grid at the 1:63,360 map scale for Alaska. Coverage is currently incomplete. The longitudinal cell limits vary from 20 minutes at the southernmost latitude to 36 minutes at the northernmost latitude. Each file provides the same coverage as a 1:63,360-scale quadrangle.
- 1-Degree DEM, using a 3- x 3-arc-second data spacing on a longitude-latitude grid at the 1:250,000 map scale for the United States. Coverage is complete. Each file provides the same coverage as one half (one third in some regions of Alaska) of a standard 1- x 2-degree quadrangle.

In addition, Maptitude supports three other DEM formats:

- GTOPO30, a worldwide DEM using a 30- x 30-arc-second data spacing on a longitude-latitude grid.
- NOAA's National Geophysical Data Census (NGDC) GRD98 format used for the coastal relief model which includes both elevation and bathymetry data.

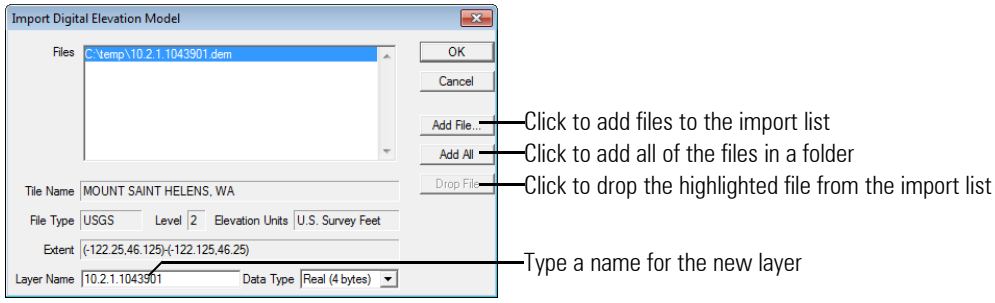
- NGA's Digital Terrain Elevation Data (DTED®) is a DEM format using the file extensions .DT0, .DT1, and .DT2 for Levels 0, 1, and 2.

The DTED format is used for the Shuttle Radar Topography Mission DEM data, with coverage between 60N and 56S latitudes in February 2000. The horizontal datum is WGS84 and the vertical datum is the mean sea level of the EGM 96 geoid. Elevation is based on the reflective surface, which may be the ground, structures, or vegetation. DTED Level 2 elevations are one arc second apart between 0 and 50 degrees latitude, and one arc second apart in latitude and two arc seconds apart in longitude between 50 and 60 degrees latitude. SRTM DTED Level 1 values are the SRTM DTED 2 values spaced 3 arc seconds apart between 0 and 50 degrees latitude, and spaced 3 arc seconds apart in latitude and 6 arc seconds apart in longitude between 50 and 60 degrees latitude. For more information see HTTP://EDCSNS17.CR.USGS.GOV/SRTMDTED/.

You have a choice of two formats for storing the DEM. A point geographic file stores each elevation as a point feature in a standard (.DBD) geographic file. You will be able to edit the points, but the file will be large. A grid geographic file uses the compact (.CDF) format file, which stores the elevations much more efficiently and displays more quickly. When Maptitude prompts you for a file name, the default file type is Compact Geographic File. You can choose Standard Geographic File if you wish to create a point geographic file instead. Elevation units are standardized to meters.

▶ To Import DEM Files

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Digital Elevation Model** as the file type, choose one or more of the files you want to import, and click **Open**. Maptitude displays the Import Digital Elevation Model dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.
5. Choose the type of file to create from the Files of Type drop-down list:

To do this...	Do this...
Create a grid geographic file	Choose Compact Geographic File
Create a point geographic file	Choose Standard Geographic File

6. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window. All elevation units will be converted to meters.

Importing U.S. Geological Survey Digital Line Graph (DLG) format files

The Digital Line Graph (DLG) is a standard format for vector geographic data developed by USGS to store digital versions of their topographic maps. The format is sometimes referred to as DLG-3. The DLG standard specifies three record formats: Standard, Optional, and Geographic. Maptitude supports all three formats.

Each USGS DLG file contains all the entities of a particular feature class digitized from a single topographic map. The maps are rectangular and can be tiled together nicely, except for their 1:2,000,000 scale product, which consists of regional groups of states. Given multiple adjoining files, Maptitude can import them together to create a single geographic database for a larger region.

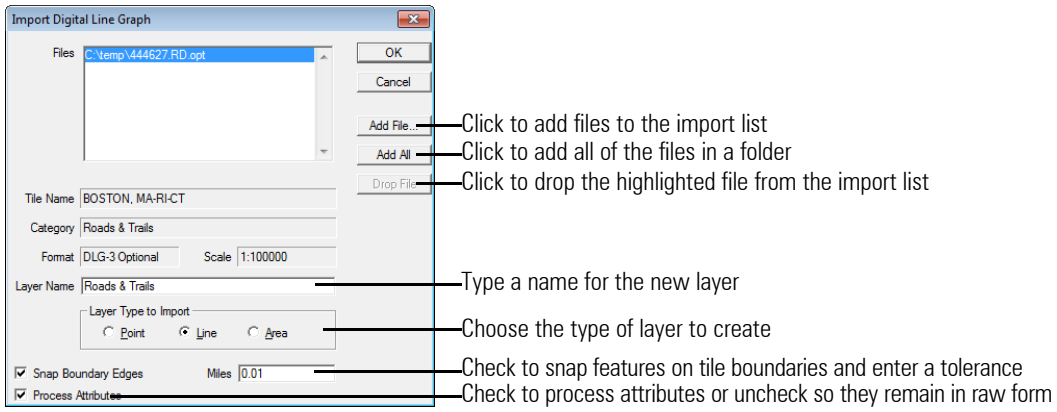
In early DLG releases, no edge matching across tiles was performed. Therefore, line and area features which cross a tile boundary in these files would not usually connect correctly with the continuation of the feature on the adjoining tile. To correct these edge-matching problems, Maptitude lets you specify whether features on tile boundaries should be snapped. If this option is enabled, nodes on the same tile edge within a specified tolerance will be snapped together. The 1:2,000,000-scale product is not edge-matched. Unfortunately, since the product is not tiled, Maptitude cannot fix this problem. DLG coverages for the 1990 and 1995 releases are instead grouped by state.

Attributes in DLG files are stored as one or more pairs of integers for each entity, called major and minor pairs. The first integer indicates the type of attribute and the second its value. Maptitude processes the attributes to convert them to a more usable form. You can, however, choose to disable attribute conversion so that the attribute data remain in raw form (major and minor pairs).

Common extensions for DLG files are .DLG, .OPT, .STD, .LGO and .LGS. Files with other extensions must be renamed before they can be imported.

▶ To Import DLG Files

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **Digital Line Graph** as the file type, choose one or more files to import, and click **Open**. Maptitude displays the Import Digital Line Graph dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.

5. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

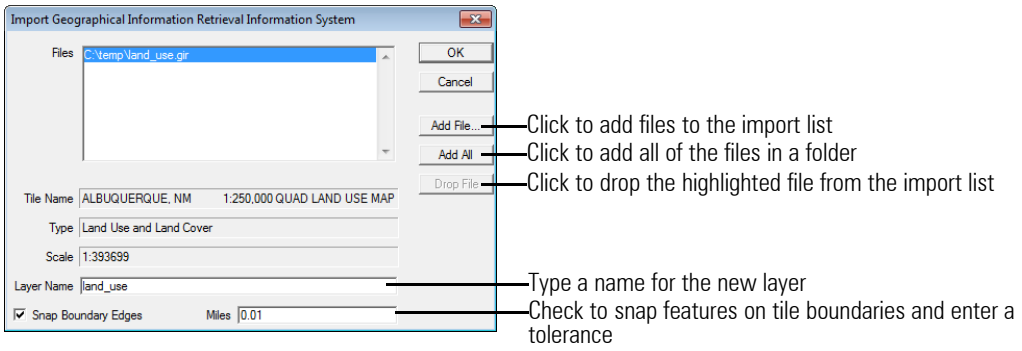
Importing U.S. Geological Survey Land Use and Land Cover (LULC) files

Land Use and Land Cover (LULC) is an older product from the U.S. Geological Survey that shows how land is used or what type of vegetation covers it, including forest land, agricultural land, wetland, urban or built-up land, water, rangeland, and barren land. The data, stored in digital format, are organized by 1:250,000- or 1:100,000-scale quadrangles. The source of the data is aerial photography from the 1970's and mid-1980's. Besides the land use information, each dataset contains reference layers, which include Census Tracts, Counties, Federal Land, Hydrographic Regions, and State Land. These can also be imported by Maptitude.

The Land Use and Land Cover product uses the Geographic Information Retrieval Analysis System (GIRAS) format. Maptitude can easily import one or more GIRAS (.GIR) files and produce an area database.

▶ To Import LULC Files

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Land Use & Land Cover** as the file type, choose one or more files to import, and click **Open**. Maptitude displays the Import Geographic Information Retrieval Analysis System dialog box.
3. Make choices as follows:



4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the geographic file and click **Save**.

Maptitude imports the data into a Maptitude geographic file and displays the map layer in a new map window.

Exporting Geographic Files

Maptitude makes it possible to export a map layer to many common interchange file formats:

- Caliper Standard (.DBD) Geographic File
- Caliper Compact (.CDF) Geographic File
- Atlas BNA
- AutoCAD DXF
- Esri Shapefile (.SHP)
- Esri Ungenerate (.LIN, .PTS)
- Google Earth KML and KMZ
- MapInfo Interchange (.MIF)
- Oracle Spatial Layer
- PostgreSQL Spatial Layer
- SQL Server Spatial Layer
- Text/Geography (.GEO)

When you export a map layer, the contents of the geographic file are written out in the desired format, so the data can subsequently be read by or imported into another software package. When you export a map layer, you can choose to export all of the features in the layer or just the features in a selection set. If you use a sorted selection set, the features will be exported in sort order. You can export a map layer with no data, with the built-in data, or with the data in any dataview associated with a map layer, including joined views. You can also choose to export data using a coordinate system other than longitude and latitude coordinates. For more information, see "Using Data in Other Coordinate Systems" on page 463.

Maptitude can export map layers that were created by opening ODBC tables, an Oracle Spatial layer, or an Esri Personal Geodatabase. You can save them as standard (.DBD) or compact (.CDF) geographic files.

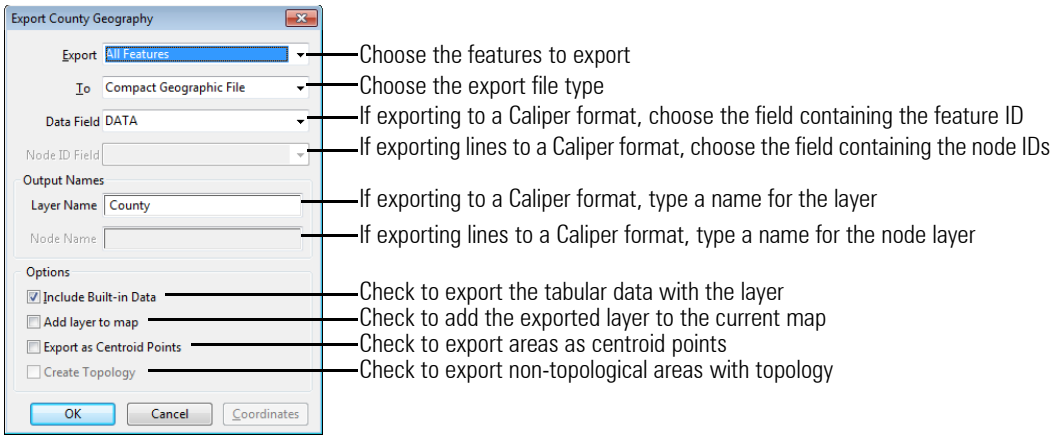
You can choose to create the topology for non-topological area layers, including Esri Shapefile, MapInfo TAB, Oracle Spatial, SQL Server Spatial, or non-topological standard geographic files. These layers can be exported as areas to standard geographic files, but not directly to compact geographic files; you can export the standard geographic file to a compact geographic file in a later step.

Maptitude can also export a point, line, or area layer to an Oracle Spatial or SQL Server Spatial database. If there is an error while exporting to a SQL Server Spatial layer, Maptitude writes the error to a log file (in the MY DOCUMENTS\CALIPER\MAPTITUDE folder) and continues exporting the remaining features.

▶ To Export a Map Layer

1. To export a map layer with no data or with the built-in data, choose the layer to export from the layer list in the map toolbar. To export a map layer with the data in a dataview associated with the map layer, make that dataview the current window.
2. Choose ***File-Export-Geography*** to display the Export Geography dialog box.

3. Make choices as follows:



4. To export geographic data using a coordinate system other than longitude and latitude, click **Coordinates** to display the Export Coordinates dialog box, choose the appropriate coordinate system, and click **OK**. For more information, see "Using Data in Other Coordinate Systems" on page 463.

5. Click **OK**. Maptitude displays the Save As dialog box.

6. Type the file name and click **Save**.

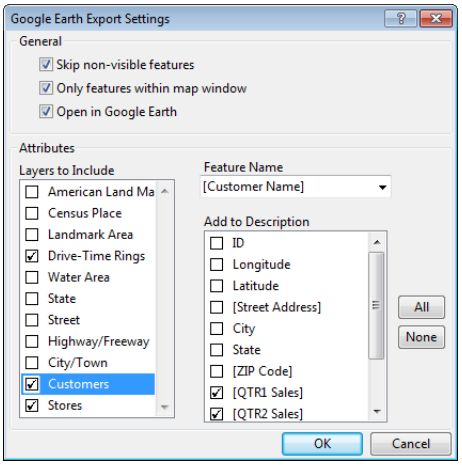
Maptitude exports some or all of the features in the map layer.

Exporting to Google Earth

You can export one or more layers to Google Earth KML or KMZ. When you export a map to Google Earth, Maptitude exports point, line, and area layers and also tries to apply as much styling and labeling as KML supports. You can also choose the attributes to be included in the feature description, and launch Google Earth to display the results.

▶ To Export One or More Layers Google Earth KML

1. Choose ***File-Export-Google Earth*** to display the Google Earth Export Settings dialog box.



2. In the General frame, check the boxes if you want to skip non-visible features (i.e., features in layers that are hidden or autoscaled off), export only features within the map window, or open Google Earth to display the results.
3. Choose which layers to export by checking boxes in the Layers to Include scroll list.
4. For each layer that you choose in step 3, choose the field that contains the feature name from the drop-down list and choose other fields to display in the feature description by checking them in the Add to Description scroll list; click All to check all the fields, or None to remove the checks from all the fields.
5. Click OK. Maptitude displays the Save as Google Earth Map dialog box.
6. Choose whether to save the file as a KML or a KMZ file from the Save as Type drop-down list.
7. Enter a name for the file and click Save.

Maptitude saves the chosen layers to a Google Earth file and opens it in Google Earth if you chose the option to do so.

Exporting to Excel

Maptitude lets you quickly export useful data about an area of interest to an Excel file. You can export data for areas in a map layer or for a shape that you create with the drawing tools.

There are several ways you can define the area you want to study:

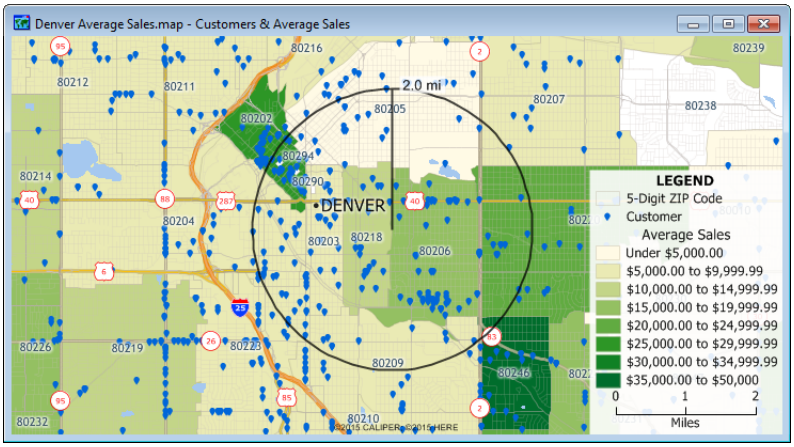
- Draw an area on the map using the Rectangle, Radius, Oval, or Shape drawing tools.
- Choose all features or a selection set in a standard (.DBD) area layer such as those created by the Buffers, Overlay, Merge by Value, Merge by Sets, Areas of Influence, Weighted Center, or Drive Time Rings geographic analysis tools, or a Shapefile or MapInfo TAB area layer.
- Choose a selection set in a compact (.CDF) area layer such as the postal code or state layers included with Maptitude.

TIP: To export territory layers to Excel, see "To Export a List of Map Features and the Territories to Which They Belong" on page 301

When you export your chosen area to Excel, the resulting file will have separate sheets containing the following information:

- Overlay demographics for the area. The demographics will vary depending upon the Country Package that you have installed. For example, if you are using the U.S. Country Package, the demographics will include income, population, gender, age, race, households, and housing units.
- A list of the features in any point layers (excluding those protected by the HERE license, such as landmarks) that are within the boundaries of your area of interest and their associated data fields. In addition, if you used the Radius or Oval tools, the straight-line distance and drive time to the center is also provided.
- A sheet with data for any area layers on which a color, chart, and/or size theme is present. These sheets will contain data from the themes for every area feature that is partially or entirely within the area of interest. Depending upon the nature of the data, this sheet may contain the original ("Copy") and a "Proportional" value. The "Proportional" value will be smaller for areas that are partially within the freehand shape.

For example, consider the following map that contains a point layer of customers and a color theme of average sales by ZIP Code:



You could use the Radius tool to draw a circle on the map. If you export this 2.0 mile radius circle, your Excel file will contain the following:

- One sheet with the income and population demographics for the population within that circle.
- A second sheet with all of the customers that are located within that 2-mile radius, their associated data, and their straight-line distance and drive time to the center of the circle.
- A third sheet with average sales values for the ZIP Codes that are located partially or fully within that circle.

▶ To Export to Excel Using the Freehand Tools

1. Open or create a map that optionally contains a standard point layer and/or an area layer with one or more themes.
2. Use the Rectangle, Radius, Oval, or Shape drawing tools to create a freehand area on the map. For more information on using the drawing tools see "Adding Freehand Items to a Map" on page 122.
3. Right-click on the shape you drew in step 2 and choose ***Export to Excel*** to display the Save As dialog box.
4. Enter a name for the Excel file and click Save.

Maptitude exports the data and opens the new file in Excel. The Excel file will contain a sheet with overlay demographic data for the area you drew. If any point layers were present, it will also contain a sheet with data for the features within the area you drew. If any area layer themes were present, it will also contain a sheet with data used in the theme(s).

▶ To Export to Excel from a Standard (.DBD), Shapefile, or TAB Area Layer

1. Open a map that contains an area that you want to study, such as a buffer or drive-time ring.
2. Choose the area layer from the drop-down list on the Standard toolbar to make it the working layer.
3. Choose ***Tools-Reports-Export to Excel*** or click on the Standard toolbar to display the Save As dialog box.

4. Enter a file name and click Save.

Maptitude exports the data and opens the new file in Excel. The Excel file will contain a sheet with overlay demographic data for the area(s). If any point layers were present, it will also contain a sheet with data for the features within the area(s). If any area layer themes were present, it will also contain a sheet with data used in the theme(s).

▶ To Export to Excel from a Selection Set on an Area Layer

1. Open a map that contains an area that you want to study.
2. Choose an area layer from the drop-down list on the Standard toolbar and select the features that define your area of interest.
3. Click on the Selection toolbar to display the Save As dialog box.
4. Enter a file name and click Save.

TIP: You can also export a selection set from a dataview. Click to export the selection set chosen in the Selection toolbar.

Maptitude exports the data and opens the new file in Excel. The Excel file will contain a sheet with overlay demographic data for the area(s). If any point layers were present, it will also contain a sheet with data for the features within the area(s). If any area layer themes were present, it will also contain a sheet with data used in the theme(s).

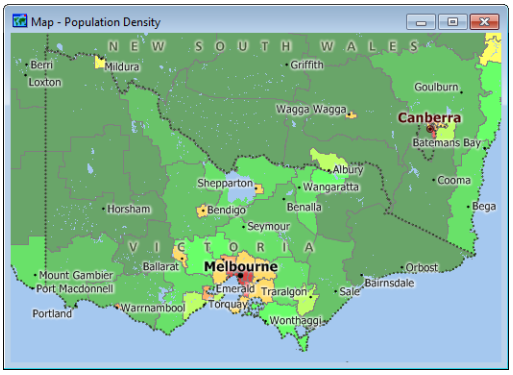
Creating Masks

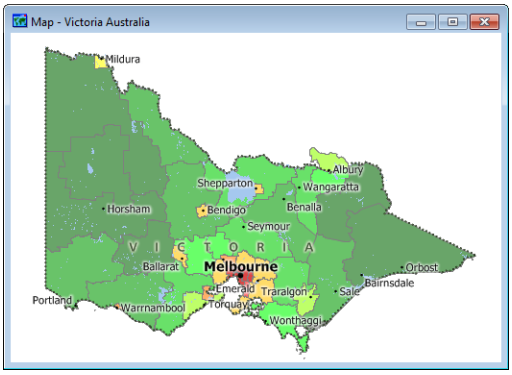
One way to display just a portion of the map is to create a **mask**. A mask creates an area that hides the features outside your area of interest.

TIP: Another way to display just the portion of a map that interests you is to use the Multi Clipper to create new geographic files for just your area of interest. For more information on the Multi clipper, see "Clipping Geographic Files by Area" on page 450.

You can choose whether your mask is a new area layer or a freehand item. If you choose to create a new mask layer, it is added on top of the other layers in your map. In addition, several new selection sets are created on the other layers to ensure that no labels are drawn for features outside of the area of interest. Masks that are freehand items are faster to create, but they will obscure any portions of labels that extend beyond your area of interest. You may need to move some labels after creating the mask. For more information on moving labels, see "Customizing Labels" on page 92.

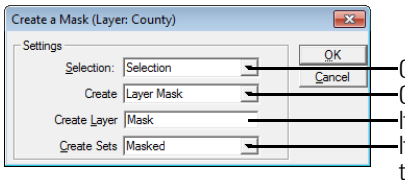
When you create a mask from features in an area layer, the mask aligns with the borders of the features you choose. You can also create a new mask layer from features in a point or line layer, in which case the mask will be a rectangle that is a little wider than the most eastern and western features and a little taller than the most northern and southern features. You cannot create freehand masks from point or line features.





▶ To Create a Mask

1. Choose the layer on which to base the mask from the drop-down list on the Standard toolbar. If necessary, create a selection set of features in your area of interest.
2. Choose ***Tools-Reports-Mask*** to display the Create a Mask dialog box.
3. Make choices as follows:



Choose whether to base the mask on All Features or a selection set
Choose whether to create a Freehand Mask (areas only) or a Layer Mask
If you chose a Layer Mask, type a name for the mask layer
If you chose a Layer Mask, choose or type a name for the selection sets that the procedure creates on all of the layers for the purpose of hiding the labels

4. Click **OK**.

   If you are creating a layer mask, Maptitude prompts you if you want to save the map in its current state. Click **Yes** to save the map or click **No** to create the mask layer and selection sets without saving the map.

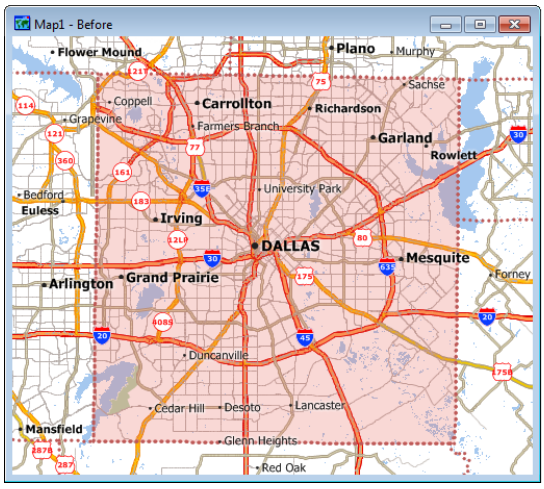
Maptitude adds the mask to the map.

Try It Yourself: Creating a Mask

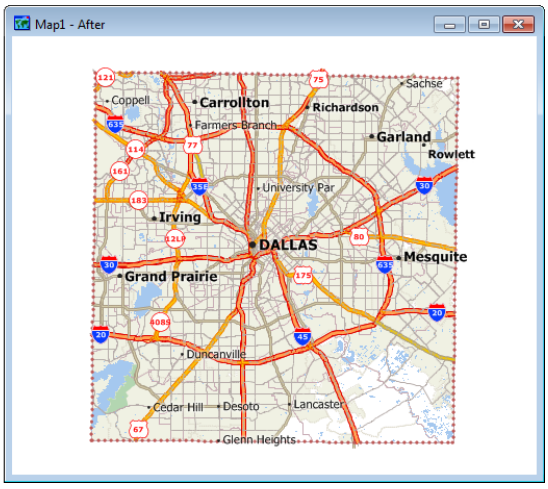
1. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **rhodeis.map** in the Tutorial folder. Maptitude opens a map with counties, highways, and places for Rhode Island.
2. Choose **County** as the working layer from the drop-down list on the Standard toolbar.
3. If the Selection toolbar is not open, choose ***Selection-Toolbar*** or click on the Standard toolbar.
4. Click on the Selection toolbar to activate the Select by Pointing tool.
5. Click on **Kent County** to select it. This will be the county used for masking.
6. Choose ***Tools-Reports-Mask*** to display the Create a Mask dialog box.
7. Choose **Selection** from the Selection drop-down list and **Layer Mask** from the Create drop-down list.
8. Click **OK** to display the Save As dialog box.
9. Type "**My Mask**" as the file name and click **Save**.
10. Click **No** when Maptitude asks if you want to save the map. Maptitude creates the mask and adds it to the map so that only Kent County is visible.
11. Choose ***File-Close*** and click **No** to close the map without saving any changes.

Clipping Geographic Files by Area

You can export the portion of one or more layers that is within an area of interest by clipping. When you clip geographic files Maptitude creates new geographic files that contain only your area of interest. The geographic files will have the same names as the original files, but in a folder of your choice. The result is similar to what you would see by creating a mask as described in "Creating Masks" on page 448, but whereas a mask hides features outside your area of interest, clipping creates geographic files that only contain features in your area of interest.



Select Dallas County from the county layer...



...and create clipped versions of the layers for just Dallas County

The following table shows how each type of geographic layer is handled when it is clipped:

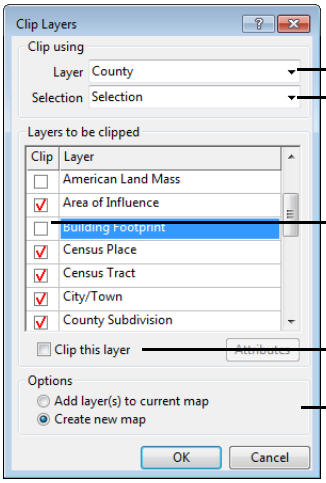
Type of layer	Action
Point	All points within and on the boundary of the cutting layer are exported to a new point file.
Line	All lines that are entirely within the cutting layer are exported. Lines that are partially within the cutting layer are split so that the portions that are within the cutting layer are also exported.
Area	All areas that are entirely within the cutting layer are exported. Areas that are partially within the cutting layer are split so that the portions that are within the cutting layer are also exported.

You can control how attributes are handled for lines and areas that are split. Maptitude will properly handle fields that it identifies as ZIP Codes or as address ranges.

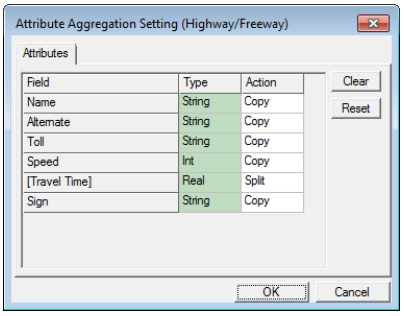
▶ To Clip Geographic Files by Area

1. If necessary, create a new folder to store the new geographic files.
2. Choose an area layer from the drop-down list on the Standard toolbar, and select the features that define your area of interest.
3. Choose ***Tools-Editing-Clip Layers*** to display the Clip Layers dialog box.

4. Make choices as follows:



5. To edit how to compute the attributes for a layer, highlight the layer in the scroll list and click **Attributes** to display the Attribute Aggregation Setting dialog box.



The default settings for a line or area layer are to split numeric (Int and Real) values and to copy character (String) values for features that are clipped. For a point layer, the default settings are to copy all values. Fields in a line layer that are identified as address ranges will be divided proportionally. Numbers that are codes or IDs should be copied rather than split. Make changes as follows:

To do this...	Do this...
Split numeric fields	Highlight one or more numeric fields in the scroll list and click the Split radio button (lines and areas only)
Copy fields	Highlight one or more fields in the scroll list and click the Copy radio button
Omit fields	Highlight one or more fields in the scroll list and click the Omit radio button
Omit all fields	Click Clear
Restore the default settings	Click Reset

Click **OK** when you are done.

6. Click **OK**. Maptitude displays the Browse for Folder dialog box.
7. Choose a folder for the new geographic files and click **Select Folder**.

Maptitude clips the layers, saves them to new geographic files, and displays them in the current map or a new map.

Try It Yourself: Clipping Geographic Files

1. Create a new folder in the Tutorial folder using a file manager such as Windows Explorer.
2. Choose ***File-Open*** or click on the Standard toolbar, then open the map file **rhodeis.map** in the Tutorial folder. Maptitude opens a map with counties, highways, and places for Rhode Island.
3. Choose **County** as the working layer from the drop-down list on the Standard toolbar.
4. If the Selection toolbar is not open, choose ***Selection-Toolbar*** or click on the Standard toolbar.
5. Click on the Selection toolbar to activate the Select by Pointing tool.
6. Click on Providence County to select it. This will be the county used for clipping.
7. Choose ***Tools-Editing-Clip Layers*** to display the Multi-Clipper dialog box. The default settings are appropriate.
8. Click **OK**. Maptitude displays the Browse for Folder dialog box.
9. Choose the folder you created in step 1 and click **Select Folder**. Maptitude displays a map with the new layers.
10. Choose ***File-Close All*** and click **No to All** to close the maps without saving any changes.

Merging Geographic Files

You can merge features in the working layer and another layer into a new standard (.DBD) geographic file. The other layer can be any layer in any map with the same feature type (point, line, or area) as the working layer. For example, two people could work on two adjacent map sheets and then merge their geographic files with the ***Tools-Editing-Merge Layers*** command. Duplicate or similar map features are handled as follows:

Type of layer	Action
Point	If two features have the same coordinate, you can choose to merge them or to leave them as two separate features.
Line	If two features have the same endpoints and shape points, they will remain two separate features. If endpoints in either layer have the same coordinate, you can choose to merge them or to leave them separate.
Area	If two features have the same boundary, the feature in the other layer is ignored. If two features overlap, you can choose to add the overlapping areas to the area in the working layer or to create new areas from the overlapping areas

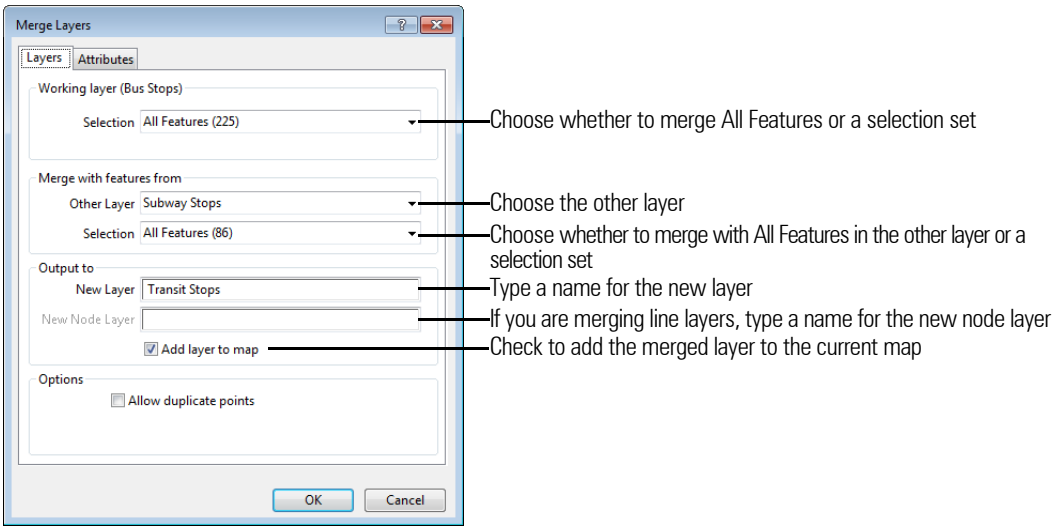
When you merge geographic files you will also be merging the data associated with the files. Maptitude will suggest how to match up the fields in the other layer to the fields in the working layer based on their names and types. You can choose the field in the other layer to match with a field in the working layer based on their names and types. You can use the ***Dataview-Table-Modify*** command first to add fields to the working layer to accommodate data from the other layer.

