ArcGIS Fire Incident Mapping Tool
Version 1.83 Build 3

DRAFT

User's Guide and Tutorial

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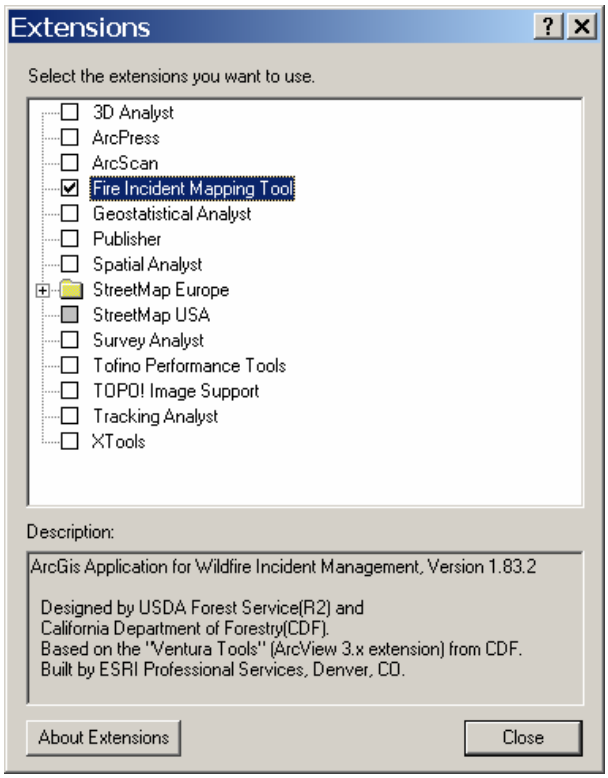
Introduction:

Welcome to the Fire Incident Mapping Tools for ArcGIS.

This User's Guide was developed to describe how to utilize the Fire Incident Mapping Tools (FIMT) version 1.83 Build 2 in ArcGIS. The document is divided into functional sections designed to instruct users in operating the fire mapping tools in ArcMap as they apply to the workflow typical at an Incident command. The best way to learn ArcMap and the fire mapping tools are to try them yourself. This User's Guide includes step-by-step tutorial sections (highlighted in light gray) and a sample tutorial dataset for instructional purposes. The sample dataset is a modified version of actual data collected from the Colgate fire that occurred near Nevada City, California. A majority of the incident data has be fabricated for use in a tutorial work flow.

Fire Incident Mapping Tools for ArcGIS

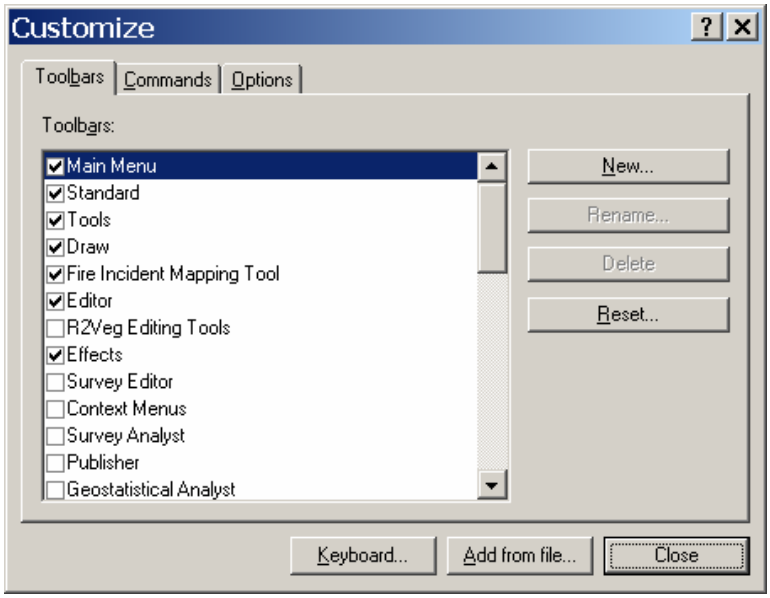
The Fire Incident Mapping Tools are an ArcGIS extension. The extension is a persistent extension. In other words, there is no requirement to turn it on or off.



The FIMT Fire Mapping Tools are accessed through the FIMT toolbar, which is added to ArcMap using the Customize dialog. To add custom controls and toolbars:

1. Click the Tools menu, and then click Customize.

2. Click the Toolbars tab if it is not already selected.
3. Click the check box to the left of the FIMT Fire Mapping Tools toolbar name.
4. Click Close.



The FIMT Fire Mapping Tools toolbar is loaded into the ArcMap GUI (Graphical User Interface). The toolbar can be docked to the ArcMap GUI in any desired location.

The FIMT Fire Mapping Tools toolbar is composed of icons that represent both buttons and tools. For the purpose of this document, buttons perform an immediate task. Tools require interaction from the user either in the form of cursor control in the map view or in a popup dialog. The buttons contained on the FIMT toolbar are activated based on the current settings in the ArcMap document. The current editing environment, selected sets, and the entity type of selected features all affect which buttons are enabled. (**Note**: Each tool is described in detail in Appendix I). The FIMT Fire Mapping Tools toolbar is divided into groups separated by vertical bars. The tools located in each group are described in Appendix I; the following sections describe a more functional use of the tools.

Incident Management and Information

There are several tools that allow you to manage the information contained in your Incident personal geodatabase. This management allows the user to tailor the FIMT map environment to support the local requirements of the Incident and to support routine GIS tasks during the Incident.

Creating a New Incident

Each Incident created by the Fire Incident Management tools is managed as a personal geodatabase (PGDB) stored on your file system (See Appendix III for detailed information on the structure of the Incident PGDB). At the start of a new Incident, you will create a new Incident and corresponding personal geodatabase.

To create a new Incident, click the **New Incident** button on the FIMT toolbar. A popup dialog allows you to enter the information needed to create a new Incident.

The current release of the Fire Incident Mapping Tools (Version 1.82 Build 2) supports the management of multiple Incidents from the same ArcMap document. Each Incident is contained in its own personal geodatabase and is accessed in ArcMap using a concept of an active Incident. Only one Incident can be active at a time and a tool is provided to switch active Incidents. The switch can only occur when there is no current editing session taking place. At the point one or more individual fire Incidents converge into a single event, they can be combined into a single Incident using standard editing tools. Tools for copying features from one or more sources into an Incident are available in the FIMT toolbar and are explained in Appendix I.

Each Incident consists of the following information:

Incident Name: The Incident (fire) name can consist of any text string and is usually already assigned to an Incident.

Incident Number: The Incident number may be pre-assigned from the IMSR database located at NIFC in Boise, Idaho.

Magnetic Declination: Magnetic declination is sometimes referred to as magnetic variation or magnetic compass correction. It is the angle through which a magnetic compass bearing must be rotated in order to point to the true bearing. The FIMT New Incident dialog contains web links to web pages maintained for regions including the United States, Canada, and Australia[1]. The NOAA National Geophysical Data Center (NGDC) manages the United States web page. Users

[1] Other regions can be added by inserting records to the “DeclinationSites” table in the template geodatabase. See Appendix II for details on the Incident PGDB data model.

who have Internet access can use these web pages to determine the correct declination value for the Incident location. Otherwise, magnetic declination can be located on most standard map series. **Note**: The magnetic declination is provided for reference purposes only; it does not affect the performance of the FIMT Fire Mapping Tools.

Coordinate Format: Each Incident has a default coordinate format that establishes how latitude/longitude values are entered and displayed by the tools. The options include:

Decimal Degree (*37.46842 N:: 107.71703 W*)
Degree Decimal Minutes (*37 28.105 N:: 107 43.022 W*)
Degrees Minutes Seconds (*37 28 6.33 N:: 107 43 1.30 W*)

Spatial Reference: Every new Incident must be assigned a spatial reference. The spatial reference defines the coordinate system (map projection information) and the x/y domain of the data contained in your Incident. You should *always* set the coordinate system for new Incidents. The FIMT tool will automatically calculate the x/y domain based on the coordinate system you select. This calculation is pre-established by the tool and is based on maintaining adequate precision for your data as well as allowing for a bounding box that is large enough to accommodate the data you will be managing. Advanced users can manually calculate and set a specific x/y domain. However, be aware that this cannot be changed once the Incident PGDB is created. Incorrect x/y domain values may prevent data from being inserted into the Incident. The easiest way to set this is to import a coordinate system from an existing dataset that covers the area where the incident occurs or is likely to cover.

The installation package used to install the FIMT extension includes an ESRI developer sample called "CalcLoadingParams.exe". This executable can be used to help you calculate a suitable X,Y domain for your incident. See Appendix III

Geodatabase: Each new Incident is written to a new personal geodatabase (PGDB) stored in the location selected by the user. Use the browse button to select the path and enter the name of the PGDB to create.

Opening an Existing Incident

You can open an existing Incident at any time. Since all of the information needed to manage an Incident is stored in the personal geodatabase, the FIMT Fire Mapping Tools can reestablish their own environment. Use the "**Open Incident"** button on the FIMT toolbar. Navigate to the Incident personal geodatabase you want to open and then click Open on the browser dialog. The Incident grouped layer will be added to your map document.

The FIMT Fire Mapping Tools allow you to manage more than one Incident in an ArcMap document. The "**Open Incident"** button will add the selected Incident personal geodatabase to the existing map document along with any other Incident that was already opened.

You can also open any existing ArcMap document (.MXD) that has the FIMT grouped layer in its table of contents without the need to use the Open FIMT Incident button. If you have added other supporting feature classes, images, or tables to your map document, you will want to save and reopen your ArcMap document to maintain the reference to those layers.

Switch Incidents

If you have loaded more than one Incident into the current map document, you can switch between active Incidents using the "**Switch Incident"** button . The Switch Incident button can only be used when there is no current edit session. If you are editing features, the Switch Incident button will be disabled. Saving and stopping editing will reactivate the Switch Incident button.

Getting Incident Information

At any time during the use of the Fire Incident Mapping Tools, you can access the Incident information you entered when you created the Incident PGDB. The "**Incident Information"** button gives the user access to the Incident name, number and other information. The dialog can also be used to modify the same information if necessary.

Moving Data to a New Data Frame

ArcMap supports the use of multiple data frames in an ArcMap document. Multiple data frames can be used to represent your Incident with different background source information. For example, you may need to display both digital orthophotography (DOQ) and Digital Raster Graph (USGS/FS single edition quadrangle maps) in your Incident maps. Rather than toggling between the two images in the ArcMap table of contents, you can establish separate data frames for each image source.

