Using ArcGIS® Military Overlay Editor

GIS by ESRI™

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Introducing MOLE

1

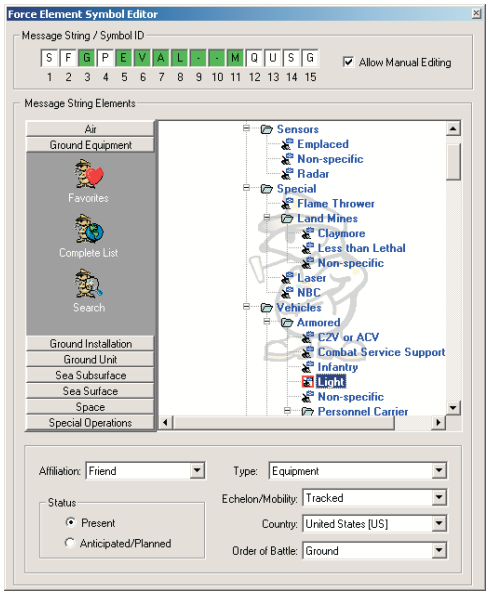
IN THIS CHAPTER

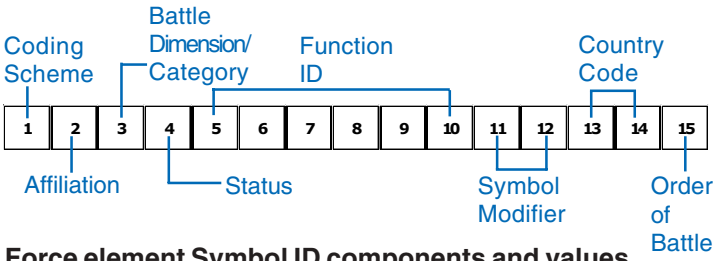
- **Symbol ID code**
- **MOLE layers**
- **MOLE toolbars**

Welcome to ESRI® ArcGIS™ Military Overlay Editor (MOLE), an extension to ArcGIS that allows you to easily display and edit military symbology in your maps. MOLE enhances the effectiveness of your C2 and mission planning applications by combining the geospatial analysis capabilities of ArcGIS with the military symbology of the *MIL-STD-2525B* standard. It is a customizable tool, providing a flexible API with which you can build your own MOLE applications. You can store your MOLE layers as feature classes in a personal geodatabase; or you can store your MOLE layers in an RDBMS, such as Oracle® or SQL Server™, so that multiple users can access and edit the data through ArcSDE. MOLE is compatible with other ESRI GIS solutions as well, including ArcIMS® and ArcGIS Tracking Analyst.

Symbol ID code

The foundation of MOLE is the *MIL-STD-2525B* 15-character Symbol ID identifier code. *MIL-STD-2525B* defines the Symbol ID in the following way: “An alphanumeric code based on a database structure that provides the minimum elements required to construct the basic icon and/or a complete symbol.” MOLE uses the Symbol ID attribute of a feature to determine the symbology that the feature should be drawn with. Each component of the Symbol ID defines a specific characteristic of the feature. MOLE analyzes the Symbol ID characters, searches through tables in the moleCore.mdb database for the geometric primitive components that correspond to the characters, and combines the pieces together to form the MOLE symbol. MOLE allows you to manually enter the Symbol ID in the attribute table of the MOLE feature, or, if the feature class is stored in a MOLE geodatabase, you can use the Symbol Editor, pictured below, to add symbols.





Force element Symbol ID components and values

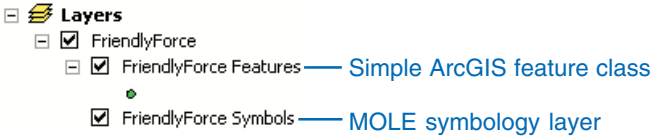
CODING SCHEME (1) (POSITION 1)	AFFILIATION (1) (POSITION 2)	BATTLE DIMENSION (1) (POSITION 3)	STATUS (1) (POSITION 4)
S - WARFIGHTING G - TACTICAL GRAPHICS W - METOC I - INTELLIGENCE M - MAPPING (reserved - under development) O - Military Operations Other Than War (MOOTW)	P - PENDING U - UNKNOWN A - 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 (6) (POSITION 5 - 10)	**SYMBOL MODIFIER (2) (POSITION 11, 12)**	**COUNTRY CODE (2) (POSITION 13, 14)**	**ORDER OF BATTLE (1) (POSITION 15)**
Describes the specific function of a symbol. See MIL-STD-2525B for values.	Describes echelon, mobility, equipment, or installation characteristics of symbol. See MIL-STD-2525B for specific values.	See FIPS Pub series 10	A - AIR OB E - ELECTRONIC OB C - CIVILIAN OB G - GROUND OB N - MARITIME OB S - STRATEGIC FORCE RELATED

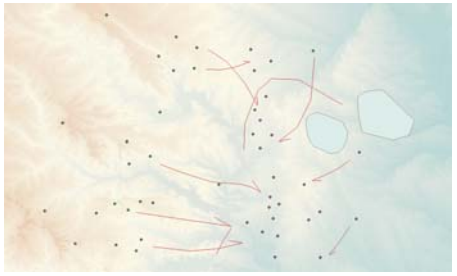
Tactical graphic Symbol ID components and values

CODING SCHEME (1) (POSITION 1)	AFFILIATION (1) (POSITION 2)	CATEGORY (1) (POSITION 3)	STATUS (1) (POSITION 4)
S - C² Symbology: Units, Equipment, and Installations G - C² Symbology: Military Operations W - METOC I - Signals Intelligence M - Mapping (Reserved - under Development) O - Military Operations Other than War (MOOTW)	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 - C² & General Maneuver M - Mobility/survivability F - Fire Support S - Combat Service Support O - Other	A - Anticipated Planned P - Present
FUNCTION ID (6) (POSITIONS 5 - 10)	**ECHELON/SIZE (2) (POSITIONS 11, 12)**	**COUNTRY CODE (2) (POSITIONS 13, 14)**	**ORDER OF BATTLE (1) (POSITION 15)**
See MIL-STD-2525B for values.	See MIL-STD-2525B for values.	See FIPS Pub series 10	X - Control Markings

MOLE layers

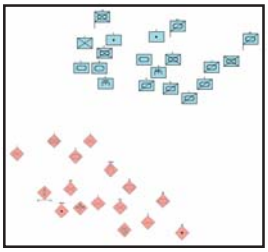
A MOLE feature is any type of feature that has a *MIL-STD-2525B* Symbol ID value associated with it. MOLE symbols can be contained in shapefiles, coverages, and personal or enterprise geodatabases. Tables containing a Symbol ID field with valid values can be converted to a feature class, and MOLE will display the appropriate military symbols. When MOLE layers are open in ArcMap™, they will be displayed as group layers in the Table of Contents (TOC). This is because MOLE layers are actually simple point, line, or area feature classes with *MIL-STD-2525B* symbology constructed around the features according to the features' Symbol ID values. The figure below shows an example of a MOLE layer in the ArcMap TOC.

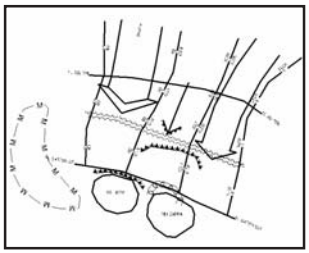




The figures to the left illustrate the two components of a MOLE group layer. The top figure shows how the underlying MOLE features appear without the MOLE symbology displayed. These are the skeletons of the MOLE symbols. The bottom figure shows the MOLE symbology built around the simple features.

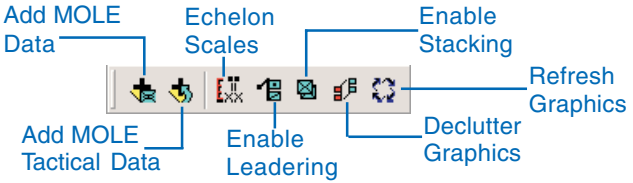
MOLE symbols can fall under one of two categories: force element symbols and tactical graphic symbols. Force element symbols are point features that represent military units, installations, and equipment. Tactical graphic symbols can be points, lines, or areas, and represent command/control and mission planning features. *MIL-STD-2525B* defines force element symbols in the following way: "The force element category consists of 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 modifiers. 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." Tactical graphic symbols are defined in the following way: "The tactical graphics category consists of point, line, and area objects that are necessary for battlefield planning and management, but cannot be presented as tactical symbols 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 modifiers. 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 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 element symbols, while the figure to the right shows tactical graphic symbols.





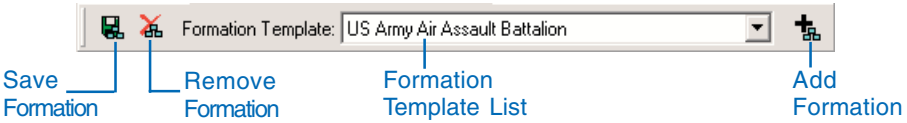
MOLE toolbars

Military Overlay Commands toolbar



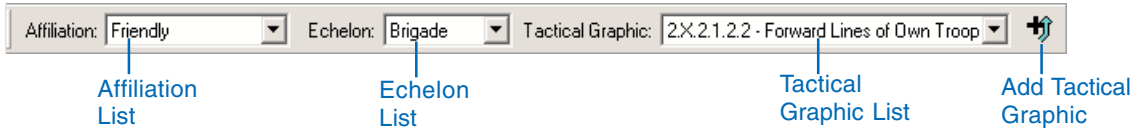
The Military Overlay Command toolbar is used to control the MOLE environment, to add new data sources—force elements and tactical graphics—enable leadering and stacking, run the decluttering utility, and refresh the graphics.

Military Force Elements toolbar



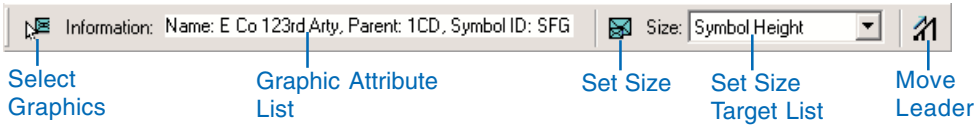
The Military Force Elements toolbar allows you to create formations of multiple symbols—for example, an Air Assault Battalion—save and reuse them. This saves time when creating standard formations or groups on your situation maps.

Military Tactical Graphics toolbar



The Military Tactical Graphics toolbar is an editing shortcut tool that allows you to create default-shaped tactical graphics quickly and easily. Graphics displayed in the dropdown list correspond to the currently associated renderers.

Military Overlay Tools toolbar



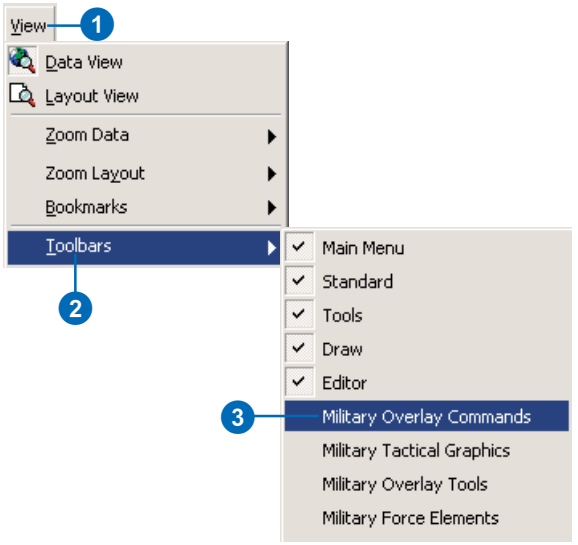
The Military Overlay Tools toolbar provides functions to change the appearance of force elements, set leadering and stacking tolerances, set text heights, and edit/move leader lines. It also provides a selection tool with an information window that displays basic unit information for the selected force element.

Opening MOLE toolbars

1. Click View in the ArcMap Main menu.
2. Click Toolbars in the View menu.

   The Toolbars list will appear.
3. Click one of the MOLE toolbars in the Toolbars list.
4. Repeat steps 1–3 to open the remaining MOLE toolbars.

   You can also access the Toolbars list by right-clicking anywhere in the ArcMap menu and toolbar area.



Tips on learning Military Overlay Editor

If you're new to GIS, take some time to familiarize yourself with ArcMap and ArcCatalog™. The books *Using ArcMap* and *Using ArcCatalog* contain tutorials to show you how to make maps and manage GIS data.

Begin learning to use the Military Overlay Editor extension in Chapter 2, 'Quick-start tutorial'. In Chapter 2 you'll learn how to display and modify feature classes, how to display symbols, modify layer properties, and create custom feature classes in a geodatabase and add military symbols. The Military Overlay Editor extension comes with the data used in this tutorial, so you can follow along step by step at your computer. You can also read the tutorial without using your computer.

Finding answers to questions

Like most people, your goal is to complete your task while investing a minimum amount of time and effort in learning how to use the software. You want intuitive, easy-to-use software that gives you immediate results without having to read pages and pages of documentation. However, when you do have a question, you want the answer quickly so that you can complete your task. That's what this book is all about—getting you the answers you need when you need them.

This book describes how to use Military Overlay Editor 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 modifying layer properties, just look it up in the table of contents or the index. You'll find a concise, step-by-step description of how to complete the task. Some chapters also include detailed information that you can read if you want to learn more about the concepts behind the tasks.

Getting help on your computer

In addition to this book, use the ArcGIS Desktop Help system to learn how to use Military Overlay Editor. To learn how to use Help, see *Using ArcMap*.

Contacting ESRI

If you need to contact ESRI for technical support, see the product registration and support card you received with ArcGIS Military Overlay Editor or 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 Military Overlay Editor and ArcGIS.

ESRI education solutions

ESRI provides educational opportunities related to geographic information science, GIS applications, and technology. You can choose among instructor-led courses, Web-based courses, and self-study workbooks to find educational solutions that fit your learning style. For more information go to *www.esri.com/education*.

Quick-start tutorial

2

IN THIS CHAPTER

- **Exercise 1: Displaying MOLE symbols**
- **Exercise 2: Editing MOLE layer properties**
- **Exercise 3: Creating MOLE layers**

Using the Military Overlay Editor (MOLE) you can display and edit *MIL-STD-2525B* symbology on your ArcGIS maps. MOLE reads the 15-character *MIL-STD-2525B* Symbol ID from a feature class' attribute table and renders the proper military unit or tactical graphic at that feature's geographic location. This tutorial will guide you through setting up a situation map using friendly forces, enemy forces, and an assortment of tactical graphics in central Texas. In the first exercise you will be introduced to MOLE and learn to display and modify the properties of existing MOLE feature classes. In the second exercise you will learn to modify the layer properties of a MOLE feature class in detail. Then in the third exercise you will create new custom MOLE feature classes in a geodatabase and add military symbols to them.

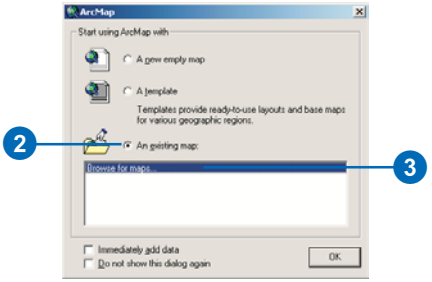
The data and maps required for these exercises are included on the MOLE installation CD under the tutorial subdirectory. Copy this folder to your computer for use in completing these exercises. You must have ArcGIS and MOLE installed in order to use this tutorial. Also for this tutorial it is assumed that you have a basic understanding of the *MIL-STD-2525B* standard and fundamental knowledge of ArcGIS.

Exercise 1: Displaying MOLE symbols

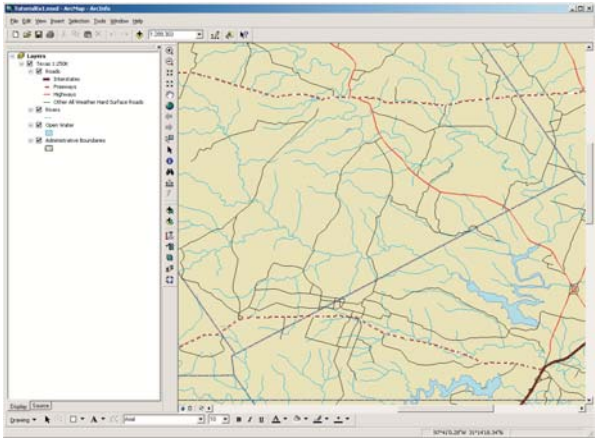
First, it is important to understand that most operations that are common in using MOLE are standard ArcMap procedures and commands. MOLE is acting as a special renderer that allows ArcMap to conform to MIL-STD-2525B specifications. Copy the tutorial directory from the MOLE installation CD to your local hard drive.

Starting MOLE

1. Start ArcMap by either double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.
2. Click the button to open an existing map.
3. Double-click Browse for maps, navigate to the location where you saved your tutorial data, and open TutorialEx1.mxd.

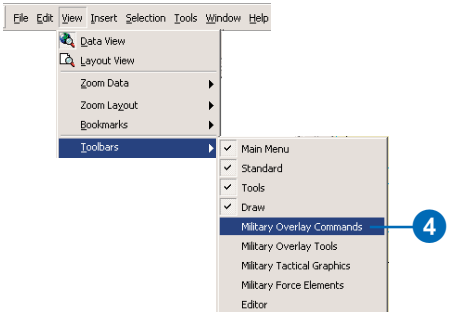


The map should appear similar to the following image.



Open the MOLE toolbars if they are not open already. There are four toolbars: Military Overlay Commands, Military Overlay Tools, Military Tactical Graphics, and Military Force Elements. See Chapter 1, 'Introducing MOLE', for more information about the MOLE toolbars.

4. Click View in the ArcMap Main menu, point to Toolbars, then click Military Overlay Commands.



5. Repeat step 4 to open the remaining MOLE toolbars.
6. Arrange the toolbars as you like, either free-floating or docked with other toolbars on the ArcMap application frame.

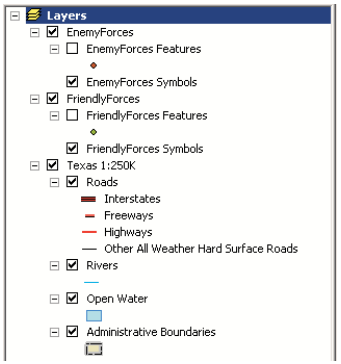
Opening MOLE force element layers

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

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

2. In the browse window navigate to the location where you saved the MOLE tutorial data. Open FriendlyForces from the OPLAN.mdb geodatabase.

   Repeat steps 1–2 to add the EnemyForces feature class. Your ArcMap Table of Contents (TOC) should now look similar to the following image.

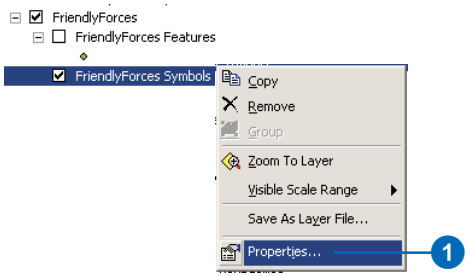


Notice that when you add MOLE layers, they are presented in the TOC as a group layer, with their corresponding features also present.

MOLE force element layer properties

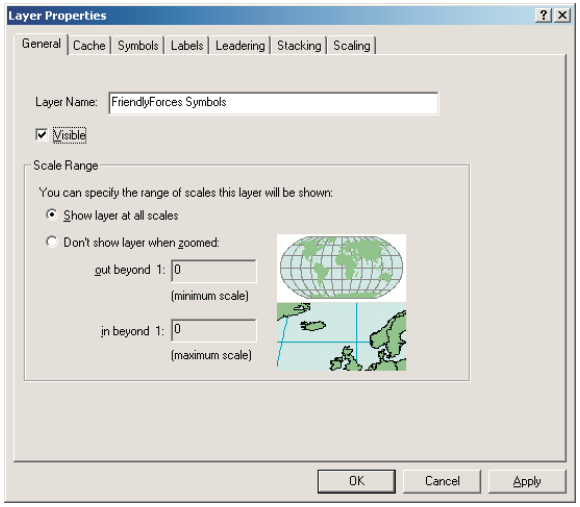
MOLE symbology consists of two different types of features: force element features and tactical graphic features. Force element features are point features that represent military units, equipment, or installations. Tactical graphic features are point, line, or polygon features that represent boundaries,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

1. Right-click FriendlyForces Symbols in the TOC, then click Properties.



The force element Layer Properties dialog box will be displayed. The parameters within the tabs in the dialog box control the display and behavior properties for this layer.

Explore the options found in each of the tabs. The Layer Properties dialog box will be covered in more detail in the next exercise; for now, simply familiarize yourself with the layer properties options. See the following page for a description of each tab in the Layer Properties dialog box.



The General tab controls basic layer functions, such as scale dependency, layer name, and its visibility.

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.

The Symbols tab allows you to control the appearance of the symbols in the layer. Setting symbol size, color—other than 2525B standards—frame fills, and other specialty functions such as hull polygons for the leaders.

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, just whether or not they are displayed on the map.

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.

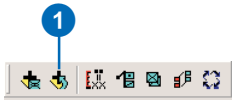
The Stacking tab controls the rules used to make unit stacks. The stacking tolerance can also be set here.

The Scaling tab allows you to set echelon-dependant display scales.

Opening MOLE tactical graphic layers

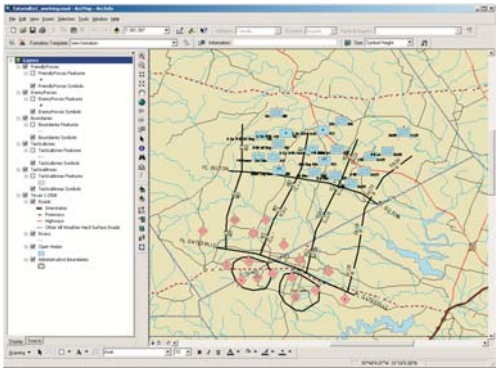
Now, your situation map consists of a few geographic features with symbols representing the ground locations of friendly and enemy forces. In order to make the map an effective planning tool you need to add graphics, which will aid in regulating movement of troops, including lane boundaries and obstacles.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

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



2. In the browse window, navigate to the location where you saved the MOLE tutorial data. Open the TacticalLines feature class from the OPLAN.mdb geodatabase.

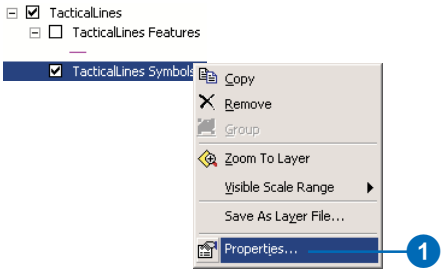
   Repeat steps 1–2 to add the Boundaries and TacticalAreas feature classes. Your ArcMap data frame should now look similar to the following image.



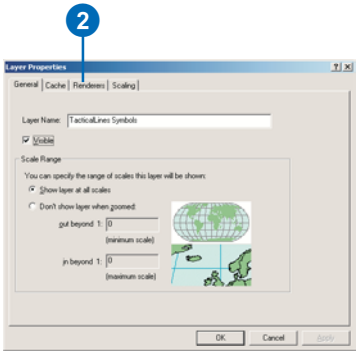
Enabling tactical graphic renderers

MOLE uses different symbology renderers to display different types of tactical graphics, such as obstacles and multipoint arrows. By default, not all of the renderers are enabled initially, so some features in the layers may not be displayed. You need to activate the necessary renderers so that all of the features will be displayed.

1. Right-click TacticalLines Symbols in the ArcMap TOC and click Properties.

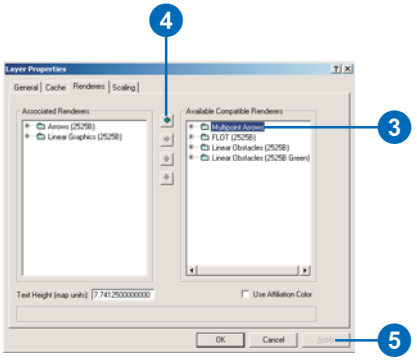


2. Click the Renderers tab in the Layer Properties dialog box.

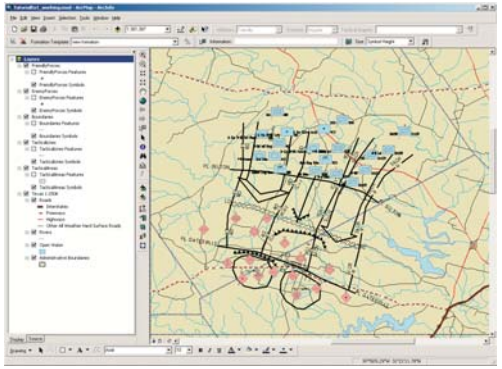


There are two list frames within the renderers tab. The frame on the left contains a list of enabled (associated) renderers, while the frame on the right contains a list of available nonassociated renderers.

3. Click Multipoint Arrows in the Available Compatible Renderers frame.
4. Click the arrow to place Multipoint Arrows inside the Associated Renderers frame.
5. Click Apply and observe the arrows that are now displayed in the data frame.



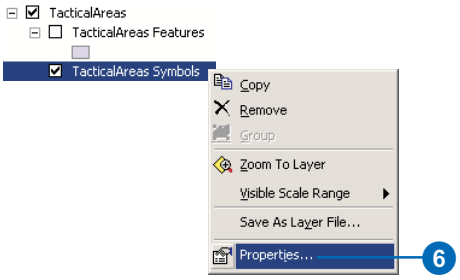
Repeat steps 3–5 to enable the Linear Obstacles (2525B) renderer and observe the features that are now displayed in the data frame, which should appear similar to the image below. Click OK to close the Layer Properties dialog box.



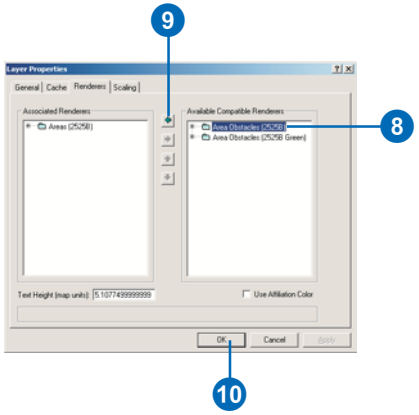
All features in the TacticalLines feature class are now displayed as all of the necessary renderers have been enabled.

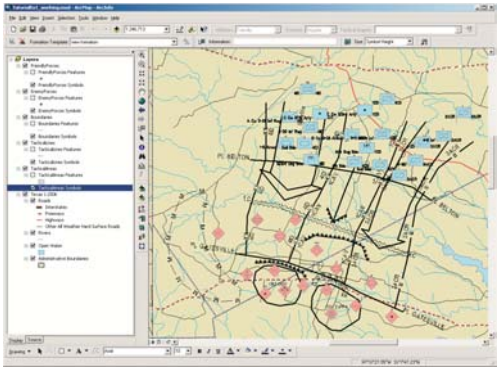
You also need to enable an additional renderer for the TacticalAreas feature class.

6. Right-click TacticalAreas Symbols in the ArcMap TOC and click Properties.



7. Click the Renderers tab in the Layer Properties dialog box.
8. Click Area Obstacles (2525B) in the Available Compatible Renderers frame.
9. Click the arrow to place the renderer in the Associated Renderers frame.
10. Click OK and observe the new area feature in the lower-left corner of the map.



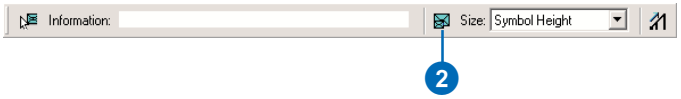


The situation map now contains all available tactical graphic and force element features.

Modifying MOLE layer properties from the Military Overlay Tools toolbar

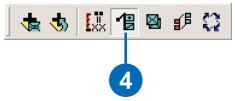
When you change the display properties of a MOLE layer from its Layer Properties dialog box, the changes are only applied to that particular layer. When you modify the display from the various MOLE toolbars, the changes are applied to all applicable layers. In this section you will explore how to control layer properties through the tools on the toolbars.

1. Uncheck the Boundaries, TacticalLines, and TacticalAreas check boxes in the ArcMap TOC in order to turn off those layers and clear up the display.
2. Ensure Symbol Height is selected in the Size dropdown list in the Military Overlay Tools toolbar, then click the Set Size button.



3. Click and drag in the data frame to draw a bounding rectangle.

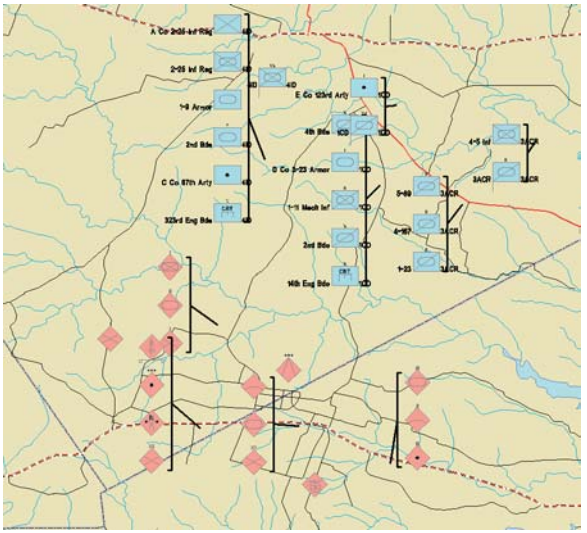
   The unit symbols on the map change size relative to the height of the box you specified. Experiment changing the symbol heights. When you are ready to continue, return the symbols to approximately their original size.
4. Click the Enable Leadering button in the Military Overlay Commands toolbar.



