ArcInfo 8—
Guide to Editing Coverages Using ArcMap™

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Contents **Page**

J-8434

Contents **Page**

ArcInfo 8— Guide to Editing Coverages Using ArcMap

Editing coverages with ArcMap™ software is different than editing coverages in past releases of ArcInfo™ software. This technical paper helps ArcMap users learn this new system and supplements the documentation shipped with ArcInfo 8.

Overview

The ArcMap Editor can be used to edit ArcInfo coverages, ESRI® shapefiles, personal geodatabases, and multiuser geodatabases. This editor was designed to be easy to use and learn. As much as possible, the ArcMap Editor provides a normalized approach to editing all of these data sources. A key part of this design is that features from these data sources are presented to the ArcMap Editor as objects. When editing coverage data, users familiar with ARCEDIT™ software should be aware that there are several basic differences in the approach between these editors.

You will find that the basic patterns of editing geographic data are present, and much of what you know of topological editing will help you learn this new system quickly. This document describes the underlying data models, strategies, and perspectives to help you determine the best approach to edit your coverages with the ArcMap Editor.

Coverages and Topological Associations

Coverages contain feature classes that are homogeneous collections of features.

The *primary types* of coverage features are points (label points), lines (arcs), polygons, and nodes. These features have *topological associations:* arcs form the perimeter of polygons, nodes form the endpoints of arcs, and label points mark the interiors of polygons. Point features have a dual identity; they can represent small geographic objects such as wells and buildings and they can mark polygon interiors.

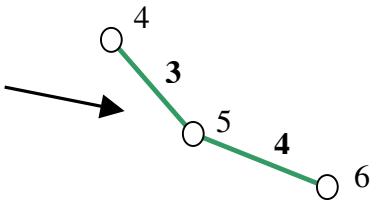
Secondary types of coverage features are tics, links, sections, and annotation. Tics are used for map registration, and links are used for adjusting features. Sections are the building blocks for a measurement system that is stored on composite route features; annotation is text labels displayed on a map.

Coverages also contain composite features. Routes are collections of arcs with an associated measurement system. A common use of routes is for transportation systems. Regions are collections of polygons, which can be adjacent, disjoint, or overlapping. Regions are used for land use and environmental applications.

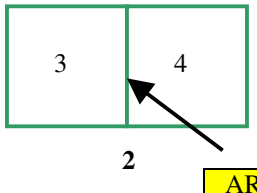
The coverage model has been designed such that most types of coverage features contain associations with other features within the coverage. These topological associations

among features are stored explicitly. For example, the topological association between a node feature and an arc feature is defined by the ARC#, FNODE#, and TNODE# items.

ARC#	FNODE#	TNODE#
3	4	5
4	5	6



Likewise, the topological association between an arc feature and a polygon feature is defined by the ARC#, LPOLY#, and RPOLY#.



ARC#	LPOLY#	RPOLY#
2	3	4

The following is a discussion of how you can edit coverages within ArcMap and how those associations are maintained.

The ArcMap Editor and Coverage Feature Classes

The ArcMap Editor identifies all coverage features as either *simple features* or *topo features*.

Simple features do not contain topological associations with other features in the coverage. Well locations stored in a single point feature class coverage are examples of simple features. If you create, modify, or delete a simple feature, it will have no effect on other features within the coverage.

Topo features store and maintain associations with other features in the coverage. Parcels stored in a polygon feature class maintain an association with parcel lines stored in the arc feature class. The parcels identify ownership or tax value as polygon features. The parcel lines store survey measurements on the arc features. If you create or modify a topo feature, associated features are also affected by that change.

The table below lists all coverage feature classes that you can edit in ArcMap and identifies them as either simple features or topo features.

Coverage Feature Classes	*Simple Features*	*Topo Features*
Primary Classes		
Tics	✓	
Points*	✓	
Label points		✓
Lines*	✓	
Arcs		✓
Nodes		✓
Polygons		✓
Composite Classes		
Regions		✓
Routes		✓

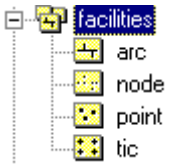
*Both points and lines have been listed twice as they share dual identity depending on what additional feature classes exist in the coverage. (If polygons exist in a coverage, both point and line features are considered topo features and listed as label point and arc feature classes. If node attributes exist in an arc coverage, the line features are considered topo features.)

How to Edit Coverage Feature Classes in ArcMap

Given that there is an inherent dependency between features in classes that store topo features, the ArcMap Editor provides special tools and functionality for editing those types of features. The way you edit each type of feature class—with both simple and topo features—is discussed below.