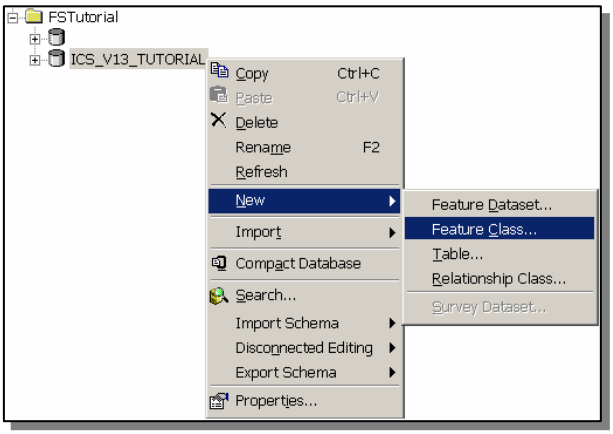
You create a new data frame using the ArcMap Insert > Data Frame menu option. You can select an existing data frame and make it active by right clicking on its name in the ArcMap table of contents and selecting Activate from the context menu. You use the "**Copy Incident Layers to Data Frame"** button to add the Incident group layer for the active incident to the new (active) data frame. You can now modify any map property in each data frame independently and thus have several alternate views of your Incident in the same map document. Each data frame can be added to a map layout to develop a variety of map products.

Creating a "scratch" Feature Class (ArcEditor, ArcInfo only)

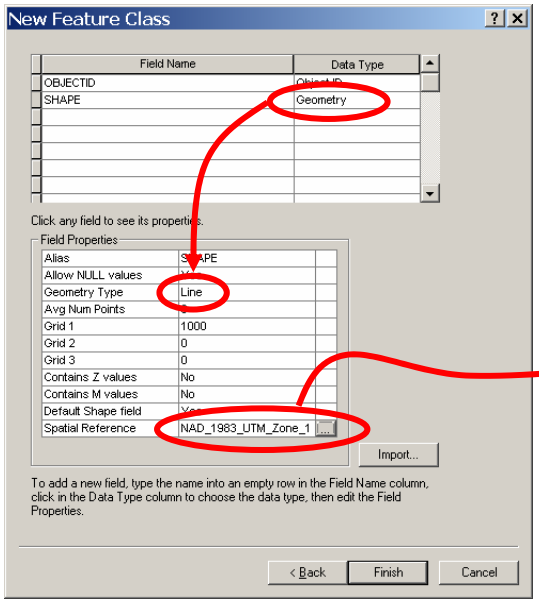
There may be occasions while editing an Incident that you need feature classes to store temporary features before they are moved into your Incident feature classes. These temporary feature classes (line and polygon) must be added to the Incident geodatabase so they can be used while in a current FIMT edit session. For example, if you are using ArcEditor or ArcInfo, you can convert a

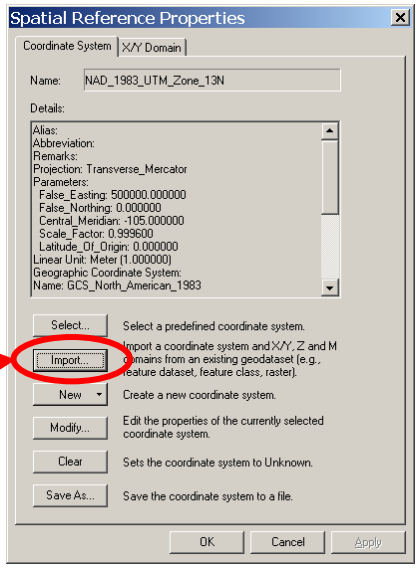
collection of lines into a polygon using the “Construct Features” tool found on the Topology tool bar. The “Convert Features” button requires a target polygon feature class to receive the created polygon. The FirePolygon feature class found in the Incident geodatabase has several custom behaviors that make it a poor target feature class to use for the Convert Features tool. The scratch polygon feature class can be used as the target feature class and then the newly created polygon can be move to the FirePolygon feature class using standard FIMT tools. To create these scratch feature classes, use the following steps.

- Save any existing edits and stop editing if a current edit session is active in ArcMap.
- Open ArcCatalog, using the catalog tree and navigate to your FIMT geodatabase.
- Right click the Incident Geodatabase, click New > Feature Class



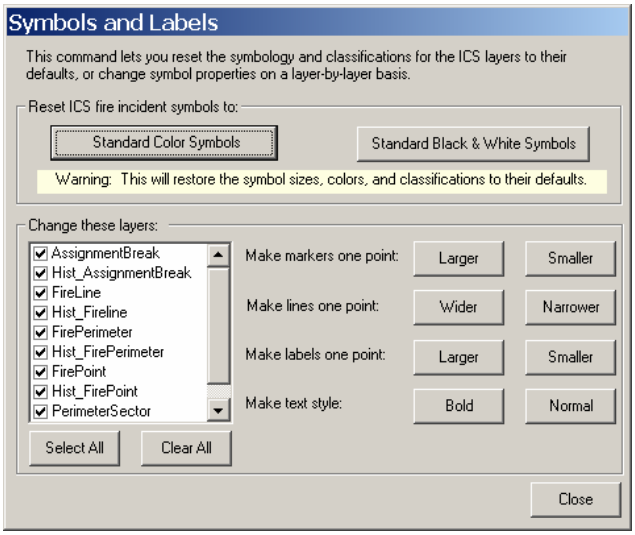
- Enter a name in the name field (i.e. “*scratch_line*”, “*scratch_poly*”)
- Click “*Next*”, Click “*Next*” again.
- Click on the “Shape” column; verify that the Geometry Type is correct for the feature class you are creating (Line, or Polygon).
- Click on the Ellipse button (“…”) to the right of the Spatial Reference Field property to set the spatial reference.
- Use the import button to navigate to the Incident geodatabase, select the FirePolygon feature class.
- Click “*Finish*” to create the feature class (see below).





Changing Symbology

There are several options for setting the map symbology used by the FIMT Fire Mapping Tools. These options include a toggle between standard color and standard black and white symbols, changing the size of point markers, lines, and text labels, and changing between bold and normal text. Use the **Incident Symbols** button to modify the FIMT symbology. The Symbols and Labels dialog contains a checklist of layers that can be modified. All other operations on the dialog will operated on the selected set of layers. Buttons on the dialog control the sizing of symbols for lines, points, and text.



Symbol Color: can be changed using the buttons at the top of the dialog to switch between standardized color and black/white symbols. The switch of symbol colors will reset the symbology to the standard default values. Any customization of the ISC layers performed by the user will be lost. The color switch applies to all the layers in the active incident; the checklist at the bottom of the dialog does not apply to the color switch.

Using Latitude/Longitude Values

Latitude and longitude values are frequently used to reference locations on the ground during an Incident. You will receive information from GPS data collection as well as manual map interpretation that you will need to process into your Incident database. You will also need to provide latitude/longitude values to personnel involved in the Incident. The Fire Incident Mapping Tools provide several functions for accessing and updating information based on latitude and longitude. See the section on Managing Data Elements, Point Locations for

information on using latitude/longitude values to create and modify Incident point features.

Obtaining Latitude/Longitude

You can easily get latitude/longitude values from your Incident database by using the **Get Latitude/Longitude** button on the FIMT toolbar. The button returns latitude/longitude values for any location clicked in the map view. The format of the coordinate values returned can be represented in Decimal Degrees, Degrees Decimal Minutes, and Degrees Minutes Seconds.

Managing Data Elements

The core functionality of the Fire Incident Mapping Tools is to provide the ability to create, modify, and display features of a wildfire Incident command. These features include fire lines, fire points, fire perimeters, assignment breaks, and perimeter sector lines, as well as tracking the history of features as they evolve over time. The following sections of this document outline the process for managing FIMT features.

Editing an Incident

The tools used for managing data elements in the FIMT toolbar are activated only during an active edit session. To activate an editing session in ArcMap, you must have the Editor toolbar added to your ArcMap GUI. From the Editor pull–down menu on the Editor Toolbar, click “Start Editing” to activate the editing environment. There is also a tool on the FIMT Fire Mapping Toolbar that activates the editing environment. Click on the Edit Incident button to begin editing. If you have added data to your ArcMap document from outside the Incident PGDB, you must select the Incident PGDB as your target database. Once you are in an active edit session, you will see that many of the tools on the FIMT toolbar have become enabled.

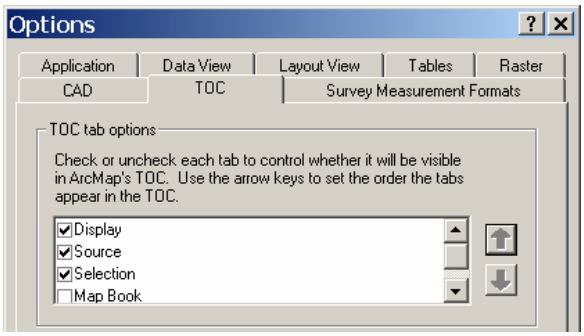
Selected Set

In addition to activating the FIMT Fire Mapping Tools during an edit session, several of the FIMT Fire Mapping Tools are only enabled when there is a selected set of features from a particular feature class contained in the FIMT geodatabase. You can use any standard ArcMap selection tool or method for creating a selected set.

Selectable Layer(s)

The selectable layer(s) can be controlled from several locations on the ArcMap GUI. The menu option “Selection” > “Set Selectable Layers” opens a dialog that is used to select the layers that can be selected. This is very important when editing certain FIMT fire features, as you will frequently be switching the selectable layers. The ArcMap Table of contents can also be changed to include

a “Selection” tab that gives the user easy access to control the selectable layer(s). Click “Options” on the “Tools” menu to open the Options menu. On the TOC (Table of Contents) tab, check the Selection box on. This will add the “Selection” tab to the bottom of the Table of Contents.



Deleting Fire line and Fire Point Features

During any ArcMap edit session, fire line and fire point Incident features can easily be deleted using standard ArcMap functionality. Select the features you want to delete and then click the Delete key on the keyboard.

Deleting Fire Perimeters

During the process of creating and maintaining an Incident database, it may be necessary to delete and replace your fire perimeter(s). The FIMT fire mapping tools maintain a relationship between the FirePolygon, PerimeterSector, and AssignmentBreak feature classes. This relationship is maintained during a delete operation. If a fire perimeter polygon is deleted, the FIMT tools will automatically delete the related objects. In the process of removing a fire perimeter, if you need to maintain the other objects, you must copy them to another feature class prior to deleting the fire polygon.