You can choose whether to copy the numeric values in an area working layer or to split them, when areas of overlap are not merged into the working layer. You can merge node attributes for line layers that have a node layer.

If you need to preserve the IDs of features in the working layer, such as for joining tables based on those IDs, you can copy the IDs from the working layer into an existing or a new integer field.

▶ To Merge Geographic Files

1. Open two geographic files of the same type as layers in one or more maps. If you want to merge just selected features, create a selection set in either or both layers.
2. Choose the working layer from the drop-down list on the Standard toolbar.
3. Choose ***Tools-Editing-Merge Layers*** to display the Merge Layers dialog box.



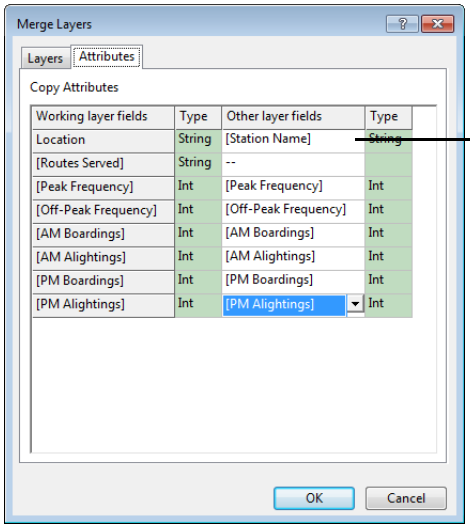
4. Choose how to handle duplicate or similar map features:

To do this...	Do this...
Merge points with the same coordinate	Remove the check from **Allow Duplicate Points** box
Keep points separate	Check the **Allow Duplicate Points** box
Merge endpoints with the same coordinate	Check the **Merge Endpoints at Matching Locations** box
Keep endpoints separate	Remove the check from the **Merge Endpoints at Matching Locations** box
Merge overlaps into working layer areas	Check the **Merge Overlapping Areas into Working Layer** box
Create new areas from areas of overlap	Remove the check from the **Merge Overlapping Areas into Working Layer** box

If you are merging area layers, you can copy the IDs from the working layer into the new layer. Make a choice from the Preserve IDs In drop-down list:

To do this...	Do this...
Copy the IDs to an existing integer field	Choose the integer field from the drop-down list
Copy the IDs to a new field	Choose <New Field> near the top of the drop-down list
Not preserve the IDs	Choose <None> at the top of the drop-down list

5. Click the Attributes tab to display the attribute settings.



Make any necessary changes to the matching fields:

To do this...	Do this...
Change the other layer field	Choose a field from the respective drop-down list in the **Other layer fields** column
Indicate that there is no equivalent field	Choose **--** from the respective drop-down list in the **Other layer fields** column
Split numeric values for area layers	Check the Split Working Layer Value box. The checkbox is disabled when the Merge Overlapping Areas into Working Layer option is checked

6. If you are merging line layers, click the Node Attributes tab to display the node attribute settings. This tab will not be enabled if one or both line layers do not have a node layer, such as with Oracle layers.

   Make any necessary changes to the matching fields:

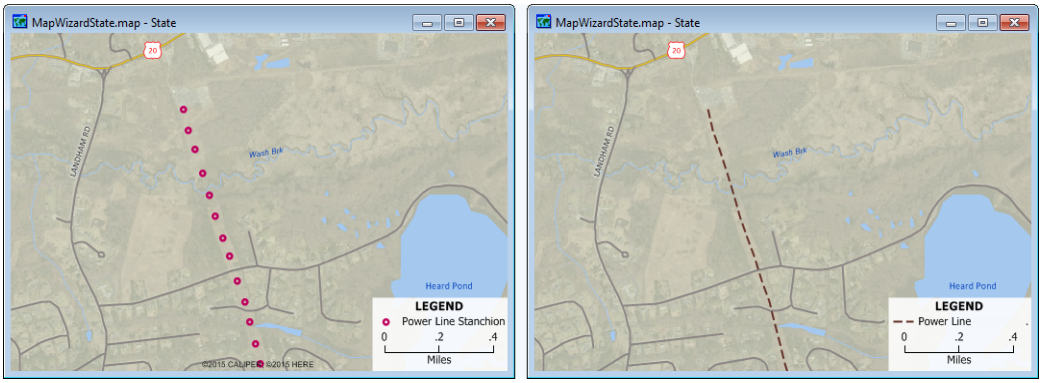
To do this...	Do this...
Change the other layer field	Choose a field from the respective drop-down list in the **Other layer fields** column
Indicate that there is no equivalent field	Choose **--** from the respective drop-down list in the **Other layer fields** column

7. Click **OK**. Maptitude displays the Save As dialog box.
8. Type a file name for the new geographic file and click **Save**.

Maptitude creates the new geographic file.

Connecting Points

You can build lines from groups of points, created with a GPS receiver or by other methods, using the ***Tools-Editing-Point to Line Conversion*** command.



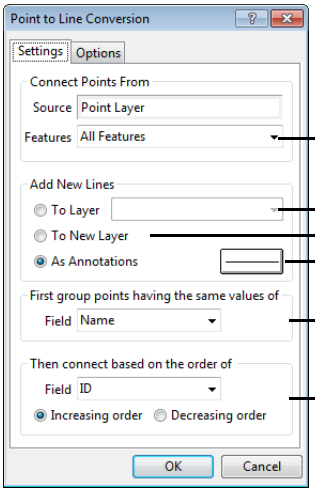
With this command you have a great amount of control over how to identify groups of points and how to organize the points into lines. You can:

- Use all of the points, or just a selection set
- Add the lines to an existing standard (.DBD) line geographic file in the current map, create a new line geographic file that will be added as a layer in the current map, or add the lines as annotations
- Connect the points based on increasing or decreasing values in any numeric field, by latitude, or by longitude
- Connect only points that have a matching value in a field, such as a street name
- Limit lines to a maximum number of points, to a maximum length, or both
- Omit lines that would have less than a minimum number of points, less than a minimum length, or both
- Set the largest gap that will be spanned when connecting points

▶ To Connect Points

1. If you are going to add lines to an existing standard (.DBD) line geographic file, make sure that it is opened as a layer in the current map.
2. Choose the point layer that will be used for connecting points from the drop-down list on the Standard toolbar. If you want to use just some of the points, create a selection set for those points.
3. Choose ***Tools-Editing-Point to Line Conversion*** to display the Point to Line Conversion dialog box.

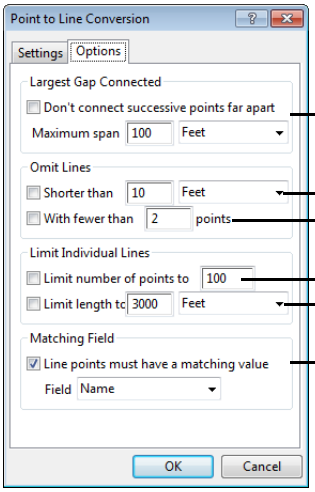
4. Make choices as follows:



- Choose to use All Features or a selection set
- Choose to add lines to an existing layer and choose the layer
- Choose to create a new line layer
- Choose to add the lines as freehand annotations and click the sample to set the line style
- Choose a field to use for grouping points into separate features or choose None if no grouping is necessary
- Choose a field for ordering the connection and a sort order

TIP: By default, only one line will be created with each input being converted into a shape point along the line. If you wish to convert each point into a node and to create a line segment between each point, make sure you check "Limit number of points to" and then enter 0 under the Options tab.

5. If you want to set options to control how lines are created, click the Options tab to display the Options page, and make choices as follows:



- Check to set a largest gap to connect, type a maximum value, and choose the units
- Check to omit short lines, type a minimum value, and choose the units
- Check to omit lines with few points and type a minimum number of points
- Check to limit the number of points in a line and type a maximum value
- Check to limit the length of a line, type a maximum value, and choose the units
- Check to prevent lines from connecting to points that do not have matching values for a field and choose the limiting field

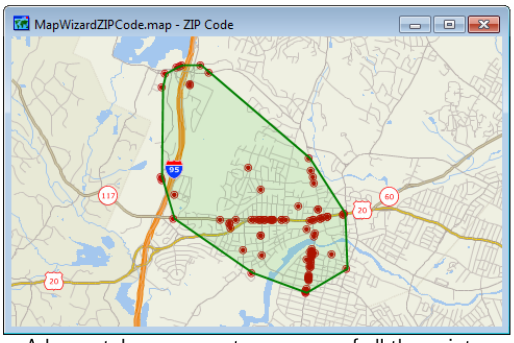
6. Click **OK**. If you chose to create lines in a new line layer, Maptitude displays the Save New Layer As dialog box. Choose a folder, type a file name, and click **Save**.

Maptitude connects the points and displays the new lines.

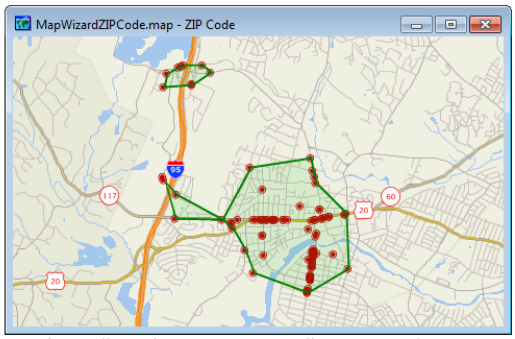
Converting Points to Areas

Maptitude lets you convert clusters of point features into area features. When you convert to area features, Maptitude creates a new geographic file containing the points.

Maptitude creates areas around the points based on a tolerance. A very large tolerance will create a convex hull of all the points. A smaller tolerance may create disconnected areas. A very small tolerance will connect none of the points, and thus create an empty area database.



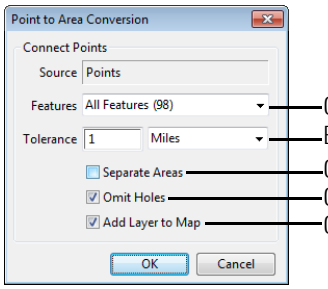
A larger tolerance creates an area of all the points



A smaller tolerance creates disconnected areas

▶ To Create Area Layers from Point Features

1. Open the map that contains the point features you want to convert, and if necessary, create a selection set of the points if you do not want to use all of the features in the layer.
2. Choose the point layer from the drop-down list on the Standard toolbar to make it the working layer.
3. Choose ***Tools-Editing-Point to Area Conversion*** to display the Point to Area Conversion dialog box.



4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name and click **Save**.

Maptitude creates the new area geographic file and adds it to your map if you chose to do so.

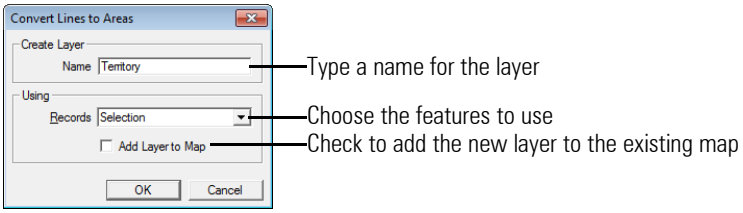
Converting Lines and Areas

Maptitude lets you convert line features to area features and vice versa. You convert lines and areas using the ***Tools-Editing-Line/Area Conversion*** command. You can either convert all the features in a layer, or use the selection tools to select particular features to convert.

For example, you might want to define sales territories by major roads. To do so, you select the roads that make up the boundaries and then convert line features to area features. Maptitude will use the roads to create boundaries and save the sales territories as an area layer in a new geographic file.

▶ To Create Area Layers from Line Features

1. Open the map that contains the line features you want to convert.
2. Choose the layer you want from the layer list on the toolbar.
3. If you want certain lines to define area boundaries, use the selection tools to select the lines.
4. Choose ***Tools-Editing-Line/Area Conversion***. Maptitude displays the Convert Lines to Areas dialog box.
5. Make choices as follows:

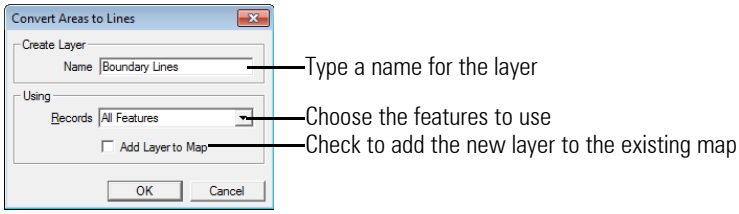


6. Click **OK**. Maptitude displays the Save As dialog box.
7. Type a file name and click **Save**.

Maptitude creates the new area geographic file. If you checked the **Add Layer to Map** box, Maptitude adds the layer to your map. If you did not check the **Add Layer to Map** box, Maptitude just saves the layer to a file.

▶ To Create Line Layers from Area Features

1. Open the map that contains the area features you want to convert.
2. Choose the layer you want from the layer list on the toolbar.
3. If you want to convert certain areas to lines, use the selection tools to select those areas.
4. Choose ***Tools-Editing-Line/Area Conversion***. Maptitude displays the Convert Areas to Lines dialog box.
5. Make choices as follows:

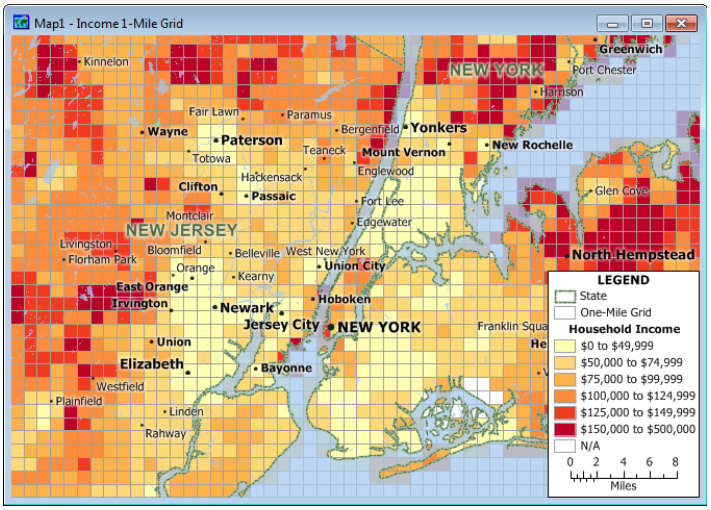


6. Click **OK**. Maptitude displays the Save As dialog box.
7. Type a file name and click **Save**.

Maptitude creates the new line geographic file. If you checked the **Add Layer to Map** box, Maptitude adds the layer to your map. If you cleared the **Add Layer to Map** box, Maptitude just saves the layer to a file.

Creating Grids

Grids offer a way of dividing a map into areas of specified dimensions. A grid is drawn along X and Y axes, and is made up of a certain number of cells with a certain width and height, or grid spacing.



The geographic files that come with Maptitude include 5-, 10-, 20-, and 30-degree grid lines for you to use in your maps. You can also create your own area, line, or point grids. For example, you can create grids to:

- Find the demographic characteristics of every 25-square-mile area in a state
- Create sample areas for use with a GPS device in gathering natural resource data
- Mark points on a map a fixed distance apart

You can add shape points to area and line grids. Add one or more shape points to each line or each area boundary to more accurately display grids with large cells or grids on projections where lines of longitude or latitude curve.

You create a grid on a map using the ***Tools-Editing-New Grid Layer*** command. To use this command, you enter information about the location and spacing of the grid you want to create.

If you create a grid based on longitude and latitude, grid spacing is expressed in degrees. Otherwise, grid spacing is expressed in the current map units.

Maptitude offers three methods. You can create a grid:

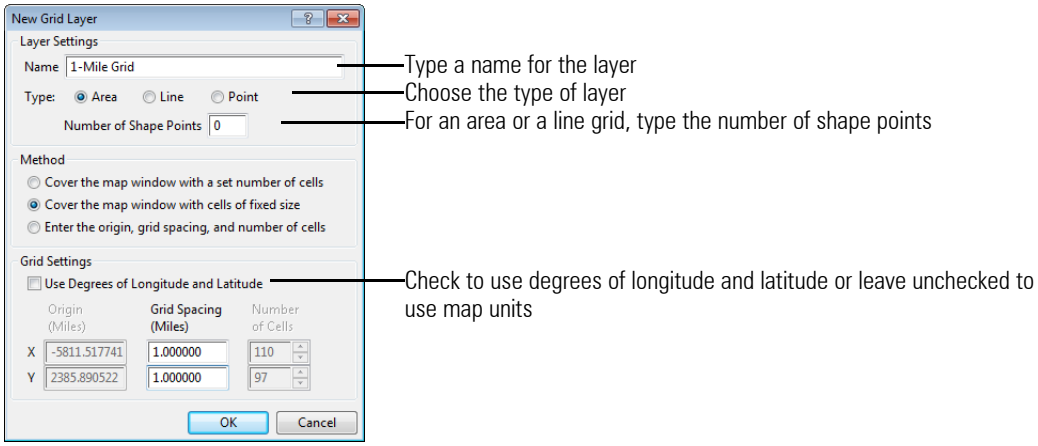
- That covers the area displayed in the map window with a set number of cells along the X and Y axes
- That covers the area displayed in the map window, with cells of fixed size along the X and Y axes
- Anywhere by entering an origin coordinate, the fixed grid spacing along the X and Y axes, and a set number of cells along the X and Y axes

In the third method, the origin coordinate is a distance from the origin of the map projection or coordinate system.

An area grid is saved into a compact (.cdf) area geographic file. A point or line grid is saved into a standard (.dbd) geographic file.

▶ To Create a Grid Layer

1. Choose ***Tools-Editing-New Grid Layer***. Maptitude displays the New Grid Layer dialog box.
2. Make choices as follows:



3. Choose a method to use to create the grid from the Method radio buttons as follows:

To create a grid...	Do this...
In the map window with a set number of cells	Choose the first method, then type the number of cells along the X and Y axes in the Number of Cells editable spinners.
In the map window with cells of fixed size	Choose the second method, then type the size of the cells along the X and Y axes in the Grid Spacing edit boxes.
Anywhere on the map	Choose the third method, then type an origin coordinate in the Origin edit boxes, the type the size of the cells along the X and Y axes in the Grid Spacing edit boxes, and the number of cells along the X and Y axes in the Number of Cells editable spinners.

4. Click **OK**. Maptitude displays the Save As dialog box.
5. Type a file name for the new geographic file and click **Save**.

Maptitude creates the grid and draws the map with the grid.

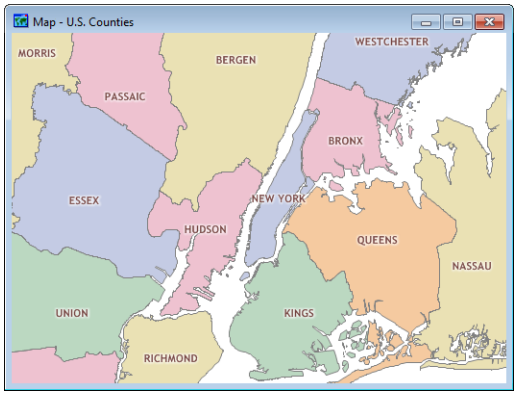
Coloring a Map

The ***Area Coloring*** command assigns color codes to areas, or uses existing color codes, and creates a color theme that displays the layer with areas next to each other having different colors. You can also store the number of areas adjacent to each area.

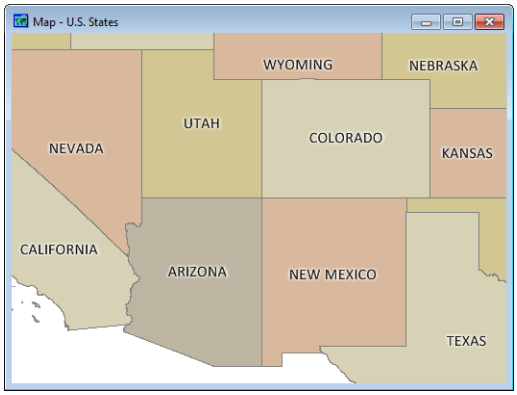
When in 1852 the English mapmaker Francis Guthrie was coloring maps so that no two adjacent regions had the same color, he noticed that he only needed four colors. It took until 1976 for there to be a formal proof of his conjecture that this was always true for simple areas. Because geographic areas can have multiple pieces and islands, and can touch at corner nodes, it can take more than four colors to make assignments that clearly distinguish areas. Maptitude uses Freimer's cartographic graphs to model the adjacency between areas, and Brelaz's Dsatur algorithm to assign the colors.

There are several adjacency methods that you can use for coloring a map:

Method	What it does
Edge	Assigns a color to every area, making sure that no areas that share a common border have the same color. The number of neighboring areas will be the total number of areas sharing a border with each feature.
Node	Assigns a color to every area, making sure that no areas that share a common border or node have the same color. The number of neighboring areas will be the total number of areas sharing a border or node with each feature.
Island	Assigns a color to every area, making sure that no areas that share a common border or node, or are separated by a body of water, have the same color. The number of neighboring areas will be the total number of areas sharing a border or node with, or are within the threshold distance of, each feature.



Counties colored with the island option: Counties separated by water are still considered adjacent and have different colors

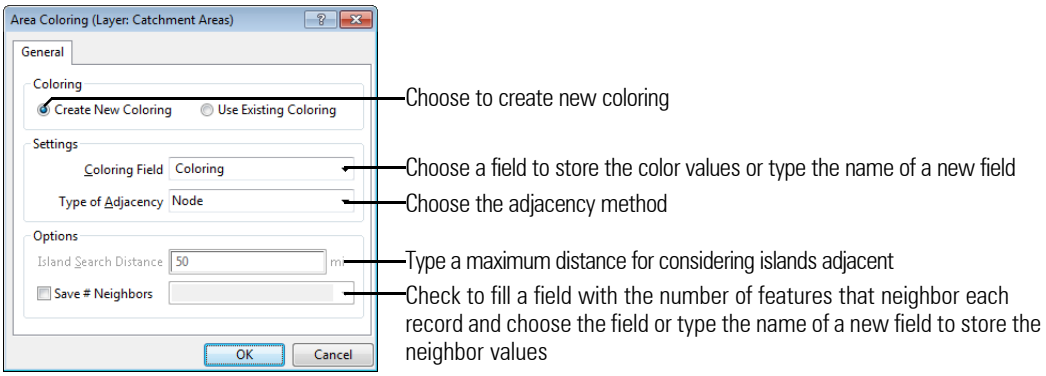


States colored with the node option: None of the "Four Corners" states is the same color

▶ To Color a Map's Areas

1. Choose an area layer to color from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Area Coloring*** to display the Area Coloring dialog box.

3. Make choices as follows:



4. Click **OK**.

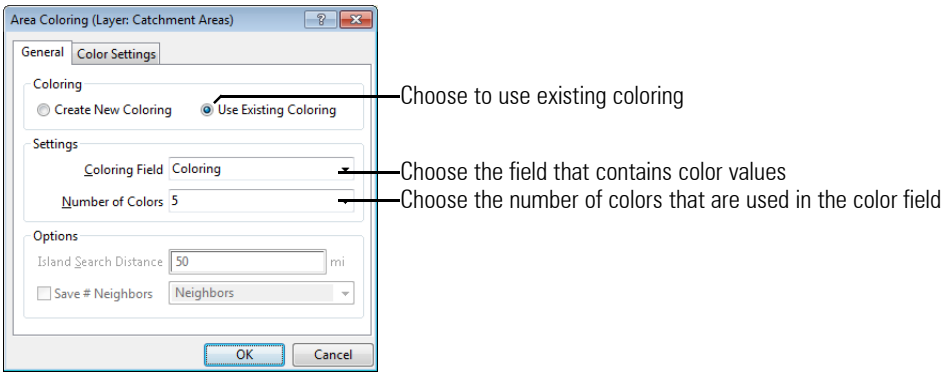
Maptitude determines the color value for every feature, fills the color field with the values, and draws the map with a color theme on the area layer.

NOTE: When you create new colors, Maptitude writes the color values to the layer table. This requires that the area layer not be in a read-only location.

To change the colors, see "To Change a Color or Pattern Theme" on page 157. To turn off the colors, see "To Turn Off a Color, Pattern, or Symbol Theme" on page 157.

▶ To Use Existing Map Coloring

1. Choose an area layer that already has a color field from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Area Coloring*** to display the Area Coloring dialog box.
3. Make choices as follows:



4. Click the Color Settings tab to choose the colors to use. You can cycle through color sets by clicking **Previous** and **Next**, or choose a color from the scroll list and click Style to specify colors individually.
5. Click **OK**.

Maptitude draws the map with a color theme on the area layer.

Using Data in Other Coordinate Systems

Maptitude stores the locations of map features in degrees of longitude and latitude. However, Maptitude can import and export the locations of map features in many other coordinate systems, including State Plane Coordinates, Universal Transverse Mercator (UTM), Australian Map Grid, and others.

To import or export data in a different coordinate system, you use the Coordinate System dialog box to indicate the coordinate system you want to use and the units in which the data are stored.

UTM coordinates for the Southern Hemisphere often have a False Northing of 10,000,000 meters added to them. You can indicate that these coordinates should be imported or exported with a False Northing. Gauss-Krüger coordinates may have a False Easting equal to the zone number times 1,000,000 meters. You can indicate that these coordinates should be imported or exported with a False Easting.

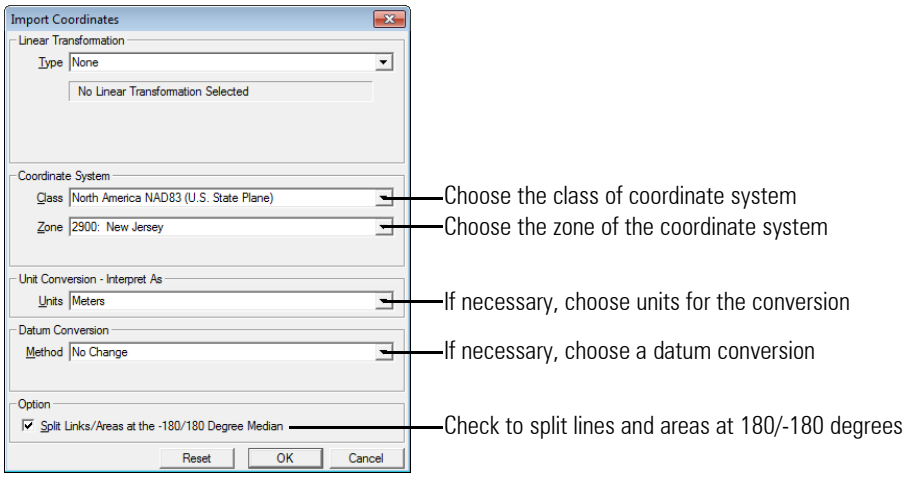
The default ellipsoid for UTM coordinates is the GRS 1980 ellipsoid, and the default ellipsoid for Gauss-Krüger coordinates is the Krassovsky 1940 ellipsoid, but you can choose another ellipsoid. See "About Ellipsoids" on page 560 for more information. If you need to change the datum or use a linear transformation to import or export data, see "Advanced Coordinate Conversion" on page 465.

To avoid problems with lines or areas crossing the 180/-180 degree meridian, you can split them at that longitude.

To learn more about coordinate systems and map projections, see *Appendix E: Projections and Coordinate Systems*.

▶ To Import Data from a Different Coordinate System

1. Begin the import procedure for the particular file type you are importing. Specific import procedures for each file type are presented in "Importing Geographic Files" on page 424.
2. When Maptitude displays the Import dialog box for the file type you have chosen, click **Coordinates**. Maptitude displays the Import Coordinates dialog box.
3. Make choices as follows:



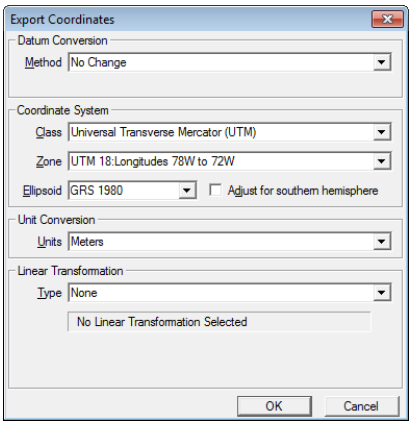
If you have chosen UTM and the coordinates have a False Northing, check **Adjust for Southern Hemisphere**. You can also choose a different ellipsoid from the Ellipsoid drop-down list.

If you have chosen Gauss-Krüger and the coordinates have a False Easting, check **Zone Factor Adjustment**. You can also choose a different ellipsoid from the Ellipsoid drop-down list.

4. Click **OK** to return to the Import Geography dialog box.
5. Return to and complete the import procedure for the particular file type you are importing.

▶ To Export Data to a Different Coordinate System

1. Begin the export procedure as described on page 444.
2. When Maptitude displays the Export Geography dialog box, click **Coordinates**. Maptitude displays the Export Coordinates dialog box.



3. Choose the class of coordinate system from the Class drop-down list.
4. Choose the zone of the coordinate system from the Zone drop-down list.
5. If you have chosen UTM and you want to add a False Northing to the coordinates, check **Adjust for Southern Hemisphere**. You can also choose a different ellipsoid from the Ellipsoid drop-down list.

   If you have chosen Gauss-Krüger and you want to add a False Easting to the coordinates, check **Zone Factor Adjustment**. You can also choose a different ellipsoid from the Ellipsoid drop-down list.
6. Click **OK** to return to the Export Geography dialog box.
7. Return to and complete the export procedure.

Advanced Coordinate Conversion

Geographic data can be stored in many different ways, including some that don't fit neatly into a defined coordinate system. Maptitude includes two advanced features that help you use geographic data from almost any source:

- Support for multiple datums
- Support for coordinate transformations

Datums

The shape of the earth is irregular. To make a map, the earth's shape needs to be "smoothed out" and shown on a regular surface, called a spheroid. A datum defines a particular spheroid that fits the whole earth, or part of the earth. For some mapping purposes it may be necessary to convert the positions of features in geographic files from one datum to another, so that they align properly. If you reference coordinates to the wrong datum, features on your map may not appear in the right locations.

For many years the standard datum for the United States and North America was the North American Datum of 1927 (NAD27). Since that time technological advances have improved the accuracy of measurements allowing for a much more accurate geocentric datum to be developed, the North American Datum of 1983 (NAD83). From NAD83, an even more precise datum was developed using GPS, called NAD83hp (high precision geodetic networks.) Maptitude supports conversions of U.S. data between all three datums, NAD27, NAD83, and NAD83hp using NADCON, the U.S. federal standard from the National Geodetic Survey (HTTP://WWW.NGS. NOAA.GOV/TOOLS/NADCON/NADCON.HTML). NADCON also supports conversions from the old pacific island datums used on Hawaii, American Samoa, Guam and the Northern Marianas to NAD83 and NAD83hp.

Both the NAD27 and NAD83 datums are also used in Canada. Maptitude converts Canadian data between these datums as well as the regional ATS77 and MAY76 datums using NTv2, the Canadian standard conversion software and grid shift files developed by Geodetic Survey Division, Geomatics Canada (HTTP://WWW.GEOD.NRCAN.GC.CA/TOOLS-OUTILS/NTV2_E.PHP). Grid files are included with Maptitude to convert between NAD27 and NAD83 for Canada, MAY76 and NAD83 for Ontario and ATS77 and NAD83 or New Brunswick.