Point Feature Class

A point feature class can exist in coverages that do not contain polygons. Point features are simple features that do not contain topological associations with other features. When you expand a coverage node in ArcCatalog™ software, you will see that the feature class name is point.



Creating New Features

- Create point features using the Create New Feature task in the ArcMap Editor.
- Place point features anywhere on the map using any of the sketch tools.
- If you snap a new point to the edge of a line feature class, it will create a new vertex on the line.
- If you attempt to place a point outside of the extent of the coverage, you will receive a message that the coordinates are out of bounds. Note: You can change the extent of the coverage from the Tics and Extent tab located in the property sheet for the coverage. Right-click the coverage name in ArcCatalog and click Properties from the context menu to access the property sheet.

Editing Existing Features

- Select and modify the location of point features using the Edit tool.
- If you rotate points using the Rotate tool, the Editor automatically updates the $ANGLE pseudo item.

- Modify feature attributes from either the Attributes dialog box (click the Attributes button on the Editor toolbar) or the Table dialog box. (Right-click the point layer name in the ArcMap table of contents and click Open Attribute Table.)

Deleting Features

- Delete features using the Delete button on the ArcMap standard toolbar or by pressing the Delete key.

Line Feature Class

If there are no node attributes or polygons in a coverage that contains arc features, ArcMap treats the arcs as simple line features that do not share topological associations with other features. Line features are simple, nontopological features that may contain topology errors (such as intersection errors, dangles, and so on) when edited in ArcMap.

Creating New Features

- Create new line features using the Create New Feature task in the ArcMap Editor.
- Line features may cross or overlap other line features in the coverage.
- If you are concerned about the connectivity among features when editing lines in ArcMap, add a snap agent to the arc feature class using the Snapping Environment window. Or you can create node topology using the Build command located in the coverage's property sheet in ArcCatalog.

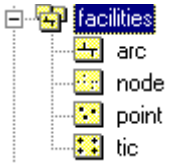
Editing Existing Features

- Select and edit line features using the Edit tool. Since line features do not share topological associations with other features, you can use any editing operation/task available to line features in the Editor.
- If you wish to maintain connectivity with other line features, use the Shared Edit tool to select coincident edges/endpoints of features, and then apply the appropriate editing operation.

Deleting Features

- Use the Delete button located on the standard toolbar or press the Delete key to remove line features.

Arc Feature Class



Line features in a coverage that also contains node and/or polygon features are topo features. They maintain a topological association with node and/or polygon features.

The ArcMap Editor maintains the association between arc and node features by storing the internal identifier (record numbers) of the node feature. These identifiers are displayed as FNODE# and TNODE# fields on the arc attribute table. Similarly, the ArcMap Editor maintains the association between arc features and polygon features by storing the internal identifier of the polygon feature. These identifiers are also displayed as LPOLY# and RPOLY# read-only fields on the arc attribute table.

J-8434

Creating New Features

- Create new arc features using the Create New Feature task.
- If a node attribute table exists when you digitize a new arc feature, ArcMap will create node features automatically. If polygons exist, ArcMap will create new polygons if the arc crosses two or more polygon boundaries.
- If you digitize an overlapping arc, it will split at the point of intersection and a node will be added automatically.

Editing Existing Features

- Use the Shared Edit tool to select an arc feature if you want to modify its shape. If you select the point where two arcs join, you can modify both arcs simultaneously.
- To modify the attributes of arc features, select them using the Edit tool.

Deleting Features

- To delete arc features, select the arc using the Shared Edit tool and click the Delete button. Associated node and/or polygon features will be removed automatically.
- If you select a point shared between two arcs and click the Delete button, ArcMap will delete all associated arcs.

Node Feature Class

Node features share topological associations with arc features. If a node attribute table (NAT) exists, node features are added to the coverage when an arc feature is added, moved when an arc moves, and deleted when an arc is removed.

ArcMap maintains the association between a node feature and an arc feature using an internal identifier (record number). The record number for a node feature is referenced as FNODE# and TNODE# attributes that are displayed as read-only attributes for an arc feature.

Creating New Features

- Create new node features using the Create New Feature task in the ArcMap Editor.
- Node features must snap to existing arc features or you will receive an error message. You can set a snap agent using the Snapping Environment window to ensure that you snap to an existing arc feature.
- Creating a new node will split the arc it snaps to into two new arcs that contain the same attributes as the existing arc.

Editing Existing Features

- Use the Shared Edit tool to select and modify the location of node features. When you move a node feature using the Shared Edit tool, the associated arc features will be updated automatically.
- You can select nodes and modify their attributes using the Edit tool. If you create a relationship class between arc and node features using the record number of the node feature class and the FNODE# and TNODE# of the arc feature class, you can inspect and modify the attributes of node features when an arc feature is selected.

