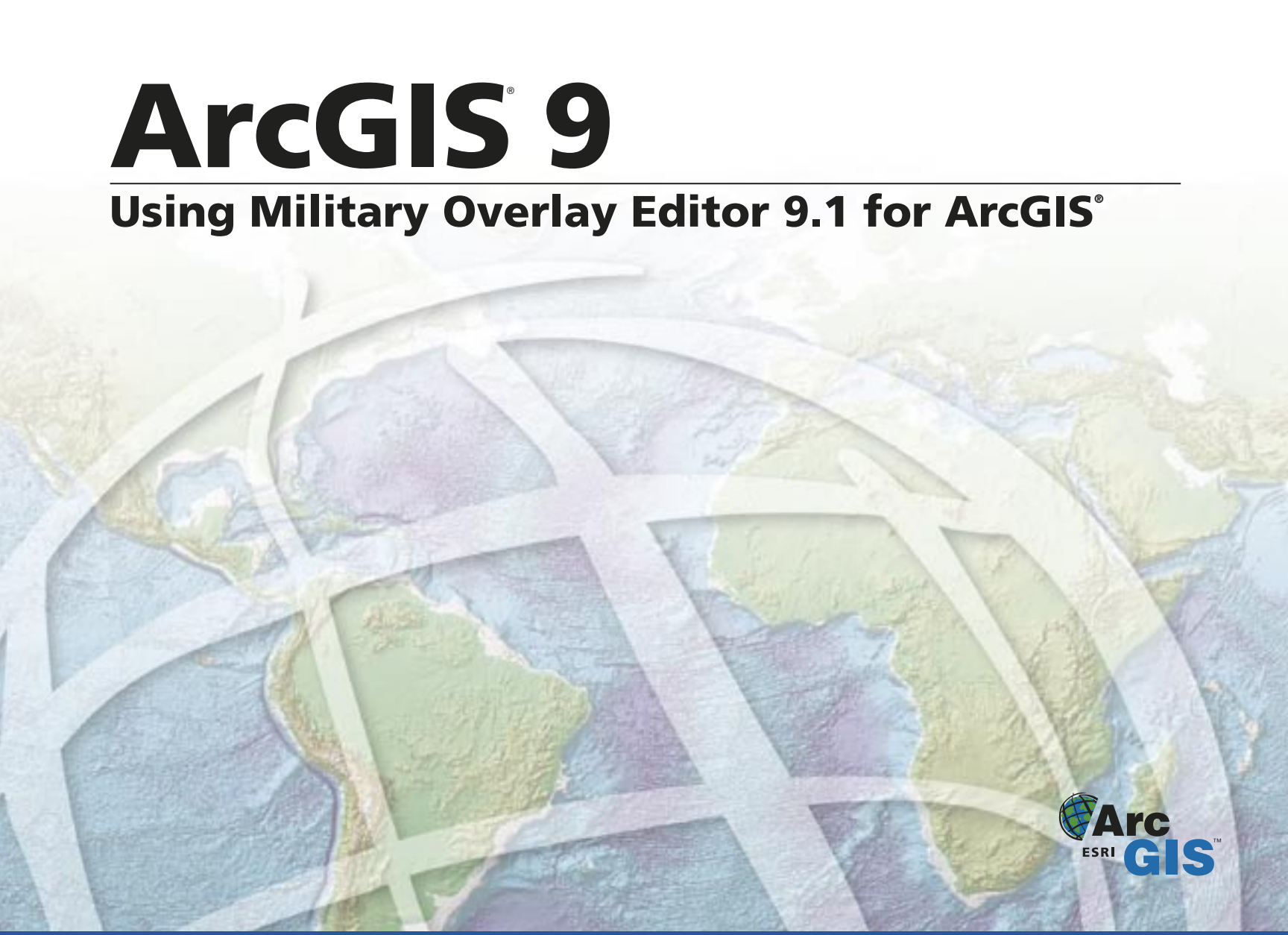
ArcGIS® 9

Using Military Overlay Editor 9.1 for ArcGIS®



ESRI ArcGIS™

GIS by ESRI™

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Introducing MOLE

1

IN THIS CHAPTER

- **What you get with the MOLE software application**
- **Getting started with MOLE**
- **Symbol ID code**
- **The MOLE Symbol Editor**
- **The Military Overlay Editor toolbar**
- **The Layer Properties dialog box**

Military Overlay Editor (MOLE™) 9.1, developed by ESRI for ArcGIS®, allows you to easily create, display, and edit military symbology in your maps. It enhances the effectiveness of your command and control (C^2) and mission planning applications by combining the spatial analysis capabilities of ArcGIS with common war fighting symbology of the Department of Defense (DoD) MIL-STD-2525B specification.

MOLE is part of the Military Analyst suite, a set of applications designed to meet the specialized needs of defense and intelligence communities.

This chapter introduces you to MOLE and the primary user interface items you work with in MOLE, such as the Military Overlay Editor toolbar and the MOLE Symbol Editor. It also provides a description of this book and the MOLE documentation set and lists additional ways to get help.

What you get with the MOLE software application

MOLE is a software application you can install with or without an ArcGIS application. As an end user, you can use the MOLE application with ArcGIS applications to create, work with, and distribute operation planning maps that adhere to MIL-STD-2525B.

As a developer, you can use the MOLE application as a base application to customize or as a way to see examples of much of the functionality available through the MOLE application programming interface (API). In these cases, you'd want to install MOLE with an ArcGIS application. However, you can also install MOLE independently of ArcGIS, for example, if you want to build MOLE applications from the ground up.

The MOLE application comes with a file converter geoprocessing tool, a documentation set, a tutorial that highlights the most common functionality, sample data, and a software developer kit (SDK). These items are described in the following sections.

The Add MOLE Fields geoprocessing tool

The Add MOLE Fields geoprocessing tool allows you to convert one file format to another. For example, you can convert a shapefile to a MOLE personal geodatabase.

The MOLE documentation set

The MOLE documentation set is automatically installed when you install MOLE. It's also accessible directly from the CD so you can access it without installing MOLE.

This section describes the MOLE documentation components. Because most high-level conceptual information about MOLE is in the end user documentation, a great place to start if you're new to MOLE is the end user documentation, which focuses on the MOLE out-of-the-box functionality and user interface.

To learn the basics, start with Chapter 2 of this guide. Chapter 2 is a tutorial that walks you through the most common MOLE tasks and provides tips along the way to help reinforce MOLE concepts. MOLE comes with the data used in this tutorial, so you can follow along step-by-step at your computer.

If you're new to geographic information system (GIS) software, take some time to familiarize yourself with ArcMap™ and ArcCatalog™. The guides *Using ArcMap* and *Using ArcCatalog* contain tutorials to show you how to make maps and manage GIS data.

For end users

- This guide, *Using Military Overlay Editor for ArcGIS,* is installed to Military_Overlay_Editor_9_User_Guide.pdf in the <MOLE Installation Directory>\Documentation directory. It describes how to use MOLE to display and edit symbology. Although you can read this book from start to finish, you'll likely use it more as a reference. When you want to know how to do a particular task, such as creating MOLE feature classes, look it up in the table of contents or the index. Some chapters also include detailed information that you can read if you want to learn more about the concepts behind the tasks.
- MOLE help system—Provides essentially the same information that's in this guide with two main exceptions: (1) the help system has fewer illustrations and does not include the tutorial and (2) the help system provides popup links to glossary definitions. Like this guide, the help system allows you to perform full-text searches on the content. It is an HTML-based help system (a .chm file).
- Help for the Add MOLE Fields geoprocessing tool—To access this help, after you add this tool, click Show Help in the tool. For information on getting started with the tool, see Chapter 7, 'MOLE geoprocessing tools'.

- The readme file (readme.htm)—Gives getting started information, such as system requirements, installation steps, and release notes. Access it from the top level of the MOLE directory on the Military Analyst Suite CD.

Help search tips

- Access the MOLE help through the ArcGIS Desktop Help if you want to see ArcGIS topics in the index and searches you perform (Help > ArcGIS Desktop Help). If you want your searches and index viewing to be focused on MOLE help topics only, open the MOLE help by double-clicking the moleUser.chm shortcut in the <MOLE Installation Directory>\Documentation directory.

  If you open the MOLE help from inside ArcGIS Desktop Help, you can view only MOLE topics in the search results by clicking the column heading Location, then scrolling down to MOLE under that heading.

Help index tips

- For an additional level of indexed MOLE terms, open <MOLE Installation Directory>\Documentation\moleUser.chm, then click the Index tab.
- To view MOLE indexed terms incorporated with ArcGIS terms, open MOLE help from within ArcGIS Desktop Help. Most MOLE keywords are under the MOLE index entry, but you don't get both levels of keywords when you open the index this way.

For developers

Descriptions of the developer documents that come with MOLE follow. A list of items included in the SDK is provided in the right column under 'The MOLE SDK'.

- *Programmer's Reference for MOLE*—Documents all the classes, interfaces, and members in the MOLE API. It includes overviews of the classes/libraries, descriptions, remarks, and sample code. It is also known as component help or class help.

  The contents of this reference can be accessed several ways, depending on your development environment. To view and search through the entire contents, regardless of environment, use esriMOLE.chm and esriMOLEUI.com. You can open them after you've installed MOLE by navigating to them in the <MOLE Installation Directory>\DeveloperKit directory.
- Object Model Diagram for MOLE—Provides a visual overview of the MOLE API. It illustrates all the public classes, interfaces, enumerations, and main relationships between the classes. You can open it after you've installed MOLE by navigating to MOLE_ObjectModel.pdf in the <MOLE Installation Directory>\DeveloperKit directory.

Sample data

Sample data is installed to the <MOLE Installation Directory>\Tutorial directory. This directory includes sample databases, sample shapefiles, sample .mxd files, sample data to use with ArcGIS Tracking Analyst functionality, and a blank MOLE database template.

The MOLE SDK

The MOLE SDK includes a programmer's reference (API documentation), an object model diagram, sample code, sample applications, and tutorial-like scenarios.

You also have access to online information on MOLE, such as discussion groups and Web versions of MOLE user help and developer documentation.

Sample applications for developers are installed to the <MOLE Installation Directory>\DeveloperKit directory. The directory includes samples in Visual Basic®, C++®, .NET®, and Java™.

For details on developer documentation, see 'For developers' in the left column of the previous page.

Contacting ESRI

If you need to contact ESRI for technical support, refer to 'Contacting Technical Support' in the 'Getting more help' section of the ArcGIS Desktop Help system. You can also visit ESRI on the Web at *www.esri.com* and *support.esri.com* for more information on MOLE and ArcGIS.

ESRI education solutions

ESRI provides an instructor-led MOLE developer training course in addition to educational opportunities related to geographic information science, GIS applications, and GIS technology. You can choose from among instructor-led courses, Web-based courses, and self-study workbooks. To find educational solutions that fit your learning style, visit *www.esri.com/education*.

Getting started with MOLE

MOLE is strict in its adherence to the MIL-STD-2525B specification. It provides symbols—MOLE graphics—for:

- Appendix A
  Force elements (symbols for military units—for example, a symbol for Company A, 1st Battalion of the 135th Infantry—equipment and installations)
- Appendix B
  Tactical graphics (operational graphics such as planned routes and obstacles)
- Appendix C
  Meteorology and oceanographic symbols (METOC)
- Appendix D
  Signals and intelligence (SIGINT)
- Appendix E
  Military operations other than war (MOOTW)

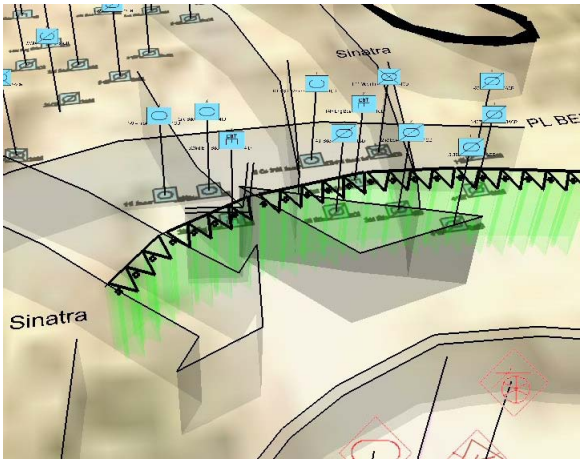
You can store your MOLE symbology layers as feature classes in geodatabases or shapefiles. MOLE is compatible with other ESRI® GIS products as well, including ArcGlobe™, ArcIMS®, ArcGIS Military Analyst, and ArcGIS Tracking Analyst.

Developers can customize MOLE or extend its out-of-the box functionality using its SDK.

Overview of MOLE features

With MOLE out of the box you can:

- Polish your maps; simplify your tasks—MOLE allows you to use a set of predefined rules to group symbols into stacks or leader lines. You can use these rules to deconflict symbols and improve the readability of your map as well as to simplify your tasks by working with groups (for example, groupings by echelon or groups you create) instead of individual symbols. The MOLE symbol editor centralizes your tasks and helps you quickly construct your symbols or your 15-character symbol identifiers. You can also use copy and paste to copy symbols to your operating system's clipboard and reuse them in other applications such as Microsoft PowerPoint and Microsoft Word.
- Use existing databases—You can import and display existing order of battle databases in accordance with the MIL-STD-2525B specification; you can create and edit corresponding symbols and attributes.
- MOLE allows you to symbolize data from tracking information using the ArcGIS Tracking Analyst extension and ArcGIS Tracking Server.
- Leverage ArcGIS functionality—You can use MOLE maps and functionality in most ArcGIS software applications. For example, you can use MOLE with ArcSDE® and ArcGlobe. You can serve maps to users over the Internet using ArcIMS.



The map display area in ArcGlobe showing billboarded and draped force elements and extruded tactical graphics

- Increase efficiency—The MOLE feature-rich symbol editor, which includes a dynamic preview pane, doubles as a training tool to help you quickly become familiar with the details of MIL-STD-2525B. The preview pane allows you to instantly see how different values in the 15-character code affect the appearance of the symbol.
- Provide lifelike views of battlefield scenarios using MOLE in ArcGlobe—A clear and accelerating trend is for mission applications to have three-dimensional displays. MOLE has extended the capability to view MIL-STD-2525B symbols to ArcGlobe.

MIL-STD-2525B

The DoD Military Standard 2525B, or MIL-STD-2525B, is a specification document that describes how military symbols should behave and display on maps.

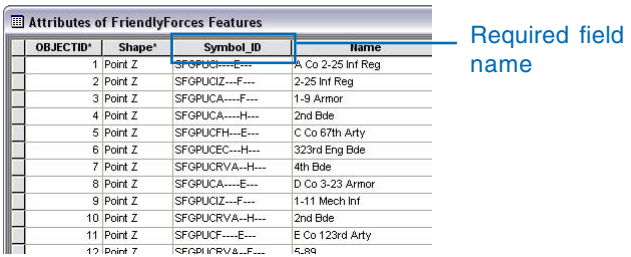
MIL-STD-2525B provides a way for military staff to interpret situation maps quickly for effective decision making. For example, by looking at a force element symbol on a MOLE map, you can quickly tell how big the unit is, if it has mobility, if it is friendly or hostile, and so on.

MOLE was designed to provide a map-based software application that implements this specification. Central to MIL-STD-2525B—and, therefore, MOLE—is the Symbol ID code. This code provides the information necessary to display or transmit a military symbol between MIL-STD-2525B-compliant systems. The characters and numbers that make up the code provide critical information about the war fighting element the code represents: how big the unit is, if it has mobility, if it is hostile, and so on. MOLE takes the information provided in the code and any additional information you provide in attributes and renders the war fighting element as a symbol in ArcGIS.

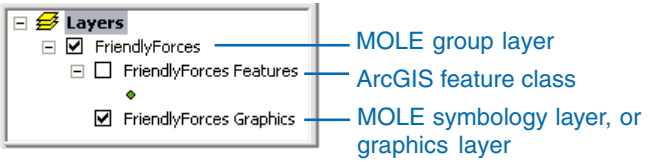
MOLE features and layers

MOLE features and layers are very similar to ArcGIS layers. The main differences are:

- MOLE features and layers must contain a Symbol_ID field to be recognized by MOLE. All other fields MOLE requires for you to take full advantage of all of its functionality can be mapped to your dataset's existing field names.



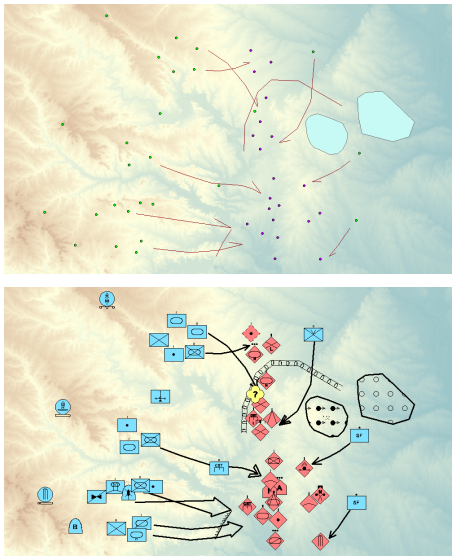
- MOLE stores its data in group layers. Each group layer contains two layers: a symbol layer, also known as a graphics layer, and its associated feature layer. In this way, MOLE is said to *overlay* graphics on features.



The ArcMap table of contents

MOLE graphics can be contained in shapefiles, coverages, and personal or multiuser geodatabases. Tables containing a Symbol_ID field with valid codes can be converted to a feature class, and MOLE will display the appropriate military symbols. When MOLE data is added to ArcMap or ArcGlobe, a group layer

is created containing a feature layer and a graphics layer. The feature layer contains the feature MOLE is symbolizing. The graphics layer contains the symbol that is constructed for that feature, which is based on the Symbol_ID field.



The figures to the left illustrate the two components of a MOLE group layer. The top figure shows how the underlying MOLE features appear without the MOLE symbology. These are the skeletons of the MOLE graphics. The bottom figure shows the MOLE symbology overlayed on the features. You can move the graphics independent of the features; a graphic does not always have to be on top of its feature.

MOLE graphics

MOLE uses four graphic types—or symbol types: force elements, tactical graphics, stacks, and leaders. Nearly every MOLE function centers around the rendering of force elements, tactical graphics, or groups of force elements. Force elements are always point features; tactical graphics can be points, lines, or areas.

MOLE uses the term graphic in place of symbol to reinforce three main distinctions between ArcGIS symbols and MOLE graphics:

- ArcGIS stores symbols and features as one layer, while MOLE stores them as separate layers in a group layer—a graphic layer and a feature layer in a MOLE group layer.
- MOLE symbology includes leaders and stacks—symbol-like elements that differ slightly from typical ArcGIS symbols. Leaders and stacks represent groups of force elements. Force element graphics can be displaced from the actual feature using leaders and stacks.
- MOLE attribute data[1] (labels) is part of the graphic.

Force elements are point features that represent military units, installations, and equipment. Tactical graphics can be points, lines, or areas, and they represent command/control and mission planning features.

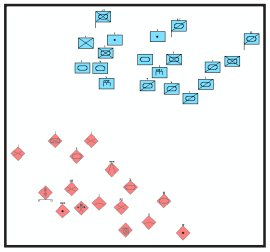
MIL-STD-2525B defines force elements as "point objects that present information that can be pinpointed in one location at a particular point in time. A [force element] is composed of an icon, frame, and fill and may include additional [attributes]. The components provide information about the symbol's affiliation, battle dimension, status, and mission. The size and shape of a symbol are fixed and remain constant, regardless of the scale of the background projection, unless changed by the operator."

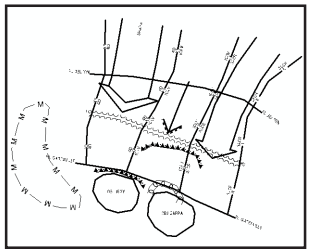
MIL-STD-2525B defines tactical graphics as "point, line, and area objects that are necessary for battlefield planning and management, but cannot be presented as [force elements] alone. Tactical graphics can delineate responsibilities and missions, provide guidance, establish control measures, and identify items of interest. A tactical graphic is composed of an icon and may include additional attributes. The size and shape of the point graphics remain fixed, while the size and shape of the line and area graphics are determined by drawing

[1] Except the Symbol_ID attribute

parameters provided by the operator and the scale of the background on which the graphic is placed."

The figure below to the left illustrates force elements; the figure to the right shows tactical graphics.





Use your existing attribute data (labels) in MOLE

Attribute table data for a MOLE graphic appears as text (labels) around the graphic in the map display. Because nearly all other data MOLE uses is derived from the Symbol ID code, once you have a Symbol ID code in your data, the only other task left is to get your existing MIL-STD-2525B attribute data, or labels, into MOLE.

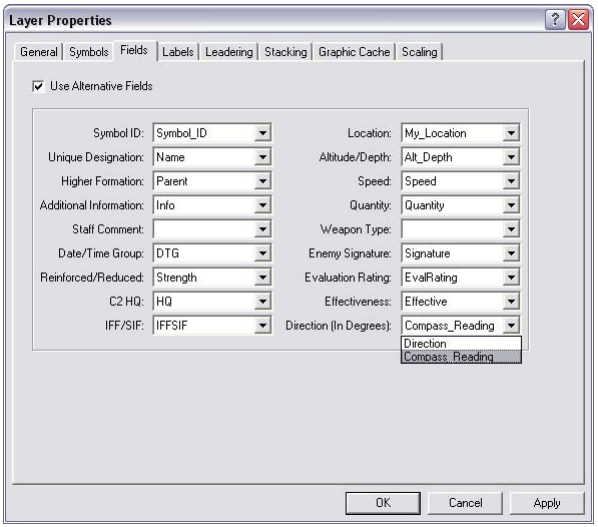
However, because MOLE cannot read datasets that don't have a field named Symbol_ID, your first task is to add a Symbol_ID field to your data if it's not already there. The field must be named Symbol_ID, it must be 15 characters long, and it must have a type of Character.

Once your dataset has the Symbol_ID field, you can open it in MOLE and use MOLE to map your other attribute field names to MOLE field names. For MOLE to recognize point features as force elements, the point features must have a Parent field. For a list of other field requirements, see Chapter 3, 'Creating a MOLE geodatabase'.

To map your attribute field names to MOLE field names:

1. If you haven't already, add the Symbol_ID field to your data as explained above, then open it in ArcMap. In the ArcMap table of contents (TOC), right-click the MOLE graphics layer, then click Properties.
2. On the Layer Properties dialog box, click the Fields tab.
3. Check Use Alternative Fields.

   If you're using some MOLE field names already, those will populate in the text boxes. All other field names used in your data will be selectable in the text boxes.



4. Click the dropdown arrow for the first field you would like to map, then choose the new field name for it. Repeat this step for all field names you want to map.
5. Click OK.

MOLE is ready to use your existing field names. The mapping of field names you performed in this procedure persists (is saved in the .lyr or .mxd file).

For MOLE attribute data field descriptions, see Chapter 3, 'Creating a MOLE geodatabase'.

Starting with a shapefile

You can use MOLE with shapefiles, but it is recommended you use MOLE with geodatabases (personal or multiuser) whenever possible. Using MOLE with geodatabases not only lets you take advantage of the functionality offered by the ArcGIS geodatabase data model, but it can also automate MOLE feature class creation tasks for you.

You can use an existing shapefile with MOLE if you first make edits to its attribute table. The bare minimum edits are:

- For force elements—the geometry type must be point, and the following fields must be present:

  Field: Symbol_ID
  Type: Character
  Length: 15

  Field: Parent
  Type: Character
  Length: 15

- For tactical graphics—the geometry type can be point, line, or polygon and the following fields must be present:
  Field: Symbol_ID
  Type: Character
  Length: 15

Adding the 15-character field named Symbol_ID to the attribute table allows MOLE to recognize the data source.

If you want to work with force elements as well, you must also add a field named Parent for those. The Parent field tells MOLE that a point feature that has a Symbol_ID is a force element and not a point tactical graphic.

Once you've performed the edits, you can bring your shapefile into an ArcGIS application, such as ArcMap, by using the Add MOLE Data button.

For MIL-STD-2525B attribute data (text labels), MOLE requires you to use certain field names or map your existing field names. For more information, see the previous section, 'Use your existing attribute data (labels) in MOLE.'

Creating new shapefiles for use with MOLE on non-Windows platforms

You may want to create a new shapefile for use with MOLE on non-Windows platforms such as Linux or Solaris. You can use any MOLE personal geodatabase or you can use the MOLE_BLANK sample database included with the tutorial data installed with MOLE.

1. Open MOLE_BLANK.mdb in ArcCatalog by navigating to <MOLE Installation Directory>\Tutorial\MOLE_Databases.
2. In the left pane of ArcCatalog, double-click MOLE_BLANK.mdb, then click the feature class you want to copy.
3. Right-click the feature class and click Export to Shapefile (single).
4. On the Export to Shapefile dialog box, browse to your destination directory and give your shapefile a name.
5. Keep all the Field Info and Output options as the defaults.
6. Click OK to create a new, empty shapefile that is ready for MOLE.

Once the new shapefile is created, you can use it on any supported platform as you would any MOLE database.

How MOLE identifies features it can use

When working with shapefiles in MOLE, it's helpful to understand how MOLE identifies that features are MOLE layers—that is, that they can have MOLE functions performed on them.

When MOLE reads data to determine if it's a MOLE layer (for example, when you use the Add MOLE Data button on the MOLE toolbar) it first reads the feature's geometry type, then looks for a Symbol_ID field. If the geometry type is a point and the Symbol_ID field is present, MOLE looks for a Parent field. If a Parent field is present, MOLE identifies the feature as a force element. However, if it doesn't find a Parent field, it identifies the feature as a point tactical graphic.

If MOLE reads the geometry type and finds a line or an area, it checks for the Symbol_ID field. If the Symbol_ID field is present, MOLE identifies the feature as a line or area tactical graphic.

Once MOLE has identified the feature as a force element or point, line, or area tactical graphic, it applies the appropriate renderer to it.

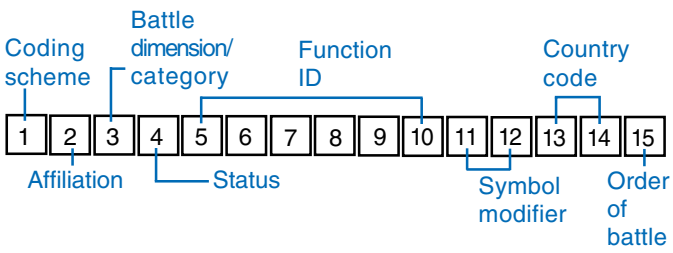
Symbol ID code

Central to MIL-STD-2525B—and, therefore, MOLE—is the Symbol ID code, a 15-character identifier. The characters and numbers that make up the code provide critical information about the war fighting element the code represents: how big the unit is, if it has mobility, if it is hostile, and so on. MOLE takes the information provided in the code and any additional information you provide in attributes and renders the war fighting element as a symbol in ArcGIS.

The presence of this code in a field named Symbol_ID in a dataset allows you to open and use the dataset in MOLE.

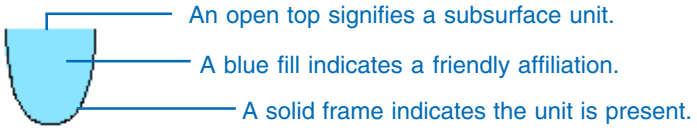
How MOLE renders the symbol based on the Symbol ID code

Each character or group of characters in the Symbol ID code gives information about,an attribute of, the war fighting element. For example, the second character in the code tells whether the war fighting element is friendly or hostile.



Each of these attributes has a corresponding visual component that can be drawn or rendered on a map. For example, if the second character is F, the war fighting element is friendly, and MIL-STD-2525B says friendly should be represented by a blue fill. When several of these components are rendered by MOLE for one war fighting element, they make a complete symbol.

To illustrate, the following image provides a complete symbol with its visual, or graphic components, described.



If you saw the above symbol on a map, you'd know that it represents a present, friendly, subsurface force element.

The valid values for these attributes (for example, F is a valid value for the affiliation attribute) are given in MIL-STD-2525B but are also excerpted from MIL-STD-2525B in the following tables.

Attribute values for force element symbols

Coding scheme	Affiliation	Battle dimension	Status
S - war fighting G - tactical graphic W - METOC I - intelligence M - mapping (for future use) O - military operations other than war	P - pending U - unknown A - assumed friend F - friend N - neutral S - suspect H - hostile J - joker K - faker O - none specified	P - space A - air G - ground S - sea surface U - sea subsurface F - SOF X - other (no frame)	A - anticipated/ planned P - present
Function ID	**Symbol modifier**	**Country code**	**Order of battle**
Describes the specific function of a symbol. See MIL-STD-2525B for values.	Describes the echelon, mobility, equipment, or installation characteristics of a symbol. See MIL-STD-2525B for specific values.	See FIPS Pub series 10.	A - air E - electronic C - civilian G - ground N - maritime S - strategic force related

Attribute values for tactical graphic symbols

Coding scheme	Affiliation	Category	Status
S - C^2 symbology; units, equipment, and installations G - C^2 symbology; military operations W - METOC I - intelligence M - mapping (for future use) O - military operations other than war	P - pending U - unknown A - assumed friend F - friend N - neutral S - suspect H - hostile J - joker K - faker O - none specified	T - tasks G - C^2 and general maneuver M - mobility/ survivability F - fire support S - combat service support O - other	A - anticipated/ planned P - present
Function ID	**Echelon/size**	**Country code**	**Order of battle**
See MIL-STD-2525B for values.	See MIL-STD-2525B for values.	See FIPS Pub series 10.	X - control markings

Special considerations for attribute values

- MOLE handles the Function ID attribute differently for force element graphics than it does for tactical graphics. For more information, see the MOLE developer documentation.
- MIL-STD-2525B often uses one or more asterisks (*) in sample Symbol ID codes to signify that any valid MIL-STD-2525B character can be used in that location. It is important to keep in mind that these are sample codes only; neither MIL-STD-2525B nor MOLE supports use of asterisks in Symbol ID codes. MOLE does not recognize an asterisk as a valid character. If you want to indicate that a character in the Symbol ID is unknown, use a hyphen (-) instead. For example, if you know the coding scheme is S, affiliation is F, battle dimension is G, and no other properties, you'd use hyphens for the other characters so your Symbol ID code would be:

S F G - - - - - - - - - - - -

and not S F G * * * * * * * * * * * *

The MOLE Symbol Editor

The MOLE Symbol Editor allows you to edit and preview a MOLE graphic (symbol), preview graphic components, search for MOLE force elements and tactical graphics, and add and edit MIL-STD-2525B labels. One of its most helpful features is that it allows you to add graphics—that is, allows you to fill in information about a graphic after you add it. It simplifies your graphic adding tasks by providing a library of all MOLE graphics and an easy way to build MIL-STD-2525B-compliant graphics from scratch. It prevents you from generating incorrect Symbol ID codes and from exceeding the default character limit for labels.

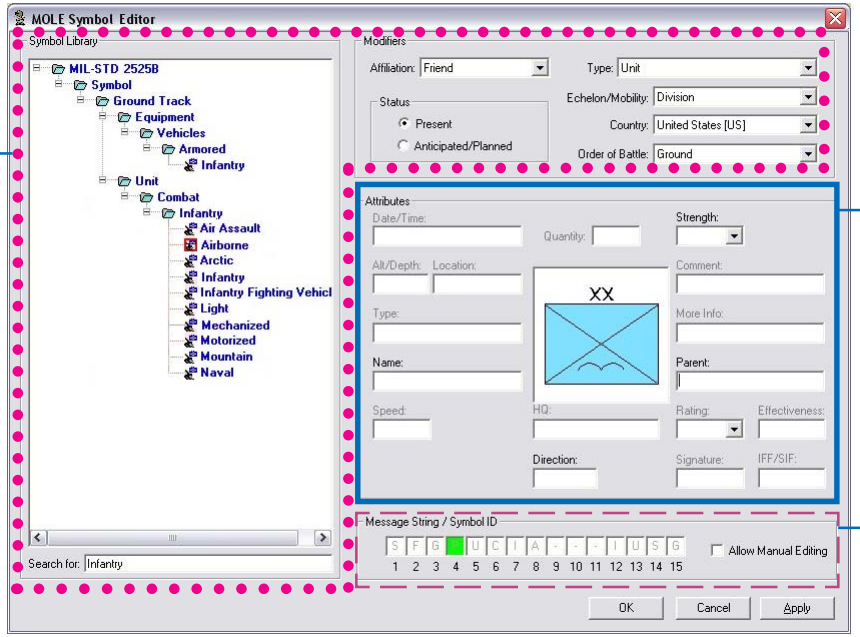
The MOLE Symbol Editor displays information for a single graphic, or, if no information is available yet for that graphic, it displays empty fields for you to populate.

Open the editor in ArcMap by clicking  on the Military Overlay Editor toolbar.

It is helpful when learning to use MOLE to have a basic understanding of where MOLE gets its information to render graphics—or where it stores its information if you are using MOLE to build your graphics from scratch. The main areas of the MOLE Symbol Editor reflect these sources, or storage areas, as described in the following illustration.

Area 1
Outlined in • • •

This area is derived from/stored in the Symbol ID code (MOLE's Symbol_ID field). Changes you make in Area 3 are reflected here.



Area 2
Outlined in ———

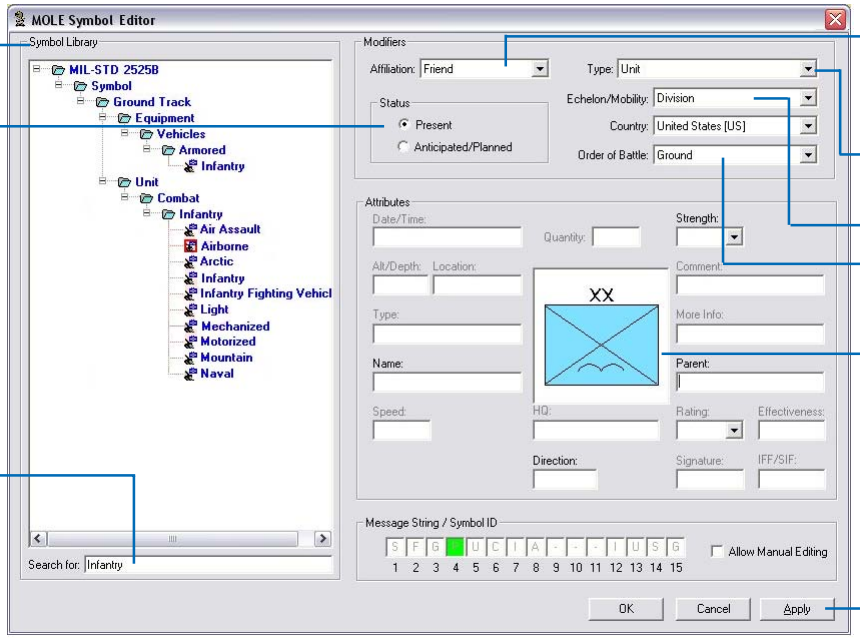
This area is derived from/stored in the attribute table. Text boxes in this area correspond to labels around the graphic. Their positions here reflect their positions around the symbol in the map display.

Area 3
Outlined in — — —

This area is the Symbol ID code. Changes you make in Area 1 are reflected here. Check Allow Manual Editing to change Symbol ID code characters (values) in your database directly from the MOLE Symbol Editor.

When you create a MOLE geodatabase in ArcCatalog and populate it according to instructions in Chapter 3, 'Creating a MOLE geodatabase', the MOLE Symbol Editor is available in ArcMap. If your MOLE features are stored in shapefiles or simple feature classes in a geodatabase, you must use the standard ArcMap Attributes dialog box to edit MOLE attribute data (and the Symbol ID code, which is also an attribute in the table).

The editor differs slightly for force elements and tactical graphics, but its controls are the same and serve the same functions for both. The main difference is that the tactical graphic version groups the graphic components according to the type of military operation, whereas the force element version groups according to battle dimension. Also, the tactical graphic version has symbol display characteristics and fewer modifiers. Tactical graphic categories include tasks, command/control and general maneuver, mobility/survivability, fire support, combat service support, and others. Force element battle dimensions include air, ground, sea subsurface, sea surface, space, and special operations forces.



Contains all MOLE symbols.

Indicates whether the element is located at its identified position or is anticipated to be there in the future.

With each character you type in this search box, MOLE updates the Symbol Library window above it to display all items that match the letters you've typed.

The threat presented by element. Values include friend, hostile, neutral, and unknown.

Values (force element only) include: headquarters, dummy, task force, and installation.

The command level and mobility.

Supplementary information about the role of a symbol in battle.

Preview window—updates to show the symbol as you make changes to it in the editor. This symbol represents a friendly infantry unit (force element).

Applies your changes to the map display. If Allow Manual Editing is checked, the changes are also applied to the database.

Labels and MOLE attribute data

MOLE derives labels for your graphics from MOLE attribute data. Aside from the Symbol_ID attribute and a few attributes required by ArcGIS, such as Shape, all MOLE attribute data is used for labels.

You can add and edit this attribute data in the MOLE Symbol Editor or in the attribute table. As explained earlier in this chapter, you can also use existing attribute data for labels. When you add an attribute (a label), MOLE positions it around the graphic in accordance with MIL-STD-2525B position descriptions. For example, if it is a date/time group label for a force element, MOLE places it up and to the left of the graphic.

In the MOLE Symbol Editor, you modify attributes of an individual symbol; however, the visibility of an attribute is a property of the layer, not the individual symbol. You can control the visibility using the Layer Properties dialog box.

The MOLE Symbol Editor uses a visual cue—black and gray text on the text box labels—to alert you to which attributes have their visibility turned on or off in the layer. If the label's text is black, the visibility is turned on. If gray, it is turned off.

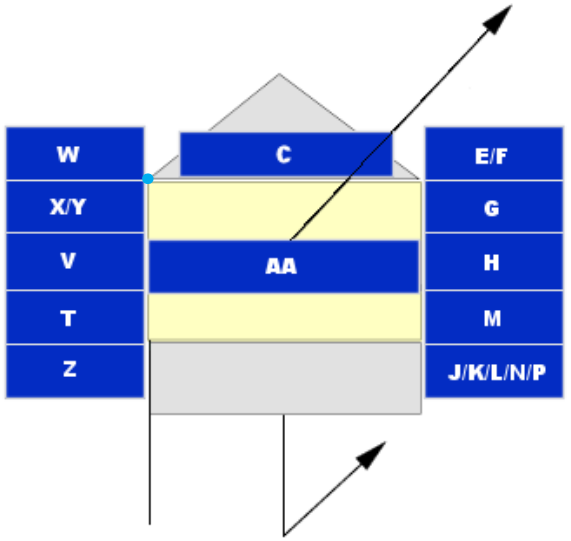
For more information on MOLE attribute data, see 'Attribute data field descriptions' in Chapter 3.

Force element labels

For force element labels, the label position around the graphic in the map display is reflected in the position of the text boxes in the MOLE Symbol Editor.

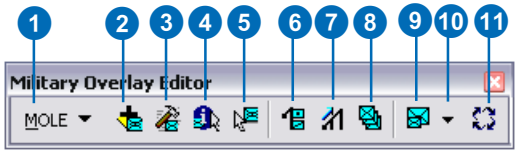
MIL-STD-2525B uses an image similar to the following one to indicate where around the MOLE graphic the attributes should be positioned. In the following image, the graphic is represented by the dotted border. The letters and blocks represent label placement in the map display around the MOLE graphic. The blue blocks with white letters represent fields in the MOLE Symbol Editor that can be displayed around a MOLE symbol.

The attribute names under the image are taken directly from MIL-STD-2525B. Notice how their positions around the graphic exactly match their positions around the preview image in the MOLE Symbol Editor.



W Date/Time group (DTG)
X Altitude/Depth
Y Location
V Type
T Name
Z Speed
C Quantity
AA Special C² headquarters
E Frame shape
F Strength (reinforced or reduced)
G Comments (staff comments)H Additional information
M Parent
J Evaluation rating
K Combat effectiveness
L Signature equipment
N Hostile
P IFF/SIF identification modes and codes

The Military Overlay Editor toolbar

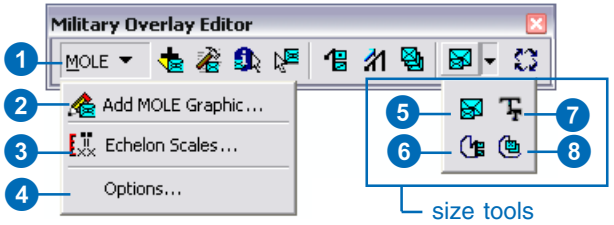


The Military Overlay Editor toolbar in ArcMap.

When you want to perform MOLE functions within ArcGIS, turn on the Military Overlay Editor toolbar by right-clicking an ArcGIS toolbar. For example, in ArcMap, right-click a toolbar, then click Military Overlay Editor.

View a brief description of each toolbar button in MOLE by resting the mouse pointer for a second or two over each button.

1. MOLE—Allows you to set echelon scales, add MOLE graphics, and set MOLE options. See the following page for details.
2. Add MOLE Data—Allows you to add data compatible with MOLE to the map as MOLE layers.
3. MOLE Symbol Editor—Allows you to edit the MOLE graphic you have selected. For more information on editing graphics, see Chapter 4, 'Adding MOLE symbols in ArcMap'.
4. Identify Graphics—Allows you to point to force elements or tactical graphics in the map display to view information about them. The information comes from the feature's attribute table.
5. Select Graphics—Allows you to select one or more MOLE graphics. For more information, see the selecting graphics section in Chapter 5.
6. Toggle Leadering—Turns leadering on or off for the force element layer or layers selected in the TOC. Turning leadering on moves force element graphics to a leader line, which typically makes the map easier to read.
7. Move Leaders—Allows you to reposition leadered force elements to a new location, typically to clean up your map when you have many leader lines displayed. Click this tool, then click a leader and drag it to a new location.
8. Toggle Stacking—Turns stacking on or off for the force element layers selected in the TOC.
9. Graphic Height—Allows you to resize graphics in the force element layer or layers selected in the TOC. You can also use this button to resize all force element graphics in the data frame at once by selecting the data frame in the TOC. Once you select the layer or layers you want, click this button, then click and drag in the map display to draw a rectangle. MOLE uses the height of the rectangle you draw as the new height for the graphics, then resizes the graphics accordingly. Also known as Set Graphic Height and Set Size.
10. Size tools dropdown menu—Displays additional Military Overlay Editor toolbar buttons. See the following page for details.
11. Refresh Graphics—Refreshes all MOLE force element and tactical graphic layers. This button also rebuilds and recaches all graphics in the MOLE graphic layers.



The menus accessed from the Military Overlay Editor toolbar. For the size tools, click the tool, then click and drag a box or circle—depending on the selected parameter—to define the magnitude of the selected property. Both menus are displayed for illustration purposes; you cannot have both displayed at once.

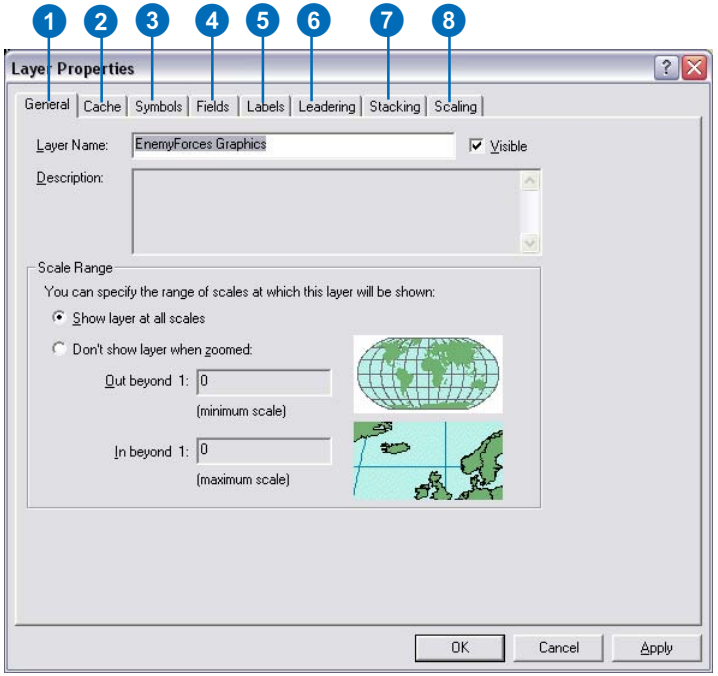
1. MOLE—Allows you to set echelon scales, add MOLE graphics, and set MOLE options.
2. Add MOLE Graphic—Allows you to click the map display area to add tactical graphic symbols.
3. Echelon Scales—Opens the Echelon Scale Band Equalizer dialog box, which allows you to set up a scale-dependent display for all MOLE layers in the map document based on their echelon property.
4. Options—Not available at MOLE 9.1.
5. Graphic Height—Allows you to resize graphics in the force element layer or layers selected in the TOC. You can also use this button to resize all force element graphics in the data frame at once by selecting the data frame in the TOC. Once you select the layer or layers you want, click this button, then click and drag in the map display to draw a rectangle. MOLE uses the height of the rectangle you draw as the new height for the graphics, then resizes the graphics accordingly. Also known as Set Graphic Height and Set Size.
6. Leader Distance—Allows you to set the minimum distance in map units that force element graphics need to be from each other to be grouped together on a leader. The changes are applied to the force element layer or layers selected in the TOC. Also known as leader tolerance.
7. Text Height—Allows you to resize all labels of all MOLE tactical graphic layers in the map display. To do this, click this button, then click and drag to draw a rectangle. MOLE uses the height of the rectangle you draw as the new height for the labels.
8. Stack Distance—Allows you to set the minimum distance in map units that symbols need to be from each other to be stacked together. The changes are applied to all force element symbols in the data frame. Also known as stack tolerance.

   Select one of the properties to modify from the list, click the Graphic Height button, then click and drag a box or circle—depending on the selected parameter—to define the magnitude of the selected property. The changes are applied to all force element symbols in the data frame. The text height attribute is applied to labels of all MOLE tactical graphic layers in the data frame.

The Layer Properties dialog box

The Layer Properties dialog box provides many options for controlling the display characteristics of a layer, including size, color, fill properties, labels, leadering, stacking, and scale-dependent display.

Many of the functions in the Layer Properties dialog box are also on the Military Overlay Editor toolbar. The main difference between these common functions is that the ones on the toolbar allow you to apply changes to all layers or selected layers for the graphic type (force element or tactical graphic) at one time, while the Layer Properties dialog box allows you to apply changes to only one layer at a time.