5. Click the Size dropdown arrow in the Military Overlay Tools toolbar, then click Leader Tolerance.

6. Click and drag in the data frame to draw a quarter-sized circle.

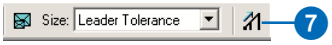
   The symbols should now be grouped together in several different leaders and should appear similar to the image below.



The leader tolerance refers to the maximum distance that force element features can be from each other in order to be grouped together onto a leader. The larger 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.

7. Click the Move Leader button in the Military Overlay Tools toolbar, then click on a leader in the data frame and drag it to a new location in the map.

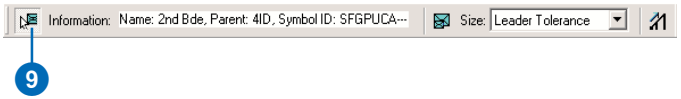


Since the force elements are leadered together they have been moved from their original positions in the map. MOLE allows you to identify force elements and their true geographic location.

8. Click the check box next to FriendlyForces Features in the ArcMap TOC in order to check it.

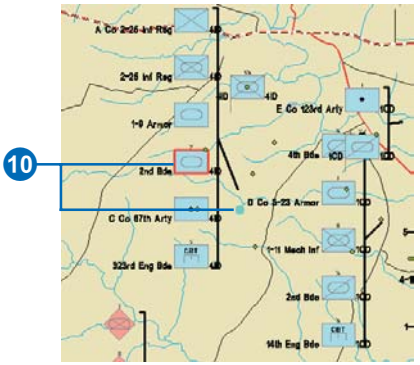
   The actual locations of the force elements will be displayed as points.

9. Click the Select Graphics button in the Military Overlay Tools toolbar.



10. Click on a force element symbol, either on a leader or a unit by itself.

    Note that some basic information about the element is displayed in the toolbar's Information text box. The symbol will be outlined in red, and the point representing its ground location will be highlighted.



11. Close the map without saving changes, or save the map with a new name.

In this exercise you were introduced to some basic MOLE functions and learned how to open MOLE layers and different methods for modifying their display properties in ArcMap. In the next exercise you will learn in depth how to modify the layer properties of MOLE force element layers.

Exercise 2: Editing MOLE layer properties

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

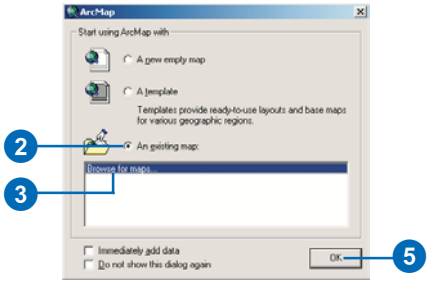
You were introduced to the MOLE force element Layer Properties dialog box in the last exercise. In this exercise you will explore the Layer Properties dialog box in depth and practice modifying the display properties of your MOLE force element layers.

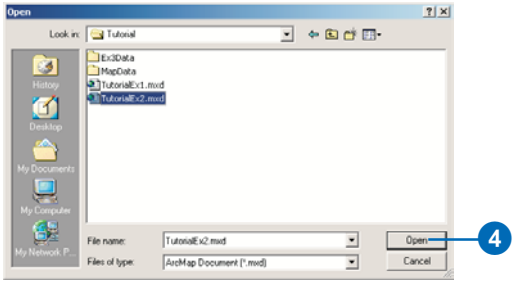
Opening the MOLE Layer Properties dialog box

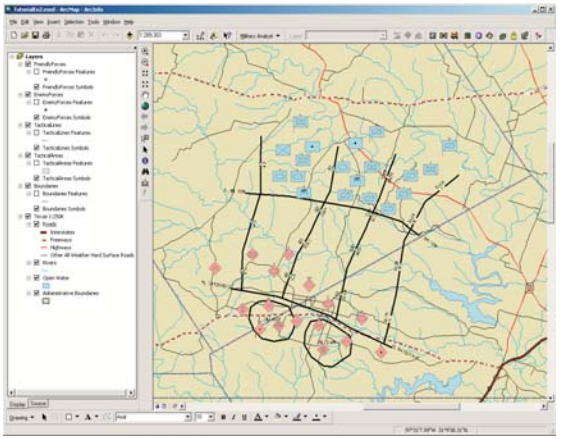
1. Start ArcMap by either double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.
2. Click the button to open an existing map in the ArcMap dialog box.
3. Double-click Browse for maps.

   A browse window appears.
4. Navigate to the location where you saved your MOLE tutorial data, click TutorialEx2.mxd, and click Open.
5. Click OK in the ArcMap dialog box.

   The map document TutorialEx2.mxd will open.





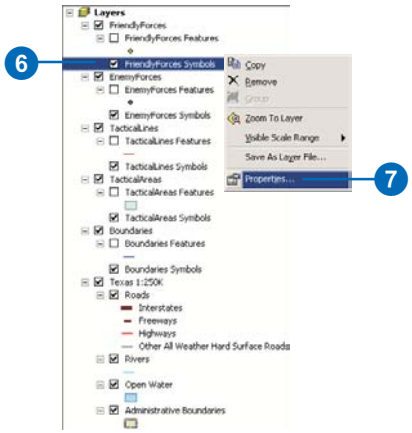


The map document TutorialEx2.mxd consists of a sample MOLE scenario so you can practice modifying the layer properties.

6. Right-click on the FriendlyForces Symbols layer in the ArcMap table of contents.
7. Click Properties in the Layer menu.

   The MOLE force element Layer Properties dialog box will open.

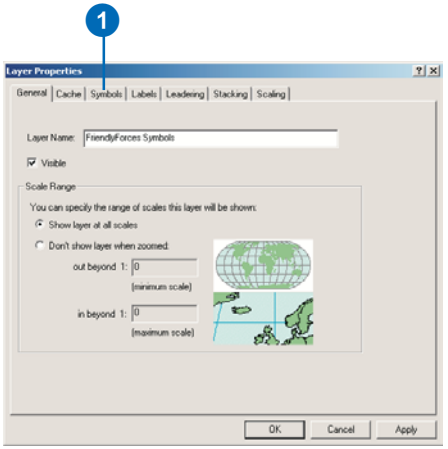
   You can also double-click on the layer to open the Layer Properties dialog box.



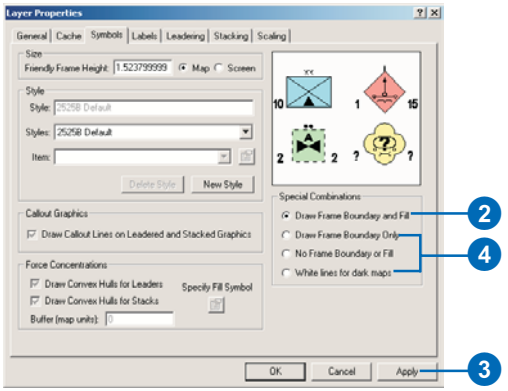
MOLE Layer Properties Symbols tab

From the Symbols tab in 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.

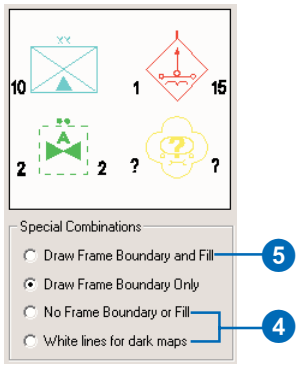
1. Click on the Symbols tab in the MOLE Layer Properties dialog box.



2. In the Special Combinations area, click the Draw Frame Boundary Only button. 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 field.

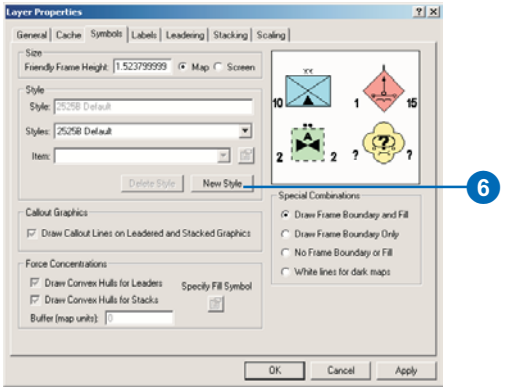


5. Click the Draw Frame Boundary and Fill button to return the symbols to the default symbology and click Apply.

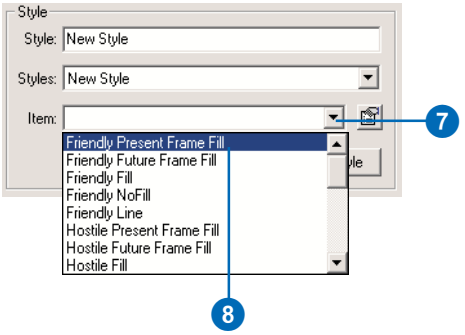


Only the outlines of the force element symbols are displayed when the Draw Frame Boundary Only option is selected.

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

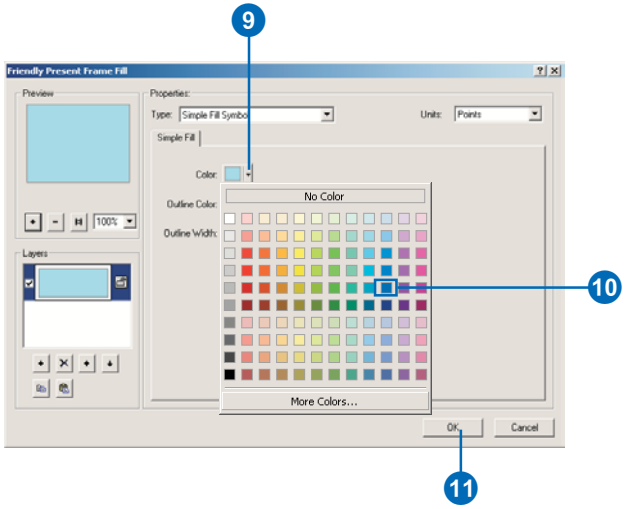


7. Click the Item dropdown arrow.
8. Click Friendly Present Frame Fill from the dropdown list.

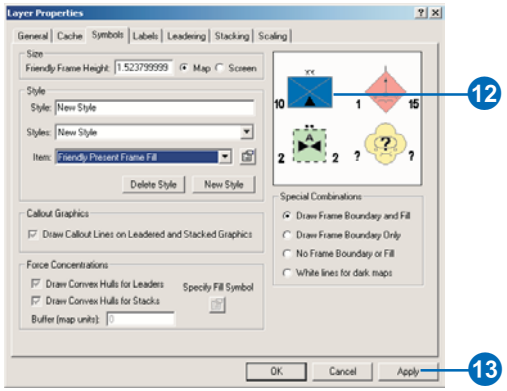


The Symbol Properties Editor dialog box will open.

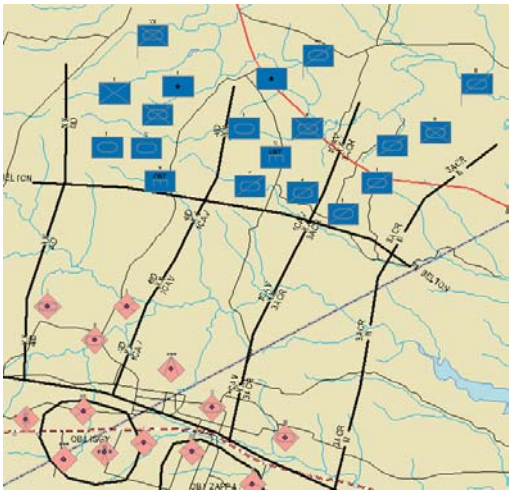
9. Click the Color dropdown arrow.
10. Click Ultra Blue.
11. Click OK.



12. Observe the changes in the Layer Properties Symbols preview window.

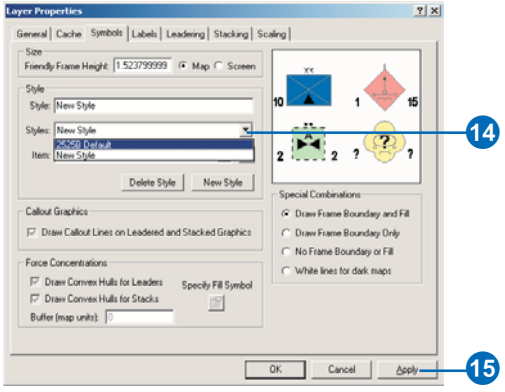


13. Click Apply and observe the changes to the layer in the data frame.



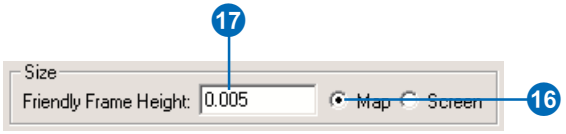
14. Click the Styles dropdown arrow, then click 2525B Default.

15. Click Apply to revert the layer to its original symbology.

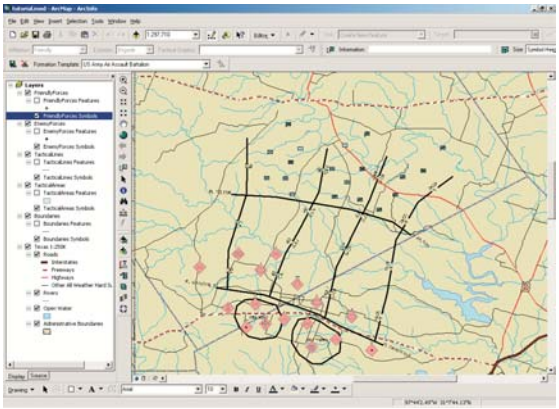


You can also change the size of the symbols from the Layer Properties dialog box. There are two ways to set the symbol size. The first way is to set the symbols to the scale of the data frame by specifying a symbol height in map units. The second way is to set the symbol height to a fixed percentage of the data frame height so that the symbols remain the same size regardless of the scale.

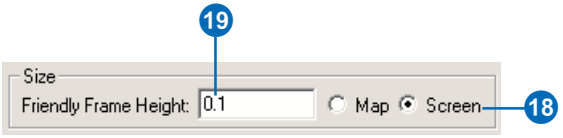
16. Click the Map button in the Size area of the Layer Properties dialog box.
17. Double-click on the value in the Friendly Frame Height text box so that it is highlighted. Type in the value "0.005" and click Apply.



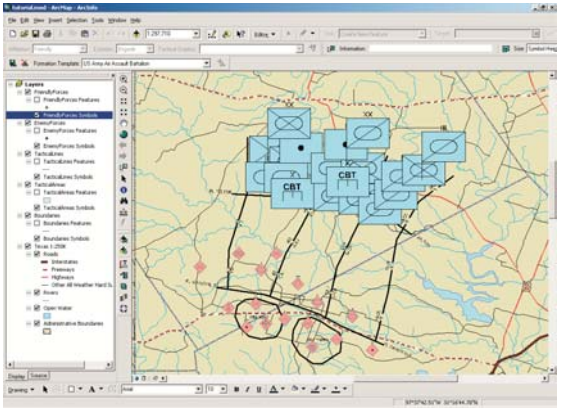
With the Map button selected, the symbols will be displayed in the specified number of map units, which are decimal degrees in this case.



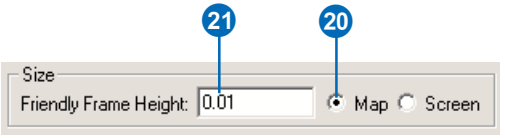
18. Click the Screen button.
19. Double-click the value in the Friendly Frame Height text box so that it is highlighted. Type the value "0.1" and click Apply.



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.



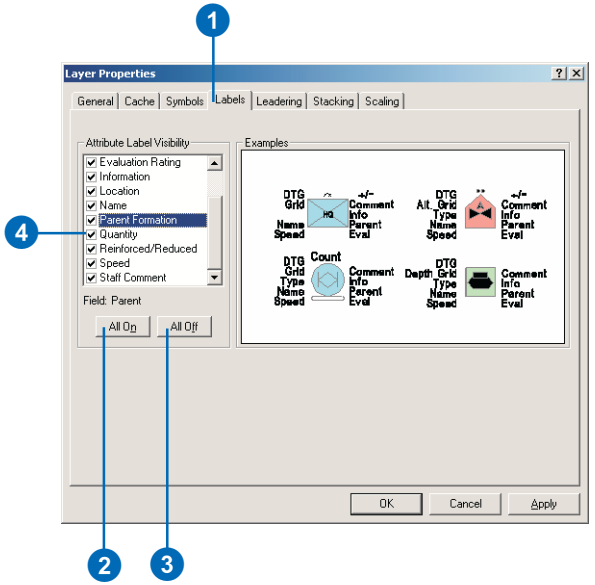
Many of the properties you change in the Layer Properties dialog box, such as symbol size and leadering, can also be changed using tools on the MOLE toolbars. The difference is that when you change properties from the toolbars the changes are applied to all force element layers within the table of contents. When you change properties from the Layer Properties dialog box the changes are only applied to the particular layer you are currently working with. See 'Exercise 1: Displaying MOLE symbols' earlier in this chapter for more information.

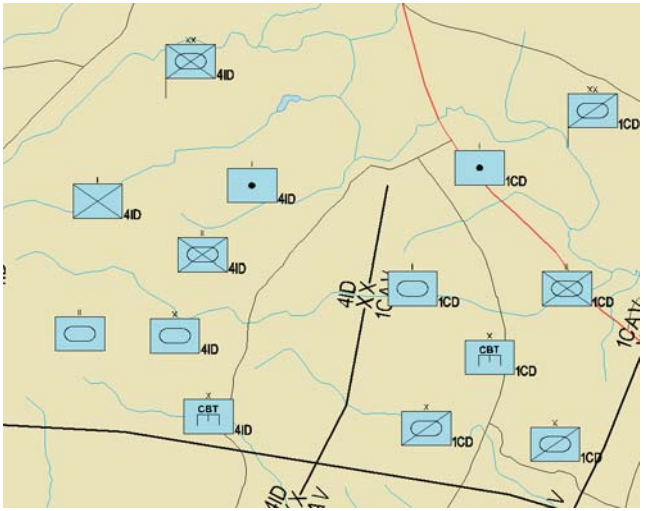
MOLE Layer Properties Leadering tab

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





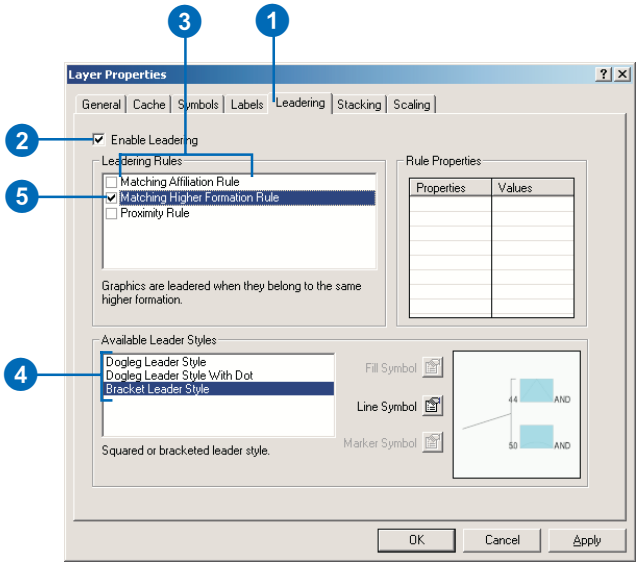
The parent label as it appears in the display

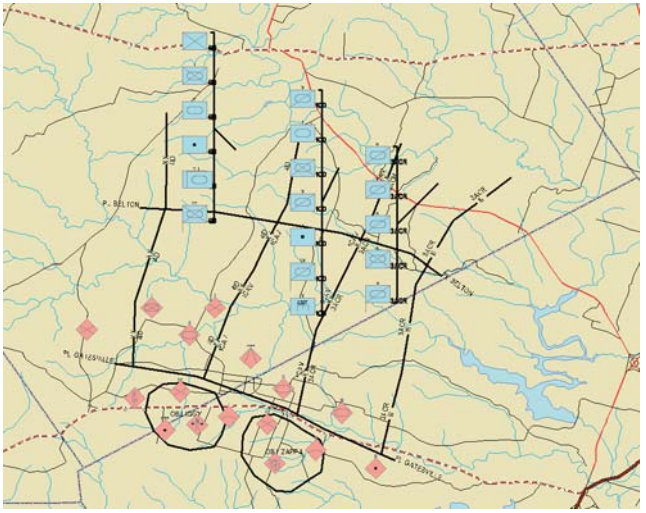
Familiarize yourself with the Leadering tab.

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

There are three different rules upon which to base leadering. The Matching Affiliation Rule groups all force elements within a layer that have the same affiliation property. This means all friendly graphic are placed together in a leader, all enemy graphics are placed in a different leader, and so on. The Matching Higher Formation Rule groups all force elements that belong to a common higher formation, or parent unit. The Proximity Rule 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. For this exercise you will use the Matching Higher Formation Rule.

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

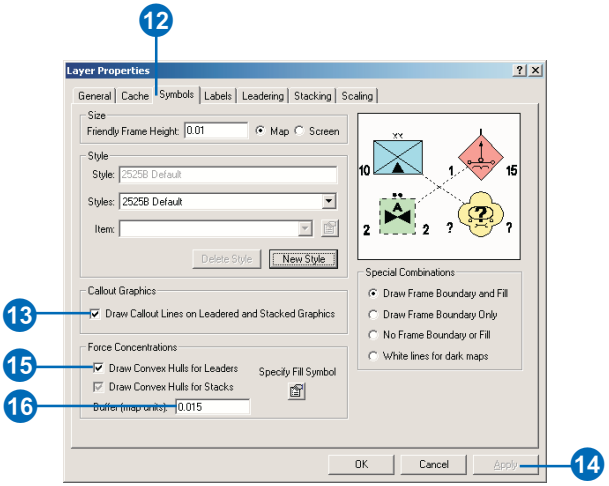




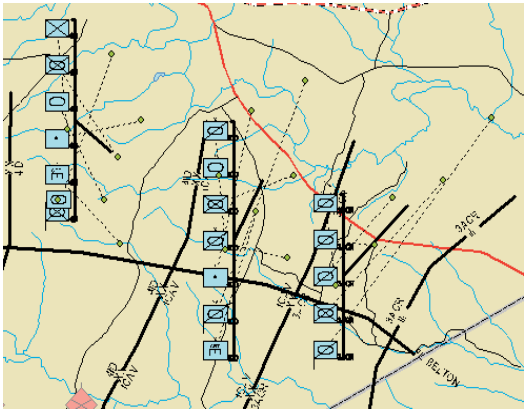
Now that the symbols are leadered they have moved from their original positions. To see the ground locations of the symbols, display the FriendlyForces Features.

10. In the ArcMap table of contents click the FriendlyForces Features check box.

11. Double-click FriendlyForces Symbols in the table of contents. The Layer Properties dialog box will open.



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



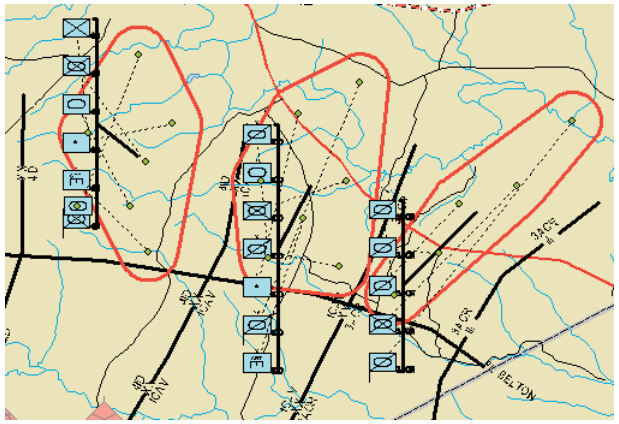
The callout lines connect the leadered MOLE symbols to their feature points, which represent their ground locations. If you select a feature point its corresponding MOLE symbol will be outlined in red.

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

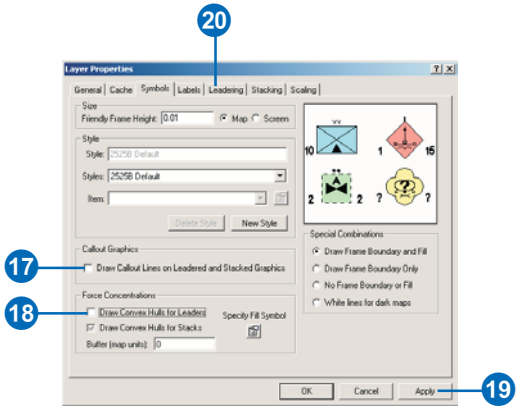
15. Click the Draw Convex Hulls for Leaders check box in the Force Concentrations frame of the Layer Properties dialog box and click Apply.
16. Type “0.015” in the Buffer (map units) text box and click Apply.

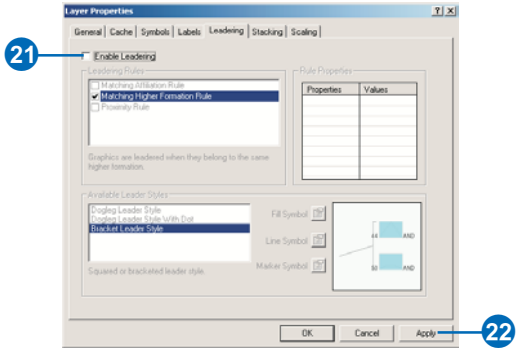
    Red lines will be drawn around the points contained by each leader, and the lines will be buffered by 0.015 decimal degrees.

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



17. Click the Draw Callout Lines on Leadered and Stacked Graphics check box to uncheck it.
18. Click the Draw Convex Hulls for Leaders check box to uncheck it.
19. Click Apply.
20. Click the Leadering tab in the Layer Properties dialog box.
21. Click the Enable Leadering check box to uncheck it.
22. Click Apply.



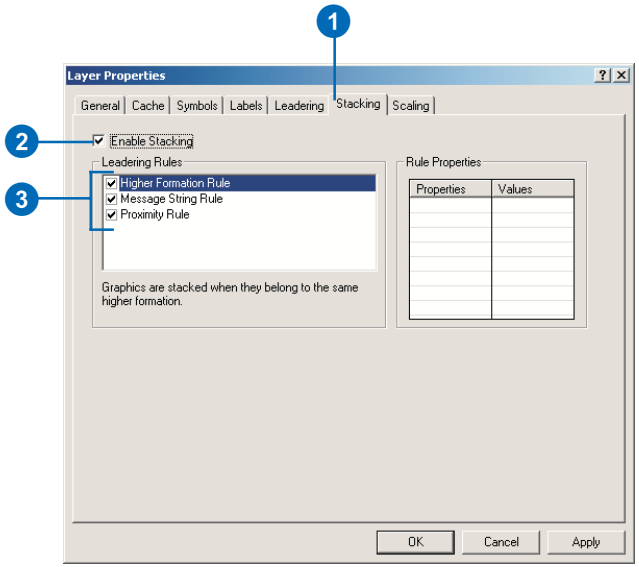


MOLE Layer Properties Stacking tab

Stacking is another way to group force element symbols together according to rules which you specify in 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.

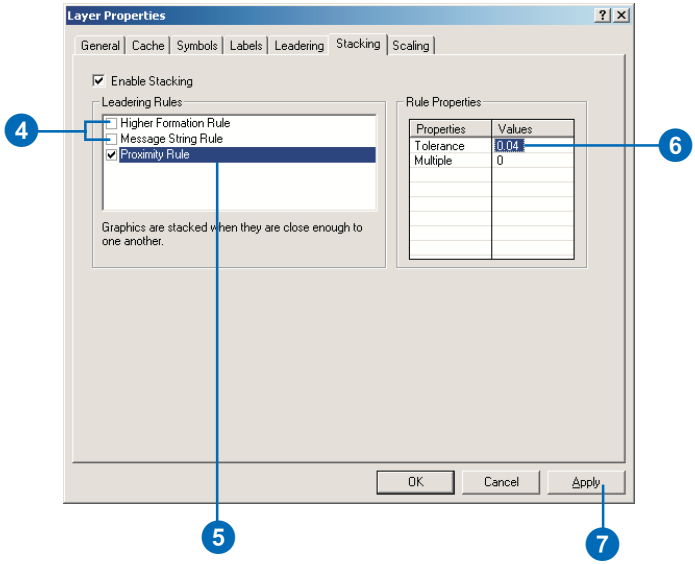
Familiarize yourself with the contents of the Stacking tab.

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



There are three different rules upon which to base stacking. The Higher Formation Rule groups all symbols that belong to a common higher formation, or parent unit. The Message String Rule groups all force symbols with matching Symbol_ID value. The Proximity Rule groups symbols that are within a specified distance of each other, as it does for leadering.

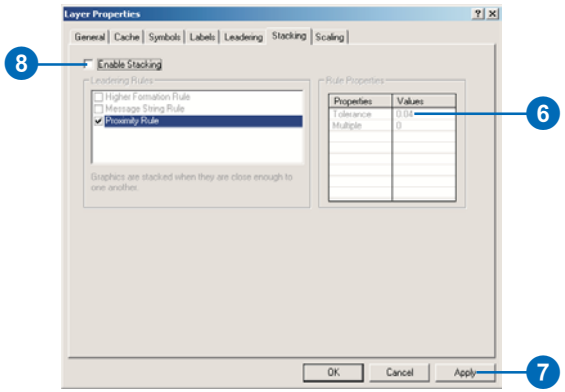
4. Click in the Higher Formation Rule and Message String Rule check boxes to uncheck them.
5. Click on the Proximity Rule to activate the Rule Properties text box.