For Australia, Maptitude converts between the AGD66, AGD84 and GDA94 datums using the Canadian NTv2 software. The included A66 National (13.09.01).gsb, National 84 (02.07.01).gsb grid shift files for converting between AGD66, AGD84 and GDA94 were produced by Australia's Intergovernmental Committee on Surveying and Mapping and are available on their website: HTTP://WWW.ICSM.GOV.AU.

For Austria, Maptitude converts between the MGI and ETRS89 datums using the Canadian NTv2 Software. The conversion requires the AT_GIS_GRID.GSB grid shift file, available from the Bundesamt für Eich- und Vermessungswesen website: HTTP://WWW.BEV.GV.AT. It needs to be installed in the Datum folder in the Maptitude program folder.

For Brazil, Maptitude converts between the CA61, CA7072, SAD69 and SAD69(96)datums and the SIRGAS2000 datum using the Canadian NTv2 Software. The included CA61_003.GSB,

CA7072_003.GSB, CA69_003.GSB SAD96_003.GSB grid shift files were produced by the Instituto Brasileiro de Geografia e Estatística and available on their website: HTTP://WWW.IBGE.GOV.BR.

For France, Maptitude converts between the NTF and RGF93 datums using the Canadian NTv2 Software. The included Ntf_r93.gsb grid shift file was produced by IGN (Institut Géographique National) and available on their website: HTTP://LAMBERT93.IGN.FR.

For Germany, Maptitude converts between the DHDN and ETRS89 RGF93 datums using the Canadian NTv2 Software. The included BETA2007.GSB grid shift file was produced by Bundesamt für Kartographie und Geodäsie and available on their website: HTTP://CRS.BKG.BUND.DE.

For New Zealand, Maptitude converts between the NZGD49 and NZGD2000 datums using the Canadian NTv2 software. The included nzgd2kgrid00005.gsb grid shift file was produced by the Office of the Surveyor-General, Land Information New Zealand and available on their website: HTTP://WWW.LINZ.GOVT.NZ.

For Portugal, Maptitude converts between the Datum73, DLx, DLx (Bessel), and ED50 datums and the ETRS89 datum using the Canadian NTv2 software. The included Pt73_e89.gsb, ptLX_e89.gsb, ptLB_e89.gsb, ptED_e89.gsb were produced by Faculdade de Ciências da Universidade do Porto: HTTP://WWW.FC.UP.PT/PESSOAS/JAGONCAL/COORDENADAS/INDEX_EN.HTM

For Spain, Maptitude converts between the ED50 and ETRS89 datums using the Canadian NTv2 software. Separate conversions are provided for the Iberian Peninsula and the Balearic Islands. The included R2009V9.gsb and BALR2009.gsb grid shift files were produced by the Instituto Geografico Nacional - Ministerio de Fomento and available on their website: HTTP://WWW.01.IGN.ES.

For Switzerland, Maptitude converts between the CH1903, CH1903+, and ETRS89 datums using the Canadian NTv2 Software.

For Great Britain, Maptitude converts between the OSGB36 and ETRS89 datums, using Ordnance Survey's OSTN02 transformation method.

For the Republic of Ireland and the province of Northern Ireland, Maptitude converts between the Irish datum (1975 adjustment) and ETRS89 using the Ordnance Survey of Ireland (OSi)/Ordnance Survey of Northern Ireland (OSNI) polynomial transformation method.

Other datum translation methods are required when you work with datums used in other countries not mentioned above. These methods are not currently supported by Maptitude.

Maptitude helps make sure your location information is correct by providing options for converting between datums. Suppose you have two or more geographic files that you want to use together in a map, but their coordinates are not based on the same datum. You need to pick one datum, and convert the other geographic files to that datum. The conversion is done by specifying the new datum when you export the geographic file. When you convert from one datum to another, Maptitude shifts the coordinates from one datum to the coordinates of another datum.

▶ To Import Data from Another Datum

1. Begin the import procedure for the particular file type you are importing. Specific import procedures for each file type are presented in "Importing Geographic Files" on page 424
2. When Maptitude displays the Import Geography dialog box, click **Coordinates**. Maptitude displays the Import Coordinates dialog box.
3. Choose the datum conversion you want from the Method drop-down list. For datum conversions involving NAD83hp, choose a region from the Region drop-down list.
4. Click **OK** to return to the Import Geography dialog box.
5. Return to and complete the import procedure for the particular file type you are importing.

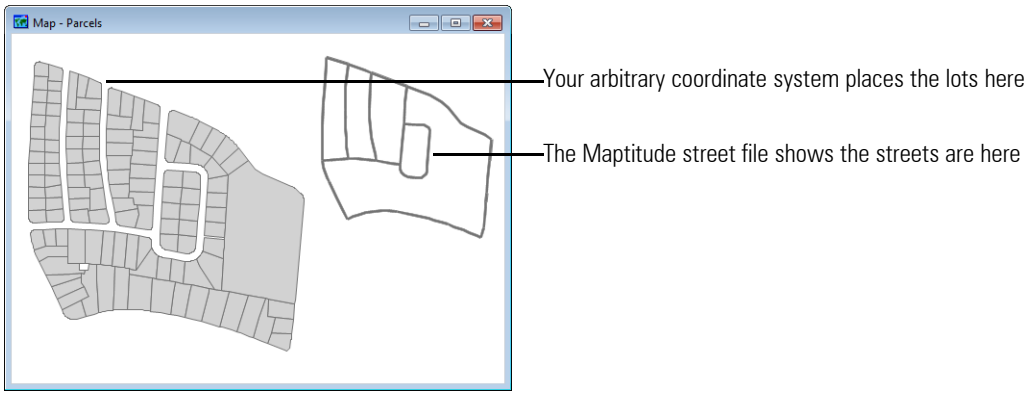
▶ To Export Data to Another Datum

1. Begin the export procedure as described on page 444.
2. When Maptitude displays the Export Geography dialog box, click **Coordinates**. Maptitude displays the Export Coordinates dialog box.
3. Choose the datum conversion you want from the Method drop-down list. For datum conversions involving NAD83hp, choose a region from the Region drop-down list.
4. Click **OK** to return to the Export Geography dialog box.
5. Return to and complete the export procedure.

Linear Transformations

Maptitude stores the data in its geographic files in degrees of longitude and latitude. Some standard coordinate systems, such as State Plane, Gauss-Krüger, Universal Transverse Mercator (UTM), and others, have well-defined conversions to and from coordinates in longitude and latitude. Maptitude has these conversions built in. For other coordinate systems, you need to provide the conversion information. These other coordinate systems are referred to here as **arbitrary coordinate systems**.

Linear transformations let you convert data that are in an arbitrary coordinate system so that they can be used in Maptitude. For example, suppose the positions of parcels in your arbitrary coordinate system do not match up with the positions of streets in the Caliper U.S. Streets file. If you are combining Maptitude data with data that uses an arbitrary coordinate system, you need to transform the coordinates of the latter so that the two sets of data match up.



Maptitude lets you shift and scale the coordinates in an arbitrary coordinate system so that they match up with coordinates in a standard coordinate system. This way, Maptitude can correctly convert the data and store it in degrees of latitude and longitude. You can also convert Maptitude data so it can be used in your arbitrary coordinate system.

To transform coordinates from an arbitrary coordinate system, you import the data. To transform coordinates from a Maptitude geographic file to match coordinates in an arbitrary coordinate system, you export the data.

Maptitude provides three ways to make data from an arbitrary coordinate system fit correctly into Maptitude geographic files, and vice versa. They are:

- Scale and Offset
- Center and Extent
- N-Point Transformation

All three linear transformation methods allow you to shrink or expand the scale of coordinates and to shift those coordinates by a certain distance. The N-Point Transformation method gives you the added option of adjusting the orientation of (rotating) coordinates.

Scale and Offset

When you use the Scale and Offset method to import coordinates from an arbitrary coordinate system, Maptitude:

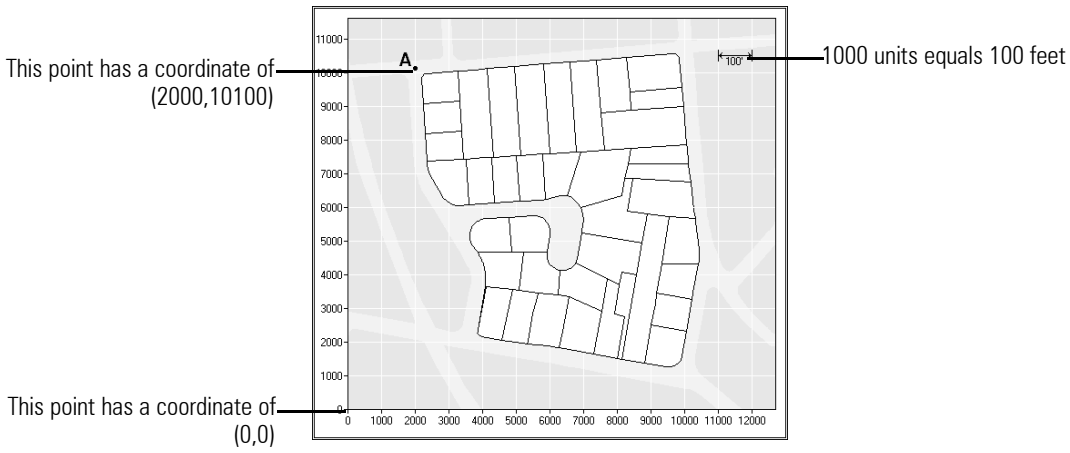
- Reads the coordinates in their original form
- Multiplies each coordinate by fixed-scale values (an x-value and a y-value)
- Adds fixed-offset values (an x-value and a y-value) to each coordinate
- Converts the coordinates to longitude and latitude and stores them in the geographic file

When you use the Scale and Offset method to export coordinates to an arbitrary coordinate system, Maptitude:

- Reads the coordinates from the geographic file and converts them from longitude and latitude
- Subtracts fixed-offset values (an x-value and a y-value) from each coordinate
- Divides each coordinate by fixed-scale values (an x-value and a y-value)
- Stores the modified coordinates in the export file

To use the scale and offset method, you must supply four values: the x- and y-offset values, and the x- and y-scale values. For example, suppose you are working with a map of tax parcels that comes from a CAD system. In this particular data set, the coordinates are measured in tenths of a foot, and the

lower left corner of the CAD drawing has a coordinate of (0,0) and point "A" has a coordinate of (2000,10100).



From an existing Maptitude map, you may know that the intersection where point "A" is located has a particular coordinate. Let's say, for example, that in the Rhode Island 1983 State Plane coordinate system, point "A" has a coordinate in feet of (11438.0, 24601.0).

To import the CAD data and convert it to the Rhode Island State Plane coordinate system, you would use the following four values:

Parameter	Value	How it works
X-scale	0.1	The original coordinate of 2000 is multiplied by 0.1 to get the value of 200 feet.
X-offset	11238	This offset is added to 200 feet to get 11438 feet.
Y-scale	0.1	The original coordinate of 10100 is multiplied by 0.1 to get the value of 1010 feet.
Y-offset	23591	This offset is added to 1010 feet to get 24601 feet.

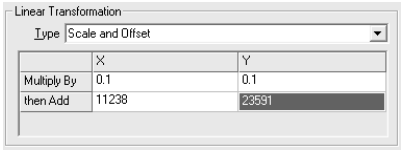
To export Maptitude data so that the coordinates match the CAD drawing, you would use the following four values:

Parameter	Value	How it works
X-offset	11238	This offset is subtracted from 11438 to get 200 feet.
X-scale	0.1	200 feet is divided by 0.1 to get the value of 2000 CAD units.
Y-offset	23591	This offset is subtracted from 24601 to get 1010 feet.
Y-scale	0.1	1010 feet is divided by 0.1 to get the value of 10100 CAD units.

▶ To Import Data Using Scale and Offset

1. Begin the import procedure for the particular file type you are importing. Specific import procedures for each file type are presented in "Importing Geographic Files" on page 424.
2. Click the **Coordinates** button to display the Import Coordinates dialog box.

3. Choose **Scale and Offset** from the Linear Transformation Type drop-down list.

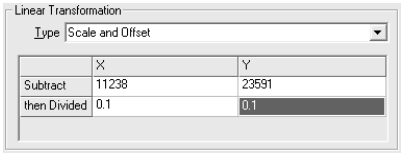


4. If you want to scale coordinates, type the x-scale value and the y-scale value in the respective Multiply By cells.
5. If you want to shift coordinates, type the x-offset value and the y-offset value in the respective Then Add cells.
6. Click **OK** to return to the Import Geography dialog box.
7. Return to and complete the import procedure for the particular file type you are importing.

Maptitude adjusts the coordinates accordingly.

▶ To Export Data Using Scale and Offset

1. Begin the export procedure as described in "To Export a Map Layer" on page 444.
2. Click the **Coordinates** button to display the Export Coordinates dialog box.
3. Choose **Scale and Offset** from the Linear Transformation Type drop-down list.



4. If you want to shift coordinates, type the x-offset value and the y-offset value in the respective Subtract cells.
5. If you want to scale coordinates, type the x-scale value and the y-scale value in the respective Then Divide By cells.
6. Click **OK** to return to the Export Geography dialog box.
7. Return to and complete the export procedure as described on page 444.

Maptitude adjusts the coordinates accordingly.

Center and Extent

The Center and Extent method for transforming coordinates is similar to the Scale and Offset method, but you enter the data that are needed for the transformation in a slightly different way.

To use this method, you provide two types of information:

- The coordinates of a single, known location in both the arbitrary coordinate system and the standard coordinate system. These values are used to determine the x- and y-offset values between the two coordinate systems.
- The size of a particular map feature or map measurement in both the arbitrary coordinate system and the standard coordinate system. These values are used to determine a scaling factor between the two coordinate systems.

Note that the Center and Extent method applies a uniform scale factor to both the x- and y-coordinates. The Scale and Offset method, on the other hand, can use different scale factors for the x- and y-coordinates. This makes the Scale and Offset method slightly more flexible.

When you use the Center and Extent method to import coordinates from an arbitrary coordinate system, the following steps take place:

- The coordinates are read in their original form
- The coordinates are adjusted by a scaling factor so they are of the correct magnitude
- The coordinates are shifted so that the known point lines up correctly
- The coordinates are converted into longitude and latitude and stored in the geographic file

When you use the Center and Extent method to export coordinates to an arbitrary coordinate system, the following steps take place:

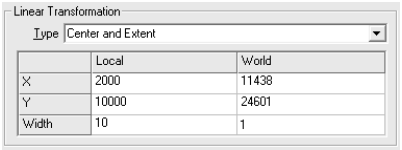
- The coordinates are read from the geographic file and converted from longitude and latitude
- The coordinates are shifted so that the known point lines up correctly
- The coordinates are adjusted by a scaling factor so they are of the correct magnitude
- The modified coordinates are stored in the export file

As an illustration, let's return to the CAD map example shown on page 427. To convert the CAD data to the Rhode Island State Plane coordinate system, or vice versa, you would enter the following parameters:

Parameter	Value
Local X-value	2000
Local Y-value	10100
World X-value	11438.0
World Y-value	14601.0
Local width	10
World width	1

▶ To Import Data Using Center and Extent

1. Begin the import procedure for the particular file type you are importing. Specific import procedures for each file type are presented in "Importing Geographic Files" on page 424.
2. Click the **Coordinates** button to display the Import Coordinates dialog box.
3. Choose **Center and Extent** from the Linear Transformation Type drop-down list.



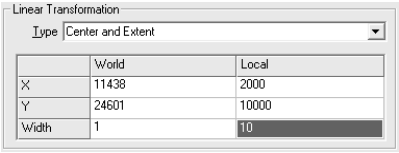
4. If you want to shift coordinates, type local X and Y coordinates in the Local column and the corresponding standard coordinates in the World column.
5. If you want to scale coordinates, type a value for the width of a feature in the local coordinate system in the Local Width cell and the corresponding standard width in the World Width cell.

6. Click **OK** to return to the Import Geography dialog box.
7. Return to and complete the import procedure for the particular file type you are importing.

Maptitude adjusts the coordinates accordingly.

▶ To Export Data Using Center and Extent

1. Begin the export procedure as described in "To Export a Map Layer" on page 444.
2. Click the **Coordinates** button to display the Export Coordinates dialog box.
3. Choose **Center and Extent** from the Linear Transformation Type drop-down list.



4. If you want to shift coordinates, type standard X and Y coordinates in the World column and the corresponding local coordinates in the Local column.
5. If you want to scale coordinates, type a value for the width of a feature in the standard coordinate system in the World Width cell and the corresponding local width in the Local Width cell.
6. Click **OK** to return to the Export Geography dialog box.
7. Return to and complete the export procedure as described on page 444.

Maptitude adjusts the coordinates accordingly.

N-Point Transformation

When the orientation of features in an arbitrary coordinate system differs from the orientation of features in a standard coordinate system, you must use N-Point Transformation to convert the coordinates. With the N-Point Transformation method, not only can you shift and scale coordinates, you can rotate them as well.

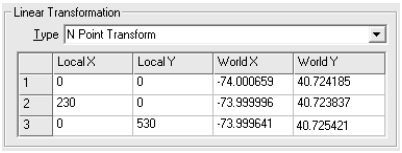
To use the N-Point Transformation method, you enter the coordinates of one or more known points in both the arbitrary coordinate system and the standard coordinate system. Maptitude uses this information to compute the scale, offset, and rotation that are required to convert the coordinates.

In general, you can enter one, two, or three pairs of points when using the N-point Transformation:

- If you enter one control point for both the local and world X and Y coordinates, Maptitude shifts the coordinates accordingly.
- If you enter two control points for both the local and world X and Y coordinates, Maptitude can both shift the coordinates and change the scale of the coordinates.
- If you enter three control points for both the local and world X and Y coordinates, Maptitude can shift the coordinates, change the scale of the coordinates, and rotate the coordinates.

▶ To Import Data Using N-Point Transformation

1. Begin the import procedure for the particular file type you are importing. Specific import procedures for each file type are presented in "Importing Geographic Files" on page 424.
2. Click the **Coordinates** button to display the Import Coordinates dialog box.
3. Choose **N Point Transform** from the Linear Transformation Type drop-down list.

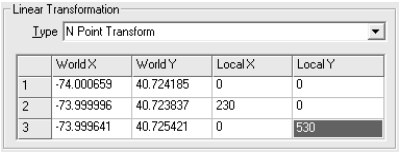


4. Type one, two, or three sets of local X and Y coordinates in the Local X and Local Y columns and the corresponding standard coordinates in the World X and World Y columns.
5. Click **OK** to return to the Import Geography dialog box.
6. Return to and complete the import procedure for the particular file type you are importing.

Maptitude adjusts the coordinates accordingly.

▶ To Export Data Using N-Point Transformation

1. Begin the export procedure as described in "To Export a Map Layer" on page 444.
2. Click the **Coordinates** button to display the Export Coordinates dialog box.
3. Choose **N Point Transform** from the Linear Transformation Type drop-down list.



4. Type one, two, or three sets of standard X and Y coordinates in the World X and World Y columns and the corresponding local coordinates in the Local X and Local Y columns.
5. Click **OK** to return to the Export Geography dialog box.
6. Return to and complete the export procedure as described on page 444.

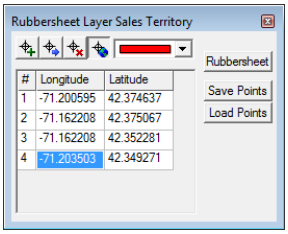
Maptitude adjusts the coordinates accordingly.

Rubbersheeting Geographic Files

If you need to make adjustments to the positions and shapes of many map features in a geographic file, you can use rubbersheeting. Imagine putting pins in a distorted map and moving those pins to their correct location to remove the distortion. The areas between the pins will be stretched and moved as well. The more pins (control points) you use, the more detailed the correction can be. The ***Tools-Editing-Advanced-Rubbersheet*** command displays a toolbox that lets you set control points, identify their true location, and save the results in a new geographic file. You must use at least three control points to rubbersheet a layer.

▶ To Rubbersheet a Geographic File

1. Choose a layer from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Editing-Advanced-Rubbersheet*** to display the Rubbersheet toolbox.



3. Place your control points as follows:

To do this...	Do this...
Place a control point	Click and click on the layer where you want a control point. Maptitude draws a symbol and number on the control point, and adds it to the list in the toolbox.
Move a control point	Click in the list on the control point you want to move, click , and click on the new location for the control point. Maptitude draws the control point in the new location.
Delete a control point	Click in the list on the control point you want to delete, and click . Maptitude removes the control point and renumbers the remaining control points.
Change the color	Choose a color from the drop-down list. Maptitude draws the control points in the chosen color.

To load existing control points, click Load Points to display the Load Coordinates dialog box, choose a Coordinates File, and click Open.

To save your control points, click Save Points to display the Save Coordinates As dialog box, choose a folder and type the name of the new Coordinates File, and click Save.

4. Enter the true location of each control point as follows:

To do this...	Do this...
Type in the location	Enter the coordinates of the control point in the respective cells in the Longitude and Latitude columns. If you want to use the local coordinates, check the Local box.
Click on the location	Click in the list on the control point you want to locate, click  , then click on a map to mark the true location.

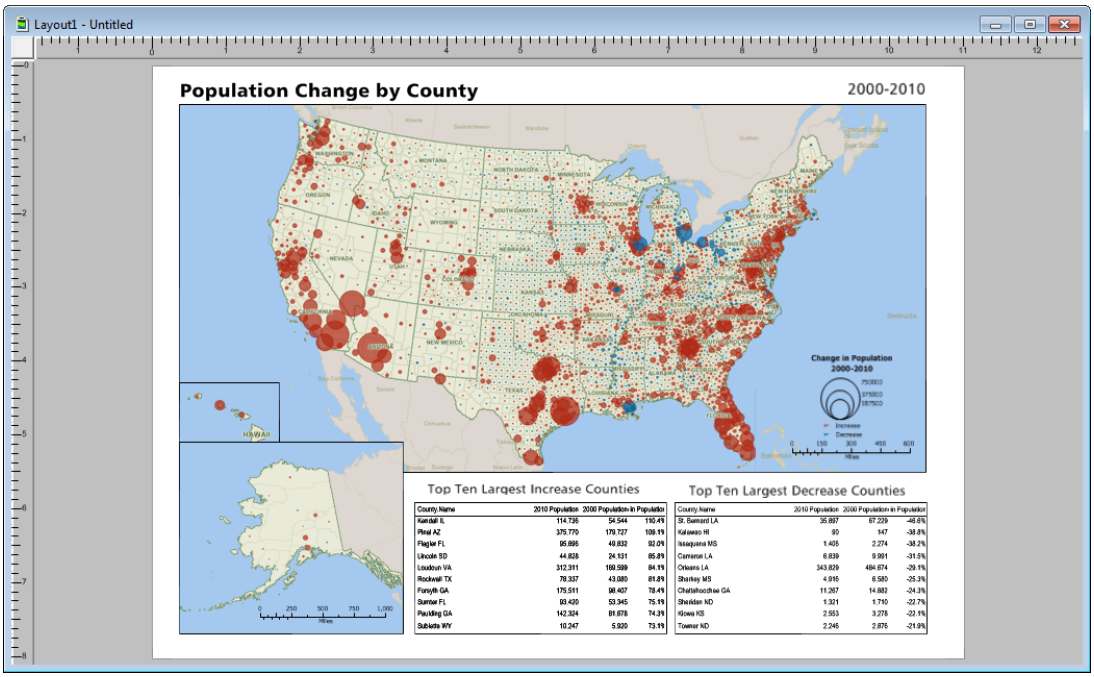
5. Click **Rubbersheet**. Maptitude displays the Save As dialog box.
6. Type the file name and click **Save**.

Maptitude rubbersheets the geographic file, and adds the new geographic file as a layer in the map.

CHAPTER 15:
Creating and Using Layouts

A Maptitude layout is an arrangement of maps, dataviews, figures (including charts, prism maps, and 3D maps), text, and freehand drawings. You create a layout when you want to print two or more maps on a single document or to combine maps with dataviews, text, or drawings to make a point. You also use layouts when you want to print maps or figures that are larger than a single sheet of paper.

In addition, a layout can serve as a template for reports or production work. You can set up a standard report or presentation page, add company logos or other design elements, and designate spaces into which you can fit maps and dataviews.



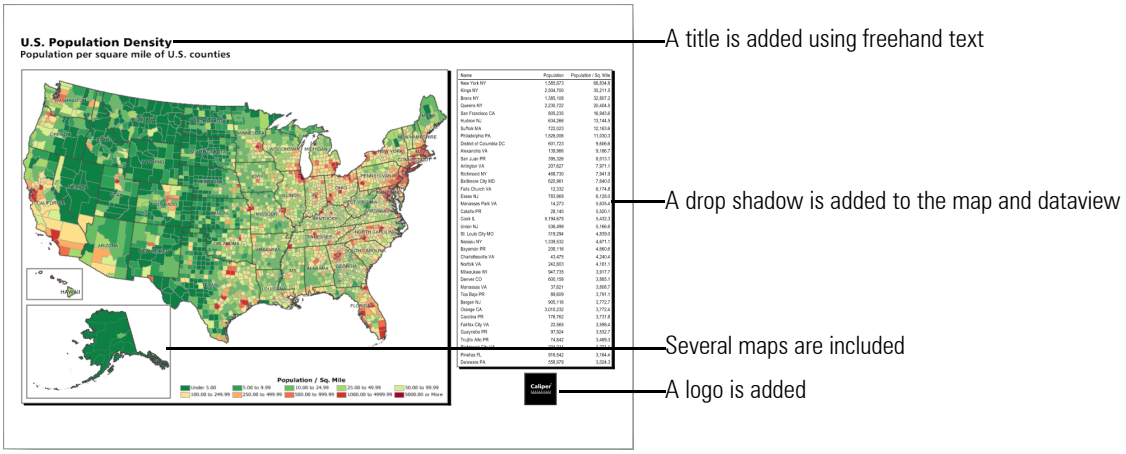
In this chapter:

Creating Layouts

You can create a layout for any printer that you have installed on your computer. When you create a new layout, Maptitude uses your default Windows printer and settings. You can use the ***File-Properties*** command to change the printer to use, as well as other layout settings such as the number of pages, the paper size, and orientation.

You place maps, dataviews, and figures using the tool on the Drawing toolbar. You can also use the freehand tools in the Tools toolbar to further enhance your layout. Once you have placed items, you can adjust and arrange them any way you want. You can also choose to use rulers and a snap-to grid to help you position items on the page.

The following layout shows some of the possibilities for your final product:



When placing maps, figures, and dataviews into a layout, remember two important points:

- The maps, figures, and dataviews you place in a layout are copies of the original. Once placed, the copy does not change even if you make changes to the original. For example, once you place a map in the layout, changing the visible layers on the original map has no effect on the map in the layout. Similarly, once you place a dataview in a layout, changing the font or columns in the original dataview has no effect on the dataview in the layout.
- The data in a layout are live. If the data change, the map components depicting that data will change. For example, if you update the data that is used for a color theme on a map in your layout, the theme will reflect the updated data if you print the layout. Data in the visible columns of a dataview also will change if the data change.

Once you create a layout, you can save and open it just as you do a map, figure, or dataview.

A layout can be any number of pages wide and high. Maptitude prints across pages to reach the layout size you specified. To assemble your final product, trim the printed pages and tape them together.

▶ To Create a Layout

1. Choose ***Tools-Reports-New Layout***.

Maptitude displays a new window containing the empty layout. You are now ready to place maps, figures, dataviews, and freehand items into the layout.

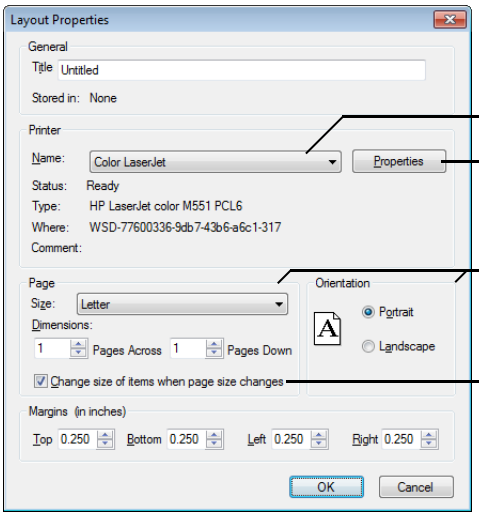
Changing Layout Settings

You can change the layout settings at any time, even after you have placed items in the layout. If you choose to change the page size, you can also choose whether or not to have items in the layout change size too.

▶ To Change Layout Settings

1. Choose ***File-Properties***, click  on the Standard toolbar, or right-click anywhere on the layout window except on an item and choose ***Properties***. Maptitude displays the Layout Properties dialog box.

2. Make choices as follows:



3. Click OK.

Maptitude draws the layout with the new settings.

Moving Around a Layout

Maptitude offers you tools and commands to move around your layout and to see it at different sizes.

▶ To Use Tools to Change the Layout Scale and Center

1. Choose a tool from the Tools toolbar as follows:

To do this...	Do this...
Zoom in	Choose in the Tools toolbar to activate the Zoom In tool. Click on the layout, or click and drag a rectangle, to make it larger.
Zoom out	Choose in the Tools toolbar to activate the Zoom Out tool. Click on the layout to make it smaller.
Pan	Choose in the Tools toolbar to activate the Pan tool. Click and drag on the layout to change the center.

TIP: If your mouse has a scroll wheel you can zoom in by rolling the scroll wheel away from you, zoom out by rolling the scroll wheel toward you, and pan by holding the scroll wheel down and dragging the layout to a new location.

▶ To See the Entire Layout

1. Click on the Standard toolbar, right-click anywhere on a layout except on an item and choose ***Entire Layout***, or choose All from the drop-down list on the toolbar.

Maptitude displays the entire layout within the Layout window.

▶ To See the Layout in Actual Size

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Actual Size***.

Maptitude displays as much of the layout as will fit in the Layout window at actual size.

▶ To Set the Scale of a Layout to a Percentage of the Actual Size

1. Choose a scale from the drop-down list on the Standard toolbar.

—OR—

1. Click a scale button as follows:

Toolbar Button	What It Does
	Shows the layout at 10% of its actual size
	Shows the layout at 25% of its actual size
	Shows the layout at 50% of its actual size
	Shows the layout at 200% of its actual size

Maptitude changes the scale of the layout according to the settings you chose.

▶ To See the Layout in its Previous Size

1. Click on the Tools toolbar, or right-click anywhere on a layout except on an item and choose ***Previous Size***.

Maptitude displays the layout at the size it was before the last size change.

Using the Rulers and the Snap Grid

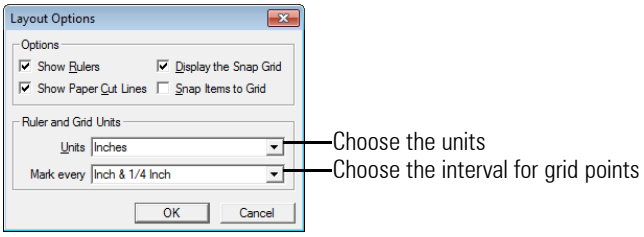
The rulers and the snap grid help you position items in exact locations on the page. The rulers are displayed across the top and down the left edge of the layout; they show the exact dimensions of the layout. The snap grid is a series of dots and crosses that appear throughout the layout. When you display rulers and the snap gird, you can choose to use inches, centimeters, or other units. You can also choose the interval of the grid points.

You can choose to enable or disable snapping of layout items to the snap grid. If snapping is enabled, the following things occur:

- When you move any layout item, Maptitude places the item so that the upper-left corner is positioned at the nearest grid point.
- When you resize any layout item, Maptitude adjusts the corner or edge you move so that it is positioned at the nearest grid point.

▶ To Set Up the Rulers and Snap Grid

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Options***. Maptitude displays the Layout Options dialog box.
2. Make choices as follows:



3. Click **OK**.

▶ To Display or Hide Rulers Along the Top and Left Edges

1. Click on the Standard toolbar.

—OR—

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Options***. Maptitude displays the Layout Options dialog box.
2. Check the **Show Rulers** box to display the rulers, or clear the box to hide the rulers, and click **OK**.