The Layer Properties dialog box for force elements

Tab descriptions for the force element Layer Properties dialog box

1. The General tab controls basic layer functions, such as scale dependency, layer name, and visibility.
2. The Cache tab allows you to set a database refresh rate. This is only needed if you are working in a multiuser database environment and others are updating the same situation display that you are. You can also change the symbol that displays the current selection.
3. The Symbols tab allows you to control the appearance of the symbols in the layer. For example, you can set symbol size, set color other than MIL-STD-2525B colors, frame fills, and other specialty functions, such as hull polygons for the leaders.
4. The Fields tab allows you to substitute the database field MOLE uses to display text attributes, such as displaying a custom attribute in place of the standard Staff Comment field or Parent attribute locations. Changes made through this tab are persisted as part of the MOLE graphics layer.
5. The Labels tab allows you to specify which of the attribute labels gets displayed with the symbol. This does not control access to the attributes, only whether they are displayed on the map.
6. The Leadering tab controls the way units appear on leader lines, the leader line style, and the line symbol used for the leader itself. You can also set the leader tolerance here.
7. The Stacking tab controls the rules used to make unit stacks. The stacking distance can also be set here.
8. The Scaling tab allows you to set echelon-dependent display scales for the layer.

Quick-start tutorial

2

IN THIS CHAPTER

- **Exercise 1: Displaying MOLE symbols in ArcMap**
- **Exercise 2: Editing MOLE layer properties in ArcMap**
- **Exercise 3: Creating MOLE layers**
- **Exercise 4: Displaying and working with MOLE data in ArcGlobe**

Using MOLE, you can display and edit MIL-STD-2525B symbology on your ArcGIS maps. MOLE reads the 15-character MIL-STD-2525B Symbol ID code from a feature class's attribute table and renders the proper military unit or tactical graphic at that feature's geographic location.

This tutorial guides you through setting up a situation map using friendly forces, enemy forces, and an assortment of tactical graphics in central Texas. The first exercise introduces you to MOLE and shows you how to display and modify the properties of existing MOLE feature classes. In the second exercise, you learn to modify the layer properties of a MOLE feature class in detail. In the third exercise, you create new custom MOLE feature classes in a geodatabase and add military symbols to them.

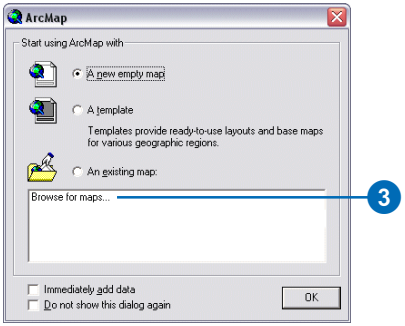
The data and maps required for these exercises are installed at <MOLE Installation Directory>\Tutorial. You can also access them on the Military Analyst Suite installation CD under the Tutorial subdirectory. For this tutorial, it is assumed that you have a basic understanding of the MIL-STD-2525B military specification and a fundamental knowledge of ArcGIS.

Exercise 1: Displaying MOLE symbols in ArcMap

First, it is important to understand that most operations that are common in using MOLE are standard ArcMap procedures and commands. MOLE acts as a special renderer that allows ArcMap to conform to MIL-STD-2525B specifications.

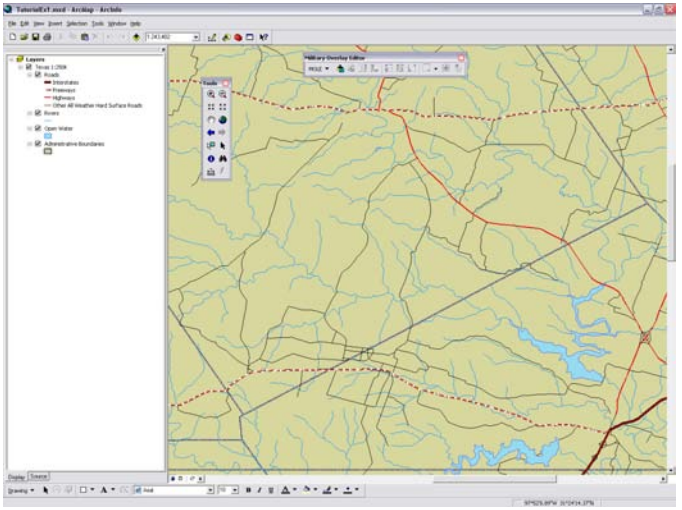
Starting MOLE

1. If you haven't already, install ArcGIS and MOLE. For MOLE installation instructions, see the MOLE readme file at the top level of the MOLE directory on the Military Analyst Suite CD.
2. Click Start, All Programs, ArcGIS, ArcMap.



3. Double-click Browse for maps and navigate to <MOLE Installation Directory>\Tutorial\MOLE_OPLAN\OPLAN_Tutorial_Ex1.mxd.
4. In the TOC (left pane), check Roads, Rivers, Open Water, and Administrative Boundaries. You may have to specify a data source by navigating to the MapData subdirectory of the directory in which OPLAN_Tutorial_Ex1.mxd is stored.

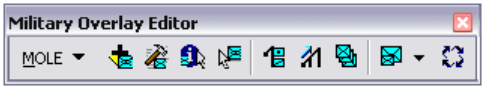
The map should appear similar to the following image.



Now you're ready to start MOLE by turning on the Military Overlay Editor toolbar.

5. In ArcMap, right-click a toolbar, then click Military Overlay Editor.

   The Military Overlay Editor toolbar appears. Most buttons on this toolbar won't activate until you add MOLE data.

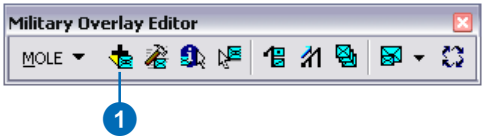


Like ArcMap toolbars, you can choose to dock or float the toolbar by clicking and dragging it.

Opening MOLE force element layers

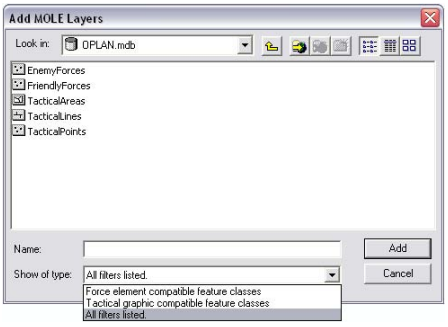
After you've opened the tutorial map, you should see some basic roads, rivers, and other geographic features. Now add some military unit symbols, or force elements, to your map.

1. Click the Add MOLE Data button on the Military Overlay Editor toolbar.



2. In the Add MOLE Layers dialog box, navigate to <MOLE Installation Directory>\Tutorial\MOLE_OPLAN. Open the FriendlyForces feature class from the OPLAN.mdb geodatabase.

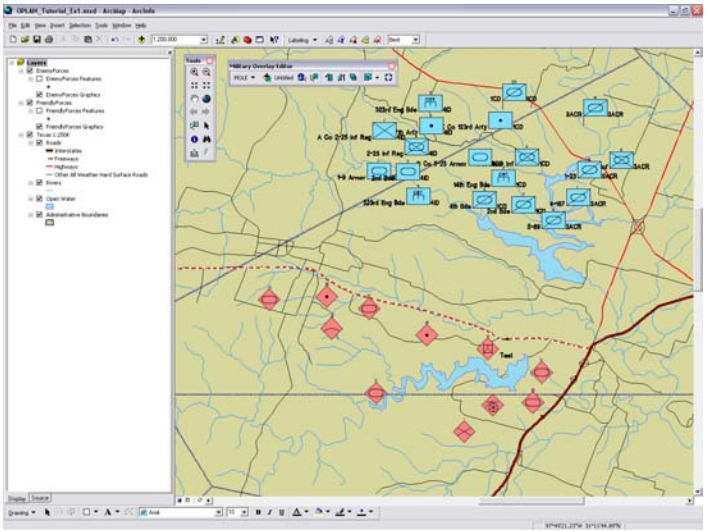
   Note that if this .mdb file had been saved last in MOLE 2, you would have had to update it before opening it in ArcMap to use it. See Chapter 3, 'Creating a MOLE Geodatabase' for more information on updating the following to MOLE 9.0 or greater: MOLE databases, map documents, and .lyr files (or data sources linked to them).



   ArcMap displays the data on the map. Note that MOLE toolbar commands work in reference to which layers are selected in the ArcMap TOC. If Layers (the top level of the TOC) is highlighted, the toolbar commands function at a global level (the command affects all layers in the TOC for the MOLE graphic type). For example, if the Graphic Height tool is used to resize symbols and Layers is selected in the TOC, all force element graphic layers in the TOC are resized in the map display. However, if one particular layer (such as FriendlyForces) is selected, only that layer will be resized. The Text Height command is enabled only when Layers, a tactical graphic layer, or no layer is selected in the TOC.

3. Repeat steps 1–2 to add the EnemyForces feature class to the map.

   Your ArcMap display should now look similar to the image below.

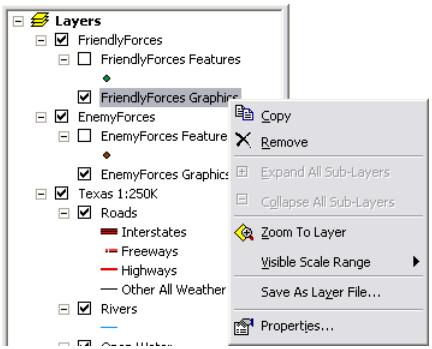


Notice that when you add MOLE data, it is presented in the TOC as a group layer with a features component and a corresponding graphics component.

MOLE force element layer properties

MOLE symbology consists of two different types of graphics: force element and tactical graphic. Force elements are point features that represent military units, equipment, or installations. Tactical graphics are point, line, or polygon features that represent boundaries, obstacles, and directions of movement. In this section, you explore the MOLE force element Layer Properties dialog box.

1. In the TOC, right-click FriendlyForces Graphics, then click Properties.



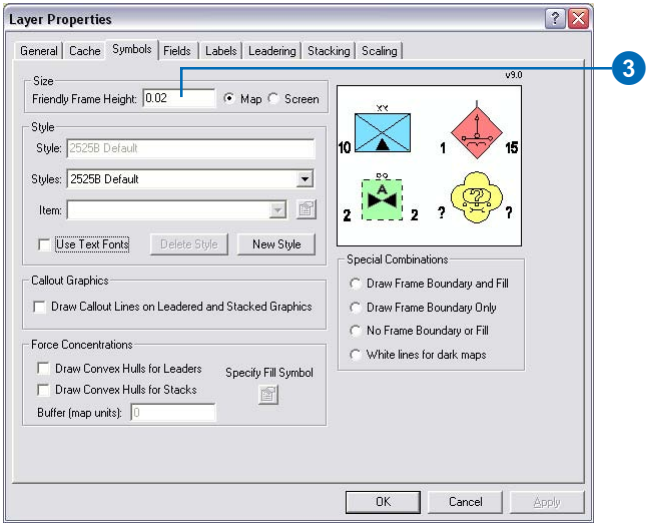
   The force element Layer Properties dialog box appears. The parameters within the tabs on the dialog box control the display and behavior properties for this layer.

2. Click the Symbols tab.

3. In the Size area in the Friendly Frame Height text box, type “0.02”. Be sure the Map button is selected.

4. Click OK.

   Notice that the friendly forces graphics changed size.



   Open the Layer Properties dialog box again and explore the options found on each of the tabs. The Layer Properties dialog box is covered in more detail in the next exercise; for now, simply familiarize yourself with the available options.

Modifying MOLE layer properties from the Military Overlay Editor toolbar

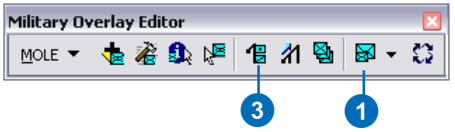
When you change the display properties of a MOLE layer from its Layer Properties dialog box, the changes are only applied to that particular layer. When you modify the display from the Military Overlay Editor toolbar, the changes are applied to all applicable layers. In the next part of the tutorial, you explore how to control layer properties through the tools on the toolbar.

1. Make sure Layers in the TOC is selected, then on the Military Overlay Editor toolbar, click the Graphic Height button.

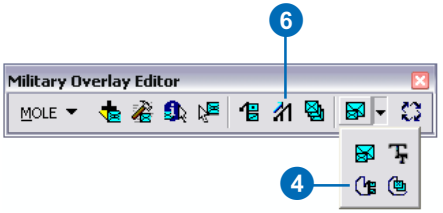
2. Click and drag in the map to draw a bounding rectangle.

   The unit symbols on the map change size relative to the height of the box you specified. Experiment by changing the symbol heights. When you are ready to continue, return the symbols to approximately their original size.

3. On the Military Overlay Editor toolbar, click the Toggle Leadering button to turn on Leadering.

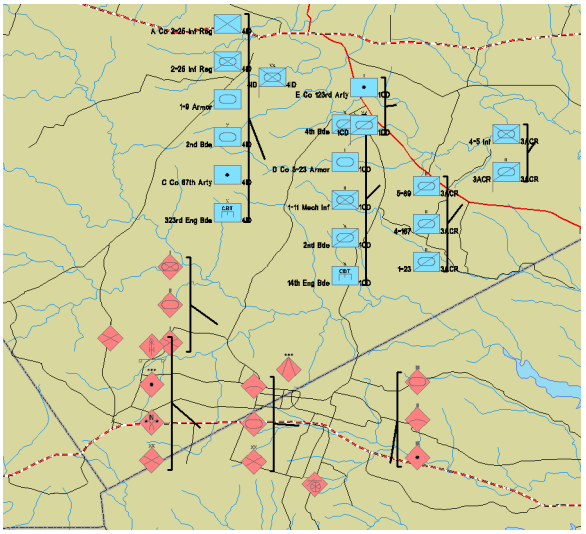


4. Click the Leader Distance button.



5. Click and drag in the map to draw a quarter-sized circle.

The symbols should now be grouped together in several different leaders and should appear similar to the following image.



The leader tolerance refers to the maximum distance that force element features can be from each other to be grouped together onto a leader. The greater the tolerance—or the larger the circle you draw—the greater the number of force elements that will be grouped together.

You can move the leaders around to place them in better positions.

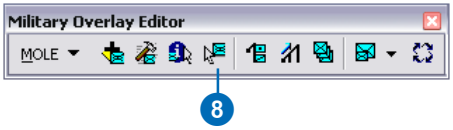
6. On the Military Overlay Editor toolbar, click the Move Leader button, then click a leader in the map and drag it to a new location in the map.

Since the force elements are leadered together, they have been moved from their original positions in the map. MOLE allows you to identify force elements and their true geographic location as follows.

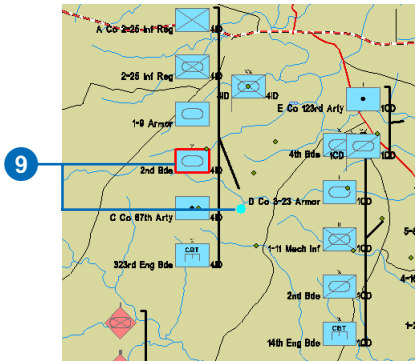
7. In the ArcMap TOC, check the check box next to FriendlyForces Features.

   The actual locations of the force elements will be displayed as points.

8. Click the Select Graphics button on the Military Overlay Editor toolbar.



9. Click a force element symbol (either on a leader or a unit by itself).

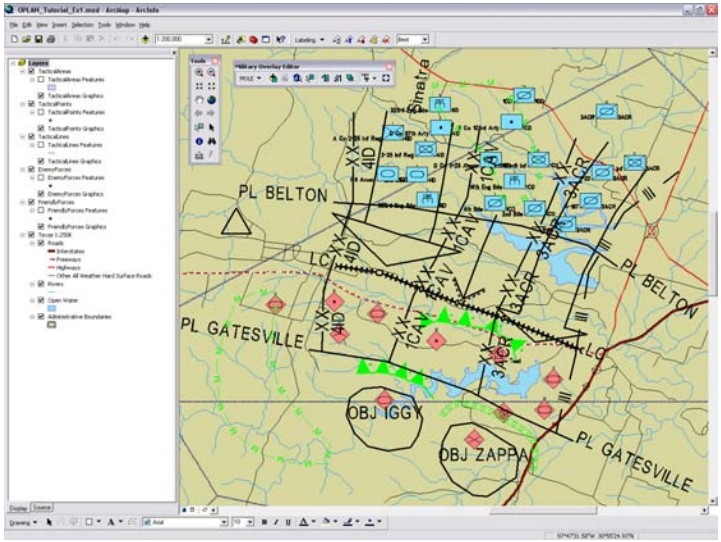


The symbol will be outlined in red, and the point representing its ground location will be highlighted.

Opening MOLE tactical graphic layers

Now, your situation map consists of a few geographic features with symbols representing the ground locations of friendly and enemy forces. To make the map an effective planning tool, you need to add tactical graphics, which will aid in regulating movement of troops, including lane boundaries and obstacles. Now add some tactical graphics to your map.

1. Click the Add MOLE Data button on the Military Overlay Editor toolbar.
2. In the browse window, navigate to <MOLE Installation Directory>\Tutorial. Open the TacticalLines feature class from the OPLAN.mdb geodatabase.
3. Repeat steps 1–2 to add the TacticalPoints and TacticalAreas feature classes. Your ArcMap map display should now be similar to the following image.

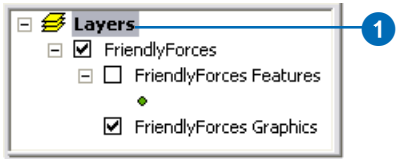


Resizing tactical graphic text

You can resize the text associated with the tactical graphics by using the Text Resize tool. If you select the data frame first, you can globally resize all the tactical graphic text. You can also individually select MOLE tactical graphic layers and resize the text on a layer-by-layer basis.

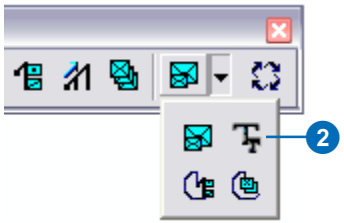
In this next exercise, you globally resize tactical graphics by first selecting the data frame.

1. In the ArcMap TOC, select the data frame.

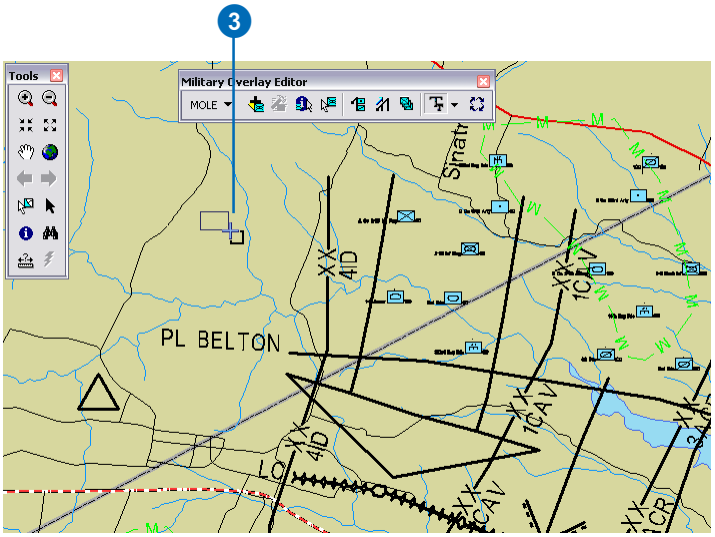


Selecting the data frame applies the resizing of the text to all layers in the data frame.

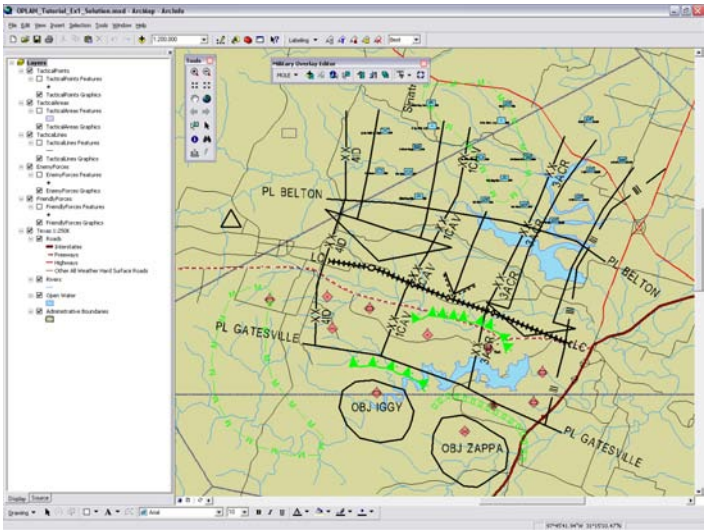
2. Click the Text Resize tool on the Military Overlay Editor toolbar.



3. Click and drag a rectangle on the map.



The height of this rectangle will set the height of all the tactical graphic text.

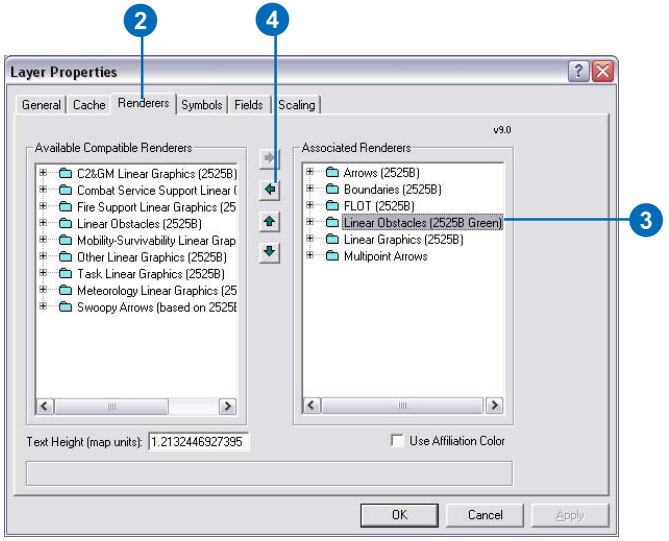


Enabling tactical graphic renderers

MOLE uses different symbology renderers to display different types of tactical graphics, such as obstacles. Sometimes it is necessary to display features differently from what is suggested in the MIL-STD-2525B specification. The underlying design of MOLE gives application developers the freedom to substitute the default renderers and replace them with their own. Developers can build their own custom renderers so that tactical graphics can be displayed according to their criteria.

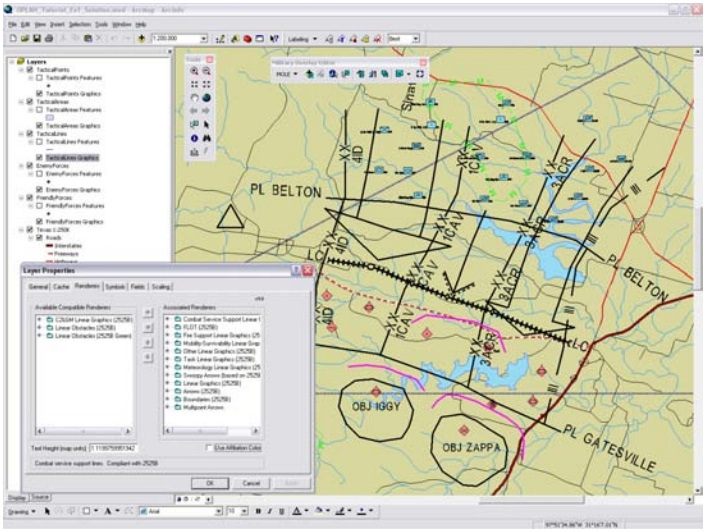
The next steps will show you how to remove the MOLE default renderer for displaying obstacles and replace it with another renderer.

1. Right-click TacticalLines Graphics and click Properties.
2. Click the Renderers tab.
3. Click the Linear Obstacles (2525B Green) renderer.

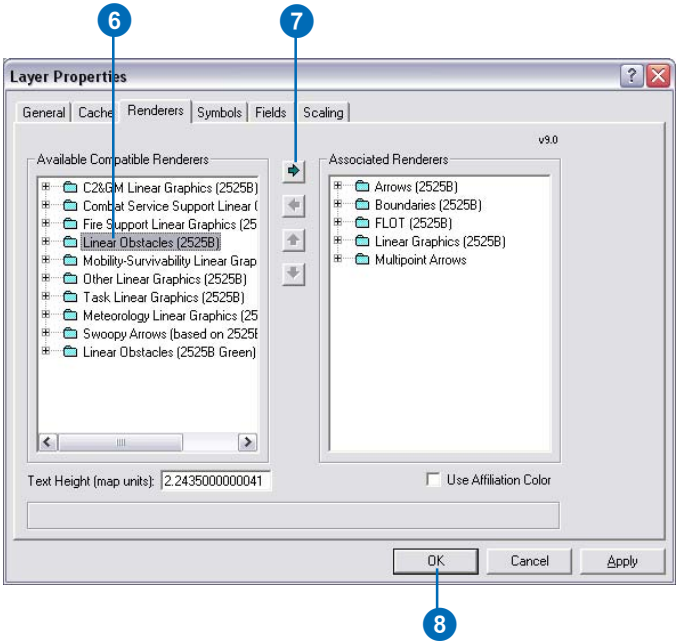


4. Move it to the Available Compatible Renderers side.
5. Click Apply.

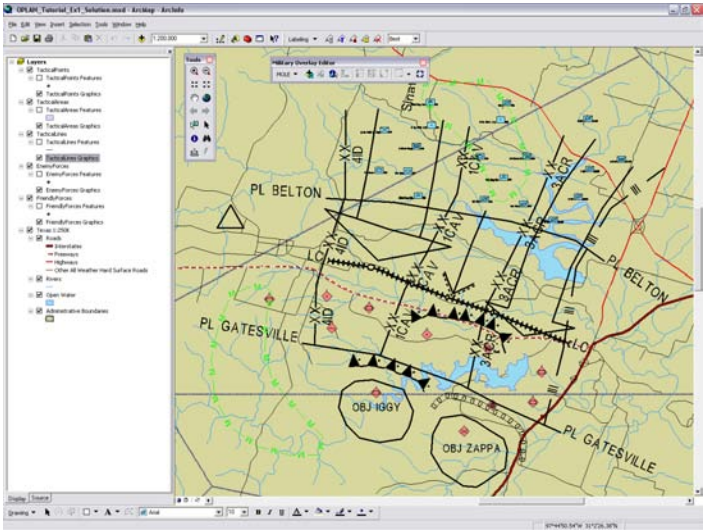
   Notice that the obstacles are now magenta in color. Because the Linear Obstacles renderer was removed, MOLE does not know how to symbolize the underlying features and shows them as magenta lines. MOLE displays all unknown linear tactical graphics as magenta lines.



6. Click the Linear Obstacles (2525B) renderer.
7. Move it to the Associated Renderers side.
8. Click OK.



Notice that the obstacles are now drawn in black. There are two renderers for linear obstacles: Linear Obstacles (2525B Green) and Linear Obstacles (2525B). One renderer displays the features as green symbols, while the other displays them as black symbols. If both renderers were added to the Associated Renderers side, the renderer listed first would have priority. The priority of the renderers can be changed by using the Up and Down arrows on the Renderers tab.



In this exercise, you were introduced to some basic MOLE functions, learned how to open MOLE data, and learned different methods for modifying symbol display properties in ArcMap. The next exercise teaches you how to modify the layer properties of MOLE force element layers.

Exercise 2: Editing MOLE layer properties in ArcMap

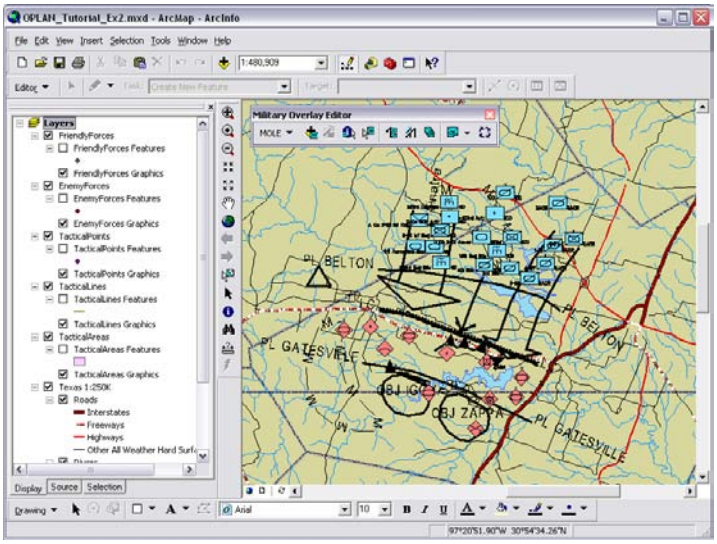
One of the most important aspects of a map is the way it presents the information it contains. MOLE provides many options for displaying force element symbols and controlling the appearance of your situation map.

You were introduced to the MOLE force element Layer Properties dialog box in the last exercise. In this exercise, you explore the Layer Properties dialog box in depth and practice modifying the display properties of your MOLE force element layers.

Opening the MOLE Layer Properties dialog box

1. If you're continuing from Exercise 1, close the map without saving changes, or save the map with a new name.
2. In ArcMap, click File and click Open to open an existing map.
3. Navigate to <MOLE Installation Directory>\Tutorial\MOLE_OPLAN\ OPLAN_Tutorial_Ex2.mxd and click Open.

   The map document OPLAN_Tutorial_Ex2.mxd displays in the map display area.

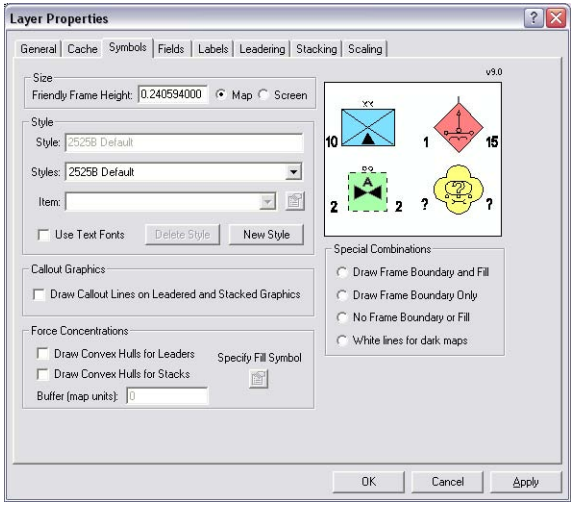


The map document OPLAN_Tutorial_Ex2.mxd consists of a sample MOLE scenario so you can practice modifying the layer properties.

4. Right-click the FriendlyForces Graphics layer in the ArcMap TOC.
5. Click Properties in the Layer menu.

   The MOLE force element Layer Properties dialog box appears.

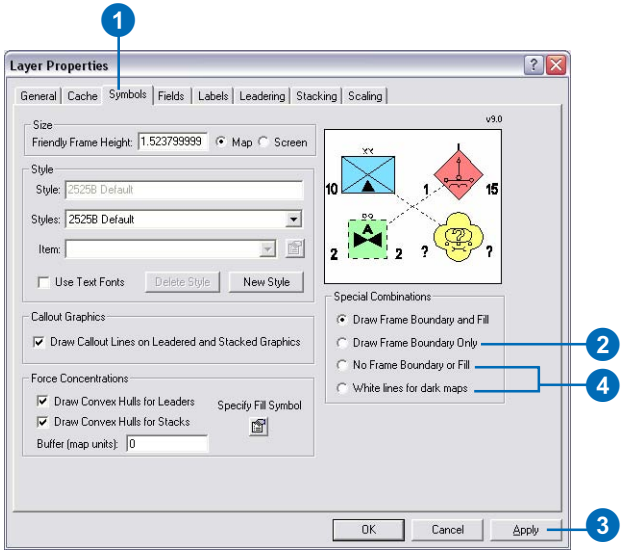
   You can also double-click the layer to open the Layer Properties dialog box.

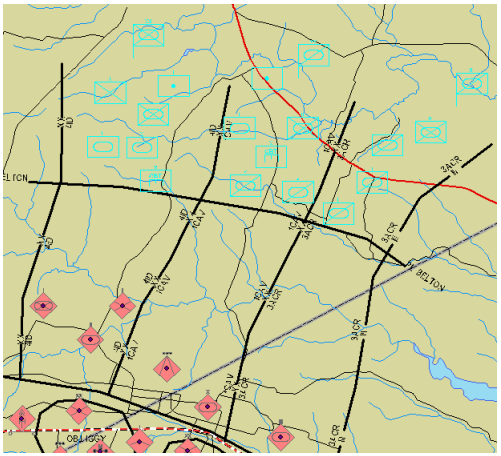


MOLE Layer Properties Symbols tab

From the Symbols tab on the MOLE Layer Properties dialog box, you can modify the size and color of the force element symbols of a single MOLE layer. You can also add graphics to assist in visualizing stacked and leadered force elements; this will be covered later in this exercise.

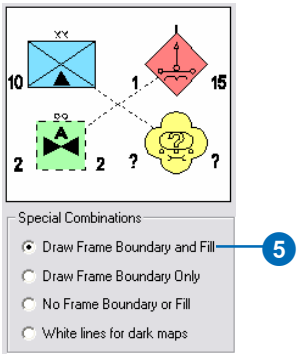
1. Click the Symbols tab on the MOLE Layer Properties dialog box.
2. In the Special Combinations area, click Draw Frame Boundary Only. Observe the changes in the preview window.
3. Click Apply and observe the changes to the layer.
4. Repeat steps 2 and 3 for the other options in the Special Combinations area.



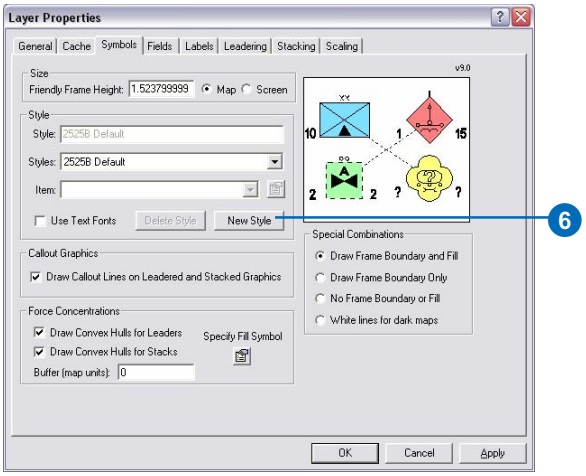


Only the outlines of the force element symbols are displayed when the Draw Frame Boundary Only option is selected.

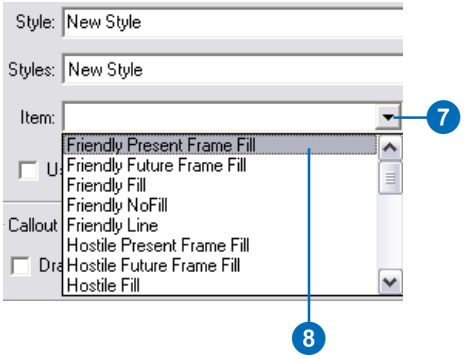
5. Click the Draw Frame Boundary and Fill button to return the symbols to the default symbology and click Apply.



6. Click New Style on the Layer Properties dialog box.

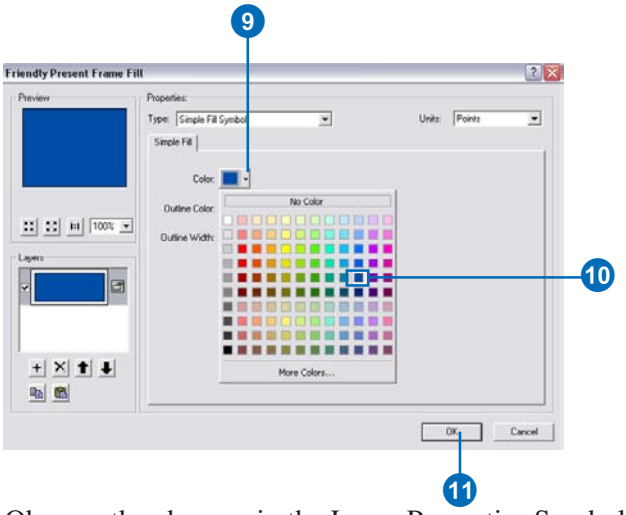


7. Click the Item dropdown arrow.
8. Click Friendly Present Frame Fill from the dropdown list.

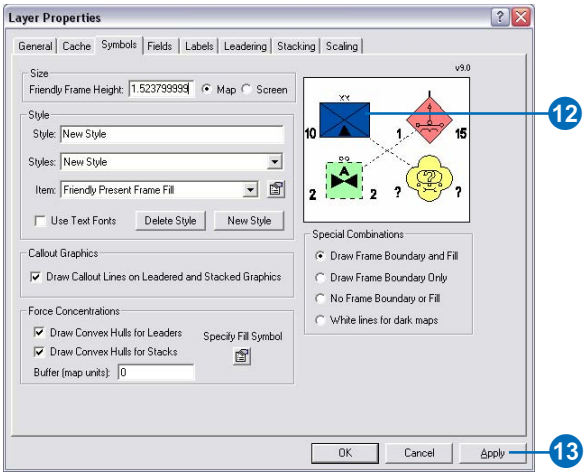


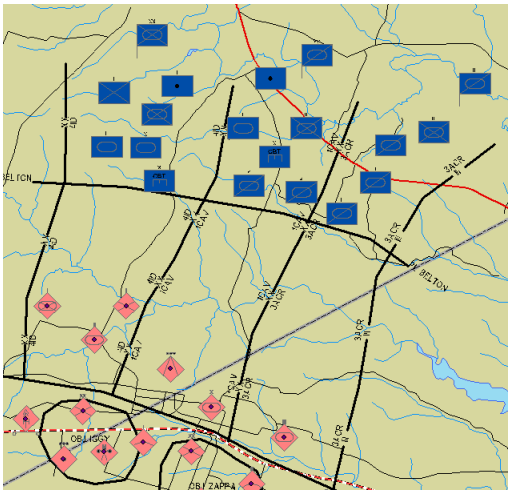
The Symbol Properties Editor dialog box appears.

9. Click the Color dropdown arrow.
10. Click Ultra Blue.
11. Click OK.

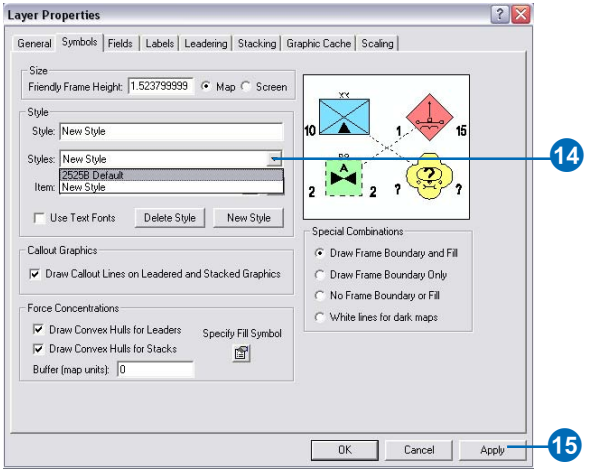


12. Observe the changes in the Layer Properties Symbols preview window.
13. Click Apply and observe the changes to the layer in the map display area.



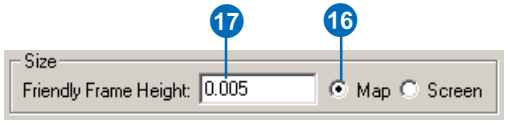


14. Click the Styles dropdown arrow, then click 2525B Default.
15. Click Apply to revert the layer to its original symbology.

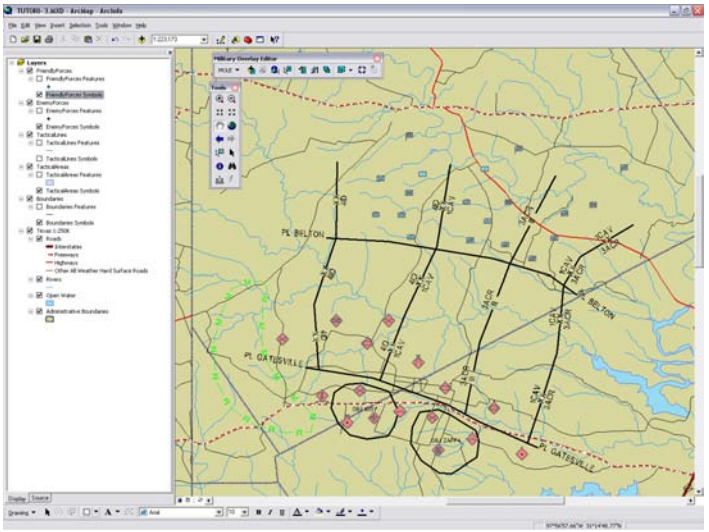


There are two ways to change symbol size on the Layer Properties dialog box. One is to set the symbols to the scale of the data frame by specifying a symbol height in map units, which changes symbol size when you zoom in and out of the map. The second way is to set the symbol height to a fixed percentage of the data frame height so the symbols remain the same size regardless of the scale.

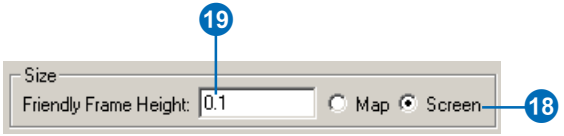
16. Click the Map button in the Size area of the Layer Properties dialog box.
17. Double-click the value in the Friendly Frame Height text box to select it. Type “0.005” and click Apply.



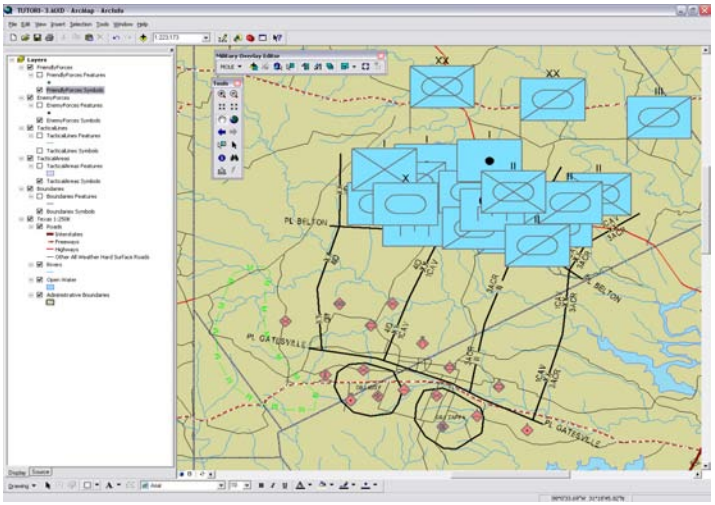
With the Map button selected, the symbols will be displayed in the specified number of map units, which are decimal degrees in this case.



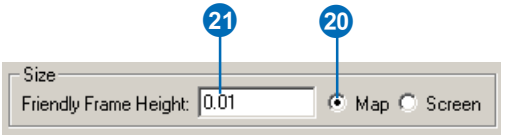
18. Click the Screen button.
19. Double-click the value in the Friendly Frame Height text box to select it. Type “0.1” and click Apply.



The height of the symbols in the layer will be displayed at 10 percent of the data frame height and will remain at this constant size as you zoom in and out.



20. Click the Map button.
21. Double-click the value in the Friendly Frame Height text box, type “0.01”, and click Apply.



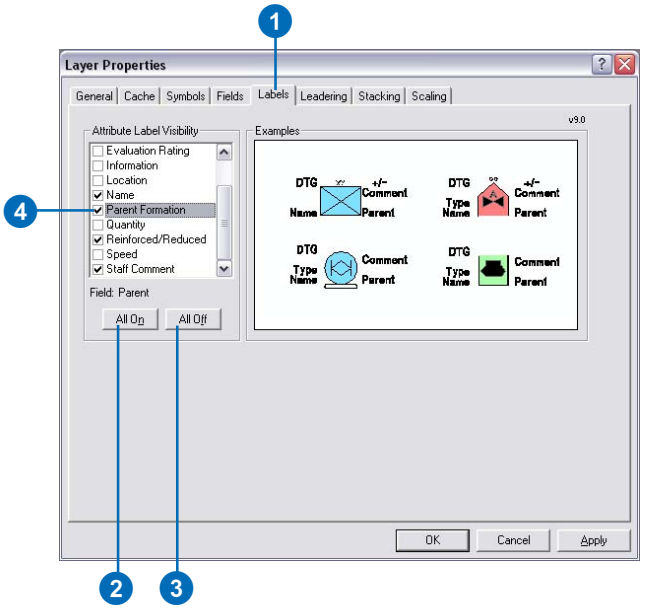
Many of the properties you change on the Layer Properties dialog box, such as symbol size and leadering, can also be changed using tools on the Military Overlay Editor toolbar. The difference is that when you change properties from the toolbar, the changes are applied to all force element layers within the ArcMap TOC. When you change properties from the Layer Properties dialog box, the changes are applied only to the particular layer with which you are currently working. For more information, see 'Exercise 1: Displaying MOLE symbols in ArcMap' in this chapter.

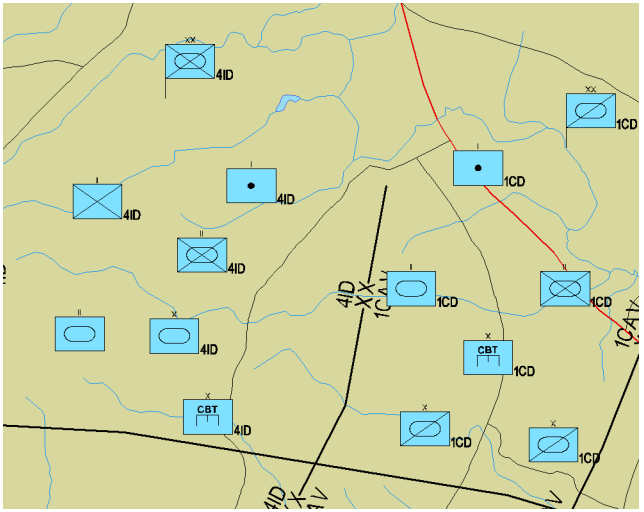
MOLE Layer Properties Leadering tab

Leadering is a way to organize and group the force element symbols being displayed based on rules that you specify from the Layer Properties dialog box. It is useful if you have many overlapping symbols and want to clean up the display or if you want to group related units together or define perimeters or areas of interest for formations.

Before you apply the leadering settings, turn on the labels around the symbols so the parent unit label is displayed.