ArcMap Tip: *The FIMT fire mapping tool uses a relationship between the FirePolygon ObjectID field and the PerimeterSector and AssignmentBreak feature classes PerimeterID field. If there are a number of associated PerimeterSector and AssignmentBreak features, you can use this relationship to select all of the features for deletion. Prior to deleting the FirePolygon polygon, identify the ObjectID for the selected polygon(s). You can then use this value to query the PerimeterSector and AssignmentBreak feature classes to select the associated features that also need deleting.*

FIMT Features

The FIMT geodatabase consists of two Feature datasets each containing five feature classes. The following table shows the contents of the Incident geodatabase.

Feature	Feature Class	Geometry	Use

Dataset			
Incident	AssignmentBreak	Point	Point location indicating changes in Sector, Division, Branch and zone.
Incident	Fire Line	Line	Fire line locations
Incident	FirePolygon	Polygon	Actual fire perimeter polygons
Incident	Fire Point	Point	Misc. point locations
Incident	PerimeterSector	Line	Lines matching fire perimeter used to indicate changes in assignment for fire perimeter.
History	Hist_AssignmentBreak	Point	Assignment break features snapshot by time/date
History	Hist_Fire Line	Line	Fire line features snapshot by time/date
History	Hist_FirePolygon	Polygon	Fire Perimeter(s) snapshot by time/date
History	Hist_Fire Point	Point	Fire point features snapshot by time/date
History	Hist_PerimeterSector	Line	Linear features used to indicate changes in assignment for fire perimeter features snapshot by time/date

Fire Lines

Fire Lines are linear features used to represent a variety of linear features in your Incident personal geodatabase. There are eighteen (18) fire line types that are maintained in a coded value domain in your Incident PGDB (See Appendix II for a diagram representing the fire line domain).

Creating

Fire lines can be created using several methods. Data input can include heads-up digitizing from a raster backdrop (DOQ, DRG) or by moving selected features from another data source into the Fire Line feature class.

Create Fire Lines:
This tool allows you to draw directly into the Fire Lines feature class using the mouse. The tool prompts the user for fire line attributes once a fire line is entered. Using the standard “create Feature” process in ArcMap will not prompt for these attributes and should be avoided to eliminate the possible of missed attributes.

Vertices along a line are entered using the left mouse button. You can control existing vertices along a line by clicking the right mouse button while the cursor is positioned over a vertex. You can access additional coordinate input methods and other vertex commands using the right mouse button while the cursor is positioned away from existing vertices. You complete (Finish Sketch) the line by double-clicking the left mouse button. Once the line input is complete, a popup dialog is displayed that allows you to specify the fire line type and division designation if desired.

Copy to Fire Lines:
This tool allows you to copy any selected linear feature(s) from any source into the Fire Line feature class. You will frequently receive input in the form of shapefiles or coverages that have been collected using a variety of different

processes. Any of these sources can be used to input data into Fire Line. The copied lines will not be attributed, and will default to an Unknown fire line type. After using the "**Copy to Fire Lines** tool, you must then set the fire line type and division assignment appropriately. If Firelines are imported from another incident PGDB or have any fields in common with the fireline class, these attributes will also be imported.

Modifying Fire Line Geometry

You will frequently be required to update or modify FIMT features based on the condition of the Incident and operations that are taking place daily on the ground. Several FIMT Tools support these modification tasks.

Split Fire Lines:
This tool allows you to split a single selected line into two parts. The "**Split Fire Lines"** tool changes the cursor to a knife icon that is used to draw a line across a single existing fire line. The crossed line is divided into two parts. A dialog is opened that allows you to set the line type and division assignment for both parts of the split line segment. Only a single line segment can be split during a single split operation. Drawing across multiple line segments will produce an error message.

Join Fire Lines:
This tool allows you to merge two separate line segments into a single line. The two lines must be selected, and the end points must be connected (coincident). Use the standard ArcMap tools to select the features you want to join. Clicking the "**Join Fire Lines"** tool will open a dialog that allows you to select the line type and assign the division to the single line segment created from the two selected fire lines.

Modify Fire Line Attributes:
During the lifespan of the Incident database, you will periodically need to change the line type designation for your fire lines. This operation is accomplished using the "**Change Fire Line Type"** tool. You can use any ArcMap selection method to select a single fire line. Clicking the "**Change Fire Line Type"** button will activate the dialog that allows you to select the fire line type and to assign a division designation.

Fire Perimeters

Fire perimeters are polygon features stored in the FirePolygon feature class. The FIMT Fire Mapping tools maintain additional feature classes that store features needed to symbolize, label and track portions of the fire perimeter.

Perimeter Assignment Breaks (Zone, Division, Branch and Sector)

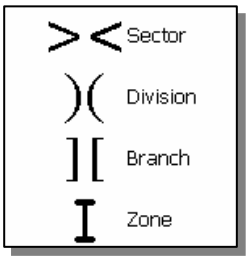
Zone, Division, Branch and Sector assignment breaks provide the administrative mechanism to divide the fire perimeter into separate, attributed line segments. Under normal operating procedures, Divisions are nested inside of Branches.

Zones and Sectors are provided for those Organizations that require the additional levels of the hierarchy. The FIMT Fire Mapping Tools allow the user to manage zones, divisions, branches and sectors through a line feature class named PerimeterSector and a point feature class named AssignmentBreak.

The geometry of the PerimeterSector line feature class is designed to automatically follow (snap to) the geometry of the FirePolygon polygon feature class. The FIMT Fire Mapping Tools performs feature snapping between the FirePolygon and the PerimeterSector feature class when the FirePolygon is edited. No editing of the shape of the lines in the PerimeterSector feature class can be performed. Any attempted reshaping of the PerimeterSector lines will be snapped back to follow the fire perimeter. The only direct editing of the PerimeterSector feature class allowed is splitting the lines into separate segments that can be attributed with their corresponding attribute values. The splitting of the PerimeterSector feature class is performed using the standard "Split" tool on the Editor Toolbar.

Update Perimeter Assignment Breaks

The AssignmentBreak point feature class has special symbology that indicates the change in assignment represented by special bracketed symbols. These point symbols are automatically generated based on the assignment attributes given to the lines in the PerimeterSector feature class. The symbology of the break points as well as updating any required changes in the geometry are updated using the "**Update Perimeter Assignment Breaks"** button. The following symbology is used based on the level of assignment break change in attributes.



Creating a New Incident Perimeter

You can create a fire perimeter using any methodology for data entry available in ArcMap. These methods may include heads up digitizing from a reference image, digitizing from paper source maps, importing data from GPS collection, and importing other coverages or shapefiles into ArcMap. Polygons from these sources are copied into the FirePolygon feature class using the "**Copy to Perimeter Layer"** button. The FirePolygon feature class is populated and attributed using tools in the FIMT toolbar. When creating a fire perimeter in a new Incident PGDB there are several steps that must be followed:

Step 1A – "Copy to Perimeter layer"
(Using existing polygons): Use the button to move any set of selected polygons into the FirePolygon feature class. If this is a new (empty) Incident PGDB, the FirePolygon feature class will be empty. During the copy to perimeter process, both the FirePolygon feature class will be populated and the matching lines in the PerimeterSector feature class will also be created.

Step 1B – (Using existing polylines ArcInfo or ArcEditor): You can create a FirePolygon from line segments that connect or cross to form a closed area. This process is only available with **ArcEditor** and **ArcInfo** licenses (*ArcView license users can use the Trace tool to trace linear features to create a polygon*). Use the Topology toolbar to access the "Construct Features" tool. This step also requires the use of a target scratch polygon feature class to receive the constructed polygon (See section "Creating a scratch Feature Class" above). NOTE: Do not use the actual FirePolygon feature class for the target feature class when using the Construct Features tool; you must create the polygon into a scratch feature class before it can be copied into the FirePolygon feature class.

1. Make sure the Topology tool bar is added to the ArcMap GUI.
2. Select the existing line segments that form a closed polygon from any available source.
3. Set the Target Feature class on the Editor Toolbar to your scratch polygon feature class.
4. Set the edit task to "Create New Feature".
5. Click the "Construct Features" tool on the topology toolbar, accept the default cluster tolerance and click "OK". This will create a new polygon in the scratch polygon feature class.
6. Set the selectable layers to include the scratch polygon feature class, and then select the newly created polygon.
7. Click the "**Copy to Fire Perimeter**" button to copy the new polygon into the FirePolygon feature class. This will also create the corresponding polylines in the PerimeterSector feature class.

Step 1C – (Using existing polylines ArcView): You cannot create a FirePolygon from line segments that connect or cross to form a closed area when using an ArcView ArcGIS license. The topology toolbar "Create features" tool is disabled with an ArcView license. You can, however, use the ArcGIS Trace tool to trace selected lines that close to form a polygon area. The FirePolygon feature class should not be used as the target feature class for creating the polygon. You should create a scratch polygon feature class in the Incident PGDB that can be used to capture the new polygon. The following steps can be used to create a fire perimeter polygon by tracing existing line segments. Note: This process is described in detail in the section: "*Tutorial: Adding a Fire Perimeter-Advanced Editing*"

1. Set the selectable layer to the source of the lines being traced
2. Select all the line segments that you need to trace.

3. Set the Target on the Editor Toolbar to a scratch polygon feature class and set the Task to Create New Feature.
4. Select the Trace tool from the Editor Toolbar.
5. Click in any location on the selected line segments and begin tracing.
6. Trace along the first line segment until you reach an intersection with another selected line or you reach the endpoint of the line currently being traced.
7. Left Click (once) to stop tracing at the intersection, then Left Click again in a location in the next line segment to trace. This stops tracing of one line segment and begins tracing again on the next segment.
8. Continue until the entire area has been traced, and then Double Click to end the trace process and complete the closed polygon.

Step 1D - Creating polygon from no existing vector source:
Use the "**Create Fire Perimeter**" tool to manually draw any new fire perimeters using whatever source of information you have available. Make note that when you select this tool, the edit task is automatically set to "Create Fire Perimeter" and the target feature class is set to the FirePolygon feature class.

The remaining steps outline the process for completing a new fire polygon and adding the attributes and assignment breaks.