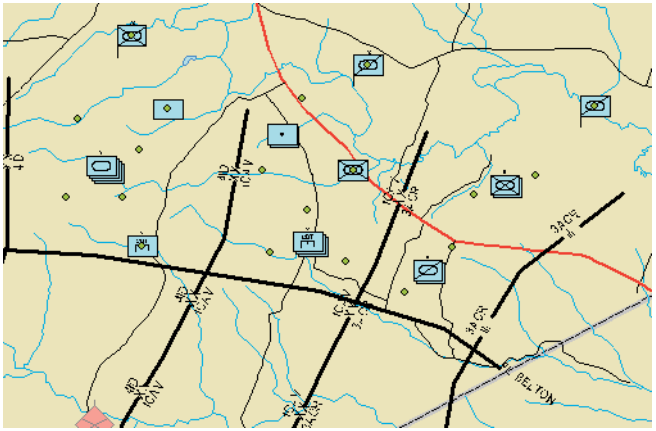


There are two ways to set the stacking distance. Specifying a Tolerance value in the Rule Properties text box sets a minimum distance in map units, which MOLE uses to determine which symbols should be stacked. Symbols within this distance of each other will be stacked together. The tolerance is applied to the center point of the symbols. If a Multiple value is specified it will be multiplied by the Friendly Frame Height value—in 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 Tolerance Value 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. Click the Enable Stacking check box to uncheck it, then click Apply.



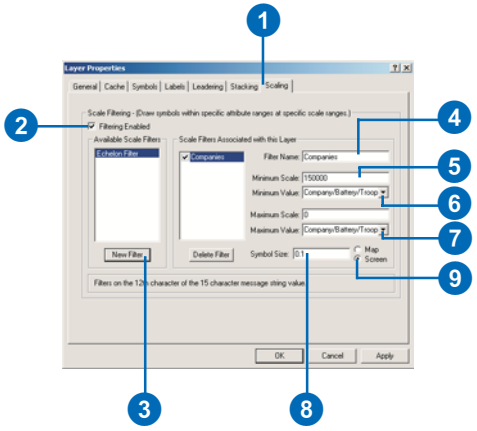


MOLE Layer Properties Scaling tab

MOLE allows you to set scale-dependent display of force element symbols from the Layer Properties dialog box. The scale dependency is based upon 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 in the Military Overlay Commands 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

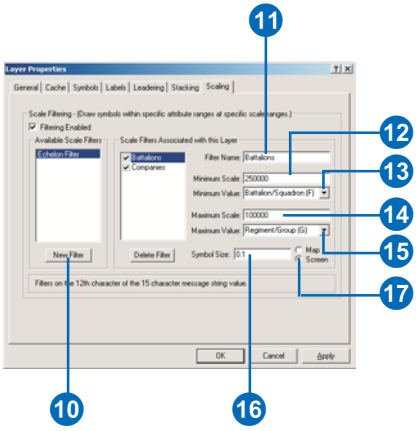
These are the scaling rules you will create.



1. Click the Scaling tab in the Layer Properties dialog box.
2. Click the Enable Scaling check box.
3. Click the New Filter button.

   This will be the first scaling rule you will set. You will set a total of three.
4. Highlight “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) in the dropdown list.
7. Click the Maximum Value dropdown arrow, then click Company/Battery/Troop(E) in the dropdown list.
8. Double-click in the Symbol Size text box and type “0.08”.
9. Click the Screen button.

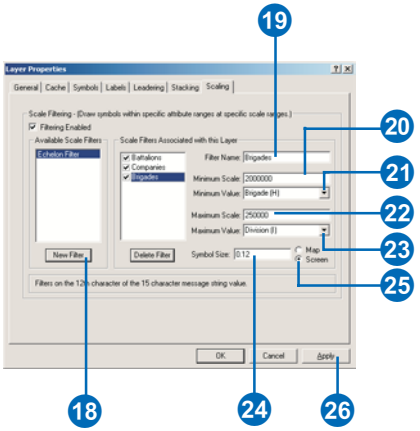
This causes force element symbols representing company-sized echelons and smaller to only be displayed when you are zoomed into the data frame from the scales 1:0 to 1:150,000.



10. Click the New Filter button.
11. Highlight “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) in the dropdown list.
14. Double-click in the Maximum Scale text box and type “100000”.
15. Click the Maximum Value dropdown arrow, then click Regiment/Group(G) in the dropdown list.

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 the New Filter button.
19. Highlight “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) in the dropdown list.
22. Double-click in the Maximum Scale text box and type “250000”.
23. Click the Maximum Value dropdown arrow, then click Division(I) in the dropdown list.
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 data frame and notice that different symbols are displayed at different zoom scales. You can also manually type in a map scale in the ArcMap Standard toolbar to experiment with specific scales.

Close the map 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 will be introduced to the process of creating new MOLE feature classes and populating them with symbols.

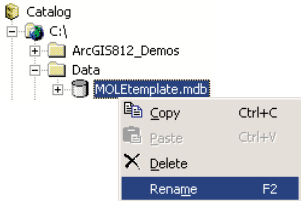
Exercise 3: Creating MOLE layers

In the first two exercises you've learned how to display MOLE symbols and modify their properties. In order to use MOLE effectively you also need to know how to build MOLE layers. In this exercise you will create a personal geodatabase with two custom MOLE feature classes—a force element layer (point) and a tactical graphic layer (line)—and add features to it. Using custom MOLE feature classes in a geodatabase, rather than using shapefiles, gives you an advantage by allowing you to utilize the MOLE symbol editor interface to add and edit tactical graphic and force element features. If your MOLE features are stored in shapefiles, in order to edit or add new features you must manually enter the MIL-STD-2525B symbol IDs associated with the features into the shapefile's attribute table. For more information on geodatabases, see *Building a Geodatabase*. For more information on using ArcCatalog, see *Using ArcCatalog*.

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 personal geodatabase named MOLEtemplate.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 ahead to the section 'Creating a personal geodatabase' in this exercise.

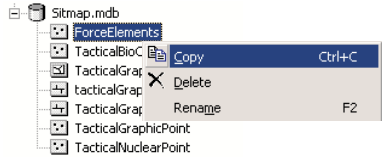
MOLEtemplate.mdb for ArcView users

1. Start ArcCatalog by double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.
2. In the Catalog tree, in the ArcCatalog window, navigate to the folder where you copied the MOLEtemplate.mdb geodatabase to. Right-click MOLEtemplate.mdb and click Rename.



3. Type "Sitmap" in the highlighted area and press Enter.

4. Expand Sitmap.mdb in the Catalog tree by clicking the plus sign (+) next to it. Right-click ForceElements and click copy.



5. Right-click Sitmap.mdb in the Catalog tree and click Paste. Click OK in the Data Transfer window.

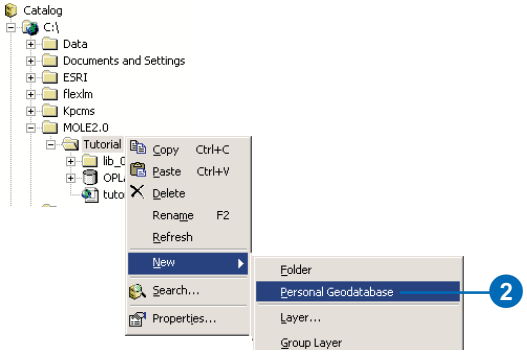
   There will now be a feature class named ForceElements and one named ForceElements_1 in Sitmap.mdb.

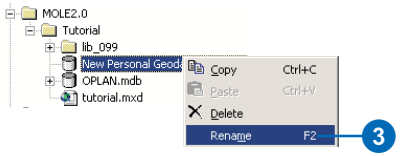
6. Right-click ForceElements in the Catalog tree and click Rename. Type “Allies” in the highlighted area and press Enter.
7. Right-click ForceElements_1 and click Rename. Type “Axis” in the highlighted area and press Enter.
8. Right-click the feature class in Sitmap.mdb named TacticalGraphicLine and click Rename. Type “Graphics” in the highlighted area and press Enter.
9. Skip ahead to the section in the tutorial named ‘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 in your Start menu.
2. Navigate to the folder where you saved your MOLE tutorial data in the Catalog tree in the ArcCatalog window. Right-click the Tutorial folder, select New, then click Personal Geodatabase.

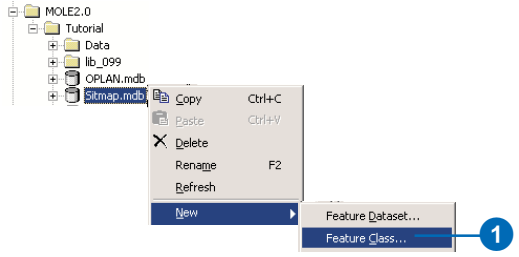
   An empty geodatabase, New Personal Geodatabase.mdb, will appear in the Catalog tree.
3. Right-click the file New Personal Geodatabase.mdb, then click Rename.
4. Type “Sitmap” in the highlighted area and press Enter.



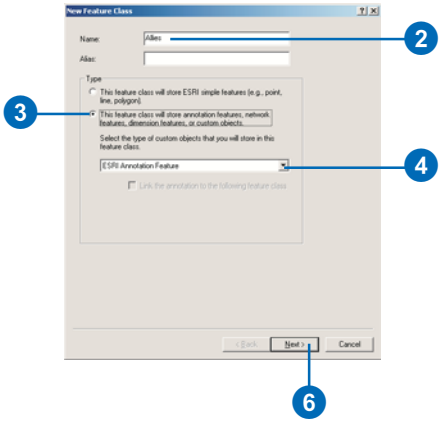


Creating custom MOLE force element feature classes

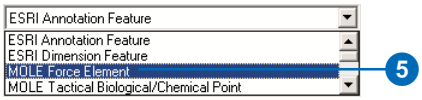
1. Right-click Sitmap.mdb in the Catalog tree, click New, then click Feature Class.



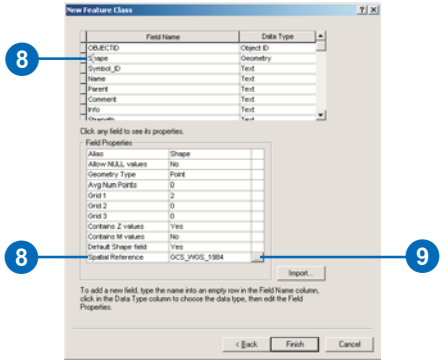
2. Type “Allies” in the Name text box in the New Feature Class dialog box.
3. Click the button to store custom objects.
4. Click the custom objects dropdown arrow.



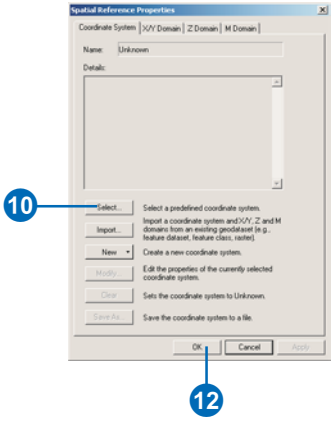
5. Click MOLE Force Element from the custom objects dropdown list.



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 Names 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. Click the ellipse next to the Spatial Reference field if the Spatial Reference is not set to GCS_WGS_1984.
10. Click Select in the Spatial Reference Properties dialog box.
11. Navigate to and select Geographic Coordinate Systems > World > WGS 1984.prj in the browse window, then click Add.
12. Click OK in the Spatial Reference Properties dialog box, then click Finish.

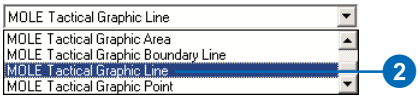


13. Repeat the preceding steps to create another MOLE force element feature class, Axis, in the Sitmap geodatabase.

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

Creating custom MOLE tactical graphics 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 editors, which makes it easy to edit the feature classes and add symbols to them. First, you need to open the feature classes in ArcMap.

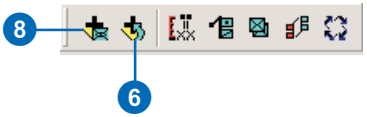
1. Start ArcMap by double-clicking a shortcut installed on your desktop or using the Programs list in your Start menu.
2. Click OK in the ArcMap startup dialog box to open an empty map.
3. Open the MOLE toolbars following the steps in Exercise 1, if they are not already displayed.

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 in the ArcMap Standard toolbar.

5. Navigate to the folder where you saved the MOLE tutorial data, open the Ex3Data folder, and open Texas_Sub.lyr.
6. Click the Add MOLE Tactical Data button in the Military Overlay Commands toolbar.

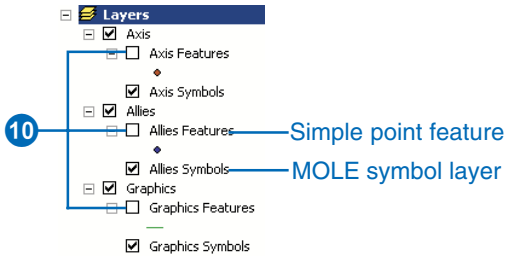
   This button is used to open MOLE tactical graphic layers.



7. Navigate to Sitmap.mdb and open Graphics.
8. Click the Add MOLE Data button in the Military Overlay Commands toolbar.

   This button is used to open MOLE force element layers.
9. Navigate to Sitmap.mdb and open the Allies and Axis feature classes.

The feature classes are now displayed in the ArcMap table of contents (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. Click the check boxes next to Allies Features, Axis Features, and Graphics Features in the TOC to check them.

In order to add symbols to the MOLE layers you must edit the layers.

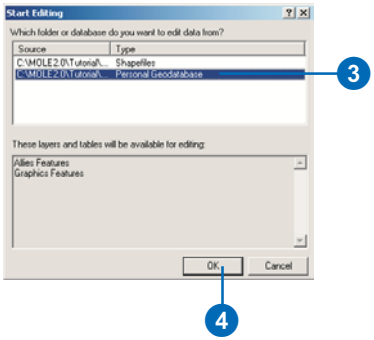
Adding symbols to MOLE force element layers (Allies layer)

1. Click the Editor Toolbar button in the ArcMap Standard toolbar.

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

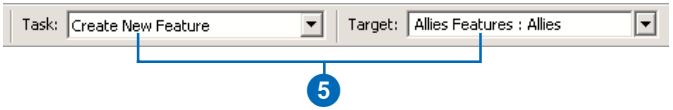
The Start Editing dialog box will open.

3. Click Personal Geodatabase in the table where it asks which folder to edit from.
4. Click OK.



Add features to the Allies force element layer first.

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



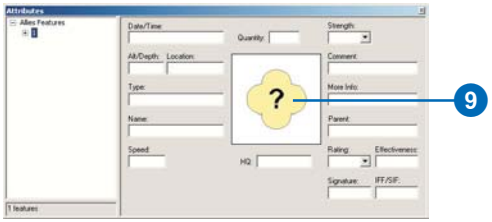
6. Click the Create New Feature button in the Editor toolbar.

7. Click in the data frame to place a point near the lake to the north.

The MOLE unknown force element feature symbol will appear and be selected.

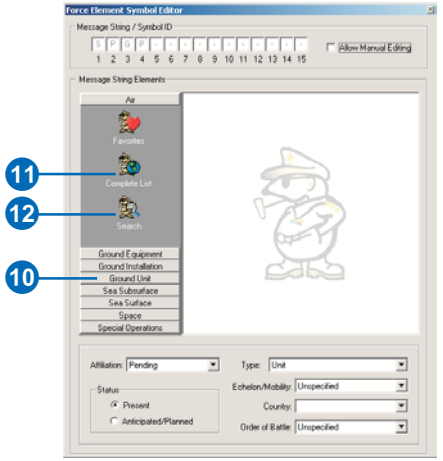
8. Click the Attributes button in the Editor toolbar.

The MOLE Attributes editor dialog box will open. 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.



9. Click the symbol in the center of the Attributes editor dialog box to open the MOLE Force Element Symbol Editor.

The Force Element Symbol Editor provides an interface that allows you to quickly add new force elements to the display and change existing ones. 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.

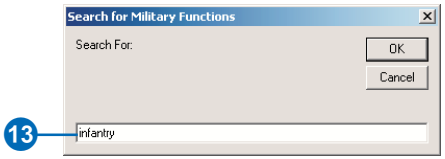


10. Click the Ground Unit button.
11. Click Complete list.

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

12. Click the Search button.
13. Type "infantry" in the search dialog box and click OK.

    Only infantry units will be displayed in the Symbol Editor list.



14. Click Airborne in the list of ground units.

    Note that the symbol in the Attributes editor and map display is automatically updated as changes are made in the Symbol Editor. The Symbol_ID field at the top of the Symbol Editor is also updated as changes are made.

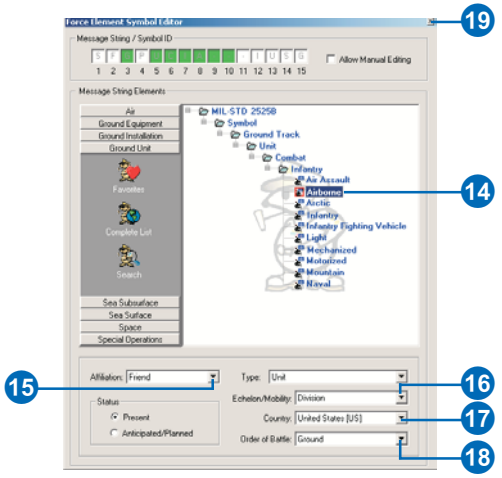
15. Click the Affiliation dropdown arrow at the bottom of the Symbol Editor and click Friend.

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

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

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

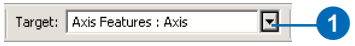
19. Click the Close button at the top of the Symbol Editor to close it and do the same for the Attributes editor.



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.

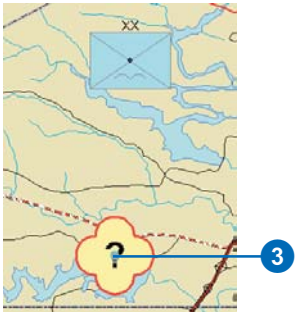
1. Click the Target dropdown arrow in the Editor toolbar and click Axis Features : Axis.



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

3. Click in the data frame to place a point above the lake to the south as shown on the next page.

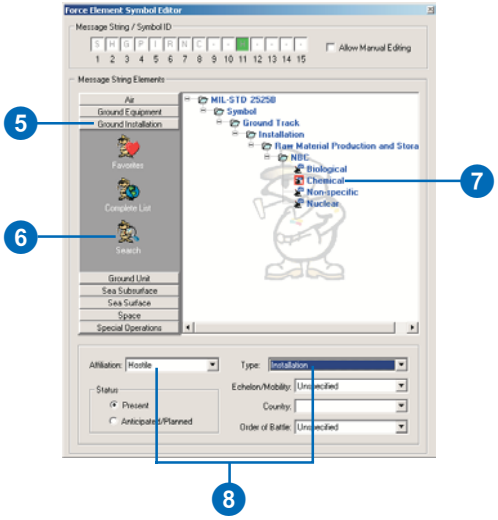
4. With the new symbol selected, follow steps 8–9 from the previous section to open the MOLE Force Element Symbol Editor.



This time the symbol you'll add is a ground installation type element.

5. Click the Ground Installation button.
6. Click Search and type "nbc".
7. Click Chemical in the list of elements matching the search to select it.
8. Set the Affiliation to Hostile and the Type to Installation and keep the default values for the rest of the fields.
9. Close the Symbol Editor and Attribute Editor dialog boxes. Save your edits.

Note how the Friendly and Hostile type symbols are different, as specified in MIL-STD-2525B. You can experiment with adding other types of force element symbols and changing the affiliation and echelon/mobility properties to see the different symbol types that are available.

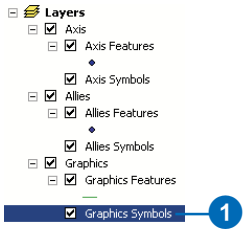


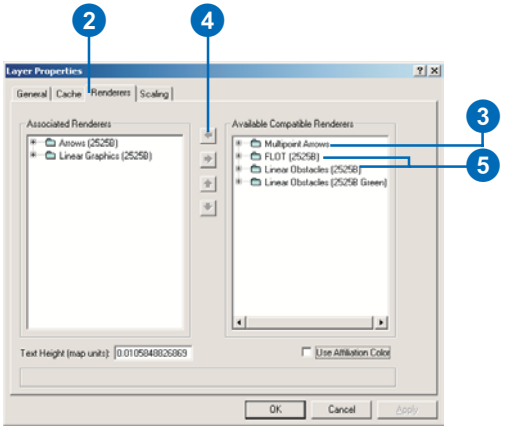
Adding MOLE tactical graphic symbols

Adding MOLE tactical graphic symbols to a map is very similar to adding force elements. For this portion of the exercise it is assumed that you have completed the first part, your MOLE layers and toolbars are displayed, and you have started editing. You will create an axis of advance symbol.

The first step is to enable the necessary MOLE tactical graphic renderers.

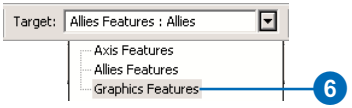
1. Double-click the Graphics Symbols layer in the TOC to open the Layer Properties dialog box.





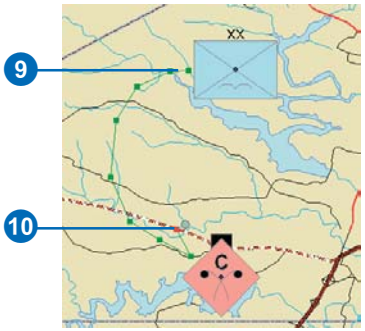
The Associated Renderers list shows the renderers that are currently being used. The Available Compatible Renderers shows the other renderers that are not being used. The renderers in the list can be expanded by clicking the plus sign in order to see the features that are drawn by each renderer.

2. Click the Renderers tab in the Layer Properties dialog box.
3. Click Multipoint Arrows in the Available Compatible Renderers list so it is highlighted.
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.
6. Click the Target dropdown arrow in the Editor toolbar and click Graphics Features.



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

9. Click in the data frame to place the first vertex of the line to the left of the force element symbol you created earlier.
10. Continue placing vertices as shown. To create a multipoint arrow symbol, the final vertex you place must be behind the previous vertex. This will form the arrowhead.
11. To complete the line, press F2 or right-click and click Finish Sketch.

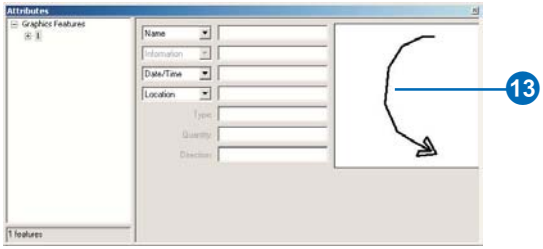


By default, a direction of main attack arrow will be drawn and selected.

12. Click the Attributes button in the Editor toolbar.

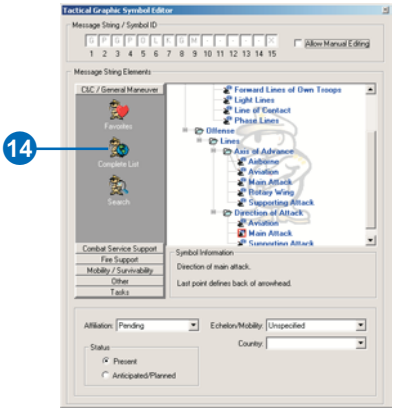
The MOLE Attributes editor dialog box will open. As with force elements, the text boxes around the symbol represent the fields in the MOLE feature attribute table. Values entered in these text boxes will appear as text labels around the symbols in the display.

13. Click the symbol to open the MOLE symbol editor.

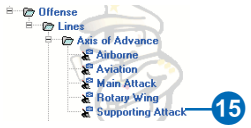


14. Click Complete list.

    Note the red box on Direction of Main Attack in the list, indicating that it is the currently selected symbol.

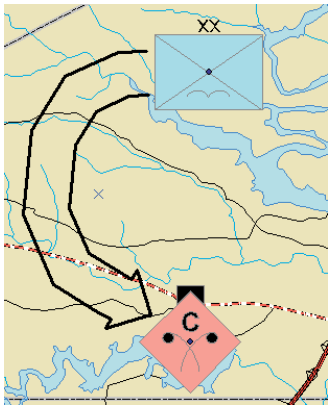


15. Click Supporting Attack under Axis of Advance in the list. Note that the symbol changes in the Attributes editor as well as in the data frame.



16. Close the Tactical Graphic Symbol Editor and the Attributes editor and save your edits.

17. Click the Graphics Feature check box in the TOC to uncheck it. Your ArcMap display should look similar to the image on the following page.



You can continue adding force element and tactical graphic symbols to your map as you wish. Save your edits and save changes to the map.

You can also add tactical graphics by using the shortcuts in the MOLE Tactical Graphics toolbar.

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 element and tactical graphic symbols to them. Continue reading the remaining chapters in this manual in order to reinforce and expand upon what you have learned in these exercises.

Creating a MOLE geodatabase

3

IN THIS CHAPTER

- MOLE feature types
- Creating a geodatabase
- Creating MOLE feature classes
- Creating MOLE geodatabases (ArcView users)

With MOLE you can take advantage of the functionality offered by the ArcGIS geodatabase data model. While 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. By using a geodatabase—personal or enterprise—you can leverage all the features of MOLE and all the additional capabilities that using a geodatabase provides. The steps required to create a MOLE geodatabase will be discussed in this chapter.

If you are planning to create multiuser enterprise databases, please 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. Force element symbols are described in Appendix A of *MIL-STD-2525B*. They are sometimes referred to by a hierarchy code (1.x). These symbols include Battle Dimensions for Space, Air, Ground, Sea Surface, Sea Subsurface, Special Operations Forces and Other.

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.

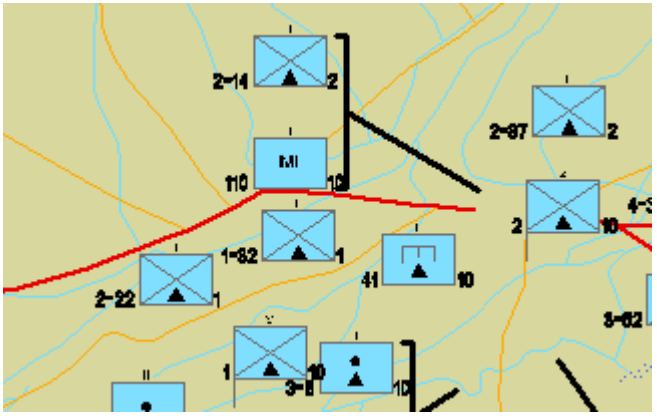
Tactical graphics

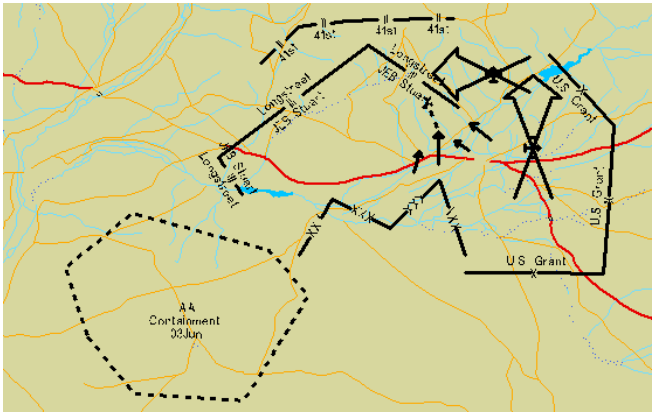
Tactical graphics symbolize other military operations, such as movement, obstacles, areas of operations, and so on. These symbols are line and polygon as well as point feature classes in the geodatabase.

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

Tactical Graphics layers are different than Force Element layers. Tactical Graphics are drawn using custom renderers, which allows for adding new or customized versions of tactical graphic symbols.

MOLE further subdivides Tactical Graphics into 6 groups, according to 2525B categories: Tasks, C2 & 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 and also add custom behaviors—leadering and stacking of units—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.

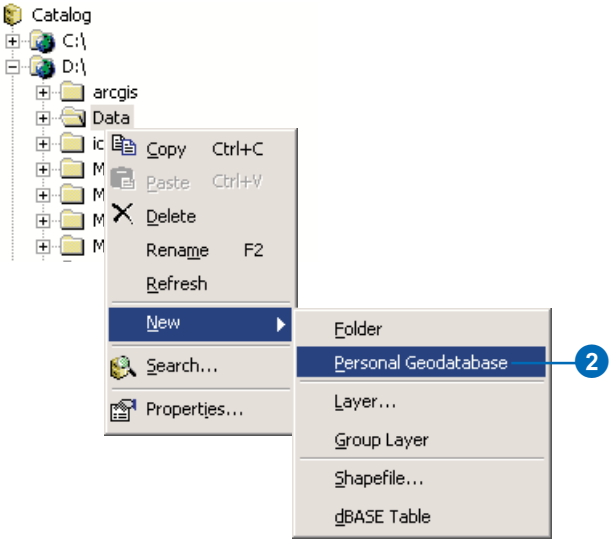
See Also

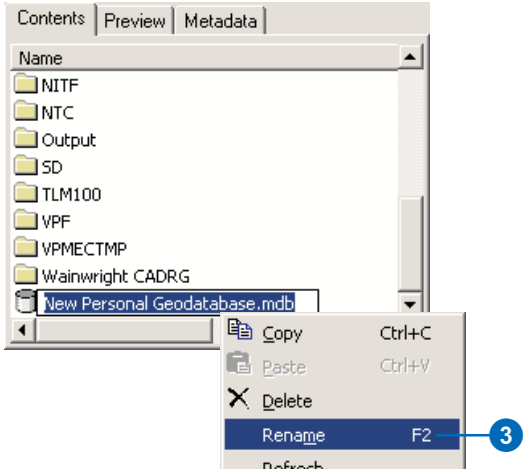
See Building a Geodatabase *for complete information on the geodatabase data model.*

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. Right-click the new personal geodatabase in the Catalog tree, in the Contents tab in the ArcCatalog window, 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.