1. Click the Labels tab on the Layer Properties dialog box.
2. Click the All On button and examine the choices in the Attribute Label Visibility list and the Examples preview window.
3. Click All Off.
4. Check the Parent Formation check box and click Apply.





The parent label as it appears in the display

Familiarize yourself with the Leadering tab.

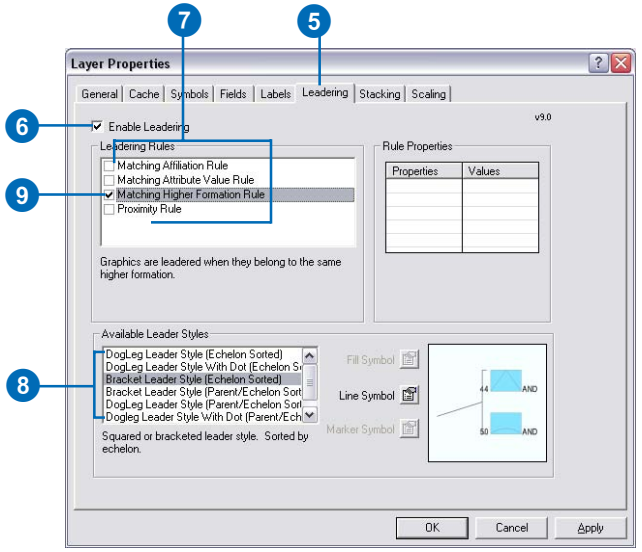
5. Click the Leadering tab on the Layer Properties dialog box.
6. Check the Enable Leadering check box.
7. Click each of the Leadering Rules so they are selected, and note the description of each one below the list of rules.

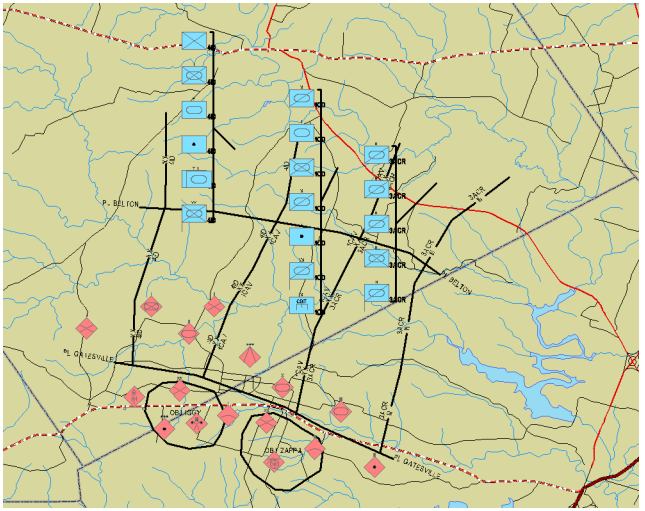
You can use one or more of the following rules to specify the leadering you want MOLE to use:

- Matching affiliation—Groups all force elements within a layer that have the same affiliation property. This means all friendly symbols are placed together in a leader, all enemy graphics are placed in a different leader, and so on.
- Matching attribute value—Groups all force element symbols together that have the same value for a field in the attribute table. You specify which field you want MOLE to use for the grouping by typing the field name in the first row of the Values column in the Rule Properties area.
- Matching higher formation—Groups all force elements that belong to a common higher formation, or parent unit.
- Proximity—Groups force elements that are within a specified distance of each other. The distance can either be an explicit distance in map units or a multiple of the symbol height.

The next exercise uses the matching higher formation rule.

8. Click each of the Available Leader Styles and note the appearance of each in the preview window. Ensure Bracket Leader Style (Echelon Sorted) is selected before moving on.
9. Check the Matching Higher Formation Rule check box and ensure the check boxes of the other rules are cleared, then click OK.

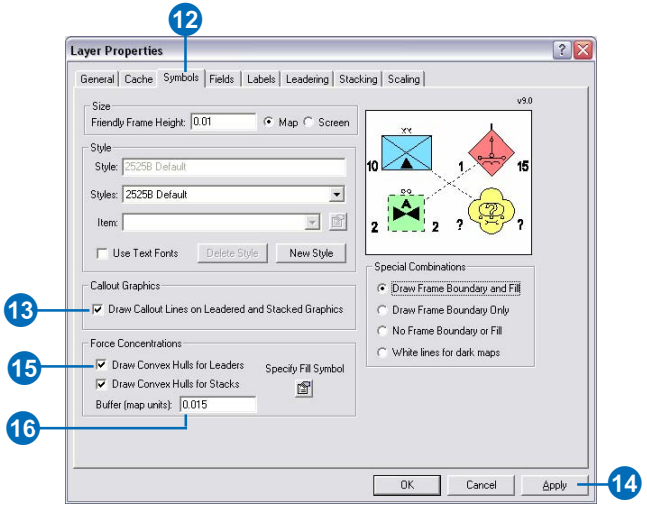


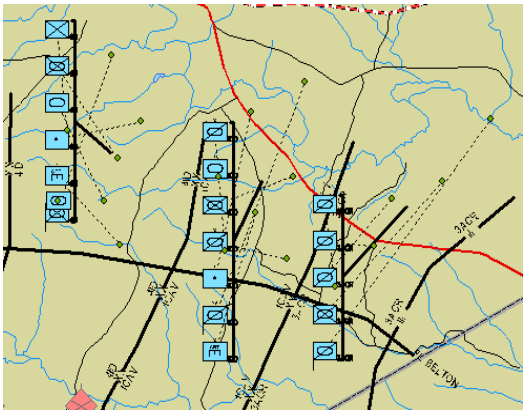


Now that the symbols are leadered, they have moved from their original positions. To see the ground locations of the symbols, display the FriendlyForces Features layer.

10. In the ArcMap TOC, check the FriendlyForces Features check box.
11. Double-click FriendlyForces Graphics in the table of contents. The Layer Properties dialog box appears.

12. Click the Symbols tab on the Layer Properties dialog box.
13. Check the check box to Draw Callout Lines on Leadered and Stacked Graphics.
14. Click Apply.





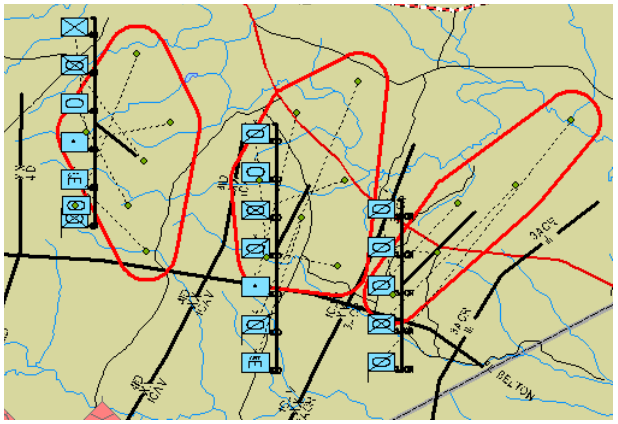
The callout lines connect the leadered MOLE symbols to their feature points, which represent their ground locations. If you select a feature point, its corresponding MOLE symbol will be outlined in red.

You can also outline the groups of feature points (force concentrations) that compose each leader to define attributes such as areas of responsibility or boundaries.

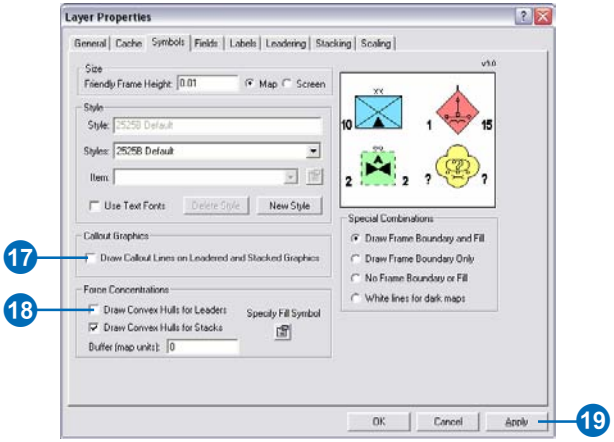
15. Check the Draw Convex Hulls for Leaders check box in the Force Concentrations area and click Apply.
16. Type “0.015” in the Buffer (map units) text box and click Apply.

    Red lines will be drawn around the points contained by each leader, and the lines will be buffered by 0.015 decimal degrees.

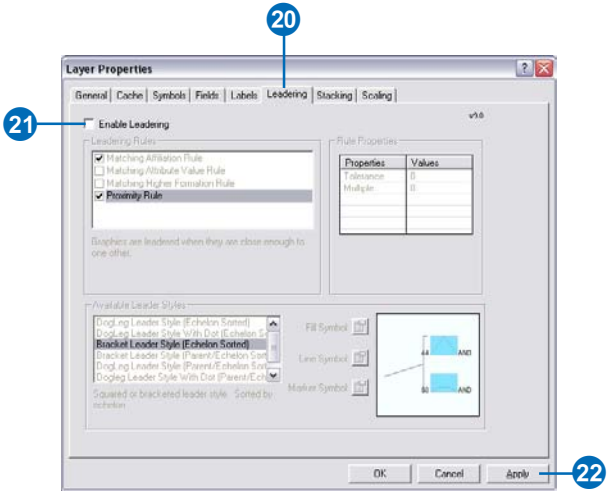
    You can change the style of the outlines on the Specify Stack and Leader Convex Hull Symbol dialog box by clicking the Specify Fill Symbol button.



17. Clear the Draw Callout Lines on Leadered and Stacked Graphics check box.
18. Clear the Draw Convex Hulls for Leaders check box.
19. Click Apply.



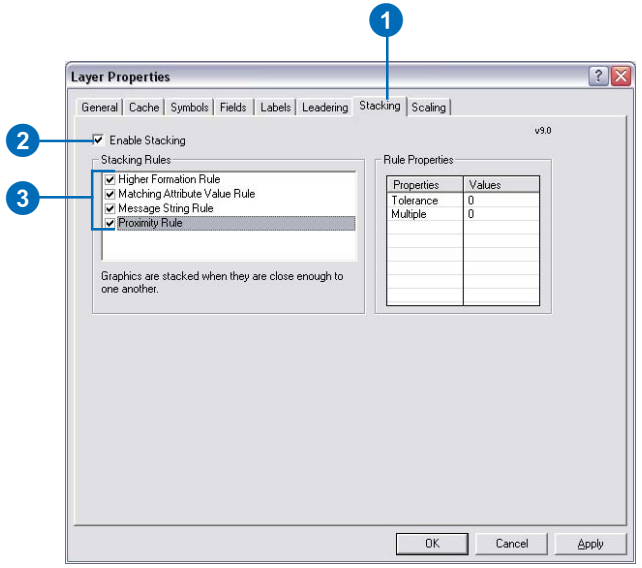
20. Click the Leadering tab on the Layer Properties dialog box.
21. Clear the Enable Leadering check box.
22. Click Apply.



MOLE Layer Properties Stacking tab

Stacking is another way to group force element symbols together according to rules you specify on the Layer Properties dialog box. Symbols that meet the criteria you set are stacked on top of each other, rather than being placed in brackets as they are with leadering.

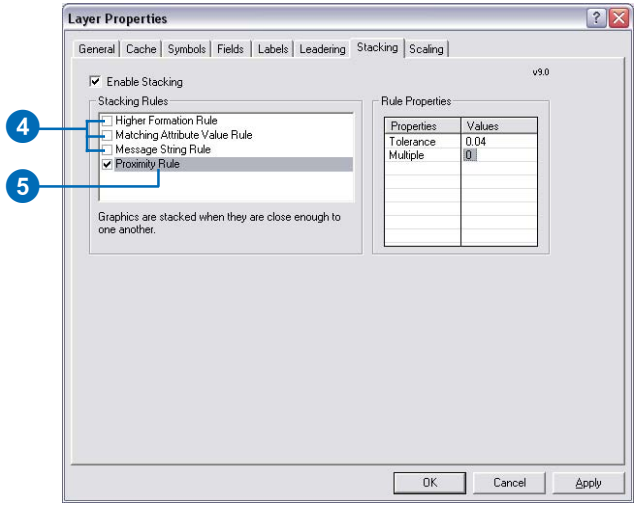
1. Click the Stacking tab on the Layer Properties dialog box.
2. Check the Enable Stacking check box.
3. Click each of the Stacking Rules and note the description of each below the list of rules.



You can use one or more of the following rules to specify the stacking you want MOLE to use:

- Higher formation rule—Groups all symbols that belong to a common higher formation, or parent unit.
- Matching attribute value rule—Groups all force element symbols together that have the same value for a field in the attribute table. Specify which field you want MOLE to use for the grouping by typing the field name in the first row of the Values column in the Rule Properties area.
- Message string rule—Groups all force symbols with matching Symbol_ID value.
- Proximity rule—Groups symbols that are within a specified distance of each other, as it does for leadering.

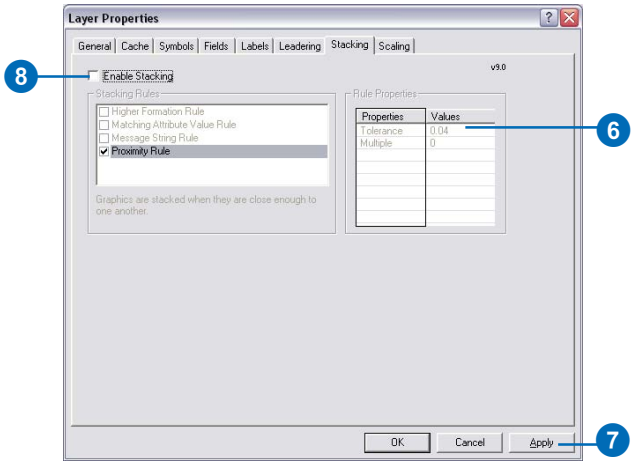
4. Clear the Higher Formation Rule, Matching Attribute Value Rule, and Message String Rule check boxes.
5. Click the Proximity Rule to activate the Rule Properties text box.

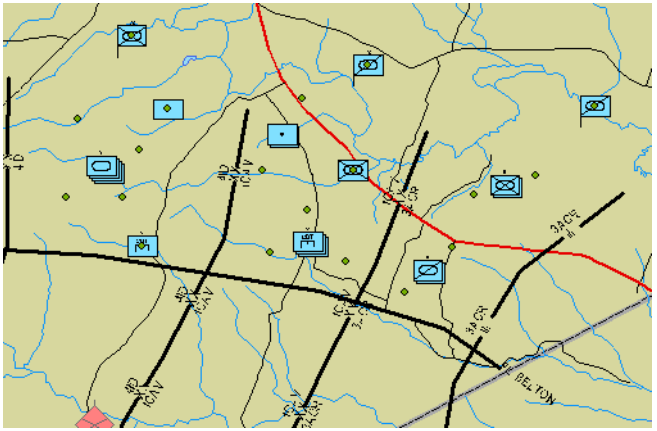


There are two ways to set the stacking distance. Specifying a Tolerance value in the Rule Properties text box sets a minimum distance in map units, which MOLE uses to determine which symbols should be stacked. Symbols within this distance of each other will be stacked together. The tolerance is applied to the center point of the symbols. If a Multiple value is specified, it will be multiplied by the Friendly Frame Height value—on the Symbols tab of the Layer Properties dialog box—to define the stacking distance. In both cases, increasing the value will increase the number of symbols being stacked.

6. Left-click and hold in the Values field in the Rule Properties text box and type “0.04”.
7. Click Apply.

   The symbols within 0.04 decimal degrees of each other will be stacked.
8. Clear the Enable Stacking check box, then click Apply.





MOLE Layer Properties Scaling tab

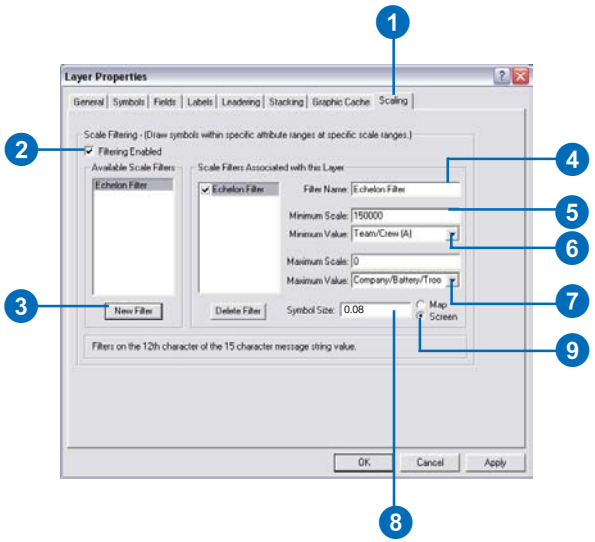
MOLE allows you to set scale-dependent display of force element symbols from the Layer Properties dialog box. The scale dependency is based on the layer’s echelon (unit size) property. You can set as many rules for scale dependency as you like. This differentiates it from the Echelon Scaling Equalizer available on the Military Overlay Editor toolbar, which allows a maximum of three rules.

Echelon Filter Name	Echelons (Units) Displayed	Scale Range
Companies	Company	1:0 - 1:150K
Battalions	Battalion - Regiment	1:100K - 1:250K
Brigades	Brigade - Division	1:250K - 1:2M

These are the scaling rules to create.

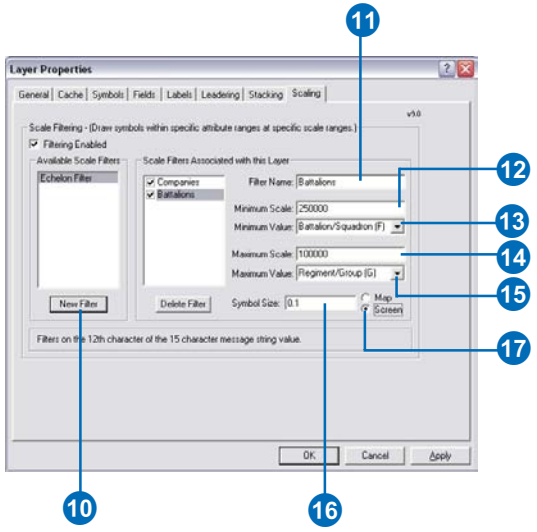
1. Click the Scaling tab on the Layer Properties dialog box.
2. Check the Filtering Enabled check box.
3. Click New Filter.

   This will be the first scaling rule you set. You will set a total of three.
4. Select Echelon Filter in the Filter Name text box and type “Companies”.
5. Double-click in the Minimum Scale text box and type “150000”.
6. Click the Minimum Value dropdown arrow, then click Team/Crew(A).
7. Click the Maximum Value dropdown arrow, then click Company/Battery/Troop(E).
8. Double-click in the Symbol Size text box and type “0.08”.



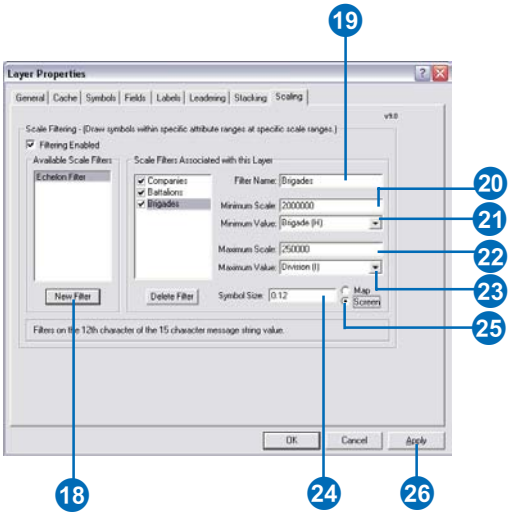
9. Click the Screen button.

   This causes force element symbols representing company-sized echelons and smaller to only be displayed when you are zoomed in to the map display from the scales 1:0 to 1:150,000.
10. Click New Filter.
11. Select Echelon Filter in the Filter Name text box and type “Battalions”.
12. Double-click in the Minimum Scale text box and type “250000”.
13. Click the Minimum Value dropdown arrow, then click Battalion/Squadron(F).
14. Double-click in the Maximum Scale text box and type “100000”.



15. Click the Maximum Value dropdown arrow, then click Regiment/Group(G).
16. Double-click in the Symbol Size text box and type “0.1”.
17. Click the Screen button.

    In addition to the first rule, this causes force element symbols representing battalion and regiment-sized echelons to be displayed from the scales 1:100,000 to 1:250,000. Note that the rules overlap and will both be applied from 1:100,000 to 1:150,000.
18. Click New Filter.
19. Select Echelon Filter in the Filter Name text box and type “Brigades”.
20. Double-click in the Minimum Scale text box and type “2000000”.
21. Click the Minimum Value dropdown arrow, then click Brigade (H).
22. Double-click in the Maximum Scale text box and type “250000”.
23. Click the Maximum Value dropdown arrow, then click Division (I).
24. Double-click in the Symbol Size text box and type “0.12”.
25. Click the Screen button.
26. Click Apply.



In addition to the first two rules, this causes force element symbols representing brigade and division-sized echelons to be displayed from the scales 1:250,000 to 1:2,000,000.

Now that you have set up your scaling rules, zoom in and out of the map display and notice that different symbols are displayed at different zoom scales. You can also manually type in a map scale on the ArcMap Standard toolbar to experiment with specific scales.

Exit ArcMap without saving changes when you are finished, or save the map with a different name.

In this exercise, you learned in detail how to modify and control the layer properties of an existing MOLE force element layer and saw how MOLE allows you to optimize the appearance of your map. In the next exercise, you are introduced to the process of creating new MOLE feature classes and populating them with symbols.

Exercise 3: Creating MOLE layers

In this exercise, you create a personal geodatabase with two custom MOLE feature classes—a force element layer (point) and a tactical graphic layer (line in this case)—and add features to it. It is recommended that you use custom MOLE feature classes in a geodatabase rather than shapefiles. In a geodatabase, you can use the MOLE Symbol Editor to add and edit force elements and tactical graphics. If your MOLE features are stored in shapefiles, to edit or add new features, you must manually enter the MIL-STD-2525B Symbol ID codes associated with the features into the shapefile's attribute table. For more information on geodatabases, see *Building a Geodatabase* in the ArcGIS documentation set. For more information on shapefiles and MOLE, see Chapter 1, 'Introducing MOLE'. For more information on using ArcCatalog, see *Using ArcCatalog* in the ArcGIS documenation set.

Note: If you are using an ArcView® license, you will not be able to create a MOLE custom object feature class. You can, however, copy and modify existing custom object feature classes. Included on the MOLE installation CD is a single-user geodatabase named MOLE_BLANK.mdb. It contains an empty MOLE custom feature class for each possible type of MOLE feature. Copy the geodatabase to a folder on your computer, then complete the following steps. If you are an ArcEditor™ or ArcInfo® user, skip to 'Creating a personal geodatabase' in this exercise.

MOLE_BLANK.mdb for ArcView users

If you are using ArcEditor or ArcInfo, skip to 'Creating a personal geodatabase' and continue with the exercise.

1. Start ArcCatalog by double-clicking a shortcut installed on your desktop or using the Programs list on your Start menu.
2. In the Catalog tree in the ArcCatalog window, navigate to the <MOLE Installation Directory>\Tutorial\MOLE_databases folder. Right-click MOLE_BLANK.mdb and click Rename.
3. Type "Sitmap" and press Enter.
4. Expand Sitmap.mdb in the Catalog tree by clicking the plus sign (+) next to it. Right-click ForceElement and click Copy.
5. Right-click Sitmap.mdb in the Catalog tree and click Paste. Click OK in the Data Transfer window.

   There will now be a feature class named ForceElement and one named ForceElement_1 in Sitmap.mdb.
6. Right-click ForceElement in the Catalog tree and click Rename. Type "Allies" and press Enter.
7. Right-click ForceElement_1 and click Rename. Type "Axis" and press Enter.
8. Right-click the TacticalGraphicLine feature class in Sitmap.mdb and click Rename. Type "Graphics" and press Enter.

9. Skip to ‘Adding MOLE force element layers to the ArcMap display’ and continue with the exercise.

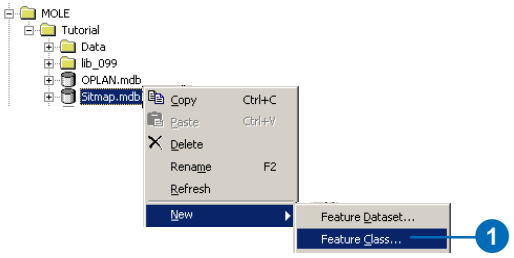
Creating a personal geodatabase

1. Start ArcCatalog by double-clicking a shortcut installed on your desktop or using the Programs list on your Start menu.
2. Navigate to the folder where you saved your MOLE tutorial data in the Catalog tree of the ArcCatalog window. Right-click the Tutorial folder, click New, then click Personal Geodatabase.

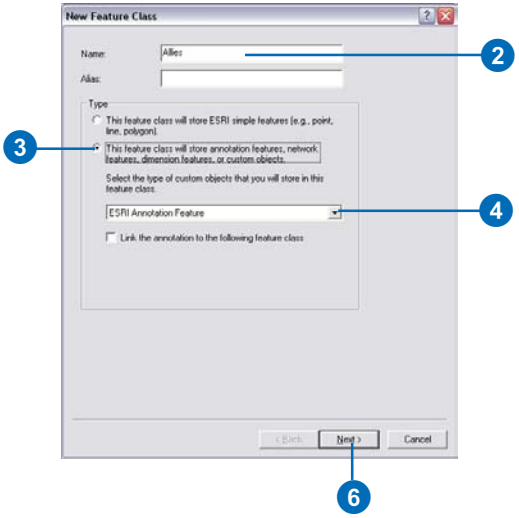
   An empty geodatabase, New Personal Geodatabase.mdb, appears in the Catalog tree.
3. Right-click the file New Personal Geodatabase.mdb, then click Rename.
4. Type “Sitmap” and press Enter.

Creating custom MOLE force element feature classes

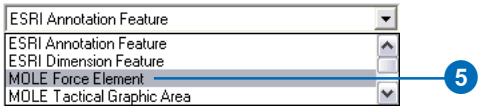
1. Right-click Sitmap.mdb in the Catalog tree, click New, then click Feature Class.



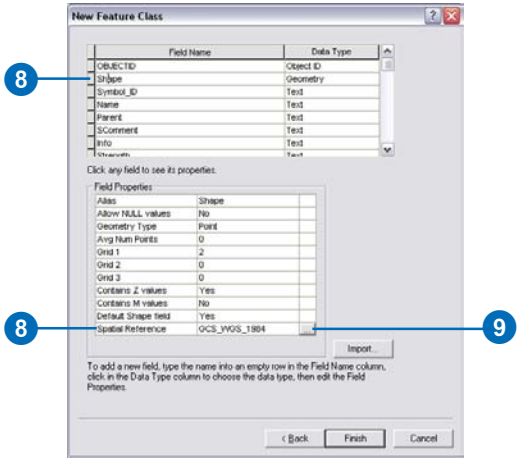
2. Type “Allies” in the Name text box on the New Feature Class dialog box.
3. Click the button to store custom objects.
4. Click the custom objects dropdown arrow.



5. Click MOLE Force Element from the dropdown list.



6. Click Next in the New Feature Class dialog box, then click Yes in the message box asking if you want support for z-values.
7. Click Next again, keeping the Default button selected.
8. Click Shape in the Field Name list. In the Field Properties list, ensure that Spatial Reference is set to GCS_WGS_1984. If it is, click Finish and skip to step 13.
9. If the Spatial Reference is not set to GCS_WGS_1984, click the browse button next to the Spatial Reference field.

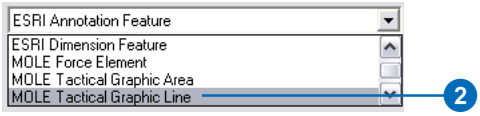


10. Click Select on the Spatial Reference Properties dialog box.
11. In the browse window, click Geographic Coordinate Systems, click World, then click WGS 1984.prj. Then click Add.
12. Click OK on the Spatial Reference Properties dialog box, then click Finish.
13. Repeat the preceding steps to create another MOLE force element feature class, “Axis”, in the Sitmap geodatabase.

Next you will create a MOLE tactical graphic custom feature class.

Creating custom MOLE tactical graphic feature classes

1. Repeat steps 1–4 from the last procedure, creating the feature class “Graphics”.
2. Click MOLE Tactical Graphic Line from the custom objects dropdown list.



3. Repeat steps 6–12 from the last procedure.

Adding MOLE force element layers to the ArcMap display

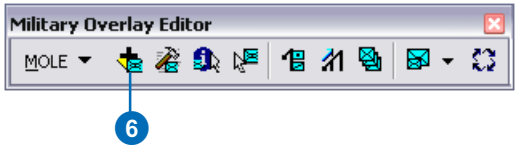
The feature classes you created in the previous set of steps are initially empty. The next step is to populate them with MOLE symbols. Because you created custom feature classes in a geodatabase, you will be able to take advantage of the MOLE Symbol Editor, which makes it easy to edit the feature classes and add symbols to them. First, you need to open the feature classes in ArcMap.

1. Start ArcMap by double-clicking a shortcut installed on your desktop or using the Programs list on your Start menu.
2. Click OK on the ArcMap startup dialog box to open an empty map.
3. If not already open, open the Military Overlay Editor toolbar, following the steps in Exercise 1.

Before opening the MOLE layers, you should display a base layer to use as a geographic reference for adding MOLE symbols in your area of interest. For this exercise, use the tutorial data for the background.

4. Click the Add Data button on the ArcMap Standard toolbar.

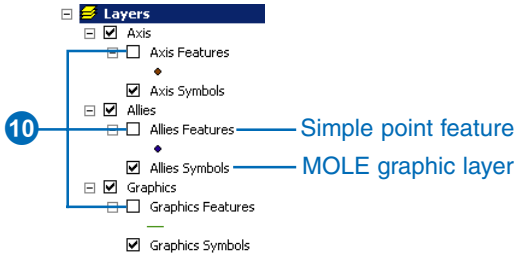
5. Navigate to the tutorial folder, open the MOLE_OPLAN\Ex1Data folder, and open Texas_Sub.lyr.



6. Click the Add MOLE Data button on the Military Overlay Editor toolbar.
7. Navigate to Sitmap.mdb and open Graphics.
8. Click the Add MOLE Data button on the Military Overlay Editor toolbar.
9. Navigate to Sitmap.mdb and open the Allies and Axis feature classes.

The feature classes are now displayed in the ArcMap TOC. Note that each MOLE layer is actually a group layer composed of a simple point or line feature layer and a MOLE symbol layer.

10. Check the check boxes next to Axis Features, Allies Features, and Graphics Features in the TOC to turn them on.



To add symbols to the MOLE layers, you must edit the feature layers.

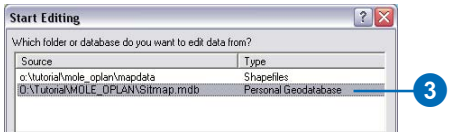
Adding symbols to MOLE force element layers (Allies layer)

1. Click the Editor toolbar button on the ArcMap standard toolbar.

2. Click the Editor dropdown arrow on the Editor toolbar and click Start Editing.

The Start Editing dialog box opens.

3. Click Personal Geodatabase.

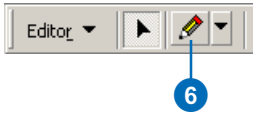


4. Click OK.

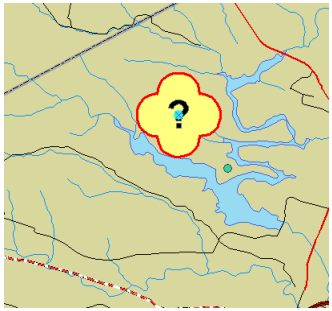
Add features to the Allies force element layer first.

5. Ensure Allies Features: Allies is selected on the Editor toolbar as the target and Create New Feature is selected as the task.

6. Click the Create New Feature button on the Editor toolbar.

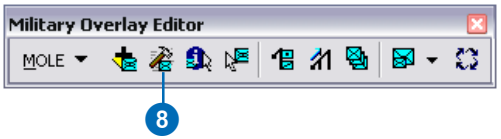


7. Click in the map display area to place a point near the lake to the north.



The MOLE unknown force element feature symbol appears and is selected.

8. Click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.

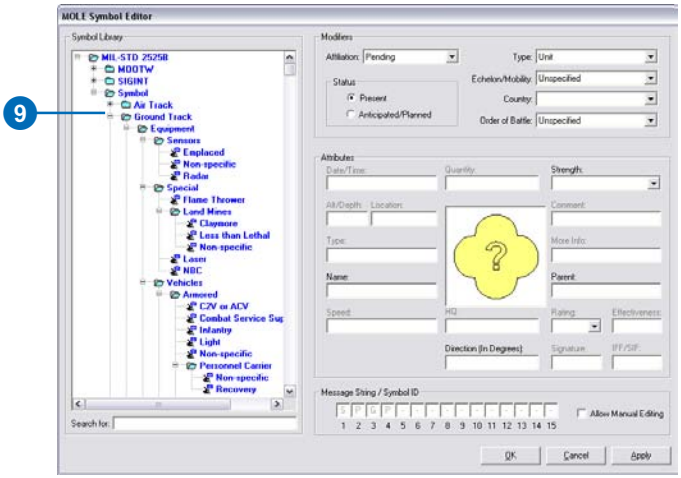


The MOLE Symbol Editor dialog box opens. The text boxes around the symbol represent the fields in the MOLE feature attribute table. Values entered in these text boxes will appear as text labels around the symbols in the display. See Exercise 2 in this chapter for more information on labels.

The Force Element Symbol Editor provides an interface that allows you to quickly change the properties of an existing force element in the map display. You can manually enter the Symbol ID (15-character code) of the desired element or choose from the list. Changes made to the element are applied to the Symbol ID and saved in the layer's feature attribute table.

9. Expand the Ground Track branch of the tree.

   Scroll down the list and note the units that are available.



10. Type “Infantry” in the Search for box and press Enter.

    Notice that only infantry units display in the list.

11. Click the Airborne entry from the Catalog tree.

    Note that the symbol in the MOLE Symbol Editor is updated. The Symbol_ID field at the bottom of the dialog box is also updated.

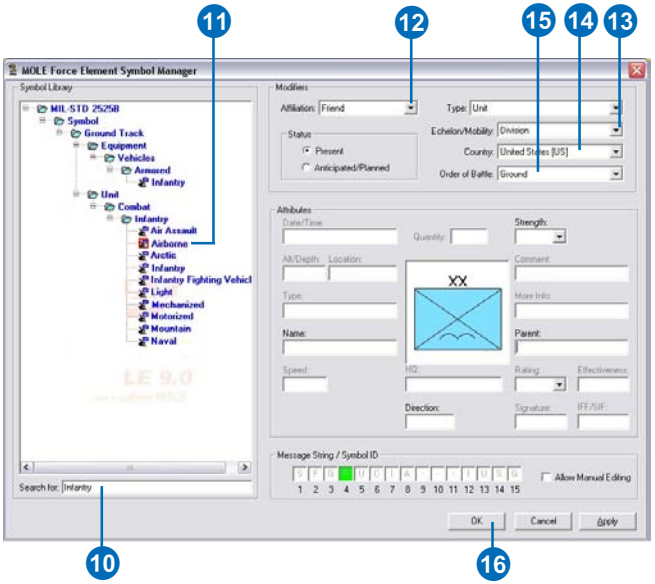
12. Click the Affiliation dropdown arrow and click Friend.

13. Click the Echelon/Mobility dropdown arrow and click Division.

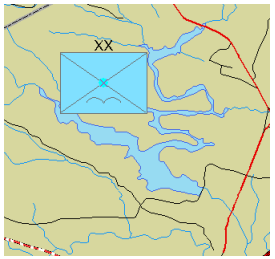
14. Click the Country dropdown arrow and click United States (US).

15. Click the Order of Battle dropdown arrow and click Ground.

    The MOLE Symbol Editor should look like the one in the following illustration.



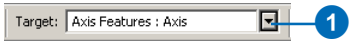
16. Click OK.



Adding symbols to MOLE force element layers (Axis layer)

Now repeat the previous steps to add a chemical weapons raw materials production facility symbol to the Axis layer.

1. Click the Target dropdown arrow on the Editor toolbar and click Axis Features : Axis.

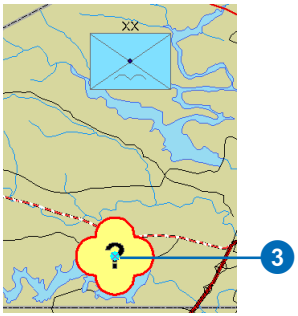


2. Ensure the edit task is set to Create New Feature, then click the Create New Feature button on the Editor toolbar.

3. Click in the map display area to place a point above the lake to the south as shown on the next page.

   MOLE draws a yellow, clover-shaped symbol to indicate the required properties have not been set yet.

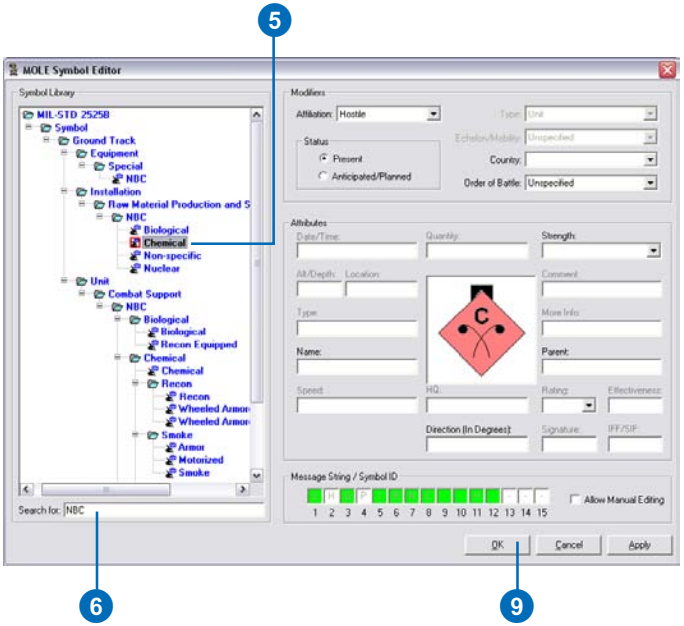
4. With the new symbol selected, click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.

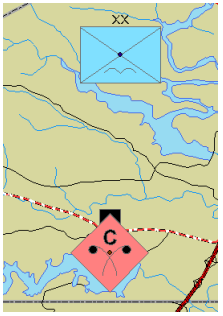


This time, the symbol you add will be a ground installation type element.

5. Expand the Ground Track > Installation branch of the tree.
6. In the Search box, type “NBC” for nuclear, biological, and chemical, then press Enter.
7. Click Chemical in the list of elements matching the search to select it.
8. Set the Affiliation to Hostile and keep the default values for the remaining fields.
9. Click OK.
10. Save your edits.

Note how the friendly and hostile graphic types are different, as specified in MIL-STD-2525B. You can experiment with adding other types of force elements and changing the affiliation and echelon/mobility properties to see the different graphic types that are available.





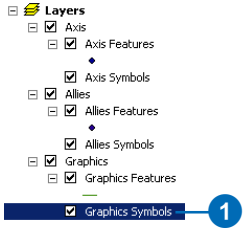
Adding MOLE tactical graphics

Adding MOLE tactical graphics to a map is similar to adding force elements. In this part of the exercise, you create an axis of advance tactical graphic that is a multipoint arrow.

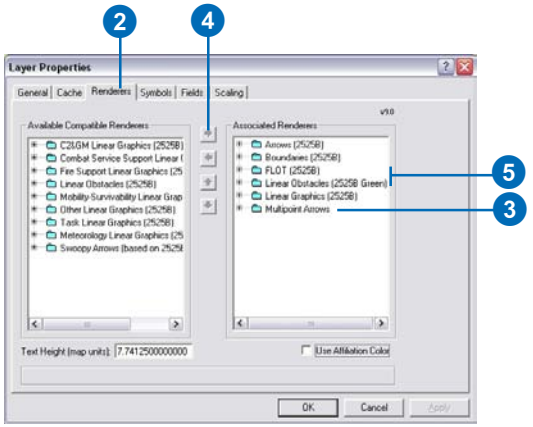
Most tactical graphic renderers are not turned on by default, so the first step in adding a tactical graphic is often to enable its renderer.

For this part of the exercise, it is assumed you've completed the first part, your Military Overlay Editor toolbar and layers are displayed, and you have started editing.

1. Double-click the Graphics Symbols layer in the TOC to open the Layer Properties dialog box.

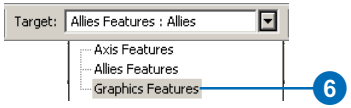


2. Click the Renderers tab on the Layer Properties dialog box.
3. Click Multipoint Arrows in the Available Compatible Renderers list.
4. Click the arrow to place the renderer in the Associated Renderers list.
5. Follow steps 3 and 4 for FLOT (2525B) and Linear Obstacles (2525B), then click OK.



The Associated Renderers list shows the renderers that are currently enabled. The Available Compatible Renderers shows the other renderers, which are not being used. To see the features that are drawn by each renderer, click the plus sign next to the renderer.

6. Click the Target dropdown arrow on the Editor toolbar and click Graphics Features.



7. Ensure Create New Feature is selected in the Task list on the Editor toolbar.
8. Click the Create New Feature button on the Editor toolbar.

9. Click in the map display area to place the first vertex of the line to the left of the force element symbol you created earlier.

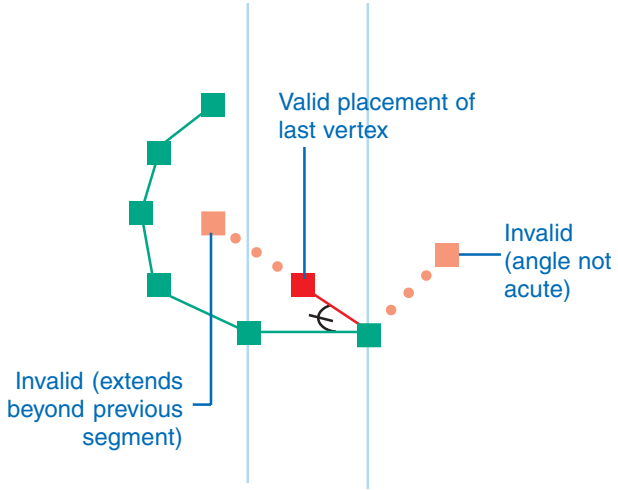
10. Continue placing vertices, about four or five more, until you add the second-to-last one near the border of the enemy force element symbol.

    Now you are ready to create the arrowhead and finish adding the arrow. You create the arrowhead when you add the last vertex. The placement of the last vertex determines the size and shape of the arrowhead.

11. Click in the display to add the last vertex, as shown in the illustration in the right column of this page. You must follow two rules when adding the last vertex. The line segment you create when you add the last vertex:

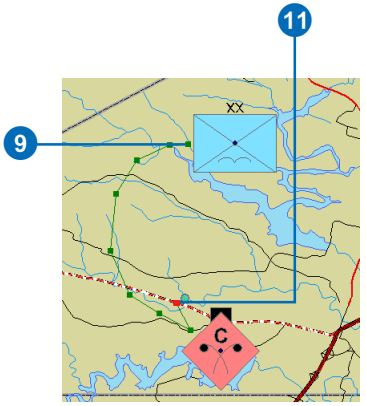
    - Must form an acute angle with the previous line segment
    - Must not extend beyond the previous line segment

    The area between the blue lines in the illustration below indicates the allowable area for the last vertex.



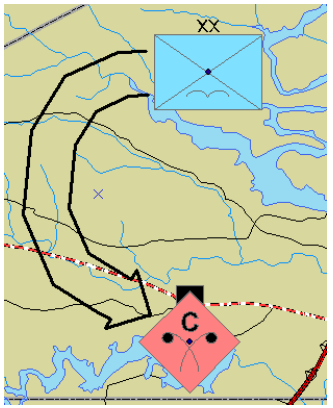
For details on the MOLE logic behind rendering multipoint arrows, see the symbol rendering section in Chapter 4, 'Adding MOLE symbols in ArcMap'.

If you do not position the last vertex in the allowable area, MOLE cannot render the arrow and, instead, draws a curved magenta line with no arrowhead.

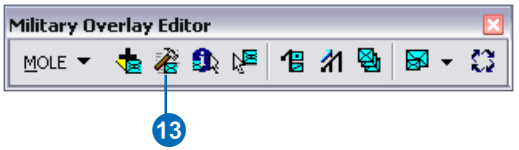


12. To complete the tactical graphic, press F2 or right-click and click Finish Sketch.

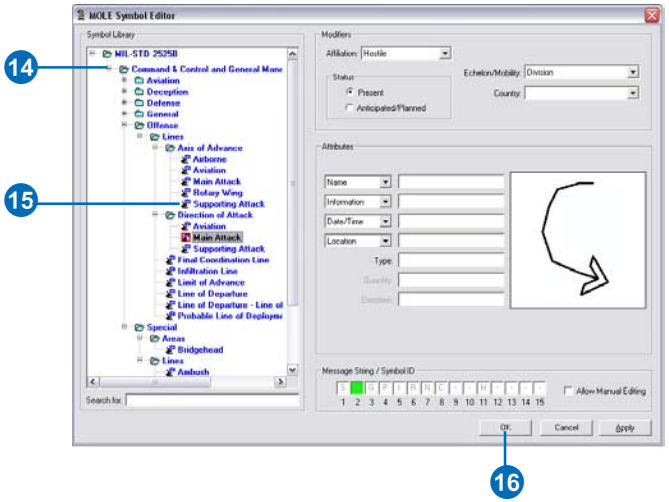
    Your tactical graphic should look similar to the arrow in the image to the right. By default, a direction of main attack arrow will be drawn and selected.



13. Click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.



The MOLE Symbol Editor dialog box opens.



As with force elements, the text boxes around the symbol represent the fields in the MOLE feature attribute table. Values entered in these text boxes will appear as text labels around the symbols in the display.

14. Expand the Command & Control and General Maneuver branch of the tree.
15. Click Supporting Attack under Axis of Advance in the list. Note that the symbol updates in the MOLE Symbol Editor preview window.
16. Click OK.
17. Save your edits.
18. Uncheck the Graphics Feature check box in the TOC.

You can continue adding force elements and tactical graphics to your map. When finished, save your edits and save changes to the map.

In this exercise, you learned how to create custom MOLE feature classes in a geodatabase in ArcCatalog. You also practiced editing the feature classes and adding force elements and tactical graphics to them. The remaining chapters in this guide can help reinforce and expand upon what you have learned in these exercises.