Step 2: **Creating Assignment Break geometry**:
Once you actually create a FirePolygon, all of the associated assignment values (Division, Branch, and Sector) contained in the PerimeterSector feature class will be set to "Unassigned". The line segment representing the fire polygon assignments in the PerimeterSector feature class will consist of a single line that closes to match the fire polygon. If the new FirePolygon will be associated with more than one assignment break, you must first split the PerimeterSector line at the appropriate locations.

"**Split Assignment Line**"
Use the "Split Assignment Line" tool on the FIMT Toolbar to perform this task. You will need to split the PerimeterSector line at each location that corresponds to your administrative assignment of Zone, Division, Branch, and Sector. The "Split Assignment Tool" will re-draw the split PerimeterSector line segments with a temporary graphic displaying each side of the split in **blue** and **green** colors. A dialog is them presented that allows you to set the assignment attributes to each side of the split. (**Note:** *These categories are all optional; you can allow the Zone and Sector values to remain unassigned if these are not used at your incident*).

ArcMap Tip: *Do not use the ArcMap "Merge" tool to un-split PerimeterSector lines, as this will create unpredictable results. You can use the ArcMap "Split Tool" to split a PerimeterSector tool, however; you will have to manually set the Unit assignment using the Assign to Unit tool.*

Step 3: Assigning to Unit:
Use the "**Assign to Unit"** tool to attribute the line segments with the correct Zone, Division, Branch, and Sector label. You should make certain that all lines have been assigned the correct assignment values. During the Assignment break process, you may inadvertently create an additional line segment between the last assignment break and the point where the original FirePolygon closed.

Step 4: **Update Perimeter Assignment Breaks**:
Use the "**Update Perimeter Assignment Breaks**" button to generate AssignmentBreak point symbols at the connection point between multiple PerimeterSector lines. This tool will insert the appropriate point symbol into the AssignmentBreak point feature class. The tool will automatically un-split (merge) all connecting PerimeterSector lines that have identical assignment attributes.

Merging/Splitting Assignment Breaks

The assignment breaks in the PerimeterSector feature class can be modified at any time. New assignments can be created and removed by updating the assignment attributes for the lines requiring modification.

Removing Assignment Breaks: Update the associated attribute values for Zone, Division, Branch, and Sector in the PerimeterSector Feature class. Then, use the "**Update Perimeter Assignment Breaks**" button to remove Assignment breaks if the attribute values in the PerimeterSector feature class are the same on both sides of the Assignment break.

Create Assignment Break: Use the "Split Assignment Line" tool to split a selected PerimeterSector line in the location of the new Assignment break. Then, use the "**Assign to Unit**" button to assign different Assignment break attributes to the lines on each side of the split. The "**Update Perimeter Assignment Breaks**" button then can be used to update the Assignment breaks and create the new point feature at the location of the split.

Point Locations

Point locations are used to indicate single point locations on the ground. The FIMT Fire Mapping Tools provide functionality to add, modify, attribute and label point features. The points are stored in the Fire Point feature class in the Incident PGDB.

Creating

Point locations can be added from several sources including heads up digitizing using a reference image, digitized from paper maps, input from a GPS device or other source coverages and shapefiles, and added using latitude/longitude values. The add point functionality in the FIMT Fire Mapping Tools provides a dialog for setting the point type and point type specific information such as

Name and Date for particular point types. The spot fire point type also includes a direction to indicate the direction of spread.

Create New Fire Point:
This tool adds point locations to the Fire Point feature class based on user input. You simply click on the location for the new point feature. A dropdown list is displayed containing a list of valid point types. Additional attribute input boxes will change based on the point type selected.

Create New Fire Point Latitude/Longitude Coordinate Input:
This tool adds point locations to the Fire Point feature class based on the latitude/longitude values entered by the user. The input dialog accepts coordinate values in Decimal Degrees, Degree Decimal Minutes, and Degrees Minutes Seconds. After entering a coordinate, a dropdown list is displayed containing a list of point types. Additional attribute input boxes will change based on the point type selected.

Modifying

Move Fire Point: Latitude/Longitude Coordinate
Point feature attributes and location (x/y coordinates) can be modified using the FIMT Fire Mapping Tools. Points can be selected and moved using the ArcMap Edit tool to select and drag and drop features in the map view. Entering a new latitude/longitude value using the "**Move Fire Point: Latitude/Longitude Coordinate"** Input tool can also be used to modify point locations. You use this tool to move a selected point to a new location based on known latitude/longitude values. The tool accepts coordinate input in Decimal Degrees, Degree Decimal Minutes, and Degrees Minutes Seconds.

Importing from Other Source

Copy Features to Fire Points
Any valid point data source can be used to input points into the Fire Point feature class. Use the "**Copy Features to Fire Points"** button to move the selected set of points into the Fire Point feature class. The selected points will be copied to the Fire Point feature class and given the default miscellaneous point type. After a set of selected points are moved into the Fire Point feature class, you can set the point type using the "**Change Point Information"** tool.

Changing Point Types

You can change the point type and corresponding additional attribute values of a single selected point in the Fire Points feature class using the "**Change Point Information"** button. A dialog will open that contains a list of fire point types and their associated attributes.

Incident History

One of the most significant features contained in the FIMT Fire Mapping Tools and the Incident PGDB is the ability to create snapshots of the current Incident information and store it into history layers. There are five history feature classes contained in the Incident PGDB that match the feature classes in the Incident feature dataset. These include Hist_AssignmentBreak, Hist_Fireline Line, Hist_FirePolygon, Hist_Fireline Point, and Hist_PerimeterSector.

All of the features that are copied to the history feature classes are attributed with a date and time stamp. This attribute allows any number of uses that require information about the condition of the Incident at a particular time. During an Incident command, the GIS staff editing an Incident database should make periodic copies to the history feature classes. This should be done at lease once per day.

Moving Incident Elements to History Layers

Copy to History

The "**Copy to History"** tool opens a dialog that allows you to select from Fire Lines, Fire Perimeters, and Fire Points to snapshot into the history feature classes. Selecting the Fire Perimeter option will actually snapshot FirePolygon, Assignment Breaks, and PerimeterSector lines to their respective history feature class. Based on the frequency of change, you should decide how often historical snapshots should be made.

Generating Reports

Fire line, fire perimeter, and fire perimeter change reports can be generated based on the assignment attributes on the PerimeterSector lines and the Fire Line feature classes. The reporting tools in the FIMT toolbar contain the functionality that copies the contents of the report to the Windows clipboard. You can then use the paste functionality to add the report text to any text editor/word processor, or you can paste the report text into the ArcMap layout view.

Fire Line Report

The fire line report contains a summary of each fire line type by feet, miles, and chains.

Perimeter Report

The perimeter report summarizes the fire perimeter branch and division as well as summarizing the fire line features by division. This report gives you a complete list of all line types by division.

Perimeter Change Report

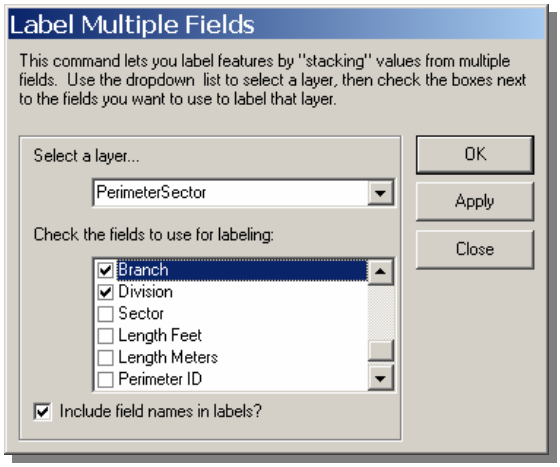
The perimeter change report uses the information saved in the history feature classes to produce a report of changes in perimeter area over the lifespan of the Incident. For each date in the perimeter history, a record will be reported showing the actual area and the change in area.

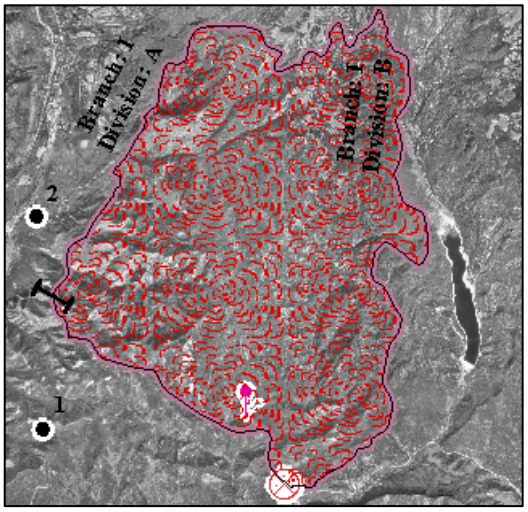
Output to Text Editor

The copy button on the popup report dialog box utilizes the Windows clipboard to store the text from either a perimeter or Fire Line report. You can paste the copied text into any text editor that supports Windows cut and paste functionality.

Labeling Incident Features

All of the Incident features can be labeled using the "**Label Multiple Fields**" tool on the FIMT toolbar. This tool includes a pull down list of all the FIMT feature classes and a series of check boxes next to each attribute item found in the selected feature class. Checking the radio button next to one or more attribute columns will add that column to the custom label properties for the selected feature class. A label string is constructed and added to the map display. The option to include the attribute column name in the label string is also available. This is particularly useful for labeling PerimeterSector divisions and branches.





The "Label Multiple Fields" tool actually builds a label expression that can be accessed and edited using the feature class Layer properties dialog under the "Label" tab.

FIMT Fire Mapping Tools Tutorials:

Tutorial: Installing the Data

A sample set of data has been created from the Colgate fire. The actual data contained in the Tutorial data set has been created to demonstrate steps you might actually perform during an incident. This is not real data and may not represent the actual procedures you follow.

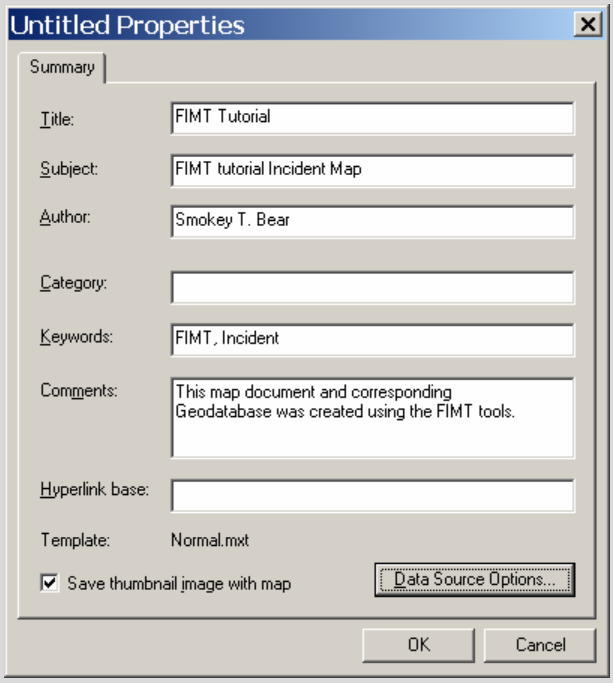
Using Windows Explorer, navigate to the tutorial CD and run the setup.exe. Store the training data in any working directory you wish and make note of it since you will use this directory for the remaining tutorial steps.