▶ To Show or Hide the Snap Grid for Positioning Items

1. Click on the Standard toolbar.

—OR—

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Options***. Maptitude displays the Layout Options dialog box.
2. Check the **Display the Snap Grid** box to display the grid, or clear the box to hide the grid, and click **OK**.

▶ To Snap Items to the Grid

1. Click on the Standard toolbar.

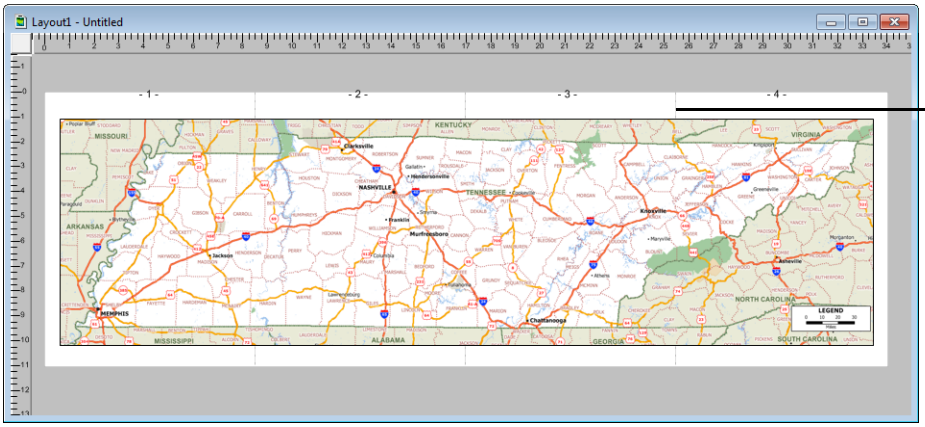
—OR—

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Options***. Maptitude displays the Layout Options dialog box.
2. Check the **Display the Snap Grid** box and the **Snap Items to Grid** box, and click **OK**.

Paper Cut Lines

If you want to create a layout that is larger than a page size supported by your printer, you can choose to have the layout span across and down any number of pages. After printing the pages, you can paste them together to get the complete layout.

When your layout is made up of more than one page across and/or down, you can choose to display paper cut lines in your layout to show where objects are placed in relation to how the pages are printed.



▶ To Show Paper Cut Lines

1. Click on the Standard toolbar.

—OR—

1. Click on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Options***. Maptitude displays the Layout Options dialog box.
2. Check the **Show Paper Cut Lines** box and click **OK**.

Maptitude displays paper cut lines in your layout.

Placing Windows in a Layout

When you place a map or figure in a layout, Maptitude makes sure your labels, symbols, and line styles remain the same size relative to the map or figure window. For example, if a label is about 1/20th the height of your map window, it will be about 1/20th the size of the map in the layout, no matter what size paper you are printing to. If, however, you want labels to be a certain size (say, 12 point) no matter how big or small your map is in the layout, you can tell Maptitude to use the actual point sizes you set up in your map. When you use the actual point sizes, the map in the layout may not exactly match the map window. For example, if you place a map into a large layout for a plotter with the actual point size option, you will likely see many more features labeled because there is now more room for labels than in the map window.

Place this map in a layout...

...the labels, line widths, and point features will scale so that they appear as in the map (WYSIWYG) when the Use Actual Point Sizes option is off

...the labels, line widths, and point features will use the sizes specified in the map when the Use Actual Point Sizes option is on

You can lock the scale of a map when you place it in a layout. This means that even if you resize or reshape the map in the layout, Maptitude remembers the scale you set and adjusts the map so that it always displays the geographic data at that fixed scale. The map in the layout may cover a smaller or larger geographic area than the map window.

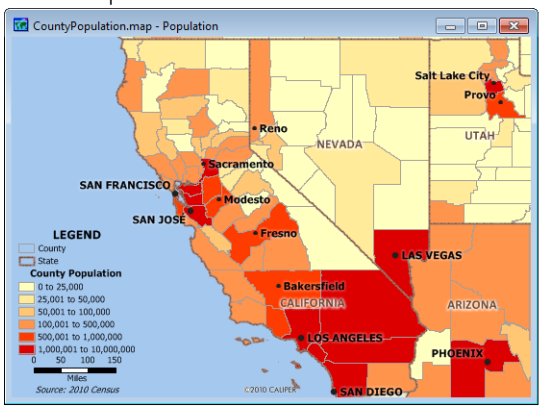
Place this 1:10,000,000 scale map in a layout...

...it displays the same geographic extent when the Print at Fixed Scale option is off. The scale in the layout will likely be larger or smaller depending on the layout page size.

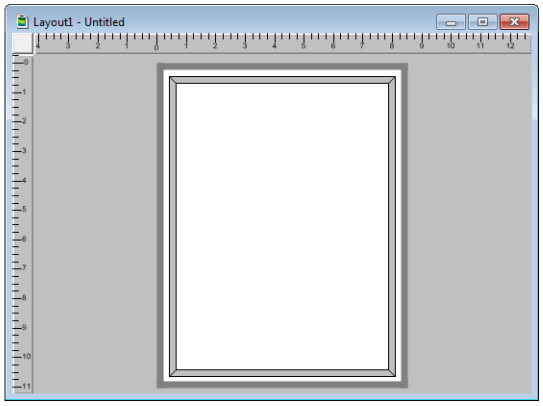
...it will continue to be 1:10,000,000 when the Print at Fixed Scale option is on. The geographic extent may be more or less depending on the layout page size.

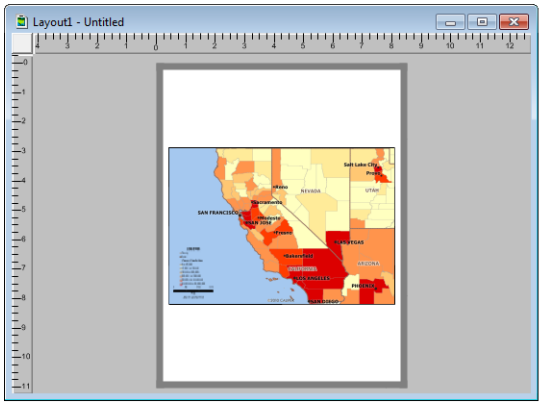
You can also choose to keep the shape of the map window (aspect ratio), or to extend the map to fill the frame. The first choice may change the height or width of the frame, while the second preserves the height and width of the frame.

Place this map...

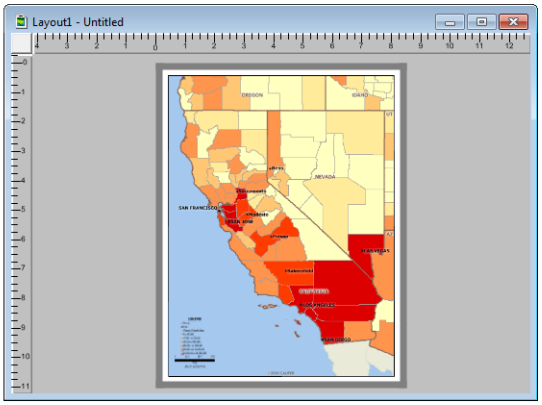


...in this frame





It will look like this if you keep the map's aspect ratio...



...and like this if you don't keep the map's aspect ratio

When you place a dataview in a layout Maptitude displays every column and uses a font that makes it possible to fit all the columns in the space you set for the dataview. If you have many columns, the text in the dataview can be too small to read. For this reason, it's a good idea to set up your dataview first so that only the most important fields are included.

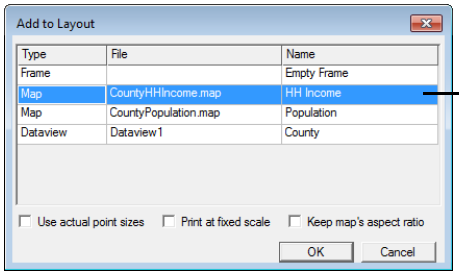
Once you have placed the dataview, you can change its location, size, and shape with the Pointer tool. Although Maptitude displays every column in your dataview, the number of records (rows) shown is dependent on the height of the dataview. Maptitude displays as many records as possible in the area you sketched out. If you make the dataview longer than is necessary to show all of the data, Maptitude automatically reduces its size.

Once you place an item in a layout, you can move and resize it using the Pointer tool. If you want an object to maintain its relative width and height as you reshape it, hold down the Shift key while you drag an editing handle with the Pointer tool.

You can place as many maps, dataviews, and figures as you like in the layout, along with any number of freehand items.

▶ To Place a Map, Dataview, or Figure in a Layout

1. Create a map, dataview, or figure, and design it so it looks the way you want.
2. Make the layout window the active window.
3. Click on the Drawing toolbar to activate the Place tool.
4. Drag a rectangle in the layout to show where you want to place the map, dataview, or figure. Maptitude displays the Add to Layout dialog box.



5. Choose an item to place in the layout from the grid view.
6. Choose options based on the following table:

To do this...	Do this...
Show labels, symbols, & line styles at their actual point sizes	Check the **Use Actual Point Sizes** box
Show labels, symbols, & line styles at the same relative size (WYSIWYG)	Remove the check from the **Use Actual Point Sizes** box
Draw maps at the same scale used in the map window	Check the **Print at Fixed Scale** box
Draw maps at a scale that fits into the frame	Remove the check from the **Print at Fixed Scale** box
Keep the shape of the map window	Check the **Keep Map's Aspect Ratio** box
Extend the map to fill the dragged rectangle	Remove the check from the **Keep Map's Aspect Ratio** box

7. Click **OK**.

Maptitude draws the map, dataview, or figure in the layout at the location you specified.

Editing a Map, Dataview, or Figure from a Layout

To edit an item in a layout, you open it in a separate map, dataview, or figure window. After you make changes, you place the revised map, dataview, or figure into the layout.

▶ To Edit Maps, Dataviews, and Figures from a Layout

1. Click on the Drawing toolbar to activate the Pointer tool, and double-click on the map, dataview, or figure you want to change, or right-click on the map, dataview, or figure you want to change, and choose ***Open***. Maptitude displays the map, dataview, or figure in a new window.
2. Make any desired changes.
3. Make the layout window the active window.
4. Right-click on the map, dataview, or figure you want to change, and choose ***Replace***. Maptitude displays the Add to Layout dialog box.

5. Choose the revised item to replace.
6. Click **OK**.

Maptitude updates the layout.

Using Frames

Frames are placeholders in a layout. Use frames when you want to create a standard template that you can use over and over again. You place a frame in a layout the same way you place any other window. Later, you can place a map, dataview, or figure into the frame.

▶ To Place a Frame in a Layout

1. Click  on the Drawing toolbar to activate the Place tool.
2. Drag a rectangle in the layout to show where you want to place the frame. Maptitude displays the Add to Layout dialog box.
3. Choose **Empty Frame**.
4. Click **OK**.

Maptitude draws an empty frame in the layout.

▶ To Place a Map, Dataview, or Figure in a Frame

1. Click  on the Drawing toolbar to activate the Pointer tool and double-click on the frame, or right-click on the frame and choose Replace. Maptitude displays the Add to Layout dialog box.
2. Choose an item to place in the layout from the scroll list.
3. Choose options based on the following table:

To do this...	Do this...
Show automatic labels, symbols, & line styles at their actual point sizes	Check the **Use Actual Point Sizes** box
Show automatic labels, symbols, & line styles at the same relative size	Remove the check from the **Use Actual Point Sizes** box
Draw maps at the same scale used in the map window	Check the **Print at Fixed Scale** box
Draw maps at a scale that fits into the frame	Remove the check from the **Print at Fixed Scale** box
Keep the shape of the map window	Check the **Keep Map's Aspect Ratio** box
Extend the map to fill the dragged rectangle	Remove the check from the **Keep Map's Aspect Ratio** box

4. Click OK.

Maptitude updates the layout.

Placing Freehand Items in a Layout

Freehand items include text, symbols, lines, circles, rectangles, and other graphics. You create free-hand items on a layout using the drawing tools on the Drawing toolbar, first presented in "Using the Drawing Tools" on page 134. Here is a quick summary of the drawing tools and how they work:

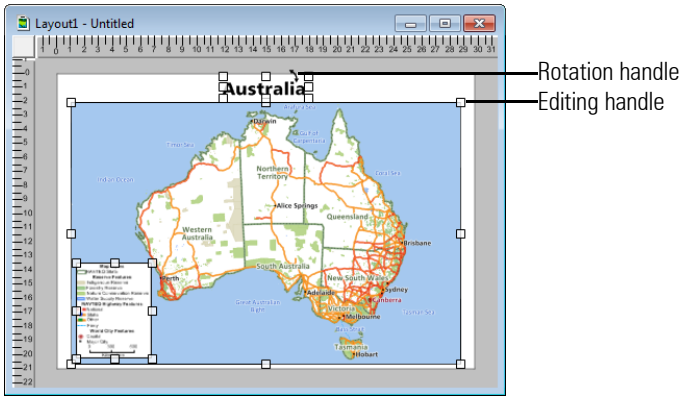
Tool	Name	How to use it
	Text	Drag a rectangle in the layout, type the text you want and press Enter. Type a vertical bar "|" to skip to another line.
	Curved Text	Click on each point along the curve, double-click to end it, type the text you want, and press Enter.
	Rectangle	Drag a rectangle in the layout, or hold the Shift key to drag a square.
	Rounded Rectangle	Drag a rectangle in the layout, or hold the Shift key to drag a square with rounded corners.
	Circle	Drag a circle in the layout
	Oval	Drag an oval in the layout, or hold the Shift key to drag a circle
	Shape	Click on each corner of the shape, and double-click to close it (the first and last points connect automatically).
	Line	Click on each point along the line, and double-click to end it.
	Arrow	Click on each point along the arrow, and double-click to end it.
	Curve	Click on each point along the curve, and double-click to end it.
	Bitmap	Drag a rectangle on the map, then choose an image file in any of the supported formats.
	Symbol	Click on the layout. Hold the Shift key and click on the layout to choose a symbol.

You can also hold the Ctrl key to drag a rectangle, rounded rectangle, or oval from its center.

Note that you cannot use the North Arrow, Radius, or Great Circle tools in a layout, only on a map.

Moving, Editing, and Arranging Layout Items

As you see a layout taking shape, you may want to change the position or contents of individual items. To edit, move, resize, delete, or align items in a layout, you must first select them with the Pointer tool. When you select an item in the layout, square blocks appear at the corners and sides of the item. These blocks are called editing handles. Text and symbol items also have a rotation handle, which you use to rotate the item.



▶ To Select Items in a Layout

1. Click on the Drawing toolbar to activate the Pointer tool.
2. Select items as shown in the table:

To do this...	Do this...
Select a single item	Click on the item.
Select another item	Hold the Shift key and click on the item.
Remove an item from the selected group	Hold the Ctrl key and click on the item.
Select a group of items	Drag a rectangle around the items.
Select additional items	Hold the Shift key and drag a rectangle around the items.
Remove items from the selected group	Hold the Ctrl key and drag a rectangle around the items.
Select all items in the layout	Choose ***Edit-Drawing-Select All***.

▶ To Move Layout Items

Items in a layout can be moved individually or in groups. To move layout items:

1. Click on the Drawing toolbar to activate the Pointer tool, and select one or more items.
2. Position the cursor over one of the selected items (but not on one of the handles).
3. Press and hold down the mouse button. Borders appears around all the selected items.
4. Drag the items to a new location, and release the mouse button.

Maptitude draws the items in their new location.

▶ To Change the Size of a Layout Item

1. Click on the Drawing toolbar to activate the Pointer tool, and select one or more items.
2. Position the cursor over one of the editing handles.
3. Press and hold down the mouse button on the handle. A border appears around the item.
4. Drag the handle until the border is the correct size, and release the mouse button.

TIP: The ratio of width to height is not fixed for rectangle and circle freehand items. Hold the Shift key while resizing these items if you want to keep the aspect ratio.

Maptitude draws the item in the new size.

▶ To Rotate a Text or Symbol Item

Text and symbol items can be rotated to any desired angle. To rotate a text or symbol item:

1. Click on the Drawing toolbar to activate the Pointer tool, and click on an item to select it.
2. Position the cursor over the rotation handle.
3. Press and hold down the mouse button on the handle. A border appears around the item.
4. Drag the handle until the border is shown at the desired angle, and release the mouse button.

   Rotated items normally align themselves to the nearest 5-degree angle. This automatic alignment makes it easy to place text vertically, horizontally, or diagonally. To rotate items more precisely, hold the Ctrl key while dragging the rotation handle.

Maptitude draws the item in its new location.

▶ To Edit Freehand Items in a Layout

1. Click on the Drawing toolbar to activate the Pointer tool, select one or more freehand items, and double-click on any of the selected items to display a dialog box for editing the items. The contents of the dialog box depend on the type of items that are selected.

   —OR—

   Right-click on a freehand item and choose ***Properties*** to display a dialog box for editing the items. The contents of the dialog box depend on the type of items that are selected.

2. Change the settings according to the following table:

For this type of items...	You can change...
Text	The font, style, color, frame style, and the text to display
Curved Text	The font, style, color, and the text to display
Rectangle	The border pattern, width, and color, and fill pattern and color
Rounded rectangle, circle, or polygon	The border pattern, width, and color, and fill pattern and color
Line or curved line	The line pattern, width, and color; you can also add direction arrows
Bitmap	The picture file
Symbol	The font, size, symbol, color, and style

3. Click OK.

Maptitude draws the items with the changes.

NOTE: To edit several items in one step, all must be of a similar type. For example, you can edit the style of two rectangles and a circle in a single step, but you cannot edit the style of a text item and two circles in a single step.

▶ To Delete Items from a Layout

1. Right-click on a freehand item and choose ***Delete***. Maptitude displays a dialog box to confirm the deletion.
2. Click **Yes** to delete the freehand item or No to cancel the deletion.

   —OR—

1. Click on the Drawing toolbar to activate the Pointer tool, and select one or more items.
2. Press the Del key, or choose ***Edit-Drawing-Delete*** and click **Yes** to confirm the deletion.

Maptitude deletes the selected items from the layout.

▶ To Align Layout Items

1. Click on the Drawing toolbar to activate the Pointer tool, and select one or more items. If you will be aligning items, they will be aligned with respect to the first item that you select.

2. Choose a command from the ***Edit*** menu, click a button on the Standard toolbar, or right-click on one of the selected items and choose the command from the menu as described in the following table:

Button	Command	What it does
	Edit-Drawing-Duplicate	Makes a copy of the items
	Edit-Drawing-Pull to Front	Moves the selected items to the front
	Edit-Drawing-Push to Back	Moves the selected items to the back
	Edit-Drawing-Align	Aligns the left edges of selected items
	Edit-Drawing-Align	Aligns the centers of selected items left to right
	Edit-Drawing-Align	Aligns the right edges of selected items
	Edit-Drawing-Align	Aligns the top edges of selected items
	Edit-Drawing-Align	Aligns the centers of selected items top to bottom
	Edit-Drawing-Align	Aligns the bottom edges of selected items
	Edit-Drawing-Center	Centers the group of selected items left to right in the layout
	Edit-Drawing-Center	Centers the group of selected items top to bottom in the layout
	Edit-Drawing-Distribute	Distributes selected items left to right in the layout
	Edit-Drawing-Distribute	Distributes selected items top to bottom in the layout

When you use the ***Distribute*** command or the distribute tools, the spacing between items is normally set to one-quarter inch. You can change the default spacing of layout items using the ***Edit-Preferences*** command and choosing the Freehand/Layout tab in the User Preferences dialog box.

Try It Yourself: Creating a Layout, Part 1

1. Choose ***File-Open Workspace***, then open the workspace **layout.wrk** in the Tutorial folder.
2. Choose ***Tools-Reports-New Layout***. Maptitude displays a new layout window.
3. Click on the Drawing toolbar to activate the Place tool, and drag a rectangle in the upper half of the layout. Maptitude displays the Add to Layout dialog box.
4. Choose **Map1–States of the United States** from the scroll list, remove the check from the **Keep map's aspect ratio** box, and click **OK**. Maptitude draws the map in the rectangle.
5. Click on the Drawing toolbar to activate the Pointer tool. Click on the legend and drag it so that it is on the lower left side of the map.
6. Click to activate the Place tool again. Drag a rectangle in the lower half of the layout. Maptitude displays the Add to Layout dialog box again.
7. Choose **Dataview1–State** from the scroll list and click **OK**. Maptitude draws the dataview in the rectangle.
8. Choose ***File-Save*** or click on the Standard toolbar. Maptitude displays the Save As dialog box.
9. Choose a folder on your computer in which to save the layout (you will need to remember this folder for Part 2 of this tutorial), then type "**My New Layout**" as the file name, and click **Save**. Maptitude saves your layout.
10. Choose ***File-Close All*** to close the map, dataview, and layout.

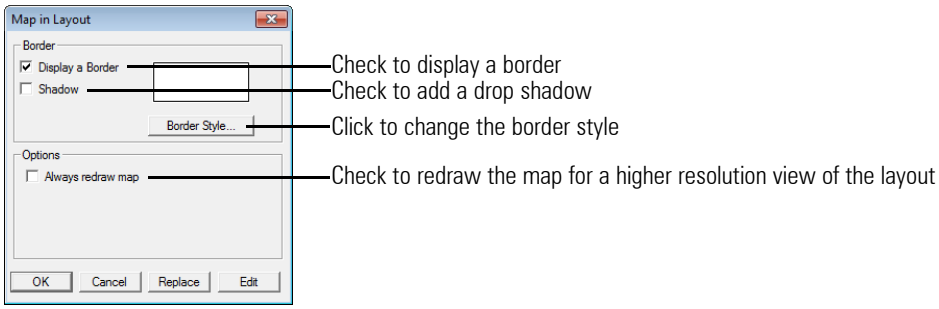
Enhancing Your Layout

There are several ways you can make your layout more attractive. You can add borders to your maps, figures, and dataviews, and add shadows to those borders. You can also change the font styles of a dataview, and you can change the font style of, edit, and add frames to freehand text.

Normally when a map is added to a layout, a snapshot of the map is displayed on the layout. The advantage to this is that you do not have to wait for the map to redraw every time you change the layout scale. You can, however, choose to have the map redraw every time you change the layout scale if you require a more precise view of the layout.

▶ To Add Borders and Shadows to Maps, Figures, and Dataviews

1. Right-click on the map, figure, or dataview, and choose ***Properties***. Maptitude displays the appropriate dialog box for the item you are enhancing.
2. Make changes as follows:

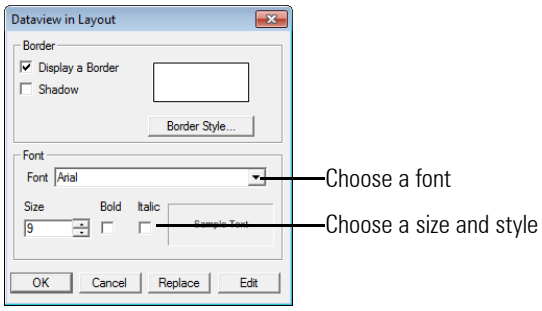


3. Click **OK**.

Maptitude displays the item with the new settings.

▶ To Change the Font Styles in a Dataview

1. Right-click and choose ***Properties***. Maptitude displays the Dataview in Layout dialog box.
2. Make changes as follows:



3. Click **OK**.

Maptitude updates the dataview with the new settings.

NOTE: If you resize the dataview with the Pointer tool, the size of text will also change.

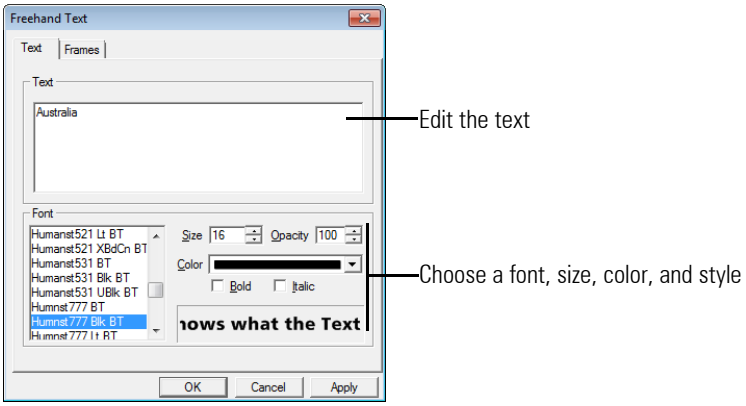
▶ To Enhance Freehand Text

1. Click on the Drawing toolbar to activate the Pointer tool, select the freehand text you want to enhance and double-click on the text. Maptitude displays the Freehand Text dialog box.

   — OR —

   Right-click on the freehand text and choose ***Properties***. Maptitude displays the Freehand Text dialog box.

2. Click on the Text tab to display the Text page and make changes as follows:



3. Click on the Frames tab to display the Frames page and make changes as follows:

To do this...	Do this...
Add or edit a frame	Click Frames and adjust the frame settings to set the shape, style, and color. Check the **Shadow** box to add a drop shadow to a rectangular frame.
Add or edit a shield	Click Shields and choose a shield style.
Remove a shield or frame	Click No Frames.

4. Click **OK**.

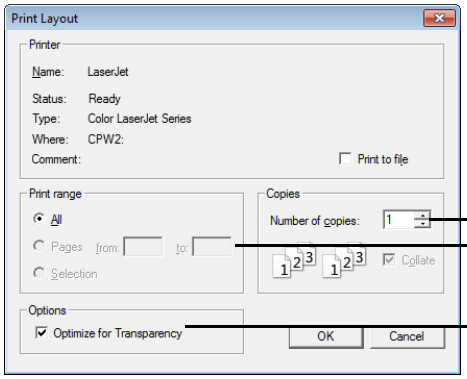
Maptitude draws your freehand text with the new settings.

Printing Layouts

You can print an entire layout or any subset of the pages in a layout. Maptitude automatically selects the correct printer, paper size, and orientation based on the layout settings.

▶ To Print a Layout

1. Choose ***File-Print*** or click on the Standard toolbar to display the Print Layout dialog box.
2. Make choices as follows:



Choose the number of copies

If the layout contains multiple pages, choose the pages to print

Check to print through a high resolution bitmap to best handle effects such as opacity, halos, and shadows, or remove the check to print directly to the printer

3. Click **OK**.

Maptitude prints your layout. You can interrupt printing of the layout at any time by clicking the Cancel button.

Try It Yourself: Creating a Layout, Part 2

1. If you have not already done Part 1 of this tutorial, go back now and do it.
2. Choose ***File-Open*** or click on the Standard toolbar, then open the layout file **My New Layout.lay** that you saved in Part 1.
3. Click on the Drawing toolbar to activate the Pointer tool.
4. Right-click on the map and choose ***Properties*** from the menu to display the Map in Layout dialog box.
5. Check the **Shadow** box and click **OK**. Maptitude adds a drop shadow to the map.
6. Right-click on the dataview and choose ***Properties*** from the menu to display the Dataview in Layout dialog box.
7. Change the font size to **11**, remove the check from the **Bold** box, and click **OK**. Maptitude updates the font settings to the dataview. The dataview is still selected.
8. Click on the Standard toolbar. Maptitude centers the dataview on the page.
9. Choose ***File-Print*** or click on the Standard toolbar and click **OK**. Maptitude prints the layout.
10. Choose ***File-Close*** and click **No** to close the layout without saving any changes.

Saving and Opening Layouts

You save a layout in a layout file. When you save a layout, Maptitude automatically saves all of the maps, figures, and dataviews that are part of the layout. When you open the layout again later, Maptitude restores all the maps, figures, and dataviews to their original appearance.

When you close a layout or exit the program, Maptitude alerts you if the layout has changed since you opened it and asks if you want to save it in its most current form.

▶ To Save a Layout

1. Choose ***File-Save***, click  on the Standard toolbar, or right-click anywhere on a layout except on an item and choose ***Save***.
2. If you are saving the layout for the first time, Maptitude displays the Save As dialog box.
3. Type a file name for the layout file.
4. Click **Save**.

Maptitude saves the layout to a file on disk. Maptitude layout files always have the extension .LAY.

▶ To Save a Layout with a New Name or as a Different File Type

1. Choose ***File-Save As***, or right-click anywhere on a layout except on an item and choose ***Save As*** to display the Save As dialog box.
2. Choose a file type from the Files of Type drop-down list:

Choose...	To save...
Layout File	All of the layout settings in a layout (.LAY) file
Windows Bitmap	A graphic of the map in a .BMP file; click Options to choose a resolution other than that of the map window
Enhanced Metafile	A graphic of the layout in a .EMF file, which will be drawn at the resolution of the display or output device
JPEG Compressed Image	A graphic of the map in a .JPG file; click Options to choose a resolution other than that of the map window or to specify the image quality, where 100 means no compression (the best quality) and lower numbers mean better compression (smaller file size) at the expense of quality
GIF Image	A graphic of the map in a .GIF file, which is limited to 256 colors; click Options to choose a resolution other than that of the map window
TIFF Image	A graphic of the map in a .TIF file; click Options to choose a resolution other than that of the map window
Portable Network Graphics	A graphic of the map in a .PNG file; click Options to choose a resolution other than that of the map window

3. Type a new name for the layout file.
4. Click **Save**.

Maptitude saves the layout into a file of the chosen type.

TIP: You can quickly open recently used layouts by choosing ***File-Recent Files*** and choosing the layout from the submenu.

▶ To Open a Saved Layout

1. Choose ***File-Open*** or click on the Standard toolbar to display the File Open dialog box.
2. Choose **Map, Dataview, Figure, Layout** as the file type.
3. Choose a layout file from the list.
4. Click **Open**.

Maptitude opens the file and displays the layout.

Creating Automated Layouts

You can print layouts focused on individual features within an area layer, such as states or sales territories, with the ***Tools-Reports-Automated Layouts for Areas*** command. You can choose which areas to print, whether to show adjacent areas, and other options in your automated layouts.

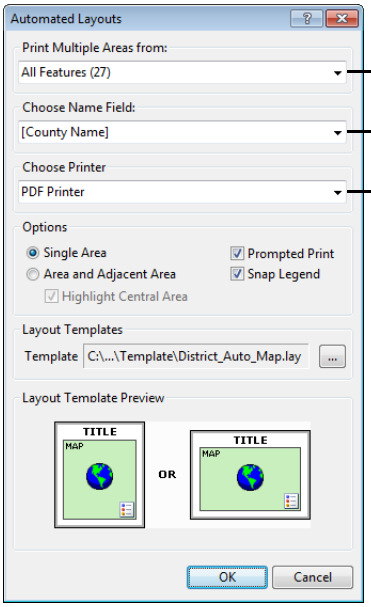
The following templates are stored in the TEMPLATE folder within the program folder:

Template	Description
DISTRICT_AUTO_MAP.LAY	Automatically displays the map and legend in portrait or landscape orientation
DISTRICT_LANDSCAPE_MAP.LAY	Displays the map and legend in landscape orientation
DISTRICT_PORTRAIT_MAP.LAY	Displays the map and legend in portrait orientation

When you choose a template, Maptitude displays a preview of the layout template in the dialog box.

▶ To Create Automated Layouts

1. Choose an area layer from the drop-down list on the toolbar, and if necessary, select the areas for which you want to print reports.
2. Choose ***Tools-Reports-Automated Layouts for Areas*** to display the Automated Layouts dialog box and make choices as follows:



Choose whether to create reports for All Records or a selection set
If the layout contains multiple pages, choose the pages to print

Choose a field to use for the printed title

Choose a printer

3. Choose additional options as follows:

Option	What it does
Single Area	Choose this to show just the area in each layout
Area and Adjacent Area	Choose to show the area and its immediate neighbors in each layout; Check the Highlight Central Area box to show the adjacent areas in a different style
Prompted Print	Check to preview the layouts before printing and to be given a choice as to whether or not to print each individual layout
Snap Legend	Check to locate the legend based on its map location or uncheck to locate the legend based on the template

4. The default template will automatically choose whether to use landscape or portrait for each area that is printed. You have the option to use a portrait-only or landscape-only template for all of the areas that are printed. To use a different template, click ..., choose a layout template, and click Open.