Exercise 4: Displaying and working with MOLE data in ArcGlobe

Working with MOLE data in ArcGlobe is very similar to working with it in ArcMap except that you're working in a three-dimensional environment. When working with MOLE in ArcGlobe, keep in mind these basic concepts:

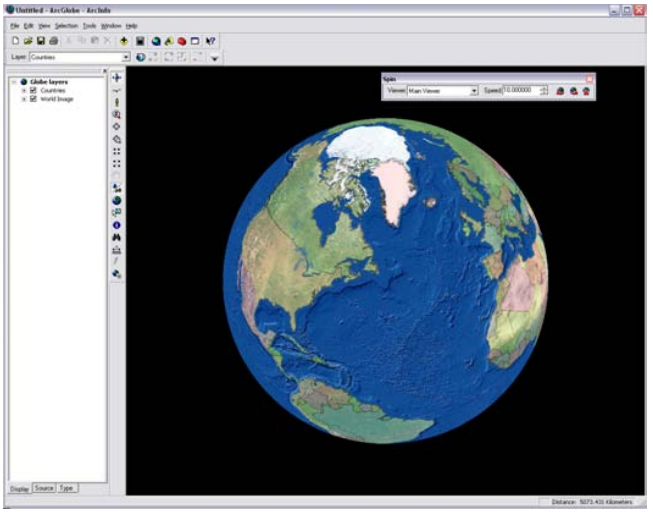
- Force element graphics are always associated with point features, and tactical graphics are associated with point, line, or polygon features.
- You *extrude* lines and polygons when you make them three-dimensional; but you *billboard* point features. You can apply the draping display type to any MOLE graphic (to any feature type).
- Extrude and billboard apply to the graphic associated with the feature.

This exercise steps you through adding, displaying, and working with MOLE data in ArcGlobe. In the first set of tasks in this exercise, you work with force elements; in the second set, you work with tactical graphics.

Adding and displaying MOLE data

1. If you haven't already, install the ArcGIS 3D Analyst™ extension.
2. Click Start, All Programs, ArcGIS, ArcGlobe.

   ArcGlobe opens. The following image shows ArcGlobe after you first start it.

   For more information on installing 3D Analyst or starting ArcGlobe, see Chapter 6, 'Using MOLE with other ESRI products'.

3. Add the Military Overlay Editor toolbar in ArcGlobe by right-clicking any toolbar, then clicking Military Overlay Editor.

   The Military Overlay Editor toolbar displays. It contains a subset of the tools on the ArcMap version of the Military Overlay Editor toolbar.

4. Click the Add MOLE Data button on the MOLE toolbar.
5. On the Add MOLE Layers dialog box, navigate to the OPLAN tutorial data. By default, this data is installed

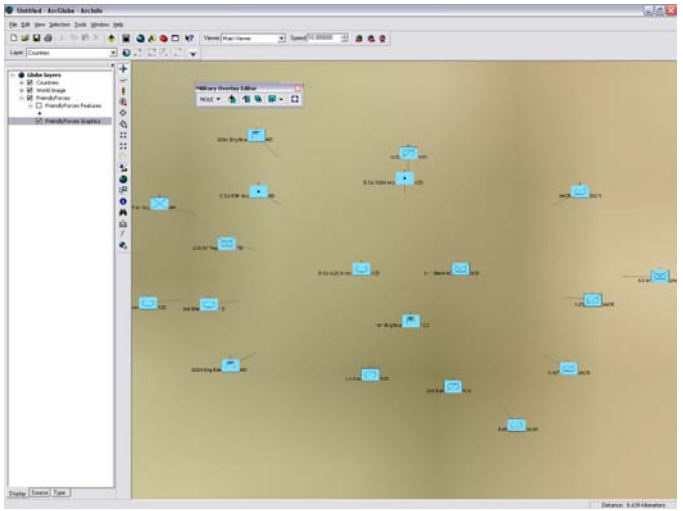
with MOLE to the <MOLE Installation Directory>\Tutorial\Mole_oplan directory.

6. Double-click OPLAN.mdb, click Friendly Forces, then click Add.

   The MOLE data is now in ArcGlobe. You can check this by seeing if a new group layer called FriendlyForces appears in the ArcGlobe TOC pane.

7. In the ArcGlobe TOC, right-click the FriendlyForces Graphics layer and click Zoom To Layer.

   The map should appear similar to the following image.

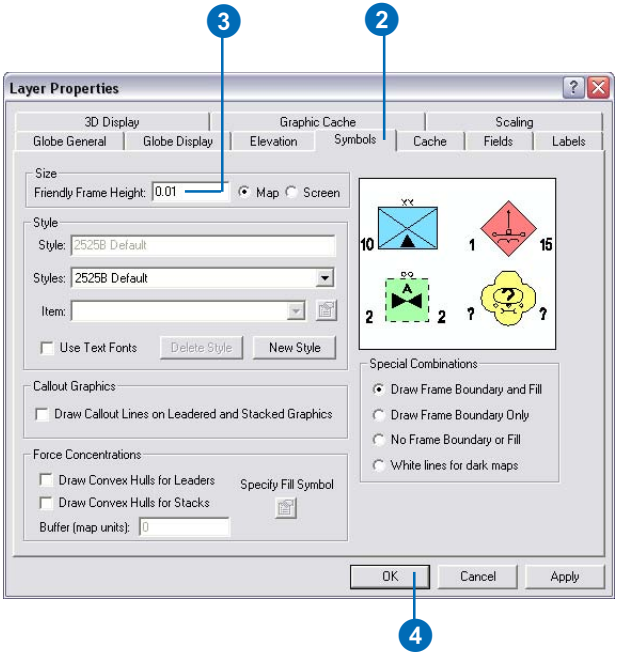


Resizing force elements

Next you'll resize the force elements you just added.

1. In the ArcGlobe TOC, right-click the FriendlyForces Graphics layer, then click Properties.

2. On the Layer Properties dialog box, click the Symbols tab.

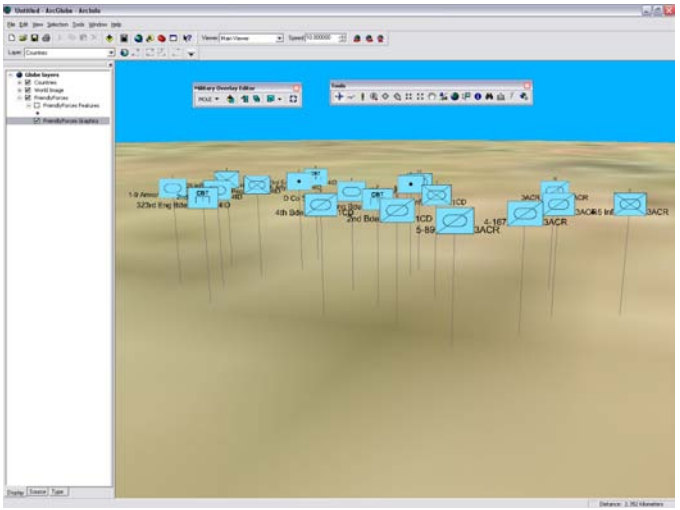


3. In the Friendly Frame Height text box, type "0.01" to indicate 0.01 map units.

4. Click OK.

   Now you can use the ArcGlobe Navigate tool to change the display so you can see the symbols on their callout lines.

   Your map should look similar to the following image.

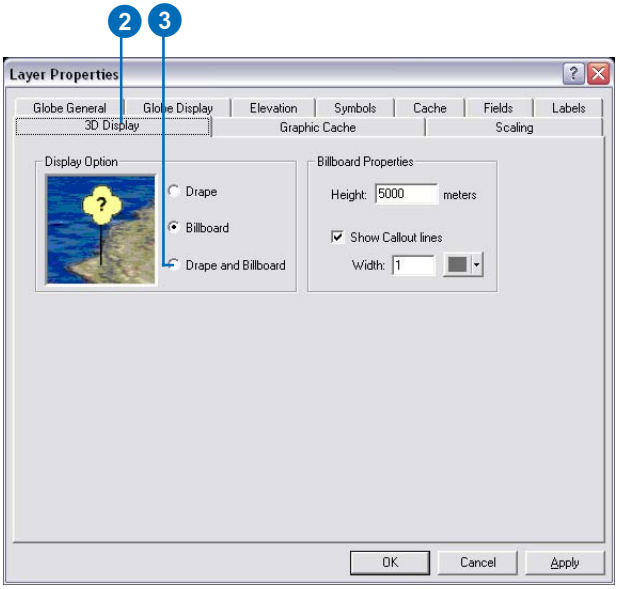


Changing the three-dimensional display type of force elements

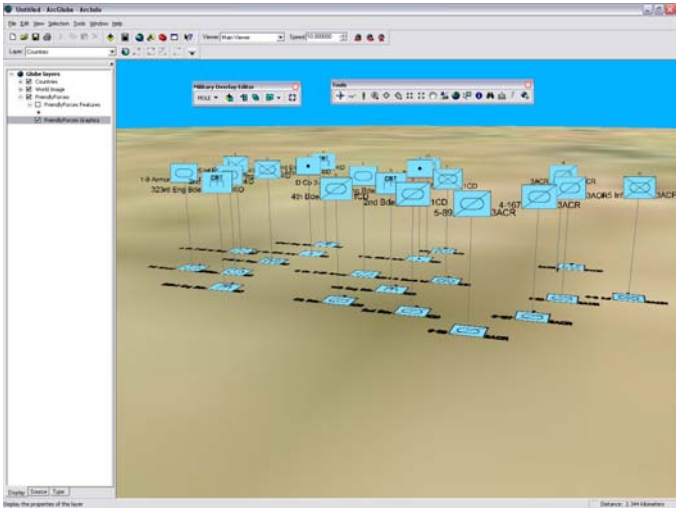
Three-dimensional display types for force elements include drape, billboard, and drape and billboard. For more information on these display types, see the ArcGlobe section of Chapter 6, ‘Using MOLE with other ESRI products’.

In this task you change the three-dimensional display type of force elements to drape and billboard.

1. In the ArcGlobe TOC, right-click the FriendlyForces Graphics layer and click Properties.
2. On the Layer Properties dialog box, click the 3D Display tab, then click Drape and Billboard.
3. Click OK.



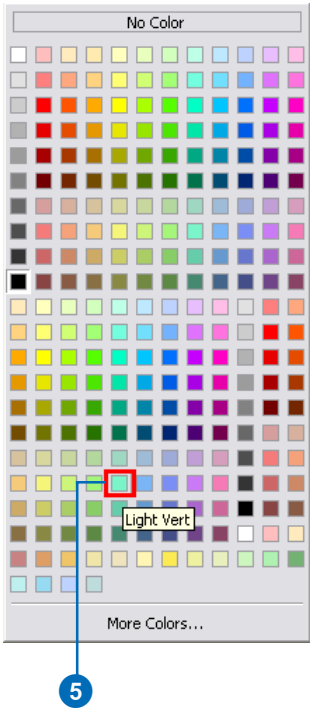
Your map should appear similar to the following image.



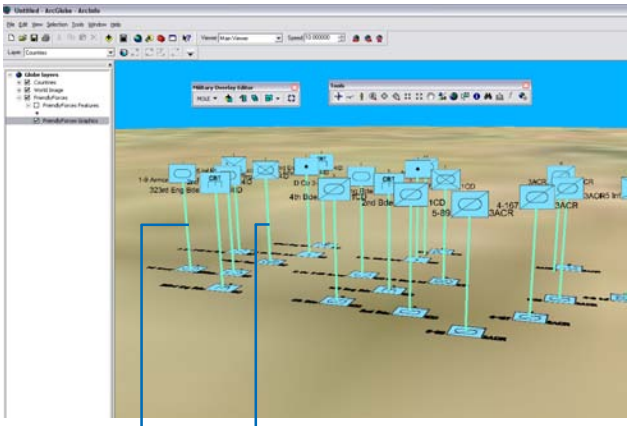
Change thickness and color of a force element callout line

Next change the thickness and color of the callout line.

1. In the ArcGlobe TOC, right-click the FriendlyForces Graphics layer, then click Properties.
2. On the Layer Properties dialog box, click the 3D Display tab.
3. In the Width text box, type “5” to change the callout line thickness to five units.
4. To change the color of the callout line, click the color selection dropdown arrow.
5. In the color palette that displays, click the color Light Vert.
6. Click OK to close the Layer Properties dialog box and apply your changes.



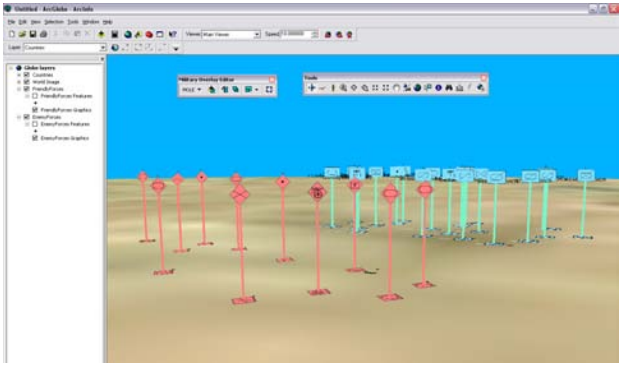
Your map should appear similar to the following image.



MOLE callout lines in ArcGlobe

Adding enemy force elements

See if you can add the force element layer for enemy forces and symbolize it the same way you symbolized the friendly forces graphics layer. But instead of using the color Light Vert for the callout line, use Medium Coral or a color that is in the red color family. When finished, your map should look similar to the following image.



Adding tactical graphics

Adding tactical graphics in ArcGlobe is the same as adding force elements.

1. If you haven't already, install the ArcGIS 3D Analyst extension.
2. Click Start, All Programs, ArcGIS, ArcGlobe.

   ArcGlobe opens.

   For more information on installing 3D Analyst or starting ArcGlobe, see Chapter 6, 'Using MOLE with other ESRI products'.
3. In ArcGlobe, click the Add MOLE Data button on the Military Overlay Editor toolbar.

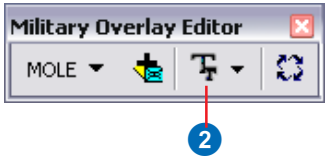
4. On the Add MOLE Layers dialog box, navigate to the OPLAN tutorial data. By default, this data is installed with MOLE to the <MOLE Installation Directory>\Tutorial\Mole_oplan directory.
5. Double-click OPLAN.mdb, click TacticalLines, then click Add.

   MOLE adds the tactical graphics to the ArcGlobe map display. The map display should appear similar to the following image if you performed the previous exercises.

Resize tactical graphic labels (text)

1. In the ArcGlobe TOC, click the MOLE graphic layer TacticalLines.

   The Text Height button appears on the Military Overlay Editor toolbar.



2. Click the Text Height button.
3. In the map display, click and drag to create a small rectangle.

   MOLE redraws the labels so their height matches the height of the box you drew.

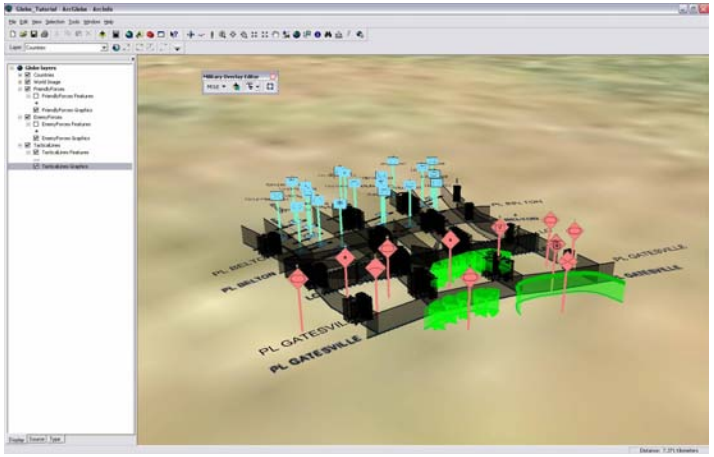
Change the three-dimensional display type for tactical graphics

1. In the ArcGlobe TOC, right-click the TacticalLines graphics layer and click Properties.

   When you open the Layer Properties dialog box for a line graphic layer, the Drape and Extrude displays where the Drape and Billboard option displayed for the force elements (point) graphic layer.
2. On the Layer Properties dialog box, click the 3D Display tab, then click Drape and Extrude.
3. Type "2000" in the Height text box.

4. Click OK.

   MOLE applies the Drape and Extrude display type to the tactical graphics you selected in the TOC, uses an extrusion height of 2,000 units, and draws the graphics in the map display.



5. Use the ArcGlobe Navigate tool to pan and zoom in and out of the 3D graphics and observe their behavior as you move around them.

Creating a MOLE geodatabase

3

IN THIS CHAPTER

- **MOLE feature types**
- **Creating a geodatabase**
- **Creating MOLE feature classes**
- **Attribute data field descriptions**
- **Creating MOLE geodatabases (ArcView users)**
- **Updating MOLE datasets**

With MOLE you can take advantage of the functionality offered by the ArcGIS geodatabase data model. By using a geodatabase—personal or multiuser—you can leverage all the features of MOLE and all the additional capabilities that using a geodatabase provides.

If you are building MOLE data for the first time, it is recommended you create it in a personal or multiuser geodatabase instead of a shapefile. If you want to use MOLE with shapefiles instead or are working on a non-Windows® system, review the shapefile section in Chapter 1, 'Introducing MOLE'.

Although you can use MOLE to create MIL-STD-2525B symbology for any supported ArcGIS vector format, you may not have access to some of the more advanced MOLE functionality.

The steps required to create a MOLE geodatabase are discussed in this chapter.

If you are planning to create multiuser enterprise databases, read *Building a Geodatabase*. You'll find this book in the ArcGIS documentation set or for purchase at *www.esri.com*.

MOLE feature types

MOLE organizes all the different object types found in MIL-STD-2525B into two categories: force elements and tactical graphics.

Force elements

Force elements are a category of symbols that represent unit, equipment, and installation military features. They are represented in the geodatabase as point feature classes. These symbols include battle dimensions for space, air, ground, sea surface, sea subsurface, special operations forces, and others.

Force element symbols have properties and behaviors that MOLE manages automatically. Symbols that are located close together, within a user-defined tolerance, can be rendered on leader lines. Identical units that occur at the same location can be stacked. These properties, along with other symbol display details, are controlled by the MOLE Layer Property tabs in ArcMap.

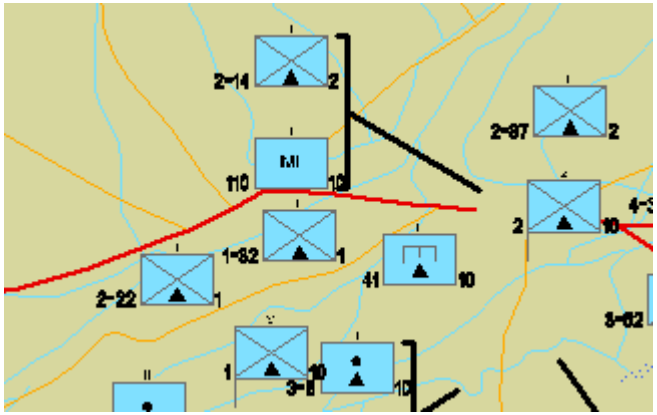
Tactical graphics

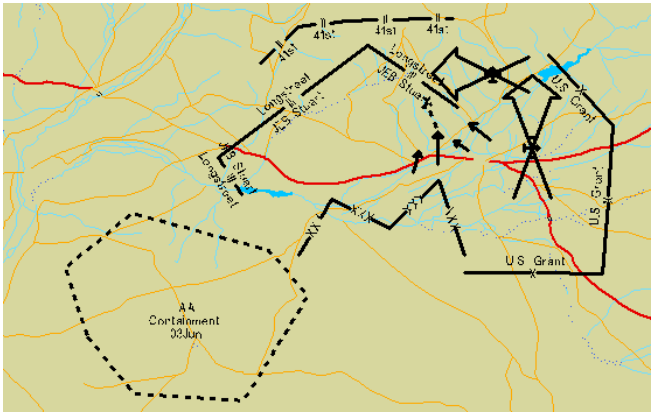
Tactical graphics symbolize other military operations, such as movement, obstacles, and areas of operations. These symbols are line and area as well as point feature classes in the geodatabase.

These symbols appear in Appendix B of the MIL-STD-2525B documentation. They are sometimes referred to by a hierarchy code (2.x).

Tactical graphic layers are different from force element layers. Tactical graphics are drawn using custom renderers, which allow adding new or customized versions of tactical graphic symbols.

MOLE further subdivides tactical graphics into six groups, according to 2525B categories: tasks, C^2 and general maneuver, mobility/survivability, fire support, combat support, and other. Each of these can also have different feature types, points, lines, or polygons.





Creating a geodatabase

A geodatabase is a relational database that supports a model of topologically integrated feature classes. It also supports complex feature types and relationships. The geodatabase model is an object-oriented vector data model. Entities are represented as objects with properties, behaviors, and relationships.

MOLE creates class extensions within a geodatabase. These class extensions will automatically define the MIL-STD-2525B attributes that are required for proper symbolization along with a number of validation rules specific to MOLE. In addition, by utilizing MOLE geodatabase class extensions, you have the ability to use the MOLE Symbol Editor, which is discussed in the following chapter. ►

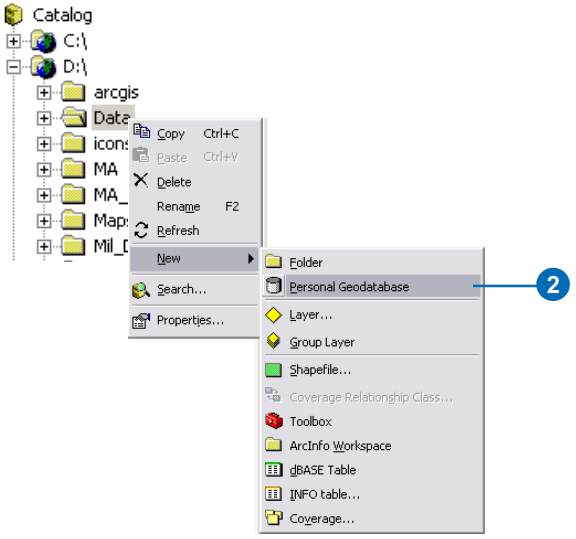
See Also

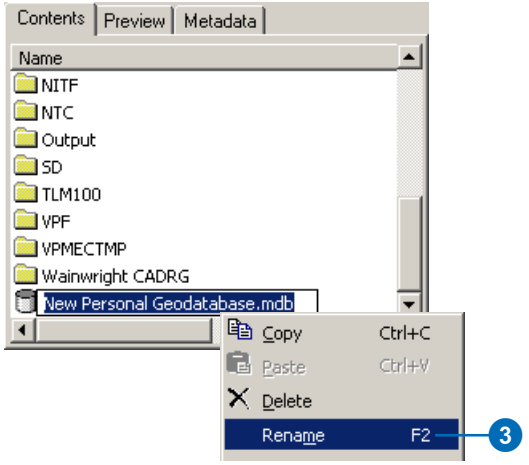
See Building a Geodatabase *for complete information on the geodatabase data model.*

Creating a personal geodatabase

1. Start ArcCatalog.
2. Navigate to the folder where you want to create the new geodatabase in the ArcCatalog Catalog tree. Right-click the folder, point to New, then click Personal Geodatabase.
3. On the Contents tab of the ArcCatalog window, right-click New Personal Geodatabase.mdb in the Catalog tree and click Rename.
4. Type a new name for the geodatabase and press Enter.

   You now have an empty geodatabase within which you can create MOLE feature classes.





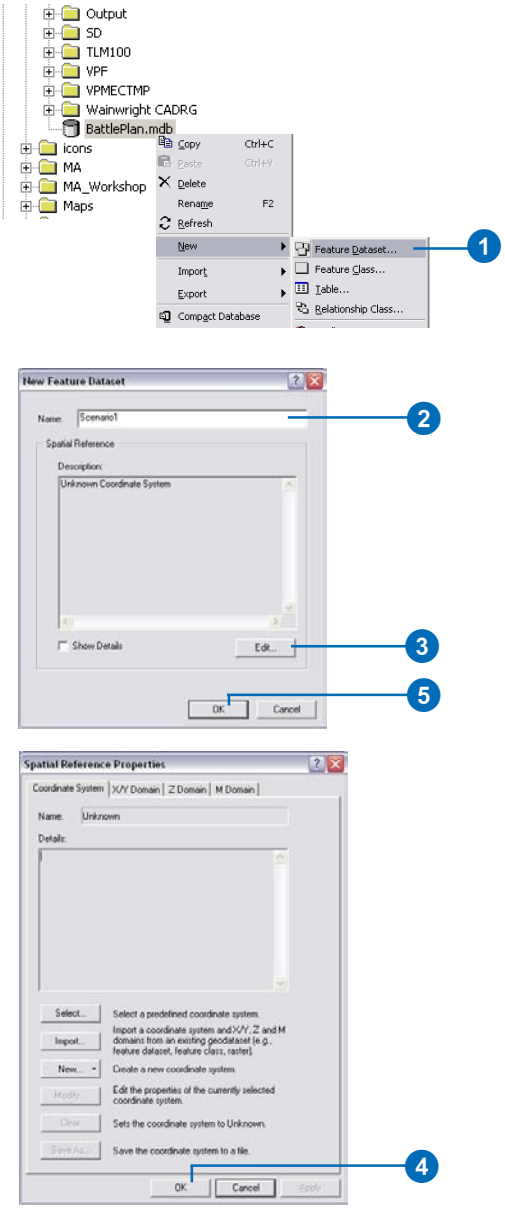
Feature datasets are primarily designed to contain feature classes that are topologically connected; you can use them to organize your MOLE feature classes. When you create a feature dataset, you can define a spatial reference for it. The spatial reference properties will automatically be applied to all the feature classes that are subsequently created within the feature dataset. You can create multiple feature datasets within a single geodatabase, each with a different spatial reference, if so desired.

See Also

See Building a Geodatabase *for more information on feature datasets.*

Creating feature datasets

1. Right-click the geodatabase in which you want to create a feature dataset, point to New, then click Feature Dataset.
2. Type a name for the feature dataset in the Name text box of the New Feature Dataset dialog box.
3. Click Edit to open the Spatial Reference Properties dialog box.
4. Define the spatial reference of the feature dataset. Click Select to choose a predefined coordinate system, or click Import to use the coordinate system of another feature dataset or feature class. Click the X/Y, Z, and M domain tabs to define the spatial domain and precision of the dataset. Click OK when you are finished setting the spatial reference properties.
5. Click OK on the New Feature Dataset dialog box.



Creating MOLE feature classes

When you create a MOLE geodatabase feature class, you can either create it within a feature dataset, or it can be a standalone feature class directly within the geodatabase. When you create a feature class within a feature dataset, the feature class automatically obtains the spatial reference (coordinate system and spatial domain) of the feature dataset. When you create a MOLE feature class directly in a geodatabase, MOLE assigns a default spatial reference to it. The default coordinate system is Geographic WGS84. The steps in this task will cover creating a force element feature class within a feature dataset.

Tip

Z-values

If the data source for your force element points has z-values that you want to maintain, you must specify that when you create the feature class. You cannot add z-value support once the feature class is created.

Creating a force element feature class

1. Right-click the feature dataset in which you want to create the feature class, point to New, then click Feature Class.

   To create a standalone feature class in a geodatabase, right-click the desired geodatabase rather than the feature dataset. All other steps are the same.

2. Type a name for the feature class in the Name text box on the New Feature Class dialog box.

   Optionally, type an alias for the feature class.

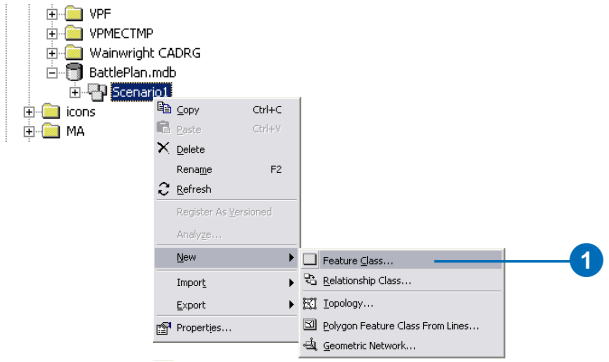
3. Click the button to store custom objects.

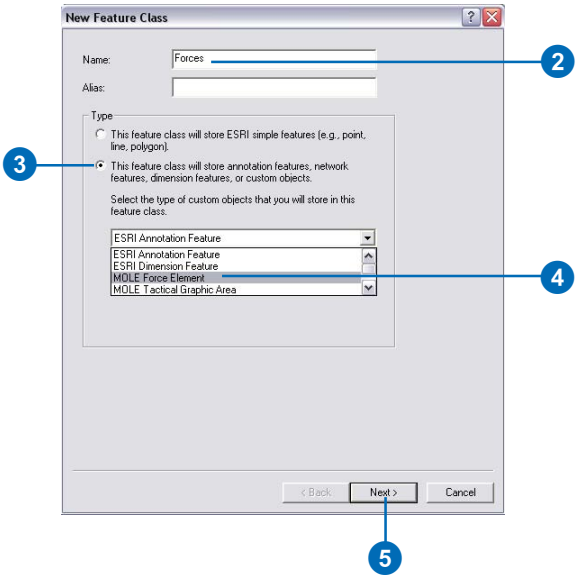
4. In the Type area, click the custom objects dropdown arrow and click MOLE Force Element.

5. Click Next.

6. You will be asked if you want to add z-values. If your data source will supply or support z-values, click Yes. Otherwise, click No.

7. Accept the defaults and click Next on the following dialog box, then click Finish.

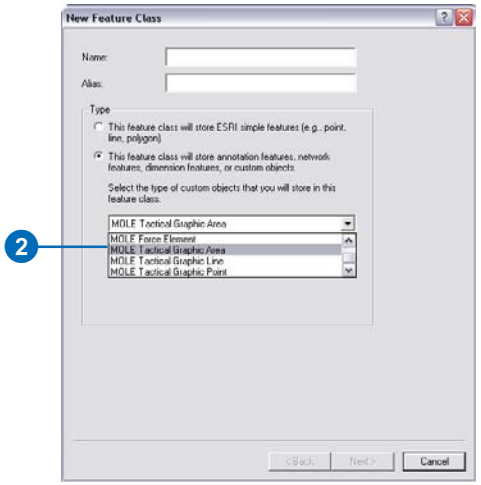




Creating a tactical graphic feature class

1. Follow steps 1–3 in the previous task to create a new geodatabase feature class.
2. In the Type area, click the custom objects dropdown arrow, then click any of the MOLE custom object types other than MOLE Force Element.
3. Follow steps 5–7 from the previous task.

   Repeat these steps as necessary to create the feature classes for your application. Note that the class extensions installed with MOLE choose the appropriate feature type—point, line, or area—for you automatically according to the tactical graphic custom object type you select.



Tip

MOLE custom object types

There are several MOLE custom objects you can define when setting up your feature classes.

- *MOLE Force Element*
- *MOLE Tactical Graphic Area*
- *MOLE Tactical Graphic Line*
- *MOLE Tactical Graphic Point*

Tip

Custom feature classes in MOLE

MOLE uses geodatabase class extensions to create specific feature class types for the categories of tactical graphics in MIL-STD-2525B. These class extensions also tell MOLE which renderers are valid for each feature class, so you don't have to search long lists of items to find a particular graphic. MOLE manages that classification for you.

Attribute data field descriptions

MOLE derives labels for its graphics from MOLE attribute data. Apart from Symbol_ID and a few attributes required by ArcGIS, such as Shape, all MOLE attribute data is used for labels.

You can add and edit this attribute data in the MOLE Symbol Editor or in the attribute table. You can also use existing attribute data for labels.

When you add an attribute (a label), MOLE positions it around the graphic in accordance with MIL-STD-2525B position descriptions. For an overview of MOLE attribute data and positioning of labels, see 'The MOLE Symbol Editor' in Chapter 1.

The tables to the right give details for MOLE attributes.

If the field name (left column) is bold, the field is either required to have that exact name or you must map your existing fields to those fields to display labels. There are several ways to use existing field names in MOLE. ▸

Point tactical graphics

Field name	Type	Default character limit
Symbol_ID	Text	15
Name	Text	20
Name1	Text	20
Info	Text	50
Info1	Text	50
Info2	Text	50
Location	Text	20
DTG	Text	20
DTG1	Text	20
Etype	Text	10
Speed	Text	10
Direction	Double	na

Line tactical graphics

Field name	Type	Default character limit
Symbol_ID	Text	15
Name	Text	20
Name1	Text	20
Location	Text	20
DTG	Text	20
DTG1	Text	20
Info	Text	20
Info1	Text	20
Etype	Text	20

Area tactical graphics

Field name	Type	Default character limit
Symbol_ID	Text	15
Name	Text	20
Name1	Text	20
Info	Text	50
Info1	Text	50
Info2	Text	50
Location	Text	20
DTG	Text	20
DTG1	Text	20
Etype	Text	10
Quantity	Text	10

Force elements

Field name	Type	Default character limit
Symbol_ID	Text	15
Name	Text	20
Parent	Text	20
SComment	Text	50
Info	Text	50
Strength	Text	5
EvalRating	Text	2
Location	Text	20
Alt_Depth	Text	10
Speed	Text	10
DTG	Text	20
HQ	Text	10
Quantity	Text	10
EType	Text	20
Effective	Text	10
Signature	Text	10
IFFSIF	Text	10

For more information on using existing field names in MOLE, see 'Getting started with MOLE' in Chapter 1. For more information on Speed and Direction fields for point tactical graphics, see 'Symbology rendering in MOLE' in Chapter 4.

Required field names for MOLE feature classes

When MOLE adds feature classes, it looks for specific fields in the attribute table of the feature class by which to render the symbology and text labels of the features.

For example, if you have a force element feature class with an attribute field named Parent, MOLE will add the values in that field as labels at the bottom-right corner of the symbols in the layer. Similarly, if the same attribute field is given an alias of Parent, but the field name is different, MOLE will still display the values in the field at the same location around the symbols.

In short, MOLE honors both attribute field names and aliases when it renders labels. Either the field name or the alias must conform to the naming conventions in the tables on the previous page for the labels to be displayed. The Symbol ID is different, however. The field containing Symbol ID values must be named Symbol_ID. Even if the field alias is Symbol_ID, the MOLE symbology will not be displayed if the field name is not Symbol_ID.

When you create a custom object feature class, MOLE will automatically create the necessary attribute fields with the correct field names or aliases. The field names are only a concern if you are planning to create custom MOLE applications or design a MOLE database and do not want to use the default MOLE custom object feature classes. Note that it is not necessary to create all the fields in the tables on the previous page for a particular feature class. However, if you want particular labels displayed with the MOLE graphics, the attribute fields containing the values for those labels must either be named or aliased according to the tables.

Default character limits

When creating new MOLE feature classes in a geodatabase, MOLE creates attribute fields, each of which has a default maximum number of characters you can specify for its value until MOLE truncates the value. For example, if you type an entry in a field in the MOLE Symbol Editor that exceeds the character limit for that field, MOLE truncates the entry and, as a result, does not store the removed characters in the source data upon save. The MOLE Symbol Editor indicates via message boxes whether or not an entry exceeds this limit. Default character limits are also known as length.

Force element attribute data field descriptions

The table on the following page, excerpted from MIL-STD-2525B and adapted for this guide, lists field descriptions for force element attribute data. This attribute data is used for labels.

Date/Time	A label for units, equipment, and installations that displays traditional military Date/Time group format: DDHHMMSSZMONYY.
Quantity	A label for an equipment graphic that identifies the number of items present.
Strength	A label for a unit that displays (+) for reinforced, (-) for reduced, and (+/-) for reinforced and reduced.
Comment	A label for units, equipment, and installations; content is implementation specific.
More Info	A label for units, equipment, and installations; content is implementation specific.
Parent	A label for units that indicates the number or title of a higher-echelon command (corps are designated by Roman numerals).
Effectiveness	A label that indicates unit effectiveness or installation capability.
IFF/SIF	A label that displays IFF/SIF identification modes and codes.
Signature	A label for hostile equipment; "!" indicates detectable electronic signatures.
Rating	A label for units, equipment, and installations that consists of a one-letter reliability rating and a one-letter credibility rating: Reliability ratings: A-completely reliable, B-usually reliable, C-fairly reliable, D-not usually reliable, E-unreliable, F-cannot be judged. Credibility ratings: 1-confirmed by other sources, 2-probably true, 3-possibly true, 4-doubtfully true, 5-improbable, 6-cannot be judged.
HQ	A label for units; indicator is contained inside the frame; contains the name of the special C^2 headquarters.
Speed	A label for units, equipment, and installations that displays velocity as set forth in the United States Message Text Formatting Program specification, MIL-STD-6040.
Name	A label for units, equipment, and installations that uniquely identifies a particular graphic; also known as track number. Identifies acquisition number when used with SIGINT symbology.
Type	A label that indicates type of equipment.
Location	A label for units, equipment, and installations that displays a graphic's location in degrees, minutes, and seconds (or in UTM or other applicable display format).
Alt/Depth	A label for units, equipment, and installations that displays the altitude portion of GPS; flight level for aircraft; depth for submerged objects; height in feet of equipment or structures on the ground.

Field descriptions for force element attribute data

Using the Type field for tactical graphics

The role of the Type field is different from that of the other fields in the Modifiers area of the MOLE Symbol Editor. It is a graphical property for specific symbols. In other words, values entered here do not appear as labels around the selected symbol but, instead, change its appearance. This only applies to the following graphics: tactical graphic areas/minefields/dynamic depiction (symbol ID G*M*OFD) and tactical graphic points/minefields/static depiction (symbol ID G*M*OFS). The following table contains the valid input values, which are not case sensitive, for the possible mine types. If any other value is entered or if the Type field is blank, MOLE displays unspecified mines by default.

Mine Type	Valid Values
Antipersonnel Mine	OMP, OMP---, ANTIPERSONNEL, AP
Antitank Mine	OMT, OMT---, ANTITANK, AT
Antitank Mine + Anti-Handling Device	OMD, OMD---, ANTITANK ANTIHANDLING, ANTIHANDLING ANTITANK, AT AH, AH AT, AHAT, ATH, HAT
Directional Antitank Mine	OME, OME---, ANTITANK DIRECTIONAL, DIRECTIONAL ANTITANK, AT D, D AT, ATD, DAT
Unspecified Mine	OMU, OMU---, UNSPECIFIED
Wide Area Mine	OMW, OMW---, WIDE AREA MINES, WIDE, WIDE AREA, W, WA, WAM

The table on the following page describes each of the text fields in the tactical graphic MOLE Symbol Editor dialog box.

Name	A text modifier that uniquely identifies a particular tactical graphic; also known as track number. Nuclear: delivery unit (missile, aircraft, satellite.)
Information	A text modifier for tactical graphics; content is implementation specific.
Date/Time	A text modifier that displays DTG format: DDHHMMSSZMONYY.
Location	A text modifier that displays a graphic's location in degrees, minutes, and seconds (or in UTM or other applicable display format).
Type	A text modifier that indicates mine type.
Quantity	A text modifier in a nuclear symbol that identifies the detonation in kilotons; yield (can be displayed in decimals).
Direction	A graphic modifier for nuclear, biological, and chemical events that identifies the direction of movement (see paragraph 5.5.2.1 and figure 11 of MIL-STD-2525B).

Creating MOLE geodatabases (ArcView users)

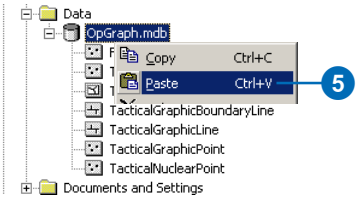
MOLE uses geodatabase feature classes with custom objects to perform many functions involving editing and symbol creation. The previous tasks outline the steps involved in creating such feature classes. The ability to create feature classes that store custom objects is supported by ArcEditor and ArcInfo but not ArcView. If you are using MOLE with an ArcView license, you will not be able to create MOLE feature classes with custom objects. However, in ArcView you can use custom feature classes by making copies of and renaming existing custom feature classes. On the MOLE installation CD–ROM, you will find a MOLE geodatabase template, MOLE_BLANK.mdb, you can use to create your own geodatabases if you have an ArcView license. The templates contain an empty feature class for each of the MOLE custom object types. You can also delete or copy any of the feature classes within the template database to suit your needs. You can use the database for any MOLE application.

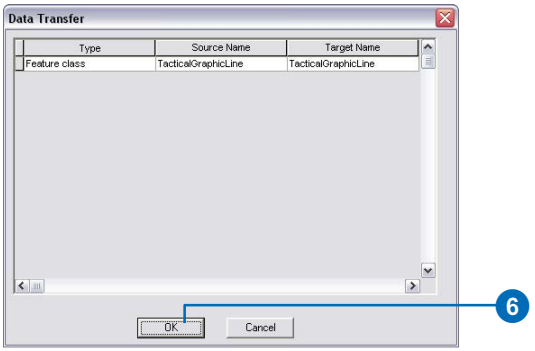
Using the MOLE_BLANK.mdb geodatabase

1. Copy MOLE_BLANK.mdb from the installation CD to your local computer.
2. Navigate to the folder in which you saved MOLE_BLANK.mdb in the ArcCatalog Catalog tree. Right-click MOLE_BLANK.mdb and click Rename, then type the new name.
3. Expand MOLE_BLANK.mdb in the Catalog tree by clicking the plus sign to view the feature classes it contains.

   To add more feature classes to the geodatabase, copy and paste the appropriate feature classes in the geodatabase.
4. Right-click the feature class type you want to add and click Copy.
5. Right-click the geodatabase to which you want to add the feature class and click Paste.
6. Click OK on the Data Transfer dialog box.

   The feature class will be added to the specified geodatabase. You can copy, paste, and rename the feature classes in the template geodatabase as your project requires.





Updating MOLE datasets

In some MOLE releases, the MOLE attribute data schema changes, requiring you to update your existing datasets. If your dataset meets one of the following conditions, you must update the dataset. Step-by-step procedures for updating your dataset are provided in this section.

Conditions that require you to perform an update procedure:

- If you want to use MOLE 2 data in MOLE 9.0 or greater
- If you want to use wind barbs (meteorological graphics for wind) and your dataset was created in MOLE 9.0 or earlier

Schema changes

Schema changes are documented in the release notes of each release. The most significant schema changes since MOLE 2 are:

- In MOLE 9.0, data for the Boundaries, TacticalBio, and TacticalNuclear feature classes was brought into the Tactical Lines, TacticalBio, and TacticalNuclear feature class extensions.
- Two fields, Speed and Direction, were added to point tactical graphics at MOLE 9.1 to allow for easier use of wind barbs on MOLE maps.

For an overview of the field names and descriptions of the MOLE schema for this release, see ‘Attribute data field descriptions’ in this chapter.

Update MOLE 2 data

If you want to work with a MOLE 2 database (personal or multiuser) in MOLE 9.0 or greater, you must first update it.

Once you update it, you can open it in ArcMap and work with it using the commands on the Military Overlay Editor toolbar.

You must use this same update procedure if you want to open a data source in MOLE that contains feature classes generated by MOLE 2 (a feature class or linked data sources such as a map document or .lyr file).

Tip

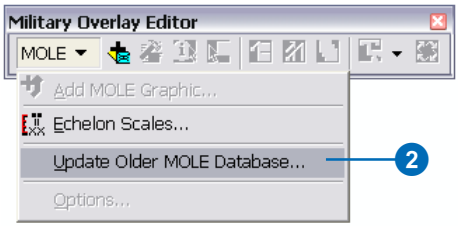
MOLE 2 permitted the creation of three feature classes in an 8.x geodatabase that contained class extensions incompatible with MOLE 9.0 or greater. These feature classes are Boundaries, TacticalBio, and TacticalNuclear. In MOLE 9.0 and greater, the Boundaries feature class is handled by the Tactical Lines feature class extension, and TacticalBio and TacticalNuclear are handled by the Tactical Point feature class extension.

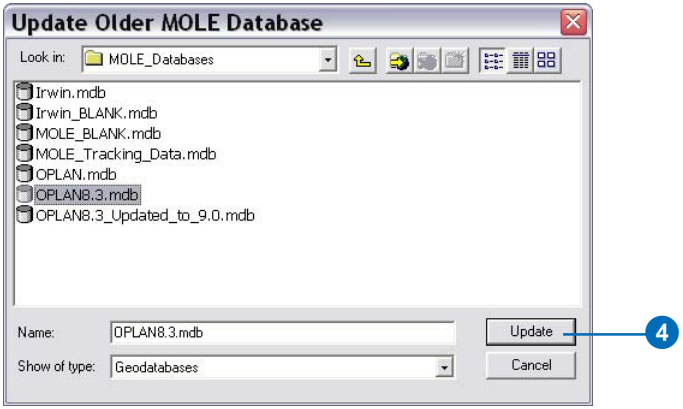
1. If you haven't already, open a blank ArcMap document in ArcMap (click File, New, then on the My Templates tab, double-click Blank Document).
2. On the Military Overlay Editor toolbar, click MOLE, then Update Older MOLE Database.
3. On the Update Older MOLE Database dialog box, navigate to and choose a database containing layers generated in MOLE 2.

   You can select one or more geodatabases (workspaces) at a time if they're in the same directory.
4. Click Update.

   MOLE examines the feature classes and datasets in the selected database or databases and validates each feature class's extension class ID. If the class extension is missing or incorrect, MOLE clears the class extension information.

   When MOLE is finished updating the database, it displays a message box confirming that the update is complete.





Adding wind barb graphics to datasets created in MOLE 9.0 and earlier

Adding wind barb graphics to datasets created in MOLE 9.0 and earlier requires the addition of two fields to the dataset.

These fields, Direction and Speed, are added the same way you add any attribute fields to an ArcGIS dataset. One common method, provided to the right, is to start the procedure in ArcMap. You can also start in ArcCatalog.

1. If you haven't already, open your dataset in ArcMap.
2. In the TOC, right-click the MOLE feature layer.

   In this case, the feature layer must be a point tactical graphics feature layer, because wind barbs are point features in MOLE.
3. Click Open Attribute Table.
4. In the Attributes window, click the Options button.
5. On the menu that appears, click Add Field.
6. On the Add Field dialog box, in the Name text box, type "Direction".
7. Click the Type dropdown arrow and click Double.
8. Click OK.
9. In the Attributes window, click the Options button.
10. On the menu that appears, click Add Field.
11. On the Add Field dialog box, in the Name text box, type "Speed".
12. Click the Type dropdown arrow, then click Text.
13. In the Field Properties area, in the Length text box, type "10".
14. Click OK.