Tutorial narrative: *The text shown in green italic font represents the tutorial narrative. These narratives are intended to emulate an incident scenario. These steps are strictly hypothetical and are not intended to represent the actual steps used at a real incident command.*

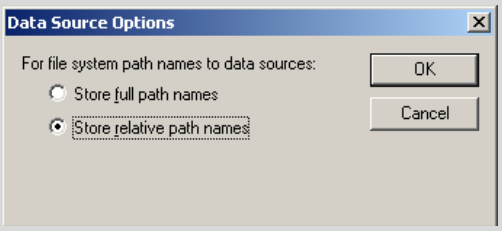
Tutorial: Setting up a New Incident

Create a new map document, set map properties, and then load the FIMT Fire Mapping Tools.

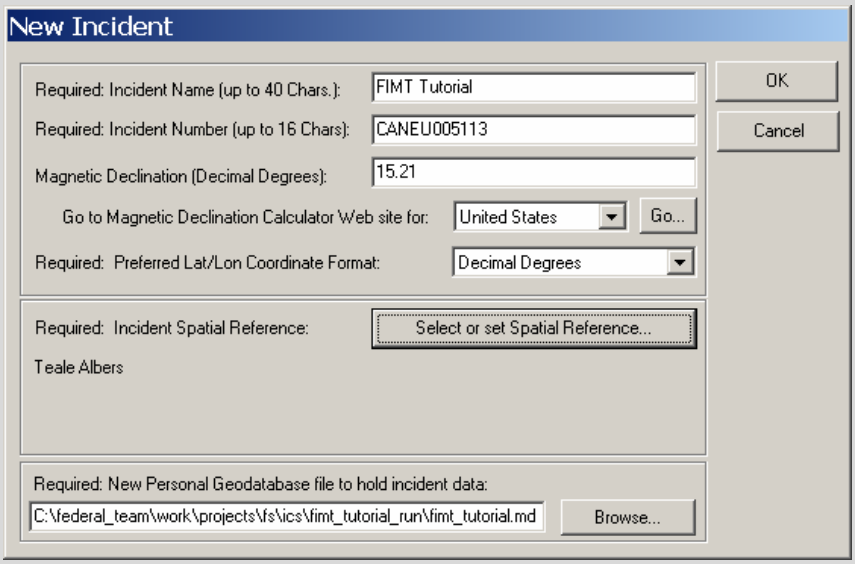
Open ArcMap. Set the properties for your map document. Click the File menu, and then click Map Properties. Fill in the appropriate information on the Map Properties dialog.



Click the Data Source Options… button to set your ArcMap document to use relative paths. This is especially important if you are going to be distributing you map document and data to other computers. Storing your data relative to the map document will eliminate the need to set the data source on other computers.

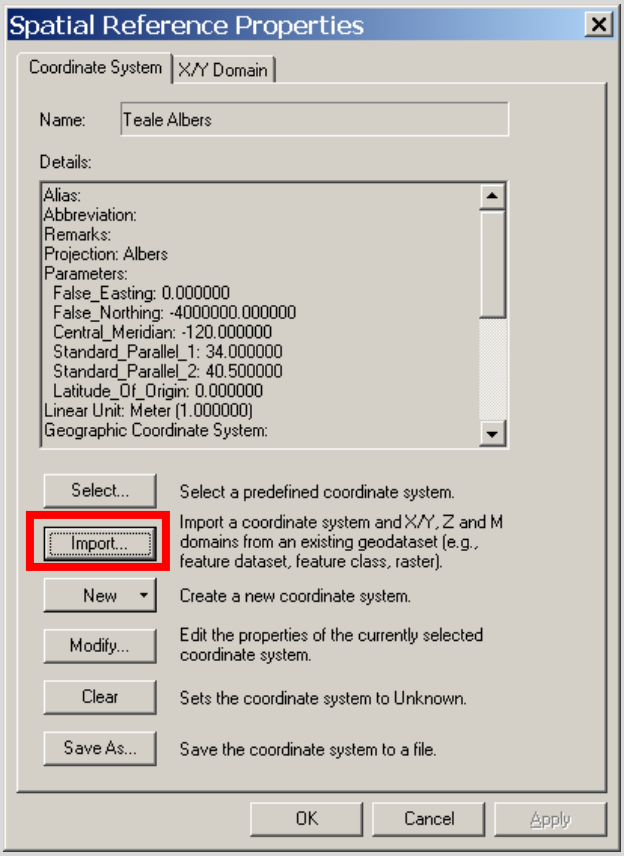


1. Click the Tools Menu, and then click Customize.
2. Check on the "Fire Incident Mapping Tool" from the Toolbar tab.
3. Dock the FIMT Toolbar to the ArcMap GUI in any location you like.
4. Click the **Create Incident** tool on the FIMT Toolbar.
5. For the purposes of the tutorial, enter the information shown on the following graphic.



6. Click the Set Spatial Reference button to select a spatial reference. This button will open the standard ArcGIS spatial reference properties menu.
7. Click the import… button.

Note: *For the purpose of the tutorial, you will be using a custom "Teale Albers" projection commonly used in the western U.S. (California, Oregon and Washington). The actual coordinate system you use will depend on the location of your incident, the size of the incident, and the coordinate system of available of supporting data such as digital orthophotography and digital raster graphics*.



8. Use the Spatial Reference Properties dialog to navigate to the tutorial data directory. Select the “082904_1500_per_colgate.shp” shapefile to import the spatial reference from the data provided.

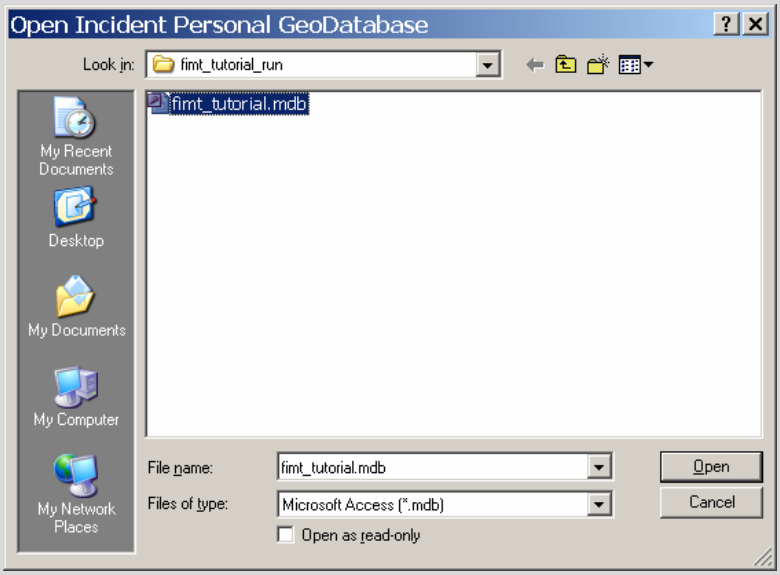
Note: *Selecting a defined projection using the Select… button will automatically set the x/y domain. The FIMT tool automatically defines the x/y domain for all standard coordinate systems.*

9. Click OK.
10. Make sure you specify a working directory for the Incident Personal geodatabase. Name the Incident PGDB “Missionary_Ridge.mxd”.
11. Click OK on the FIMT New Incident dialog. A new personal geodatabase will be created and saved in the directory specified. A grouped layer named Missionary_Ridge::CO-SJF-26804 will be added to the ArcMap table of contents. The grouped layer contains all of the feature classes used by the FIMT Fire Mapping Tools.
12. Save your ArcMap document to your working directory. Name it “Missionary_Ridge.mxd”.
13. Close ArcMap.

Tutorial: Opening an Existing Incident

Open ArcMap. Make sure the FIMT Fire Mapping Tools are turned on.

14. Click the Open FIMT Incident button on the FIMT toolbar.
15. Using the browser, navigate to the FIMT_Tutorial.mdb personal geodatabase saved in the Creating a New Incident tutorial step. Click Open.



Optional:
Alternatively, you could open the map document, which already contains your Incident personal geodatabase.

16. Open ArcMap.
17. Open the FIMT_Tutorial.mxd ArcMap document located in your working directory.

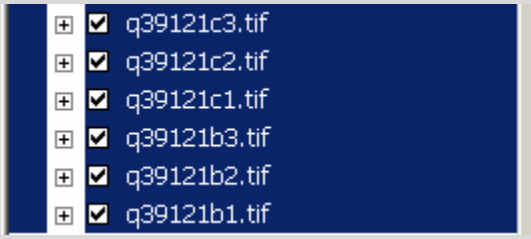
Tutorial: Adding Reference Data to your Incident

The data provided with the FIMT tutorial includes several USGS Digital Raster Graphic (DRG) images as well as a low resolution Digital Orthophoto mosaic. You will use these images to provide reference data for your FIMT Incident. First you will create an additional data frame to your map document, and then you will add the DRG images to one data frame and the DOQ image to the other. You will be able to activate either data frame to view your Incident with a DRG or orthophoto background.

1. Right-click the Layers data frame in the ArcMap table of contents, then click Properties.
2. Using the General tab, name this data frame “DRG”.
3. Click “OK”.
4. Click the Insert menu, and then click Data Frame.
5. Right-click the new data frame in the table of contents and select Properties from the context menu.
6. Using the General tab, name this data frame “DOQ”.
7. Using the “Coordinate System,” tab, set the coordinate system by importing from an existing source. Navigate to the tutorial data directory. Select the

"082904_1500_per_colgate.shp" shapefile to import the spatial reference from the data provided

8. Click "OK" to close the data frame properties dialog box.
9. Right-click the DRG data frame, then click Activate. This data frame should be in bold text on the table of contents indicating that it is the active data frame.
10. Click the ArcMap Add Data button, and browse to images directory contained in the FIMT Tutorial install directory.
11. Add All 6 tiff images that are prefixed with "***q39121***" to the active data frame.
12. Select all 6 images in the ArcMap Table of Contents (TOC) as shown in the graphic below:



13. Right click the selected images, and then select "Group" from the context menu. This will create a group layer containing all six images. The group layer will facilitate turning the images on and off easier.
14. Right click the group layer, and then click "Properties".
15. Using the General tab, rename the group layer "Digital Raster Graphics".
16. Right-click "Digital Raster Graphics" group layer in the TOC, then click Zoom to Layer.
17. Right-click the DOQ data frame, then click Activate.
18. The DOQ data frame should be active. This data frame should not contain any layers.
19. Click the **Copy FIMT Layers to Dataframe** button on the FIMT toolbar. This button will copy all of the FIMT Incident layers to the data frame.