5. Click **OK**. Maptitude displays a progress bar, and prepares the first layout and displays it in a layout window. If you chose the Prompted Print option, Maptitude displays a Confirm dialog box. Click **Yes** to print the layout, or **No** to continue without printing the layout.

6. Maptitude displays the Print Layout dialog box. Choose the number of copies to print and, if your map uses halos, shadows, or transparency in it, check the Optimize for Transparency box.

7. Click **OK**.

   If you did not choose the Prompted Print option, Maptitude prints the first layout and continues to print layouts for every area you chose. If you did choose the Prompted Print option, Maptitude prints the layout, prepares and displays the layout for the next area, and displays a Confirm dialog box where you can again choose whether or not to print the next layout.

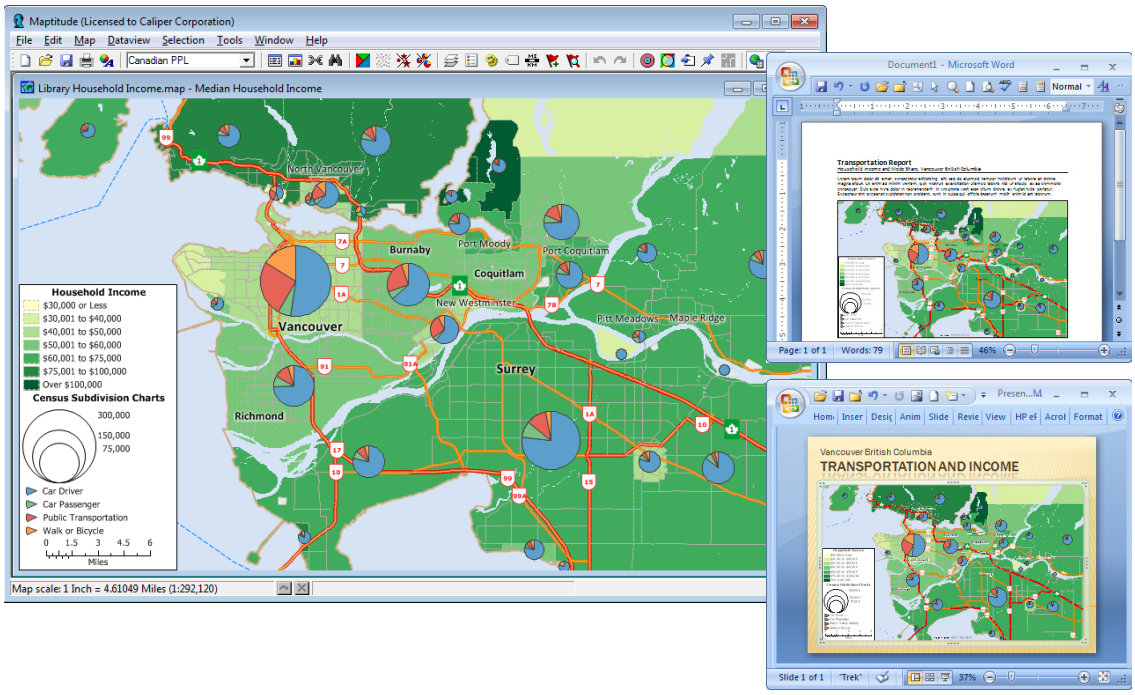
Try It Yourself: Creating Automated Layouts

1. Choose ***File-Open*** or click on the Standard toolbar, then open the map **rhodeis.map** in the Tutorial folder. You are going to preview automated layouts of counties based on this map.
2. Choose ***Tools-Reports-Automated Layouts for Areas*** to display the Automated Layouts dialog box.
3. Choose the **Single Area** option and make sure the **Prompted Print** box is checked.
4. Click **OK**. Maptitude displays a preview of a map for the first county.
5. Click **No** in the Confirm dialog box. Maptitude skips printing the layout of the first county and displays a preview of a map for the next county. Continue to click **No** in the Confirm dialog boxes until you have previewed all five county layouts.
6. Choose ***File-Close*** and click **No** to close the map without saving changes.

CHAPTER 16:
Sharing Your Maps

Once you have built your map, figure (including chart, 3-D map, or prism map), or layout, you may want to incorporate it into a presentation or report for others to see. Maptitude makes this easy with Windows features such as Object Linking and Embedding (OLE). You can also save maps and other Maptitude windows in several graphic formats for use with other applications or on the World Wide Web.

In addition, with Maptitude for the Web, you can add interactive maps to your web site. Any maps or analysis that you can do with Maptitude you can deliver to your web site users with Maptitude for the Web. For more information on Maptitude for the Web, visit the Caliper Corporation web site at WWW.CALIPER.COM or call Maptitude Sales at 617-527-4700.



In this chapter:

Saving Maptitude Windows as Graphic Files

Maptitude lets you save any map, dataview, figure, or layout as a graphic file that can be used with other programs.

- Windows bitmap (BMP) files
- GIF files, which are limited to 256 colors
- Joint Photographic Experts Group (JPEG) files
- Windows Enhanced Metafiles (EMF)
- Portable Network Graphics (PNG) files
- Tagged Image File Format (TIFF) files

EMF files are vector files and can be resized and stretched with no change in resolution. This is not true of the other formats. Dataviews cannot be saved as enhanced metafiles.

▶ To Save a Window as a Graphic File

1. Choose ***File-Save As***, or click the right mouse button on the window and choose ***Save As*** to display the Save As dialog box.
2. Choose the format you want from the Save As Type drop-down list:

Choose...	To save...
Windows Bitmap	A graphic of the map in a .BMP file; Click Options if you want to choose a resolution other than that of the map window
Portable Network Graphics	A graphic of the map in a .PNG file; Click Options if you want to choose a resolution other than that of the map window
JPEG Compressed Image	A graphic of the map in a .JPG file; Click Options if you want to choose a resolution other than that of the map window or if you want to choose an image quality, where 100 means no compression and lower numbers better compression (smaller file size) at the expense of quality
GIF Image	A graphic of the map in a .GIF file, which is limited to 256 colors; click Options to choose a resolution other than that of the map window
TIFF Image	A graphic of the map in a .TIF file; click Options to choose a resolution other than that of the map window
Enhanced Metafile	A graphic of the map in a .EMF file, which will be drawn at the resolution of the display or output device

3. Type the file name and click **Save**.

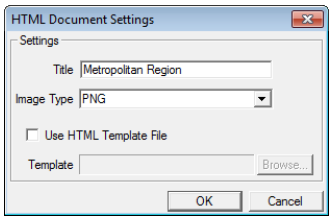
Maptitude saves the window as a graphics file in the chosen format.

Saving Maptitude Maps in HTML Files

Maptitude lets you save a map as an HTML file with an associated JPEG file. When you save a map as an HTML file you have the option of using a template HTML file. When you use a template, all instances of the text "<!--MAP_IMAGE-->" in your template will be replaced with the file name of the JPEG image file, and all instances of the text "<!--MAP_TITLE-->" will be replaced with a title that you specify.

▶ To Save a Map in an HTML File

1. Choose ***File-Save As***, or click the right mouse button on the map and choose ***Save As*** to display the Save As dialog box.
2. Choose **HTML Document** from the Files of Type drop-down list.
3. Type the file name and click **Save**. Maptitude displays the HTML Document Settings dialog box.



4. Type a title for the map in the Title box.
5. To use a template for the HTML output, check the **Use HTML Template File** box and click **Browse** to display the Choose HTML Template File dialog box. Browse for the template and click **Open** to return to the HTML Document Settings dialog box.
6. Click **OK**.

Maptitude saves the HTML file and a JPEG image of the map.

Saving Maptitude Maps in Animated GIF Files

Maptitude lets you save a series of map, prism map, chart, or dataview images as an animated GIF file using the Animated GIF Toolbox. Creating an animated GIF is an effective way for showing your map data for a time series. For example, create a thematic map showing your 1st quarter sales and add that as the first image in your animated GIF, then add successive images for your 2nd, 3rd, and 4th quarter sales. You can then view the resulting GIF to see the four images in series.

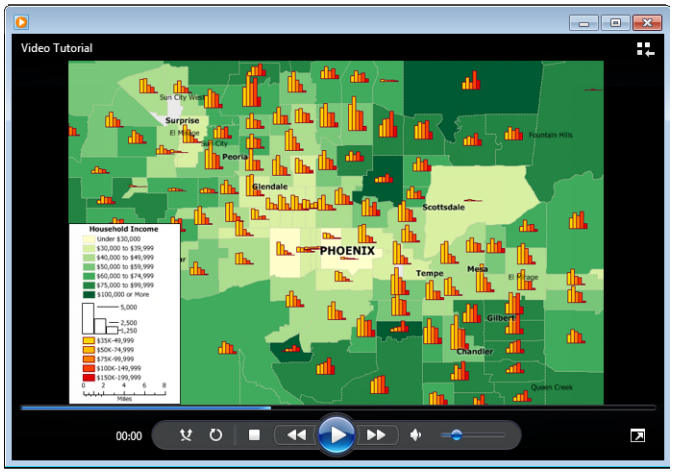
TIP: Animated GIFs often look best when the images are all the same size. Use the ***Windows-Cascade*** command or maximize separate windows to make different windows the same size.

▶ To Save Maps in an Animated GIF File

1. Create a map as you want it to appear at the start of your animated GIF.
2. Choose ***File-Share-Animated GIF*** to display the Animated GIF Toolbox.
3. Click  to add the map as the first frame in the GIF.
4. Make changes to your map and click  again to add an additional frame. Continue to add frames in this manner until you are done.
5. Choose how long to display each frame in hundredths of a second using the Delay spinner.
6. Click  to display the Save As dialog box.
7. Choose a folder in which to save the GIF, enter a file name, and click Save.

Maptitude saves the animated GIF file in the folder you specified.

Creating Map Videos

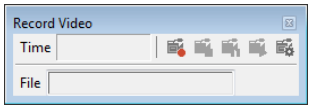


The Record Video toolbar lets you create video files of a map window. When you record video, Maptitude creates a video file of all changes that you make to the active map window. There are several guidelines you should consider when recording video of a map window:

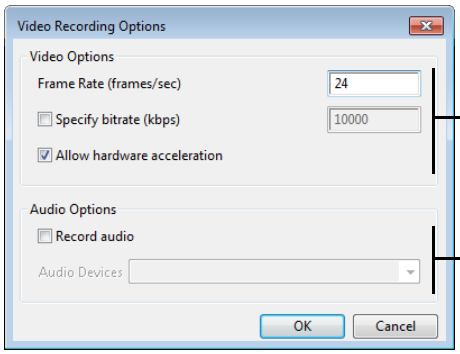
- Everything that is visible in the map window area is recorded. Therefore, you may want to move the Record Video toolbar off of the map so that it is not included in your video. Similarly, you may want to attach the map legend to the map to ensure that it is always visible in its entirety.
- Depending on your computer and graphics processing speeds, video files that are larger than 1024 pixels in width or 728 pixels in height may slow down the software.

▶ To Create a Video of a Map Window

1. Set up your map as you would like it to appear at the beginning of your video.
2. Choose ***File-Share-Record Video*** to display the Record Video toolbar.



3. To record audio or to modify the default frame rate or bitrate, click  to display the Video Recording Options dialog box and make any changes as follows:



Click OK when you are finished.

4. Click  to display the Save As dialog box.
5. Choose a video format from the Save as Type drop-down list, choose a folder and file name, and click Save. Maptitude starts recording the video.
6. Make the changes to the map that you want to record. Click  if you need to pause recording and click  again to resume recording.

7. Click when you are done to stop recording the video and enable the Play button.
8. Click to play the video. Maptitude launches your default video player application and plays the video.
9. When you are done, click the Close button in the upper right corner of the toolbar or choose ***File-Share-Record Video*** again to close the toolbar.

Linking & Embedding Maptitude Maps in Other Programs

Maptitude helps you place maps where they will do the most good using Windows Object Linking and Embedding, or OLE. OLE lets you place a Maptitude map directly into your favorite spreadsheet, word processing, graphics or other program, and modify the map to be up-to-date as your data changes.

OLE provides two methods of placing a Maptitude map into another application: **linking** and **embedding**. When you embed or link a map to a spreadsheet or document file, the other application knows that Maptitude was used to create the map. Therefore, when you want to edit or update the map, the other application knows how to start Maptitude and let you make the changes you want. The file into which you place the map is called the **target file**; the application that creates the target file is call the **target application**.

When you embed a map in a target file, a copy of the map is stored in your spreadsheet or other document. Once the map has been embedded, you can only open the map from the target application. When you link a map to a target file, only the name and path of map file is stored in the target file. You can open a linked map using either Maptitude or the target application. When you create a link, you can use an option called automatic update to make sure that the linked map is updated as needed.

In either case, the target file initially contains a picture of the map as it looked when you inserted it, and you can double-click on the map in the target application to edit, update, or modify the map. You cannot convert a linked map to an embedded map or vice versa.

Embedding a Map

There are four ways to embed a map in a spreadsheet, word processing, or other OLE application:

- Copy and paste using the Windows clipboard
- Insert a newly created map from within the target application
- Insert a copy of an existing map file from within the target application
- Use the OLE Drag and Drop tool

The instructions for embedding that follow may vary slightly for different target applications.

▶ To Copy a Map to the Clipboard by Embedding

1. Open the Maptitude map you want to place.
2. Click on the map window to make it active.

3. Choose ***Edit-Copy Map*** or click the right mouse button on the map window and choose ***Copy***.

Maptitude copies the map to the Clipboard. You can also use the ***Edit-Copy Map*** command to copy and paste figures and layouts into other programs.

▶ To Paste a Map from the Clipboard into Another Application by Embedding

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Edit-Paste Special***. (The command name may vary from application to application.)
3. Choose the Maptitude Map object format.
4. Choose Paste from the radio list.
5. Click OK to embed the map at the current cursor location.

—OR —

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Edit-Paste***.

▶ To Embed a New Map from within the Target Application

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Insert-Object***. (The command name may vary from application to application.)
3. If you have the option, indicate that you want to insert a new object.
4. Choose Maptitude Map from the list of object types, and click OK.
5. Maptitude starts if it is not already running and displays a new, empty map window.
6. Use Maptitude to add layers, adjust the styles and scale, and make any other changes until the map is finished.
7. From Maptitude, choose ***File-Update*** to embed the map in the target file. The map will be grayed out in the target application, because it is still open in Maptitude.
8. From Maptitude, choose ***File-Close*** or ***File-Exit***. The target application shows the map in its normal colors.

▶ To Embed an Existing Map from within the Target Application (OLE 2.0 Applications Only)

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Insert-Object***. (The command name may vary from application to application.)
3. Indicate that you want to use an existing file.
4. Choose a Maptitude map file and click OK.

A copy of the selected map is embedded into your target file at the cursor location. This operation may take some time, depending on the complexity of the map.

▶ To Embed a Map with OLE Drag and Drop (OLE 2.0 Applications Only)

1. Use Maptitude to create the map you want to embed.
2. Open the target application and file.
3. Adjust the windows of the two applications so they are side-by-side ("tiled") on your screen.
4. Click  to activate the OLE Drag and Drop tool.
5. Hold the cursor over the map and press and hold the left mouse button. The cursor changes to an hourglass while Maptitude captures an image of the map. This step may take some time, depending on the complexity of the map. You can keep track of the progress by watching the status bar. When the map is ready to be dropped, the cursor changes.
6. Drag the cursor to the desired location in the target application and release the mouse button.

Maptitude embeds a copy of the map into the target file at the specified location.

▶ To Edit an Embedded Map

Once you embed a map into a target file, you can easily edit the map and update the target file.

1. Open the target application and file. The embedded map should be displayed on the screen.
2. Double-click on the map.
3. Maptitude starts if it is not already running, and displays the embedded map in a map window.
4. Edit the map as necessary.
5. Choose ***File-Update*** to embed the updated map in the target file. The map will be grayed out in the target application, because it is still open in Maptitude.
6. Choose ***File-Close*** or ***File-Exit***.

The target application shows the map in its normal colors.

▶ To Delete an Embedded Map

You can delete an embedded map the same way you delete anything else in your target file.

1. Open the target application and file. The embedded map should be displayed on the screen.
2. Click on the map to select it.
3. Press the Delete key to delete the map.

Linking a Map

There are two ways to link a map to a spreadsheet, word processing, or other OLE application:

- Copy and paste using the Windows clipboard
- Insert a map file from within the target application

The instructions for linking that follow may vary slightly for different target applications.

▶ To Copy a Map to the Clipboard by Linking

1. Open the Maptitude map you want to place.
2. Click on the map window to make it active.
3. Choose ***Edit-Copy Map*** or click the right mouse button on the map window and choose ***Copy***.

Maptitude copies the map to the Clipboard.

▶ To Paste a Map from the Clipboard into Another Application by Linking

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Edit-Paste Special***. (The command name may vary from application to application.)
3. Choose the Maptitude Map Object format.
4. Choose Paste Link from the radio list.
5. Click OK to link the map at the current cursor location.

▶ To Link to an Existing Map from within the Target Application (OLE 2.0 Applications Only)

1. Start the target application, open the file into which you want to place the map, and place the cursor at the location where you want the map to appear.
2. Choose ***Insert-Object***. (The command name may vary from application to application.)
3. Indicate that you want to use an existing file.
4. Check the Link box in the Insert Object dialog box.
5. Choose a Maptitude map file from the standard File Open dialog box, and click OK.

The selected map is linked to your target file at the cursor location. This operation may take some time, depending on the complexity of the map.

▶ To Edit a Linked Map from within the Target Application

1. Open the target application and file. The linked map should be displayed on the screen.
2. Double-click on the map.
3. Maptitude starts if it is not already running, and displays the linked map in a map window.
4. Edit the map as necessary.
5. Choose ***File-Save*** to save the map to its file and automatically update the target file.

▶ To Edit a Linked Map Using Maptitude

1. Start Maptitude if it is not already running.
2. Open the map file.
3. Edit the map as necessary.
4. Choose ***File-Save*** to save the edited map.

The next time you open the target file using the target application, the changes you have made to the map will appear automatically (if you enabled Automatic Update) or when you choose the Update Link command in the target application.

▶ To Delete a Linked Map

You can delete a linked map the same way you delete anything else in your target file.

1. Open the target application and file. The linked map should be displayed on the screen.
2. Click on the map to select it.
3. Press the Delete key to delete the map.

Changing a Link

Once you create a link between a target file and a map, the link can be edited or modified in several ways. Here are some of the ways you can edit a link:

- Change the link update from manual to automatic or vice versa
- Change the name of the map file that is linked to the target file
- Force the link to be updated
- Lock out all updates to the link until further notice

▶ To Edit a Link

1. Start the target application and open the file in which the linked map appears.
2. Choose ***Edit-Links*** from the target application. (The command name may vary from application to application.)
3. Make the required changes, as documented by the target application.
4. Click OK.

The link is edited as specified.

Note that many target applications contain a Break the Link option in the Edit Links dialog box. If you choose this option, the link is broken and the linked map is converted to a Windows metafile graphic.

Sending Maptitude Files via E-Mail

You can e-mail maps created in Maptitude provided that the recipient of your map has access to the same data files and to Maptitude.

▶ To Send a Maptitude Map File via E-Mail

1. Open the map you want to send by e-mail.
2. Choose ***File-Share-Send***. Maptitude launches your e-mail program and creates a new message to which the map is attached.
3. Enter a recipient, subject, and any message, and send your e-mail.

The Maptitude map is mailed with the rest of your message.

Linking Documents, Files, & Web Sites to Map Features

In addition to sharing your maps with other applications as discussed earlier in this chapter, you can also link all types of information to features on a map. By placing the correct information in a field in a table associated with a geographic file, you can link map features to documents, programs, or sites on the World Wide Web. There can be any number of these **link fields**.

The link field must have a name that includes the word "File" (for example, Photo File, Web Site File, Data File, etc.). You can rename a field in a dataview using the ***Dataview-Fields-Properties*** command, or in the table itself, using the ***Dataview-Table-Modify*** command. If your layer does not have a field in which to store the document or program file name, use the ***Dataview-Table-Modify*** command to add a new character field. Note that the field must be wide enough to hold the full path and file name. For more information see *Chapter 7: Working with Tables, Databases, & Charts*.

When you access a link to another Windows application file, Maptitude launches the appropriate program which opens the document or website. When you access a link to another Maptitude file (map, dataview, figure, or layout), Maptitude opens the file and displays it in another window. When you link to Word or Excel documents, you can link to a specific position in a file by adding a vertical bar and the name of a bookmark, cell, or range. For example:

To link to...	Enter this in the link field	Example
A website	The URL	http://www.caliper.com
A picture	The full path and file name	C:\Users\Me\Pictures\image.jpg
Another Maptitude map	The full path and file name	C:\Users\Me\Documents\Caliper\Maptitude\detail.map
A Word file	The full path and file name, and optionally a bookmark	C:\Office\My Report.doc|Territory1
An Excel file	The full path and file name, and optionally a cell or range	C:\Office\My Data.xlsx|database

Maptitude lets you launch any Windows application, with optional arguments to be passed to the application. For example, you could run an application that polls a traffic control for its status and displays the data in a message. Put the full path and file name in the field, including the extension, such as .EXE. If you are passing arguments, put them after a vertical bar. For example, "C:\PROGRAM FILES\MYPROGS\POLL.EXE|-I643" might run the Poll application and pass the identifier 643 as an argument.

Once you create a link, you can access it in two ways:

- By clicking on the feature with the Info Link tool
- By clicking on the feature with the Info tool and then clicking the ➡ symbol in the Info window.

▶ To Link a Document, Program, or Web Site to a Map Feature

1. If necessary, use the ***Dataview-Table-Modify*** command to create a new field that includes the word "File." Make sure that the field is wide enough to hold the full path and file name.
2. Find the feature that you want to link, either by scrolling through a dataview, using the ***Edit-Find*** command, or by using the Info tool.

3. Type the link information in the link field as outlined below:

To do this...	Do this...
Link a picture, sound, or video file to the feature	Type the path and file name of the picture, sound, or video file.
Link an application document to the feature	Type the path and file name of the document (and any Word bookmark or Excel cell or range after a vertical bar).
Link an application to a feature	Type the path and file name of the application, and any arguments after a vertical bar.
Link a URL to the feature	Type the web page URL.

Maptitude stores the link.

▶ To Access Links with the Info Link Tool

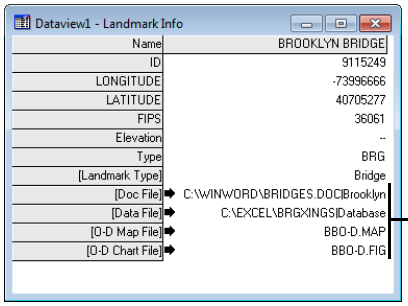
1. Click  to activate the Info Link tool.
2. Click on a map feature. If the feature has more than one link field, Maptitude displays a tool-box that lists all of the links. Click on a link.

Maptitude determines the type of link, and either launches the appropriate application (if it is not already running) and displays the document or web page, or runs the specified application (with any optional arguments).

You can continue to use the Info Link tool to display links for any number of map features.

▶ To Access Links with the Info Tool

1. Click  to activate the Info tool.
2. Click on a map feature. Maptitude displays data for the feature in the Info window.



3. Use the scroll bars to locate the link fields.
4. Click on a ➡ symbol next to a link field.

Maptitude determines the type of link, and either launches the appropriate application (if it is not already running) and displays the document or web page, or runs the specified application (with any optional arguments).

You can continue to use the Info tool to display links for any number of map features.

APPENDIX A:
Formulas, Conditions, and Functions

This appendix defines Maptitude formulas, conditions, and functions, describes how Maptitude interprets the components of a formula or condition, and defines functions available in Maptitude that you can use in formulas and conditions.

Basic Definitions

Formula

A formula is an expression that returns some value. It tells Maptitude how to manipulate data in order to calculate a desired result. You will most often use formulas when you create formula fields or fill cells in a dataview with a formula. Here are some examples:

Formula	Description
Population / Area	Divide Population field by Area field to get the population density
City + " " + State	Combine the City and State fields into one string, separated by a space
Round([Avg Cost],2)	Use the Round() function to round the Avg Cost field to two decimal places

For more information, see "Doing Calculations with Data" on page 194.

Condition

A condition is similar to a formula, but it is in the form of a logical test that returns either the number one ("True") or the number zero ("False"). You will most often use conditions when creating selection sets or as the basis for making decisions in formulas. Conditions use logical operators to perform the logical test. Here are some examples:

Condition	Description
Population > 50000	True if the value in the Population field is above 50,000, False otherwise
City = "Boston" and State = "MA"	True only if both the value in the City field is "Boston" and the value in the State field is "MA"; False if either or both are a different value
HHI between 10000 and 25000	True if the value in the HHI field is in the range from 10,000 to 25,000, False otherwise

For more information, see "Selecting Features Based on Attributes" on page 244.

Function

A function is a string, numerical, or conversion operation pre-encoded in Maptitude. Functions can be used in formulas and conditions. Here are some examples:

Function	Description
Upper(City)	Returns strings in the City field with all upper case letters
Max(LastYear,ThisYear)	Returns the larger of the numbers in the LastYear and ThisYear fields
Format(Sales,"$#,##0.00")	Converts numbers in the Sales field to strings with a leading dollar sign, commas separating thousands groups, at least one digit to the left of the decimal place and at least two digits to the right

See the "Functions" on page 515 for a list of the available functions and for more examples.

Building a Formula or Condition

You build a formula or condition using the following three basic elements:

- **Operands** are the numbers or strings that the formula or condition operates upon
- **Operators** are the symbols that tell Maptitude what to do with operands in a formula or condition
- **Separators** are the signposts that tell Maptitude how to combine various operators and operands into a formula or condition

Operands

An operand may be a number, a string, or a field name, or it may be the result of another formula, a condition, or a function. Here are some examples:

Operand	Description
7	An integer constant
1.5	A real number constant, shown with a decimal point
3.776E+12	A real number constant, shown with exponential notation
"highway"	A string constant
'post32'	Another string constant – you can use single or double quotes around strings, as long as they match
Population	The value of the Population field
State.Income	The value of the Income field in the State dataview
Value(Address)	The numeric value of the house number at the beginning of the character (string) field Address, or zero if the field does not start with one or more digits
HHI between 10000 and 25000	True (1) if the number in the HHI field is in the range from 10,000 to 25,000, False (0) otherwise

Conditions can be treated either as having a logical value (True or False) or has having a numerical value (1 or 0) when using conditions with other operands.

Operators

The operators in Maptitude are in four groups: mathematical, relational, logical, and string.

- **Arithmetic** operators are for doing addition, subtraction, multiplication and division, plus identifying values as positive or negative. The result of an operator is a numerical value, either an integer value if the result is a whole number or a real value if the result is a decimal number.
- **Relational** operators are for comparing numerical or string values. Most work with numerical and string values, while two are for strings only. The result of an operator is a logical value.
- **Logical** operators are used with operands that have a value of True or False. The result of an operator is a logical value.
- The **String** operator is used to combine two strings into one. The result of the operator is a string value.

Here are the operators:

Arithmetic operators	
+	addition, or identification of a value as positive
–	subtraction, or identification of a value as negative
*	multiplied by
/	divided by

Logical operators	
and (or &)	both parts of the expression must be true
or (or |)	at least one part of the expression must be true
not (or !)	not (changes True expression to False or vice versa)

Relational operators	
= (or eq)	equals
<> (or != or ne)	is not equal to
< (or lt)	is less than
> (or gt)	is greater than
<= (or le)	is less than or equal to
>= (or ge)	is greater than or equal to
between...and...	is greater than or equal to one expression and less than or equal to the other
like (or ?)	string equals (with wildcards)
contains	string contains the character sequence

String operator	
+	string concatenation

Separators

Separators define the limits of a part of a condition or formula. Separators used in Maptitude include:

- **Square brackets []** – A field name can include spaces or special characters. To make clear the limits of the field name, any field name that includes one or more spaces or other special characters must be placed in square brackets. You can also place a single-word field name in square brackets, although it is not necessary. If a field name starts with a digit or is the word "do," "if," "return," "not," "null," "runmacro," or "rundbox," it also will be placed in square brackets.
- **Parentheses ()** – You can use parentheses in complex formulas to tell Maptitude the order in which you want the formula evaluated. See "How Maptitude Calculates a Formula" on page 514 for more details.

Combining Formulas and Conditions

You can use conditional expressions in formula. Since True and False are equivalent to the numbers 1 and 0, you can also do mathematical calculations using the result of a condition. Here are some examples:

Formula with Condition	Description
(if Population > 50000 then "Big" else "Small")	Returns the string "Big" if the value in the Population field is above 50,000, otherwise returns the string "Small."
(City = 'Boston') * 25	Returns the number 25 if the value in the City field is "Boston," otherwise returns 0
(if HHI between 1000 and 2500 then H1 else H2)	If the value in the HHI field is in the range from 1,000 to 2,500 return the value in the H1 field, otherwise return the value in the H2 field

You can use formulas in conditions, to calculate a value needed for the logical test. Here are some examples:

Condition with Formula	Description
Population / Area > 1000	True if the population density is over 1000 people/areal unit, False otherwise
A.City + ' ' + A.State = B.[City & State]	True if the combined City and State fields in table A contain the same string as the [City & State] field in table B, False otherwise
Round([Avg Cost],2) le 1.25	True if the rounded [Avg Cost] field is less than or equal to 1.25, False otherwise

How Maptitude Calculates a Formula

Maptitude performs the operations in a formula according to a set order. The order is determined by the **precedence number** of each operation. The lower the precedence number, the earlier in the process Maptitude performs that operation. Maptitude performs operations with the same precedence number sequentially from left to right in the formula. The following table shows the precedence number for all Maptitude operations.

Precedence Number	Operation	Operators
1	Parentheses	( )
2	Identification of value as negative or positive	- +
2	Multiplication and division	* /
3	Addition and subtraction	+ -
3	String concatenation	+
4	Equals relation	= eq
4	Not-equal-to relation	<> ne
4	Less-than relation	< lt
4	Greater-than relation	> gt
4	Less-than-or-equal-to relation	<= le
4	Greater-than-or-equal-to relation	>= ge
4	Range relation	between...and...
5	Logical NOT	not !
6	Logical AND	and &
7	Logical OR	or |
8	Conditional expression	if...then...else...

You can use parentheses to change the order in which operations are performed. Everything inside the parentheses is evaluated before evaluating anything outside the parentheses. Here are some examples:

Example	Description
Age16 + Age17 / Population	This looks simple, but because the division operator (/) gets precedence over the addition operator (+) this formula first calculates the number of persons aged 17 divided by the total population, then adds the number of persons aged 16. This is probably not very useful.
(Age16 + Age17) / Population	First calculates the sum of persons aged 16 and 17 then divides that sum by the total population. The parentheses around the age fields force the sum to be calculated first. This gives the proportion of 16- and 17-year-olds to the total population, which is very different from the first example, even though they look similar.

Functions

The following functions are available in Maptitude. Note that function names are **not** case sensitive. The functions are grouped into functions for strings, functions for numbers, and functions for converting between strings and numbers. This section also describes conditional expressions.

For clarity, most of the examples use string or numeric constants as arguments. You can use any value as an argument, including a formula, condition, or function, as long as it is of the correct type.

This is just a subset of the functions that are available when you use the GIS Developer's Kit (GISDK) to create add-ins, custom applications, or map servers. For more information on GISDK, please see the Maptitude Help.