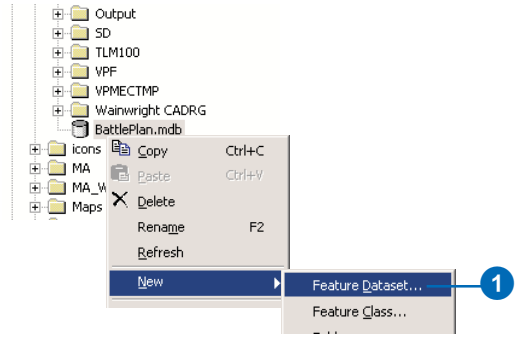
Feature datasets are primarily designed to contain feature classes that are topologically connected. You have the option of using them to organize your MOLE feature classes. When you create a feature dataset you can define a spatial reference for it. The spatial reference properties will automatically be applied to all of 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.

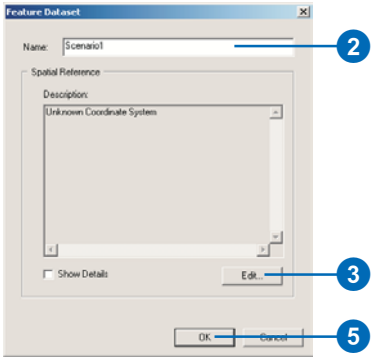
See Also

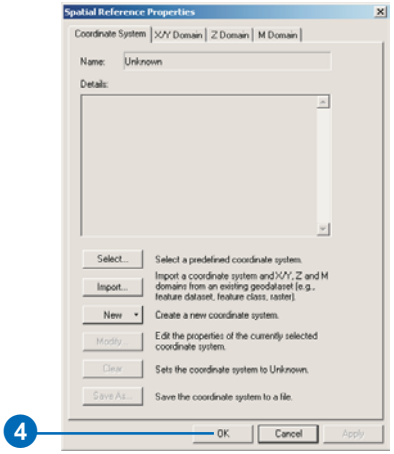
See Building a Geodatabase *for more information on feature datasets.*

Creating feature datasets

1. Right-click the geodatabase you want to create a feature dataset in, point to New, then click Feature Dataset.
2. Type a name for the feature dataset in the Name text box in the Feature Dataset dialog box.
3. Click Edit in the Feature Dataset dialog box to open the Spatial Reference Properties dialog box.
4. Define the spatial reference of the feature dataset. Click Select to choose a pre-defined 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 in the Feature Dataset dialog box.







Creating MOLE feature classes

A feature class is a file that contains the actual MOLE symbols. 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 wish to maintain, you must specify that when you create the feature class. You cannot add z value support once the feature class is created. While MOLE doesn't use these values, the database will store them for future use.

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 in the New Feature Class dialog box.

   Optionally, type an alias for the feature class in the Alias text box.

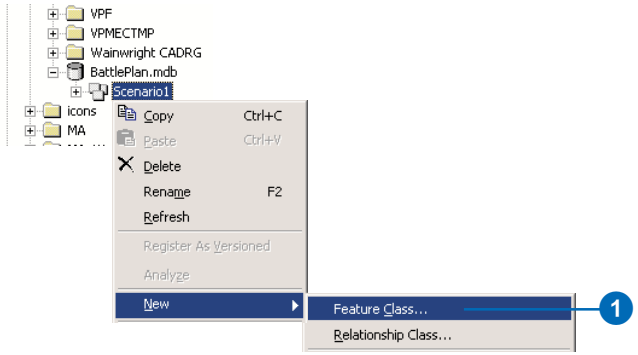
3. Click the button to store custom objects.

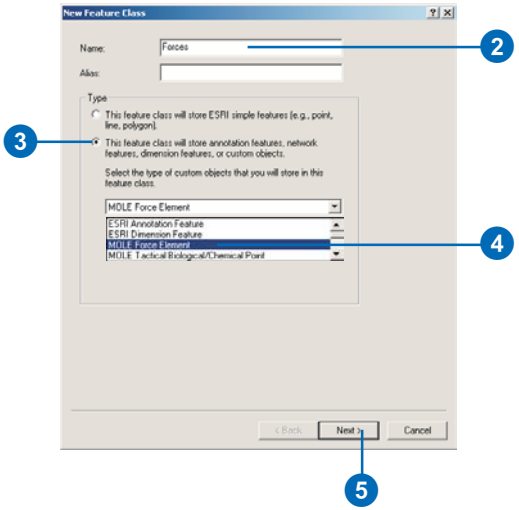
4. Click the custom objects dropdown arrow and click MOLE Force Element.

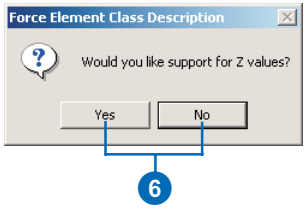
5. Click Next.

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 in the following dialog box, then click Finish.



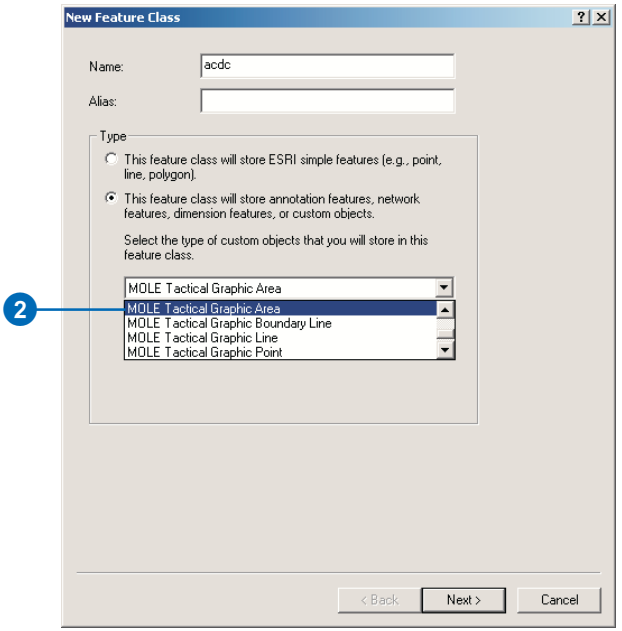




Creating a tactical graphic feature class

1. Follow steps 1–3 in the previous task to create a new geodatabase feature class.
2. Click the custom feature dropdown arrow, then click any of the MOLE custom object types in the dropdown list 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 will choose the appropriate feature type—point, line or polygon—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. Note that the MOLE Tactical Biological/ Chemical Point and Tactical Nuclear Point custom object types do not have MOLE symbols associated with them at this time.

1. MOLE Force Elements

2. MOLE Tactical Biological/ Chemical Point

3. MOLE Tactical Graphic Area

4. MOLE Tactical Graphic Line

5. MOLE Tactical Graphic Boundary Line

6. MOLE Tactical Point

7. MOLE Tactical Nuclear 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 the graphic you're looking for. MOLE manages that classification for you.

Creating MOLE geodatabases (ArcView users)

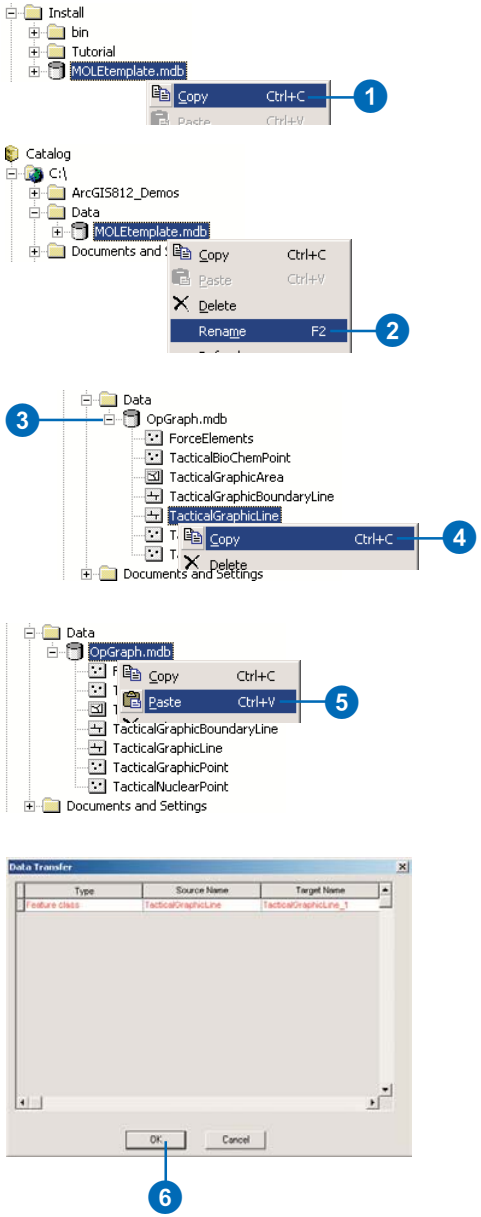
MOLE uses geodatabase feature classes with custom objects to perform many functions involving editing and symbol creation. The previous tasks outline the steps involved in creating such feature classes. The ability to create feature classes that store custom objects is supported by ArcEditor and ArcInfo, 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 that you can use to create your own geodatabases if you do not have access to an ArcEditor or ArcInfo license. The template contains 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 MOLEtemplate database to suit your needs. You may use this database for any MOLE application.

Using the MOLEtemplate.mdb geodatabase

1. Copy MOLEtemplate.mdb from the installation CD–ROM to your local computer.
2. Navigate to the folder in which you saved MOLEtemplate.mdb in the ArcCatalog Catalog tree. Right-click MOLEtemplate.mdb and click Rename, then type the new name.
3. Expand MOLEtemplate.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 you want to add the feature class to and click Paste.
6. Click OK in 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.



Required field names for MOLE feature classes

When MOLE draws 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.

The symbology is defined by the value of the 15-character identifier code in the Symbol_ID attribute field (see Chapter 1, 'Introducing MOLE', for more information on the Symbol ID). Labels are displayed in specific locations around the symbols according to the values in the attribute fields listed in the following table. 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 text labels at the bottom-right corner of the symbols in the layer (see the section 'The MOLE Attribute Editor' in Chapter 4, 'Adding MOLE symbols in ArcMap', for more information on MOLE force element and tactical graphic attribute fields). 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. The following table lists the attribute field names/aliases required by MOLE to display the respective text labels with the symbols for each feature class type. Note that either the field name or the alias must conform to the naming conventions in the table 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. Consult the following table to see the required attribute field names/aliases for MOLE feature classes. Note that it is not necessary to create all of the fields in the table for a particular feature class. However, if you want particular labels displayed with the MOLE symbols, the attribute fields containing the values for those labels must either be named or aliased according to the above table.

Force Elements	Tactical Graphic Points	Tactical Graphic Lines	Tactical Graphic Areas	Tactical Graphic Boundaries
Name	Name	Name	Name	Name
Parent	Info	Location	Info	Name1
Comment	Location	DTG	Location	Location
Info	DTG		DTG	
Strength	DTG 1		DTG 1	
EvalRating	Type		Type	
Location				
Alt_Depth				
Speed				
DTG				
HQ				
Quantity				
Type				
Effective				
Signature				
IFFSIF				

The above table lists the attribute field naming conventions for MOLE feature classes. These are the field names that MOLE looks for to render the text descriptor labels around MOLE symbols.

Adding MOLE symbols in ArcMap 4

IN THIS CHAPTER

- The MOLE Attribute Editor
- The MOLE Symbol Editor
- Adding MOLE symbols in ArcMap
- Tactical Graphic shortcuts
- Symbology rendering in MOLE

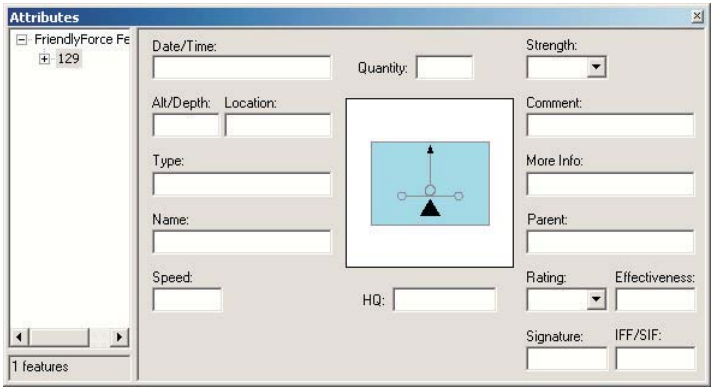
When you store your MOLE features in a geodatabase with class extensions, as discussed in Chapter 3, 'Creating a MOLE geodatabase', you have access to the MOLE Attribute and Symbol Editors. These custom editor dialog boxes greatly simplify the process of adding *MIL-STD-2525B* symbology to your map, as well as editing existing symbology. MOLE also provides additional shortcuts for adding tactical graphic symbols. These shortcuts, the MOLE Attribute and Symbol Editors, the process of adding and editing military symbols in ArcMap, and a description of the way MOLE renders *MIL-STD-2525B* symbology will be discussed in this chapter.

The MOLE Attribute Editor

When you create a MOLE geodatabase in ArcCatalog and populate it with custom object feature classes (see Chapter 3, 'Creating a MOLE database'), the MOLE Attribute Editor and Symbol Editor become available for editing in ArcMap. If your MOLE features are stored in shapefiles or simple feature classes in a geodatabase, only the standard ArcMap Attributes dialog box is available, and you can only change MOLE symbols by modifying their attributes manually.

The MOLE Attribute Editor provides access to the Symbol Editor and allows you to add text labels around MOLE symbols. There is also a preview window which displays the selected symbol. Clicking the symbol in the preview window opens the Symbol Editor. The preview window is updated as you change the symbol with the Symbol Editor. The Attribute Editor is different for force elements and tactical graphics, but each serves the same function.

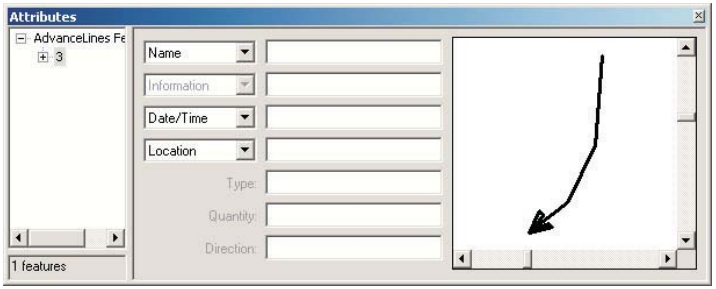
Force element Attribute Editor



The force element Attribute Editor contains several text boxes positioned around a preview window displaying the selected object. Entering values in the text boxes will cause text labels to be displayed around the object in the data frame in approximately the same location as in the Attribute Editor. The values entered in the text boxes are also saved in the symbol's attribute table. See the table below for an explanation of these text fields.

Date/Time	A text modifier for units, equipment and installations that displays traditional military Date/Time Group format: DDHHMMSSZMONYY.
Quantity	A text modifier in an equipment symbol that identifies the number of items present.
Strength	A text modifier in a unit symbol that displays (+) for reinforced, (-) for reduced, (+) reinforced and reduced.
Comment	A text modifier for units, equipment and installations; content is implementation specific.
More Info	A text modifier for units, equipment, and installations; content is implementation specific.
Parent	A text modifier for units that indicates number or title of higher echelon command (corps are designated by Roman numerals).
Effectiveness	A text modifier for units and equipment that indicates unit effectiveness or installation capability.
IFF/SIF	A text modifier displaying IFF/SIF Identification modes and codes.
Signature	A text modifier for hostile equipment; "!" indicates detectable electronic signatures.
Rating	A text modifier 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-reliability cannot be judged. Credibility Ratings: 1-confirmed by other sources,2-probably true, 3-possibly true, 4-doubtfully true, 5-improbable, 6-truth cannot be judged.
HQ	A text modifier for units; indicator is contained inside the frame; contains the name of the special C^2 headquarters.
Speed	A text modifier for units, equipment, and installations that displays velocity as set forth in MIL-STD-6040.
Name	A text modifier for units, equipment, and installations that uniquely identifies a particular symbol; track number. Identifies acquisition number when used with SIGINT symbology.
Type	A text modifier for equipment that indicates type of equipment.
Location	A text modifier for units, equipment, and installations that displays a symbol's location in degrees, minutes, and seconds (or in UTM or other applicable display format).
Alt/Depth	A text modifier 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.

Tactical graphic Attribute Editor



The tactical graphic Attribute Editor also contains text boxes and a preview window displaying the selected tactical graphic object. Values entered in these text boxes will populate the object's attribute table; value entered in the attribute table will also show up in the Attribute Editor. Values entered in certain fields will be displayed around the object in the ArcMap data frame as well. Two different values can be placed in the fields with dropdown lists. This is primarily for boundary line features that need to display the name of the units on either side of the line. Fields that are grayed out in the Attribute Editor are not available in the selected object's attribute table. If the fields are added to the attribute table they will become active in the Attribute Editor; values entered in these fields in the Attribute Editor will also be added to the attribute table. They will not be displayed as labels in the data frame, however.

Using the Type field

The role of the Type field is different from that of the other text fields in the tactical graphic Attribute Editor. It is actually a graphical modifier for specific symbols. In other words, values entered here will not appear as labels around the selected symbol, but will instead modify its appearance. This only applies to the following symbols: 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 will display 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 below describes each of the text fields in the tactical graphic Atribute Editor dialog box.

Name	A text modifier that uniquely identifies a particular tactical graphic; track number. Nuclear: delivery unit (missile, aircraft, satellite, etc.)
Information	A text modifier for tactical graphics; content is implementation specific.
Date/Time	A text modifier that displays Date/Time Group (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 (NBC) events that identifies the direction of movement (see paragraph 5.5.2.1 and figure 11).

Force element Symbol Editor

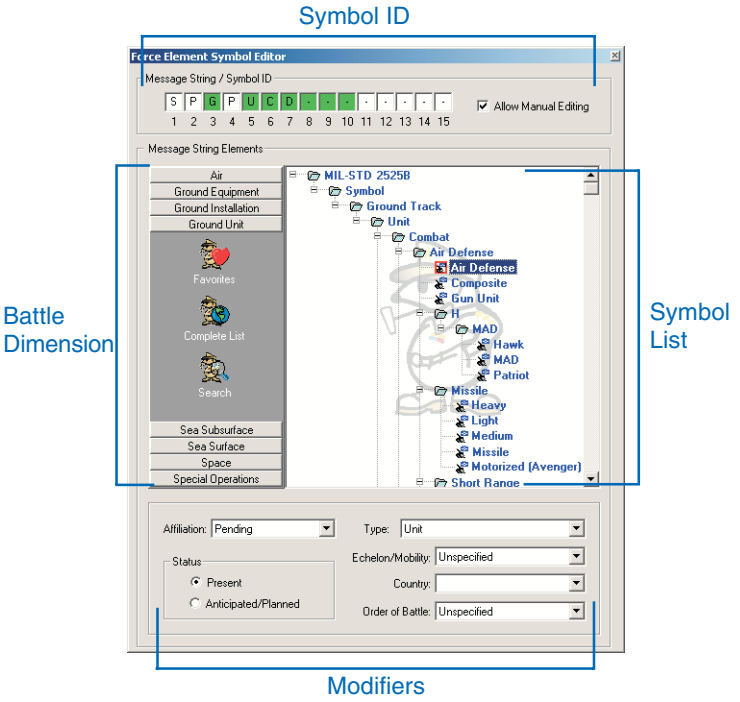
The advantage of MOLE lies in the Symbol Editor, an interface that makes it easy for users with limited knowledge of *MIL-STD-2525B*, the military symbology specification, to add military symbols to their maps in ArcMap. The Symbol Editor allows you to choose the symbols that you want to populate your MOLE layers with from lists of military units, equipment, and installations. There are also dropdown lists containing values for MOLE symbol modifiers, such as affiliation, echelon, and order of battle. When you choose a symbol or a modifier the changes to the feature are stored in the Symbol_ID field in its attribute table. The Symbol Editor affords flexibility by also providing the option to bypass the lists and manually edit the 15-character symbol ID to change existing symbols.

Symbol ID

The Symbol ID field displays the 15-character Symbol ID of the currently selected symbol. When a different symbol is chosen from the symbol list or a new modifier value is assigned, the Symbol ID field is updated. The relevant components of the Symbol ID are also highlighted in green when you choose a symbol or click any of the modifier dropdown lists. You can manually modify the Symbol ID by checking the Allow Manual Editing check box and typing the desired values in the Symbol ID text boxes.

Battle dimension

MIL-STD-2525B divides force elements into groups based on their mission area within the battlespace. This is called the battle dimension. The battle dimensions defined by 2525B are air, ground, sea surface, sea subsurface, space, and special operations forces. Ground elements are further divided into units, equipment, and installations. MOLE organizes force elements into lists in the Symbol Editor according to the battle dimensions.



Clicking one of the battle dimension buttons and clicking Complete List will display all of the elements for that battle dimension in the symbol list frame.

Symbol list

The symbol list displays the elements within the selected battle dimension category. The currently selected element will be highlighted in the list. Clicking Complete List will display all elements within the chosen battle dimension category, while clicking Search allows you to search for specific elements by keyword. You can also save elements that you use often to a list of favorites by right-clicking the desired symbol and clicking Add

to Favorites. The favorites list for each battle dimension can be accessed by clicking the Favorites button.

Modifiers

Modifiers provide additional optional information about symbols. Various modifiers, described below, are available at the bottom of the Symbol Editor dialog box.

Affiliation: The Affiliation modifier refers to the threat presented by the selected force element. The primary values in this dropdown list are friendly, hostile, neutral, and unknown.

Type: The Type dropdown list contains values for the headquarters, feint/dummy, task force, and installation indicators.

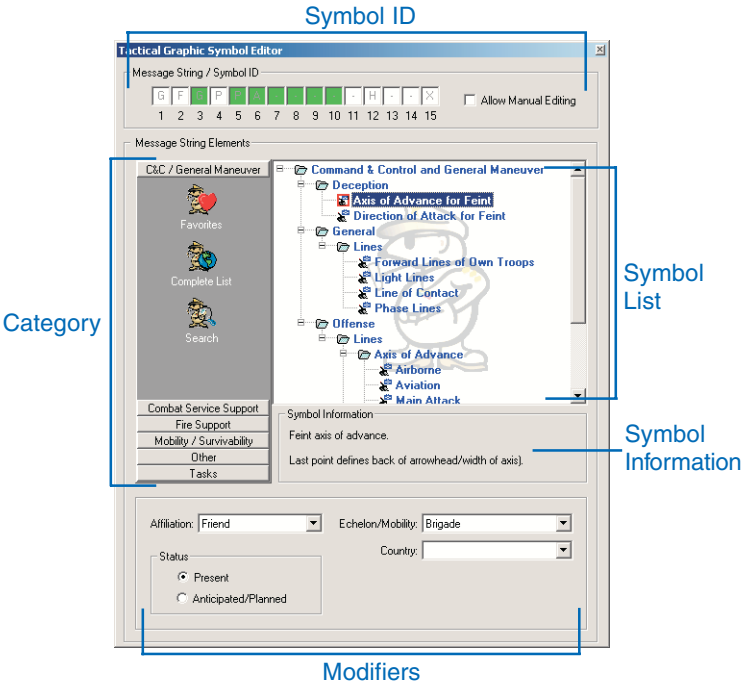
Echelon/Mobility: This dropdown list contains values for the echelon and mobility indicators. The echelon indicator refers to the command level of the selected unit symbol. The mobility indicator depicts the mobility of an equipment symbol.

Country: The Country dropdown list contains values that refer to the country that a symbol is associated with.

Order of Battle: The Order of Battle dropdown list contains values that provide supplementary information about the role of a symbol in battle.

Status: The Status modifier refers to whether an object is presently located at its identified position (present) or will be in the future (anticipated/planned).

Tactical graphic Symbol Editor



The MOLE tactical graphic Symbol Editor is similar to the force element Symbol Editor. The major difference is that instead of being grouped together based on the battle dimension property, tactical graphics are divided into groups, called categories, according to the type of military operation the graphic is related to. The categories are tasks, command/control and general maneuver, mobility/survivability, fire support, combat service support, and other. There are other differences as well—there are fewer modifiers to choose from, and there is a symbol information message displayed for the selected symbol describing it and its display characteristics.

Adding MOLE symbols in ArcMap

The easiest way to add symbols to MOLE feature classes in ArcMap is to use the MOLE Symbol Editor. Both force element symbols and tactical graphic symbols can be added with the Symbol Editor. You can also add or modify MOLE symbols by adding records with a valid Symbol ID value to the layer's attribute table. If your MOLE symbols are stored in a shapefile or other simple feature class, you can only add symbols in this way. This chapter will only cover the 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 symbols will not display.

See Also

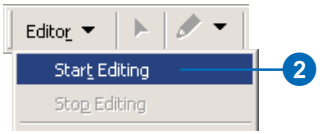
See Editing in ArcMap *for more information about using the ArcMap editor.*

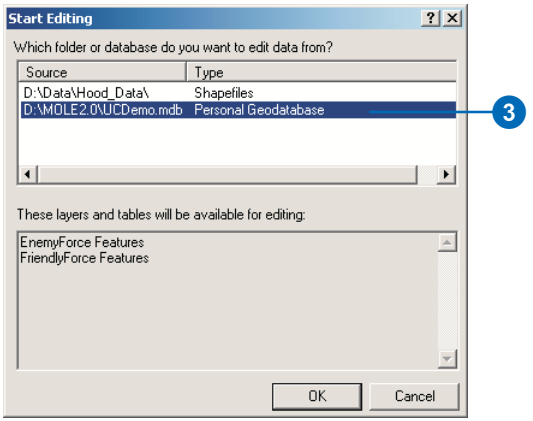
Adding MOLE force element symbols

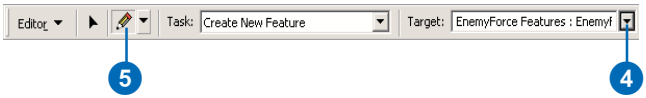
1. Click the Add MOLE Data button in the Military Overlay Commands toolbar. In the browse window, navigate to and open the desired force element layer.
2. Click the Editor dropdown arrow in the Editor toolbar and click Start Editing.
3. Choose the folder or database containing the MOLE layers you wish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

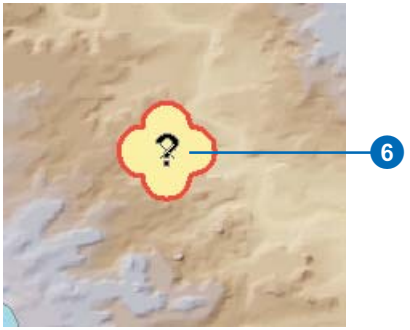
   If there are other editable feature classes displayed in the ArcMap data frame, the Start Editing dialog box will open.
4. Click the Target dropdown arrow in the Editor toolbar and click the MOLE layer you want to edit.
5. Click the Create New Feature button in the Editor toolbar, ensuring that Create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

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









7. Click the Attributes button in the Editor toolbar.

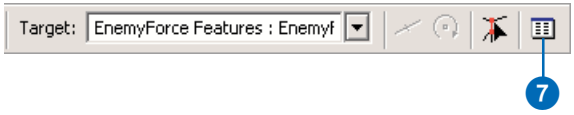
   The MOLE Attribute Editor will open.

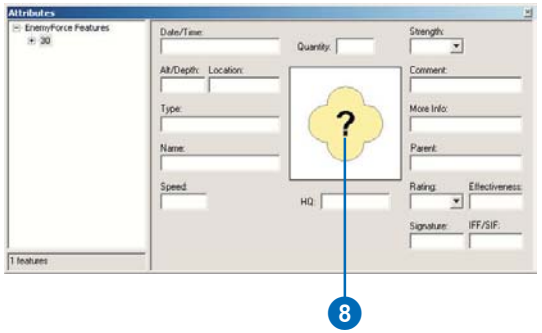
8. Click the symbol in the center of the Attribute Editor to open the MOLE force element Symbol Editor.

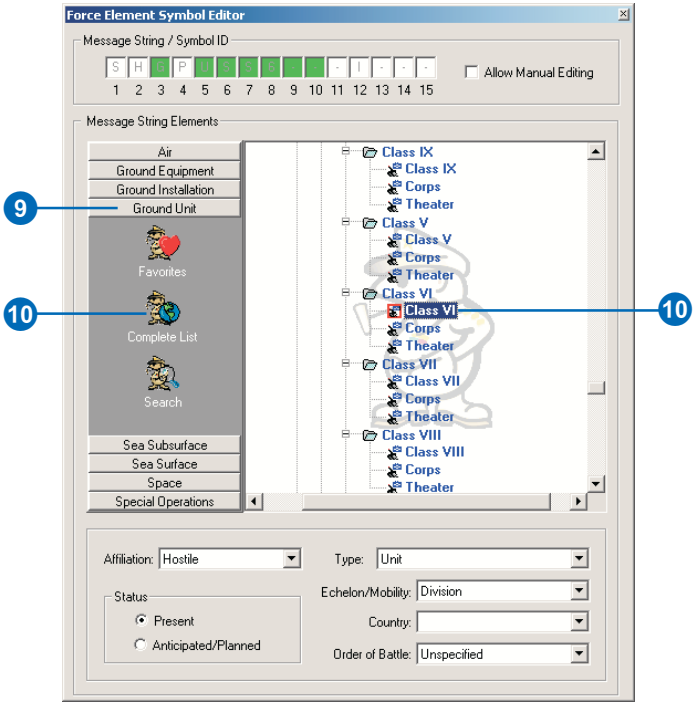
9. Click one of the battle dimension buttons on the left side of the Symbol Editor dialog box. Ground Unit is an example.

10. Click Complete List to display all of the available force elements for the category you chose in step 9, then click a force element from the list. Class VI is an example.