Note: *The "**Copy FIMT to Dataframe**" tool makes a copy of each FIMT feature class from the active incident database into the active dataframe. Since this is a copy of the active incident database, editing can take place in either data frame.*

20. Click the ArcMap Add Data button, and browse to FIMT Tutorial data directory.
21. Add the DOQ.tif image to the active data frame. Ignore the warning about the missing spatial reference if it appears.
22. Right click the DOQ image in the table of contents, then click Zoom to Layer.
23. Save your map document.

Tutorial: Creating the initial Incident data:

Tutorial narrative: *In the initial phases of this Incident, it is August 29, 2004 and you are assigned to the FIMT Tutorial Incident. At 20:00, the Situation Unit Leader informs you that he will need the IAP map for the morning IAP packet. Your IAP will be for the day shift on August 30th and it will be distributed at the 6 a.m. morning briefing.*

You have received the initial perimeter, contained in a shapefile, from the infrared interpreter. The shapefile is located in the FIMT Tutorial installation directory. The file is named 082904_1500_per_colgate.shp.

You have also received a GPS shapefile from a field crew. The shapefile contains waypoint information. You will use the table definitions for each waypoint to build FIMT points and to assign branch/division breaks to the fire polygon. The shapefile is located in the FIMT Tutorial installation directory. The file is named 082904_1500_wayp_colgate.shp.

24. Click the DRG data frame and click Activate if it is not the current active data frame.
25. Click the Add Data button, and browse to your FIMT Tutorial install directory.
26. Add the *082904_1500_per_colgate.shp* shapefile to the active data frame.
27. Start the editing environment on the Incident personal geodatabase. Click the "Edit Incident" button.

Note: *You can also start editing by selecting "Start Editing" from the Editor Toolbar > Editor Pull down menu. Several of the FIMT Fire Mapping Tools that were previously grayed out should now be enabled.*

Next you will select the source perimeter and copy it to the FirePolygon feature class.

ArcMap Tip*: From this point on in the editing process, you will be frequently switching selected sets. You can add the selection tab to the Table of Contents to make this task easier. Open the Options dialog under the Tools > Options menu. Activate the TOC tab, and then check the Selection check box in the TOC Tab Options control panel. Click OK to close the Options dialog.*

28. Set the selectable layer to *082904_1500_per_colgate.shp*.
29. Use the Select Features tool to select the perimeter contained in the selectable layer.
30. Click the Copy to Perimeter Layer button on the FIMT toolbar.
31. Right-click the perimeter1.shp layer, then click Remove.

Examine the contents of the FirePolygon feature class. Notice it now contains the polygon that was selected from the *082904_1500_per_colgate* shapefile. This

process can be used to move any selected polygon from any valid polygon vector data source into the FirePolygon feature class.
Also examine the contents of the PerimeterSector feature class. You will notice that this feature class now contains a line that matches the shape of the fire perimeter. The PerimeterSector feature class contains linear features that are used for attributing assignment breaks in relation to the fire perimeter.

Tutorial: Adding Initial Assignment breaks.

Tutorial narrative: You will use the attributed WayPoints to create assignment breaks on the PerimeterSector feature class in the FIMT Tutorial Incident geodatabase. Your Situation Unit Leader has informed you that the FirePerimeter has been assigned the following Branch/Divisions.

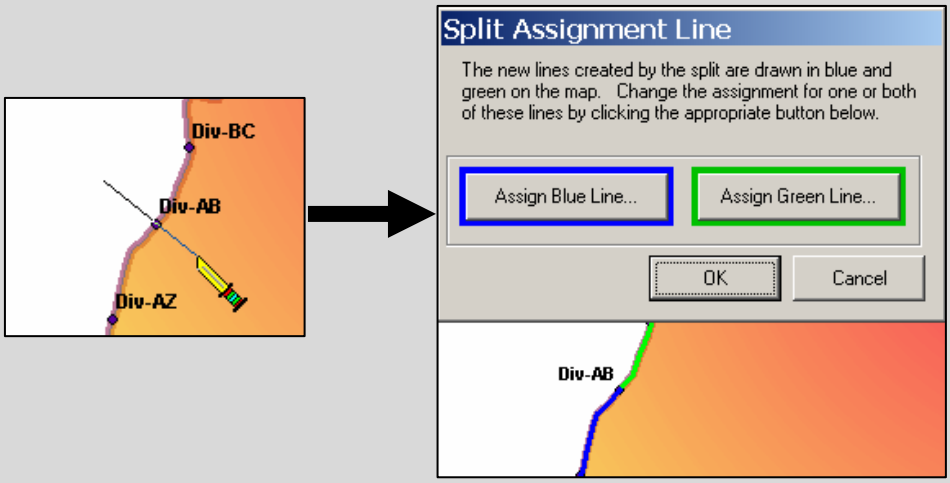
Branch I – Div A, B, C, D
Branch II – Div E, F, G, H
Branch III – Div T, U, V
Branch IV – Div X, W, Y, Z

The 082904_1500_wayp_colgate shapefile contains two attribute columns that you will use to construct your IAP map. The WAYPOINT column contains a label text string. The TYPE field contains the WAYPOINT category. You will label the WAYPOINT layer so you can see the Division breaks. You will use the TYPE field to create a definition query to display only the Division/Branch break points to simplify the map display.

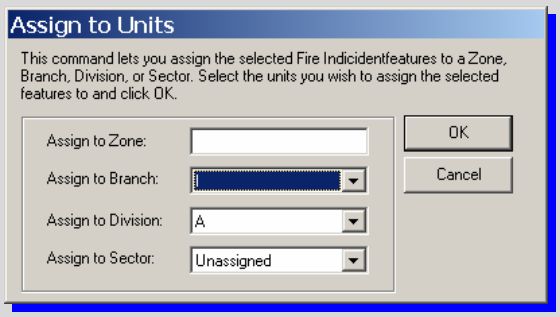
1. Click the Add Data button, and browse to your FIMT Tutorial install directory.
2. Add the *082904_1500_wayp_colgate.shp* shapefile to the active data frame.
3. Right click the 082904*_1500_wayp_colgate.shp, then click "Properties…"*
4. In the **Labels** tab on the Layers Properties dialog, check the "Label Features in this Layer" check box. Verify or set the Label Field to the WAYPOINT attribute column.
5. In the **Definition Query** Tab, use the Query builder to construct the following query string: ***"TYPE" = 'DivBrk'***
6. Click 'OK' to accept the Layer Properties.
7. Click the "Split Assignment Line" button to activate the Split tool.

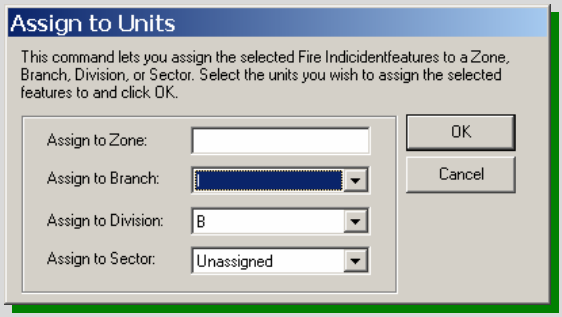
Note: the cursor should change to a knife icon. You use the split tool by clicking to draw a line across the location of the split.

Once you create the split, the PerimeterSector line will be temporarily re-drawn in **Green** and **Blue** indicating both sides of the split. The Split Assignment Line dialog box will open. Use the "**Assign Blue Line…**" and "**Assign Green Line…**" buttons to assign the Sector, Branch, Division, and Zone attributes to the color coded line. The Sector and Zone values can remain "unassigned" if those values are not used at your incident.



8. Click the Assign Blue Line…" button to open the "Assign to Units" dialog box. Follow the graphic example below and assign the **Blue** line to Branch "I" and Division "A".
9. Repeat the process for the **Green** line, assigning it the values: Branch "I" and Division "B"
10. Click OK to complete the Split Assignment process.





Note: Once the Split Assignment process is completed, the associated AssignmentBreak point symbol will be added to the map display.

11. Repeat the Split Assignment Line process for all of the Division break waypoints located around the fire polygon. Make certain you assign the appropriate Branch value for each Assignment Break using the list on the previous page.

Tutorial: Annotating Initial Assignment breaks

Once you have correctly created the Assignment breaks by subdividing and attributing the PerimeterSector feature class, you need to add division and branch labels to your IAP map. There are several methods that you can use to create labels on your map. The FIMT tool bar contains the "Label Multiple Fields" button that can generate labels from several attribute columns as well as include the field name in the labels. In many cases, attribute labels are adequate for map generation.

In this tutorial step, you will use to “Label Multiple Fields” tool to generate labels that you will then convert into geodatabase annotation. You can then edit the annotation to create better placed text on your map.

1. Click the “Label Multiple Fields” on the FIMT toolbar.
2. Select the PerimeterSector feature class in the “Select a Layer…” pull down menu.
3. Check the DivisionID field in the “Check the fields to use for labeling…” scrolling list.
4. Check on the “Include field names in labels?” check box.
5. Click “OK” to create the labels.

Note: you should now see the DivisionID: labels oriented parallel to the PerimeterSector lines.

Next, you will edit the PerimeterSector Label expression to abbreviate the Division label to “Div” and then convert the labels to geodatabase annotation.