String Functions

Left (string, number)

Description: Returns the leftmost **number** of the characters in **string**.
Arguments: **string** – any string
number – any number up to the number of characters in **string**
Returned value: A string of the **number** leftmost characters of **string**
Examples: Left ("New York City",8) returns "New York"
Left ("the greatest",8) returns "the grea"

Len (string)

Description: Returns the length (number of characters) of **string**.
Arguments: **string** – any string
Returned value: A value equal to the number of characters in **string**
Examples: Len ("New York City") returns 13
Len ("equal ") returns 6

Lower (string)

Description: Converts **string** to all lower case.
Arguments: **string** – any string
Returned value: A string equal to string changed to all lower case
Examples: Lower ("New York City") returns "new york city"
Lower ("PLEASE REDUCE THE") returns "please reduce the"

Lpad (string, length)

Description: Makes string length characters long by adding spaces in front.
Arguments: string – any string
length - the desired length of the string
Returned value: A string that is length characters long
Example: Lpad ("Hello", 10) returns " Hello"

Position (string1, string2)

Description: Finds the location of **string2** in **string1**.
Arguments: **string1** - the string to be searched
string2 - the string to search for
Returned value: A number indicating the character position in **string1** where **string2** was found, or zero if the **string2** is not found in **string1**
Examples: Position ("ABCDEFGHIJK", "CDE") returns 3
Position ("ABCDEFGHIJK", "Maptitude") returns 0

Proper (string)

Description: Converts string to initial caps.
Arguments: string – any string
Returned value: A string equal to string changed to initial caps
Examples: Proper ("NEW YORK CITY") returns "New York City"
Proper ("please reduce the") returns "Please Reduce The"

Right (string, number)

Description: Returns the rightmost number of the characters in string.
Arguments: string – any string
number – any number up to the number of characters in string
Returned value: A string of the number rightmost characters of string
Examples: Right ("annual sales of $12 million",14) returns "of $12 million"
Right ("Boston MA",2) returns "MA"

Rpad (string, length)

Description: Makes string length characters long by adding spaces at the end.
Arguments: string – any string.
length - the desired length of the string
Returned value: A string that is length characters long
Example: Rpad ("Hello", 10) returns "Hello "

Substitute (input, find, replace, n)

Description: Replaces the nth occurrence of the find string with the replace string. If n is omitted, all occurrences are substituted. You must include all three commas.
Arguments: input – any string
find – the string to be replaced
replace – the string to replace with
n – a number indicating which occurrence to substitute
Returned value: Returns the modified string
Examples: Substitute ("input string", "in", "out",1) returns "output string"
Substitute ("input string", "in", "out",) returns "output stroutg"

Substring (string, start, length)

Description: Returns the portion of string starting at the start character and including the following length characters.
Arguments: string – any string
start – a number corresponding to the number of characters from the left end of string where you want to start the substring. Note that start must be smaller than the total number of characters in string
length – a number corresponding to the number of characters of string you want to include in the substring
Returned value: A string, starting with the start character of string, and including length characters
Examples: Substring ("New York City",5,4) returns "York"
Substring ("for a=25",7,2) returns "25"

Trim (string)

Description: Trims leading and trailing spaces from string.
Arguments: string – any string
Returned value: string without leading or trailing spaces
Examples: Trim (" every three digits ") returns "every three digits"
Trim ("equal to ") returns "equal to"

Upper (string)

Description: Converts string to all upper case.
Arguments: string – any string
Returned value: A string equal to string changed to all upper case
Examples: Upper ("New York City") returns "NEW YORK CITY"
Upper ("the 23rd") returns "THE 23RD"

Word (string, n)

Description: Finds the nth word in string.
Arguments: string – any string
n – any number
Returned value: A string consisting of the nth word in string, or an empty string if string is less than n words long
Examples: Word ("New York City", 2) returns "York"
Word ("Maptitude", 3) returns "" (an empty string)

Numeric Functions

Abs (value)

Description: Converts value to an absolute value.
Arguments: value – any number
Returned value: A value equal to the absolute value of value
Examples: Abs (245) returns 245
Abs (-245) returns 245
Abs (-32.75) returns 32.75

Acos (value)

Description: Returns the arccosine of value.
Arguments: Value – any number between -1 and 1
Returned value: A value equal to the angle in radians whose cosine is value
Examples: Acos (0.50) returns 1.05
Acos (-0.50) returns 2.94

Acosh (value)

Description: Returns the hyperbolic arccosine of value.
Arguments: value – any number greater than or equal to 1
Returned value: A value equal to the number whose hyperbolic cosine is value
Examples: Acosh (3) returns 1.76
Acosh (300) returns 3.40

Asin (value)

Description: Returns the arcsine of value.
Arguments: value – any number between -1 and 1
Returned value: A value equal to the angle in radians whose sine is value
Examples: Asin (0.5) returns 0.524
Asin (-0.5) returns -0.524

Asinh (value)

Description: Returns the hyperbolic arcsin of value.
Arguments: value – any number
Returned value: A value equal to the number whose hyperbolic sine is value
Examples: Asinh (-2.5) returns 1.647
Asinh (10) returns 2.998

Atan (value)

Description: Returns the arctangent of value.
Arguments: value – any number
Returned value: A value equal to the angle in radians (from -pi/2 to pi/2) whose tangent is value
Examples: Atan (1.0) returns 0.785
Atan (300) returns 1.567

Atanh (value)

Description: Returns the hyperbolic arctangent of value.
Arguments: value – any number greater than -1 and less than 1
Returned value: A value equal to the number whose hyperbolic tangent is value
Examples: Atanh (0.5) returns 0.549
Atanh (-0.5) returns -0.549

Atan2 (y_num, x_num)

Description: Returns the angle between the x-axis and the coordinates x_num, y_num.
Arguments: x_num – any positive or negative number
y_num – any positive or negative number
Returned value: A value equal to the angle, in radians, between the x-axis and the coordinates x_num, y_num. The returned value lies between -pi and pi, excluding -pi. If both x_num and y_num = 0, atan2 returns a Divide-by-Zero error
Examples: Atan2 (25,10) returns 0.381
Atan2 (0,25) returns 1.571

Ceil (value)

Description: Returns the next larger integer after value.
Arguments: value – any number
Returned value: A value equal to the next larger integer after value
Examples: Ceil (3.72) returns 4
Ceil (-2.75) returns -2

Cos (value)

Description: Returns the cosine of the angle value.
Arguments: value – any angle, expressed in radians
Returned value: A number between 0 and 1
Examples: Cos (0.7) returns 0.765
Cos (1.2) returns 0.362

Cosh (value)

Description: Returns the hyperbolic cosine of value.
Arguments: value – any angle, expressed in radians
Returned value: A number, in radians, representing the hyperbolic cosine of value
Examples: Cosh (1.5) returns 2.35
Cosh (-10) returns 11013.23

Exp (value)
Description: Returns the value of the constant e raised to the power value.
Argument: value – any number
Returned value: The value of the constant e raised to the power value
Examples: Exp (2) returns 7.389
Exp (-1.9) returns 0.150

Factorial (value)

Description: Returns the factorial of value.
Arguments: value – any integer
Returned value The factorial (n!) of value
Examples: Factorial (6) returns 720
Factorial (25) returns 1.55 x 1025

Floor (value)

Description: Returns the next smaller integer before value.
Arguments: value – any number
Returned value: A value equal to the next smaller integer before value
Examples: Floor (3.72) returns 3
Floor (-2.75) returns -3

Log (value)

Description: Returns the value of the natural logarithm of value.
Argument: value – any number
Returned value: The value of the natural logarithm (base e) of value
Examples: Log (2) returns 0.693
Log (4.87) returns 1.583
Log (1002.38) returns 6.910

Log10 (value)

Description: Returns the value of the common logarithm of value.
Argument: value – any number
Returned value: The value of the common logarithm (base 10) of value
Examples: Log10 (2) returns 0.301
Log10 (4.87) returns 0.688
Log10 (1002.38) returns 3.001

Max (x, y)

Description: Returns the larger of x and y.
Arguments: x – any number
y – any number
Returned value: A value that is the larger of x and y
Examples: Max (243.7, 443.2) returns 443.2
Max (24, -42) returns 24

Min (x, y)

Description: Returns the smaller of x and y.
Arguments: x – any number
y – any number
Returned value: A value that is the smaller of x and y
Examples: Min (23, 25) returns 23
Min (243.7, 443.2) returns 243.7
Min (24, -42) returns -42

Mod (x, y)

Description: Returns the remainder (modulus) of x/y.
Arguments: x – any number
y – any number
Returned value: A value that is the remainder of the calculation x/y
Examples: Mod (23,7) returns 2
Mod (256,9) returns 4
Mod (-442.2,5) returns -2.2

Pow (x, y)

Description: Returns the value of x to the y power.
Arguments: x – any number
y – any number
Returned value: A value that is x to the y power
Examples: Pow (2,3) returns 8
Pow (7.2,2.5) returns 139.10
Pow (3,-2) returns 0.111

RandomNumber ()

Description: Generates a random number between 0.0 and 1.0.
Arguments: none
Returned value: A pseudo-random real number between 0.0 and 1.0
Examples: RandomNumber () returns a different number each time

Round (value, decimals)

Description: Returns value rounded to decimals places.
Arguments: value – any number
decimals – an integer
Returned value: A value equal to value rounded to decimals places
Examples: Round (3.42, 0) returns 3
Round (3.72, 0) returns 4
Round (3.72, 1) returns 3.7
Round (-3.42, 1) returns -3.4

Sign (number)

Description: Returns the sign of a number.
Arguments: number – any number
Returned value: Returns -1 if the number is less than zero, 1 if it is greater than zero, or 0 if it is equal to zero
Examples: Sign(3.4) returns 1
Sign(-18) returns -1
Sign(0) returns 0

Sin (value)

Description: Returns the sine of the angle value.
Arguments: value – any angle, expressed in radians
Returned value: A number between 0 and 1
Examples: Sin (1.0) returns 0.841
Sin (1.5) returns 0.997

Sinh (value)

Description: Returns the hyperbolic sine of the angle value.
Arguments: value – any angle, expressed in radians
Returned value: A number representing the hyperbolic sine of the angle value
Examples: Sinh (3) returns 10.02
Sinh (0.7) returns 0.759

Sqrt (value)

Description: Returns the value of the square root of value.
Arguments: value – any number
Returned value: A value that is the square root of value
Examples: Sqrt (16) returns 4
Sqrt (12) returns 3.464

Tan (value)

Description: Returns the tangent of the angle value.
Arguments: value – any angle, expressed in radians
Returned value: A number representing the tangent of the angle value
Examples: Tan (0.785) returns 0.992
Tan (1.5) returns 14.1

Tanh (value)

Description: Returns the hyperbolic tangent of the angle value.
Arguments: value – any angle, represented in radians
Returned value: A number representing the hyperbolic tangent of the angle value
Examples: Tanh (-2) returns -0.964
Tanh (0.5) returns 0.462
Tanh (4) returns 0.999

Conversion Functions

Char (i)

Description: Changes i to the corresponding character in the ASCII table.
Arguments: i – an integer between 0 and 255
Returned value: A string of one character, whose ASCII value is i.
Examples: Char (32) returns " " (a blank character)
Char (75) returns "K"
Char (107) returns "k"
Char (189) returns "½"

CreateDate (day, month, year)

Description: Changes day, month, and year into a DateTime compound variable.
Arguments: day – day number
month – month number
year – year number
Returned value: A DateTime compound variable with the time properties null.
Example: CreateDate(3,1,2013) returns a DateTime compound variable containing the date 03Jan2013

CreateDateTime (day, month, year, hour, minute, second, millisecond)

Description: Changes day, month, year, hour, minute, second, and millisecond into a DateTime compound variable.
Arguments: day – day number
month – month number
year – year number
hour – hour number in 24-hour format
minute – minute number
second – second number
millisecond – millisecond number
Returned value: A DateTime compound variable.
Example: CreateDateTime(3,1,2013,11,22,19,48) returns a DateTime compound variable containing the date 03Jan2013 and the time 11:22:19.48 AM

CreateTime (hour, minute, second, millisecond)

Description: Changes hour, minute, second, and millisecond into a DateTime compound variable.
Arguments: hour – hour number in 24-hour format
minute – minute number
second – second number
millisecond – millisecond number
Returned value: A DateTime compound variable with the date properties null.
Example: CreateDateTime(11,22,19,48) returns a DateTime compound variable containing the time 11:22:19.48 AM

Format (num, fmt)

Description: Formats num according to fmt into a string.
Arguments: num – any numeric value
fmt – the desired format
Returned string: a string that has:

- at least as many digits to the left of the decimal as there are zeros to the left of the decimal in fmt
- at most as many digits to the left of the decimal as there are zeros and number signs to the left of the decimal in fmt
- at least as many digits to the right of the decimal as zeros to the right of the decimal in fmt
- at most as many digits to the right of the decimal as there are zeros and number signs to the right of the decimal in fmt
- a leading dollar sign if a dollar sign appears in fmt
- commas every three digits if a comma appears in fmt
- exponential notation if 'e' or 'E' appears in fmt
- at least as many digits in the exponent as zeros to the right of the 'e' in fmt
- at most as many digits in the exponent as zeros and number signs to the right of the 'e' in fmt
- extra digits to the right of the decimal are rounded
- extra digits to the left of the decimal cause an overflow and result in a string of all number signs
- if a "*" appears to the left of the decimal, Maptitude uses as many digits as are necessary

Examples: Format (123.456, "$0,000.00") returns "$0,123.46"
Format (123.456, "#.000e00") returns "1.2346e+02"
Format (100, "#.00##E##") returns "1.00E+2"
Format (-24.6835, "#0.00###") returns -24.6835"

FormatDateTime (datetime, fmt)

Description: Formats datetime according to fmt into a string.
Arguments: datetime – DateTime compound variable
fmt – the desired format
Returned string: A string formatted based on the Standard System Formats and/or DateTime specifiers.
Examples: If dt is created with CreateDateTime(3,1,2013,22,11,19,48) then:
FormatDateTime(dt,) returns "1/3/2013 10:11:19 PM"
FormatDateTime(dt,"ddMMMyyyy") returns "03Jan2013"
FormatDateTime(dt,"HH:mm:ss") returns "22:11:19"

IntToString (i), I2S (i)

Description: Changes i to the string representation of the integer value.
Arguments: i – any integer
Returned value: A string representing the value of i
Examples: IntToString (123) returns "123"
I2S (73) returns "73"

ParseDateTime (string, fmt)

Description: Formats string according to fmt into a DateTime compound variable.
Arguments: string – DateTime compound variable
fmt – the desired format
Returned string: A string formatted based on the Standard System Formats and/or DateTime specifiers.
Examples: ParseDateTime("1/3/2013 10:11:19 PM",) returns a DateTime compound variable with the date 1/3/2013 and the time 10:11:19 PM
ParseDateTime("2013.1.3 22:9:43","yyyy.M.d HH:m:s") returns a DateTime compound variable with the date 1/3/2013 and the time 10:09:43 PM

RealToInt (n), R2I (n)

Description: Changes n to an integer value.
Arguments: n – any real number
Returned value: An integer that is equal to the integer portion of n. To round to an integer, use the Round() function with zero decimal places. Integers are promoted to real numbers as necessary, so there is no need for an IntToReal() function.
Examples: RealToInt (12.3) returns 12
r2i (.73) returns 0

RealToString (n), R2S (n)

Description: Changes n to the string representation of the real number.
Arguments: n – any real number
Returned value: A string representing the value of n
Examples: RealToString (12.3) returns "12.3"
r2S (.73) returns "0.73"

String (number)

Description: Converts number to a string.
Arguments: number – any numeric value
Returned value: a string equal to "number"
Examples: String (1234) returns "1234"
String (1.756) returns "1.756"

StringToInt (string), S2I (string)

Description: Changes string to an integer value.
Arguments: string – a string starting with a number
Returned value: An integer equal to the value of string, or zero if string begins with a non-numeric character
Examples: StringToInt ("123") returns 123
S2I (".43") returns 0

StringToReal (string), S2R (string)

Description: Changes string to an real number.
Arguments: string – a string
Returned value: A real number equal to the value of string, or zero if string begins with a non-numeric character
Examples: StringToReal ("123.45") returns 123.45
S2I ("43") returns 43.00

Value (string)

Description: Converts string to a numeric value.
Arguments: string – a string starting with a number
Returned value: A value corresponding to the value of the number in string. Value() ignores all characters starting with the first alphabetic character. Therefore, a string starting with a non-numeric character evaluates to zero (0) and a string containing a number followed by letters evaluates to the number preceding the first letter
Examples: Value ("23347") returns 23347
Value ("455.77") returns 455.77
Value ("bridges") returns 0
Value ("123roads") returns 123
Value ("123roads456") returns 123

Conditional Expressions

if x then b

Description: If the condition x evaluates to true, then the value of the expression is b. If not, the value is null.
Arguments: x – a condition
b – an expression that the command evaluates to if x is true
Returned value: The value of b or null, depending on whether x evaluates to true or false, respectively
Examples: (if population>100000 then 1)
(if distance<5 then buffer)

if x then b else c

Description: If the condition x evaluates to true, then the value of the expression is b. If not, the value is c.
Arguments: x – a condition
b – an expression that the command evaluates to if x is true
c – an expression that the command evaluates to if x is false
Returned value: The value of b or c, depending on whether x evaluates to true or false, respectively. b and c can be any expression, and their types need to match when used in a formula. x, b and c are all evaluated before a value is returned.
Examples: (if population>100000 then 1 else 0)
(if distance<5 then buffer else no_buffer)

Standard System Formats and DateTime Specifiers

These Standard System Formats and DateTime specifiers can be used in the **FormatDateTime()** and **ParseDateTime()** functions. The Standard System Formats are according to Regional Settings system control panel. The Standard System Formats can be combined, e.g., @dT, which is the default format string. If **fmt** is null then ParseDateTime() will try to guess the format.

Standard System Format	Description
@d	Short date
@D	Long date
@t	Short time
@T	Long time

Specifier	Description
d	The one- or two-digit day
dd	The two-digit day; Single-digit day values are preceded by a 0
ddd	The three-character day-of-week abbreviation
dddd	The full day-of-week name
h	The one- or two-digit hour in 12-hour format
hh	The two-digit hour in 12-hour format; Single digit values are preceded by a 0
H	The one- or two-digit hour in 24-hour format
HH	The two-digit hour in 24-hour format; Single digit values are preceded by a 0
m	The one- or two-digit minute
mm	The two-digit minute; Single digit values are preceded by a 0
M	The one- or two-digit month number
MM	The two-digit month number; Single digit values are preceded by a 0
MMM	The three-character month abbreviation
MMMM	The full month name
s	The one- or two-digit seconds
ss	The two-digit seconds; Single digit values are preceded by a 0
t	The one-letter A.M./P.M. abbreviation (e.g., A.M. is displayed as "A")
tt	The two-letter A.M./P.M. abbreviation (e.g., A.M. is displayed as "AM")
y	The one-digit year (e.g., 2001 is displayed as "1")
yy	The last two digits of the year (e.g., 2020 is displayed as "20")
yyyy	The full year (e.g., 2020 is displayed as "2020")

APPENDIX B: Configuring Your Computer and LAN

Most computers that have Windows installed can run Maptitude without any changes. In some cases, however, you may need or want to change the way your computer is set up. In particular, if you are a network administrator, you will want to take advantage of features that let you share data files on a local area network (LAN). This appendix covers the following topics:

- Operating Systems
- Sharing Maptitude Data Files on a Local Area Network
- Using a Search Path for Shared Files
- Temporary Files

Operating Systems

Maptitude is designed to run on Windows Vista, 7, 8, and 10. Users may notice some small differences in the appearance and operation of certain dialog boxes.

Sharing Maptitude Data Files

You can share tabular data and geographic files that are used by Maptitude. To share geographic and tabular files, you copy them to a directory on a network drive that can be accessed by all Maptitude users. When you share tabular or geographic files, you avoid having to make a separate copy of each file for each user.

Sharing Tabular Data Files

There are several ways to control how tabular data files are shared. If you wish to prevent users from updating a certain file, use the file system to set the file protections to read-only for the file or the directory you wish to protect. Maptitude will automatically detect this setting and open the file for reading only. Your network administrator can assist you in setting file protections. Additionally, if you want to avoid accidentally changing data in a table that is not read-only protected, you can choose to open it in read-only mode in the File Open dialog box.

When you open a table, you have the option of making it available for your exclusive use. The table cannot be accessed or edited by other users when you exclusively open it. There are some operations you cannot perform on a data file while another user is using it. For example, the ***Dataview-Table-Modify*** command requires exclusive access to a file; you cannot modify the structure of a data file while another user is using it. Also, you cannot overwrite a table file (using the ***File-Save As*** and other commands) when the existing file is in use.

You can change the default sharing settings by choosing the ***Edit-Preferences*** command and clicking the File Sharing tab. You can set the options differently for local and network drives. For example, if you do not share files on your local drives, you can set them without read-only restrictions and in exclusive mode, for the most flexibility and speed. You can also set the default file sharing options on a drive by drive basis using the Advanced button on the File Sharing page. These settings take precedence over the defaults you set for local and network drives. In all cases, the default settings can be overwritten when using the File Open dialog box.

Please note that the mode you choose to open a table may not be how the file actually gets opened, depending on how other users are already accessing the file. For example, when you open a file for exclusive use that is already open for sharing by another user, it will open for sharing. Similarly, if another user has a file open in read-only mode, it will open in read-only mode for other users regardless of whether they choose that option.

As long as a file is not open for exclusive use, any number of users can update and view the same file at the same time. Except in certain cases with ODBC tables, any changes that one user makes are immediately available to all users. You will not see the changes in your map or dataview, however, until the next time your dataview or map is drawn on the screen. Use the ***Window-Refresh*** command to update a map or dataview and see any changes to the data made by other users.

In the case of ODBC tables, users must specify a shared directory for each ODBC source to make sure that changes made to the table can be viewed in all circumstances. Maptitude uses the native ODBC indices when you are working with the whole table, but uses stand-alone indices with selection sets. All users should first specify a common shared directory for the ODBC source on the File Sharing page of the User Preferences dialog box so that they use the same stand-alone indices.

Sharing Compact Format Geographic Files

You do not need to do anything special to share compact format (.CDF) geographic files (the type of files supplied with Maptitude). Any number of users can share these files at the same time. Because compact format geographic files are read-only, you cannot edit the features in a compact format geographic file. You can, however, edit the tabular data that come with it just like any other tabular data file. If you wish to prevent users from editing the tabular data, set the file protections to read-only as described above.

Sharing Standard Format Geographic Files

Maptitude also supports standard format (.DBD) geographic files. Standard format geographic files are required when you use the geographic editing tools to add, delete, or modify geographic features. In addition, certain Maptitude commands (***File-New***, ***Tools-Analysis-Buffers***, etc.) create standard format geographic files.

If you want to share standard format geographic files *so that any number of users can read them*, you must do one of two things:

- Place the files in a read-only directory

- Use the Windows Explorer or other file manager to set the file attributes of all the files in the database to read-only

If you want to share standard format geographic files *so that one or more users can edit the files while they are in use by others*, things get somewhat more complicated. In this case, Maptitude uses an extra program to help keep track of who is using each file. This program is called the Lock Manager, because it allows each user to lock portions of the files for a short time as needed.

Proper use of the Lock Manager varies greatly depending upon the network operating system and the operating system on the individual desktop computers. For information on how to install and configure the Lock Manager, please collect all of the relevant operating system information and contact Caliper technical support for assistance.

Using a Search Path for Shared Files

Certain Maptitude commands require specific data files. For example, the ***Locate by Address*** command may require the CCSTREET.CDF or NTSTREET.CDF geographic file and various other supporting files.

Maptitude maintains a **search path** to locate files. The search path is simply a list of folders that may contain the required files. The search path can point to a DVD drive, a hard disk drive, a network drive, or any combination. Maptitude automatically includes any folders where Maptitude data files have been installed in the search path. You can modify your search path choosing the ***Edit-Preferences*** command and going to the System tab in the User Preferences dialog box.

Network administrators should know that the search path can also be set using the CALIPER_PATH environment variable in each user's system environment. If the CALIPER_PATH environment variable is set, Maptitude will look for required files first in the individual user's search path and then in the path specified by the CALIPER_PATH environment variable.

Temporary Files

Maptitude creates many temporary files while it is running. Regardless of whether you use a local or shared installation, these files are stored in the following locations:

- If the TEMP environment variable is defined, Maptitude creates a CALIPER folder in the TEMP folder and places all temporary files in this folder.
- Otherwise, Maptitude creates a CALIPER folder in the WINDOWS folder and places all temporary files in this folder.

Maptitude automatically removes all temporary files in the CALIPER folder when the program starts and when the program ends.

APPENDIX C:
Using Your Data: Advanced Topics

Maptitude includes many tools to simplify using your data on a map. There are, however, some special cases, when the standard tools for mapping your data may be insufficient:

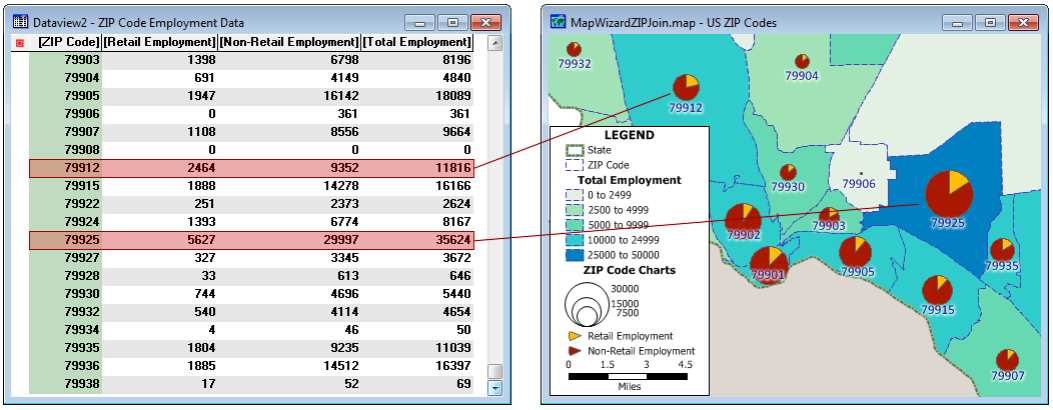
- Create-a-Map Wizard (described in Chapter 3) is designed to join your data to map features that are part of your Country Package and map the results. For example, Create-a-Map Wizard can aggregate your sales data by postal code, state/province, or country and automatically create a thematic map of the results. But if you have created your own geographic files, such as sales territories or school districts, and you want to attach your data to those files, it will be necessary for you to manually join your data to the layer.
- The Find and Locate commands (described in *Chapter 4: Moving Around a Map* and *Chapter 9: Geocoding: Locating Your Data on a Map* respectively) can automatically find and geocode your data to the street level with the street file provided in your Country Package. If, however, you have your own custom layer on which you want to find locations, you will need to create a Location index to use with it.

This appendix describes how to use your data in a Maptitude map when these circumstances apply.

Joining Your Data to a Map

With Maptitude you can make maps from your data, enabling you to visualize the data in new and different ways. If your database includes postal codes, state abbreviations, tract or county FIPS codes, or ISO country codes, you should use Create-a-Map Wizard to automatically create a thematic map of your data joined to the appropriate layer. See "Using Create-a-Map Wizard" on page 56 for more information.

If, however, you want to join your data to a layer not supported by Create-a-Map Wizard, you can join your data to a map layer by matching the records in your file to the features in a geographic file. This creates a **joined view**. For example, if you have a spreadsheet of sales data by territory, you can join that to a sales territory layer and then create maps that use the spreadsheet data.



Creating a Joined View

To create a joined view you need to:

- Choose the layer you want to use and display it in a map or dataview.
- Choose the spreadsheet or table that contains the data to join

To join the layer and your data, the values in one of the fields in your data must exactly match the values in one of the fields of the layer. *The column headings or names of the fields can be different, as long as the values match.* For example, you can link a sales dataview to a state layer, as long as both of them have a field containing the name of the state or the state abbreviation. If, however, your data do not match exactly, you will need to create a field with values that do. See "Values That Don't Match" on page 534.

You can also define a join using more than one field. For example, you may have two dataviews with origin and destination fields where one shows trip data and the other shows travel times. You can create a joined dataview that shows the trip data and the travel times by choosing the Multiple Fields option and specifying the origin and destination fields in each dataview. When joining with multiple fields, the following rules apply:

- The number of fields needs to be the same for both dataviews
- The fields must be specified in the same order
- If one field type is numeric then the other must also be numeric
- If one field type is DateTime then the other must also be DateTime

Once you have created a join, Maptitude lets you see the tables and layers that make up the joined view.

Editing Data in a Joined View

There are two minor restrictions on editing data in a joined view.

- You cannot edit the two fields you used to create the joined view, because these fields are the glue that holds the two files together.
- You cannot add or delete records, since what appears to be a single record in the joined view is really a combination of data from two different places.

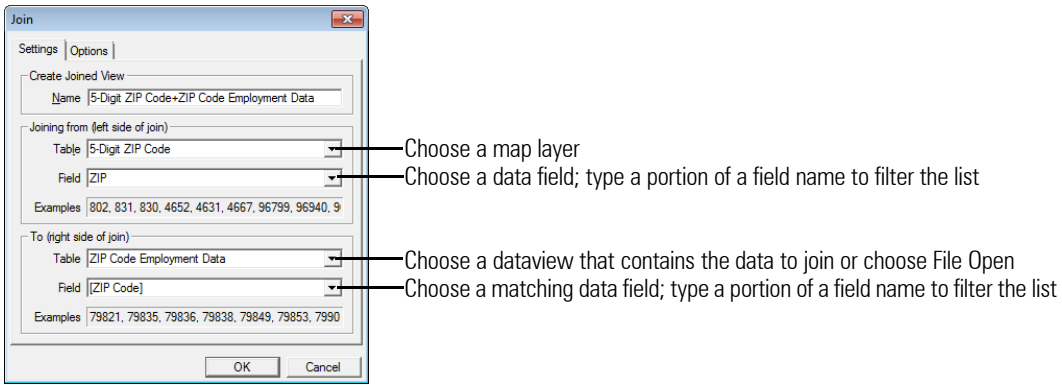
When Column Headings Collide

Sometimes the field names from your data file are exactly the same as the field names from a map layer. When you join these two files together to create a joined view, Maptitude automatically changes the field names so you can tell which column comes from what source.

For example, suppose you join States (which has ID, Name, and other data fields) to Customers (which has ID, Name, and other data fields). Maptitude changes the column headings to States.ID, States.Name, Customers.ID, and Customers.Name. The first two columns contain data from the states layer. The third and fourth columns contain data from your customer file.

▶ To Create a Joined View

1. Choose ***Dataview-Table-Join*** or, if a dataview is the active window, click on the Standard toolbar to display the Join dialog box.
2. Make choices as follows:



   You can also define a join using more than one field by choosing **Multiple Fields** from the Field drop-down lists. Choosing Multiple Fields will display the Choose Fields to Join dialog box. Choose from the fields to use from the Available Join scroll list and click **Add>>** then **OK**. Be sure to choose the same number of fields and in the same order in both instances.
3. Type a name or edit the suggested name for the joined view in the Name text box.
4. Click **OK**.

Maptitude creates a joined view, linking the map layer to the dataview that contains your data.

You don't need to do anything special to save a joined view. When you save a map, layout, dataview, or workspace that is based on a joined view, Maptitude saves the joined view automatically.

When you open a map, dataview, or layout that contains a joined view, Maptitude recreates the link from the map layer to your data. If the values in your data file have changed (for example, if your corporate database has been updated or you used some other software package to modify the information in the file), the map or dataview will show all of those changes. Consequently, your maps, layouts, and dataviews automatically use the most recently available data.

Try It Yourself: Creating and Using a Joined View

1. Choose ***File-Open Workspace***, then open the workspace **ussales.wrk** in the Tutorial folder. Maptitude shows a map of states and a dataview of sales by state. By joining them, you can prepare maps of sales by state.
2. Choose ***Dataview-Table-Join*** to display the Join dialog box.
3. Choose **[Abbrev.]** from the first Field drop-down list. Maptitude automatically finds the ABBREV field in the STSALE table.
4. Type "**Sales by State**" as the name for the new dataview.
5. Click **OK**. Maptitude displays the new dataview with all of the fields from both the States layer and the STSALE dataview.
6. Scroll to the far right of the joined dataview, click on the **Total** column heading, and choose ***Map-Thematic Mapping-Color***. Maptitude creates a new color theme map of the sales for the year.
7. Choose ***Map-Thematic Mapping-Chart*** or click on the toolbar to display the Chart Theme dialog box. Click and drag on the **QUARTER1**, **QUARTER2**, **QUARTER3**, and **QUARTER4** fields to highlight them.
8. Click **OK**. Maptitude adds pie charts to the map to show the proportion of sales in each quarter for each state.
9. Choose ***File-Close All*** and click **No to All** to close the dataviews and maps without saving any changes.