    You can also search for specific force elements and save favorites. Modify the remaining parameters at the bottom of the Symbol Editor dialog box as you wish. See the section 'The MOLE Symbol Editor' earlier in this chapter for more information on the Symbol Editor.







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 Table of Contents (TOC) so that the symbol may be selected and the MOLE Attribute and Symbol Editors accessed.

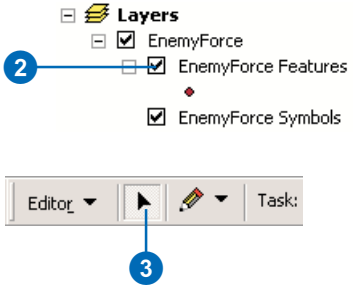
Symbol ID conflicts are also possible when you change a force element feature from one symbol to another. For example, if the existing symbol is an equipment-type symbol with a mobility value in the Symbol ID, and you change it to an air-type symbol, such as a bomber, that cannot have a mobility value, 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 wish to edit in the ArcMap TOC.
3. Click the Edit button in the Editor toolbar.
4. Click the MOLE feature you wish to edit in the data frame to select it.

   You must click the feature, rather than the symbol, to select it.
5. Click the Attributes button in the Editor toolbar.

   The MOLE Attribute Editor will open.
6. Click the symbol in the center of the Attribute Editor to open the MOLE Force Element Symbol Editor.
7. Follow steps 9 and 10 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 upon 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

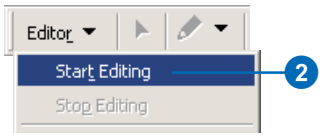
Creating arrow symbols

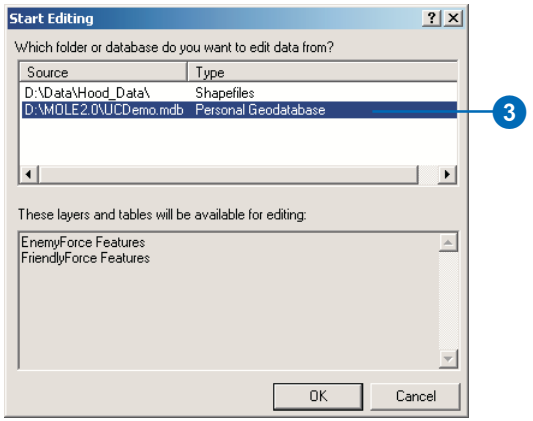
Many C2/General maneuver tactical graphic line symbols are arrows. To create the arrow shape, the last vertex you add must be placed behind and offset from the vertex placed before it. The last vertex defines the shape and size of the arrowhead, and, with certain symbols, the size of the symbol itself.

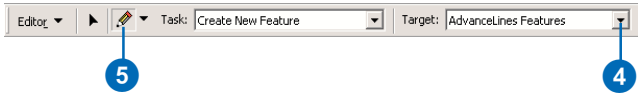
Adding MOLE tactical graphic symbols

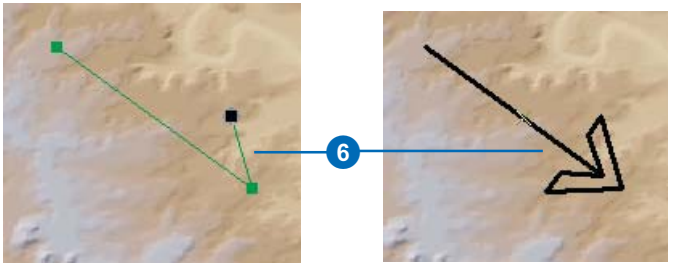
1. Click the Add MOLE Tactical Data button in the Military Overlay Commands toolbar. In the browse window, navigate to and open the desired tactical graphic layer.
2. Click the Editor dropdown arrow in the Editor toolbar and click Start Editing.
3. Choose the folder or database containing the MOLE layers you wish to edit and click OK. If there are other editable feature classes displayed in the ArcMap data frame the Start Editing dialog box will open.
4. Click the Target dropdown arrow in the Editor toolbar and click the MOLE layer you wish to edit.
5. Click the Create New Feature button in the Editor toolbar, ensuring that Create New Feature is selected in the Task dropdown list.
6. Click inside the data frame, placing vertices to form the type of feature (point, line, or area) you wish 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, by ▸









default the symbol for direction of main attack will be drawn.

7. Click the Attributes button in the Editor toolbar.

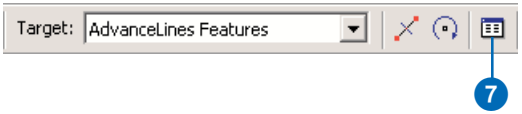
   The MOLE tactical graphic Attribute Editor will open.

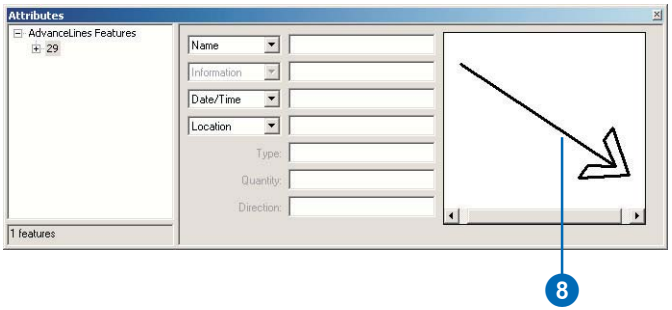
8. Click the symbol in the center of the Attribute Editor to open the MOLE Tactical Graphic Symbol Editor.

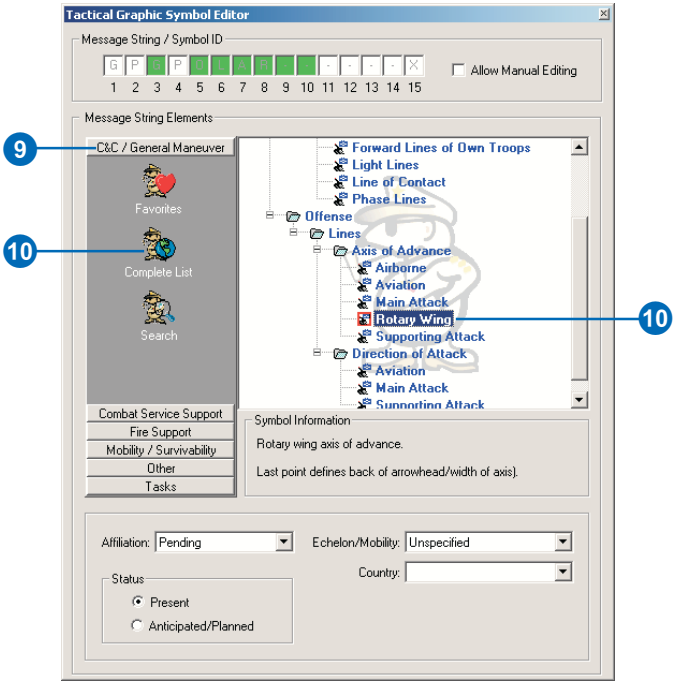
9. Click one of the category buttons on the left side of the Symbol Editor dialog box. C&C/General Maneuver is an example.

10. Click Complete List to display all of the available tactical graphics for the category you chose in step 9, then click a tactical graphic from the list. Axis of Advance/Rotary Wing is an example.

    You can also search for specific tactical graphics and save favorites. Choose values for the modifiers at the bottom of the Symbol Editor dialog box as you wish. See the section 'The MOLE Symbol Editor' earlier in this chapter for more information on the Symbol Editor.







Like force element layers, MOLE tactical graphic layers are group layers that are composed of a simple point, line, or polygon feature class layer with a MOLE symbology layer built around it. The feature class layer must be activated in the TOC so that its features may be selected for editing and the MOLE Attribute and Symbol Editors accessed. When you change a tactical graphic feature from one symbol to another you may need to modify the shape of the feature so that 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 will display the message Unable to Render Selected Feature in the Attribute Editor. The symbol will then be displayed as a simple magenta feature in the data frame.

See Also

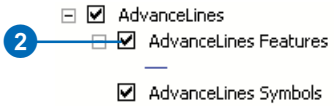
See the section 'Symbology rendering in MOLE' later in this chapter for more information.

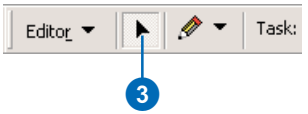
Editing MOLE tactical graphic symbols

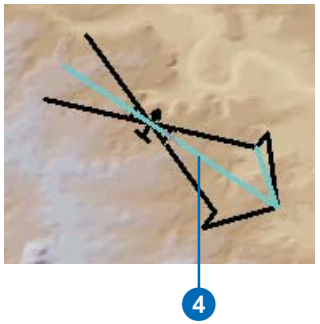
1. Open a MOLE tactical graphic layer in ArcMap, following the steps from the previous task, and start editing.
2. Check the feature layer check box of the MOLE tactical graphic group layer you wish to edit in the ArcMap Table of Contents (TOC).
3. Click the Edit button in the Editor toolbar.
4. Click the MOLE feature you wish to edit in the data frame to select it.

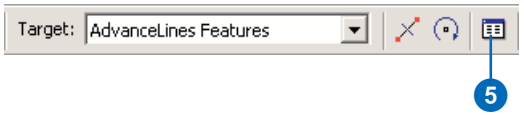
   You must click the feature, rather than the symbol, to select it.
5. Click the Attributes button in the Editor toolbar.

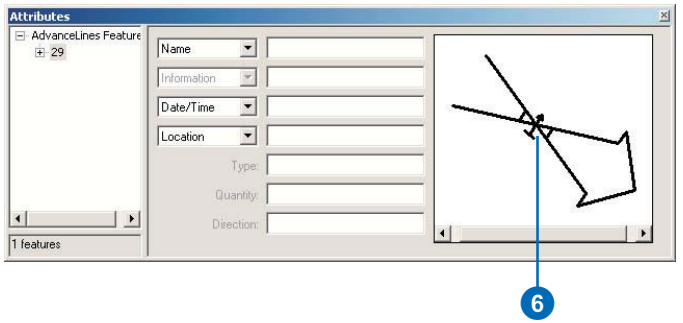
   The MOLE Attribute Editor will open.
6. Click the symbol in the center of the Attribute Editor to open the MOLE Tactical Graphic Symbol Editor.
7. Follow steps 9 and 10 from the previous task to select a new tactical graphic symbol.











Tactical graphic shortcuts

When adding tactical graphics it is possible to bypass the Symbol Editor and use the Add Tactical Graphic tool from the Military Tactical Graphics Toolbar to add symbols. The advantage of using the shortcut to add tactical graphic symbols is that all of the available symbols can be accessed from a dropdown list in the toolbar. Thus it requires less steps to add a symbol in this way. The disadvantage is that when you add a symbol with the Add Tactical Graphic tool it places a generic four-point line or area in the map, which you must reshape by adding, deleting, and moving vertices. So one method is not necessarily better than the other—you simply have more options for adding tactical graphic symbols.

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

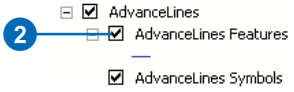
See the section 'Symbology rendering in MOLE' later in this chapter for more information about tactical graphic renderers.

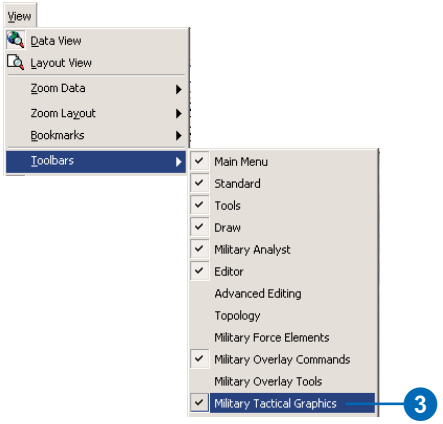
Adding tactical graphics using the Military Tactical Graphics toolbar

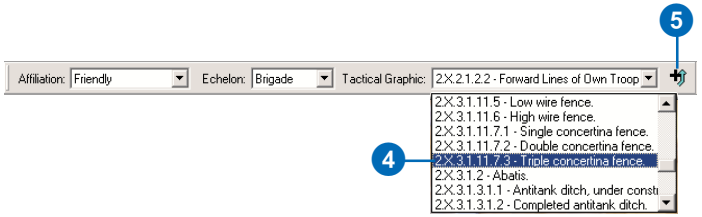
1. Following steps 1–4 from 'Adding MOLE tactical graphics' earlier in this chapter, open a tactical graphic layer and start editing.
2. In the ArcMap TOC check the feature layer check box of the MOLE tactical graphic group layer you wish to edit.
3. Click View from the ArcMap Main menu, click Toolbars, then click Military Tactical Graphics to open that toolbar.
4. Click the Tactical Graphic dropdown arrow in the Military Tactical Graphics toolbar and click the symbol you want to add.

   You can also set the values for the Affiliation and Echelon modifiers from the appropriate dropdown list.
5. Click the Add Tactical Graphic button in the Military Tactical Graphics toolbar.
6. Click inside the data frame 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 will be placed in the data frame. ▸



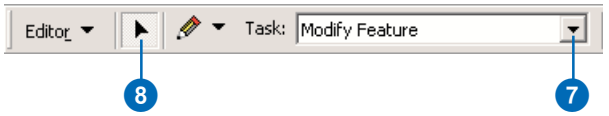


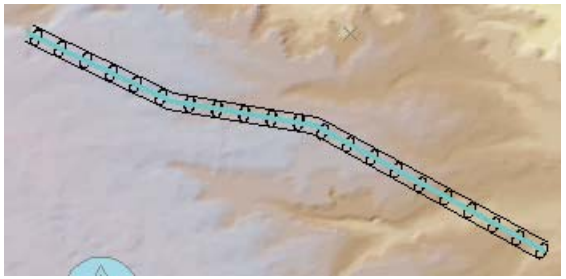


See Also

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

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





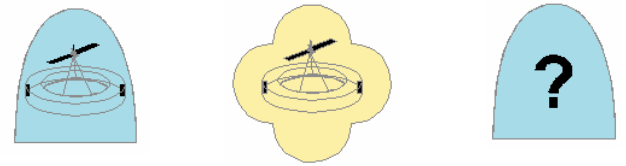
Symbology rendering in MOLE

MOLE contructs its symbology according to the 15-character Symbol ID code. See Chapter 1, 'Introducing MOLE', for more information on the Symbol ID. The moleCore.mdb database contains many tables that relate specific characters and combinations of characters in the Symbol ID to Computer Graphics Metafile (CGM) 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.

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 of 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 affilliation is unknown or pending, the shape will also be 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 shape of the symbol; 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 will handle it 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 will display 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 will display the symbol with the appropriate frame with a question mark icon inside. See the illustrations below for an example.



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.

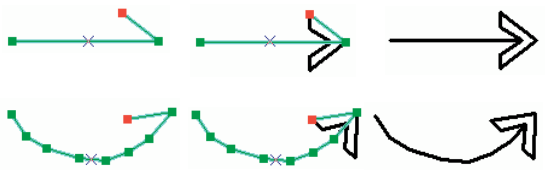
The third figure represents a space station symbol with an invalid function ID. The battle dimension (Space) corresponds to the type/echelon/mobility, so MOLE draws the appropriate frame for a Space symbol but fills it with a question mark because it doesn't recognize the function ID value.

Tactical graphic line rendering

Because there is such a large number of 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 and the symbols they support are listed in the table on the following page. The renderers are also listed in the tactical graphic symbols' Layer Properties dialog box, where you can activate and disable the renderers 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, the appropriate renderer must be enabled and the feature must be drawn with the required properties for the symbol to be displayed properly. 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 needs to 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 examples below. 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.

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. See the section 'Tactical graphic Attribute Editor' earlier in this chapter for information on this. 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.

Tactical Graphic Line Renderers

Renderer	Symbol	Rendering Properties
Arrows (3-point)	Axis of Advance for Feint	1
	Direction of Attack for Feint	2
	Axis of Advance: Airborne	1
	Axis of Advance: Aviation	1
	Axis of Advance: Main Attack	1
	Axis of Advance: Rotary Wing	1
	Axis of Advance: Supporting Attack	1
	Direction of Attack: Aviation	2
	Direction of Attack: Main Atack	2
	Direction of Attack: Supporting Attack	2
Linear Graphics	Bridge or Gap	5
	Lane	5
	Light Lines	4
	Phase Lines	4
Multipoint Arrows	Axis of Advance for Feint	1
	Direction of Attack for Feint	2
	Axis of Advance: Main Attack	1
	Axis of Advance: Supporting Attack	1
	Direction of Attack: Aviation	2
	Direction of Attack: Main Atack	2
	Direction of Attack: Supporting Attack	2
FLOT	Forward Lines of Own Troops	3
	Line of Contact	3
Linear Obstacles	Abatis	4
	Antitank Ditch: Complete	4
	Antitank Ditch: Under Construction	4
	Antitank Ditch, Reinforced with Mines	4
	Antitank Wall	4
	Obstacles: Belt	4
	Obstacles: Line	4
	Mine Cluster	5
	Obstacle Effect: Block	6
	Obstacle Effect: Disrupt	6
	Obstacle Effect: Fix	5
	Obstacle Effect: Turn	5
	Explosives, State of Readiness 1 (Safe)	6
	Explosives, State of Readiness 1 (Armed-But Passable)	6
	Planned	6
	Roadblock Complete (Executed)	6
	Concertina Fence: Double Strand	4
	Concertina Fence: Single Strand	4
	Concertina Fence: Triple Strand	4
	Concertina Fence: Double Apron Fence	4
	Concertina Fence: Double Fence	4
	Concertina Fence: High Wire Fence	4
	Concertina Fence: Low Wire Fence	4
	Concertina Fence: Single Fence	4
	Concertina Fence: Unspecified	4

Rendering Properties: 1 = Last point defines back of arrowhead/width of axis; 2 = Last point defines back of arrowhead; 3 = Multipoint polyline; 4 = Simple polyline; 5 = 2-point line; 6 = 3-point polyline

Controlling the MOLE display

5

IN THIS CHAPTER

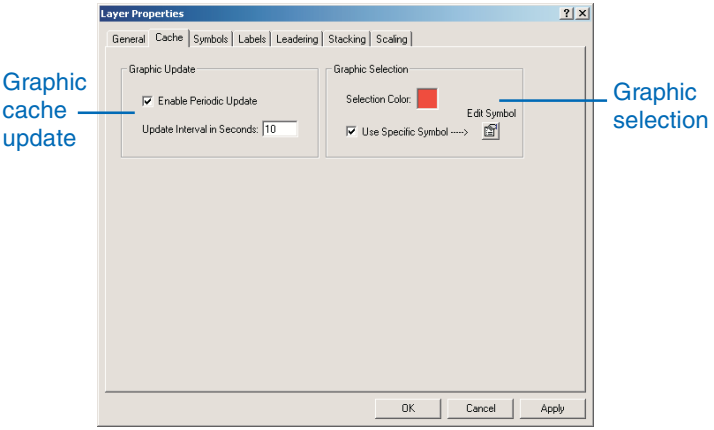
- The force element Layer Properties dialog box
- The tactical graphics Layer Properties dialog box
- MOLE toolbars
- Modifying force element symbols with the MOLE toolbars
- Leadering individual force element symbols

When you create a map, next to data accuracy and integrity the most important aspect of the map is its 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 MOLE toolbars. The various methods available in MOLE to modify the display properties of military symbols will be 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 MOLE toolbars. However, changes made from tools in the toolbars are applied to all MOLE force element layers currently displayed in the data frame. If you only want to modify the properties of a particular MOLE layer you must do it through the Layer Properties dialog box.

Cache tab



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

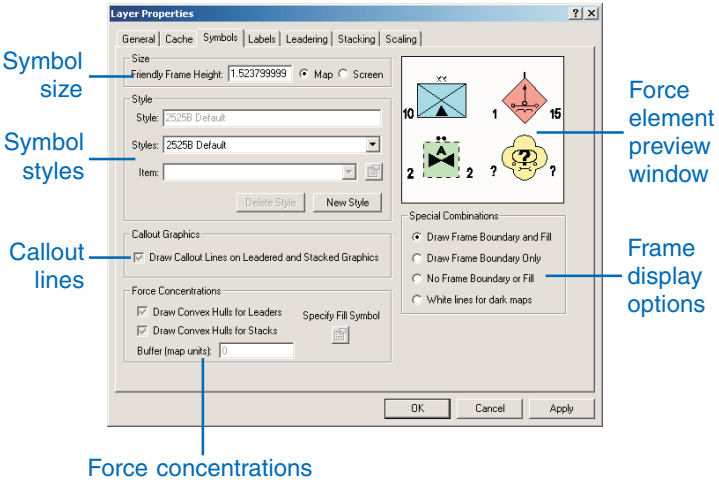
Graphic cache update

When MOLE renders symbols in ArcMap it stores the graphics in a cache so that it doesn't have to re-render the graphics every time the display is refreshed, as with panning and zooming. This includes MOLE symbols, leader lines, callout lines—any graphics 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 in the Military Overlay Commands 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 in 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 Layer Properties 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.

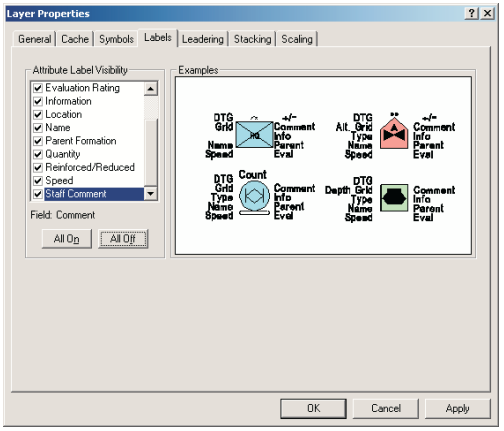
Frame display options

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.

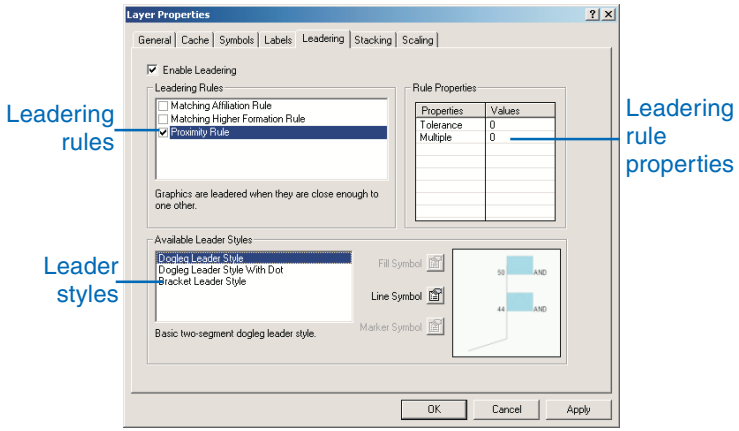
Labels tab



From the Labels tab you can select the text modifiers that you want to be displayed around the force element symbols. The text modifier values can be entered in the force element Attribute Editor or in the appropriate fields in the layer attribute table. See

the section ‘The MOLE Attribute Editor’ 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 three different 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 Higher Formation Rule groups together units that have the same higher formation, or parent, attribute value.

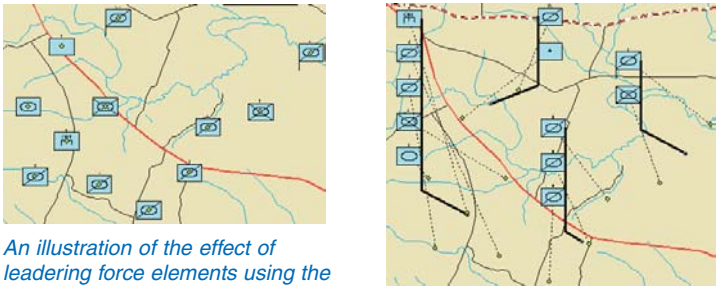
The Proximity Rule groups together symbols that are within a certain distance of each other. The distance is set in the Rule Properties section of the Leadering tab. Symbols must satisfy all selected rules to be placed on a leader.

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 in the Symbols tab to determine the leadering distance. If values are entered in both the Tolerance and Multiple fields, the Multiple value takes precedence.

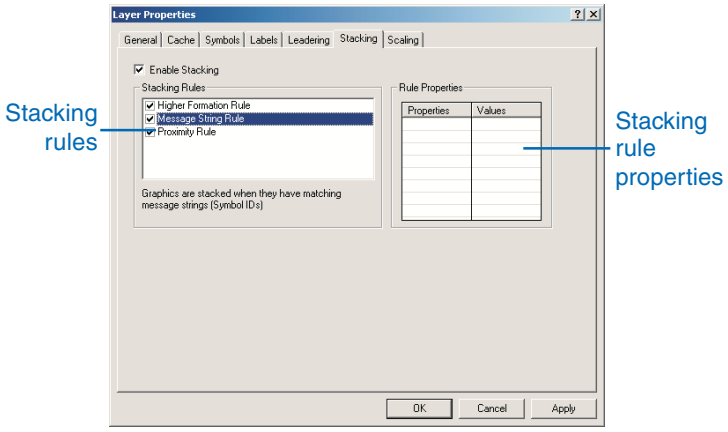
Leader styles

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.



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

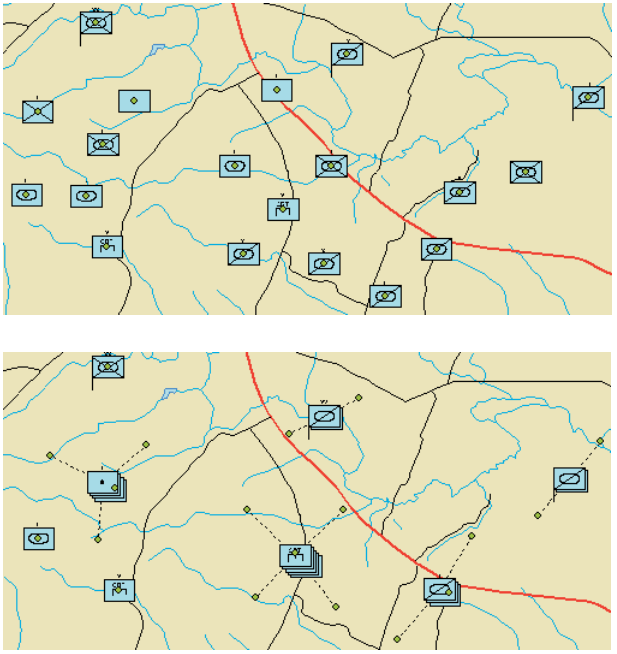
Stacking tab



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 in the Layer Properties dialog box are placed on top of each other.

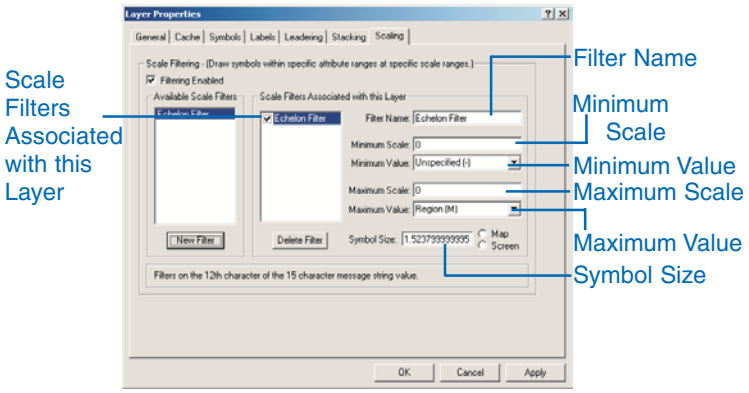
Stacking rules

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 this and the previous page. The stacking rule properties are the same as the leadering rule properties and are also described earlier on this 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 illustrations on the following page, which show how symbols are stacked when the Higher Formation Rule and Proximity Rule are applied.



The screenshots 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 data frame, the symbols will be displayed or hidden, based on the filters you create in 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 box 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.

Scale Filters Associated with this Layer

This list box 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 here.

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 furthest 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.

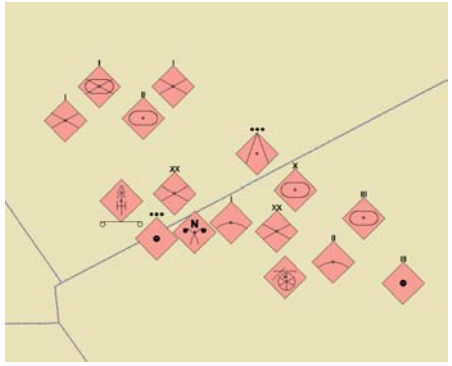
Maximum Value

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

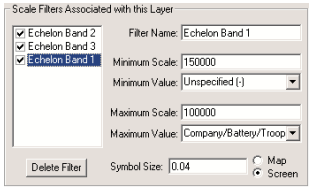
Symbol Size

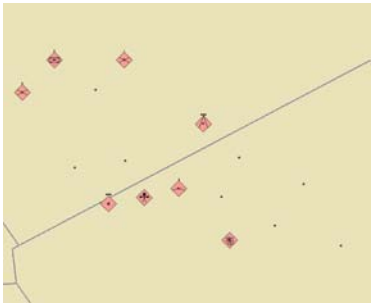
The value in the Symbol Size text box represents the size at which symbols satisfying the filter's echelon criteria will be displayed. You can set a new value for the filter, with the option of selecting map or screen units for the size. See the description of the Symbols tab earlier in this chapter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



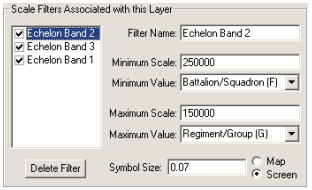
1

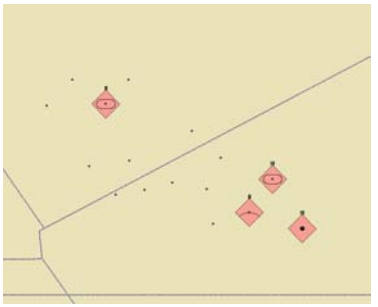




The first scale filter specifies that symbols with an echelon value up to Company/Battery/Troop, including those with an unspecified echelon value, will be displayed with a symbol height of four percent of the data frame height when zoomed in at scales between 1:100,000 and 1:150,000.