Adding MOLE symbols in ArcMap

4

IN THIS CHAPTER

- **Adding MOLE graphics in ArcMap**
- **Using the Add MOLE Graphics dialog box**
- **Symbology rendering in MOLE**

When you store your MOLE features in a geodatabase with class extensions as discussed in Chapter 3, 'Creating a MOLE geodatabase', you have access to the MOLE Symbol Editor. This editor greatly simplifies the process of adding MIL-STD-2525B symbology to your map, as well as editing existing symbology. MOLE also provides additional shortcuts for adding tactical graphic symbols.

Adding MOLE graphics in ArcMap

The easiest way to add graphics for force elements and tactical graphics to MOLE feature classes in ArcMap is to use the MOLE Symbol Editor. You can also add or modify MOLE graphics by adding records with a valid Symbol ID value to the layer's attribute table. If your MOLE graphics are stored in a shapefile or other simple feature class, you can only add symbols in this way. This chapter covers only the MOLE Symbol Editor.

Tip

Add MOLE Data button

You must use the Add MOLE Data button to open MOLE layers in ArcMap. If you open a MOLE layer with the standard ArcMap Add Data button, the MOLE graphics do not display.

See Also

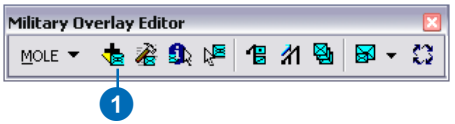
See Editing in ArcMap *for more information about using the ArcMap Editor toolbar.*

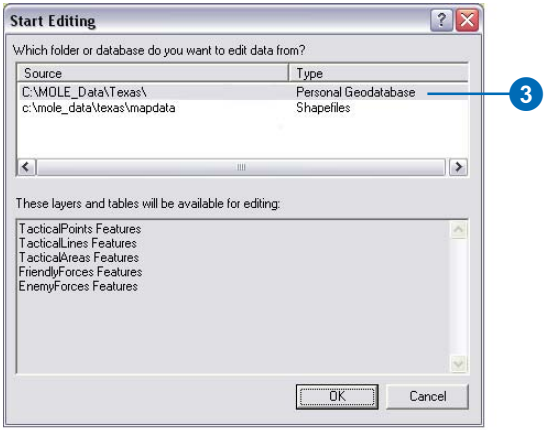
Adding MOLE force element graphics

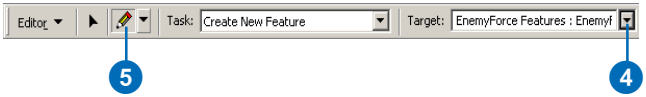
1. Click the Add MOLE Data button on the Military Overlay Editor toolbar. In the browse window, navigate to and open the desired force element layer.
2. Click the Editor dropdown arrow on the Editor toolbar and click Start Editing.
3. Choose the folder or database containing the MOLE layers you want to edit and click OK.

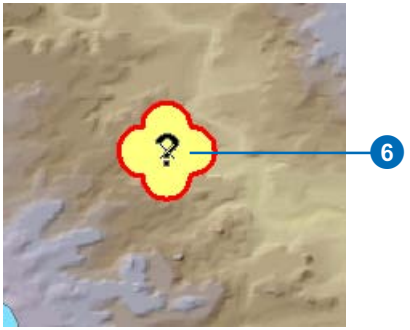
   If there are other editable feature classes displayed in the ArcMap data frame, the Start Editing dialog box appears.
4. Click the Target dropdown arrow on the Editor toolbar and click the MOLE layer you want to edit.
5. Click the Create New Feature button on the Editor toolbar, ensuring that Create New Feature is selected in the Task dropdown list.
6. Click in the map display area to place a force element symbol.

   The MOLE symbol for an unknown force element is displayed by default. ▸









7. On the Military Overlay Editor toolbar, click the MOLE Symbol Editor button.

   The MOLE Symbol Editor opens.

8. Expand one of the battle dimension branches in the Symbol Library area. Ground Track is an example.

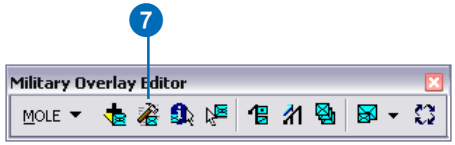
9. In the Symbol Library area, click a force element symbol to select it. Airborne is an example.

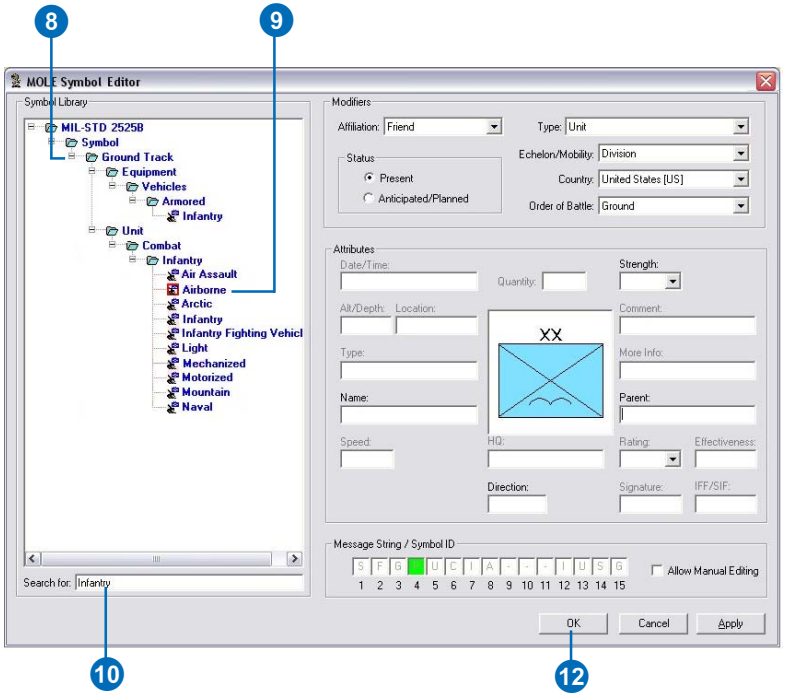
10. In addition to using the branch expand method described above to find the element you want to select, you can enter its name and have MOLE navigate to it in the Symbol Library area. To do this, type the name of the element in the Search for text box. MOLE expands the branches as you type to open the instance of the term (or character set) you typed that's lowest in the branch.

    You can also save favorites and select from your favorites.

11. Modify the remaining parameters in the MOLE Symbol Editor.

12. When finished modifying, click OK.





When you modify existing MOLE force element symbols, you follow many of the same steps as when you add new symbols. You need to have an understanding of one of the defining characteristics of MOLE force element layers—the fact that they are actually group layers composed of a simple point feature and a complex symbol built around it—when you select symbols to edit. The point feature component must be activated in the ArcMap TOC so the symbol can be selected and accessed by the MOLE Symbol Editor.

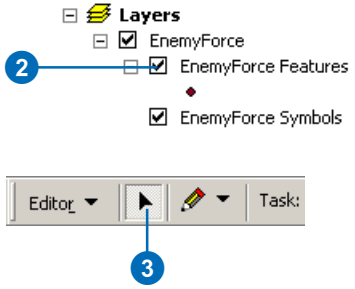
Symbol ID conflicts are also possible when you change a force element feature from one symbol to another. For example, if the existing symbol is an equipment type of symbol with a mobility value in the Symbol ID code and you change it to an air type, such as a bomber that cannot have a mobility value, a conflict is presented. While MOLE will handle these situations gracefully (see the last section of this chapter, 'Symbology rendering in MOLE'), you should become familiar with the way MOLE displays such symbols so you are aware if there is a Symbol ID conflict.

Editing MOLE force element symbols

1. Open a MOLE force element layer in ArcMap, following the steps from the previous task, and start editing.
2. Check the feature layer check box of the MOLE force element group layer you want to edit in the ArcMap TOC.
3. Click the Edit button on the Editor toolbar.
4. Click the MOLE feature you wish to edit in the map display to select it.

   You must click the feature, rather than the symbol, to select it.
5. Click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.

   The MOLE Symbol Editor opens.
6. Follow steps 8 and 9 from the previous task to select a new force element symbol.



Adding tactical graphics in ArcMap is similar to adding force elements yet slightly more complicated. Because tactical graphic symbols take on such a wide variety of complex forms, when you draw the features there are specific geometric properties they must conform to for MOLE to display the symbols properly. MOLE also uses several different renderers to display tactical graphic symbols, based on the type of military feature they represent. The last section in this chapter, 'Symbology rendering in MOLE', details the way tactical graphics must be drawn to be rendered by MOLE.

Tip

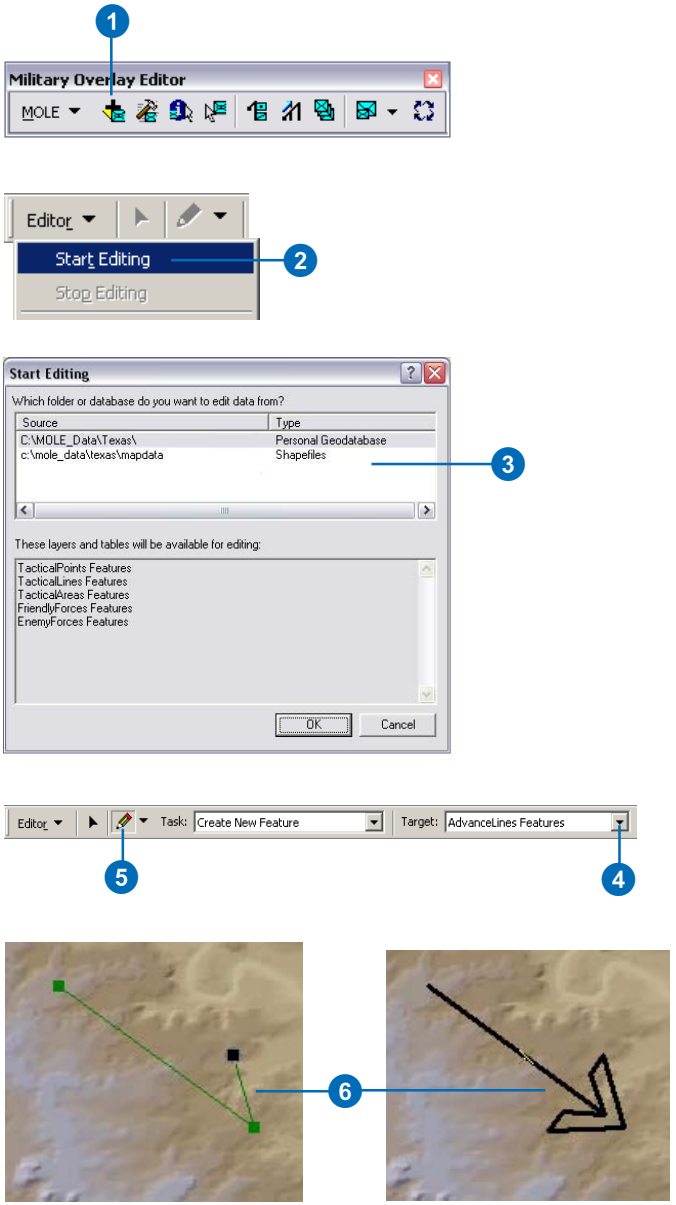
Creating arrow symbols

Many C²/general maneuver tactical graphic line symbols are arrows. To create the arrow shape, the last vertex you add must be placed behind and offset from the vertex placed before it. The last vertex defines the shape and size of the arrowhead and, with certain symbols, the size of the symbol itself.

Adding MOLE tactical graphic symbols

1. Click the Add MOLE Data button on the Military Overlay Editor toolbar. In the browse window, navigate to and open the desired tactical graphic layer.
2. Click the Editor dropdown arrow on the Editor toolbar and click Start Editing.
3. Choose the folder or database containing the MOLE layers you want to edit and click OK. If there are other editable feature classes displayed in the ArcMap data frame, the Start Editing dialog box appears.
4. Click the Target dropdown arrow on the Editor toolbar and click the MOLE layer you want to edit.
5. Click the Create New Feature button on the Editor toolbar, ensuring that Create New Feature is selected in the Task dropdown list.
6. Click the map display area, placing vertices to form the type of feature (point, line, or area) you want to add. If you are creating a line or area, when you are finished placing vertices, press F2 to complete the feature.

   If you place a tactical graphic line feature, as pictured, ►



the symbol for direction of main attack is drawn by default.

7. Click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.

   The MOLE Symbol Editor opens.

8. Expand one of the branches in the Symbol Library area. Command & Control and General Maneuver is an example.

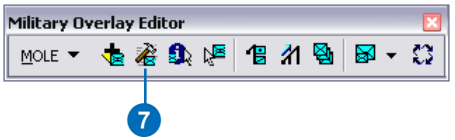
9. In the Symbol Library area, click a tactical graphic to select it. Axis of Advance/Rotary Wing is an example.

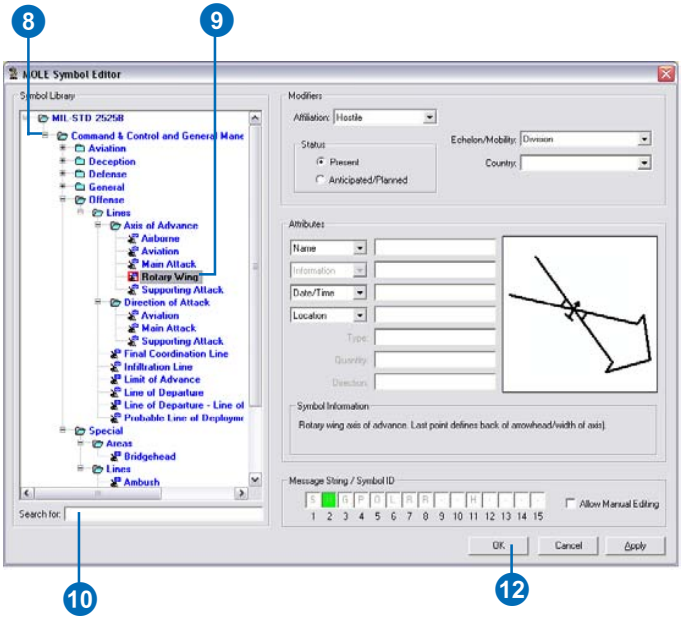
10. In addition to using the branch expand method described above to find the element you want to select, you can enter its name and have MOLE navigate to it in the Symbol Library area. To do this, type the name of the element in the Search for text box. MOLE expands the branches as you type to open the instance of the term (or character set) you typed that's lowest in the branch.

    You can also save favorites and select from your favorites.

11. Modify the remaining parameters in the MOLE Symbol Editor.

12. When finished modifying, click OK.





Like force element layers, MOLE tactical graphic layers are group layers that are composed of a simple point, line, or area feature class layer with a MOLE symbology layer built around it. The feature class layer must be activated in the TOC so its features can be selected for editing with the MOLE Symbol Editor. When you change a tactical graphic feature from one symbol to another, you may need to modify the shape of the feature so it conforms to the geometry requirements of the new symbol. If the geometry of the feature does not satisfy the requirements of the selected symbol, MOLE displays the message Unable to Render Selected Feature in the MOLE Symbol Editor. The symbol is then displayed as a simple magenta feature in the map display area.

See Also

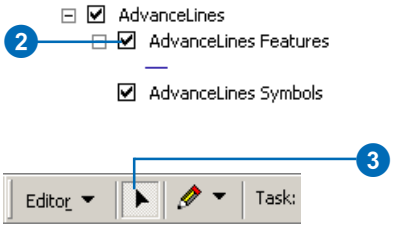
See the section 'Symbology rendering in MOLE' later in this chapter for more information.

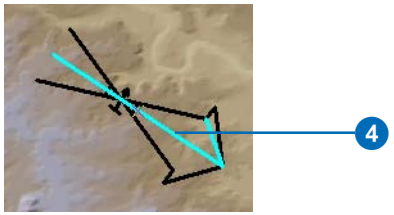
Editing MOLE tactical graphic symbols

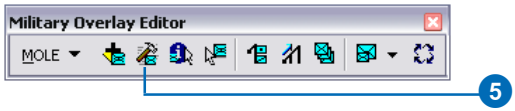
1. Open a MOLE tactical graphic layer in ArcMap, following the steps from the previous task, and start editing.
2. Check the feature layer check box of the MOLE tactical graphic group layer you want to edit in the ArcMap TOC.
3. Click the Edit button on the Editor toolbar.
4. Click the MOLE feature you want to edit in the map display area to select it.

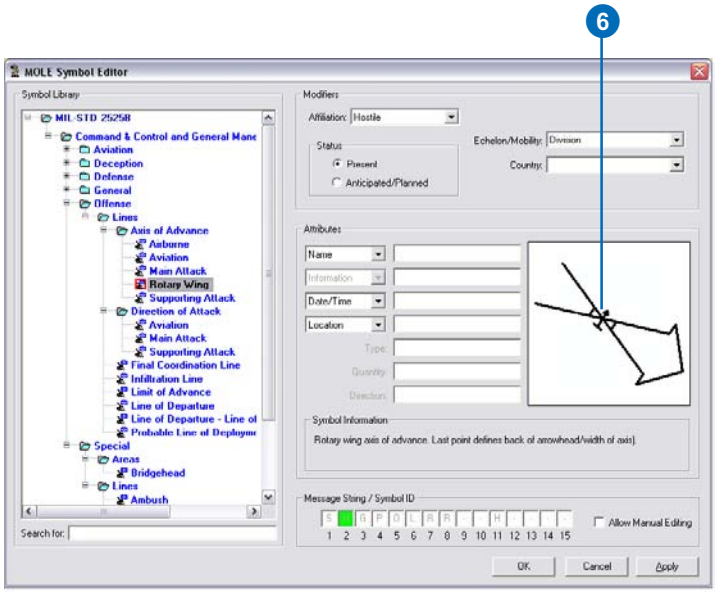
   You must click the feature, rather than the symbol, to select it.
5. Click the MOLE Symbol Editor button on the Military Overlay Editor toolbar.

   The MOLE Symbol Editor opens.
6. Follow steps 8 and 9 from the previous task to select a new tactical graphic symbol.









Using the Add MOLE Graphics dialog box

When adding tactical graphic symbols, you can add a feature and use the MOLE Symbol Editor to symbolize the feature or you can use the Add MOLE Graphics dialog box. The advantage of using the Add MOLE Graphics dialog box is that you can select the tactical graphic that you want from a dropdown list and when you click on the map, both the feature and the selected symbology are placed on the map. This method is well suited for adding many tactical graphics at once. The only drawback is that the feature MOLE places on the map is a generic four-point line or area, so you must manually reshape the feature to match the shape you want by moving, adding, or deleting vertices.

Tip

Tactical graphic renderers

Only the symbols that are available with the currently enabled tactical graphic renderers will be listed in the Tactical Graphic dropdown list.

See Also

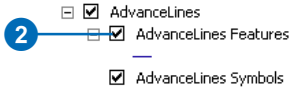
See the section 'Symbology rendering in MOLE' later in this chapter for more information about tactical graphic renderers.

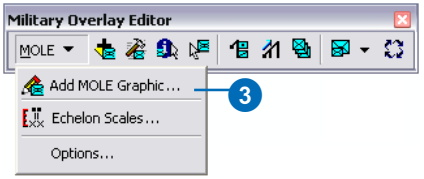
Adding tactical graphic symbols

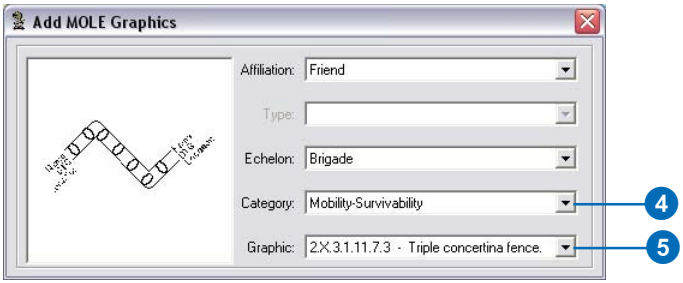
1. Following steps 1–4 from 'Adding MOLE tactical graphic symbols' earlier in this chapter, open a tactical graphic layer and start editing.
2. In the ArcMap TOC, check the feature layer check box of the MOLE tactical graphic group layer you want to edit.
3. Click Add MOLE Graphic on the MOLE menu from the Military Overlay Editor toolbar.
4. In the Category list, choose a graphic category, in this case, MobilitySurvivability.
5. Click the Graphic dropdown arrow and click the symbol you want to add.

   You can also set the values for the Affiliation and Echelon attributes from the appropriate dropdown lists.
6. Click inside the map display area at the location where you want to place the symbol.

   In the case of linear tactical graphics, a four-point line with the chosen symbology is placed in the map display area. ▸



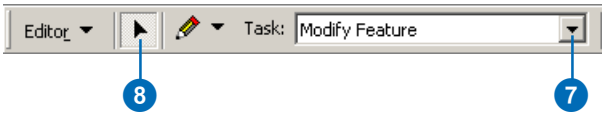


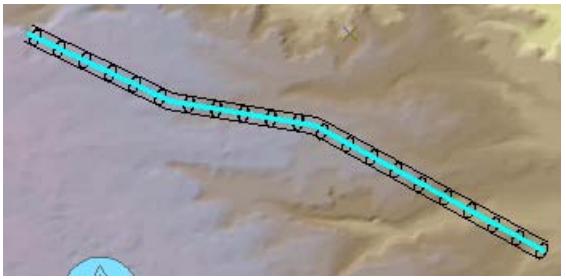


See Also

See Editing in ArcMap *for more information about using the ArcMap Editor toolbar.*

7. Click the Task dropdown arrow on the Editor toolbar and click Modify Feature.
8. Click the Edit button on the Editor toolbar.
9. Place the pointer over the highlighted vertices, then click and drag to move them. You can also insert and delete vertices as desired. Press F2 when finished editing.





Symbology rendering in MOLE

As discussed in Chapter 1, 'Introducing MOLE', MOLE constructs its symbology according to the 15-character Symbol ID code. The moleCore.mdb database contains many tables that relate specific characters and combinations of characters in the Symbol ID to Computer Graphics Metafile components—graphic pieces that, when merged, constitute the complete MOLE symbols. MOLE also uses ArcGIS style sheets to build some of the more complex tactical graphic symbols.

This section provides on overview of the way MOLE renders graphics. For more information, see the MOLE developer documentation.

Force element rendering

MOLE force elements are composed of four graphic components: frame, icon, echelon, and mobility. The frame defines the shape of the symbol, the icon is the symbol inside the frame that denotes what the feature is, and the echelon and mobility indicators are additional graphics outside the frame. The shape and color of the frame change according to the symbol's affiliation. In the case of friendly affiliated symbols and, to a lesser extent, hostile-affiliated symbols and symbols where the affiliation is unknown or pending, the shape is also determined by the battle dimension of the symbol being represented. See MIL-STD-2525B for more details on force element symbol specifications.

As mentioned above, MOLE renders force elements according to their Symbol ID. Character 3, the battle dimension, is the component of the Symbol ID that controls the frame; characters 5–10, the function ID, define the icon and the type of military feature the symbol represents; characters 11 and 12 are the placeholders for the type, echelon, and mobility indicators. If MOLE encounters an invalid or unrecognized Symbol ID value, it is handled in one of two ways. If a symbol has a valid function ID but has conflicts between the battle dimension and type/echelon/mobility indicators, MOLE displays the symbol with the default pending (unknown) frame and the proper icon. If the function ID is invalid but the battle dimension and other indicators are valid, MOLE displays the symbol with the appropriate frame with a question mark icon inside. See the illustrations below for examples.

The first figure represents a proper space station symbol with a correct Symbol ID.

The second figure represents a space station symbol with a correct function ID that has been given the value for Installation in the Type indicator field. Because a Space symbol cannot be an installation, MOLE draws the symbol with a Pending frame. The icon inside the symbol is drawn properly, however, because the symbol's function ID is correct.

The third figure represents a space station symbol with an invalid function ID. The battle dimension (Space) corresponds to the type/echelon/mobility, so MOLE draws the appropriate frame for a Space symbol but fills it with a question mark because it doesn't recognize the function ID value.

Tactical graphic area and point rendering

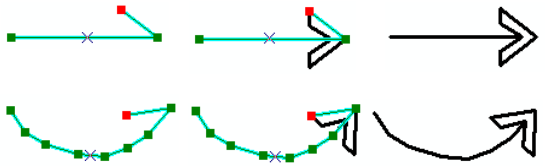
Area and point tactical graphic rendering is straightforward compared to lines. The only instance deserving special attention is when you display minefield symbols. For more information on mines, see 'Attribute data field descriptions' in Chapter 3. As with lines, if MOLE encounters area and point symbols with an invalid Symbol ID or a Symbol ID for which MOLE has no renderer, then those symbols will be displayed in magenta as simple area or point features without MOLE symbology.

If you want to use wind barbs (meteorological graphics for wind) in your MOLE maps, you must populate the Speed and Direction attribute fields for the MOLE point tactical graphic you want to serve as the wind barb. If your dataset was created in MOLE 9.0 or earlier, you must add the Speed and Direction fields. For more information, see 'Updating MOLE datasets' in Chapter 3.

Tactical graphic line rendering

Because there are so many possible tactical graphic line symbols in MIL-STD-2525B with so many varied rules for constructing them, MOLE has several renderers to handle the different cases. The renderers are listed in the tactical graphic Layer Properties dialog box, where you can turn renderers on and off as you wish. See Chapter 5, 'Controlling the MOLE display', for more information on the Layer Properties dialog box. When you add a MOLE line symbol in ArcMap, for MOLE to render it properly, you must have turned on the appropriate renderer and have drawn the feature with the required properties. For example, if you want to display a turn-effect obstacle, the feature that you want to be represented as such must be a two-point line and the linear obstacles renderer must be enabled. If the feature does not conform to these requirements, it will be displayed in magenta as a simple line feature without MOLE symbology.

Arrow symbols can be either straight (three point) or curved (multipoint), depending on the type of arrow. Airborne, aviation, and rotary wing axis of advance arrows cannot be curved; all others can be straight or curved. When creating arrow symbols, the location and positioning of the vertices, except for the last one placed, determines the shape and length of the arrow body. The position of the last vertex defines the shape and size of the arrowhead. See the following examples. The red point represents the last vertex placed; as illustrated, the last vertex must be placed behind the previous vertex for MOLE to render the arrowhead.



Tactical graphic obstacle features (points, lines, and areas) can also be displayed in green, as specified by MIL-STD-2525B. This is controlled by an additional renderer, which can be activated from the Layer Properties dialog box.

Line segment direction that does not adhere strictly to MIL-STD-2525B

In ArcGIS and MOLE, line segments can have direction. The default line direction ArcGIS and MOLE use is derived from the order in which you added or digitized the vertices in the line or polygon.

For example, if you are digitizing pipes in a water distribution system as line segments, you can add their vertices in an order that reflects the flow of water inside the pipes. To do this, you would add your first vertex at the source, for example, a tank, then you would click to follow the pipe system until you add your last vertex, for example, at a residential parcel.

When MOLE adds MOLE graphics to your map display or source data, it uses a certain direction for its line segments; that is, it creates the vertices in a certain order. Usually this order conforms to MIL-STD-2525B, but in a few cases, it does not (a list of known cases follows). In these instances, the graphic looks identical to the way MIL-STD-2525B specifies it should look; however, the direction of some segments may not adhere to the direction defined in MIL-STD-2525B.

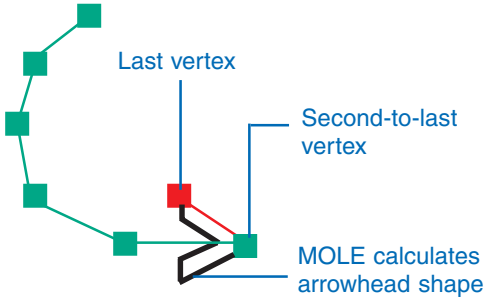
Tactical graphics that may contain segments that do not adhere strictly to MIL-STD-2525B segment direction:

- 2.X.2.3.1 Dummy (deception/decoy)
- 2.X.2.3.2 Axis of advance for feint
- 2.X.2.3.3 Direction of attack for feint
- 2.X.2.4.2.2 Principal direction of fire
- 2.X.2.5.2.1.1 Friendly aviation
- 2.X.2.5.2.1.3 Friendly attack, rotary wing
- 2.X.2.5.2.1.4.1 Main attack
- 2.X.2.5.2.1.4.2 Supporting attack, axis of advance/ground
- 2.X.2.5.2.2.1 Aviation
- 2.X.2.5.2.2.2.1 Main attack
- 2.X.2.5.2.2.2.2 Supporting attack, direction of attack/ground
- 2.X.2.5.3.3 Attack by fire position
- 2.X.2.5.3.4 Support by fire position
- 2.X.2.6.1.1 Ambush
- 2.X.3.1.6.3 Gap
- 2.X.3.2.2.1 Assault crossing area

Rules for multipoint arrows

When you add or digitize a multipoint arrow, you must follow specific rules when adding the last vertex.

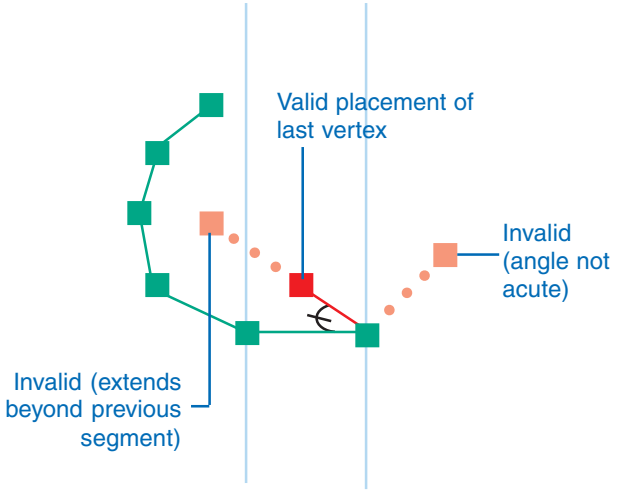
The last vertex you draw in a multipoint arrow is important because it tells MOLE how to draw the arrowhead. MOLE determines what size and shape the arrowhead should be based on the position of the last vertex. MOLE uses the second-to-last vertex you add as the pointer tip of the arrowhead.



You must follow two rules when adding the last vertex. The line segment you create when you add the last vertex:

- Must form an acute angle with the previous line segment
- Must not extend beyond the previous line segment

The area between the blue lines in the illustration below indicates the allowable area for the last vertex.



If you do not place the last vertex in the allowable area, MOLE cannot render the arrow and, instead, draws a magenta line.

Controlling the MOLE display

5

IN THIS CHAPTER

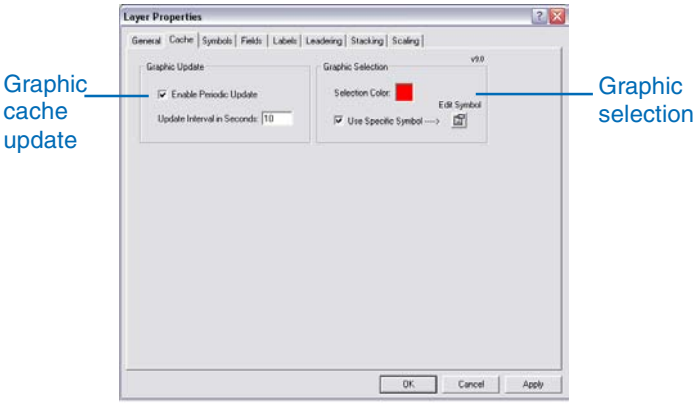
- The force element Layer Properties dialog box
- The tactical graphic Layer Properties dialog box
- The Layer Properties dialog box versus the toolbar
- Identifying graphics
- Selecting graphics
- Resizing graphics
- Moving leaders
- Working with labels
- Modifying force element graphics with the toolbar

When you create a map, next to data accuracy and integrity, the most important aspect is the map's appearance. The data within your map will not be as effective if it is not conveyed in a manner that is easily understood or interpreted. This is especially true with maps portraying military symbology because there are so many different types of symbols that can be displayed on various map backgrounds. For this reason, MOLE provides many options for tailoring the appearance of MIL-STD-2525B symbology from the Layer Properties dialog boxes of individual layers and from the Military Overlay Editor toolbar. The various methods available in MOLE to modify the display properties of military symbols are discussed in this chapter.

The force element Layer Properties dialog box

MOLE provides many different ways to modify the appearance of force element layers. Within the force element Layer Properties dialog box are numerous options for controlling the display characteristics of individual force element layers, including size, color, fill properties, labels, leadering, stacking, and scale-dependent display. Many of these properties can also be accessed from the Military Overlay Editor toolbar and can, therefore, be applied to more than one layer at a time, depending on what you have selected in the TOC before you click the toolbar button.

Cache tab



The Cache tab contains options for specifying the cached graphic update properties and the symbol selection settings.

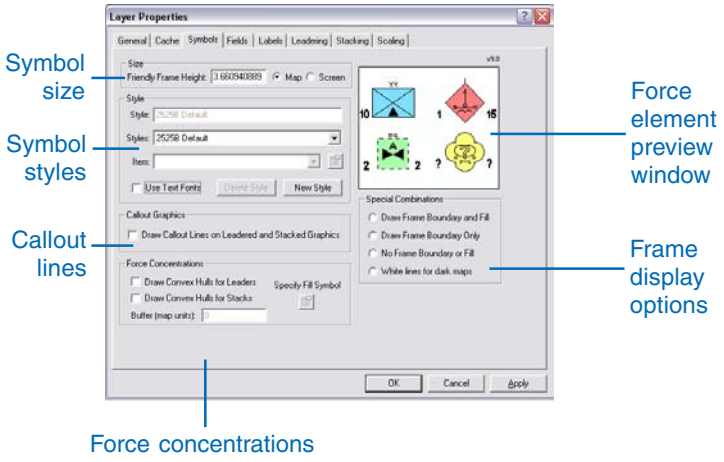
Graphic cache update

When MOLE renders symbols in ArcMap, it stores the graphics in a cache so it doesn't have to rerender the graphics every time the display is refreshed, as with panning and zooming. This includes MOLE symbols, leader lines, callout lines—any graphic that MOLE creates. You can specify a time interval by which the MOLE graphic cache will be periodically updated. The results are the same as clicking the Refresh Graphics button on the Military Overlay Editor toolbar.

Graphic selection

You can define the color of the outline for selected force element symbols by clicking the Selection Color, or you can modify the selection style by checking the Use Specific Symbol check box and clicking the Edit Symbol button to access the Edit Graphic Selection Symbol dialog box.

Symbols tab



The Symbols tab on the force element Layer Properties dialog box allows you to modify the display size and style of force element symbols. You can also control the display of callout lines and force concentration outlines for leadered or stacked graphics from the Symbols tab.

Symbol size

You can specify the symbol size (frame height) in one of two ways. With the Map button selected, the symbol height will be set to the value entered in the Frame Height text box, in map units. The symbols will be displayed at a constant height relative to the ground. In other words, if the map units are meters, and a value of 50 is entered in the Frame Height text box, the symbols will be 50 meters high in the map. With the Screen button selected, the symbol height will be set to a percentage of the screen (data frame) height, based on the value entered in the Frame Height text box. The symbols will be displayed at a constant height relative to the screen size. If a value of 0.1 is entered in the Frame Height text box, the symbols will always be displayed as 10 percent of the screen height, regardless of how far you zoom in or out.

Symbol styles

You can create new display styles for the selected force element layer in the Style section of the Symbols tab. The display style specified in MIL-STD-2525B is used as the default. You can change the frame fill, icon fill, line properties, text properties for labels, and callout line properties. The new style will be saved with the map document. You can also persist the style by saving the force element layer as a Layer (.lyr) file.

Callout lines

When force element symbols are leadered or stacked together, they are displaced from their original position. Callout lines connect the symbols to their original position on the ground. The callout line display properties can be modified in the Style section of the Symbols tab.

Force concentrations

Force concentrations, or convex hulls, are outlines that delineate the ground location of groups of leadered or stacked force element symbols. You can change the display properties of the outlines and set a buffer distance, in map units, to denote perimeters or areas of interest for the force element groups. Convex hulls are displayed as red lines by default.

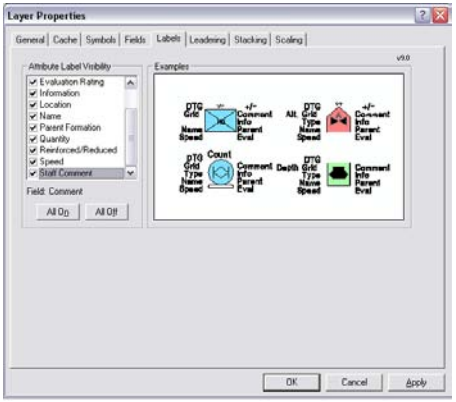
Frame display options

The Special Combinations section of the Symbols tab allows you to specify the manner in which force element symbol frames will be displayed. The options are to draw the frame boundary and frame fill, the frame boundary only (no frame fill), no frame boundary or fill (only the icon will be displayed), or white frame boundary lines for dark backgrounds.

Force element preview window

The force element preview window allows you to view changes to the symbology before they are applied.

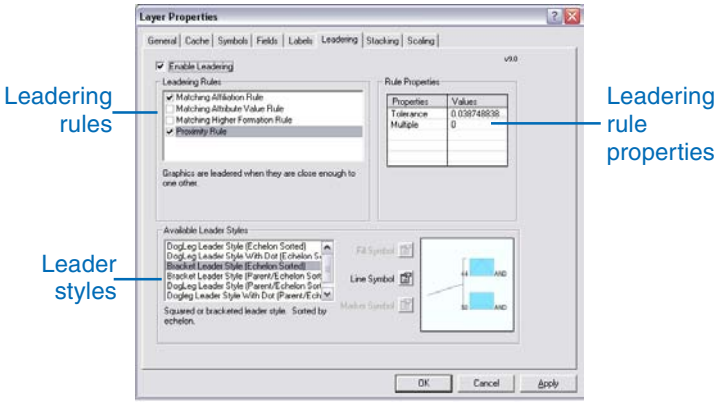
Labels tab



From the Labels tab, you can select the attributes that you want to be displayed around the force element symbols. The attribute values can be entered in the MOLE Symbol Editor or in the

appropriate fields in the layer attribute table. See the section ‘Adding MOLE symbols in ArcMap’ in Chapter 4 for more information on text modifiers.

Leadering tab



Leadering is a way to organize and group the force element symbols being displayed based on rules that you specify from the Layer Properties dialog box. It is useful if you have many overlapping symbols and want to clean up the display, or if you want to group related units together or define perimeters or areas of interest for formations. Symbols that are grouped together on leader lines are ordered according to their echelon value. In cases where echelon values are not specified or are equivalent, symbols are grouped on leaders according to their OBJECTID value.

Leadering rules

Symbols can be leadered together based on four different rules. You can apply multiple rules. The Matching Affiliation Rule groups together force element symbols that have the same affiliation value. In other words, all units with an affiliation value of Faker are grouped on a leader, or all units with a Hostile affiliation.

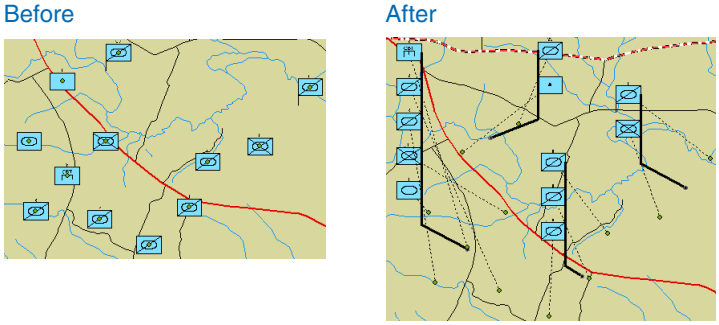
The Matching Attribute Value Rule groups together units that have the same value for a selected field from the attribute table. The Field name is entered in the Rule Properties section of the Leadering tab. Symbols with the same value for this field will be grouped together.

The Matching Higher Formation Rule groups together units that have the same higher formation, or parent, attribute value.

The Proximity Rule groups together symbols that are within a certain distance of each other. The distance is set in the Rule Properties section of the Leadering tab. Symbols must satisfy all selected rules to be placed on a leader.

Leadering rule properties

The Rule Properties section of the Leadering tab is where you specify, for the Proximity Rule, the maximum distance that force elements can be from each other to be leadered together. The distances are evaluated from the center of the force element symbols. You can either set a Tolerance value or a Multiple value. The Tolerance value sets an absolute distance in map units. The value in the Multiple field is multiplied by the Frame Height value on the Symbols tab to determine the leadering distance. If



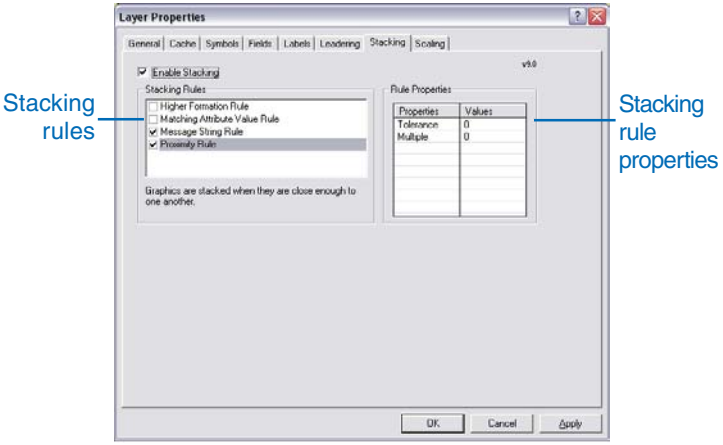
An illustration of the effect of leadering force elements using the proximity rule

values are entered in both the Tolerance and Multiple fields, the Multiple value takes precedence.

Leader styles

MOLE provides three options for displaying leader lines. You can choose a dogleg leader, a dogleg leader with a dot at the leader origin, or a bracket leader. There is a preview window allowing you to see the leader appearance before you apply changes. You can also change the color and style of the line.

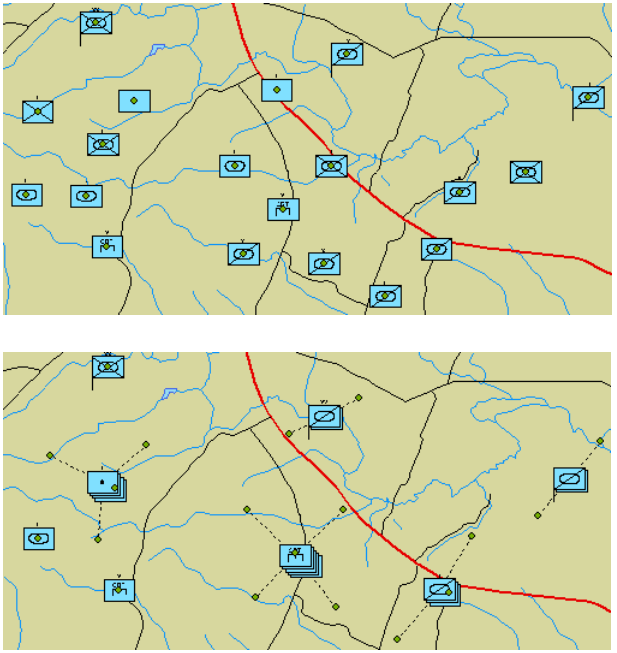
Stacking tab



Stacking is another means of grouping force element symbols together based on common attributes. As the name implies, symbols conforming to the stacking rules specified on the Layer Properties dialog box are placed on top of each other.

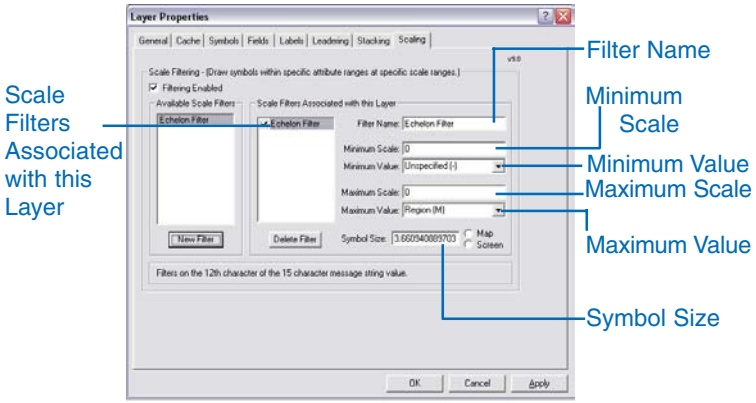
Stacking rules

As with leadering, symbols can be stacked according to three different rules. The Message String Rule stacks symbols together that have the same Symbol ID. The other two rules, the Higher Formation and Proximity Rules, apply to leadering as well as stacking and are described in the Leadering tab section on the previous page. All stacking rules selected must be satisfied for a symbol to be added to a stack. If both stacking and leadering are enabled with the same rule selected, the symbols will be stacked before they are leadered. See the following illustrations, which show how symbols are stacked when the Higher Formation Rule and Proximity Rule are applied.



The illustrations above provide an example of the results of applying stacking rules to a force element layer. The upper figure shows the appearance of a force element layer before stacking is enabled, while the lower figure shows how the same layer appears with the Higher Formation and Proximity stacking rules applied.

Scaling tab



MOLE allows you to set scale-dependent display rules (filters) for force element layers based on the echelon property—the twelfth character of the 15-character Symbol ID—of the symbols within the layer. As you zoom in and out in the ArcMap map display area, the symbols are displayed or hidden, based on the filters you create on the Scaling tab of the Layer Properties dialog box. Each time you click the New Filter button, a new echelon scaling rule is created. When the rule is applied, the force element symbols will be displayed according to the rule properties, which are specified from the Scaling tab of the Layer Properties dialog box. You can create as many scaling filters as you like. Only the filters that are checked in the Scale Filters Associated with this Layer list will be applied to the layer. To view or change the properties of any of the echelon filters, click a filter name in the Scale Filters Associated with this Layer list. These settings are saved to both the layer file and the .mxd file.

Scale Filters Associated with this Layer

This list contains the names of the filter rules that have been created for the selected force element layer. To enable a filter, check its check box in this list.

Filter Name

To change the name of a filter rule, select the filter in the Scale Filters Associated with this Layer list, then highlight the name in the Filter Name text box and type a new name for it.