6. Right click the PerimeterSector feature class in the TOC, and then click “Properties…”
7. On the Labels tab, click the “Expression…” button.
8. In the Expression text box, edit the existing expression to contain the following: *"Div" &[DivisionID]*
9. Click the “Verify” button to make sure your expression syntax is correct.
10. Click OK to accept the expression, and then click OK to close the Layer Properties dialog.
11. Right click the PerimeterSector feature class in the TOC, then click “Convert Labels to Annotation…”
12. Check off the “Display overlapping labels in the overflow window” check box.
13. Select the “In Database Option” radio button in the “annotation Storage Options” control panel.
14. Click the Browse button to the right of the “Output Annotation Featur Class” text box.
15. In the “Output Annotation Feature Class” dialog, navigate to your FIMT_Tutorial geodatabase. Enter “DivisionAnno” in the Annotation Feature Class: text box. Leave the Dataset: textbox empty.
16. Click OK on the “Output Annotation Feature Class” dialog and then click OK on the “Convert Labels to Annotation” dialog.

The DivisionAnno feature class should now be added to your map display. Next, you will orientate the Annotation horizontal, and then position the individual text to the outside of the fire polygon.

17. Click the “Select Element” tool on the ArcMap Tools toolbar.
18. Use the Select element tool to select ALL the annotation on the map display. The selected annotation should be highlighted with a dashed line.

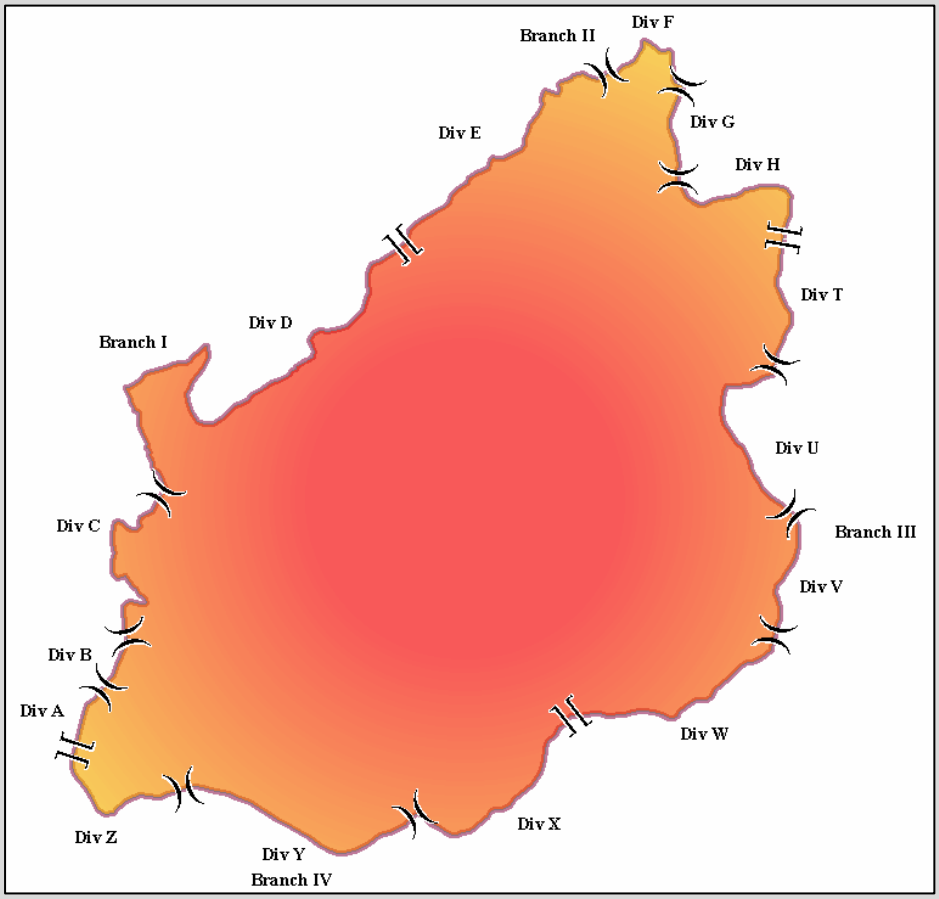
19. Position the cursor over any of the selected annotations, right click, and then select “Properties…” from the context menu.
20. Enter 0 in the Angle textbox, and then click OK.

All of the selected Annotations should now be rotated to a horizontal position.

21. Using the “Select Element” tool select each annotation one at a time and drag it to a location outside the fire polygon in a position between each assignment break symbol.

Using steps 1-21 above, repeat this process to create annotation for the Branch assignments. Modify the label text to read “Branch I”. Position these annotations outside the fire polygon between the Branch assignment break symbols.

Once you have repeated these steps for the Branch annotation, you map should appear similar to the graphic below. (The DRG/DOQ images have been turned off for clarity):



Tutorial: Adding Fire lines from the Fire Polygon

Tutorial Narrative: At the 20:00 meeting with your Situation Unit Leader, you were informed that the following fire line information has been gathered:

Active fire: Div DE break to Div UV break

Dozer Line: Div UV break to Div WX break
Completed Line: All remaining line

The concept Fire perimeter in the FIMT geodatabase is actually composed of several feature classes including; FirePolygon, PerimeterSector, and AssignmentBreak. The FirePolygon is the actual area contained by the perimeter. PerimeterSector is a line feature class that is automatically snapped to the FirePolygon. This linear feature class is used to manage the Assignment break attributes on lines that match the FirePolygon. This is necessary because the geodatabase cannot store linear attributes on a polygon feature class (FirePolygon). AssignmentBreak is a point feature class used to symbolize changes in assignment breaks.

You can use the PerimeterSector features to copy these line segments into the FireLine feature class to create fire lines that follow or conform to the FirePolygon.

1. Right click the PerimeterSector feature class, then select “Selection” > “Select All”
2. Click the “Copy to FireLines” button on the FIMT Toolbar.
3. Click off the PerimeterSector feature class in the TOC.
4. Verify that the FireLine feature class in visible.
5. On the TOC Selection tab, make the FireLine feature class the only selectable layer.
6. Use the “Select Features” tool to select the line segments from Div DE break to Div UV break. You should have six (6) lines selected.
7. Click the “Attributes” button to open the “Attributes” dialog.
8. In the left pane of the “Attributes” dialog, click on the top most “FireLine” group. The right panel should contain a list of Properties (attribute columns) with no visible attribute values.
9. Click to the right of the “FLType” property to activate the Fire Line Type domain.
10. Select “Uncontrolled Fire Edge” from the pull down list of domain values.

Note: These lines were copied from the PerimeterSector feature class so there are six selected Fire lines of the same type. You can use the Merge menu option on the Editor tool bar to merge the selected firelines into a single line to make future management of the fireline easier.

Note: When using the Attribute dialog, you can set the attributes for an entire selected set by selecting the top of the selected set in the left panel. You will not actual see the attribute values in the right panel. They will however be set and visible in the individual records.

Next, you will use the FIMT “Change Fireline” tool to set the fire line type to “Completed Dozer line” for the Lines from Div UV break to Div WX break.

11. Select the two lines represented between the breaks described above.
12. Use the Editor > Merge operation to merge the selected lines into a single line segment. Make certain the FireLine feature class is the only selectable layer.
13. Click the “Change Fireline” tool on the FIMT toolbar.

Note: The current version of the FIMT tools only supports changing a single selected line. In the next release, you will be able to have multiple line segments selected.

14. Select “Completed Dozer Line” from the Pull down list of Fire line types.

Note: You can also use the “Change Fireline” tool to assign Branch/Division values to fire lines as well as add metadata about the fire line. You should experiment with these additional buttons to become familiar with their operation.

15. Click OK to apply the change to the fireline attributes.
16. Repeat steps 11-15 for the remaining unassigned Firelines. Set the Fire line type to “Completed Line”.

Tutorial: Adding Fire Points from an existing Source

Tutorial Narrative: The 082904_1500_wayp_colgate shapefile contains additional way points that need to be added to your FIMT Tutorial database as a variety of different fire point types.

1. Right click the 082904_1500_wayp_colgate shapefile in the TOC, and then click “Properties…”
2. On the “Definition Query” tab, click the “Query Builder…” button.
3. On the Query Builder dialog, click the clear button.
4. Using any method, create a query string as follows: *"TYPE" <> 'DivBrk'* (This query will query out all points except the Division Break points you have already used.
5. Click the “Verify” button to make sure your query syntax is correct.

Note: your 082904_1500_wayp_colgate layer should still be labeled with the WayPoint field. If not, set the layer properties to label with this field.

6. Right click the 082904_1500_wayp_colgate layer in the TOC, and then click Select > Select All
7. Click the “Copy to Firepoints” button on the FIMT toolbar to copy the selected points into the FirePoint feature class.
8. Make certain the FirePoint feature class is turned on.

Note: once you copy the selected points into the FirePoint feature class, you should see the new fire points displayed as red question marks indicating the fire point type is unknown. You must now set the firepoint type from unknown to the correct fire point type based on the WayPoint label in the source shape file. Using the “Change FirePoint” tool on the FIMT toolbar, you will set the attribute values one at a time.

9. On the TOC Selection TAB, set the FirePoint as the selectable layer.
10. Select one of the FirePoints displaying the Unknown point type. (Red question mark).
11. Click the “Change Firepoint” tool on the FIMT toolbar.