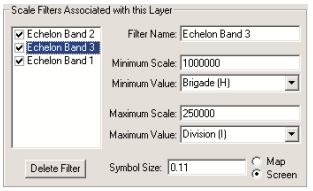
2

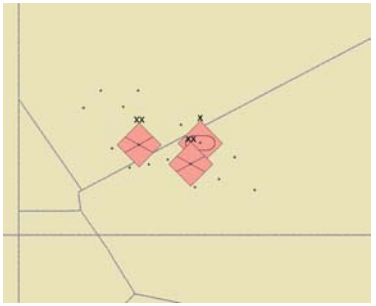




The second scale filter specifies that symbols with an echelon value between Battalion/Squadron and Regiment/Group will be displayed with a symbol height of seven percent of the data frame height when zoomed in at scales between 1:150,000 and 1:250,000.

3





The third scale filter specifies that symbols with an echelon value between Brigade and Division will be displayed with a symbol height of eleven 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 then the number.

See Also

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

Changing the symbol size

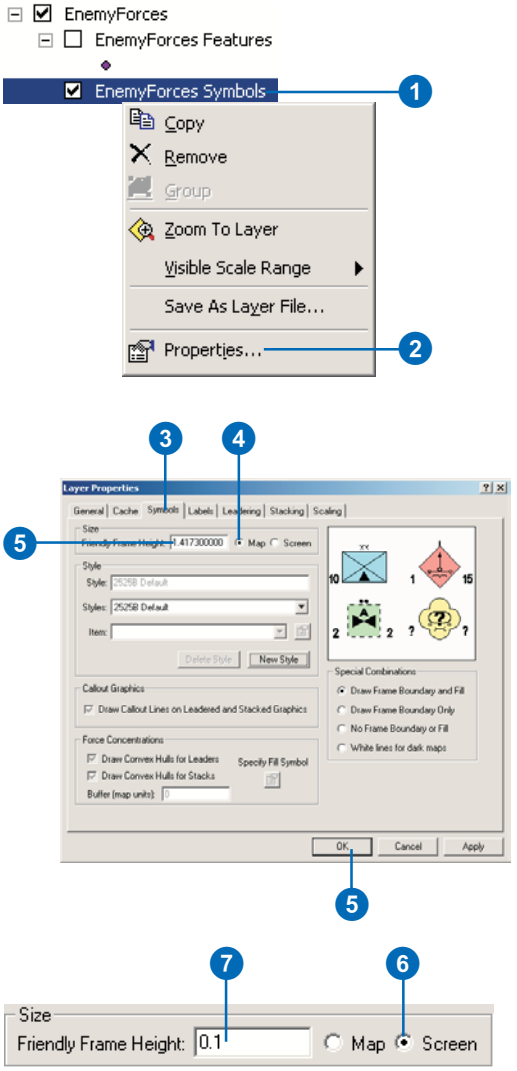
1. Right-click the Symbols layer of a MOLE force element group layer in the ArcMap TOC.
2. Click Properties from the popup menu.

   The Layer Properties dialog box will open.
3. Click the Symbols tab in the Layer Properties dialog box.
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 data frame 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 data frame and note that the symbols maintain a constant size relative to the data frame.

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

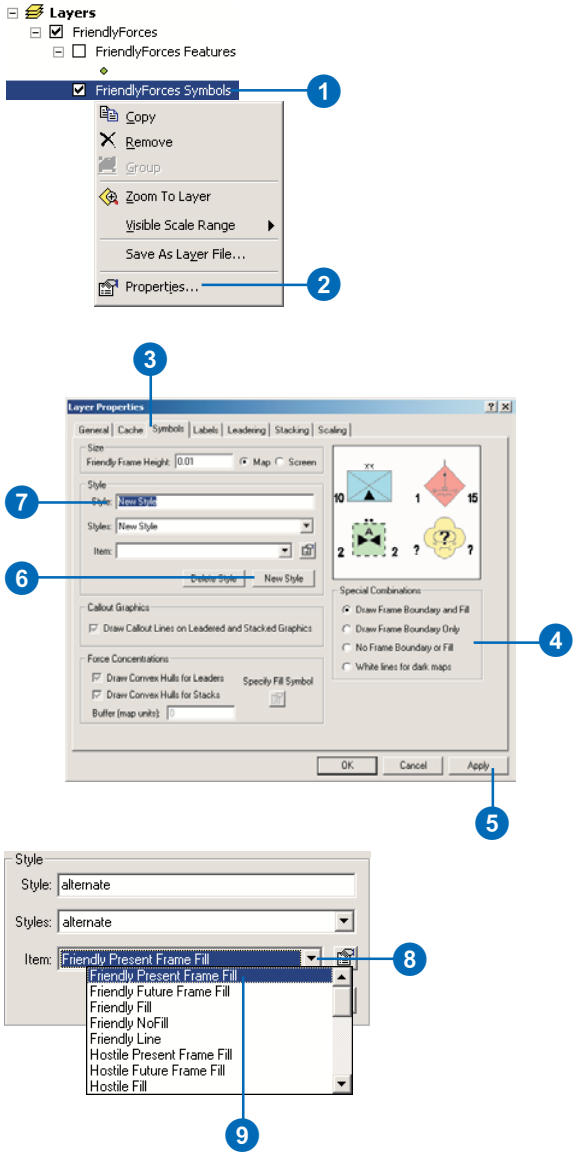


Changing symbol frame properties

By default, MOLE displays force element symbols according to the specifications of *MIL-STD-2525B*. MOLE does allow you to modify the fill color and style of force element symbols, however. You can define new style parameters for individual layers from the Symbols tab in the Layer Properties dialog box. It is important to note that the styles you create for a layer will be saved with the map document that the layer is within, rather than with the layer itself.

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

   The Layer Properties dialog box will open.
3. Click the Symbols tab.
4. Alternately click each button in the Special Combinations section and note the changes made by each option in the preview window.
5. Click Apply to see the changes in the data frame.
6. Click New Style in the Style section of the Symbols page.
7. Highlight New Style in the Style text box and type a new name for the style.
8. Click the Item dropdown arrow.
9. Click an item to change for the relevant symbol affiliation from the dropdown list. Friendly Present Frame Fill is an example. This will set the overall symbol fill color for the selected layer. ▸



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, joker, or faker affiliation value. Items with a Hostile prefix will affect hostile 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.*

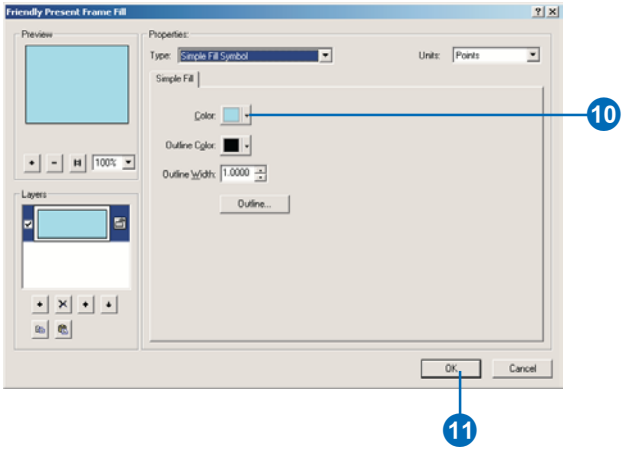
10. Click the Color dropdown arrow and click a color from the palette. In this case orange will be selected.

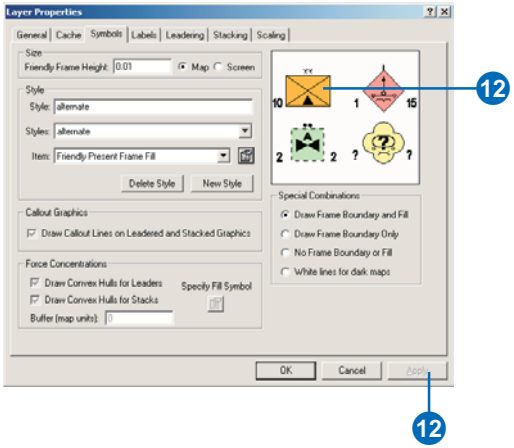
    You can change the fill type, fill color, outline style, and outline color in the Friendly Present Frame Fill dialog box.

11. Click OK in the Friendly Present Frame Fill dialog box.

12. The appropriate symbol in the Layer Properties preview window will reflect the changes. Click Apply to view the changes in the data frame.

    The symbology schemes you create will be saved with the map document and listed in the Styles dropdown list in the Symbols tab of the Layer Properties dialog box. Selecting 2525B Default from the Styles dropdown list will restore the symbols to the original style.





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 will also be 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.

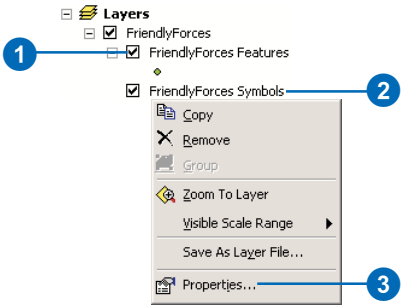
See Also

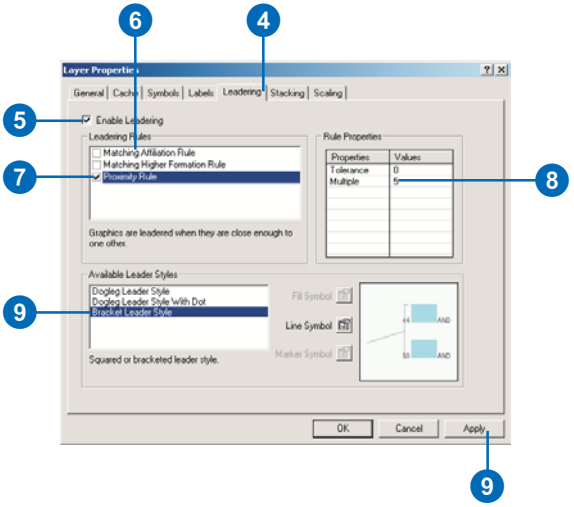
See the section 'Leadering tab' earlier in this chapter for more information on leadering.

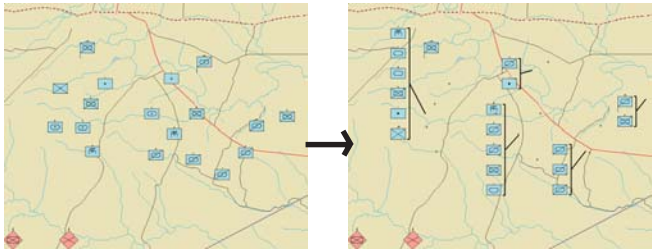
1. Check the Features layer check box of a MOLE force element group layer in the ArcMap TOC.
2. Right-click the Symbols layer of the same force element group layer.
3. Click Properties from the popup menu to open the Layer Properties dialog box.
4. Click the Leadering tab in the Layer Properties dialog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

   The Rule Properties will be enabled.
8. Left-click and drag over the Multiple value in the Rule Properties text box to highlight 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

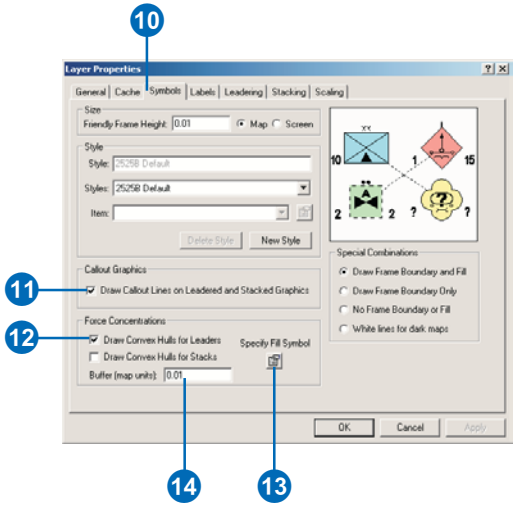
You can change the callout line style by following the steps in 'Changing symbol frame properties', earlier in this chapter; select Callout Lines from the Items dropdown list.

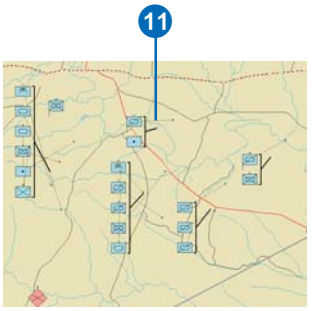
10. Click the Symbols tab in the Layer Properties dialog box.
11. Check the Draw Callout Lines on Leadered and Stacked Graphics check box and click Apply.

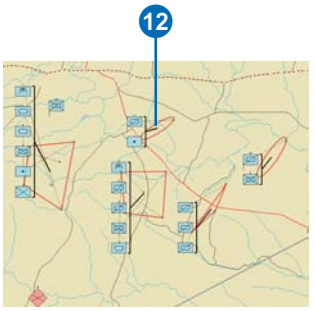
    Dashed lines will be displayed connecting the symbols to their point features.
12. Check the Draw Convex Hulls for Leaders check box, then click Apply.

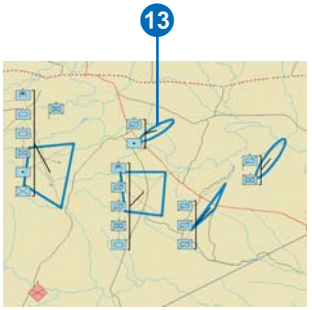
    The groups of point features, or ground locations, of symbols that are leadered together will be encircled by a red line.
13. Click the Specify Fill Symbol button and choose a new color or style for the outline.

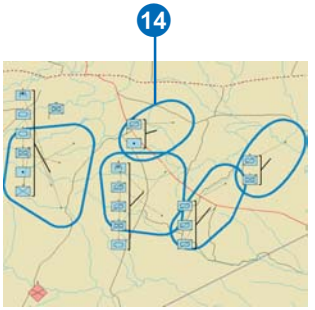
    This step is optional. The default style is a two-point red line.
14. Type a value by which to buffer the convex hull outlines in the Buffer text box. The value will be in map units. This step is optional.











Tip

Stacking rules

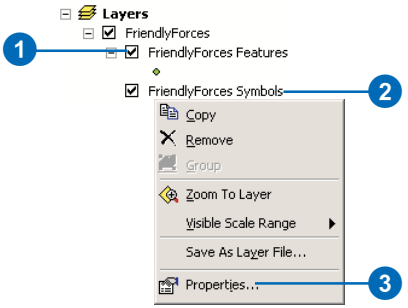
You can select more than one stacking rule, and you can stack and leader force element symbols simultaneously.

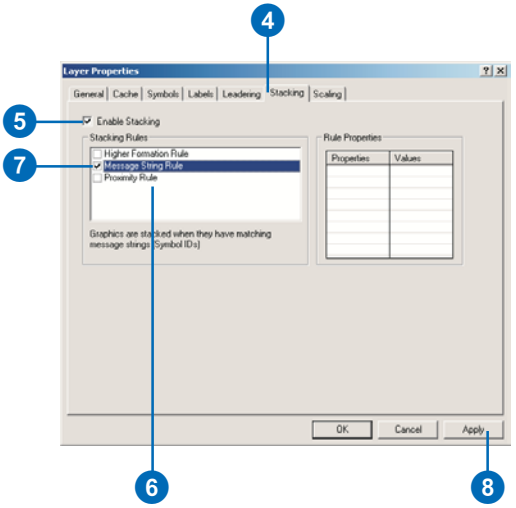
Setting stacking properties

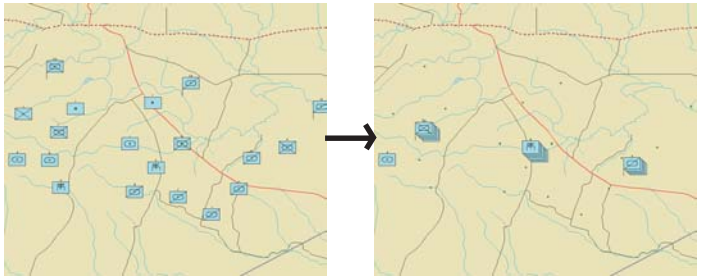
1. Check the Features layer check box of a MOLE force element group layer in the ArcMap TOC.
2. Right-click the Symbols layer of the same force element group layer.
3. Click Properties from the popup menu to open the Layer Properties dialog box.
4. Click the Stacking tab in the Layer Properties dialog 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 will be 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. ▸







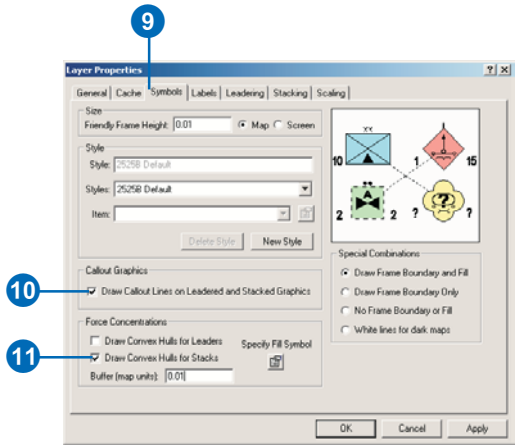
See Also

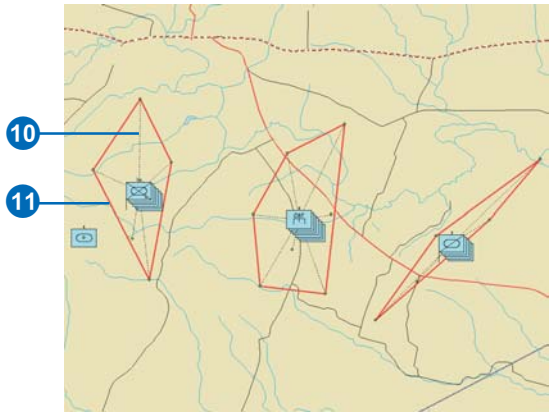
You can also apply a buffer to the convex hull (force concentration) outline. See the previous task, 'Setting leadering properties', for more information.

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

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

    The points whose symbol are grouped in individual stacks will be 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

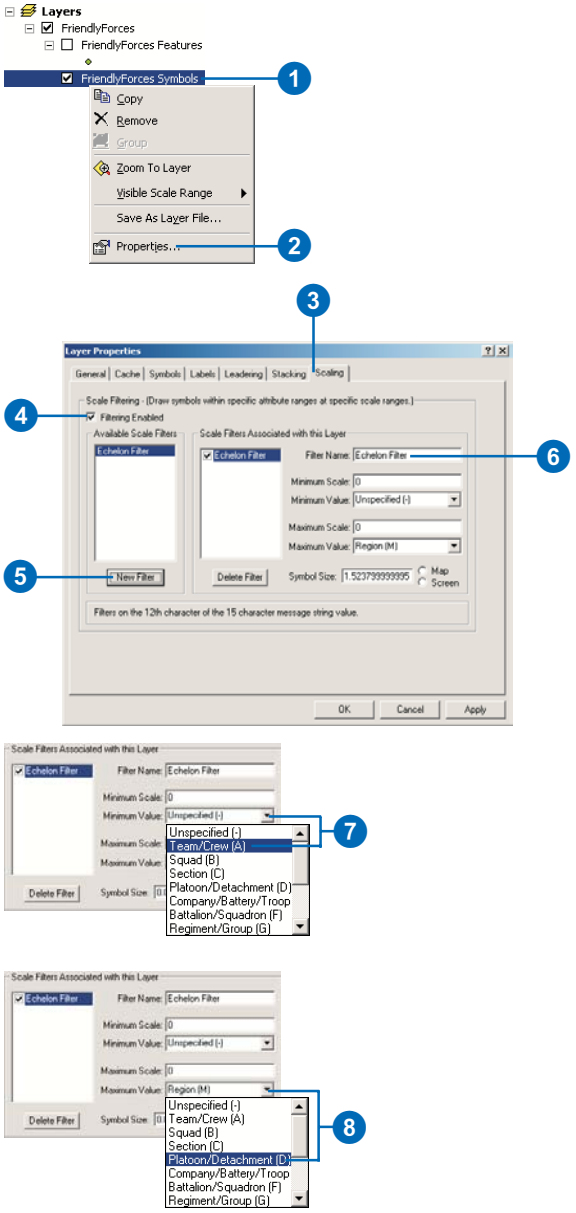
1. Right-click the Symbols layer of a MOLE force element group layer in the ArcMap TOC.
2. Click Properties from the popup menu.

   The Layer Properties dialog box will open.
3. Click the Scaling tab in the Layer Properties dialog box.
4. Click the Enable Scaling check box.
5. Click the New Filter button.

   The Scale Filters Associated with this Layer section of the Scaling tab will become active, and the name of the new filter will appear in the list box of that section. Echelon Filter is the default name.
6. Highlight 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 value that you want symbols to have to be displayed with the filter.
8. Click the Maximum Value dropdown arrow and click the largest echelon value that you want symbols to have to be displayed with the filter. ▸



Tip

Symbol size units

Selecting Map sets the units for the symbol size to map units—the units of measure for the layer, established by its coordinate system. Selecting 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 data frame, 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 want do not want the symbols to be displayed when you are zoomed in past 1:50,000 in the data frame, type “50000” in the Maximum Scale text box.

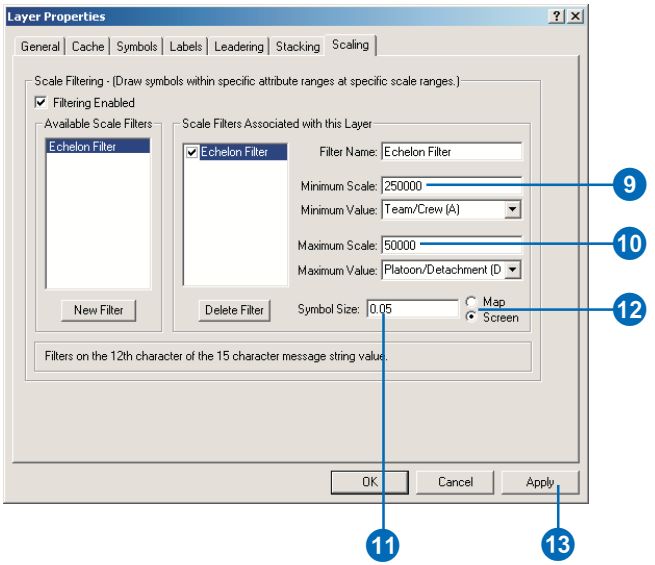
Specify the symbol size

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.

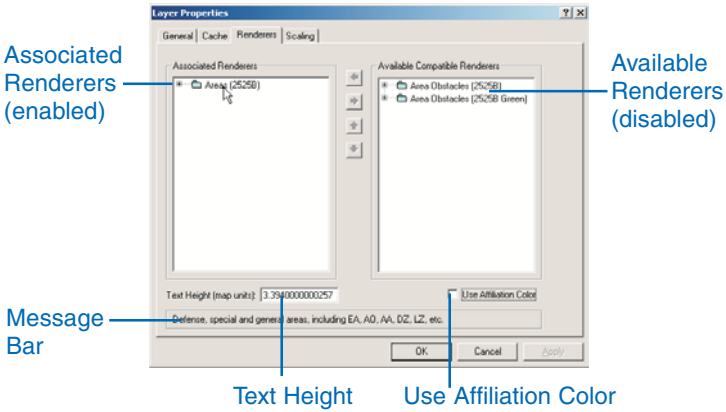
13. Click Apply.

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



The tactical graphic Layer Properties dialog box

Renderers tab



The Rendering tab for a tactical graphic area layer is shown here. The functionality is the same for tactical graphic lines, points, and boundary lines 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 in the Renderers tab of the tactical graphics 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 Renderers

The Available Renderers list displays all of 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

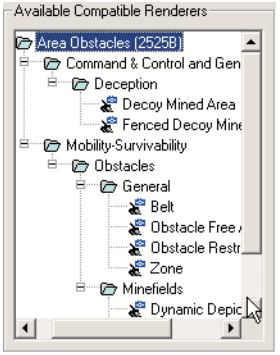
The Associated Renderers list displays the renderers that are enabled for the selected tactical graphic layer. Symbols that are supported by the renderers in this list will be displayed by MOLE with their MIL-STD-2525B symbology. Note that by default, when a tactical graphic line layer is opened in ArcMap, 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 cursor 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 symbols corresponding to the renderers displayed in the list, placing the cursor over the symbol names will also cause a description of the symbol to be displayed in the message bar.

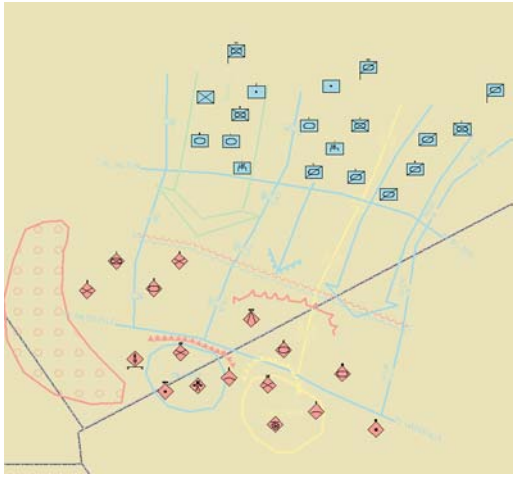


When the listed renderers are expanded, the MOLE symbols associated with each renderer are displayed.

Use Affiliation Color

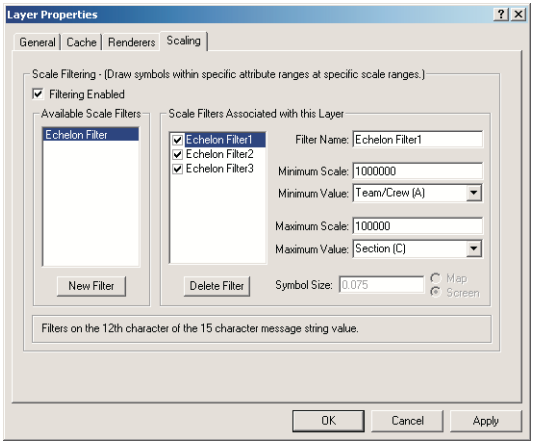
MIL-STD-2525B specifies that tactical graphic symbols be displayed with a color based on their affiliation property. See the list below to see the colors associated with each affiliation. In practice, however, tactical graphics are generally displayed in black. For this reason, by default, tactical graphic 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 screen shot below shows how tactical graphic symbols appear when displayed with their affiliation color.

Affiliation	Color
Friendly/Joker/Faker/Assumed Friend	Blue
Hostile/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. Refer to it for more information about scaling.

Enabling tactical graphic renderers

When you first open a MOLE tactical graphic layer in ArcMap, not all of the renderers are activated. For example, when you open a tactical graphic line layer, the only renderers that are enabled by default are the Arrows and Linear Graphics renderers. If you try to add an obstacle symbol to your layer the MOLE symbology will not be displayed, because the Linear Obstacles renderer is not enabled. You need to open the Layer Properties dialog box for that layer and associate the necessary renderers to see the MOLE symbology.

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 cursor over a renderer or a symbol name, a description of the selected item appears in the message bar.

See Also

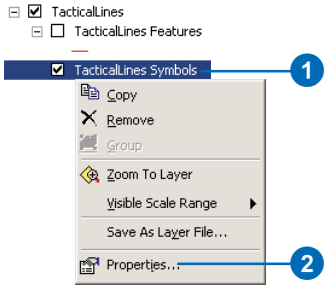
See the section 'Symbology rendering in MOLE' in Chapter 4, 'Adding MOLE symbols in ArcMap'.

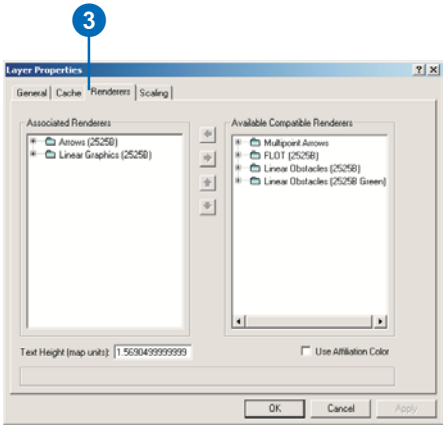
In this example, some of the symbols in a tactical graphics line layer are not initially being displayed with their MOLE symbology.

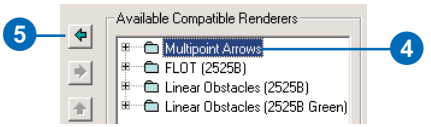
1. Right-click the Symbols layer of a MOLE tactical graphic group layer in the ArcMap TOC.
2. Click Properties from the popup menu.

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

   The disabled renderers will be 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 Left 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. ▸







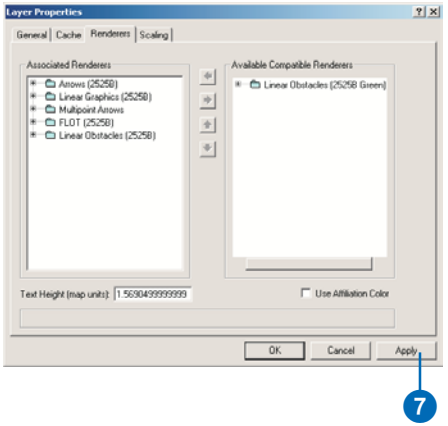
Tip

Disassociating renderers

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

7. Click Apply.

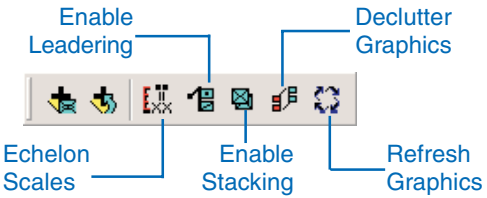
   The renderers in the Associated Renderers list will now be enabled and the symbols supported by them will be displayed in the data frame.