Minimum Scale

The value entered in the Minimum Scale text box represents the smallest scale—or the farthest you can be zoomed out—at which the symbols in the specified echelon range will be displayed, according to the selected filter rule.

Minimum Value

The value selected from the Minimum Value dropdown list represents the lowest-level echelon that will be displayed by the selected filter rule.

Maximum Scale

The value entered in the Maximum Scale text box represents the largest scale—or the closest you can be zoomed in—at which the symbols in the specified echelon range will be displayed, according to the selected filter rule.

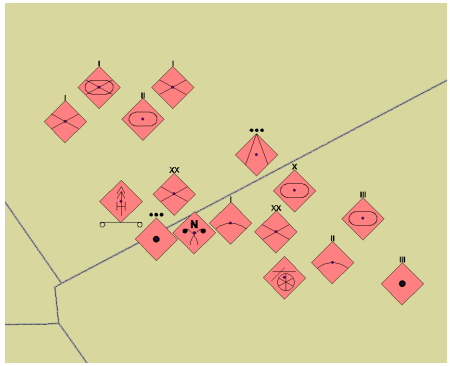
Maximum Value

The value selected from the Maximum Value dropdown list represents the highest-level echelon that will be displayed by the selected filter rule.

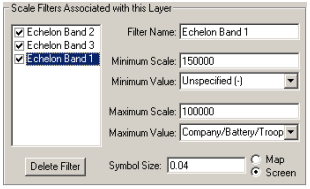
Symbol Size

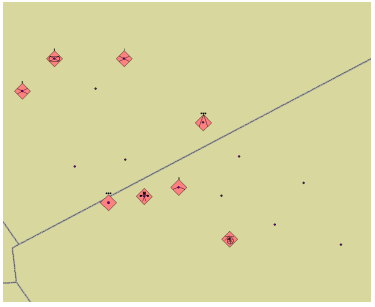
The value in the Symbol Size text box represents the size at which symbols satisfying the filter's echelon criteria will be displayed. You can set a new value for the filter, with the option of selecting map or screen units for the size. See the description of the Symbols tab earlier in this chapter for more information about the difference between map and screen units.

The following figures illustrate what happens when echelon scale filters are applied to a force element layer. The layer in question has had three scaling rules applied to it. The parameters for each filter rule and a screenshot of the layer showing the effects of the filter are shown here. The figure below shows the appearance of the layer with echelon scaling disabled.



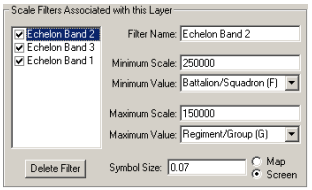
1

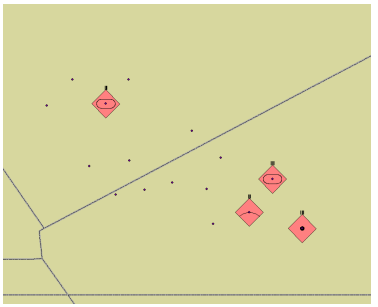




The first scale filter specifies that symbols with an echelon value up to Company/Battery/Troop, including those with an unspecified echelon value, will be displayed with a symbol height of 4 percent of the data frame height when zoomed in at scales between 1:100,000 and 1:150,000.

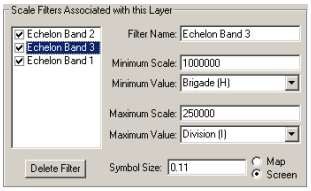
2

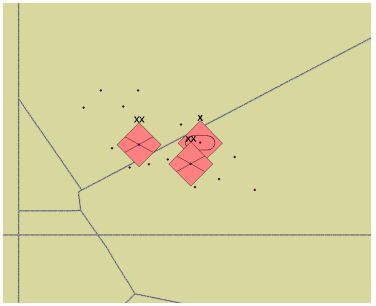




The second scale filter specifies that symbols with an echelon value between Battalion/Squadron (F) and Regiment/Group (G) will be displayed with a symbol height of 7 percent of the data frame height when zoomed in at scales between 1:150,000 and 1:250,000.

3





The third scale filter specifies that symbols with an echelon value between Brigade (H) and Division (I) will be displayed with a symbol height of 11 percent of the data frame height when zoomed in at scales between 1:250,000 and 1:1,000,000.

Modifying force element symbols from the Layer Properties dialog box

Tip

Opening the MOLE Layer Properties dialog box

You can also open the Layer Properties dialog box by double-clicking the layer.

Tip

Map units

When specifying the symbol size in map units, be sure to note the units of the coordinate system being used for the selected MOLE layer.

Tip

Entering decimal values

When entering decimal values less than one in the Friendly Frame Height text box, you must type "0", then a decimal, then the number, rather than just typing a decimal and the number.

See Also

See Chapter 4, 'Adding MOLE symbols in ArcMap', for instructions on opening MOLE force element layers.

Changing graphic size

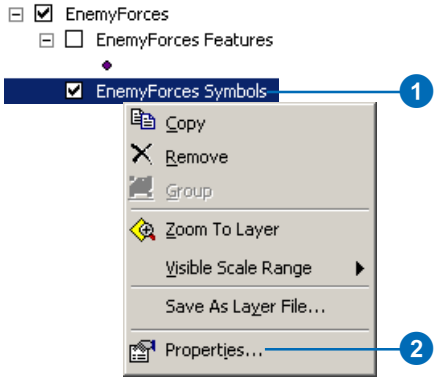
1. Right-click the Symbols layer of a MOLE force element group layer in the ArcMap TOC.
2. Click Properties.

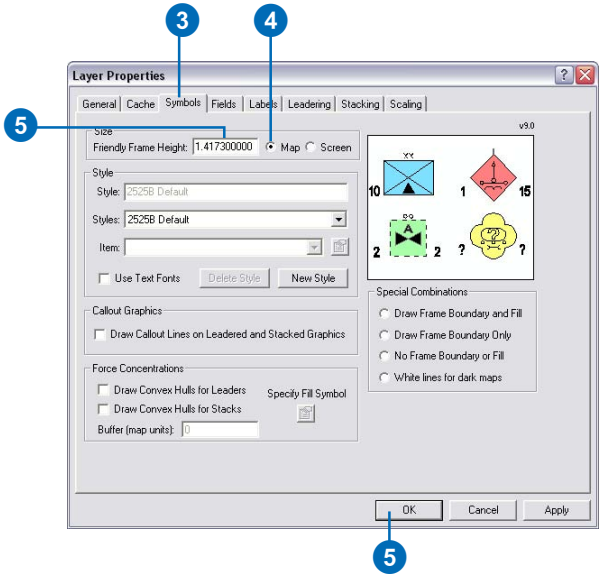
   The Layer Properties dialog box appears.
3. Click the Symbols tab.
4. Click the Map button in the Size section.
5. Type a value in the Friendly Frame Height text box and click OK.

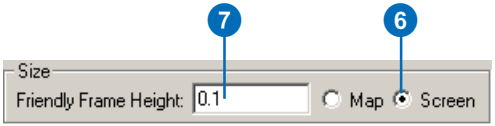
   Note how the symbol size changes in the map display area as you zoom in and out. Open the Layer Properties dialog box again, following steps 1–2 above.
6. Click the Screen button in the Size section.
7. Type a value in the Friendly Frame Height text box, then click OK.

   Zoom in and out of the map display area and note that the symbols maintain a constant size relative to the data frame.

   See the section 'The force element Layer Properties dialog box' earlier in this chapter for details on the Map and Screen options when setting the symbol size.







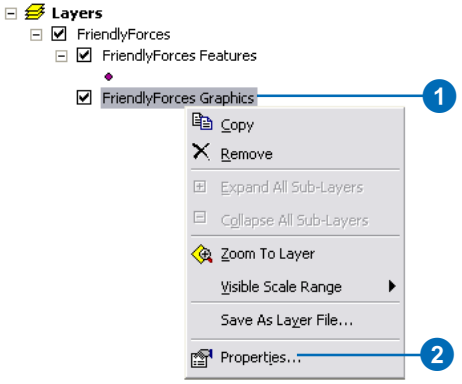
Using styles to change graphic properties

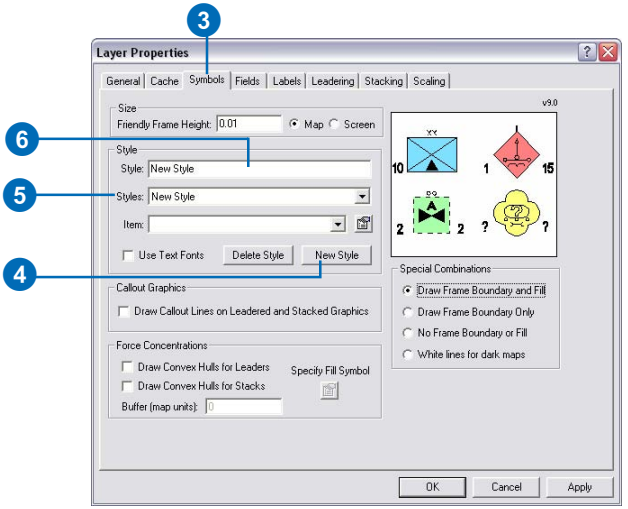
You can create a style to store a set of graphic properties for reuse on other layers of the same MOLE graphic type. If the style you create is for force elements, you can reuse the style only on force elements that have the same affiliation.

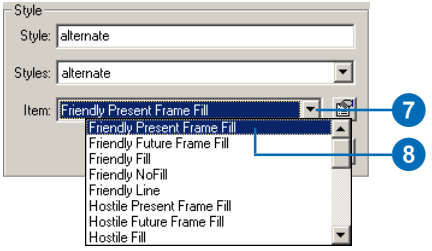
MOLE saves the styles you create for a layer with the map document that the layer is within, rather than with the layer itself. You can also persist the style by saving the force element layer as a .lyr file.

1. Right-click the Graphics layer of a MOLE force element group layer in the ArcMap TOC.
2. Click Properties.

   The Layer Properties dialog box appears.
3. Click the Symbols tab.
4. Click the New Style button in the Style section of the Symbols tab.
5. Click New Style in the Styles dropdown box.
6. In the Style text box, type a new name for the style.
7. Click the Item dropdown arrow.
8. Click an item to change for the relevant symbol affiliation. Friendly Present Frame Fill is an example. This sets the overall symbol fill color for the selected layer. ▸







Tip

Style shortcuts

You can use the options outside the Style area on the Symbols tab to apply a different appearance to the graphics in the layer without having to create a style. For example, to give all MOLE friendly force graphics in the layer a transparent fill, click Draw Frame Boundary Only.

Tip

Style items

Each item in the Items dropdown list affects symbols in the selected layer with a specific affiliation. In other words, changes made to an item with a Friendly prefix will be applied to all symbols in the layer that have a friendly or assumed friend affiliation value. Items with a Hostile prefix will affect hostile, joker, faker, and suspect-affiliated symbols. Items with an Unknown prefix will affect symbols whose affiliation is unknown, pending, or unspecified. Items with a Neutral prefix will affect symbols with a neutral affiliation value.

See Also

To learn more about changing symbology styles, see Using ArcMap *for information on the ArcMap Symbol Property Editor.*

9. Click the Color dropdown arrow and click a color from the palette. In this case, orange is selected.

   You can change the fill type, fill color, outline style, and outline color.

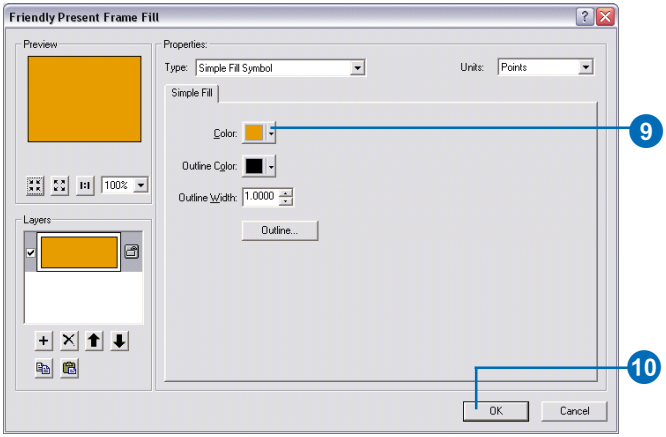
10. Click OK.

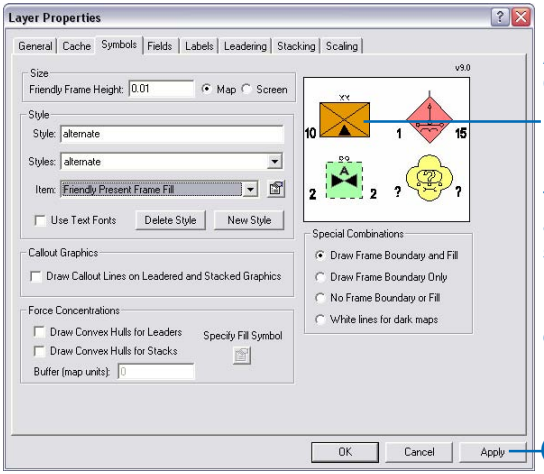
    The appropriate graphic in the Layer Properties preview window reflects the changes.

11. Click Apply to view the changes in the map display.

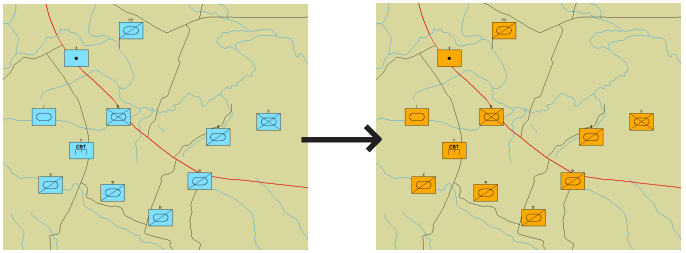
    The style is saved with the map document and included in the Styles dropdown list on the Symbols tab of the Layer Properties dialog box.

    To restore the symbols to the original style, click 2525B Default from the Styles dropdown list.





After you click OK on the Friendly Present Frame Fill dialog box, the appropriate symbol updates to reflect the change.



Setting leadering properties

Leadering allows you to group force element symbols together on leader lines based on leadering rules that you set from the Layer Properties dialog box. When you enable leadering from the Layer Properties dialog box, the rules that you specify will only be applied to the currently selected layer. Leadering is useful if the display is cluttered, or if you want to organize the layer so that, for example, symbols with a common major subordinate command (higher formation or parent) will be grouped together.

Tip

Selecting leadered symbols

Force elements are composed of two parts: a point feature and a MOLE symbol built around it. When force element symbols are leadered or stacked, if you select a MOLE feature point with the Select Features tool, the corresponding symbol is also highlighted. In addition, if you select a leadered or stacked force element symbol with the MOLE Select Graphics tool, its feature will also be highlighted.

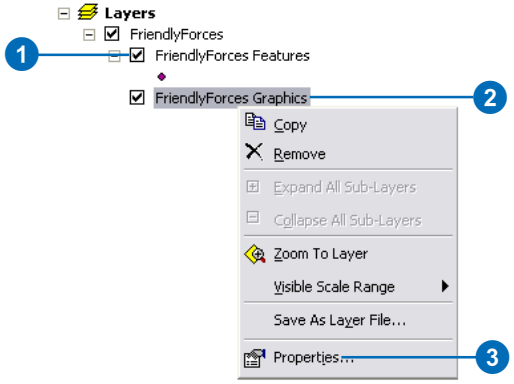
See Also

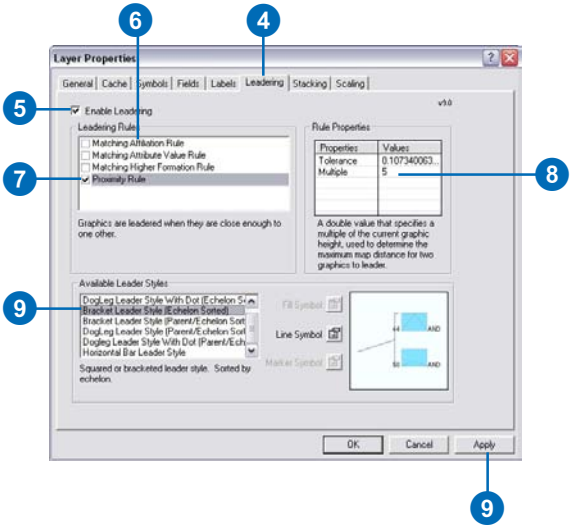
See the section 'Leadering tab' earlier in this chapter for more information on leadering.

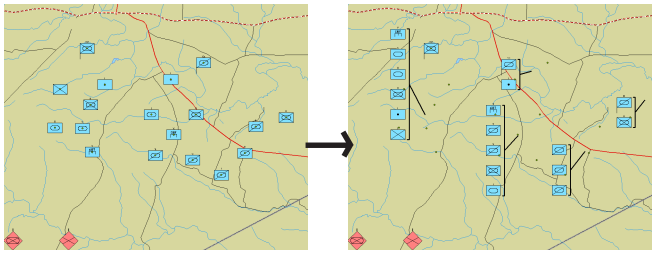
1. Check the feature layer check box of a MOLE force element group layer in the ArcMap TOC.
2. Right-click the graphics layer of the same force element group layer.
3. Click Properties to open the Layer Properties dialog box.
4. Click the Leadering tab.
5. Check the Enable Leadering check box.
6. Click each of the Leadering Rules to see a description of each below the Leadering Rules list.
7. Check the Proximity Rule check box.

   The Rule Properties will be enabled.
8. Click and drag over the Multiple value in the Rule Properties text box to select it. Type a new value and press Enter.
9. Click each of the Available Leader Styles and view them in the preview window. Choose one of them and click Apply.

   See the illustrations to the right that show how leadering changes the display of force element symbols. ▸







Tip

Callout lines

When force element symbols are leadered or stacked, they move from their original position. Callout lines link force element symbols to their original position, allowing you to see their actual location on the ground.

Tip

Callout line style

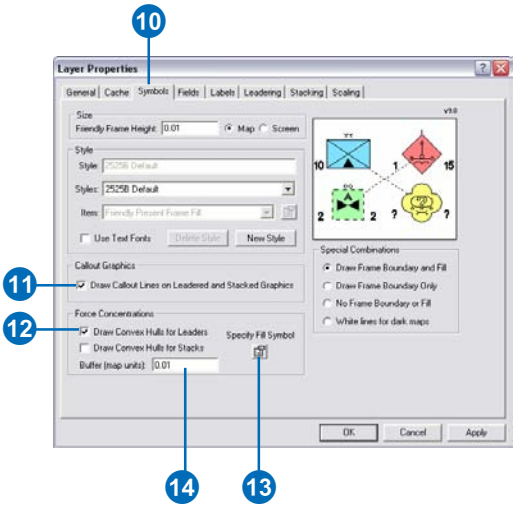
You can change the callout line style by following the steps in 'Changing symbol frame properties', earlier in this chapter; click Callout Lines from the Items dropdown list.

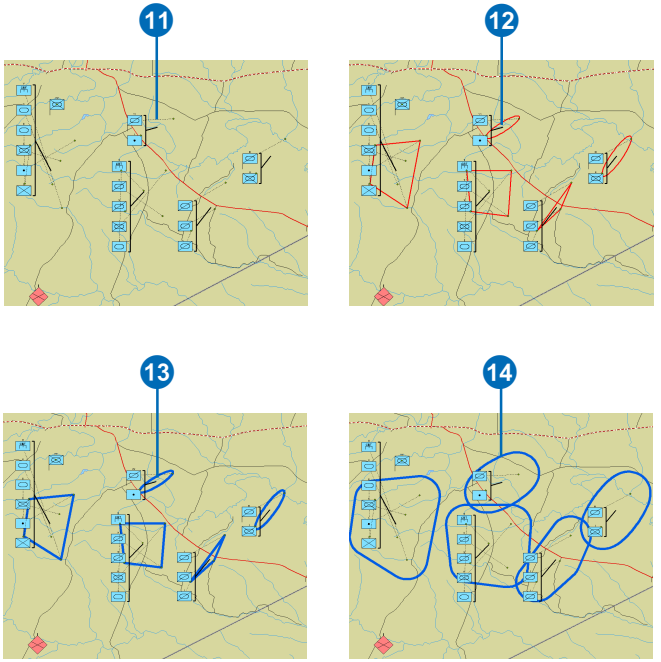
10. Click the Symbols tab on the Layer Properties dialog box.
11. Check the Draw Callout Lines on Leadered and Stacked Graphics check box and click Apply.

    Dashed lines are displayed connecting the symbols to their point features.
12. Check the Draw Convex Hulls for Leaders check box, then click Apply.

    The groups of point features, or ground locations, of symbols that are leadered together are encircled by a red line.
13. Click the Specify Fill Symbol button and choose a new color or style for the outline.

    This step is optional. The default style is a two-point red line.
14. Type a value by which to buffer the convex hull outlines in the Buffer text box. The value is in map units. This step is optional.





Tip

Stacking rules

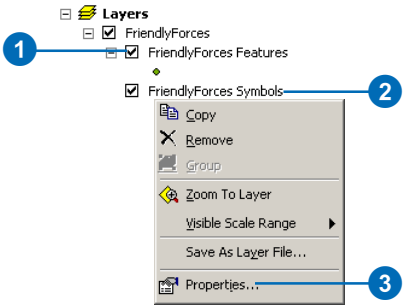
You can choose more than one stacking rule, and you can stack and leader force element symbols simultaneously.

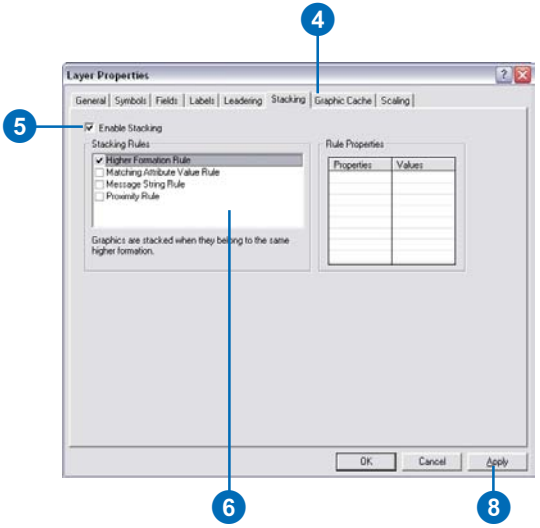
Setting stacking properties

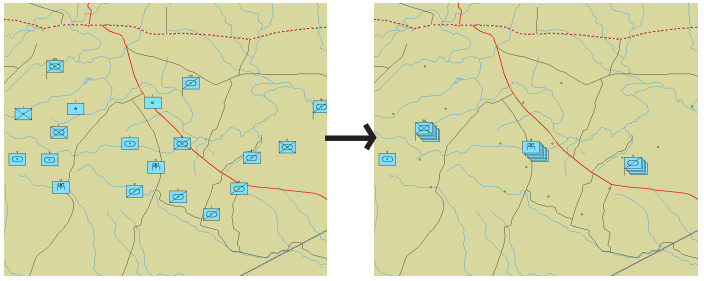
1. Check the feature layer check box of a MOLE force element group layer in the ArcMap TOC.
2. Right-click the graphics layer of the same force element group layer.
3. Click Properties to open the Layer Properties dialog box.
4. Click the Stacking tab on the Layer Properties dialog box.
5. Check the Enable Stacking check box.
6. Click each of the Stacking Rules and read the descriptions below the Stacking Rules list.
7. Check the check box of one or more of the Stacking Rules.

   In this example, the Higher Formation Rule is selected.
8. Click Apply.

   All symbols with a common value for their Parent attribute will be stacked on top of each other. The point features that the symbols are associated with remain in their original location. See the illustrations to the right that show how stacking changes the display of force element symbols. ▸







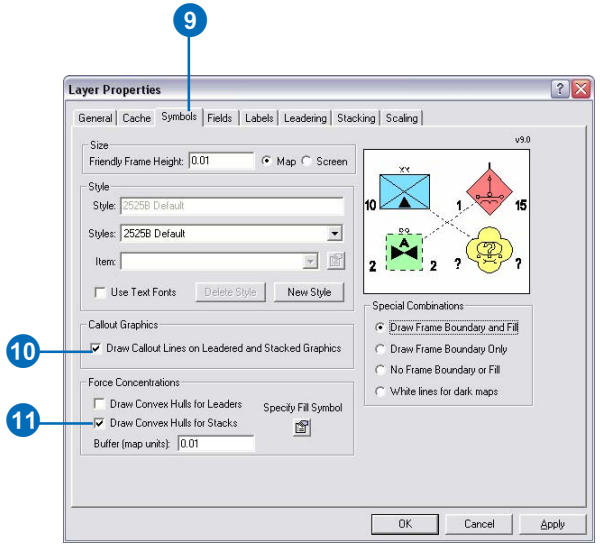
See Also

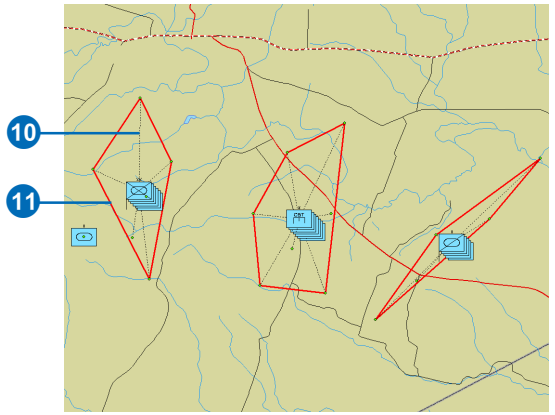
You can also apply a buffer to the convex hull (force concentration) outline. See the prior task, 'Setting leadering properties', for more information.

9. Click the Symbols tab on the Layer Properties dialog box.
10. Check the Draw Callout Lines on Leadered and Stacked Graphics check box and click Apply.

    Dashed lines are displayed connecting the symbols to their point features.
11. Check the Draw Convex Hulls for Stacks check box and click Apply.

    The points whose symbols are grouped in individual stacks are bordered by a red outline. You can change the style of the line by clicking the Specify Fill Symbol button in the Force Concentrations section of the Layer Properties dialog box. You can also apply a buffer to the outline. See the previous task.





Setting echelon scaling

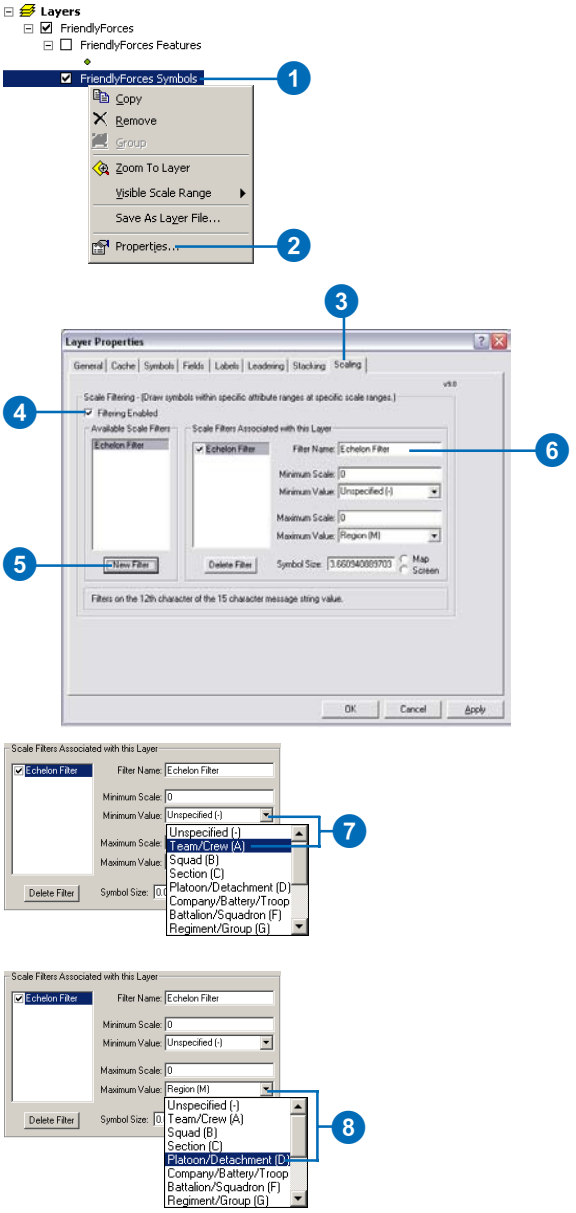
1. Right-click the Symbols layer of a MOLE force element group layer in the ArcMap TOC.
2. Click Properties.

   The Layer Properties dialog box appears.
3. Click the Scaling tab.
4. Check the Filtering Enabled check box.
5. Click New Filter.

   The Scale Filters Associated with this Layer section of the Scaling tab becomes active, and the name of the new filter appears in the list box of that section. Echelon Filter is the default name.
6. Click to select Echelon Filter in the Filter Name text box and type a new name for the filter.

Specify the echelon range

7. Click the Minimum Value dropdown arrow and click the smallest echelon that you want symbols to have to be displayed with the filter.
8. Click the Maximum Value dropdown arrow and click the largest echelon that you want symbols to have to be displayed with the filter. ►



Tip

Symbol size units

Clicking Map sets the units for the symbol size to map units—the units of measure for the layer, established by its coordinate system. Clicking Screen sets the symbol height to a percentage of the data frame height.

Specify the scale range

9. Type the value for the smallest scale at which you want the symbols to be displayed in the Minimum Scale text box.

   For example, if you do not want the symbols to be displayed when you are zoomed out beyond 1:250,000 in the map display, type “250000” in the Minimum Scale text box.

10. Type the value for the largest scale at which you want symbols to be displayed in the Maximum Scale text box.

    For example, if you do not want the symbols to be displayed when you are zoomed in past 1:50,000 in the map display, type “50000” in the Maximum Scale text box.

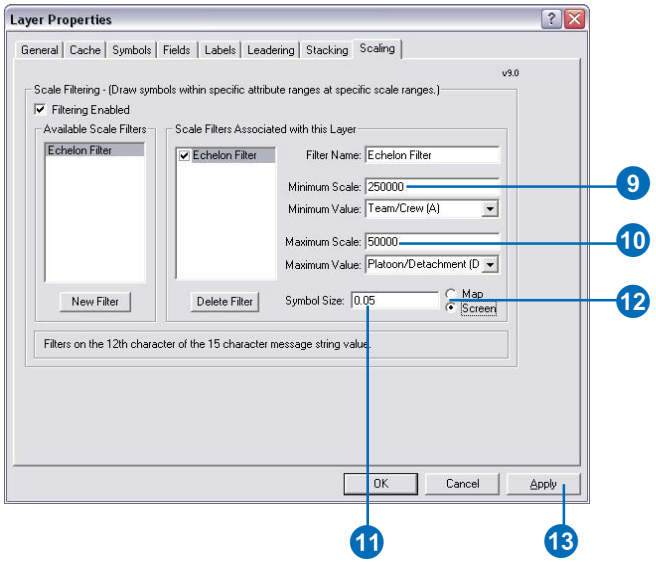
Specify the symbol size

11. Specify the symbol size for the filter by typing a value in the Symbol Size text box.

12. Click either the Map or Screen buttons to set the units for the symbol size.

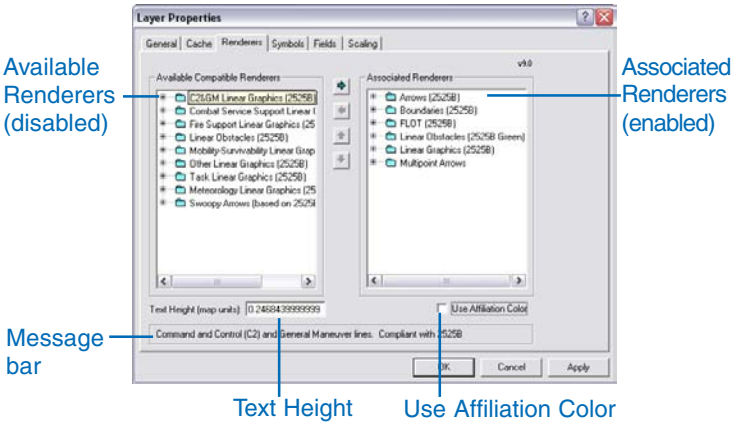
13. Click Apply.

    Repeat steps 5–11 in this task to create additional echelon filters.



The tactical graphic Layer Properties dialog box

Renderers tab



The Renderers tab for a tactical graphic area layer is shown above. The functionality is the same for tactical graphic lines, points, and area layers as well. However, each tactical graphic layer type has its own renderers.

MOLE tactical graphic renderers were introduced in the previous chapter. Each renderer is responsible for drawing specific types of tactical graphic symbols. For example, the Multipoint Arrows renderer is required to display curved arrows. The renderers are listed on the Renderers tab of the tactical graphic Layer Properties dialog box. Each renderer can be expanded by clicking the plus sign (+) next to it to list each of the symbols that are supported by the renderer.

Available Compatible Renderers

The Available Compatible Renderers list displays all the renderers that are available to the selected tactical graphic layer but have not been associated, or enabled. Symbols that are supported by renderers in this list will not be displayed with their MOLE symbology.

Associated Renderers

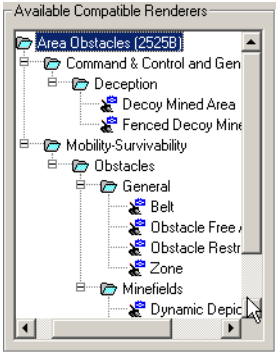
The Associated Renderers list displays the renderers that are enabled for the selected tactical graphic layer. Symbols that are supported by the renderers in this list will be displayed by MOLE with their MIL-STD-2525B symbology. Note that by default, when a tactical graphic line layer is opened in ArcMap, only the Arrows and Linear Graphics renderers will be associated. For tactical graphic area layers, only the Areas renderer will be associated by default. For tactical graphic point layers, only the Point Graphics renderer will be associated.

Text Height

The Text Height text box displays the current height in map units of the label text for the selected tactical graphic layer. It also allows you to enter a new value for the text height.

Message bar

When the mouse pointer is placed over a renderer, a brief description of the types of symbols that the renderer supports appears in the message bar. If the renderers are expanded and the



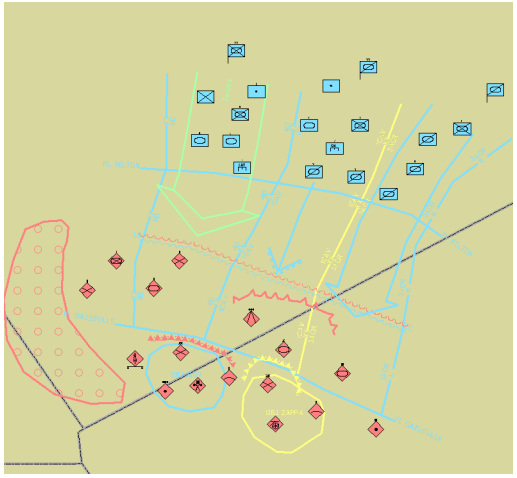
When the listed renderers are expanded, the MOLE symbol types associated with each renderer are displayed.

symbols corresponding to the renderers are displayed in the list, placing the mouse pointer over the symbol names will also cause a description of the symbol to be displayed in the message bar.

Use Affiliation Color

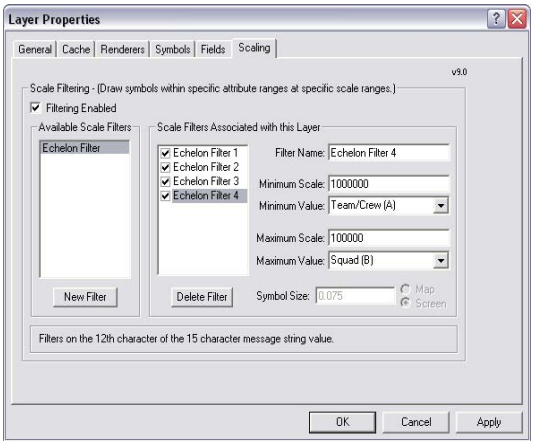
MIL-STD-2525B specifies that tactical graphic symbols be displayed with a color based on their affiliation property. See the list below to see the colors associated with each affiliation. In practice, however, tactical graphics are generally displayed in black. For this reason, by default, tactical graphic symbols are displayed in black by MOLE. You can override this by checking the Use Affiliation Color check box, which causes the symbols in the selected layer to be displayed with their affiliation color. The screenshot below shows how tactical graphic symbols appear when displayed with their affiliation color.

Affiliation	Color
Friendly/Assumed Friend	Blue
Hostile/Joker/Faker/Suspect	Red
Neutral	Green
Pending/Unknown/Unspecified	Yellow



Tactical graphic symbols can either be displayed in black, which is the default, or they can be displayed with their affiliation color, as shown above.

Scaling tab



The Scaling tab is present and works the same way in both the force element and tactical graphic Layer Properties dialog boxes. Echelon scaling for force element symbols is described earlier in this chapter in the section ‘The force element Layer Properties dialog box’. The information there also applies to tactical graphic echelon scaling.

Enabling tactical graphic renderers

When you first open a MOLE tactical graphic layer in ArcMap, not all of the renderers are enabled. If you try to add a MOLE tactical graphic whose renderer isn't turned on, the MOLE symbology will not display.

Tip

Supported symbols

Click the plus sign (+) next to a renderer to expand it and see the symbols that the renderer supports.

Tip

Renderer descriptions

As you place the pointer over a renderer or a symbol name, a description of the selected item appears in the message bar.

See Also

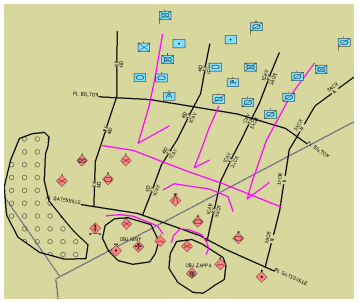
See the section 'Symbology rendering in MOLE' in Chapter 4.

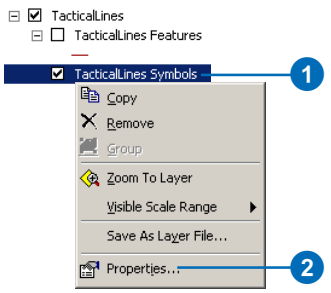
In this example, some of the symbols in a tactical graphic line layer are not initially being displayed with their MOLE symbology.

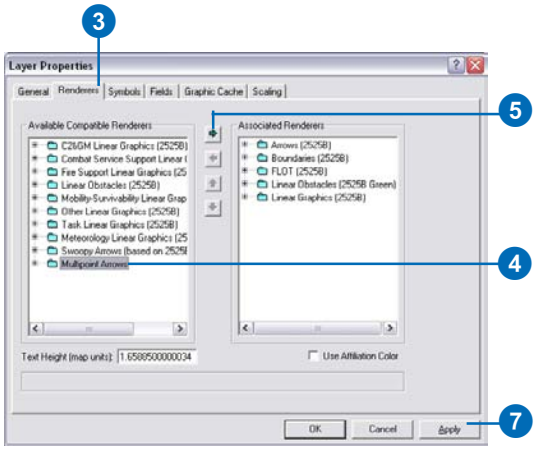
1. Right-click the graphic layer of a MOLE tactical graphic group layer in the ArcMap TOC.
2. Click Properties.

   The Layer Properties dialog box appears. The Layer Properties dialog box for a tactical graphic line layer is shown here.
3. Click the Renderers tab.

   The disabled renderers are displayed in the Available Compatible Renderers list, while the enabled renderers are displayed in the Associated Renderers list.
4. Click a renderer in the Available Compatible Renderers list.
5. Click the Right arrow to move the selected renderer into the Associated Renderers list.
6. Repeat steps 4–5 until all of the necessary renderers are displayed in the Associated Renderers list.
7. Click Apply. ▸





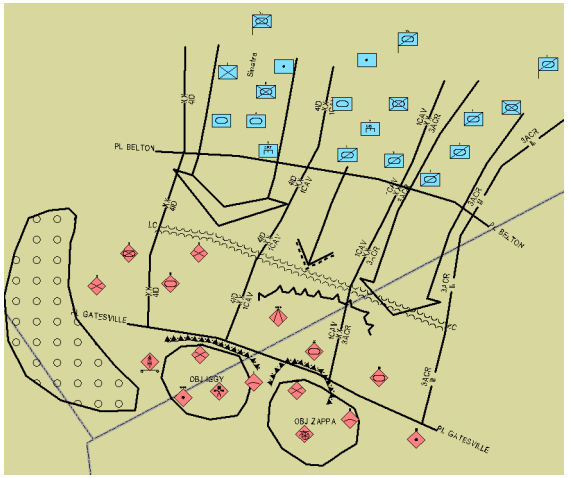


Tip

Disassociating renderers

To disable a renderer, click it in the Associated Renderers list and click the Left arrow to move it into the Available Compatible Renderers list.

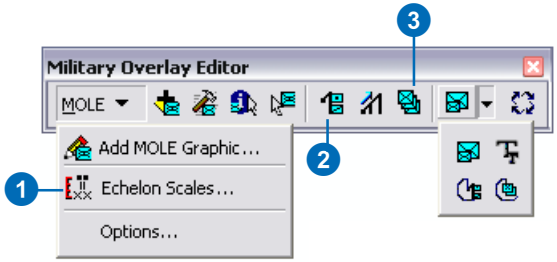
The renderers in the Associated Renderers list are now enabled and the symbols supported by them are displayed in the map display area.



The Layer Properties dialog box versus the toolbar

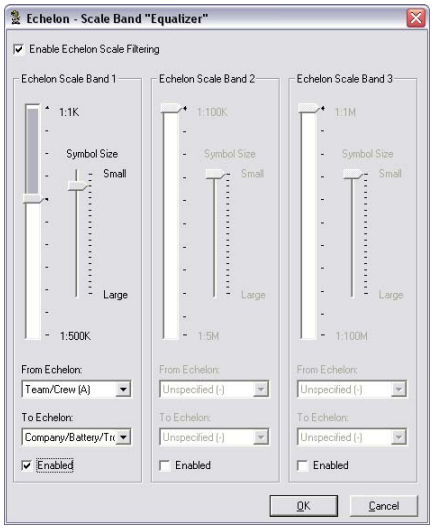
Most of the functions in the MOLE Layer Properties dialog box for modifying the display of force element symbols are also on the Military Overlay Editor toolbar. The main difference between the toolbar and Layer Properties functions is that the toolbar allows you to globally apply changes you make to all layers in the map document, while the Layer Properties dialog box does not. Changes you make with the Layer Properties functions are restricted to individual layers.

This section provides further comparison of the functions that are similar between the toolbar and the Layer Properties dialog box. For a complete list of toolbar function descriptions, see Chapter 1, ‘Introducing MOLE’.



1 Echelon Scales

Clicking Echelon Scales from the MOLE menu on the Military Overlay Editor toolbar opens the Echelon Scale Band Equalizer dialog box. This dialog box allows you to set up scale-dependent displays for all MOLE layers in the map document based on their echelon property. Unlike the Scaling tab on the Layer Properties dialog box, the Scale Band Equalizer limits the number of scaling rules you can set to three and applies the rules to all displayed force element layers.



The sliders on the Scale Band Equalizer dialog box make it easy to set scale-dependent display for MOLE layers.

2 Toggle Leadering

Click this button to leader the symbols in all the force element layers in the ArcMap data frame. Clicking this button has the same effect as checking the Toggle Leadering check box on the Layer Properties dialog box—the leadering rules that are selected on the Layer Properties dialog box of each force element layer will be applied to that layer. In other words, if a layer has no leadering rules selected, the symbols for that layer will not be leadered when the Toggle Leadering button is clicked.

3 Toggle Stacking

Click this button to stack the symbols in all the force element layers in the ArcMap data frame. Clicking this button has the same effect as checking the Enable Stacking check box on the Layer Properties dialog box—the stacking rules that are selected on the Layer Properties dialog box of each force element layer will be applied to that layer.

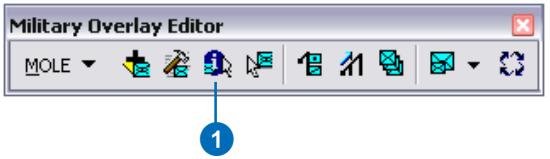
Identifying graphics

You can use the MOLE Identify tool to select a MOLE graphic in the map display and see the attributes for that feature.

Identifying graphics

1. Click the Identify Graphics button on the Military Overlay Editor toolbar.
2. Click the MOLE graphic you want to identify.

   The Identify Results dialog box appears listing the attributes of the feature associated with the MOLE graphic you selected.



Tip

You can hold down the Shift key while clicking the map to keep the results of your previous clicks in the Identify Results dialog box.

Selecting graphics

You can use the Select Graphics button on the Military Overlay Editor toolbar to select one or more MOLE symbols for editing. You can edit one at a time or apply edits to a group you've selected. Because in MOLE you typically select graphics to edit them, before you select them, you'll likely want to start an ArcMap editing session.

This button performs the same function as the ArcMap Select Features tool but operates exclusively on MOLE symbols. It allows you to select symbols without having the Features component of the force element group layer displayed.

Tip

For more information on editing symbols, see Chapter 4, 'Adding MOLE symbols in ArcMap'.

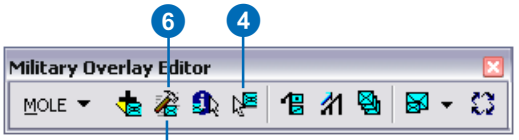
Select a graphic

1. Start an ArcMap editing session by right-clicking the ArcMap toolbar, then clicking Editor.
2. On the ArcMap Editor toolbar, click Editor, then click Start Editing.
3. On the ArcMap Editor toolbar, click the Target dropdown arrow to select the layer that corresponds to the MOLE layer you want to edit.
4. On the Military Overlay Editor toolbar, click the Select Graphics button.
5. Click a symbol you want to edit.

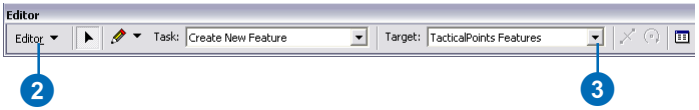
   You can select more than one symbol using one of two methods:

   Hold down the Ctrl key and click the symbols you want to select, one at a time.
   or
   Click and drag a rectangle around the graphics you want to select. MOLE selects any graphic that is touching the rectangle.