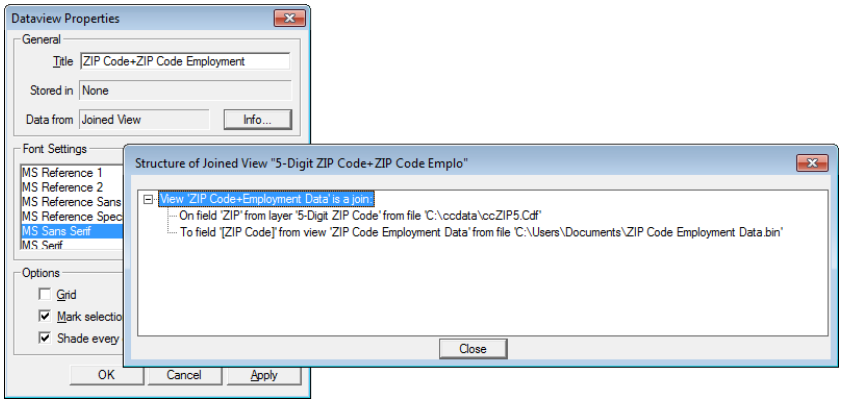
Seeing the Structure of a Joined View

Maptitude lets you see the tables and layers that make up a joined view.

▶ To See the Structure of a Joined View

1. Choose ***File-Properties*** or click on the Standard toolbar to display the Dataview Properties dialog box.
2. Click **Info** to display the Structure of Joined View dialog box. The tree shows the structure of the joined view.

3. Expand the tree to see the source files that comprise the joined view.



4. Click **OK** when you are done to return to the Dataview Properties dialog box.

5. Click **OK** or **Cancel** to close the Dataview Properties dialog box.

Dropping a Joined View

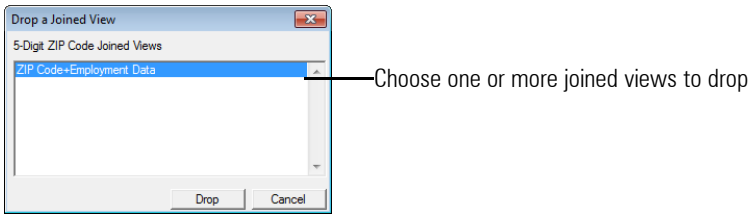
When you create a joined view by joining a table to a layer, Maptitude keeps the joined view available as long as the layer appears in any open map, dataview, or layout. When the layer is no longer in use, the joined view is automatically discarded.

Sometimes you may want to get rid of a joined view while the layer is still in use. For example, suppose you chose the wrong fields when you created the joined view and you want to recreate it using the correct fields.

You can drop a joined view while it is displayed in a dataview. When you do so, Maptitude closes the dataview as it drops the joined view. You cannot, however, drop a joined view when it is part of another more complex join or when it is being used in a map to display a theme or labels.

▶ To Drop a Joined View

1. Choose ***Dataview-Table-Drop Join*** to display the Drop a Joined View dialog box.



2. Choose one or more joined views to drop.

3. Click **OK**.

Maptitude drops the joined views, and closes any dataviews in which they are displayed. A joined view that is not associated with a layer is dropped when its dataview is closed.

Values That Don't Match

To create a joined view, the values in one of the columns of the layer must match the values in one of the columns of the dataview. Maptitude automatically handles cases where your data don't match the records in a map layer.

- If your data include records that don't match any of the features of the map, those records will not be part of the joined view. (For example, the joined view of a table that contains data by state and country that you join to a country layer will not contain any of the state data.)
- If the map layer has features that don't have matching records in your data file, the joined view will show that the data for those features are missing. (For example, the joined view of a table that contains data for some countries that you join to a country layer will show values for the countries that had data and null values for all other countries.)

In addition, the fields that you use to create a join must match exactly. For example, if you join a table that contains a record with the name "CALIFORNIA" it will not join to a feature with the name "California." In this case, you need to use a formula field to create a new column in one of the files that matches the data in the other file. The following tables show some common functions that you may use to make formula fields match.

Field	Formula	Formula Description	Returns
California	Upper(Field)	Converts values in Field to upper case	CALIFORNIA
CALIFORNIA	Proper(Field)	Converts values in Field to initial capitals	California
02461-9926	Substring(Field,1,5)	Returns the first five characters in Field	02461
Newton MA	Left(Field,Len(Field)-3)	Returns all but the last three characters of Field	Newton
Newton, MA	Substring(Field,1,Position(Field,",")-1	Returns all of the characters up to the one before the comma	Newton
Interstate 495	Word(Field,2)	Returns the second word in Field	495
US Hwy 101	"US-"+Substring(Field,8,3)	Combines "US-" with the 8-10th characters of Field	US-101
US Hwy 101	"US-"+Word(Field,3)	Combines "US-" with the third word in Field	US-101

Field1	Field2	Formula	Formula Description	Returns
JANE	SMITH	Field1+" "+Field2	Combines the fields with a space between them	JANE SMITH
1172	BEACON ST	String(Field1)+" "+Field2	Converts an integer in Field1 to a string then combines the fields with a space between them	1172 BEACON ST

There may often be several formulas that return similar results, but, depending on the data, some may be better to use than others. For example, you can use the following five formulas to trim the

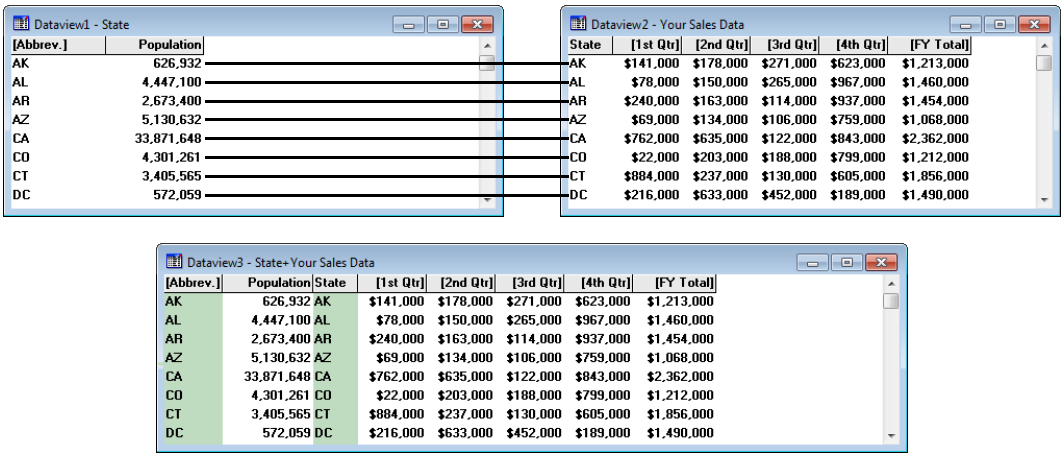
state abbreviation off of a city name field, but only two will give the proper results if the city name has more than one word in it.

Formula	Returns this for "CHICAGO IL"	Returns this for "LOS ANGELES CA"
Left(NAME,Len(NAME)-3)	CHICAGO	LOS ANGELES
Substring(NAME,1,Len(NAME)-3)	CHICAGO	LOS ANGELES
Word(NAME,1)	CHICAGO	LOS
Left(NAME,Position(NAME," ")-1)	CHICAGO	LOS
Substring(NAME,1,Position(NAME," ")-1)	CHICAGO	LOS

For more information on formula fields, see "Creating a Formula Field" on page 195. See *Appendix A, Formulas, Conditions, and Functions*, for more information on functions supported in Maptitude.

Types of Joined Views

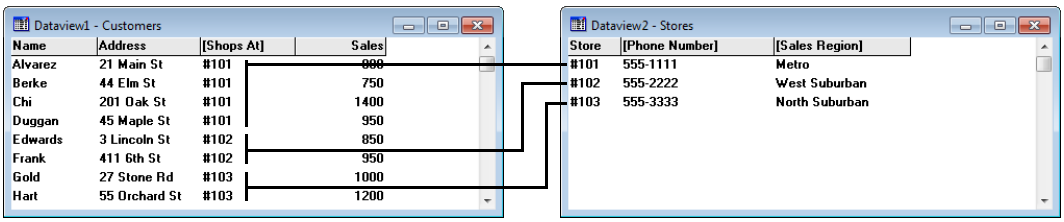
When you join a layer and a table to create a joined view, there is often a one-to-one correspondence between the records in the layer and the records in the table. For example, when you join the States layer to the Your Sales Data table shown below, each record in the States layer matches exactly one record in the Your Sales Data table.



Sometimes the layer and the table do not match record for record. There are two distinct possibilities:

- The layer has several records that match a single record in the table. This is called a many-to-one joined view.
- The layer has one record that matches several records in the table. This is called a one-to-many joined view.

In the following tables of customers and stores there is not a one-to-one correspondence.



You can join from the Customers to the Stores as a many-to-one joined view. Many of the customers shop at the same store and the information about each store is repeated for each customer who shops there.

Dataview3 - Customers+Stores

Name	Address	[Shops At]	Sales	Store	[Phone Number]	[Sales Region]
Alvarez	21 Main St	#101	800	#101	555-1111	Metro
Berke	44 Elm St	#101	750	#101	555-1111	Metro
Chi	201 Oak St	#101	1400	#101	555-1111	Metro
Duggan	45 Maple St	#101	950	#101	555-1111	Metro
Edwards	3 Lincoln St	#102	850	#102	555-2222	West Suburban
Frank	411 6th St	#102	950	#102	555-2222	West Suburban
Gold	27 Stone Rd	#103	1000	#103	555-3333	North Suburban
Hart	55 Orchard St	#103	1200	#103	555-3333	North Suburban

You can also join from Stores to Customers as a one-to-many joined view. You have two choices using the example:

- Aggregate One-to-Many Join: Each store has many customers so Maptitude counts the total number of customers at each store, and calculates the sum and average of each numeric field. This join is mappable, but you cannot see the fields for each customer.

Dataview3 - Stores+Customers

Store	[Phone Number]	[Sales Region]	[N Customers]	Sales	[Avg Sales]
#101	555-1111	Metro	4	4000	1000.00
#102	555-2222	West Suburban	2	1800	900.00
#103	555-3333	North Suburban	2	2200	1100.00

- One-to-Many Join: Maptitude displays a record for each customer and repeats the fields for the stores on the left. This join is not mappable, but you can see each of the customer fields.

Dataview3 - Stores+Customers

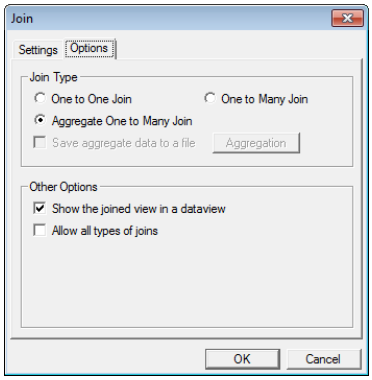
Store	[Phone Number]	[Sales Region]	Name	Address	[Shops At]	Sales
#101	555-1111	Metro	Alvarez	21 Main St	#101	800
#101	555-1111	Metro	Berke	44 Elm St	#101	750
#101	555-1111	Metro	Chi	201 Oak St	#101	1400
#101	555-1111	Metro	Duggan	45 Maple St	#101	950
#102	555-2222	West Suburban	Edwards	3 Lincoln St	#102	850
#102	555-2222	West Suburban	Frank	411 6th St	#102	950
#103	555-3333	North Suburban	Gold	27 Stone Rd	#103	1000
#103	555-3333	North Suburban	Hart	55 Orchard St	#103	1200

Usually, Maptitude can automatically tell whether the layer and the data table should be joined one-to-one or one-to-many. If you want to make sure the data are joined the way you want, use the Options tab in the Join dialog box.

▶ To Specify the Type of Joined View

1. Choose ***Dataview-Table-Join*** or, if a dataview is the active window, click on the Standard toolbar to display the Join dialog box.
2. Choose the layer, table, and matching fields in the usual way.

3. Click the **Options** tab.



4. Choose the type of join you want from the list in the Join Type box.
5. If you choose an aggregate one-to-many join, you can also choose one or more of the following options:

Option...	See...
Save aggregate data to a file	"To Save Aggregate Data to a File" below.
Change the aggregation method	"To Change the Aggregation Method when Creating a One-to-Many Join" on page 324.

6. Click **OK** to create the joined view.

▶ To Track Joined Records

1. Right-click on a dataview with an aggregate one-to-many join and choose ***Joined Records Browse***. Maptitude displays the slave dataview with the fields for the joined table.
2. When you are done tracking joined records, click the close box in the upper-right corner of the slave dataview.

Maptitude closes the slave dataview.

Try It Yourself: Creating a One-to-Many Join

1. Choose ***File-Open Workspace***, then open the workspace **avgsales.wrk** in the Tutorial folder. The dataview shows the sales for each customer. You want to present the average sales per customer and the sum of sales by state.
2. Choose ***Dataview-Table-Join*** to display the Join dialog box.
3. Choose **[Abbrev.]** from the first field drop-down list. The other settings are already correct.
4. Type "**Average Sales**" as the name for the new dataview.
5. Click **OK**. You will be asked to choose the type of join.
6. Click **Aggregate the records in the right side of the join** in the radio list and click **OK**. Maptitude shows the new dataview with the number of records, the sum of sales, and the average sales by state. Scroll to the right to see the **[N AVGSALES]**, **SALES**, and **[Avg SALES]** fields.
7. Click on the **[Avg SALES]** heading, then choose ***Map-Thematic Mapping-Color***. Maptitude creates a new color theme map showing average sales by state.
8. Choose ***File-Close All*** and click **No to All** to close the dataviews and maps without saving any changes.

Saving Aggregate Data in a One-to-Many Join

When you create an aggregate one-to-many join, Maptitude computes the sum and average values for the records in the table that go with each record in the layer. This calculation is done on the fly each time Maptitude displays a dataview or uses the values in these fields to create a thematic map or label a map. If your files are very large, or there are many records in the table for each record in the layer, this can take a long time, and the calculation will be performed over and over.

You can speed things up by saving the results of these calculations to a separate file. The advantage is that once the data are saved, you can display the aggregate data in a dataview or use it in a map very quickly. The disadvantage is that changes to the data in your table won't automatically be reflected in the joined view, unless you drop the joined view and then recreate it later on.

You can customize the way that Maptitude aggregates the data. For more information, see "Aggregation Methods" on page 321.

▶ To Save Aggregate Data to a File

1. Choose ***Dataview-Table-Join*** to display the Join dialog box.
2. Choose the layer, table, and matching fields in the usual way.
3. Click the **Options** tab and choose **Aggregate One to Many Join** type if it is not already chosen.
4. Check the **Save Aggregate Data to a File** box.
5. Click **OK**. Maptitude displays the Save As dialog box.
6. Type a name for the table in which the aggregate data should be stored, and click **OK**.

Maptitude aggregates the data, stores it in a file, and creates the joined view.

More Complex Joined Views

The examples we've used so far show how to link a map layer to data of your own that are stored in a database or spreadsheet. In fact, Maptitude lets you create joins using any combination of map layers and data tables. For example, you can join a layer to a table (as discussed earlier in the chapter), join a layer to another layer, join a table to another table, join a layer to another joined view, or even join two joined views together to form another joined view. The only requirement is that the values in one column of the first layer, table, or joined view match the values in one column of the second layer, table, or joined view.

▶ To Join Two Tables, Layers, or Joined Views

1. Choose ***Dataview-Table-Join*** or click  on the Standard toolbar to display the Join dialog box.
2. Click the **Options** tab.
3. Check the **Allow All Types of Joins** box.
4. Click the **Settings** tab, and choose the tables, layers, or joined views and the fields in the usual way.

5. Click **OK**.

Maptitude creates the joined view.

NOTE: To make the Allow All Types of Joins option your default, choose ***Edit-Preferences*** and check the Allow All Types of Joins box on the Dataview tab.

Faster Joins

When Maptitude joins geographic and tabular data, it builds a cross-reference between the two files with a temporary index (or a key) for the data fields that match between the two sources. (Maptitude makes these indexes temporary so that your original data files remain unchanged. This is important if you are sharing data with other users on a network.)

Each time you create the joined view or open a map, layout, or dataview containing the joined view, Maptitude must rebuild the temporary index. Unfortunately, this step can be time-consuming for large files.

Adding permanent indexes to your tables can result in faster joins. If your data have a permanent index, Maptitude will automatically use it whenever you join to the file. For more information about indexing a field, see "To Modify the Structure of a Table" on page 225.

Using a Location Index

The regional street data that come with Maptitude are indexed and ready to use for finding address locations on a map. If, however, you have your own custom layer on which you want to find locations, you can create a Location index to use with it.

A Location index organizes addresses so that they can be located quickly. A Location index finds an address by using first the name and then the number of the address, with a qualifier such as a postal code or city and state/province name as an optional way to distinguish between similar names. You can then specify the index to use when you choose the ***Edit-Find*** command or the ***Tools-Locate-Locate by Address*** command.

Depending on the nature of the addresses being indexed, you will need to supply more or less information to find a particular address with a Location index. Some indexes may only require a name, while others will need a number and a qualifier. Indexes can be built for your own geographic files with addresses anywhere in the world, and Maptitude can recognize different ways of structuring addresses, such as whether the number comes before or after the name.

Creating Location Indexes

Location indexes offer a way to index addresses for any place in the world. You can create Location indexes from all or selected features in point, line, and area geographic files. The index can be for up to two million features. Some uses of Location indexes are:

- Speeding location by address in metropolitan areas
- Handling places with non-numeric postal codes
- Using district names (e.g. neighborhoods or cities) as part of the address

You can index just address names, with no number, to locate bridges, public buildings, parks, etc. Alternatively, a location index can have addresses with a single number (such as for use with a point layer of office buildings that are identified by their street address), or it can have one or two address ranges.

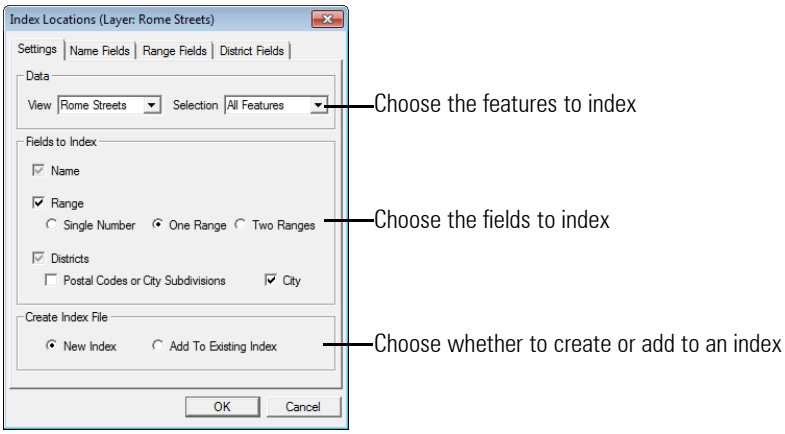
Location indexes need to include a district field to differentiate non-unique addresses. For example, if your index covers an area that includes "100 Main Street" in several different cities or postal codes, the district field helps Maptitude determine which location to choose. The districts can be numeric (e.g. ZIP Code) or character (e.g. city name) fields. When there are two address ranges on a street segment, you will need a district field for both the left and right sides.

Optionally, you can use a second level of district field. The first level handles postal codes or city subdivisions and the other level handles city names. For the U.S. and Canada, the city name may include a two-letter state or province abbreviation.

NOTE: You can choose the default location index to use by choosing ***Edit-Preferences***, clicking ... on the Locating tab, and choosing an index from the Street Layer or Index drop-down list on the Street Layer or Index dialog box.

▶ To Create a Location Index

1. Choose the layer you want to index from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Locate-Index Locations*** to display the Index Locations dialog box.



3. Choose a dataview associated with the layer from the View drop-down list.
4. Choose whether to index all features or only those in a selection set, from the Selection drop-down list.

5. If you want to index a single number or ranges, check the **Ranges** box and choose the appropriate radio button.
6. Check the **Postal Codes or City Subdivisions** and/or the **City** box depending on the number of levels of districts you want to index.
7. Choose whether to create a new index or add to an existing index, from the Create Index File radio list.
8. Click the **Name Fields** tab and make choices as follows:

To do this...	Do this...
Choose a name field	Choose a field from the Name drop-down list.
Choose an alternate name field	Choose a field from the Alternate Name drop-down list, or choose None to not have alternate names for features.
Choose a format for addresses	Make a choice from the Format drop-down list. For more information, see "Accepting Different Address Formats" on page 281.
Choose a city and state format	Choose U.S. or Canadian Cities if the city name includes a state or province two-letter abbreviation, or Cities in Other Countries if there is no abbreviation, from the City & State Format drop-down list.

9. If you checked the Ranges box, click the Range Fields tab and make choices as follows:

To do this...	Do this...
Choose a field for a single number	Choose a field from the Number drop-down list
Choose fields for one range	Choose fields from the Start Number and End Number drop-down lists
Choose fields for two ranges	Choose fields from the Start Number and End Number drop-down lists in both the Left Range and the Right Range frames

If you are indexing a line geographic file, you can make choices as follows:

To do this...	Do this...
Indicate that ranges mix even and odd numbers	Choose a field from the Parity drop-down list that contains a value of one if ranges mix even and odd numbers, or a value of zero if numbers are not mixed
Offset the location based on a value in a field	Choose a field from the Offset Field drop-down list
Not offset the location	Choose None from the Offset Field drop-down list
Indicate the units in the offset field	Choose the units from the Offset Units drop-down list

10. Click the **District Fields** tab. If you checked the Postal Code or City Subdivision box, make choices as follows:

To do this...	Do this...
Choose a field for a single number or one range	Choose a field from the Postal Code drop-down list
Choose fields for two ranges	Choose fields from the Left Postal Code and Right Postal Code drop-down lists

If you checked the City box, make choices as follows:

To do this...	Do this...
Choose a field for a single number or one range	Choose a field from the City drop-down list
Choose fields for two ranges	Choose fields from the Left City and Right City drop-down lists

TIP: You should save your location index file to the same folder where your layer is located.

11. Click **OK**. Maptitude displays the Save As dialog box.
12. Type a file name and click Save.

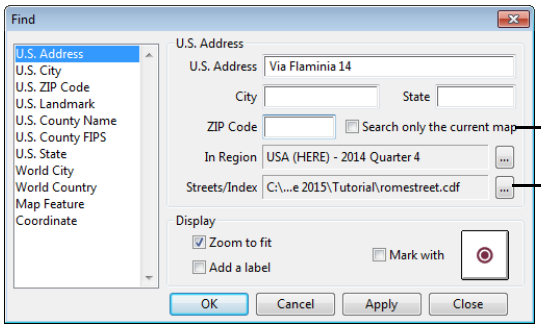
Maptitude creates the Location index.

▶ To Find Addresses Using a Location Index

1. Choose ***Edit-Find***, click on the Standard toolbar, or right click on the map window and choose Find, to display the Find dialog box.
2. Choose **Address** in the scroll list.
3. Type the address in the Address text box. Depending on the Location index, you may be able to type just a name.
4. Enter additional information as necessary:

If you know...	Do this...
The postal code	Type the postal code in the Postal Code text box
A qualifier such as a city and state name	Type the name in the City, State text box

5. Make choices as follows:



6. Click **OK**.

Maptitude finds the address and uses the display options to indicate the location. If the address cannot be found, you can return to the Find dialog box to modify the address information and try again.

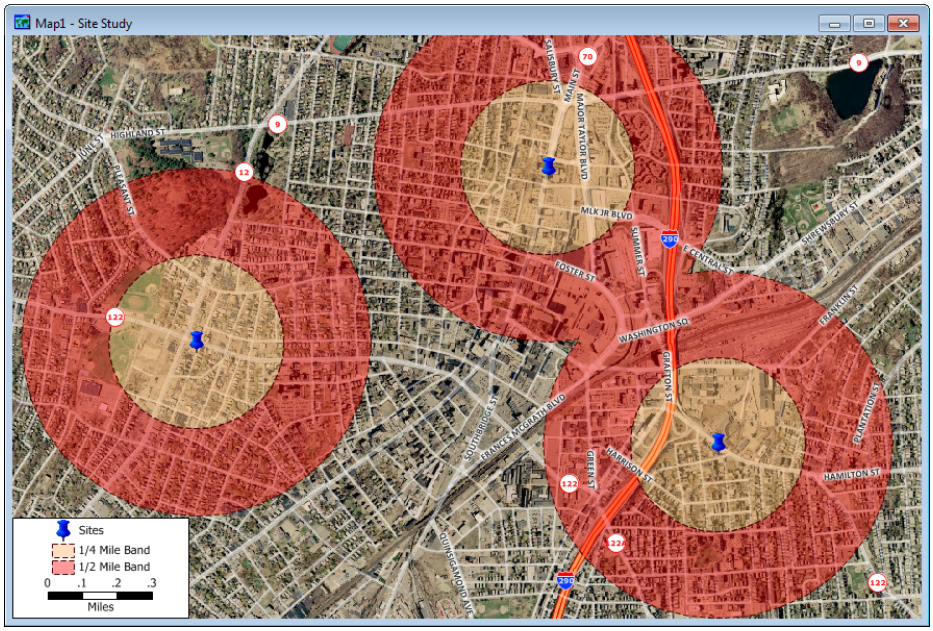
Try it Yourself: Creating and Using Location Indexes

1. Choose ***File-Open Workspace***, then open the workspace **Locateindex.wrk** in the tutorial folder. You will create an index for Rome streets and locate records with the index.
2. Choose **Rome Streets** from the drop-down list on the Standard toolbar to make it the working layer.
3. Choose ***Tools-Locate-Index Locations*** to display the Index Locations dialog box.
4. Choose **All Features** from the Selection drop-down list.
5. Check the **Range** box and choose **One Range** from the Range radio list.
6. Remove the check from the **Postal Codes or City Subdivision** box and check the **City** box.
7. Click the Name Fields tab. Choose **Street Name Followed by Number** from the Address Format drop-down list and choose **Cities in Other Countries** from the City & State Format drop-down list.
8. Click the Range Fields tab and verify that **Start** and **End** are chosen in the Start Number and End Number drop-down lists.
9. Click the District Fields tab and verify that the **City** field is chosen in the City drop-down list.
10. Click **OK** to display the Save As dialog box. You should save the Location index file to the Tutorial folder because that is where the Rome street geographic file is also stored.
11. Type "romestreet" as the file name and click **Save**.
12. Choose ***Window-Dataview1-romelocate*** or click on the **romelocate** dataview to make it active.
13. Choose ***Tools-Locate-Locate by Address*** to display the Locate by Address dialog box.
14. Click ... next to the Streets/Index text box to display the Choose Streets dialog box. Choose the **romestreet.idx** index file you just created from the Street/Index drop-down list. The other drop-down lists are automatically filled in.
15. Click **OK** to return to the Locate by Address dialog box.
16. Click the Postal Codes tab and click the **Ignore Postal Codes and City Information** radio button.
17. Click **OK** to display the Save As dialog box.
18. Type "My Rome" as the file name and click **Save**. Maptitude locates the records and displays them on the map and displays the match statistics. Click OK to continue.
19. Choose ***File-Close All*** and click No to All to close the dataviews and map without saving any changes.

APPENDIX D:
Using Imagery: Advanced Topics

Maptitude lets you use many types of image files as layers in a map. Many of these formats, such as ECW and SPOT images include information to display them at their correct location on a map. When you first use a TIFF, JPEG, MrSID, or PNG image that is not registered, however, you must indicate its true location on the map.

Maptitude also lets you manage large sets of images. You can use the Image Librarian to create Image Libraries, and then add one or more Image Libraries as layers in your map.



This appendix describes how to register images so that they align with a Maptitude map and how to group images into an image library.

Registering an Image

When you first use a TIFF, JPEG, MrSID, or PNG image that is not registered, you must indicate its true location on the map. Maptitude needs write access to the folder containing the image file to create or update a world file, which contains the registration information. Also, for a TIFF image, Maptitude stores the registration information as part of the image file.

If the image file is accompanied by a world file, Maptitude uses the file to register the image. Otherwise, you must use the Register Image toolbox to mark three or more control points on the image and indicate their true locations (longitude and latitude), either by entering the coordinates or by clicking on a map.

Maptitude can use the world files that accompany TIFF (.TFW), JPEG (.JPW), MrSID (.SDW), and PNG (.PGW) images. Maptitude adds registration information that is not normally part of a world file, and updates the registration information in a world file when you reregister an image.

Registering an Image with a World File

When you open an unregistered image file, Maptitude checks for the existence of a world file with the same file name, and a .TFW (TIFF), .JPW (JPEG), .PGW (PNG), or .SDW (MrSID) extension. If this file exists, it will contain information that can be used to register the image. It will not include information about the coordinate system for the image, so you must choose a coordinate system when you register the image.

▶ To Register an Image with a World File

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **TIFF Image**, **JPEG Image**, **Portable Network Graphics**, or **MrSID Image** as the file type.
3. Choose a file and click **Open**. Maptitude detects the presence of the world file and displays the Registering an Image with a World File dialog box.
4. Choose a class of coordinate systems from the Class drop-down list.
5. Choose a coordinate system zone from the Zone drop-down list.
6. Choose a unit of measurement from the Units drop-down list.
7. Click **OK**.

Maptitude updates the world file and registers the image.

▶ To Reregister an Image with a World File

1. Choose the image to reregister from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Raster-Registration*** to display the Register Image toolbox.
3. To reregister using the world file for a TIFF image, click TFW to display the Registering an Image with a World File dialog box, choose a coordinate system, and click **OK**.

   To reregister using the registration information in a TIFF image, or the world file for a JPEG, PNG or MrSID image, click Projection to display the Image Projection dialog box, choose a projection or coordinate.

4. Click **OK**.

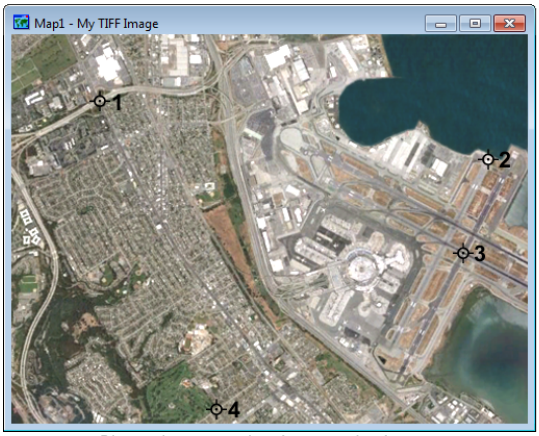
Maptitude updates the world file with the new coordinate system and registers the image. Also, for a TIFF image, Maptitude stores the registration information as part of the image file.

Registering an Image Using Control Points

To register an image using control points, you display the image in a map window, set the projection of your Maptitude map to match the projection of the image, mark three or more points on the image, and tell Maptitude the true location of each of these points. The points you mark are called **control points**, and you mark them using the control point tools in the Register Image toolbox. You get the best results with more control points (between 5 and 10) and you can improve the registration by spreading them out across the image. While you are marking the control points, you can use other tools and commands to zoom in or out, or to pan around the image.

If your image contains a grid or a set of tick marks that identify the actual coordinates of several points, use these as your control points. Otherwise, choose points you can match with points on another map layer, such as area boundaries, major intersections, and coastline or waterway boundaries.

To identify the true location of a control point, you either type the coordinates of the control point directly in the Register Image toolbox or switch to any map window, click  in the Image toolbox, and click on the location that corresponds to the control point. For example:



Place the control points on the image

Mark the true locations of each point

If you type the coordinates of control points into the dialog box, you can also specify the coordinate system you want to use. For example, if you register an image with a UTM projection, you can choose to enter coordinates in longitude and latitude or in meters. For details on map projections and coordinate systems, see *Appendix E: Projections and Coordinate Systems*.