MOLE toolbars

Most of the functions that MOLE supplies in the Layer Properties dialog box for modifying the display of force element symbols are also available in the Military Overlay Commands toolbar. Additional tools for changing the display properties of force element symbols can be found in the Military Overlay Tools and Military Force Elements toolbars. The main difference between the toolbar and Layer Properties functions is that modifications made with the toolbar functions are applied globally, to all force element layers in the map document, while changes made with the Layer Properties functions are restricted to individual layers.

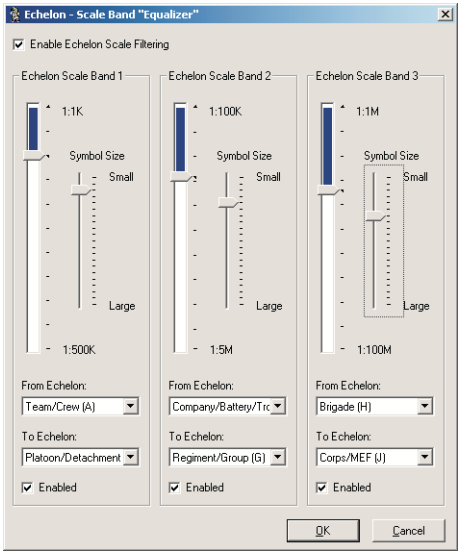
Military Overlay Commands toolbar



The Military Overlay Commands toolbar is the primary MOLE toolbar. It allows you to open MOLE layers—as discussed in the previous chapter—provides a shortcut for leadering and stacking force element symbols, and allows you to set scale-dependent display of force element layers.

Echelon Scales

Clicking the Echelon Scales button opens the Echelon Scale Band Equalizer dialog box. This dialog provides a graphical interface that allows you to easily set up scale-dependent display for all force element layers in the map document based on their echelon property. Unlike the Scaling tab in 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 slidebars in the Scale Band Equalizer make it easy to set scale-dependent display for MOLE force element layers.

Enable Leadering

Clicking the Enable Leadering button causes the symbols in all of the force element layers in the ArcMap data frame to be leadered. Clicking this button has the same effect as checking the Enable Leadering check box in the Layer Properties dialog box—the leadering rules that are selected in 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 Enable Leadering button is clicked. To disable leadering, click the Enable Leadering button again.

Enable Stacking

Clicking the Enable Stacking button causes the symbols in all of the force element layers in the ArcMap data frame to be stacked.

Clicking this button has the same effect as checking the Enable Stacking check box in the Layer Properties dialog box—the stacking rules that are selected in the Layer Properties dialog box of each force element layer will be applied to that layer.

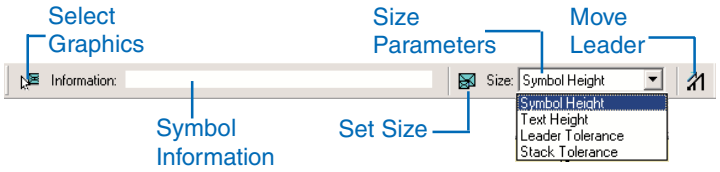
Declutter Graphics

The Declutter Graphics tool places overlapping force element symbols on individual leaders and moves them to new locations to clean up the display.

Refresh Graphics

Click the Refresh Graphics button to refresh the display of MOLE symbols. This applies to both force element and tactical graphic layers.

Military Overlay Tools toolbar



The Military Overlay Tools toolbar provides a variety of shortcuts for controlling the display of MOLE layers in ArcMap and getting information about symbol properties.

Select Graphics

The Select Graphics tool serves the same function as the ArcMap Select Features tool, but operates exclusively on MOLE force element symbols. It allows you to select force element symbols without having the Features component of the force element group layer displayed. You can click on an individual symbol to select it, click and drag a box around several symbols to select them, or simultaneously press the Ctrl key and click to select multiple symbols.

Symbol Information

When you select a force element symbol with the MOLE Select Graphics tool, its Name, Parent, and Symbol ID attribute values are displayed in the Information list box. If the text string in the list box is too long to be displayed in its entirety, click inside the list box and use the arrow keys to scroll to the end of the text string.

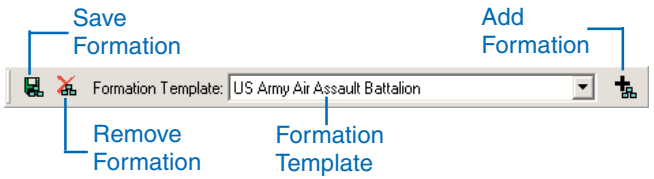
Size Parameters

The Size dropdown list, in conjunction with the Set Size tool, provides shortcuts for modifying the following MOLE symbol properties: force element Symbol Height, Text Height for labels, Leader Tolerance—minimum distance in map units that symbols need to be from each other to be grouped together on a leader—and Stack Tolerance—minimum distance in map units that symbols need to be from each other to be stacked together. Select one of the properties to modify from the list, click the Set Size 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 modifier is applied to labels of all MOLE layers in the data frame, including tactical graphic layers.

Move Leader

The Move Leader tool assists you in cleaning up your map when you have many leader lines displayed. Use it to reposition leadered symbols in the data frame. Click the Move Leader button, then click on a leader and drag it to a new location.

Military Force Elements toolbar



In addition to leadering and stacking, MOLE provides another way to organize force element symbols in the data frame. By using the tools in the Military Force Elements toolbar you can define formation templates, which are groups of force element symbols that you can save and add to other force element layers. Formation templates are useful if there are combinations of force element symbols that you use frequently. For example, if you often map a particular infantry division with all of its subordinate units, creating a formation template for the division would save you time and prevent you from having to add each individual unit.

Save Formation

Click the Save Formation button to create a formation template for a group of force element symbols that you have selected in the ArcMap data frame. The new formation will be added to the Formation Template dropdown list.

Remove Formation

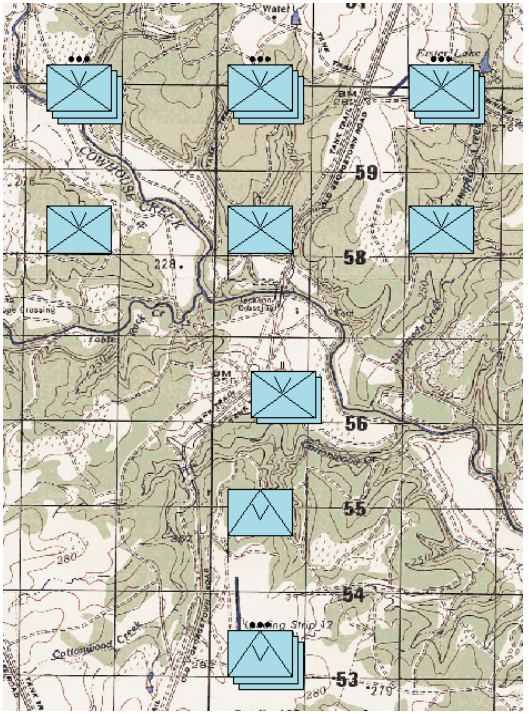
Select a formation in the Formation Template dropdown list and click the Remove Formation button to delete it.

Formation Template

The Formation Template dropdown list displays the available formations. MOLE provides two example formations out of the box: a US Army Air Assault Battalion formation and a US Army Mechanized Infantry Battalion.

Add Formation

To add a formation to your map, select a formation from the Formation Template dropdown list and click the Add Formation button. The symbols in the formation will be displayed in the same position relative to each other as they were when you created the formation. Once you add the formation you can move and modify the symbols within the formation as you would with any force element symbol. You must be in edit mode in ArcMap to add a formation.



MOLE includes two example formation templates, including one depicting a US Army Air Assault Battalion, which is pictured here.

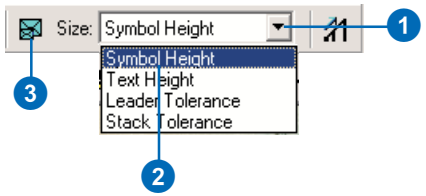
Modifying force element symbols with the MOLE toolbars

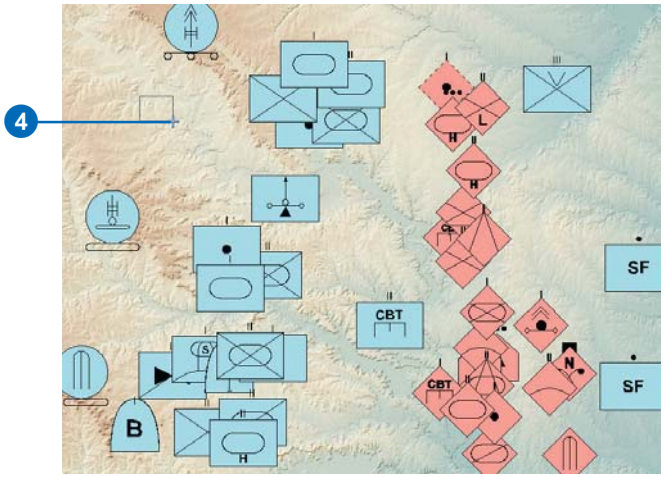
MOLE supplies a shortcut for changing the size of force element symbols displayed in the ArcMap data frame. By using the Set Size tool in the Military Overlay Tools toolbar you can bypass the Layer Properties dialog box and set the symbol size for all force element symbols in your map by drawing a box in the data frame. The height of the box defines the height of the symbols. This is especially useful in situations where the coordinate system of the force element layers in your map is different than the coordinate system of the ArcMap data frame. If you add a MOLE force element layer with a geographic coordinate system to a map with a UTM projection, the force element symbols may not appear in the data frame. 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 are too small to be seen. Following the steps outlined here, you can easily remedy the situation by using the Set Size tool to change the symbol size.

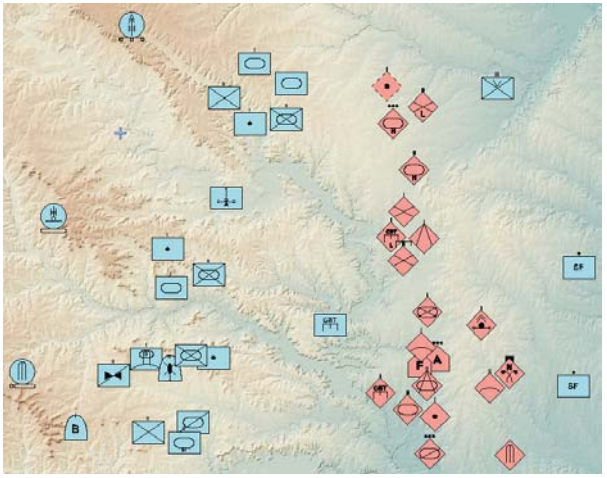
Changing the force element symbol size

1. Click the Size dropdown arrow in the Military Overlay Tools toolbar with one or more force element layers open in ArcMap.
2. Click Symbol Height in the Size dropdown list.
3. Click the Set Size button in the Military Overlay Tools toolbar.
4. Click and drag a box to set the symbol height in the ArcMap data frame.

   The height of the box will define the symbol height.
5. Click any other ArcMap tool to disable the Set Size tool.







Leadering and Stacking with the Military Overlay Commands toolbar

The Enable Leadering and Enable Stacking tools in the Military Overlay Commands toolbar, along with the Set Size tool in the Military Overlay Tools toolbar, provide shortcuts for leadering and stacking all force elements in the ArcMap TOC at the same time. You can reposition leaders as well, by utilizing the Move Leaders button in the Military Overlay Tools toolbar.

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

Tip

Leader and stacking tolerance

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

Tip

Leadering and Stacking rules

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

Leadering with the Military Overlay Commands toolbar

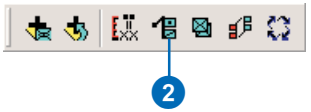
1. Follow the instructions in Chapter 1, 'Introducing MOLE', to open the Military Overlay Commands toolbar.
2. Click the Enable Leadering button in the Military Overlay Commands toolbar.

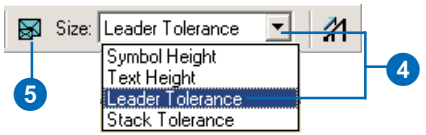
   All force element symbols in the map that satisfy the Leadering Rules selected in their Layer Properties dialog box will be placed on leader lines.

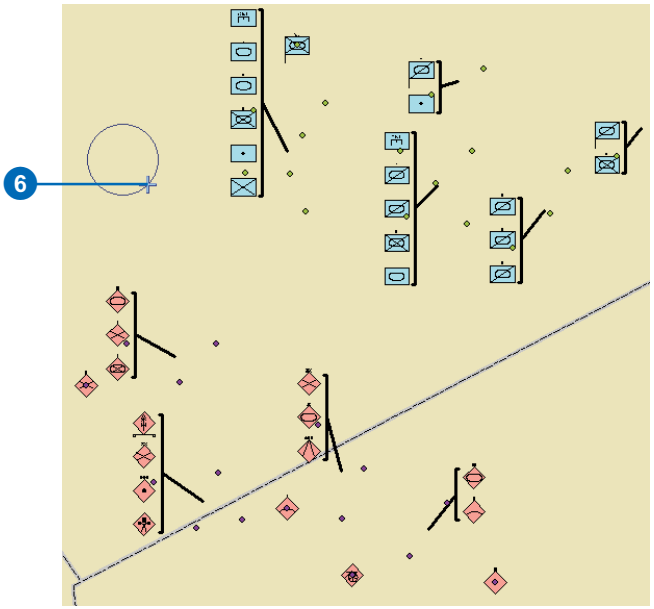
Changing the leader tolerance

3. Follow the instructions in Chapter 1, 'Introducing MOLE', to open the Military Overlay Tools toolbar.
4. Click the Size dropdown arrow in the Military Overlay Tools toolbar and click Leader Tolerance.
5. Click the Set Size button in the Military Overlay Tools toolbar.
6. Click inside the data frame and drag a circle to set the leader tolerance.

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





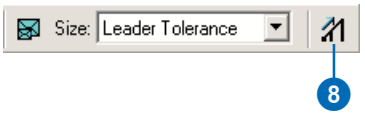


See Also

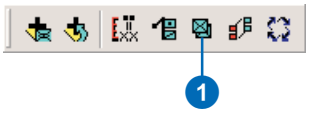
See the section 'The force element Layer Properties dialog box' earlier in this chapter for more information about leadering and stacking rules.

Moving leaders

7. Click the Move Leader button in the Military Overlay Tools toolbar.
8. Click a leader line in the ArcMap data frame and drag it to a new position.

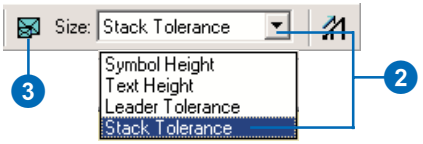


Stacking with the Military Overlay Commands toolbar



1. Click the Enable Stacking button in the Military Overlay Commands toolbar.

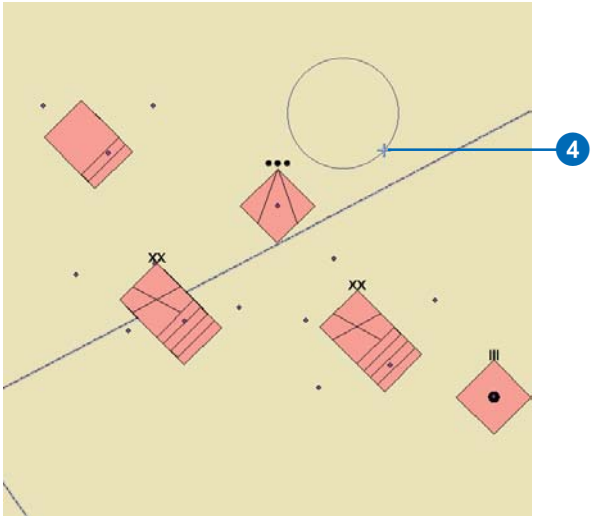
   All force element symbols in the map that satisfy the Leadering Rules selected in the symbols' Layer Properties dialog box will be placed on leader lines.



Changing the stack tolerance

2. Click the Size dropdown arrow in the Military Overlay Tools toolbar and click Stack Tolerance.
3. Click the Set Size button in the Military Overlay Tools toolbar.
4. Click inside the data frame and drag a circle to set the stack tolerance.

   The diameter of the circle defines the stack tolerance 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 Commands toolbar

The Echelon Scale Band Equalizer allows you to set scale-dependent display rules for force element layers in the data frame based on the echelon value of the symbols. The filtering rules are applied to all force element layers in the ArcMap TOC, which differentiates it from the Scaling tab in the force element Layer Properties dialog box, which allows you to set scaling rules for individual layers. You can set up to three scale filtering rules with the Echelon Scale Band Equalizer.

The scaling slider bars 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 bar, Band 2 has an Operational scale slider bar, and Band 3 has a Strategic slider bar. You can change the slider bar by right-clicking on it and selecting a new slider bar from the popup list.

1. Click the Echelon Scales button in the Military Overlay Commands toolbar.

   The Echelon Scale Band Equalizer dialog box will open.

2. Click the Enable Echelon Scale Filtering check box in the Echelon Scale Band Equalizer.

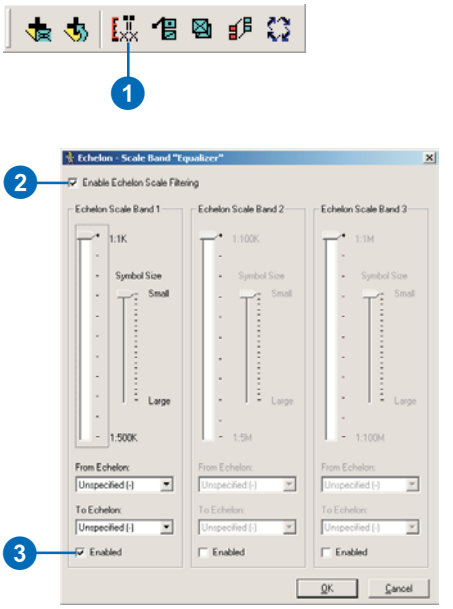
3. Click the Enabled check box in the Echelon Scale Band 1 section of the Echelon Scale Band Equalizer.

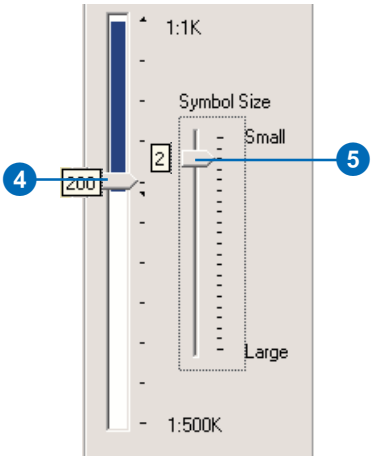
4. Click the scale slider bar in Echelon Scale Band 1 and drag it to the desired scale value.

   As you move the slider bar, the scale values will display next to it. The scale range will be indicated by a blue fill in the slidebar.

5. Click the Symbol Size slider bar in Echelon Scale Band 1 and drag it to the desired value.

   The symbols matching the criteria you specify in Echelon Scale Band 1 will be 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 will cause the symbol height to be two percent of the screen height. ▶





Tip

Scale values

Once the scale range is set, if you place the cursor anywhere inside the slidebar, the scale value will display as a tool tip.

Tip

Scale slider bars

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

Tip

Symbol size

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

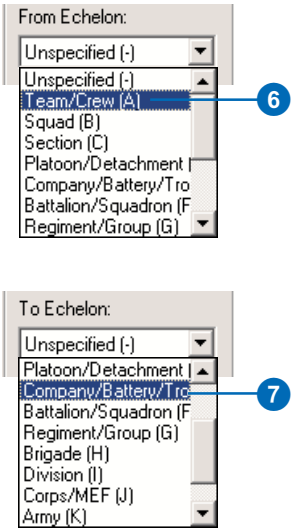
6. Click the From Echelon dropdown arrow and click a value from the list of echelons.

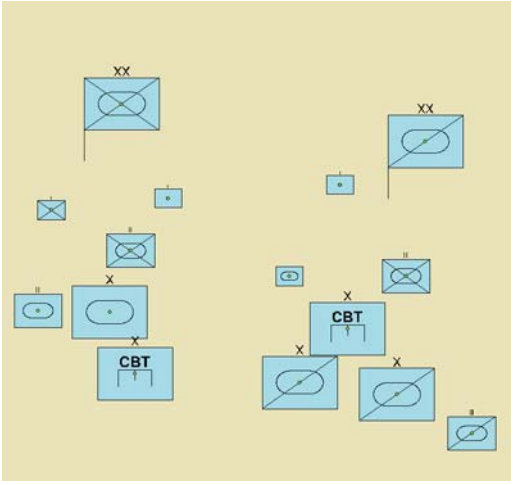
   This will set the minimum echelon size to be displayed in the specified scale range.

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

   This will set 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.

Creating and adding formation templates in ArcMap

Formation templates allow you to save groups of force element symbols in specific configurations. The formations can be added to any force element layer and provide a method for quickly populating force element layers with the symbols that you use frequently.

Tip

Selecting symbols

There are several different ways to select the symbols for inclusion in the formation template. For example, you can use the Select Features tool from the ArcMap Tools toolbar to select the desired features (as opposed to symbols) for the formation, or you can query the attribute table of the selected layer.

Tip

Selected symbols

MOLE force element symbols will be outlined in red when selected.

Tip

Available symbols

When you create a formation template, you can only include symbols from the selected force element layer in the formation.

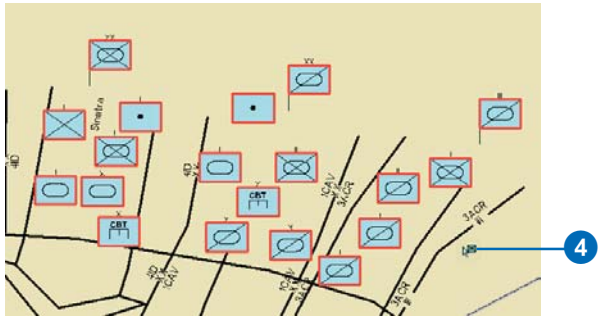
Creating formations

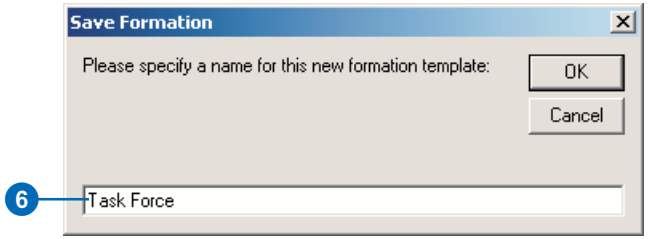
1. Follow the instructions in Chapter 1, 'Introducing MOLE', to open the Military Force Elements and Military Overlay Tools toolbars.
2. Click the Symbols layer of a MOLE force element layer in the ArcMap TOC so that it is selected.

   This enables the Save Formations button in the Military Force Elements toolbar.
3. Click the Select Graphics button in the Military Overlay Tools toolbar.
4. While pressing the Ctrl key, click the symbols in the data frame that you want to include in the formation template so that they are selected.

   You can also click and drag a box around the desired symbols in the data frame with the MOLE Select Graphics tool.
5. Click the Save Formation button in the Military Force Elements toolbar.

   The Save Formation dialog box will open.
6. Type a name for the formation in the text box in the Save Formation dialog box. ▸





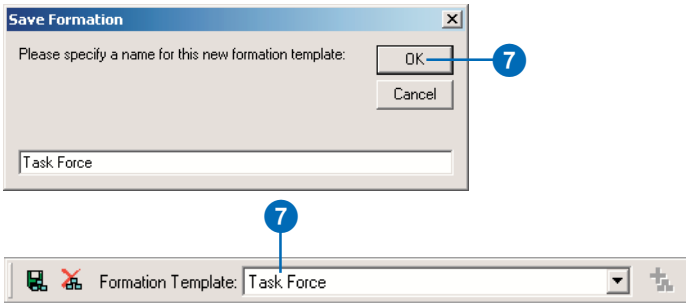
Tip

Add Formation button

The Add Formation button in the Military Force Element dialog box will not be enabled until you start editing.

7. Click OK in the Save Formation dialog box.

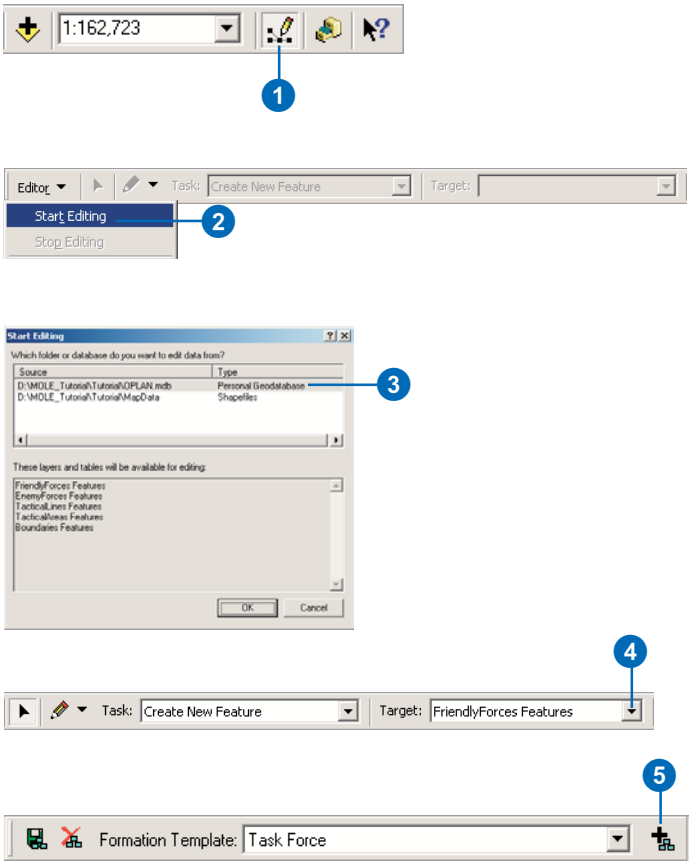
   The name of the new formation will be displayed in the Formation Template list box in the Military Force Elements toolbar. The formation can be added to any MOLE force element layer.



Adding formations

1. Click the Editor Toolbar button in the ArcMap Standard toolbar to open the Editor toolbar.
2. Click the Editor dropdown arrow in the Editor toolbar and click Start Editing.
3. If the Start Editing dialog box displays, click the database containing the feature class that you want to add the formation to and click OK.
4. Click the Target dropdown arrow in the Editor toolbar and click the layer you want to add the formation to.
5. Click the Add Formation button in the Military Force Elements toolbar.
6. Click inside the data frame at the location you want to add the formation to.

   The Add Formation dialog box will open. ▸



Tip

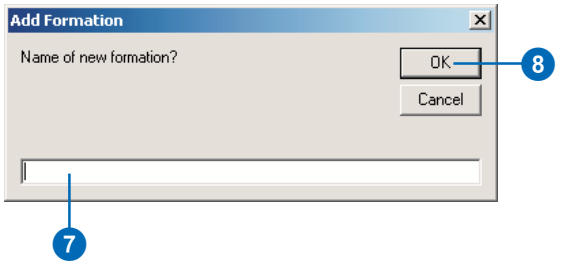
Formation name

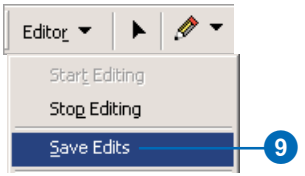
The name you provide for the new formation in the Add Formation dialog box will be used as the value for the Parent attribute of the symbols in their attribute table. You do not have to specify a name. However, you must at least press the spacebar in the Add Formation dialog box text box before clicking OK. If you click OK in the Add Formation dialog box without typing anything in the text box, the formation will not be added.

7. Type a name for the symbols within the formation in the text box in the Add Formation dialog box.
8. Click OK in the Add Formation text box.

   The symbols in the new formation will be added to the data frame in exactly the same position relative to each other as they were when the formation was created.
9. Click the Editor dropdown arrow in the Editor toolbar and click Save Edits.
10. To deactivate the Add Formation tool, click on any other ArcMap tool.

    The symbols added with the Add Formation tool can be edited and modified just like any other force element symbol.





Leadering individual force element symbols

MOLE, with the Leader Graphics tool, allows you to place individual force element symbols on leader lines, further extending your ability to customize the appearance of your map. The leaders created by the Leader Graphics tool behave the same as regular leaders. You can reposition them with the Move Leader tool and change the style of the leaders in the Layer Properties dialog box. The Leader Graphics tool is not exposed by default and must be added from the Customize dialog box. This will be covered in the steps here.

Add the Leader Graphics tool

You must have a force element layer open in ArcMap for this task.

1. Click View in the ArcMap Main menu, click Toolbars, then scroll down to the bottom of the Toolbars list and click Customize.

   The Customize dialog box will open.

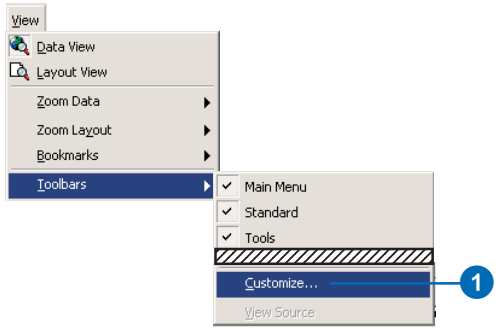
2. Click the Commands tab in the Customize dialog box.
3. Scroll down the Categories list and click MOLE.
4. Scroll down the Commands list to Leader Graphics. Click Leader Graphics and drag it onto any open toolbar. The Leader Graphics button will be added to the toolbar it is dragged onto.