   You are ready to edit the symbols you've selected.
6. On the Military Overlay Editor toolbar, click the MOLE Symbol Editor button. For details on editing MOLE symbols, see Chapter 4, 'Adding MOLE symbols in ArcMap'.



When you start an editing session in ArcMap, the MOLE Symbol Editor button becomes enabled.



Resizing graphics

You can resize all MOLE graphics on your map at one time. This is also known as setting graphic height or setting symbol size.

Resize a graphic

1. On the Military Overlay Editor toolbar, click the Graphic Height button.
2. Click and drag to draw a rectangle that has the height you want all symbols to have.

   MOLE uses the height of the rectangle you drew as the new height for all existing symbols and resizes the symbols accordingly.

Moving leaders

You can move a leader after you've created it. A leader is a line along which symbols align to improve the readability of the map.

Move a leader

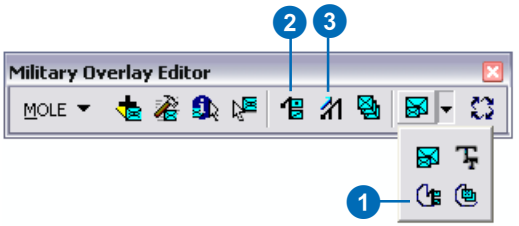
If you haven't already, create a leader by:

1. Setting the leader distance
2. Turning on leadering

   If symbols don't align along a leader, you likely must draw a larger circle when setting the leader distance.
3. On the Military Overlay Editor toolbar, click the Move Leaders button.

   The mouse pointer turns to crosshairs.
4. In the map display area, click and drag a leader to a new position in the map.

   MOLE symbols align with the new position of the leader.



Working with labels

MOLE labels differ from typical ArcGIS labels. You can use both types of labels in your map.

MOLE labels are derived from MOLE attribute data and are a part of the MOLE graphic. Apart from the Symbol_ID attribute and a few attributes required by ArcGIS, such as Shape, all MOLE attribute data is used for labels.

In ArcMap and ArcGlobe, you can add labels, turn their visibility on or off, and use your existing MIL-STD-2525B labels. In ArcMap, you can edit labels. You use the same procedure for editing labels as you do for adding them.

See Also

For an overview of MOLE attribute data and positioning of labels, see 'The MOLE Symbol Editor' in Chapter 1.

See Also

For attribute data (label) field descriptions, see Chapter 3, 'Creating a MOLE geodatabase'.

See Also

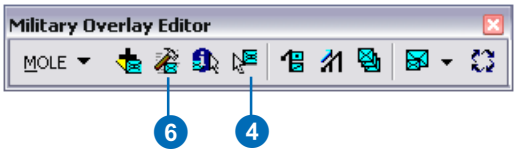
For information on using existing labels in MOLE, see Chapter 1, 'Getting started with MOLE'.

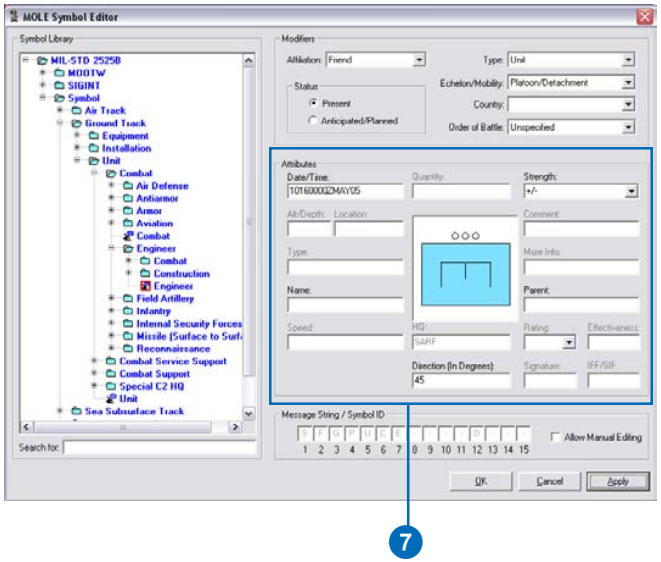
Adding labels

1. If you haven't already, start an edit session: click Editor on the Editor toolbar, then click Start Editing.
2. If other editable feature classes are displayed in ArcMap, the Start Editing dialog box appears. Choose the folder or database containing the MOLE layers you want to edit and click OK.
3. Click the Target dropdown arrow on the Editor toolbar and click the MOLE layer you want to edit.
4. Click the Select Graphic button on the MOLE toolbar.
5. Click a force element graphic in the map display area.
6. Click the MOLE Symbol Editor button on the MOLE toolbar.
7. In the Attributes area of the MOLE Symbol Editor, type a new value in the text box for the label you want to add. For example, click in the Parent text box and type "41D".

   If the text you type is gray, it will not appear on the map because its visibility is set to off. You can turn on label visibility on the Layer Properties dialog box.
8. Click OK or Apply.

   MOLE applies the label to the feature in the database, whether the label's visibility is on or off.





Turning on label visibility

You can turn MOLE attribute data visibility on or off.

Label visibility is a property of the layer, so you cannot control it for an individual graphic (unless it is the only graphic of that type—the force element type or tactical graphic type—with that attribute in the layer).

When you turn on the visibility of an attribute, MOLE positions it around the graphic in accordance with MIL-STD-2525B position descriptions. For example, if it is a date/time group label, MOLE places it up and to the left of the graphic.

The MOLE Symbol Editor uses a visual cue—black and gray text on the text box labels—to alert you to which attributes have their visibility turned on or off in the layer. If the label's text is black, the visibility is turned on. If gray, it is turned off.

Tip

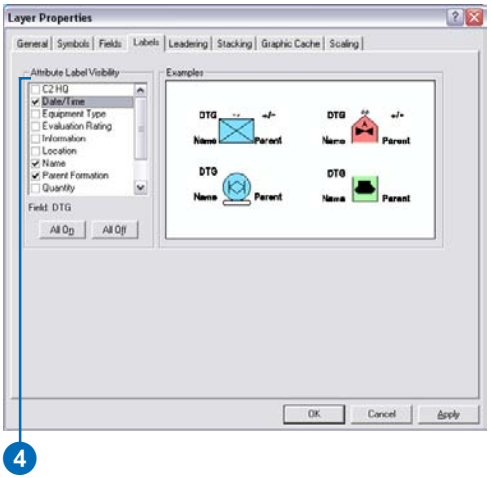
For more information on labels, see Chapter 1, 'Introducing MOLE'. For more information on editing symbols, see Chapter 4, 'Adding MOLE symbols in ArcMap'.

Turn label visibility on or off

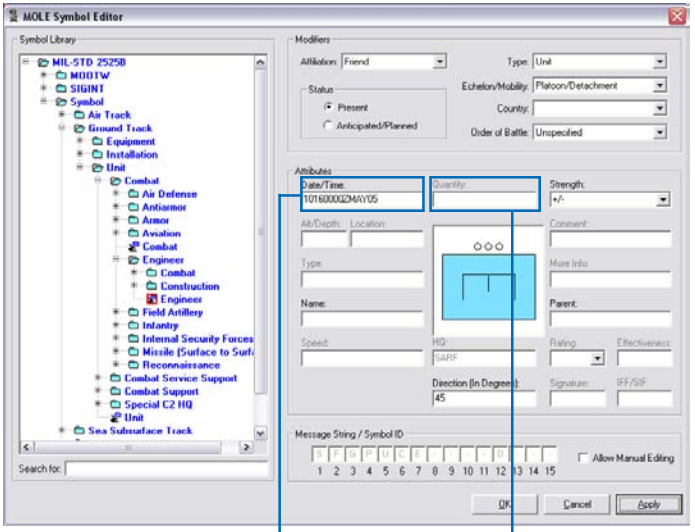
1. In the ArcMap or ArcGlobe TOC, right-click the MOLE graphics layer for which you want to turn on or off label visibility.
2. Click Properties.
3. On the Layer Properties dialog box, click the Labels tab.
4. On the Labels tab, in the Attribute Label Visibility area, check all the labels you want to display with their graphics.

   To view all labels available, use the scroll bar to the right.

   You can turn all labels on or off at one time by clicking either the All On button or the All Off button.
5. Click OK.



The Layer Properties dialog box in ArcMap. Note that checked attributes in this dialog box appear as black text in the MOLE Symbol Editor below.



Example of an attribute whose visibility is on; the MOLE Symbol Editor uses black text.

Examples of an attribute whose visibility is off; the gray text cues you that the text you type won't display on the map.

Modifying force element graphics with the toolbar

Using the Military Overlay Editor toolbar, you can bypass the Layer Properties dialog box and set the graphic size for all force elements at once in your map or for all force element layers you select in the TOC.

Changing graphic size for all force elements at once is especially useful when the coordinate system of the force element layers in your map is different from the coordinate system of the ArcMap data frame.

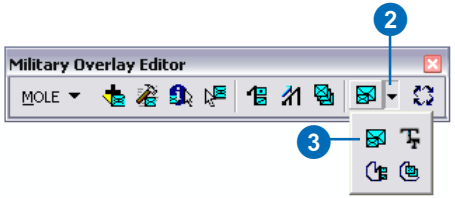
For example, if you add a MOLE force element layer with a geographic coordinate system to a map with a universal transverse Mercator (UTM) projection, the force element symbols may not appear in the map display area. This is because the size units of the force element symbols were set to decimal degrees, while the units of the UTM map are meters. The symbols are there, but they are too small to be seen. You can quickly remedy this by using the toolbar to adjust graphic height.

Changing the force element graphic size using the toolbar

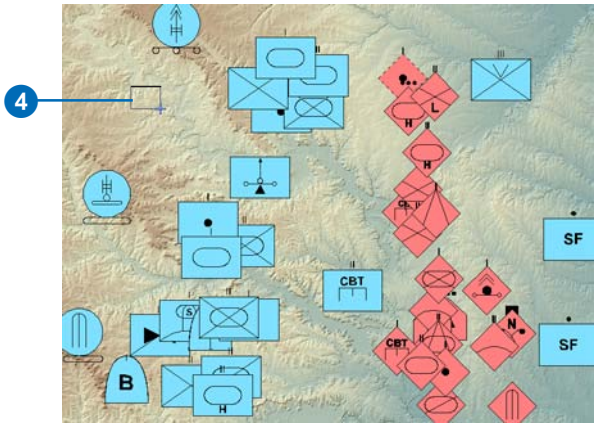
1. In the ArcMap or ArcGlobe TOC, select the force element layer or layers for which you want to change graphic size. You can select all force elements in the TOC by highlighting the highest level in the TOC, the data frame level. By default, the data frame is named Layers.
2. Click the additional tools dropdown arrow on the Military Overlay Editor toolbar.
3. Click the Graphic Height button.
4. In the map display area, click and drag a box to set the graphic height.

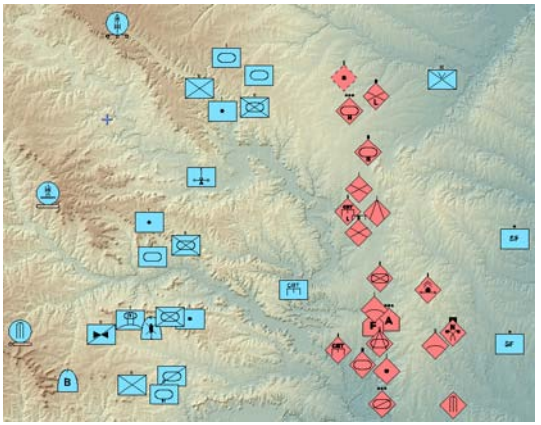
   The height of the box you draw defines the new graphic height.

   MOLE uses the height of the rectangle you drew as the new height for all applicable graphics (in this case, force element graphics) and resizes the graphics accordingly.
5. Click any other ArcMap or ArcGlobe tool to disable the Graphic Height tool.



The MOLE toolbar in ArcMap





The map display area in ArcMap after MOLE has reduced graphic size; size was reduced because the height of the rectangle drawn in step 4 was smaller than the original height of the graphics.

Leadering and Stacking with the toolbar

The Toggle Leadering and Toggle Stacking tools on the Military Overlay Editor toolbar, along with the Graphic Height tool, provide shortcuts for leadering and stacking all force elements in the ArcMap TOC at the same time. You can reposition leaders as well by using the Move Leaders button on the Military Overlay Editor toolbar.

You must have at least one force element layer open in the ArcMap data frame to perform these tasks.

Tip

Leader and stacking distance

The Proximity Rule must be selected on the Leadering and/or Stacking tab of the Layer Properties dialog box to set the leader and stacking tolerance from the Military Overlay Editor toolbar.

Tip

Leadering and Stacking rules

The leadering and stacking rules that are selected on the Layer Properties dialog box of each force element layer in the map are applied to the respective layers when the Toggle Leadering or Toggle Stacking buttons are clicked.

Leadering with the Military Overlay Editor toolbar

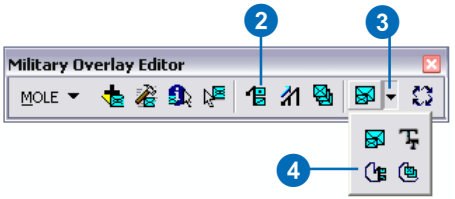
1. Follow the instructions in Chapter 1, 'Introducing MOLE', to open the Military Overlay Editor toolbar.
2. Click the Toggle Leadering button.

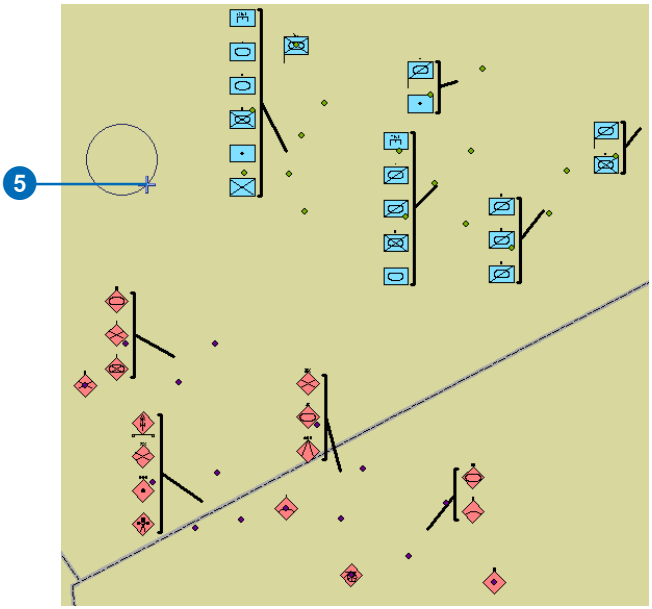
   All force element symbols in the map that satisfy the Leadering Rules selected on their Layer Properties dialog box will be placed on leader lines.

Changing the leader tolerance

3. Click the size tools dropdown menu on the Military Overlay Editor toolbar.
4. On the dropdown menu, click Leader Distance.
5. Click inside the map display and drag a circle to set the leader distance.

   The diameter of the circle defines the leader distance value for the Proximity leadering rule. Force element features within this distance of each other will be placed on a leader together. ▸



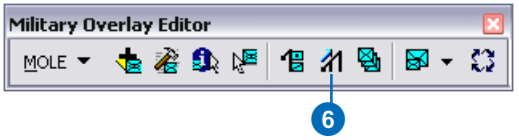


See Also

See the section 'The force element Layer Properties dialog box' earlier in this chapter for more information about leadering and stacking rules.

Moving leaders

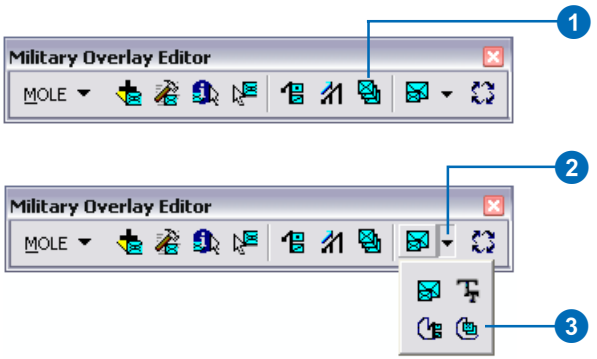
6. Click the Move Leaders button on the Military Overlay Editor toolbar.
7. Click a leader line in the ArcMap map display and drag it to a new position.



Stacking with the Military Overlay Editor toolbar

1. Click the Toggle Stacking button on the Military Overlay Editor toolbar.

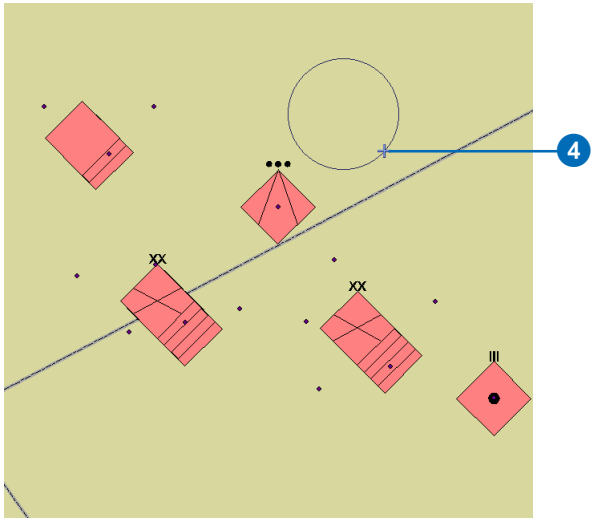
   All force element symbols in the map that satisfy the Stacking Rules selected on the symbols' Layer Properties dialog box are placed in stacks.



Changing the stack distance

2. Click the size tools dropdown arrow on the Military Overlay Editor toolbar.
3. Click the Stack Distance button.
4. Click inside the map display and drag a circle to set the stack distance.

   The diameter of the circle defines the stack distance value for the Proximity stacking rule. Force element features within this distance of each other will be stacked on top of each other.



Echelon scaling with the Military Overlay Editor toolbar

The Echelon Scale Band Equalizer allows you to set scale-dependent display rules for all MOLE layers in the TOC at once based on the echelon value of the symbols. This equalizer differs from the Scaling tab in the Layer Properties dialog box, which requires you to apply filtering to only one layer at a time. You can set up to three scale filtering rules with the Echelon Scale Band Equalizer.

The scale sliders are available in three different levels: Tactical, Operational, and Strategic. The scale range supported by the levels is listed in the figure below.

Scaling Level	Scale Range
Tactical	1:1000–1:500,000
Operational	1:100,000–1:1,000,000
Strategic	1:1,000,000–1:100,000,000

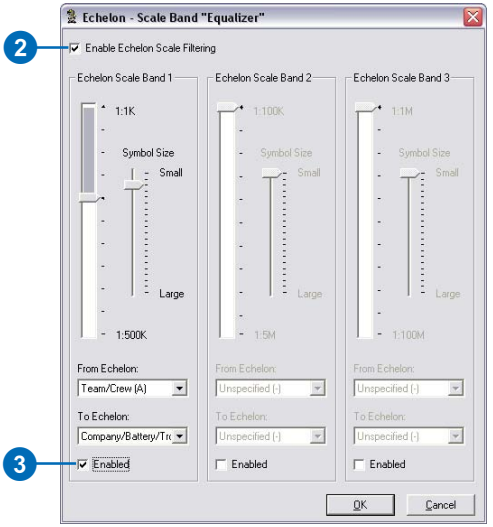
By default, Echelon Scale Band 1 has a Tactical scale slider, Band 2 has an Operational scale slider, and Band 3 has a Strategic slider. You can change the slider by right-clicking it and clicking a new slider from the popup list.

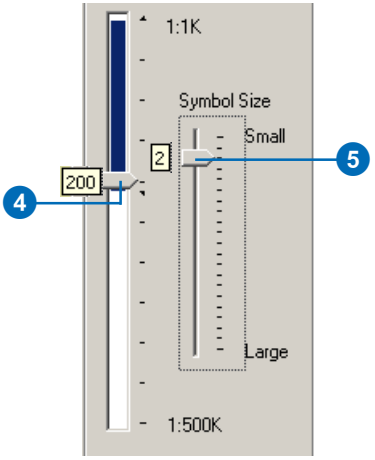
1. Click Echelon Scales from the MOLE dropdown menu.

   The Echelon Scale Band Equalizer dialog box appears.
2. Check the Enable Echelon Scale Filtering check box.
3. Check the Enabled check box for Echelon Scale Band 1.
4. Click and drag the scale slider in Echelon Scale Band 1 to the desired scale value.

   As you move the slider, the scale values will display next to it. The scale range will be indicated by a blue fill in the slider.
5. Click and drag the Symbol Size slider in Echelon Scale Band 1 to the desired value.

   The symbols matching the criteria you specify in Echelon Scale Band 1 are displayed with the symbol size you set here. The symbol height is expressed as a percentage of the data frame height. In other words, a value of 2 causes the symbol height to be 2 percent of the screen height. ►





Tip

Scale values

Once the scale range is set, if you place the pointer anywhere inside the slider, the scale value displays as a ToolTip.

Tip

Scale sliders

You can change the initial scale value for a particular slider if you do not want to use the default value. Click and drag the slider to the desired starting value, then simultaneously press Shift and click and drag the slider to the desired end value.

Tip

Symbol size

If you set the symbol size to 0, the symbols are not displayed.

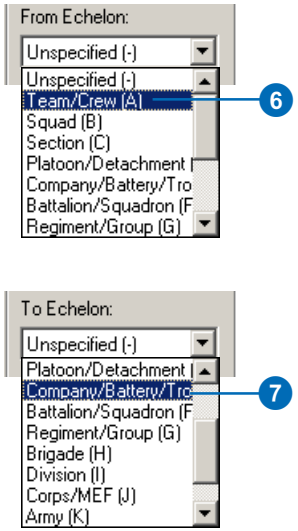
6. Click the From Echelon dropdown arrow and click a value from the list of echelons.

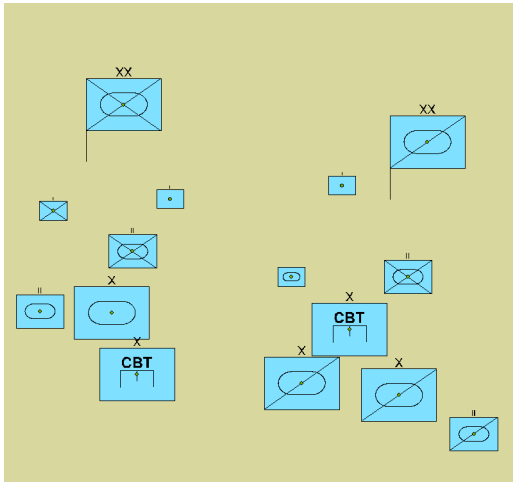
   This sets the minimum echelon size to be displayed in the specified scale range.

7. Click the To Echelon dropdown arrow and click a value from the list of echelons.

   This sets the maximum echelon size to be displayed in the specified scale range.

8. Repeat the preceding steps to set echelon scaling rules for Echelon Scale Bands 2 and 3, if desired.





The Echelon Scaling Band Equalizer can be utilized in other ways as well, such as setting up different display sizes for symbols in defined echelon ranges, as illustrated here.

Using MOLE with other ESRI products

6

IN THIS CHAPTER

- **Adding MOLE symbols with the Coordinate tool**
- **Using MOLE layers in Tracking Analyst**
- **Using MOLE with ArcSDE and ArcIMS**
- **Versioning**
- **Using MOLE with ArcGlobe**

The flexibility in MOLE allows you to use it with many ArcGIS extensions and other products in ESRI's suite of GIS software solutions. Most notably, and of the greatest relevance to military users, is the ability to use MOLE with ArcGIS Military Analyst, ArcGIS Tracking Analyst, ArcGlobe, and ESRI's enterprise GIS products—ArcSDE and ArcIMS.

You can use the Coordinate tool of Military Analyst to add MOLE force elements at precise locations in ArcMap. You can use MOLE with Tracking Analyst to model near real-time battlefield scenarios. ArcSDE allows you to store MOLE data in a relational database management system (RDBMS) and perform multiuser editing on the data. With the ArcIMS ArcMap Server component, you can distribute MOLE map documents over the Internet.

A clear and accelerating trend is for mission applications to have three-dimensional displays. MOLE has extended the capability to view MIL-STD-2525B graphics in ArcGlobe.

Adding MOLE symbols with the Coordinate tool

MOLE is fully integrated with ArcGIS, including the ArcGIS extensions. Because of this, you can take advantage of the additional functionality offered by the extensions by using MOLE in conjunction with them. One example of an extension that enhances MOLE capabilities is the Military Analyst extension. With the Coordinate tool of Military Analyst, you can add symbols to MOLE layers in ArcMap at specific locations by typing the coordinates in the Coordinate Tool dialog box while editing the layer. The MOLE symbol for an unknown force element will be placed with its center at the coordinates you enter. This ability gives you a greater degree of accuracy when adding MOLE symbols than simply looking at the coordinate display on the ArcMap status bar and estimating the location of the symbol. The Military Analyst extension must be installed for this task.

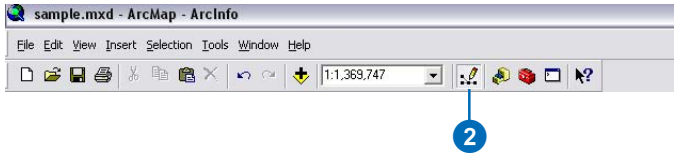
See Also

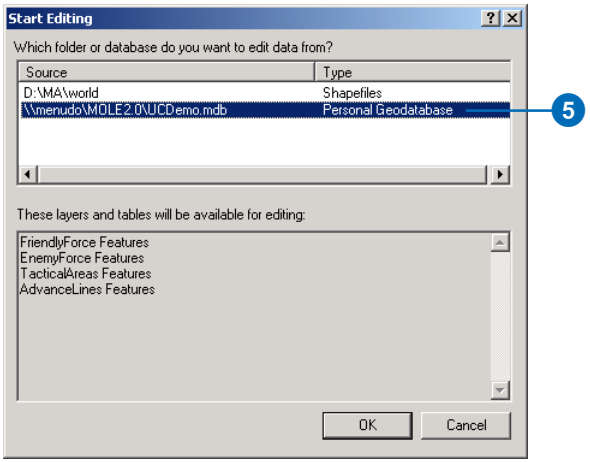
See Using ArcGIS Military Analyst *for more information on the Coordinate tool.*

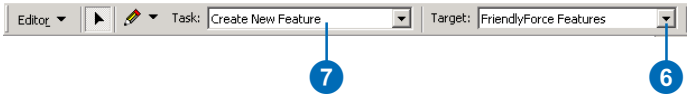
1. Activate the Military Analyst extension and open the Military Analyst toolbar following the instructions in Chapter 1 of *Using ArcGIS Military Analyst*.
2. Open the Editor toolbar by clicking the Editor toolbar button on the ArcMap Standard toolbar.
3. Open a MOLE force element layer in ArcMap.

   See Chapter 4, 'Adding MOLE symbols in ArcMap', for instructions on opening MOLE layers.
4. Click the Editor dropdown arrow on the Editor toolbar and click Start Editing.

   If there are other feature classes open in ArcMap, the Start Editing dialog box appears.
5. On the Start Editing dialog box, click the database containing the feature class you want to edit, then click OK.
6. Click the Target dropdown arrow on the Editor toolbar and click the feature classes you want to edit.
7. Ensure Create New Feature is selected in the Task dropdown list on the Editor toolbar. ▸







8. Click the Coordinate tool button on the Military Analyst toolbar.

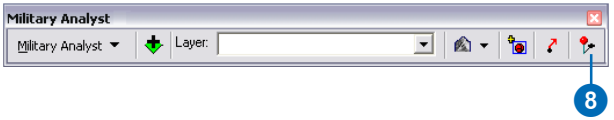
   The Coordinate Tool dialog box appears.

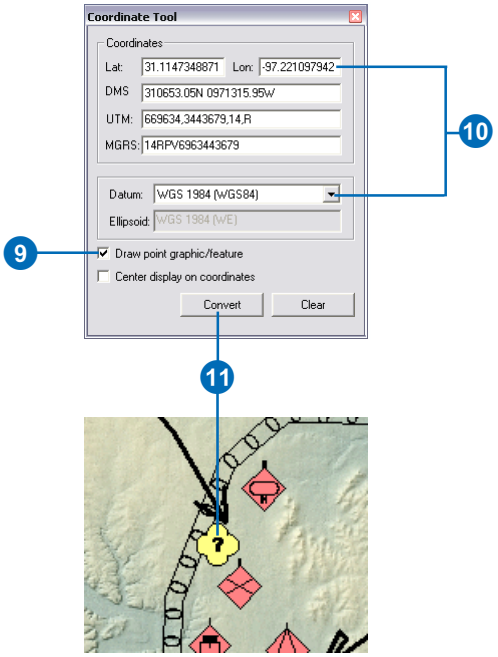
9. Check the Draw point graphic/feature check box.

10. Type the coordinates at which you want to place a force element symbol in the appropriate coordinate text field.

11. Click Convert.

    The MOLE symbol for an unknown or pending force element is placed in the map display area at the specified coordinates. You can edit the symbol as you desire.





Using MOLE layers in Tracking Analyst

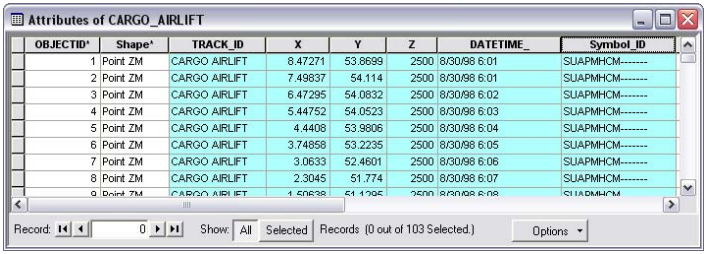
ArcGIS Tracking Analyst is another ArcGIS extension that you can use in conjunction with MOLE. Tracking Analyst allows you to model near real-time changes in geospatial data. By associating temporal signatures with feature classes, you can create two types of temporal layers. Static temporal layers contain features whose geographic locations remain constant, while their attribute values change over time. These changes can be represented by symbology changes in the features. Dynamic temporal layers contain features whose geographic locations change over time. The features move in the display, representing the geographic changes. The combination of MOLE and Tracking Analyst is ideal for mission planning and rehearsal, as well as battlefield visualization, because it allows you to track troop and equipment movement and model different engagement scenarios. The Tracking Analyst extension, as well as MOLE, must be installed and activated to use them together. There are multiple ways to create temporal (tracking) layers. Some of those methods will be discussed here, with respect to MOLE. For detailed information on Tracking Analyst and temporal layers, see *Using ArcGIS Tracking Analyst*.

Creating MOLE temporal layers

As mentioned above, there are several methods for creating temporal layers. Regardless of the technique used, features in MOLE temporal layers must have the following attributes, at a minimum, associated with them:

- A valid 15-character MOLE Symbol ID value
- Date/Time values
- X and y coordinate values as well as optional z-values

The following figure displays an example of a MOLE temporal layer table.



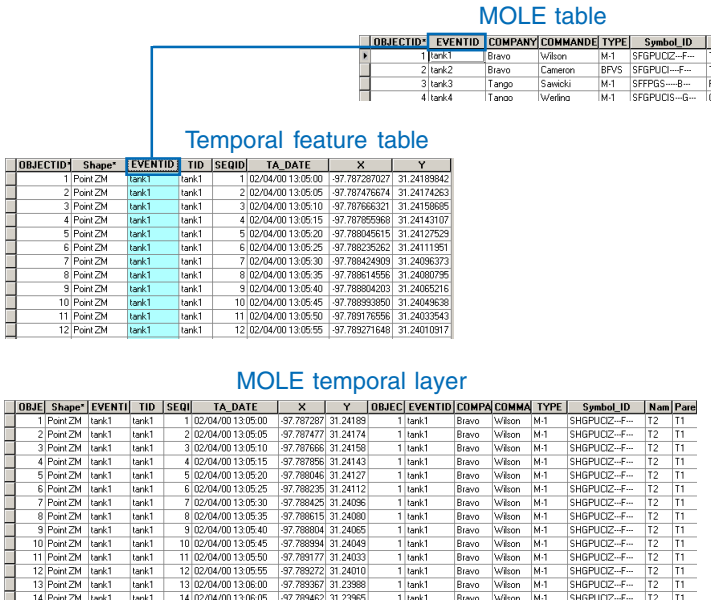
In this example, a non-MOLE, nontemporal layer table was modified by adding the necessary temporal attributes. First, a Symbol_ID field was added and populated with valid Symbol ID codes, thus making it a MOLE layer. X-, y-, and z-coordinate values were added to give the MOLE feaures the necessary geographic locations. Next a date/time field was added and populated with sequential one-minute time intervals, adding the necessary temporal component. In addition, a TRACK_ID field was added to designate the temporal tracking ID for the layer.

The following examples illustrate ways to create MOLE temporal layers:

- Create a MOLE feature class by adding a Symbol_ID field to an exising attribute table and populating the field with valid Symbol ID values. Add x, y, and date/time fields to the attribute table
- Add x, y, and date/time fields to the attribute table of a MOLE feature class and populate the fields with values.
- Using ArcMap, join the attribute table of a MOLE feature class with a table containing x, y, and date/time values that correspond to the MOLE features. This produces the same results as the first example above.
- Using the Tracking Analyst Add Temporal Data Wizard, join a temporal (x, y, date/time values) geodatabase feature class with a table containing MOLE Symbol ID values.

You are not restricted to these methods. In ArcMap you can join two feature classes with each other, two tables, or a feature class with a table. It doesn't matter which one contains the Symbol ID or the temporal data. However, when you join feature classes and tables, there must be an attribute field that is common to the tables being joined so they can be associated with each other.

The figure below displays an example of a table with MOLE Symbol ID values joined with the attribute table of a temporal feature class containing time and location information, using the field EVENTID as the join field.



Tip

Supported MOLE symbols

Only MOLE force element symbols are supported by Tracking Analyst. Tactical graphic symbols are not supported.

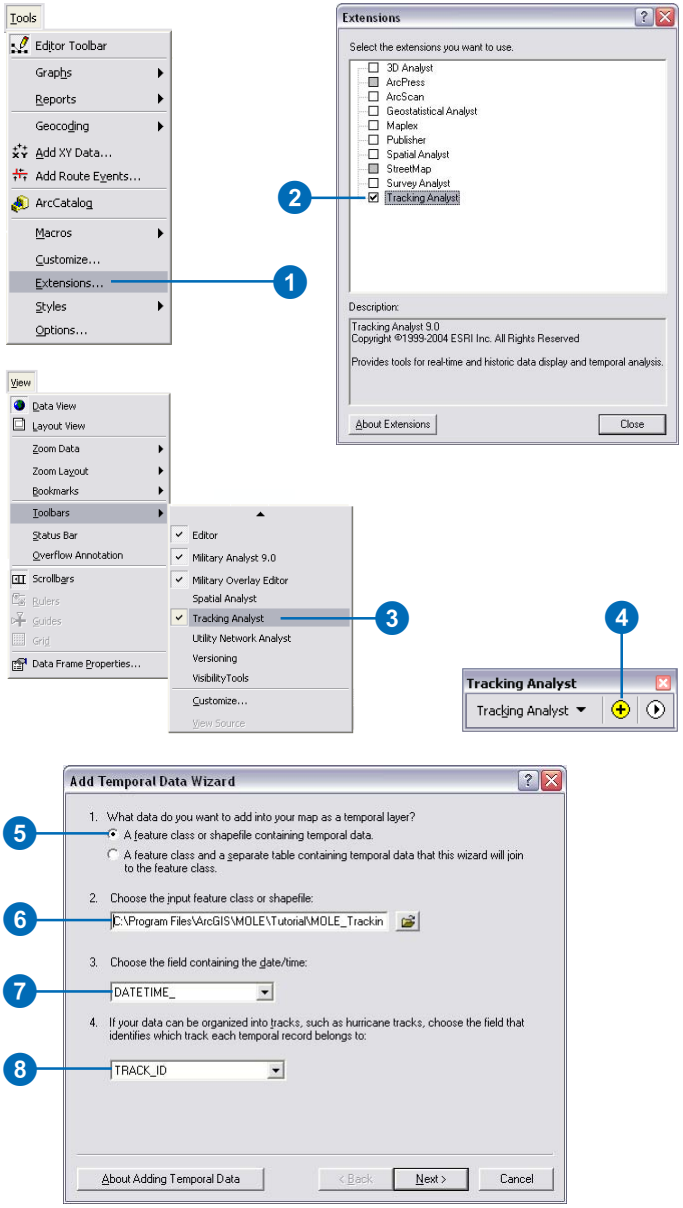
See Also

See Using ArcGIS Tracking Analyst *for information about the complete functionality of Tracking Analyst.*

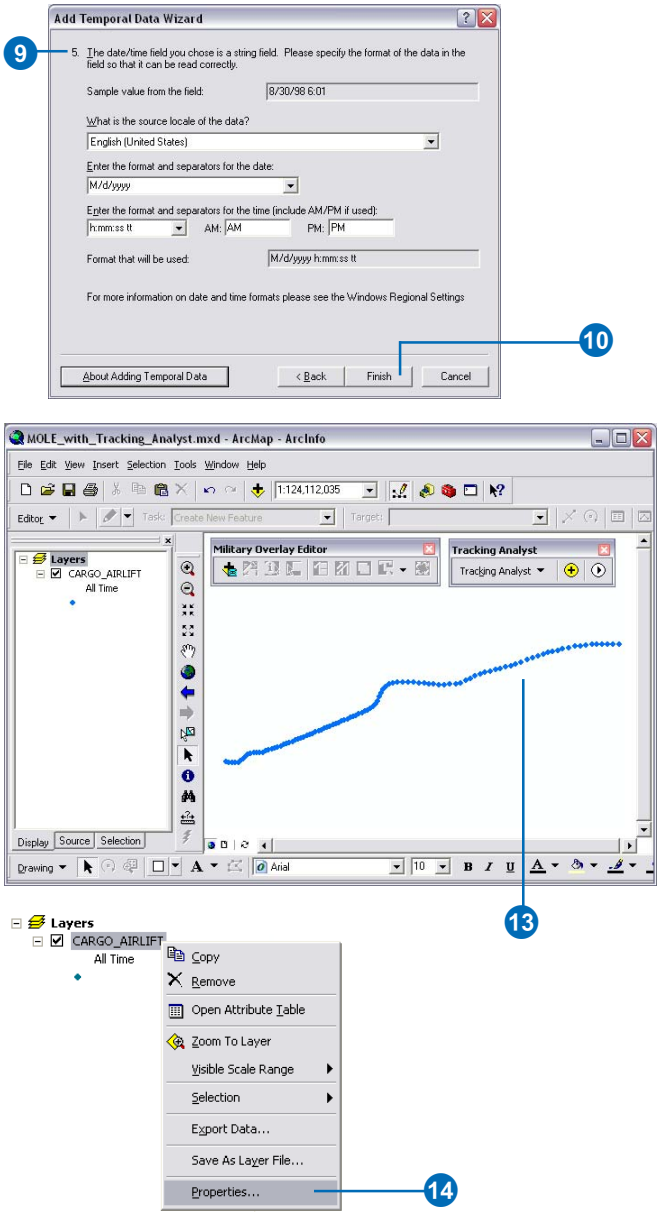
Creating a MOLE temporal layer in Tracking Analyst

1. On the ArcMap main menu, click Tools, then click Extensions.
2. Check the Tracking Analyst check box on the Extensions dialog box, then click Close.
3. Open the Tracking Analyst toolbar by clicking View on the ArcMap main menu, pointing to Toolbars, then clicking Tracking Analyst in the toolbars list.
4. Click the Add Temporal Data button to open the Add Temporal Data Wizard dialog box.
5. Choose an option.

   If you choose the second option, in a later step you will need to select and link the appropriate MOLE table to the temporal feature class.
6. Add the feature class containing temporal data in the input feature class field.
7. Click the dropdown arrow and choose the attribute field containing the temporal (date/time) data.
8. Click the dropdown arrow and choose the attribute field containing the unique track ID. Click Next. ▸

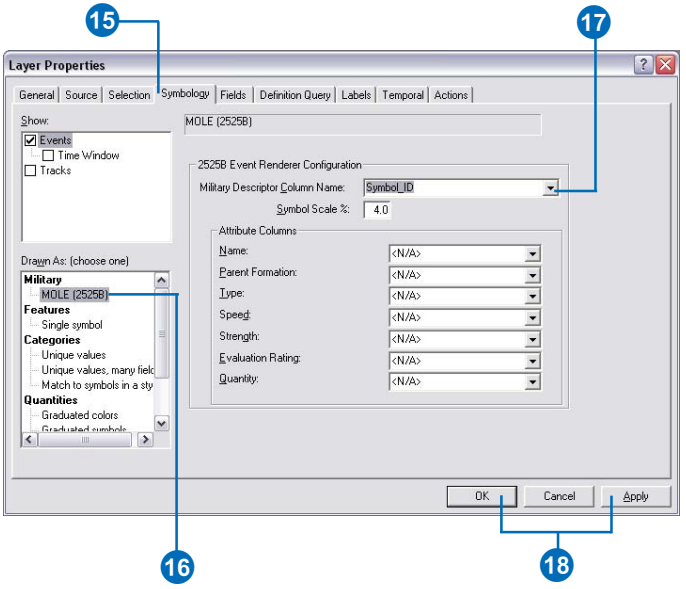


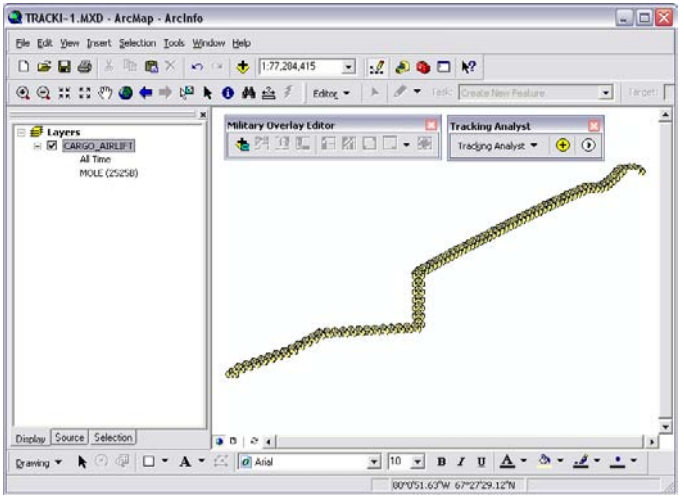
9. Choose the default options for the date/time string, or modify them to suit your date.
10. If you selected the second option in step 5, skip to step 11; otherwise, click Finish and skip to step 13 of this procedure.
11. If you chose the second option in step 5 (step 1 in the wizard), the Add Temporal Data Wizard panel appears. Choose and link the appropriate MOLE table to the temporal feature class. Click the Join Field in Input Feature Class dropdown arrow and click the field with which you want to join the MOLE table.
12. Click the Join Field in Input Table dropdown arrow to choose the corresponding field from the MOLE table. Click Finish.
13. The layer is initially displayed as simple points.
14. Specify MOLE symbology from the Layer Properties dialog box. Right-click the layer in the ArcMap TOC and click Properties to open the Layer Properties dialog box. ►



15. Click the Symbology tab on the Layer Properties dialog box.
16. Scroll up in the Draw As list and click MOLE (2525B).
17. Click the Military Descriptor Column Name dropdown arrow and click the field containing the MOLE Symbol ID values.
18. Click Apply and/or OK.

    The MOLE symbology will now be displayed in ArcMap.





Using MOLE with ArcSDE and ArcIMS

MOLE and ArcSDE

ArcSDE is a program that allows you to store geospatial data within a relational database management system and access the data with ArcGIS. You can also use ArcSDE to serve geospatial data over the Internet with ArcIMS. There are many advantages to using ArcSDE in conjunction with an RDBMS to store and connect to your geospatial data. The primary advantage is that this type of configuration allows multiple users to simultaneously edit the same GIS data. See *Understanding ArcSDE* for more information.

Because MOLE is compatible with ArcSDE, you can take advantage of the multiuser editing environment, versioning capability, and the ability to store your MOLE data in an RDBMS offered by ArcSDE and still use all of the GIS processing functionality of ArcGIS. With ArcSDE, MOLE layers are contained in an enterprise geodatabase, rather than a personal geodatabase. You can create new MOLE ArcSDE feature classes directly in ArcCatalog, or you can export existing MOLE shapefiles and geodatabase feature classes or feature datasets containing MOLE feature classes into an enterprise geodatabase. The steps that you follow to create new MOLE feature classes in an enterprise geodatabase and to view and edit MOLE ArcSDE layers in ArcMap are identical to the steps for the same processes for MOLE feature classes in a personal geodatabase. Because the processes are the same, the steps for creating new and editing existing MOLE feature classes are not discussed in this chapter. The main idea to keep in mind is that when you are working with MOLE layers in an enterprise geodatabase, you must connect to the database before you can create new layers or view and edit existing layers. MOLE layers must also be registered as versioned with the enterprise geodatabase before they can be edited. Refer to Chapter 3, ‘Creating a MOLE geodatabase’, and Chapter 4, ‘Adding MOLE symbols in ArcMap’, for information on creating and editing MOLE layers, respectively.

MOLE and ArcIMS

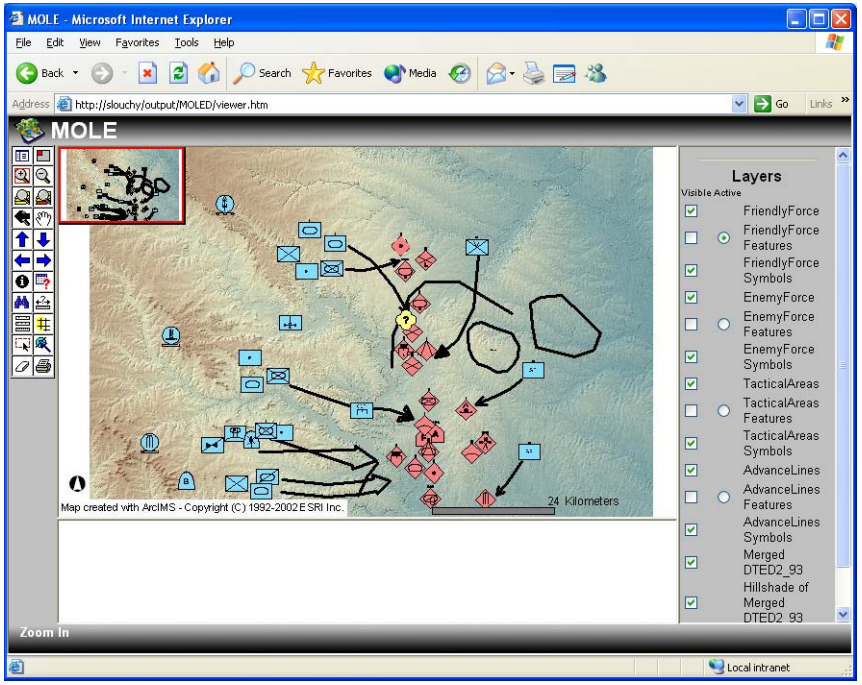
ArcIMS is a program that allows you to serve features, imagery, and map documents over the Internet, providing wide access to your geospatial data. You can use ArcIMS to distribute operational graphics and situation maps, which can contain MOLE symbology, across secure Intranets for rapid dissemination of those products. The primary benefit of using ArcIMS to distribute MOLE maps is that it provides users who do not need the advanced GIS functionality of ArcGIS the ability to view them using standard Internet browsers.