If you provide four or more control points, Maptitude can determine whether the true coordinates are consistent for each one. If the true coordinates are not consistent, Maptitude acts as follows:

If the accuracy of...	Maptitude...
All control points are OK	Registers the image using all control points
One control point is far off	Registers the image with the other control points
Several control points are far off	Does not register the image

When you register an image, it must be oriented so that North for the projection is at the top of the image. If your image is small-scale (that is, it covers a large geographic area), you will need to know if the image uses a map projection. For example, if the image was created by scanning a paper map, you will need to know the projection that was used in the paper map. If your image is large-scale (that is, it covers a small geographic area), you can indicate that no projection was used, and it shouldn't affect the accuracy of the registration.

When an image is used as a layer in a map, Maptitude locks the map projection to the projection for the image. Automatic and manual projections are disabled while the image is active.

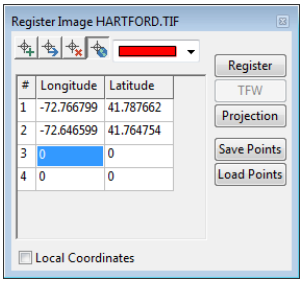
▶ To Register an Image Using Control Points

You must be able to write to the image file. You cannot register an image file that is on a CD-ROM disk or is write-protected.

1. Choose ***File-Open*** or click  on the Standard toolbar to display the File Open dialog box.
2. Choose **TIFF Image**, **JPEG Image**, **Portable Network Graphics**, or **MrSID Image** as the file type.
3. Choose a file and click **Open**. Maptitude displays the Image Projection dialog box.
4. Choose a projection, or a coordinate system if you wish to enter coordinates in units other than longitude and latitude, as follows:

To do this...	Do this...
Choose a projection	Choose a class of projection from the Class drop-down list and the projection used in the image from the Projection drop-down list.
Choose a coordinate system	Click the Coordinate System tab. Choose a coordinate system from the Class and Zone drop-down lists and the units from the X and Y In drop-down list.

5. Click **OK**. Maptitude creates a new map consisting of one layer that contains the image, and displays the Register Image toolbox.



6. Place your control points as follows:

To do this...	Do this...
Place a control point	Click and click on the image. Maptitude draws a symbol and number on the control point, and adds the control point to the list.
Move a control point	Click in the list on the control point you want to move, click , and click on the new location for the control point. Maptitude draws the control point in the new location.
Delete a control point	Click in the list on the control point you want to delete, and click . Maptitude removes the control point and renumbers the remaining control points.
Change the color	Choose a color from the drop-down list. Maptitude draws the control points in the chosen color.

   To load existing control points, click Load Points to display the Load Coordinates dialog box, choose a Coordinates File, and click Open.

   To save your control points, click Save Points to display the Save Coordinates As dialog box, choose a folder and type the name of the new Coordinates File, and click Save.

7. Enter the true location of each control point as follows:

To do this...	Do this...
Type in the location	Enter the coordinates of the control point in the respective cells in the Longitude and Latitude columns. If you want to use the local coordinates, check the Local box.
Click on the location	Click in the list on the control point you want to locate, click , then click on a map to mark the true location.

8. When you have placed the control points and entered the true locations for each one, click Register to register the image.

Maptitude registers the image and saves the registration information in the world file. Also, for a TIFF image, Maptitude stores the registration information as part of the image file. You can now use the image in any of your maps and layouts. If you want to update the registration information you can reregister the image.

▶ To Reregister an Image Using Control Points

1. Choose the image to reregister from the drop-down list on the Standard toolbar.
2. Choose ***Tools-Raster-Registration*** to display the Register Image toolbox.
3. If you want to change the projection, click **Projection** to display the Image Projection dialog box, choose the projection used in the image, and click **OK**.
4. Register the image as described in steps 6, 7, and 8 of the procedure "To Register an Image Using Control Points" on page 548.

Using the Image Librarian

An Image Library is a list of images that have the same map projection, and can be added as a single layer in a map. The images can be of different types, such as GeoTIFF, ECW, or MrSID. Image libraries will often be for mosaics of images created as a group, such as imagery covering a city or state.

There are many reasons for using an Image Library:

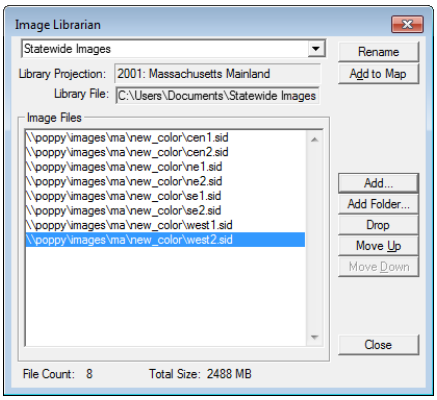
- One map layer can represent dozens, even hundreds of images
- You can choose a descriptive layer name for the Image Library, rather than the often cryptic image file names
- It is much quicker to add one Image Library layer to a map than it is to add many image layers
- It is much quicker for Maptitude to use an Image Library to determine which images need to be used to display an area than it is to check a large number of image layers

You can have any number of Image Libraries as map layers, and you can have both Image Library layers and regular image layers in any order. If images overlap, images later in the list display over images earlier in the list, both within an Image Library and within the list of map layers.

You can add a group of images or all of the images in a folder to an Image Library, as long as they have the same map projection, for a new Image Library, or the same map projection as the current images, for an existing Image Library. Maptitude will detect images with different map projections and help you choose just the images with the correct map projection.

▶ To Use the Image Librarian

1. Choose ***Tools-Raster-Librarian*** to display the Image Librarian dialog box.
2. Make choices as follows:



To do this...	Do this...
Create a new Image Library	Choose Create New from the drop-down list, choose a folder, type a file name, and click Save. Maptitude creates the new Image Library.
Load an existing Image Library	Choose File Open from the drop-down list, browse for the Image Library, and click Open. Maptitude displays the images in the Image Library in the scroll list.
Change the Image Library layer name	Click Rename, change the layer name in the New Name text edit box, and click OK. Maptitude updates the layer name and shows it above the scroll list.

To do this...	Do this...
Add images to the Image Library	Click Add, browse to the folder with the images, highlight the image files to add, and click Open. Maptitude adds the images to the scroll list.
Add all images in a folder to the Image Library	Click Add Folder, browse to the folder with the images, and click OK. Maptitude adds the images in the folder to the scroll list.
Drop images from the Image Library	Highlight the images to drop in the scroll list and click Drop. Maptitude drops the images from the scroll list.
Change the order of images	Highlight the images to move and click Move Up or Move Down.

If you are adding more than one image to a new Image Library and the images are not in the same projection, Maptitude displays the Choose the Library Projection dialog box. Highlight a projection in the Projection scroll list to see the images with that projection in the Files scroll list. Click OK to add just those images to the Image Library.

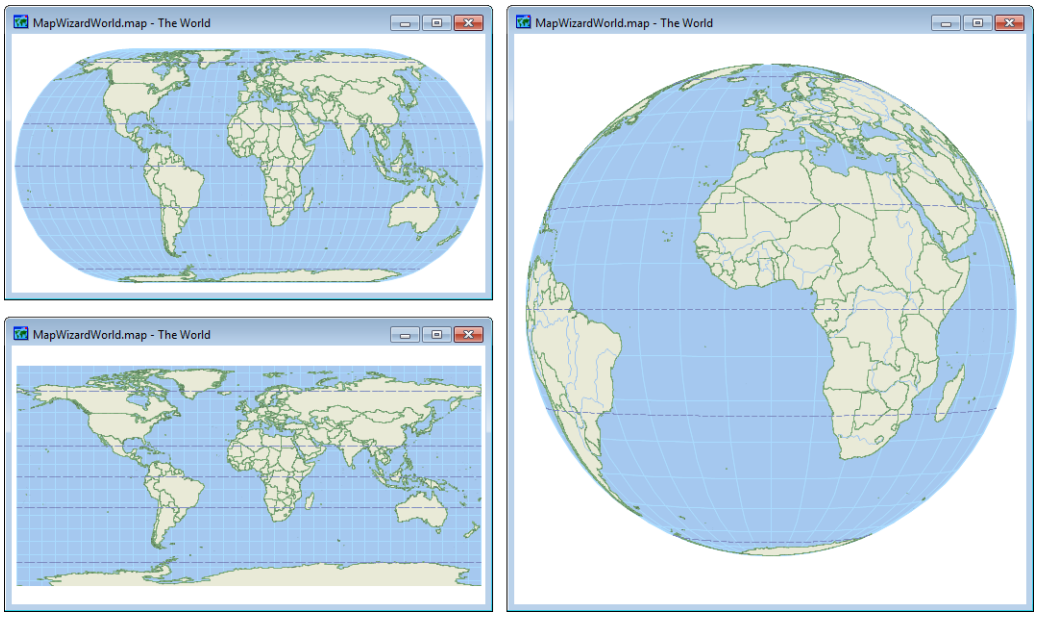
3. If the Image Library is not already a layer in a map, and if the current window is a map, you can quickly add the Image Library as a layer in the current map by clicking Add to Map. You can also use the Map-Layers command to add the Image Library to any map; for more information, see "To Add Layers to a Map" on page 63.

4. You can return to Step 2 to create another new Image Library or open another existing Image Library, and then continue making changes. When you are done, click Close.

Maptitude saves the changes to the Image Library.

APPENDIX E:
Projections and Coordinate Systems

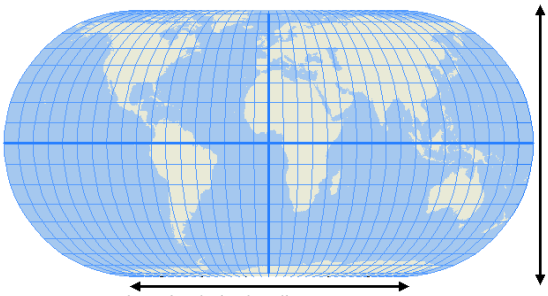
One of the challenges of making maps is to represent the curved surface of the earth on a flat computer screen or a piece of paper. Map makers through the ages have faced this issue, and developed specialized tools for addressing it. First, they developed a common reference system that could be used to identify the location of any point on the surface of the earth. Then they devised methods for taking points on the curved surface of the earth and "projecting" them onto a flat surface. These methods enable map makers to control the distortion that results from creating a flat map of the round earth. This appendix explains how Maptitude works with data stored in hundreds of different coordinate systems that are widely recognized across the United States and around the world.



Locating Points on the Earth

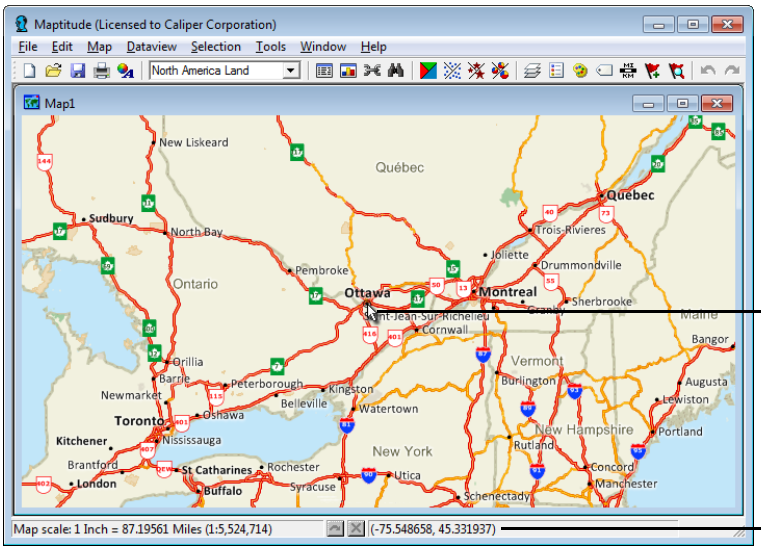
Maptitude stores and reports the locations of map features in degrees of **longitude** and **latitude**. Longitude is a measure of how far east or west the point is from a line called the Prime Meridian. The Prime Meridian is an artificial line that connects the North Pole and the South Pole and runs through Greenwich, near London, in the United Kingdom. Latitude is a measure of how far north or south the point is from the Equator.

Longitude and latitude are measured in degrees. Since there are 360 degrees in a circle, longitude values are between minus 180 degrees and zero in the Western Hemisphere, and between zero and plus 180 degrees in the Eastern Hemisphere. Latitude values are always between minus 90 degrees (the South Pole) and plus 90 degrees (the North Pole).



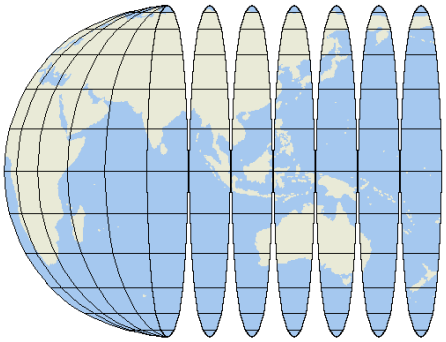
Maptitude stores all location information in geographic files using millionths of degrees of longitude and latitude. This means that locations can be accurate to within just a few inches. When you create new geographic files and add features to them, Maptitude converts the locations you enter using a mouse or digitizer into degrees of longitude and latitude, and stores these values in the geographic file. When you import information from another program into Maptitude, locations are converted automatically to degrees of longitude and latitude.

Whenever you work with a Maptitude map, the longitude and latitude of the cursor are displayed in the status bar at the bottom of the screen. As described in "About Coordinate Systems," later in this chapter, Maptitude lets you display map locations using a variety of coordinate systems other than longitude and latitude. No matter which coordinate system you choose for display purposes, the data in geographic files are always stored in longitude and latitude coordinates.

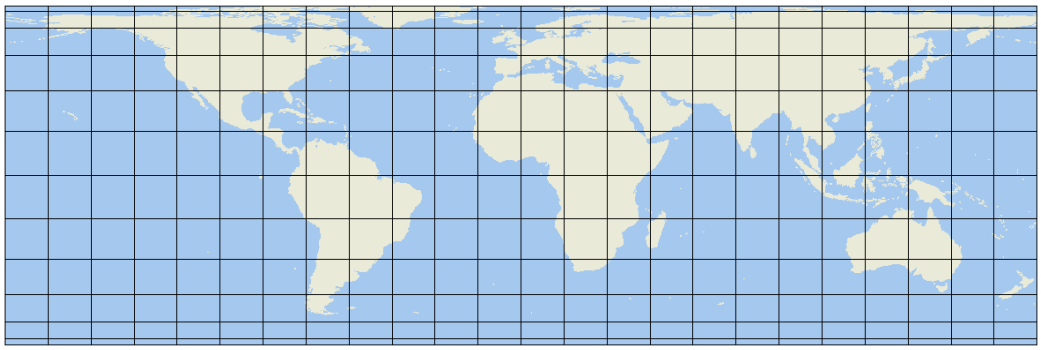


About Map Projections

A map projection is a method for taking the curved surface of the earth and displaying it on something flat, like a computer screen or a piece of paper. There are many different ways of doing this. In the first figure below, the earth is sliced into strips and the strips are laid out flat next to each other. As you can see, the spaces between the strips make it difficult to read.



If we stretch the edges of each of the strips until they meet, we get a map that looks like this:



To make this continuous, flat map of the earth, we stretched, or distorted, certain parts of the map. All flat maps of the earth cause some kind of distortion. The amount and type of distortion depends on the projection that is used.

Automatic Projections

When you use Maptitude, you don't really need to know anything about map projections. Maptitude can choose a projection for each map automatically, and change projections as needed when you change the map scale or center. This means that your maps can always use a reasonable projection that shows the area covered by your map in a sensible way. Any time you want to know what projection is being used on a map, simply look in the Map Properties dialog box.

Choosing a Projection Yourself

When you turn off automatic projections, you have many choices to make and many different projections from which to choose. When a professional map maker thinks about what projection to use for a particular map, the decision is a complicated one that depends largely on two factors:

- The location and size of the area that is shown — Is the map large scale or small scale? Is the area shown on the map near one of the poles, near the equator, or somewhere in between? Is the region covered by the map taller than it is wide, or vice versa?
- The purpose of the map — What is the map intended to show? How will it be used?

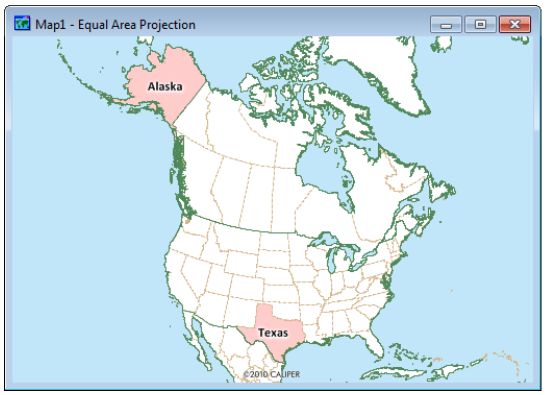
While it is not possible in this manual to give a complete description of all the factors that a map maker might consider, it is possible to discuss a few of the most important properties of certain types of map projections, and to describe why they are desirable. The following table describes three important characteristics that apply to some map projections. Note that there is no map projection with all three of these characteristics.

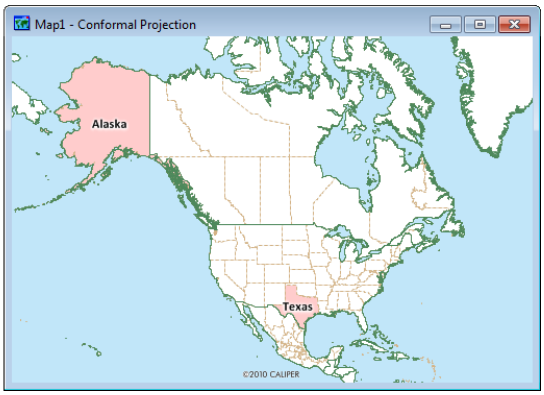
Projection property	What it means	When to use it
Equal area	Regions that are the same size on the earth are the same size on the map	When showing color, pattern, and dot-density themes
Conformal	The general shape and orientation of areas are maintained	When it is important for regions on the map to have the correct shape
Equidistant	The distance between the center point of the map and any other point is correct	When you want to measure distances from the center of the map

When you use automatic projections, Maptitude always selects an equal area projection. This guarantees that you can use color, pattern, and dot-density themes with no distortion of the size of areas on the map.

Examples of Different Projections

Here are two examples of maps that show North America. The map on the left uses an equal area projection, and correctly shows the relative size of regions on the map. Notice that the map correctly shows that Alaska is about twice the size of Texas. However, the shapes of areas on the map are distorted. Alaska is flattened and stretched so that it looks much shorter than it really is.





The map on the right uses a conformal projection, and correctly shows the shapes of areas such as Alaska and Texas. However, the sizes of areas on the map are distorted. Alaska now looks much larger than it really is.

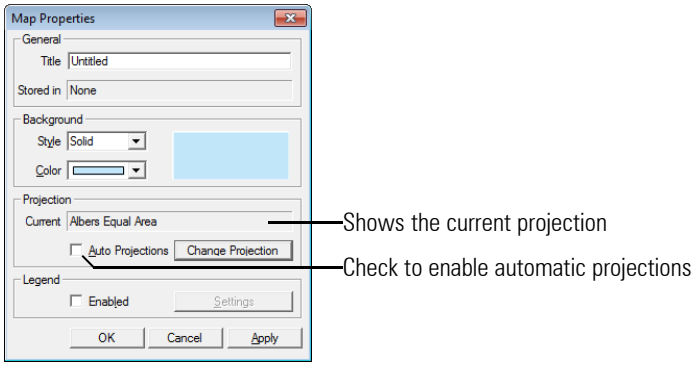
Classes of Projections

Because there are so many different map projections, Maptitude organizes them into classes, where each class includes projections that are useful for maps of particular regions of the earth. This makes it easier for you to experiment with different map projections. The following table shows the classes of projections and the regions in which they should be used:

Class...	Intended use...
U.S. and Canada	Maps that show all or parts of the United States and Canada
The World	Maps that show two or more of the continents, covering a large portion of the surface of the Earth
Equatorial Regions	Maps that show areas located at or near the Equator, usually between -23.5 degrees and +23.5 degrees of latitude (the Tropics of Capricorn and Cancer)
Polar Regions	Maps of areas located at or near the North Pole or the South Pole, below -66.5 degrees latitude or above +66.5 degrees latitude (the Antarctic and Arctic Circles)
Middle Latitudes	Maps of areas that are between the Poles and the Equator, between -66.5 and -23.5 degrees latitude, or between +23.5 and +66.5 degrees latitude

▶ To Choose a Map Projection

1. Choose ***File-Properties***, click on the Standard toolbar, or right-click on the map window and choose ***Properties***, to display the Map Properties dialog box.



2. Make choices as follows:

To do this...	Do this...
Use automatic projections	Check the **Auto Projections** box.
Choose the projection	Remove the check from the **Auto Projections** box and click Change Projection to display the Projection and Coordinate System dialog box. Choose a class of projection from the Class drop-down list, a projection from the Projection drop-down list, and click OK to return to the Map Properties dialog box.

3. Click **OK**.

Maptitude draws the map using the chosen projection.

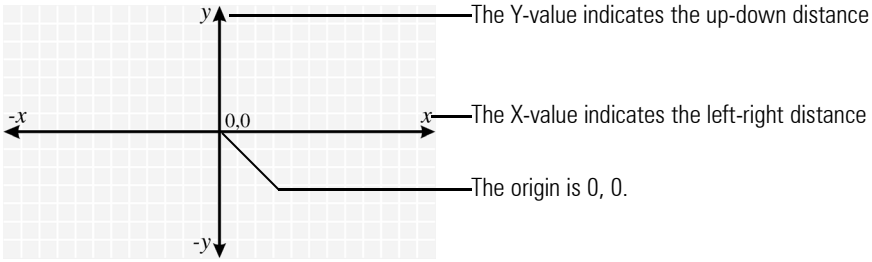
Some map projections cannot be used in certain regions of the world. For example, you can't use the Albers Equal Area projection to show the entire world. If you choose a projection that isn't appropriate for the area contained in your map, Maptitude will choose a different projection instead, just as though automatic projections were enabled. For a complete list of projections and coordinate systems, see *Supported Projections and Coordinate Systems* in the Maptitude Help.

Using Projections with Image Layers

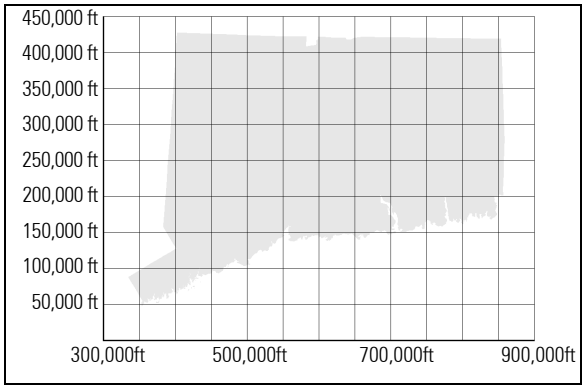
Whenever an image is used as a layer in a map, Maptitude locks the map projection to the projection for the image. Automatic and manual projections are disabled while the image layer is in the map. See "Using Images as Map Layers" on page 140, for more information.

About Coordinate Systems

A **coordinate system** is a method for identifying the location of a point on the earth. Most coordinate systems use two numbers, a **coordinate**, to identify the location of a point. Each of these numbers indicates the distance between the point and some fixed reference point, called the **origin**. The first number, known as the X value, indicates how far left or right the point is from the origin. The second number, known as the Y value, indicates how far above or below the point is from the origin. The origin has a coordinate of 0, 0.



Longitude and latitude are a special kind of coordinate system, called a **spherical coordinate system**, since they identify points on a sphere or globe. However, there are hundreds of other coordinate systems used in different places around the world to identify locations on the earth. All of these coordinate systems place a grid of vertical and horizontal lines over a flat map of a portion of the earth, like this:



A complete definition of a coordinate system requires the following:

- The projection that is used to draw the earth on a flat map
- The location of the origin
- The units that are used to measure the distance from the origin

Maptitude organizes coordinate systems into the following groups:

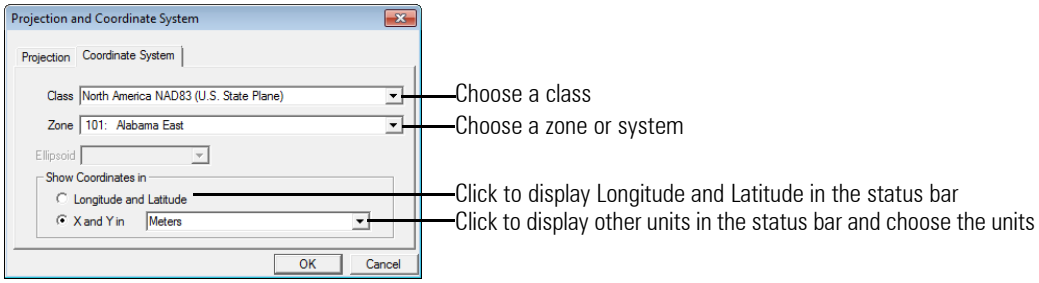
- State Plane and other 1927 North American Datum coordinate systems: a series of over 170 coordinate systems, or Zones, used for maps of various regions in the United States and Canada.
- State Plane and other 1983 North American Datum coordinate systems: a series of over 140 coordinate systems, or Zones, used for maps of various regions in the United States and Canada
- Universal Transverse Mercator (UTM): a series of 60 coordinate systems that use the Transverse Mercator projection. The coordinate systems are intended for small regions worldwide.
- Gauss-Krüger: a series of 60 coordinate systems that use the Transverse Mercator projection. The coordinate systems are intended for small regions worldwide.
- Africa: a series of over 60 coordinate systems.
- Asia: a series of over 45 coordinate systems.
- Australia and New Zealand: a series of over 80 coordinate systems.
- Central and South America: a series of over 70 coordinate systems.
- Europe: a series of over 60 coordinate systems.
- World: Lon/Lat and Web Mercator coordinate systems

All of these coordinate systems measure distances in meters, except for a few Indian subcontinent coordinate systems, and the 1927 State Plane Coordinates, which measure distances in feet. For a complete list of coordinate systems, see *Supported Projections and Coordinate Systems* in the Maptitude Help.

You can display Maptitude geographic files using any one of these coordinate systems. When you do so, you can also choose to see the position of the cursor in the status bar either in the selected coordinate system or in degrees of longitude and latitude.

▶ To Choose a Coordinate System

1. Choose ***File-Properties***, click  on the Standard toolbar, or right-click on the map window and choose ***Properties***, to display the Map Properties dialog box.
2. Make sure that the **Auto Projections** box is not checked.
3. Click **Change Projection** to display the Projection and Coordinate System dialog box.
4. Click the Coordinate System tab and make choices as follows:



5. Click **OK** to return to the Map Properties dialog box.
6. Click **OK**.

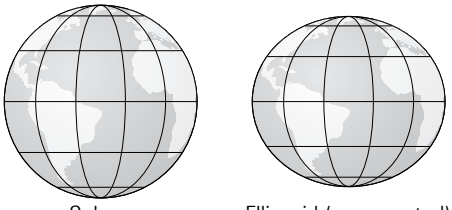
Maptitude draws the map using the chosen coordinate system and the appropriate map projection.

If you choose a coordinate system that is inappropriate for the scale and center of your map, Maptitude displays a message that the coordinate system cannot be used at the current scale and center. If you are looking at a map using a certain coordinate system and you change the map scale or center by a large amount, Maptitude may determine that the one you chose can no longer be used. When this happens, Maptitude chooses the best projection for the area displayed.

Several geographic files are provided to help you determine the correct zone: CCSPCS27.CDF for the 1927 State Plane Coordinate system, CCSPCS83.CDF for the 1983 State Plane Coordinate system, and CCUTM.CDF for the UTM zones.

About Ellipsoids

Ever since it was discovered that the Earth was round, spherical globes have been used to represent the Earth. Unfortunately, the Earth is not really a perfect sphere; it bulges out around the equator and its poles are slightly flattened. A more accurate, but still imperfect, representation of the Earth's shape is an ellipsoid, which is an ellipse rotated around its shorter axis.



Sphere | Ellipsoid (exaggerated)

Different reference ellipsoids have been used for surveying various regions of the world, such as the Clarke 1866 ellipsoid for North America and the Airy ellipsoid for Great Britain. Until recently, the ellipsoids were often chosen to give a "best fit" for a particular region, with little concern for how well they represented the remainder of the Earth. This minimized the local positional errors but led to the creation of incompatible maps that are difficult to stitch together into a worldwide geographical dataset.

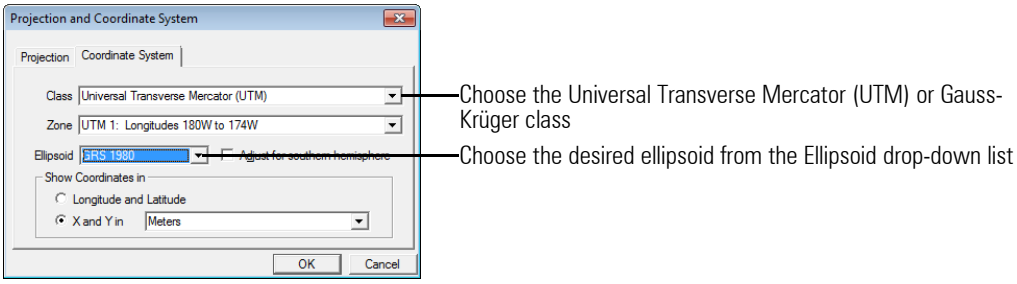
In the later part of the twentieth century, new geocentric ellipsoids (e.g. GRS80, WGS72, and WGS84) were defined to make worldwide mapping feasible. The new ellipsoids are centered at the Earth's center and attempt to minimize the overall distortion for the entire planet. The resulting model is suitable for worldwide mapping, but creates slight positional errors in certain regions.

Many of the coordinate systems supported by Maptitude specify a particular ellipsoid in their definition. For example, the NAD27 State Planes use the Clarke 1866 ellipsoid and the NAD83 State Planes use the GRS80 ellipsoid. General worldwide coordinate systems such as Universal Transverse Mercator (UTM) and Gauss-Krüger are defined independent of the ellipsoid. For these coordinate systems, Maptitude lets you choose the proper ellipsoid.

▶ To Choose an Ellipsoid

1. Choose ***File-Properties***, click on the Standard toolbar, or right-click on the map window and choose ***Properties***, to display the Map Properties dialog box.
2. Make sure that the **Auto Projections** box is not checked.
3. Click **Change Projection** to display the Projection and Coordinate System dialog box.

4. Click the Coordinate System tab and make choices as follows:



5. Click **OK** to return to the Map Properties dialog box.
6. Click **OK**.

Maptitude draws the map using the chosen coordinate system and ellipsoid.

Datum and Coordinate System Conversions

Maptitude always stores geographic data using longitude and latitude coordinates, even if you choose to display other coordinates in the status bar.

You can easily import data created in another coordinate system into Maptitude, or export geographic data from Maptitude to files that use other coordinate systems. For more information, see "Using Data in Other Coordinate Systems" on page 463. Maptitude also lets you perform conversions between the various datums that are used to define longitude and latitude. For more information, see "Advanced Coordinate Conversion" on page 465.

Displaying XY Coordinates

You can display the XY coordinates for a point layer in a map that is displayed with a coordinate system. The ***Dataview-Tools-Coordinate to XY*** command adds two formula fields, X and Y, to a dataview for the point layer. The formula fields have the following formulae:

```
X = a2r(MapCoordToXY(, coord(Longitude, Latitude)), 1)
Y = a2r(MapCoordToXY(, coord(Longitude, Latitude)), 2)
```

If you change the coordinate system for the map, the X and Y formula fields will be automatically updated.

▶ To Display XY Coordinates

1. Make sure that the map is being displayed with a coordinate system by choosing ***File-Properties***.
2. Choose a point layer from the drop-down list on the Standard toolbar.
3. Choose ***Dataview-Tools-Coordinate to XY***.

Maptitude displays a dataview for the point layer with the X and Y formula fields.

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