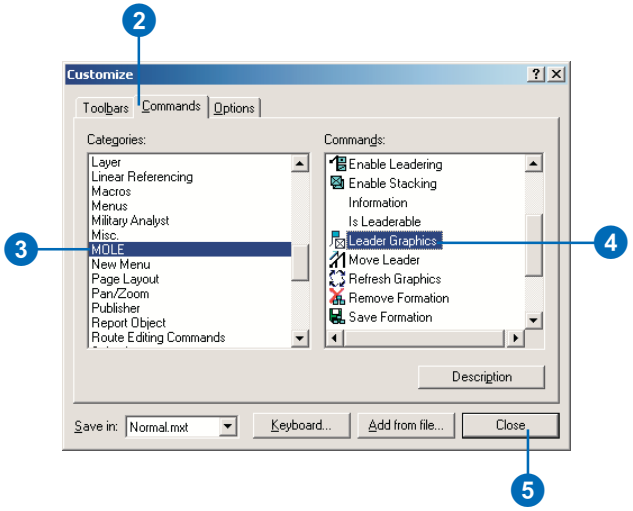
   It is a good idea to place the Leader Graphics tool in the Military Overlay Commands toolbar.

5. Click Close in the Customize dialog box to close it.

Leader an individual symbol

6. Click the Select Graphics button in the Military Overlay Tools toolbar. ▸





Tip

Leader Graphics button location

The Leader Graphics button can be placed in any active toolbar in ArcMap; it doesn't have to reside in the Military Overlay Commands toolbar.

Tip

Single-leadering multiple symbols

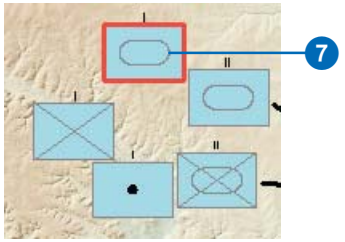
You can add many symbols within a force element layer to individual leader lines. Click the MOLE Select Graphics tool and select several symbols by either clicking and dragging a select box around them in the data frame, or by pressing the Ctrl key and clicking the desired symbols. When you click the Leader Graphics button all of the selected symbols will be placed on their own leader line.

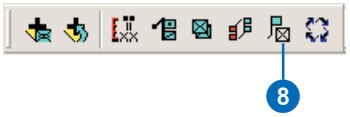
7. Click a force element symbol in the data frame to select it.

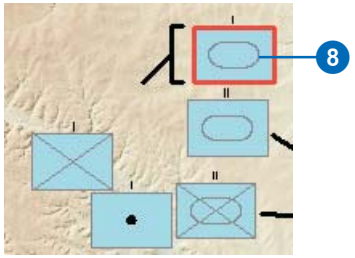
   The Leader Graphics button will become enabled when a force element symbol is selected.

8. Click the Leader Graphics button.

   The selected symbol will be placed on a leader line. To remove the leader line select the symbol and click the Leader Graphics button again.







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

MOLE's flexibility 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, and ESRI's enterprise GIS products—ArcSDE and ArcIMS. You can use the Military Analyst Coordinate tool to add MOLE force elements at precise locations in ArcMap. You can use MOLE with Tracking Analyst to model real-time battlefield scenarios. ArcSDE allows you to store MOLE data in an RDBMS and perform multiuser editing on the data. With the ArcIMS ArcMap Server extension you can distribute MOLE map documents over the Internet. These are the topics that will be discussed in this chapter.

Adding MOLE symbols with the Coordinate tool

MOLE is fully integrated with ArcGIS, including its 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's capabilities is the Military Analyst Coordinate tool. With the Coordinate tool, you can add symbols to MOLE layers in ArcMap at specific locations by typing the coordinates in the Coordinate Conversion 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 affords 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.

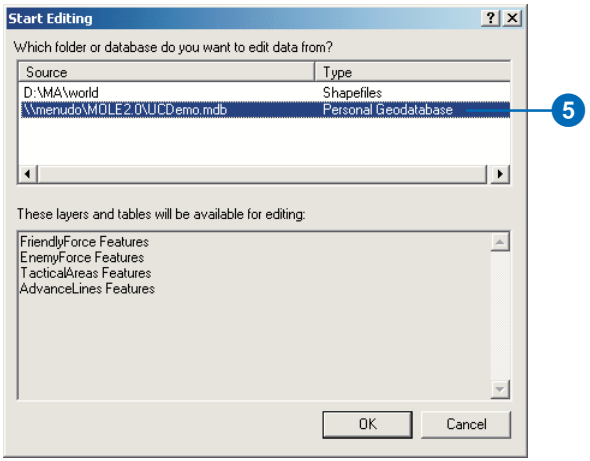
See Also

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 in the ArcMap Main 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 in the Editor toolbar and click Start Editing.

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



8. Click the Coordinate Tool button in the Military Analyst toolbar.

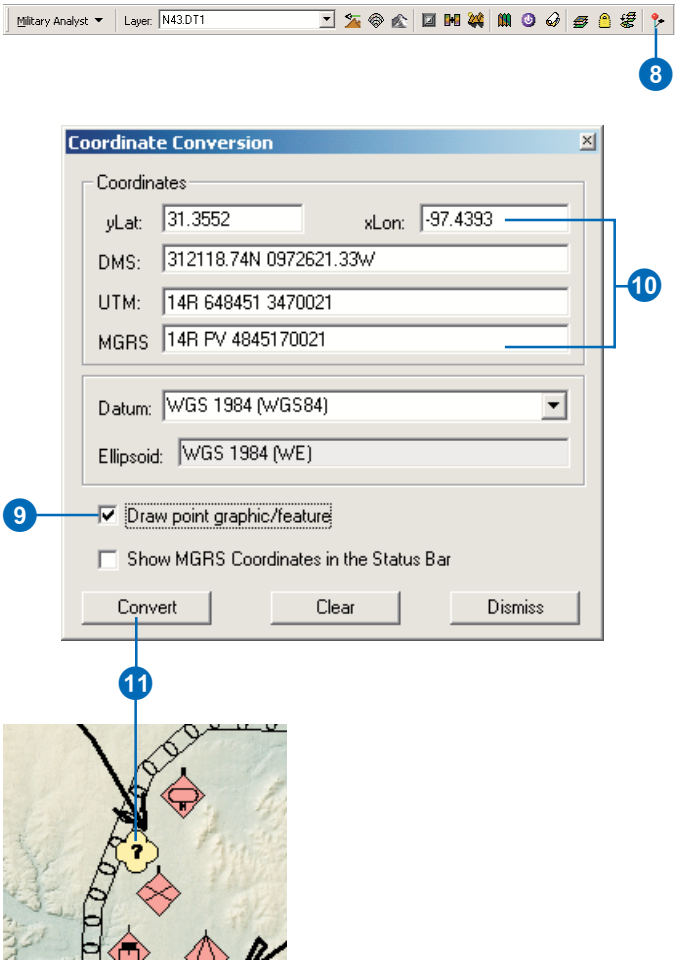
   The Coordinate Conversion dialog box will open.

9. Check the Draw point graphic/feature check box in the Coordinate Conversion dialog box.

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

11. Click Convert.

    The MOLE symbol for an unknown or pending force element will be placed in the data frame at the specified coordinates. You can edit the symbol as you wish.



Using MOLE layers in Tracking Analyst

ArcGIS Tracking Analyst is another extension that you can use in conjunction with MOLE. Tracking Analyst allows you to model 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 refer to *Using ArcGIS Tracking Analyst*.

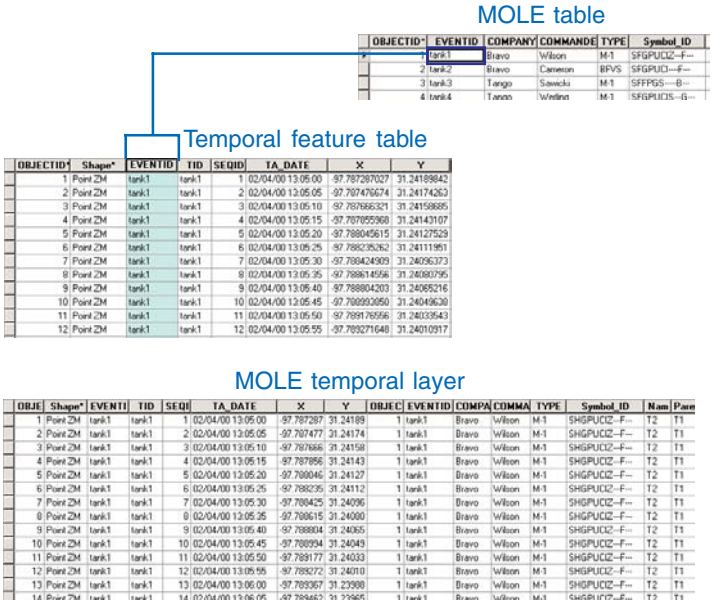
Creating MOLE temporal layers

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 MOLE Symbol ID value, date/time values, and X and Y coordinate values. The following examples illustrate ways to create MOLE temporal layers:

- 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, or 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 that 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

Suppported MOLE symbols

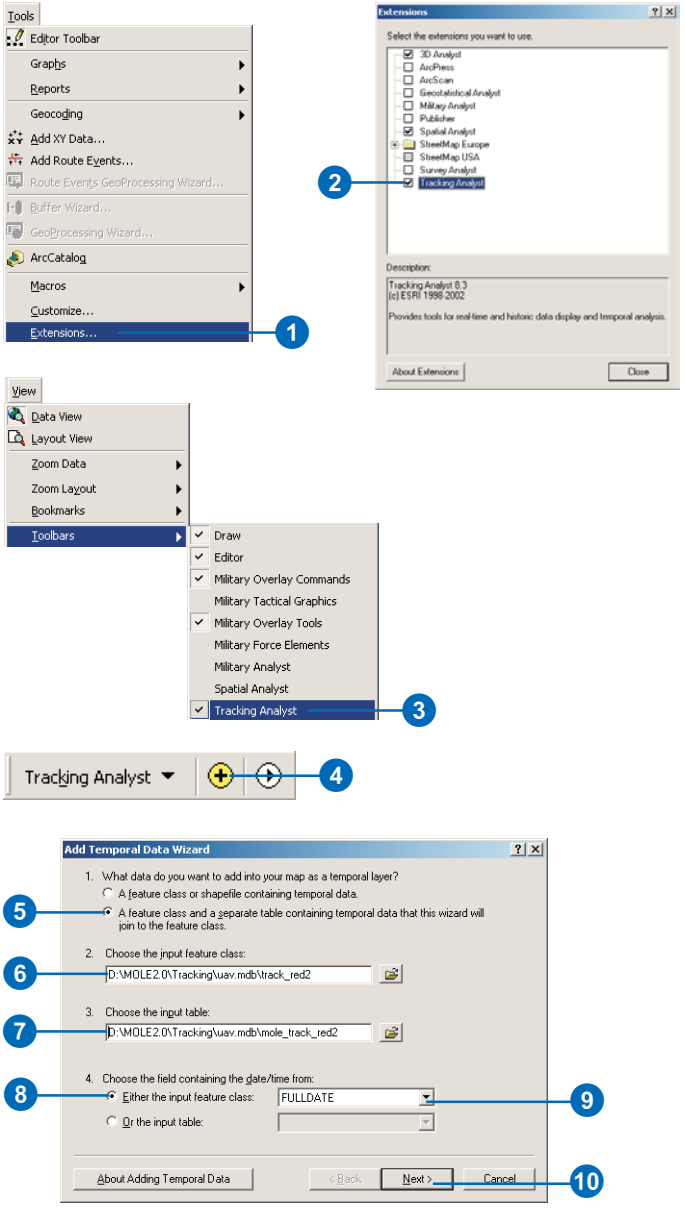
Only MOLE force element symbols are supported by Tracking Analyst. Tactical graphic symbols are not supported.

See Also

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

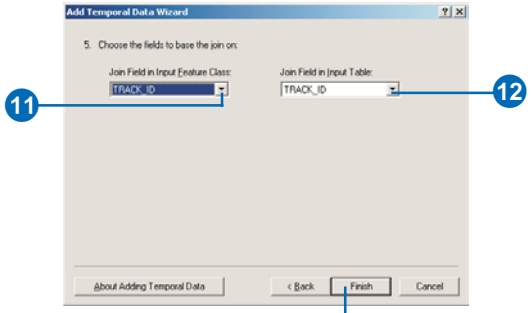
Creating a MOLE temporal layer in Tracking Analyst

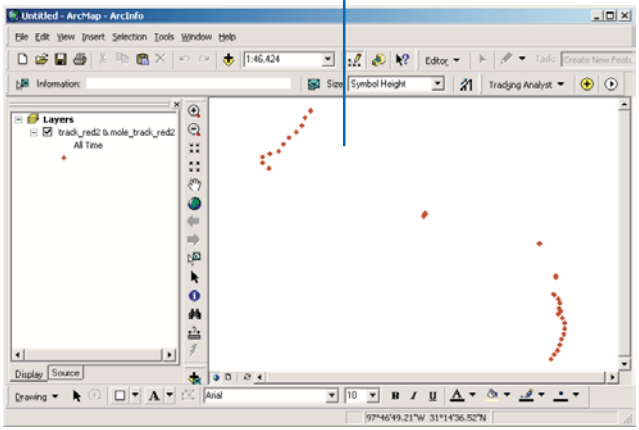
1. Click Tools in the ArcMap Main menu, then click Extensions.
2. Check the Tracking Analyst check box in the Extensions dialog box, then click Close.
3. Open the Tracking Analyst toolbar by clicking View in the ArcMap Main menu, pointing to Toolbars, then clicking Tracking Analyst in the toolbars list.
4. Click the Add Temporal Data button to open the Add Temporal Data Wizard dialog box.
5. Click the button in the Add Temporal Data Wizard to join a table to a feature class.
6. Add the feature class containing temporal data in the input feature class field.
7. Add the table containing MOLE data in the input table field.
8. Click the input feature class button in step 4 of the Add Temporal Data Wizard.
9. Click the dropdown arrow in step 4 and select the attribute field containing the temporal data.
10. Click Next. ▸

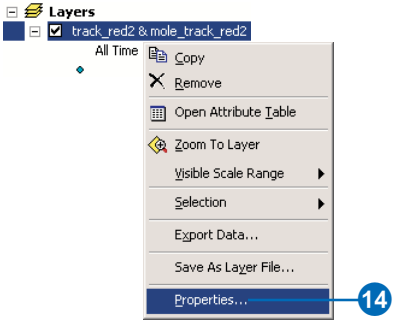


11. Click the Join Field in Input Feature Class dropdown arrow in step 5 of the Add temporal Data Wizard and select the field with which you want to join the MOLE table.
12. Click the Join Field in Input Table dropdown arrow to select the corresponding field from the MOLE table.
13. Click Finish.

    The layer will initially be displayed as simple points. You need to specify MOLE symbology from the Layer Properties dialog box.
14. Right-click the layer in the ArcMap TOC and click Properties to open the Layer Properties dialog box. ▸

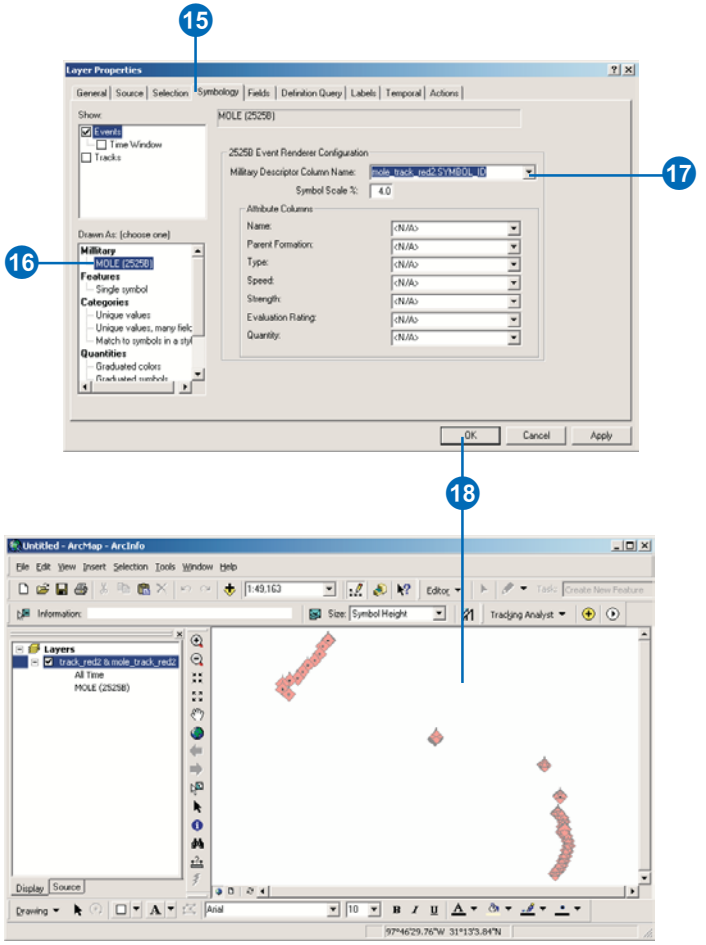






15. Click the Symbology tab in the Layer Properties page.
16. Scroll up in the Draw As list and click MOLE (2525B).
17. Click the Military Descriptor Column Name dropdown arrow and click the field containing the MOLE Symbol ID values.
18. Click Apply.

    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 (RDBMS) 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 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 utilize 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 SDE 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 SDE® 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 will not be 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.

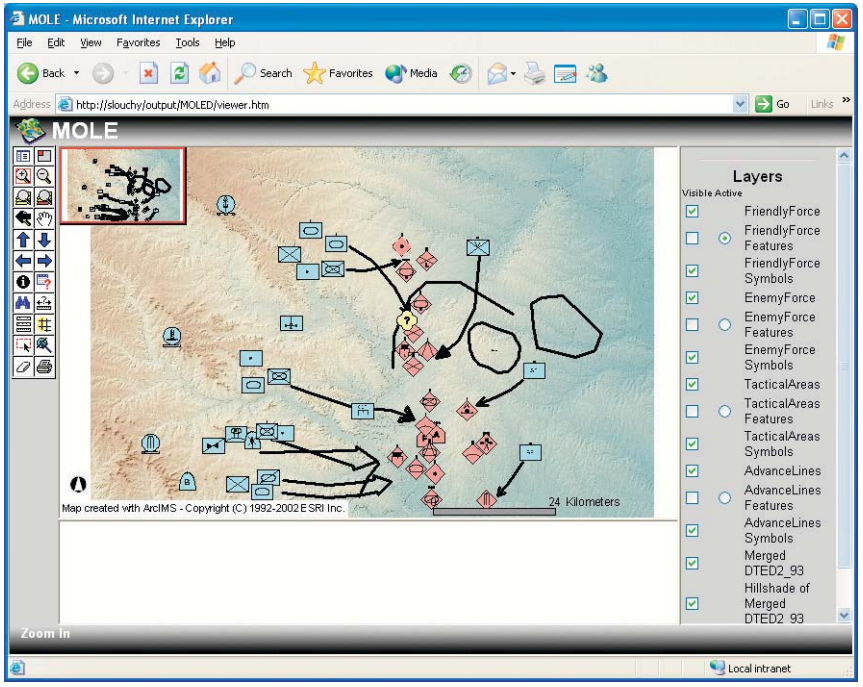
Requirements for using MOLE with ArcIMS

In order to use MOLE with ArcIMS, you must have ArcIMS 4.0.1 installed on a server, along with the ArcMap Server extension, without ArcGIS. MOLE is incompatible with earlier versions of ArcIMS. The ArcMap Server extension 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 wish to distribute within a map document produced in ArcMap and create an ArcIMS ArcMap Image service for the map. This is the only way ArcIMS will serve MOLE layers with their MOLE symbology. The actual steps required to set up ArcIMS and create an ArcMap Image service will not be discussed in this publication. Refer to *Using ArcIMS* for complete 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 table to the right lists the MOLE symbols that are not supported by ArcIMS. The figure below illustrates a sample MOLE mission planning map served on a Web page created with ArcIMS.

	Symbol Type	Symbol	Symbol ID
Tactical Graphic Areas	C2/General Maneuver –Deception	Decoy Mined Area	G*G*PM
	C2/General Maneuver –Deception	Fenced Decoy Mined Area	G*G*PY
	Mobility/Survivability –Obstacles –Minefields	Dynamic Depiction	G*M*OFD
	Mobility/Survivability –Obstacles –Minefields	Mined Area	G*M*OFA
Tactical Graphic Lines	C2/General Maneuver –General –Lines	Line of Contact	G*G*GLC
	C2/General Maneuver –General –Lines	Forward Line of Own Troops	G*G*GLF
	Mobility/Survivability –Obstacles –Antitank	Antitank Ditch –Complete	G*M*OADC
	Mobility/Survivability –Obstacles –Antitank	Antitank Ditch –Under Construction	G*M*OADV
	Mobility/Survivability –Obstacles –Antitank	Antitank Ditch, Reinforced With Mines	G*M*OAR
	Wire Obstacle –Concertina Fence	Double Strand	G*M*OWCD
	Wire Obstacle –Concertina Fence	Single Strand	G*M*OWCS
	Wire Obstacle –Concertina Fence	Triple Strand	G*M*OWCT
	Wire Obstacle	Double Fence	G*M*OWD
	Wire Obstacle	High Wire Fence	G*M*OWH
	Wire Obstacle	Low Wire Fence	G*M*OWL
	Wire Obstacle	Single Fence	G*M*OWS
	Wire Obstacle	Unspecified	G*M*OWV
Tactical Graphic Points	Obstacles –Minefields	Static Depiction	G*M*OFS
	Obstacles –Mines	Antipersonnel Mine	G*M*OMP
	Obstacles –Mines	Antitank Mine	G*M*OMT
	Obstacles –Mines	Antitank Mine + Anti-Handling Device	G*M*OMD
	Obstacles –Mines	Directional Antitank Mine	G*M*OME
	Obstacles –Mines	Unspecified Mine	G*M*OMV
	Obstacles –Mines	Wide Area Mine	G*M*OMW



See Also

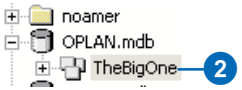
See Using ArcCatalog *for details on adding a spatial database connection.*

Exporting MOLE layers to ArcSDE

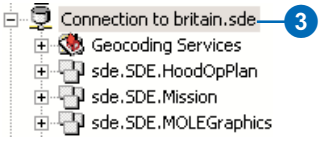
1. Expand the Database Connections folder in the Catalog tree, in ArcCatalog, and double-click Add Spatial Database Connection to connect to an ArcSDE database.

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.

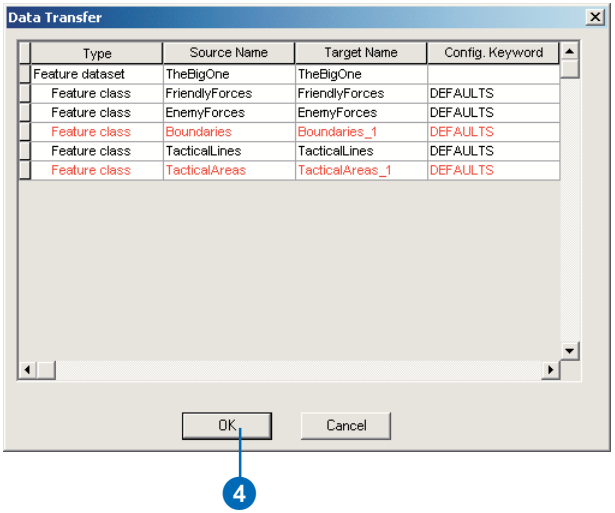


3. Right-click the database connection and click Paste, or select it and press Ctrl + V.



4. Click OK in the Data Transfer dialog box.

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



Versioning is the method ArcSDE provides for managing multiuser editing. You can create multiple versions of an enterprise database containing MOLE feature classes. Each user 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.*

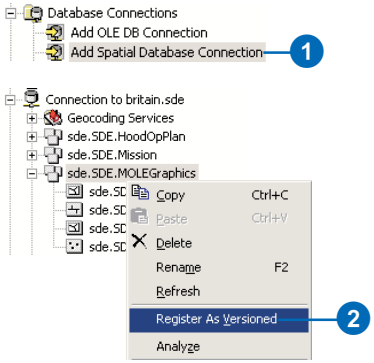
Versioning with MOLE

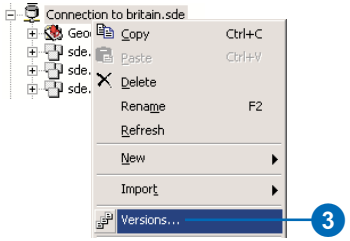
1. Connect to the SDE database in ArcCatalog containing the MOLE layer you want to edit.
2. Right-click the MOLE feature dataset or feature class you want to edit in the ArcCatalog Catalog tree, then click Register as Versioned.

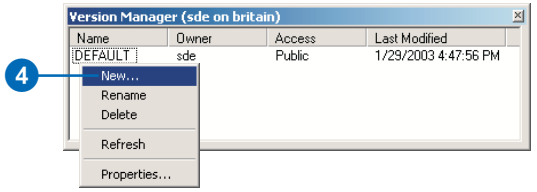
   If the feature class is contained within a feature dataset, register the feature dataset as versioned. If the feature class is not within a feature dataset, register the feature class as versioned.
3. Right-click the connection to the database containing the feature classes you want to edit and click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

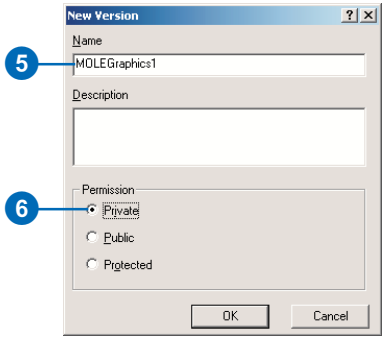
   The Version Manager window will open.
4. Right-click the name of the parent version—the version you will create the new versions from—in the Version Manager and click New.

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







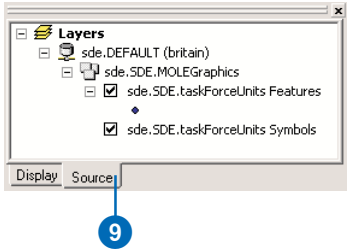


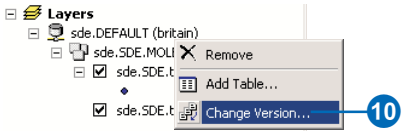
The new version will be displayed in the Version Manager. Follow the previous steps to create more versions if you desire.

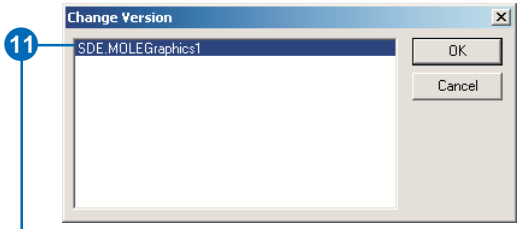
7. Close the Version Manager window.
8. Open the feature class you want to edit in ArcMap, following the instructions in Chapter 4, 'Adding MOLE symbols in ArcMap'.
9. Click the Source tab at the bottom of the ArcMap TOC.

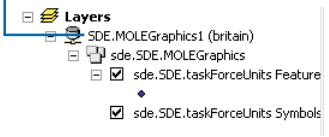
   The parent version of the geodatabase will be listed at the top of the TOC.
10. Right-click the parent version in the TOC and click Change Version.
11. Click the version you want to edit in the Change Version dialog box, then click OK.

    The new version name will be 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. ►

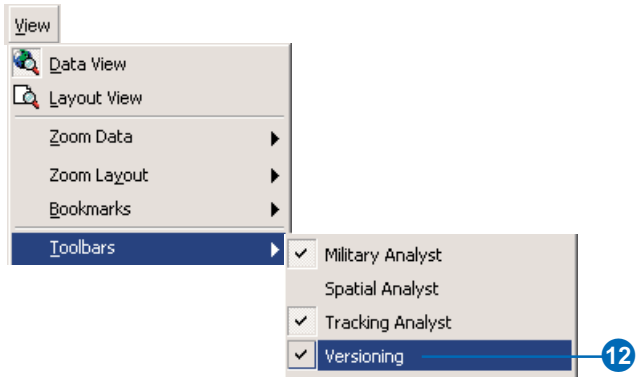


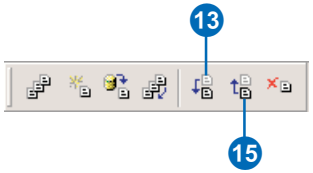


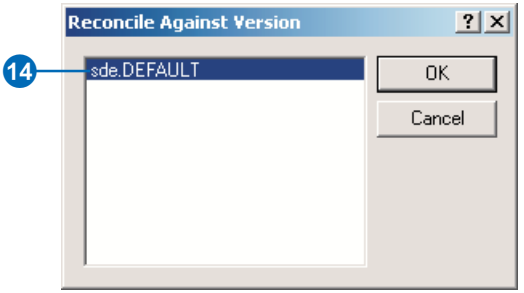




12. Open the Versioning toolbar by clicking View in the ArcMap Main menu, pointing to Toolbars, then clicking Versioning.
13. Click the Reconcile button in the Versioning toolbar.
14. Click the parent version in the Reconcile Against Version dialog box and click OK.
15. Click the Post button in the Versioning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







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