Requirements for using MOLE with ArcIMS

To use MOLE with ArcIMS, you must have ArcIMS 4.0.1 or greater installed on a server, along with the ArcMap Server component of ArcIMS, without ArcGIS. MOLE is incompatible with earlier versions of ArcIMS. The ArcMap Server component allows you to publish ArcGIS map documents (.mxd) and ArcReader™ published map format documents (.pmf) on the Internet. MOLE must be installed on the same server as ArcIMS. You also need to save the MOLE layers that you want to distribute within a map document produced in ArcMap, then create an ArcIMS ArcMap Image Service for the map. This is the only way ArcIMS will serve MOLE layers with their MOLE symbology. The steps required to set up ArcIMS and create an ArcMap Image Service are not discussed in this publication. Refer to *Getting Started With ArcIMS* or the ArcIMS help system for detailed information on ArcIMS, *Using ArcReader and ArcGIS Publisher* for information on ArcReader, and *Using ArcMap* for information on creating map documents.

MOLE symbols not supported by ArcIMS

As discussed in Chapter 4, ‘Adding MOLE symbols in ArcMap’, some of the more complex MOLE tactical graphic symbols are rendered using ArcGIS style files. Because ArcIMS does not support the use of ArcGIS style files, these symbols will not be displayed when served by ArcIMS. The symbols will be represented by black lines for line and area features and simple black points for point features. The figure below illustrates a sample MOLE mission planning map served on a Web page created with ArcIMS.



See Also

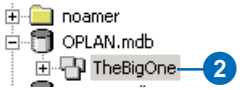
See Using ArcCatalog *for details on adding a spatial database connection.*

Exporting MOLE layers to ArcSDE

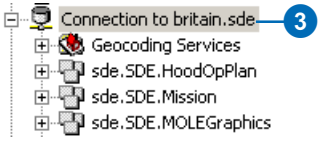
1. Expand the Database Connections folder in the Catalog tree in ArcCatalog and double-click Add Spatial Database Connection to connect to an ArcSDE database.

2. Right-click the MOLE personal geodatabase feature dataset or feature class in the Catalog tree you want to export to the database connection and click Copy.

   You can also select it and press Ctrl + C.

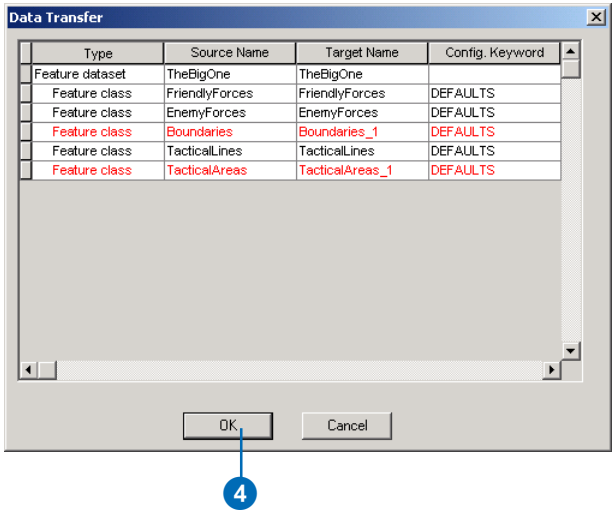


3. Right-click the database connection and click Paste, or select it and press Ctrl + V.



4. Click OK on the Data Transfer dialog box.

   The layers are added to the ArcSDE enterprise geodatabase. They can now be opened in ArcMap and edited the same way as any MOLE layer.



Versioning

Versioning is the method ArcSDE provides for managing multiuser editing. You can create multiple versions of an enterprise database containing MOLE feature classes. Users can make edits to their own version of the feature classes, and the changes will not be saved to the parent version of the feature class until the edits are explicitly reconciled against and posted to it. This allows for better quality control and management of data integrity.

Tip

Versioning

The MOLE feature class or feature dataset containing the feature classes you want to edit must be registered as versioned before they can be edited.

See Also

See Understanding ArcSDE *for more information about versioning.*

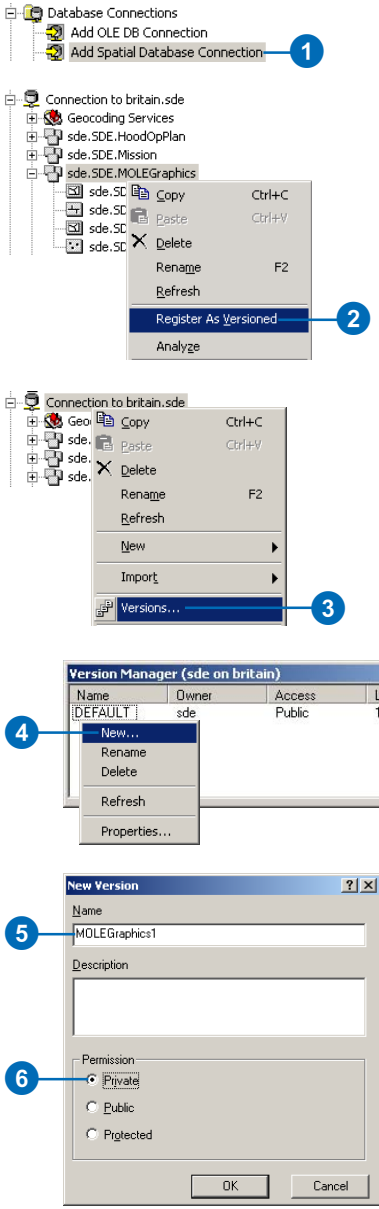
Versioning with MOLE

1. Connect to the ArcSDE database in ArcCatalog containing the MOLE layer you want to edit.
2. Right-click the MOLE feature dataset or feature class you want to edit in the ArcCatalog Catalog tree, then click Register as Versioned.

   If the feature class is contained within a feature dataset, register the feature dataset as versioned. If the feature class is not within a feature dataset, register the feature class as versioned.
3. Right-click the connection to the database containing the feature classes you want to edit and click Versions.

   The Version Manager window appears.
4. Right-click the name of the parent version—the version you create the new versions from—and click New.

   The New Version dialog box appears.
5. Type a name for the version in the Name text box on the New Version dialog box.
6. Click one of the Permission buttons to set the security level of the version, then click OK.►

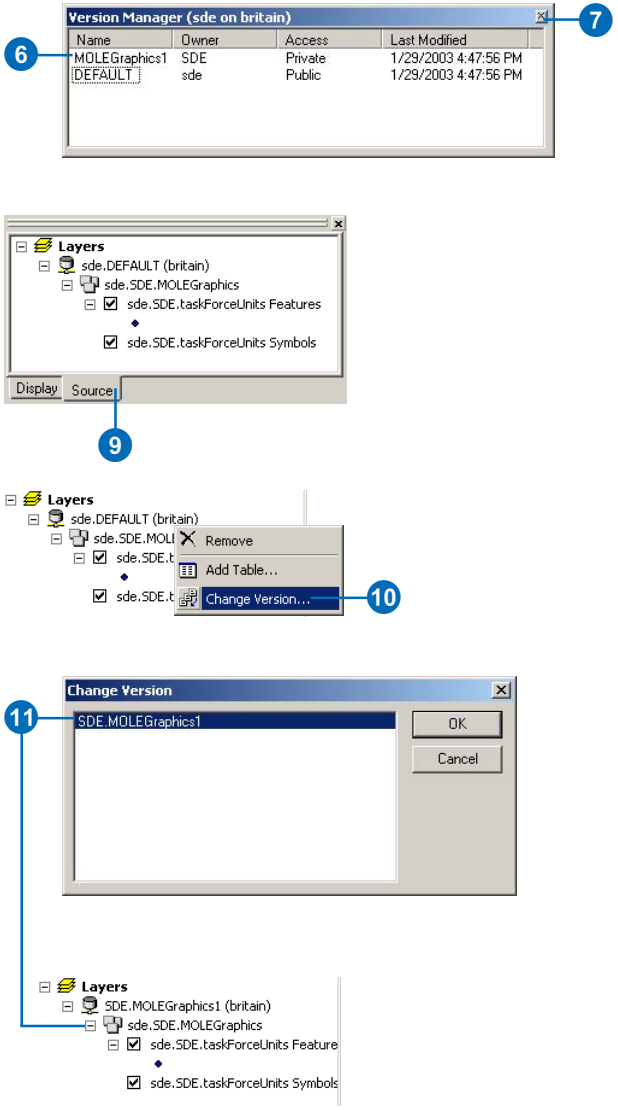


The new version is displayed in the Version Manager. Follow the previous steps to create more versions if you desire.

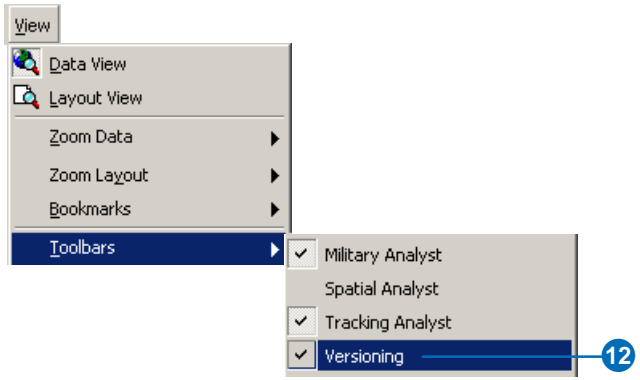
7. Close the Version Manager window.
8. Open the feature class you want to edit in ArcMap, following the instructions in Chapter 4, 'Adding MOLE symbols in ArcMap'.
9. Click the Source tab at the bottom of the ArcMap TOC.

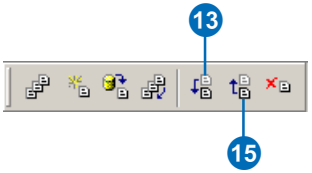
   The parent version of the geodatabase is listed at the top of the TOC.
10. Right-click the parent version in the TOC and click Change Version.
11. Click the version you want to edit in the Change Version dialog box, then click OK.

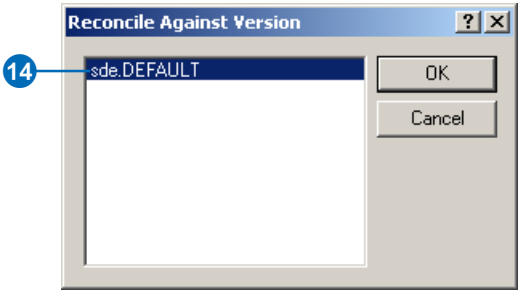
    The new version name is listed at the top of the TOC. You can now edit the version. Make sure you save your edits. Edits will not be added to the feature class until you reconcile and post them to the parent version. ▶



12. Open the Versioning toolbar by clicking View in the ArcMap main menu, pointing to Toolbars, then clicking Versioning.
13. On the Versioning toolbar, click the Reconcile button.
14. Click the parent version on the Reconcile Against Version dialog box and click OK.
15. Click the Post button on the Versioning toolbar to save the edits to the parent version of the geodatabase.







Using MOLE with ArcGlobe

Displaying MOLE data in ArcGlobe is similar to displaying it in ArcMap except that you're working in a three-dimensional environment.

MOLE in ArcGlobe gives you many options for displaying graphics in a three-dimensional environment. If you've worked with ArcGlobe before, you are likely already familiar with the options except for possibly billboarding. Billboarding, as well as some of the more commonly used options, is described in this section.

When working with MOLE in ArcGlobe, it is helpful to keep in mind:

- Force elements are always associated with point features, and tactical graphics are associated with point, line, or polygon features.
- You can apply z-values to the graphics associated with MOLE point, line, and polygon features. So you can apply z-values to force elements and tactical graphics.
- You perform *extrusions* on graphics associated with MOLE line and polygon features when you make them three-dimensional; you *billboard* MOLE point features to make them three-dimensional. So you can extrude line and polygon tactical graphics, and you can billboard force elements and point tactical graphics.
- You can apply the draping display type to any MOLE graphic.
- Extruding, billboarding, and draping affect the graphic associated with the feature. The feature remains at its original x, y, z location in its original form (point, line, or polygon) unless you change it.

To use ArcGlobe, you must have installed the ESRI 3D Analyst extension.

MOLE three-dimensional display types

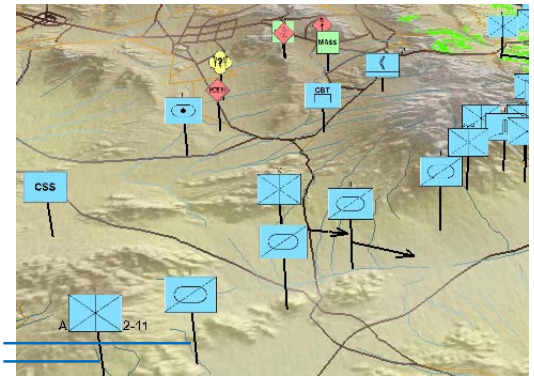
MOLE three-dimensional display types—billboarding, extruding, draping, and draping and billboarding, are described in this section.

Billboarding

Billboarding is a method for displaying graphics associated with point features in three-dimensional space by posting them on vertical callout lines as two-dimensional symbols and orienting them to always face the user.

Illustrations of sample billboarded MOLE graphics follow.

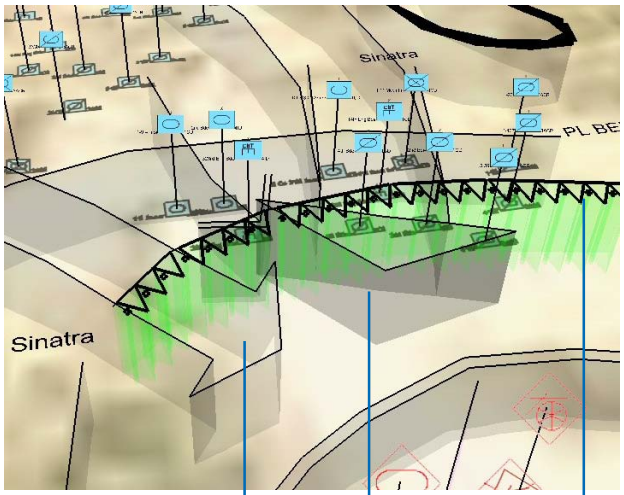
Force element graphics that have been billboarded in ArcGlobe



You can specify callout line properties. For example, the graphic can be elevated from the surface by a value you specify in the Height text box in the callout line properties.

Extruding

Extrusion is a method of projecting features in a two-dimensional data layer into three-dimensional space. Although you can apply extrusions to point features in ArcGIS, you cannot apply them to MOLE point features, only lines and polygons. You specify how high the extrusion should be from the earth's surface (in the Height text box on the 3D Display tab of the Layer Properties dialog box). The extrusion is a transparent rendition. An illustration of sample extruded MOLE tactical graphics follows.

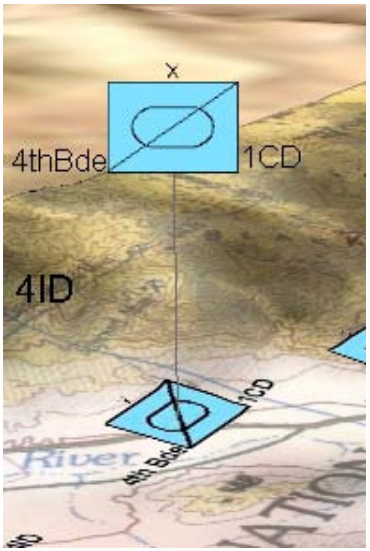


Draping

Draping renders a two-dimensional graphic superimposed onto a three-dimensional surface.

Draping and billboarding

Draping and billboarding is a method of displaying graphics associated with point features in three-dimensional space by combining the draping and billboarding methods.

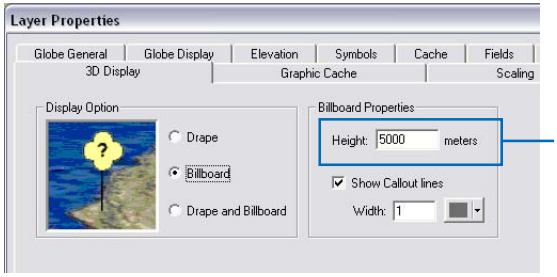


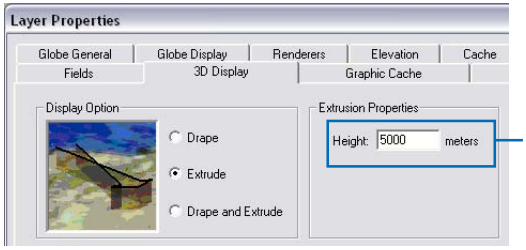
An illustration of the draping and billboarding display method

Z-values and MOLE elevation in ArcGlobe

When you are creating MOLE data or converting existing data to MOLE data, you can use z-values. In a three-dimensional model, a z-value represents elevation, or the height a feature is from the terrain.

MOLE gives you a second way to specify elevation (height) for billboarded or extruded graphics in three-dimensional models: the ArcGlobe Layer Properties dialog box as shown below.



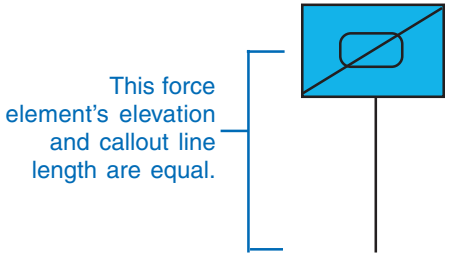


If you have z-values defined for a layer, then decide to also apply a MOLE height to that layer, MOLE uses the following logic to render the graphic.

- If the height value is greater than the z-value, MOLE uses the height value.
- If the height value is less than the z-value, MOLE uses the z-value unless the height value is negative. If the height value is negative, then MOLE uses the height value (it maintains the negative height value).

Callout lines and MOLE height

By default, a callout line extends from the center of the graphic to the terrain and has the same length as the graphic's elevation.



Starting ArcGlobe

To start ArcGlobe, you must have first installed the 3D Analyst extension.

You install extensions using the ArcGIS installation wizard, also known as the ArcGIS setup program.

The procedure on this page shows how to start ArcGlobe in a Windows XP environment.

Installing 3D Analyst

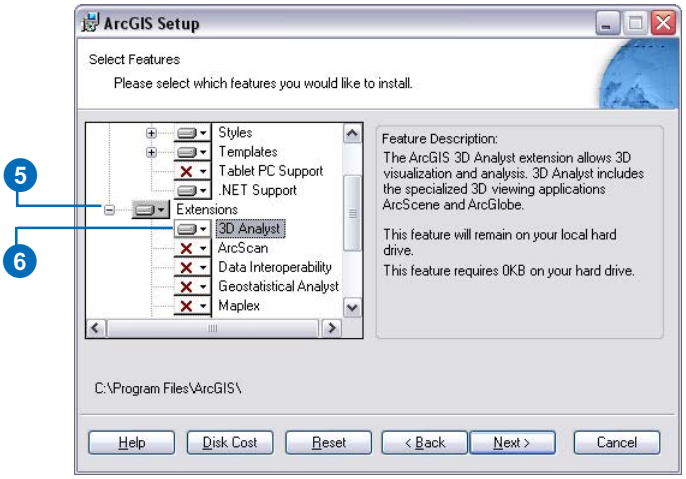
1. Click Start, Control Panel.
2. In the Control Panel window, double-click Add or Remove Programs.
3. In the Add or Remove Programs window, click ArcGIS Desktop, Change.

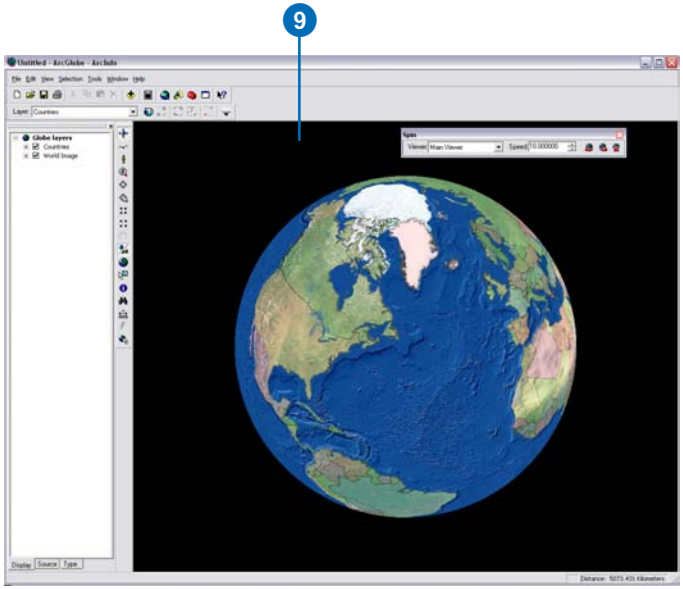
   The ArcGIS installation wizard appears.
4. In the first panel of the wizard, click Modify, then click Next.
5. In the second panel, in the list area, open the Extensions tree branch.
6. Click 3D Analyst.
7. Click Next.

   The installation wizard installs 3D Analyst.
8. When the wizard indicates the installation is finished, click Finish.

   ArcGlobe and ArcScene™ are now available from the Start menu. You may have to activate 3D Analyst by opening ArcMap then clicking Tools, Extensions.
9. To start ArcGlobe, click Start, All Programs, ArcGIS, ArcGlobe.

   ArcGlobe opens.





Adding the Military Overlay Editor toolbar in ArcGlobe

1. Right-click any toolbar, then click Military Overlay Editor.

   The Military Overlay Editor toolbar displays. It contains a subset of the tools that are available on the ArcMap version of it.

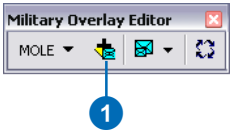
Adding and displaying MOLE data in ArcGlobe

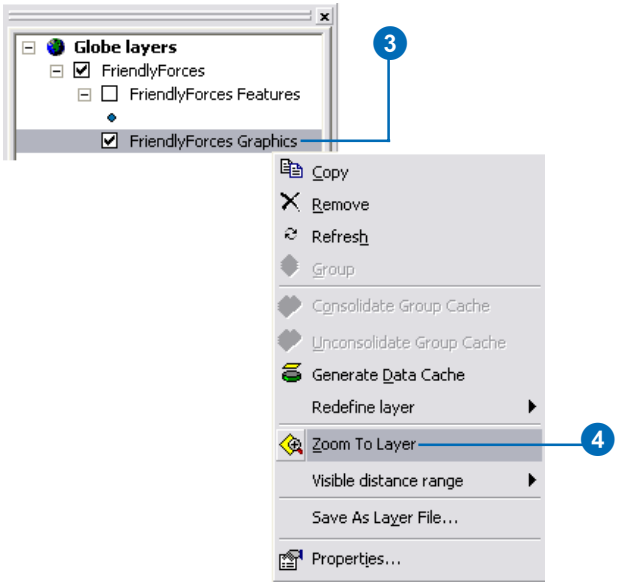
1. Click the Add MOLE Data button on the Military Overlay Editor toolbar.
2. On the Add MOLE Layers dialog box, navigate to your MOLE data and open it.

   You may have to adjust the scale of the data before you open it in ArcGlobe. If so, a prompt will appear—click OK and adjust the scale.

   Your MOLE data should appear as a new group layer in the ArcGlobe TOC pane.
3. In the ArcGlobe TOC, right-click the graphics layer of the data you just added.
4. Click Zoom To Layer.

   Your MOLE data appears in the map display.

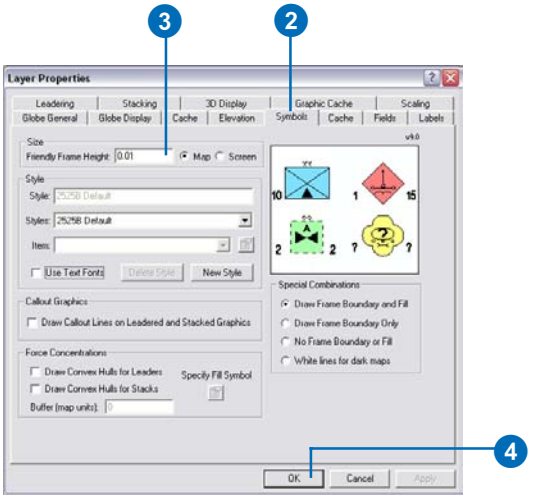




Resize force elements

1. In the ArcGlobe TOC, right-click the MOLE layer, then click Properties.
2. On the Layer Properties dialog box, click the Symbols tab.
3. In the Friendly Frame Height text box, type a new value. This value indicates map units.
4. Click OK.

   MOLE resizes the force elements in the map display.

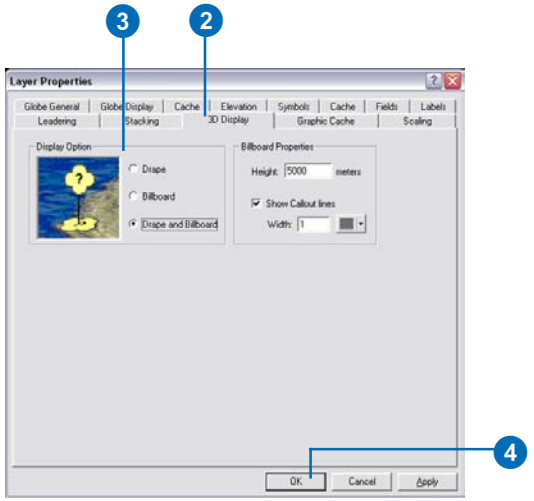


Change the three-dimensional display type

1. In the ArcGlobe TOC, right-click the MOLE graphics layer and click Properties.
2. On the Layer Properties dialog box, click the 3D Display tab.
3. Click the display type you want: Drape, Billboard, Extrude, Drape and Billboard, or Drape and Extrude.

   The extrude option won't be available if you selected a layer associated with a point feature layer in step 1. The billboard option won't be available if you selected a layer associated with a line or area feature layer in step 1.
4. Click OK.

   MOLE applies the display type you chose.



Change thickness and color of a callout line

Callout lines are used by default in billboarded MOLE graphics.

You can change the following callout line properties:

- Show callout lines—Allows you to set visibility of the callout lines on or off.
- Height—A value in map units you give to tell how high you want the billboard to be from the map surface.
- Extrude—A value you give to tell how high you want the tactical graphic to be displayed from the map surface.
- Width—A value you give to set the thickness of the callout line. The units are in map units.
- Color—Displays a color palette from which to choose a color for the callout line.

1. In the ArcGlobe TOC, right-click the MOLE graphics layer, then click Properties.
2. On the Layer Properties dialog box, click the 3D Display tab.
3. In the Width text box, type a value for the line thickness you want.
4. To change the color of the callout line, click the color selection dropdown arrow.
5. In the color palette that displays (pictured at right), click the color you want.
6. Click OK to close the Layer Properties dialog box and apply your changes.

MOLE geoprocessing tools

7

IN THIS CHAPTER

- **The Add MOLE Fields tool**
- **Accessing and using the MOLE toolbox**

Geoprocessing, also known as model building, is the performing of a function or functions on geographic information. Typically, geoprocessing is a set of functions, or operations, you've chosen or defined and put in a certain order. You can save this ordered group of operations so you can perform them on your geographic information again and again.

Common geoprocessing operations are geographic feature overlay, feature selection and analysis, topology processing, raster processing, and data conversion. An example of a geoprocessing sequence is: clip the dataset, select a part of the dataset, then intersect two datasets.

The Military Overlay Editor Tools toolbox (MOLE toolbox) is a standalone toolbox located at the highest level within the ArcToolbox™ structure. Like most ArcGIS toolboxes, it contains one or more toolsets that form a category of tools. The MOLE toolbox contains the Utilities toolset, which includes the Add MOLE Fields tool. The Add MOLE Fields tool allows you to convert existing non-MOLE datasets into MOLE datasets by adding the required fields for you.

This chapter introduces you to the Add MOLE Fields tool. For details on the tool, see the help available with the tool by clicking Show Help in the tool.

The Add MOLE Fields tool

The Add MOLE Fields tool allows you to convert existing non-MOLE datasets into MOLE datasets by adding the fields that are required to display and edit data in MOLE.

You can access this tool from any application that supports ArcToolbox. It allows you to convert multiple datasets with the same geometry type at one time. All point, line, and polygon geometries can be input as feature classes or shapefiles to add the necessary MOLE fields. You select the inputs through a standard geoprocessing dialog box or command line; the files are output to a shapefile format and directory you choose.

Field descriptions for the Add MOLE Fields tool

Input Features

In the Input Features field, enter the file or files you want to add MOLE fields to.

Click the browse button to navigate to and select the input file or files—feature classes and shapefiles. You can add multiple files of the same geometry type.

Data Type

Click the Data Type list to choose the MOLE data type used to add fields. Point

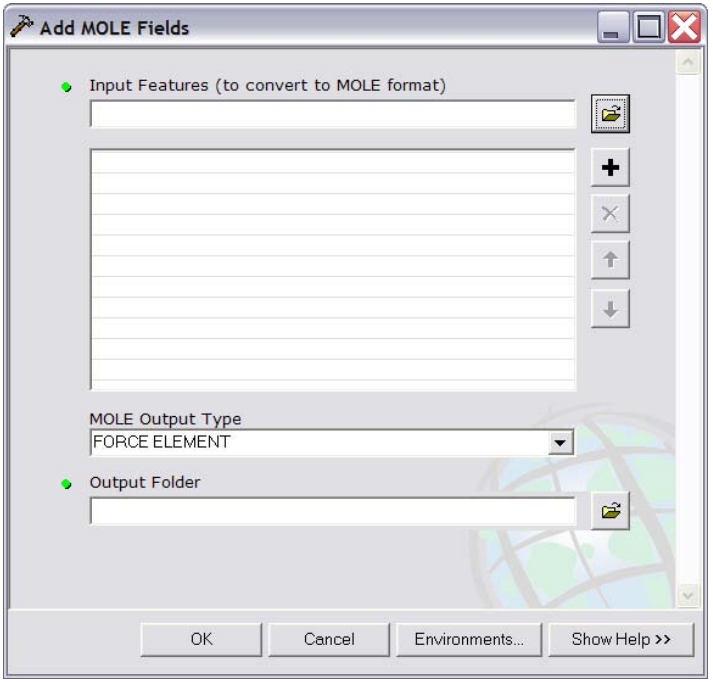
Output Features

In the Output Folder field, specify the location for the file or files to be created from the input files and added MOLE fields. The tool will save the new file or files to the location you specify. By default, the new file or files will be given the same name as the input file or files with a suffix of *featuretype*mole, where *featuretype* signifies the type of feature: point, line, or area.

Click the browse button to navigate to and select the output location. Choose an output data type, either feature class, shapefile, or table.

Overwrite Any Existing Files

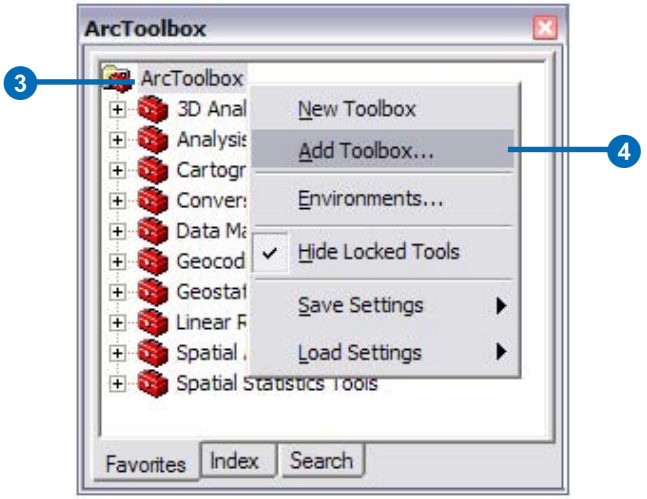
If files with the same name as the output files exist in the output location, you can overwrite them without getting prompted by checking Overwrite Any Existing Files. You must specify the option to overwrite files in the Geoprocessing Evironments settings.

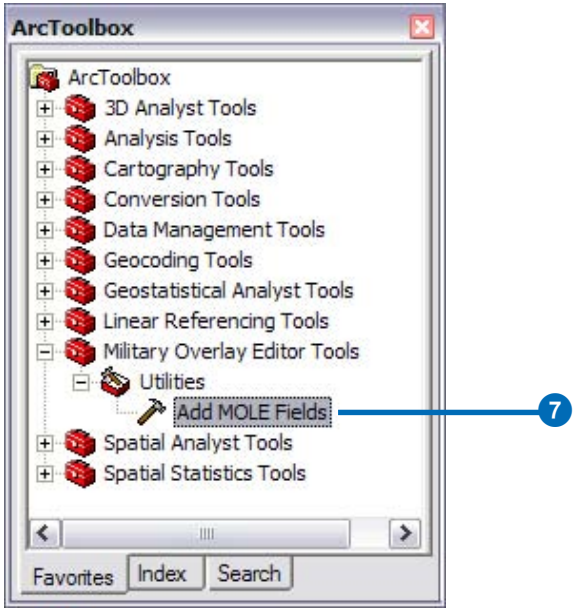


Accessing and using the MOLE toolbox

1. If you haven't already, install MOLE. Installing MOLE adds the MOLE geoprocessing toolbox to ArcToolbox.
2. Open ArcToolbox. For example, in Windows, open ArcCatalog, then click Window, ArcToolbox.
3. In ArcToolbox, right-click ArcToolbox.
4. Click Add Toolbox.
5. On the Add Toolbox dialog box, navigate to the Toolboxes folder in the ArcGIS installation directory, for example, <ArcGIS Installation Directory\ ArcToolbox\Toolboxes.
6. Choose Military Overlay Editor (MOLE) Tools and click Open.

   The toolbox and the Add MOLE Fields tool are added to ArcToolbox.
7. To use the Add MOLE Fields tool, in ArcToolbox, navigate to the MOLE toolbox. Open the Utilities toolset, then double-click the Add MOLE Fields tool.
8. Enter information in the fields according to the field descriptions on the previous page.





Glossary

affiliation

In MOLE, the type of threat posed by the war fighting element being represented. The basic types supported by MOLE are unknown, friend, neutral, and hostile. See also war fighting element.

alias

An alternative name specified for fields, tables, and feature classes that is more descriptive and user-friendly than the actual name of these items. On computer networks, a single e-mail alias may refer to a group of e-mail addresses. In database management systems, aliases can contain characters, such as spaces, that can't be included in the actual names.

attribute

Information about a geographic feature in a GIS, usually stored in a table and linked to the feature by a unique identifier. For example, attributes of a river might include its name, length, and average depth. Also known as attribute modifier, text modifier, or modifier.

billboarding

A method for displaying graphics associated with point features in three-dimensional space by posting them on vertical callout lines as two-dimensional symbols and orienting them to always face the user. See also extrusion.

C4I

In defense, an abbreviation used to signify that a computer program or system supports command, control, communication, computers, and information.

cache

In computer science, a temporary storage area. Because this storage area tends to be quicker and easier to access than others from a systems resources standpoint, developers use caches for objects to save time when operations are later performed on the objects. In the MOLE API, force element display lists and tactical graphic display lists serve as caches.

cached graphic

A term primarily used in the MOLE API to refer to graphics that are stored in (managed by) a display list. Display lists serve as caches in MOLE. There are two types of display lists: force element and tactical graphic. All MOLE graphics (force elements, tactical graphics, leaders, and stacks) can be added to and managed by these display lists.

callout line

A line between the center of a graphic and its geographic position. In three-dimensional display, callout lines are used only with force elements and point tactical graphics.

callout value

In MOLE, a number that specifies the length of the callout line. By default, a callout line extends to the terrain and has the same length as the graphic's elevation.

convex hull

In MOLE, an outline on a map that represents the location of a group of force elements (leadered or stacked force elements). See also force concentration.

coordinate system

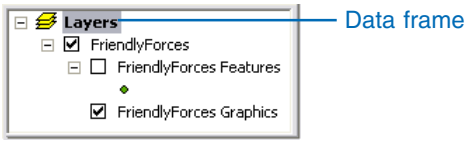
A fixed reference framework superimposed onto the surface of an area to designate the position of a point within it; a reference system consisting of a set of points, lines, and/or surfaces; and a set of rules used to define the positions of points in space in either two or three dimensions. The Cartesian coordinate system and the geographic coordinate system used on the earth's surface are common examples of coordinate systems.

coverage

A data model for storing geographic features. A coverage stores a set of thematically associated data considered to be a unit. It usually represents a single layer, such as soils, streams, roads, or land use. In a coverage, features are stored as both primary features (points, arcs, polygons) and secondary features (tics, links, annotation). Feature attributes are described and stored independently in feature attribute tables. Coverages cannot be edited in ArcGIS 8.3 and subsequent versions.

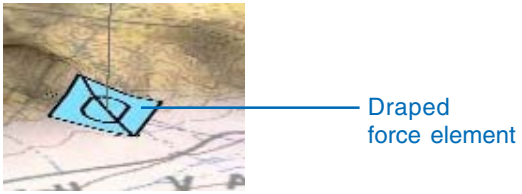
data frame

A top-level item in the ArcMap TOC.



draping

A perspective or panoramic rendering of a two-dimensional image superimposed onto a three-dimensional surface. For example, an aerial photograph might be draped over a digital elevation model to create a realistic terrain visualization.



elevation

The vertical distance of a point or object above or below a reference surface or datum (generally mean sea level). Used especially in reference to vertical height on land. In MOLE, the reference surface is the terrain.

extrusion

Projecting features in a two-dimensional data layer into three-dimensional space. Uses of extrusion include showing the depth of well point features or the height of building footprint polygons. In MOLE, extrusions can be applied to line and area tactical graphics but not force elements or point tactical graphics. See also billboarding.

extrusion value

In MOLE, a number that specifies the distance between a feature's geographic location, typically on the terrain, and its highest point when projected in a three-dimensional map display.

feature class

A collection of geographic features with the same geometry type (such as point, line, or polygon), the same attributes, and the same spatial reference. Feature classes can stand alone within a geodatabase or be contained within shapefiles, coverages, or other feature datasets. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named roads. In a geodatabase, feature classes can also store annotation and dimensions.

feature dataset

A collection of feature classes stored together that share the same spatial reference; that is, they have the same coordinate system, and their features fall within a common geographic area. Feature classes with different geometry types may be stored in a feature dataset.

fill

In MOLE, the graphic component inside the frame that forms the background. See also frame, icon.

force concentration

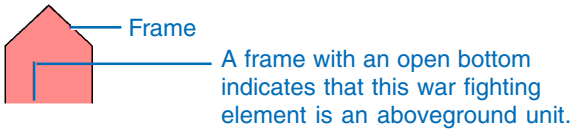
In MOLE, a component of a map display that shows where force units are located so the map reader can see where forces are the strongest and weakest. Also see convex hull.

force element

In MOLE, a type of graphic that represents a military unit (such as Company A, 1st Battalion of the 135th Infantry), equipment, or installation (such as a hospital or radar site). See also tactical graphic, stack, leader, and war fighting symbology.

frame

In MOLE, the geometric border of a graphic that indicates the affiliation, battle dimension, and status of the war fighting element that the MOLE graphic represents. See also graphic component.



geodatabase

A collection of geographic datasets for use by ArcGIS. There are various types of geographic datasets, including feature classes, attribute tables, raster datasets, network datasets, topologies, and many others.

geodatabase data model

The schema for the various geographic datasets and tables in an instance of a geodatabase. The schema defines the GIS objects, rules, and relationships used to add GIS behavior and integrity to the datasets in a collection.

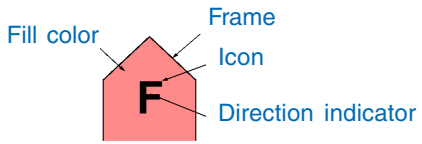
graphic

An image produced by and stored in a computer as data for display. MOLE graphics are similar to ArcGIS symbols and essentially serve as symbols in the map display. MOLE labels are part of the graphic. The types of graphics include force elements, tactical graphics, stacks, and leaders. See also symbol.

graphic component

In MOLE, the most elementary part of a graphic. Icon, frame, and fill are examples of components that make up MOLE graphics.

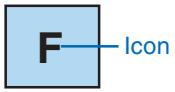
The following illustration shows examples of graphic components.



See also graphic, symbol.

icon

In MOLE, the innermost graphic component of a graphic. The icon is derived from the Function ID position of a Symbol ID code. See also graphic component, war fighting element.



layer

1. The visual representation of a geographic dataset in any digital map environment. Conceptually, a layer is a slice or stratum of the geographic reality in a particular area, and is more or less equivalent to a legend item on a paper map. On a road map, for example, roads, national parks, political boundaries, and rivers are examples of different layers.

2. In ArcGIS, a reference to a data source, such as a coverage, geodatabase feature class, raster, and so on, that defines how the data should be symbolized on a map. Layers can also define additional properties, such as which features from the data source are included. Layers can be stored in map documents (.mxd) or saved individually as layer files (.lyr). Layers are conceptually similar to themes in ArcView 3.x. A MOLE layer is an ArcGIS layer that includes a Symbol_ID field.

3. A standalone feature class in a geodatabase managed with Spatial Database Engine™ (SDE®) 3 or ArcSDE.

leader

In MOLE, typically two or more force elements grouped together and placed on a line based on user-specified rules. Leaders are often used to clean up the map display in cases where many symbols overlap, to group related units together, and to define perimeters or areas of interest for formations. See also force element, tactical graphic, stack.

map display

A graphic representation of a map on a computer screen.

MIL-STD-2525B

The Department of Defense Common Warfighting Symbology specification; the U.S. military standard that provides guidelines and criteria for the development and display of standard C4I war fighting symbology.

MIL-STD-6040

The United States Message Text Formatting Program specification; the U.S. military standard that establishes formats, contents, and procedures for messages and associated C4I data elements.

Military Analyst extension

An ArcGIS extension that optimizes the effectiveness of core ArcGIS as a toolset foundation for military planners and intelligence analysts. See also Military Analyst suite, MOLE.

Military Analyst suite

An ESRI collection of tools for the defense and intelligence user communities. Tools in the collection include the Military Analyst

extension (MA) and the Military Overlay Editor (MOLE) software application. See also MOLE, Military Analyst extension.

MOLE

Military Overlay Editor. A component of the ArcGIS Military Analyst suite that functions as a new symbol generator and editor for modern battlefield planning applications. MOLE is a collection of graphic renderers that builds graphics and displays them on a map. See also Military Analyst suite.

offset

A change in or the act of changing the z-value for a surface or features in a scene by a constant amount or by using an expression. Offsets can be applied to make features draw just above a surface.

RDBMS

Relational database management system. A type of database in which the data is organized across several tables. Tables are associated with each other through common fields. Data items can be recombined from different files. In contrast to other database structures, an RDBMS requires few assumptions about how data is related or how it will be extracted from the database.

reconcile

In version management, to merge all modified datasets, feature classes, and tables in the current edit session with a second target version. All features and rows that do not conflict are merged into the edit session, replacing the current features or rows. Features that are modified in more than one version are conflicts and require further resolution via the ArcGIS Conflict Resolution dialog box.

rendering

The process of drawing to a display. The conversion of the geometry, coloring, texturing, lighting, and other characteristics of an object into a display image.

shapefile

A vector data storage format for storing the location, shape, and attributes of geographic features. A shapefile is stored in a set of related files and contains one feature class.

spatial domain

For a spatial dataset, the defined precision and allowable range for x- and y-coordinates and for m- and z-values, if present. The spatial domain must be specified by the user when creating a geodatabase feature dataset or standalone feature class.

spatial reference

The coordinate system used to store a spatial dataset. For feature classes and feature datasets within a geodatabase, the spatial reference also includes the spatial domain.

stack

In MOLE, two or more force elements grouped together and placed one on top of another. Like leaders, stacks allow users to quickly make a map easier to read by allowing graphics to be grouped according to user-specified rules. See also force element, tactical graphic, leader.

symbol

A graphic used to represent a geographic feature or class of features. Symbols can look like what they represent (tiny trees, railroads, houses), or they can be abstract shapes (points, lines, polygons) or characters. Symbols are usually explained in a map legend.

Symbol ID code

A 15-character identifier that provides the information necessary to display or transmit a military symbol between MIL-STD-2525B-compliant systems.

tactical graphic

A type of MOLE graphic that aids in regulating the movement of force units, such as lane boundaries and obstacles. See also war fighting symbology, force element, leader, and stack.

tolerance

The minimum or maximum variation allowed when processing or editing a geographic feature's coordinates. For example, during editing, if a second point is placed within the snapping tolerance distance of an existing point, the second point will be snapped to the existing point.

vector data model

An abstraction of the real world in which spatial elements are represented in the form of points, lines, and polygons. These are geographically referenced to a coordinate system.

version

In geodatabases, an alternative state of the database that has an owner, a description, a permission (private, protected, or public), and a parent version. Versions are not affected by changes occurring in other versions of the database.

war fighting element

In MOLE, a real-world battle element, such as a ground force unit or a lane boundary, represented by MOLE graphics on a map. See also tactical graphic, force element, war fighting symbology.

war fighting symbology

Graphics on a map that represent battle elements such as ground troops and direction of troops. These graphics are used to plan and execute military operations in support of C4I functions. MOLE graphic types fall within four main categories: force elements, tactical graphics, stacks, and leaders.

World Geodetic System of 1984 (WGS84)

The most widely used geocentric datum and geographic coordinate system today, designed by the U.S. Department of Defense to replace WGS72. GPS measurements are based on WGS84.

z-value

The value for a given surface location that represents an attribute other than position. In an elevation or terrain model, the z-value represents elevation; in other kinds of surface models, it represents the density or quantity of a particular attribute.

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