Deleting Features

- To delete node features, first select the node using the Shared Edit tool and then press the Delete key.
- If two arcs are connected to the node feature, they will merge to form one arc containing the attributes of the feature with the lowest record number.

Polygon Feature Class

Polygon features share explicit topological relationships with arc, node, and label point feature classes and are worked with as topo features. Furthermore, since polygons share and maintain a topological association with arc features, they can never overlap one another. In addition, each polygon must contain at least one label point.

As mentioned in the description of the polygon feature class, the polygon to arc(s) association is displayed on the arc attribute table as LPOLY# and RPOLY# fields. Also, the association between a polygon feature and a label feature is presented as a $POLYGONID field value on the label feature's attribute record.

Creating New Features

- Use the Create New Feature task to digitize new polygon features. Use the Auto Complete Polygon task to digitize edges of new polygons that "bolt onto" existing polygons to complete the creation of new features.
- When you create new polygon features, ArcMap will automatically add new arc, label, and node features to the map.

Editing Existing Features

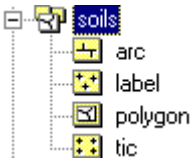
- Use the Edit tool to select polygon features whose attributes you want to modify. All attribute updates are applied to any label features within the polygon as well.
- To modify the shape of a polygon feature, select the edges of a polygon using the Shared Edit tool and then apply the appropriate editing task or operation to the edge itself. All modifications to the edge of a polygon will automatically update any associated features (arcs, labels, nodes, regions, and/or routes) automatically.

Deleting Features

- To delete a polygon, you must select and then delete an edge of the feature using the Shared Edit tool.
- Deleting the edge will also delete the associated arc feature.
- You will have to delete the label point separately.

Label Point Feature Class

A label point feature class exists when polygons are present in the coverage. When you expand a coverage node in ArcCatalog, you will see that the feature class name is label.



When polygons exist, label points are considered topo features and maintain an association with polygon features. The association stipulates that in order for a polygon to contain attributes at least one label point must be present in the coverage.

J-8434

Creating New Features

- Create label point features using the Create New Feature task in the ArcMap Editor.
- Label points are created automatically when a new polygon is created.

Editing Existing Features

- Select label point features using the Edit tool.
- You can modify the location of label point features using the Edit tool as long as you do not move that label outside of the polygon.
- You can also edit all polygon attributes when modifying the attributes of the label point. Updating the label point attributes automatically updates the polygon attributes.

Deleting Features

- As a general rule, all polygons must contain at least one label point. If multiple label points exist, you can delete them. However, if the label that you attempt to delete is the only label in the polygon, you will receive an error message.
- If you delete a polygon edge that borders the universe polygon, the label point for that polygon will be removed as well.

Region Feature Class

A region feature is a composite of one or more polygon features and can contain overlapping topo features.

Creating New Features

- Use the Union command in the ArcMap Editor to create new composite region features. First, select one or more existing polygon or region features from the same coverage, set the target layer to the desired region subclass, and click the Union command located on the Editor menu.
- You can then create multipart region features by selecting the appropriate features and clicking the Merge command.

Editing Existing Features

- Use the Shared Edit tool to select the edges of region features you want to modify. Then choose the appropriate edit operation or task to modify the shape.
- Use the Edit tool to select region features whose attributes you want to modify.
- All edits to the shape of region features will automatically update associated features in other classes (polygons, arcs, and labels).

Deleting Features

- To delete a region feature, select one or more then use the Delete button on the standard toolbar or use the Delete key on your keyboard.
- Deleting the edge will also delete the associated arc feature.

Route Feature Class

Similar to a region feature, a route feature is a composite of one or more arc features. However, route features also contain section features. Section features are the building blocks of a route feature. Sections are nonoverlapping topo features.

Creating New Features

- Use the Union command (in ArcMap) to create new composite route features. First, select two existing arc features from the same coverage, set the target layer to the desired route subclass, and click the Union command located on the Editor menu.
- You can then create multipart route features by selecting the appropriate features and clicking the Merge command on the Editor menu.

Editing Existing Features

- Use the Shared Edit tool to select the edges of route features you wish to modify. Then choose the appropriate editing operation or task to modify the shape.
- All edits to the shape of route features will automatically update associated features in other classes (arcs and sections).
- Use the Edit tool to select route features when you want to modify their attributes.

Deleting Features

- To delete a route feature, select one or more then use the Delete button on the standard toolbar or use the Delete key on your keyboard.
- Deleting the route will automatically delete the associated arc and section features from the coverage.