Tutorial Narrative**:** The Waypoint shapefile contains the following Fire Point types:

DP = Drop point, enter the “DP” and the number in the Name field
Staging = Staging Area, enter the name in the Name field
ICP = Incident Command Post, enter “ICP” in the Name field
Base = Incident Base, enter “Base” in the name field
Origin = Fire Origin, set Name field blank

12. Repeat steps 10-11 for all of the remaining Unknown fire points.

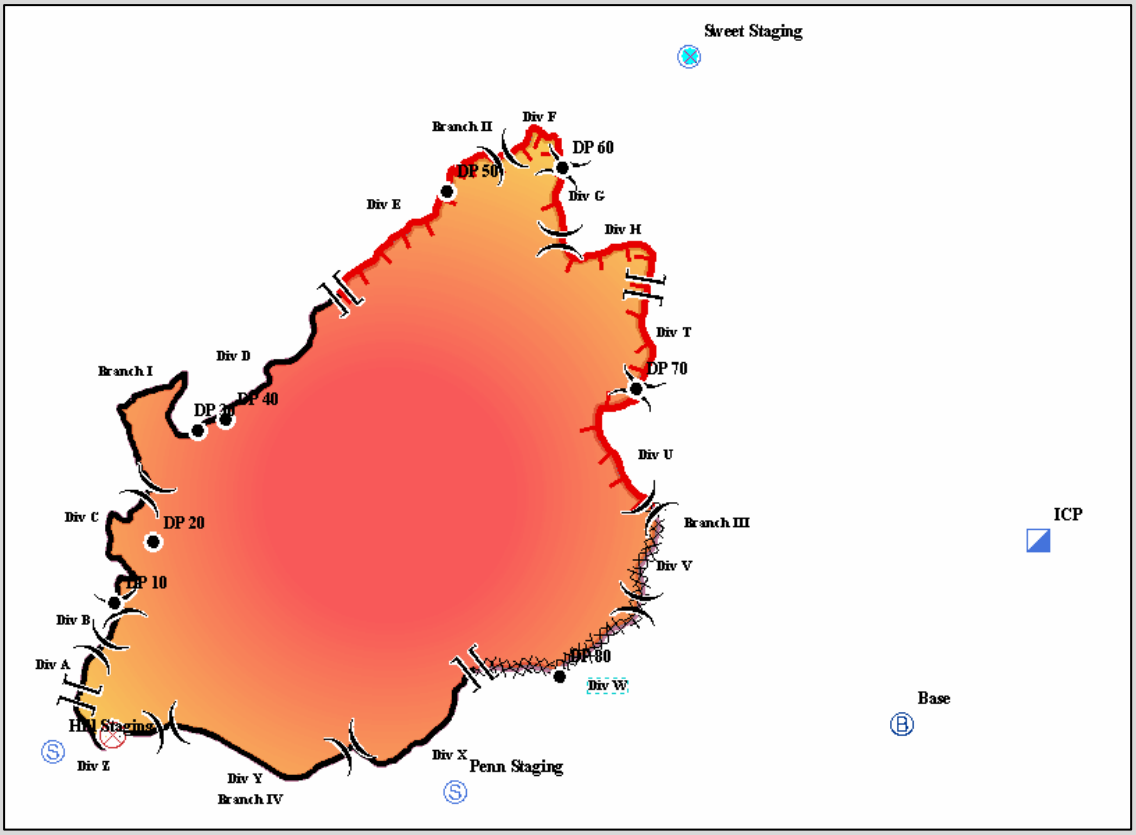
Note: The “Copy to Firepoint” tool automatically adds the text string “Not Set” in the name field for all copied points. Make sure to set the Name field blank for all fire points that do not have a name. This will prevent the string “Not Set” from displaying in labels using the Name field.

Note: The FirePoint feature class is added by default below the other FIMT feature classes in the TOC. You can move this feature class to the top by dragging it in the Display tab of the TOC.

13. Click the “Label Multiple Fields” tool on the FIMT toolbar to label the fire points. Set the layer to FirePoint, and check on the PointName field for labeling. Click OK to draw the label.

Note: The Firepoint labels may conflict with other features on the map making them difficult to read. You can follow the steps above to create another Annotation feature class containing FirePoint text.

Once you have completed the tutorial steps to this point, you map should appear similar to the graphic on the following page:

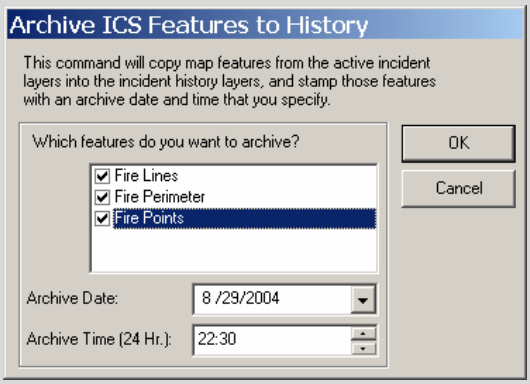


Tutorial: Creating Historical Snapshots

The FIMT Fire Mapping Tools allow you to create a series of historical snapshots of your Incident data over the life cycle of the Incident. You should decide at the beginning of the Incident what the frequency should be for making historical copies of your Incident.

1. Click the **Copy to History** button.
2. Using the dialog, select which layers you want copied to history. For the tutorial, leave all of the choices selected.

Tutorial Narrative: The first day of your assignment to this incident began on August 29th, 2004. Your first snapshot to history should be dated with this date and occurred at 22:30.



Note: examine the five feature classes associated with the history feature dataset in the ArcMap TOC. You will find that for each feature class in the Incident feature data set, there is a matching history feature class.

Tutorial: Modifying the Incident

Tutorial Narrative: It is now the second day of your assignment to the FIMT_Tutorial incident. You have received updated Fire Perimeter information in a shapefile. You have also received an updated waypoint shapefile containing new assignment breaks where the fire has spread. Infrared interpretation from the previous night has indicated that there are two large unburned areas inside the fire perimeter that contain valuable residential properties. Your Situation Unit Leader has informed you that these unburned areas have been assigned to a new Branch (V) and need to be added to the Incident map. The fire has also spread to the northwest. Updated fireline is included in the new shapefile.

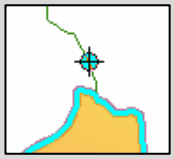
You will need to deliver the updated maps for the evening IAP packet for distribution at the 18:00 briefing.

Tutorial: Modifying the Fire Perimeter

Note: There are several methods that can be used to reshape an existing FirePolygon. This tutorial demonstrated only a few valid methods. It is important to remember that the FirePolygon is synchronized with the PerimeterSector feature class and the AssignmentBreak feature class through the FIMT extension. If you encounter behavior using the FIMT extension that indicated these feature classes are no longer synchronizing, you should save your edits and map document, exit and then restart ArcMap.

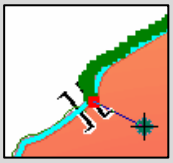
1. Navigate to the Tutorial install directory and add the following shapefiles to you map document.
   083004_1550_update.shp
   083004_1500_wayp_colgate
2. Zoom in to an area containing the two perimeter update lines in the NW area of the FirePolygon.
3. On the Editor toolbar, set the Target Layer to “FirePolygon”, and set the Task to “Reshape Feature”
4. Using the Selection tab on the TOC, set the selectable layer to FirePolygon
5. Select the FirePolygon using the standard Select tool.
6. Activate the “Sketch Tool” on the Editor Toolbar.
7. Position the cursor over the updated perimeter line, then Right-click and select “Replace Sketch”
8. With the cursor in the same position, Right-click again and select “Flip”.
9. The flip will reverse the location of the End-point of the replacement sketch (the Red point).
10. Right-click once more, select “Finish Sketch” from the context menu.

The FirePolygon will redraw with the added area. The PerimeterSector lines and AssignmentBreak points will also adjust with the FirePolygon.

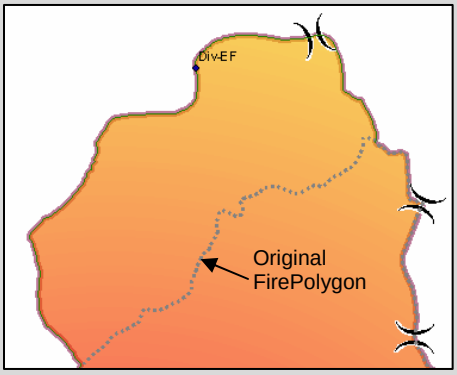


Step 7

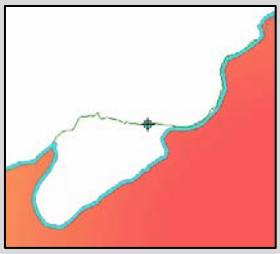
Step 8



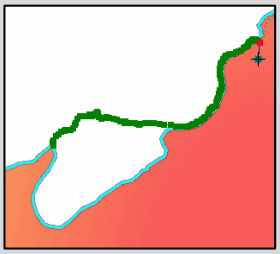
Step 9



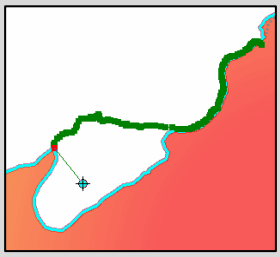
11. Repeat these steps for the next FirePolygon update in the same area.



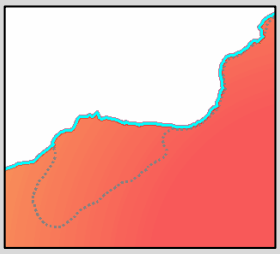
Select FirePolygon
Right click – Replace sketch



Right click – Flip



Right click – Finish sketch



Completed update

Tutorial: Modifying the Fire Perimeter, Adding Island Polygons

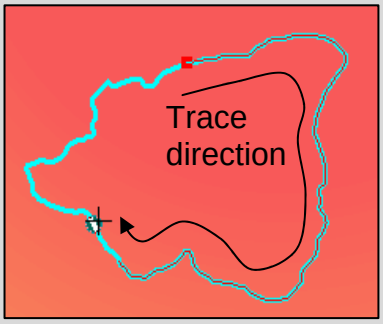
Note: The FIMT toolbar contains tools for creating and deleting FirePolygon island exclusions. You should always use the FIMT tools to create these features. Using ArcMap standard edit tasks will result in unpredictable behavior.

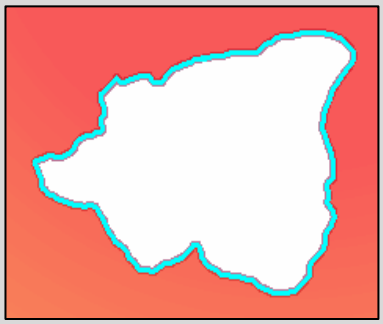
1. Zoom to the center of the existing FirePolygon where there are two update polylines. You will use these lines to create the Island polygons.
2. Click the “Create Island” tool on the FIMT toolbar.

Note: the Editor Target is automatically set to FirePolygon and the Edit task is set to “FIMT Create Island”. Do not attempt to create an island polygon using any other combination.

3. Using the Selection tab on the TOC, set the selectable layer to the FirePerimeter, and the 083004_1550_update shapefile.
4. Select both the FirePolygon and one of the 083004_1550_update polylines located in the interior of the FirePolygon.
5. Change the Edit tool to the Trace tool. See the graphic below for help on locating the “Trace” tool.

6. Click on the selected update line inside the FirePolygon, using the cursor, move around the update line, following the line as closely as possible. You will see the trace line following your cursor movement.
7. Continue tracing around the update line until you return to the beginning. Double-click to end the trace.





8. Repeat the Create Island process using the second Update polyline.

Tutorial: Modifying the Fire Perimeter, Updating Assignment breaks

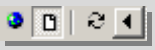
The update shapefile 083004_1500_wayp_colgate contains updated division break points. Use the skills previous learned to update the Assignment breaks where the FirePolygon has expanded in the northwest direction, and add assignment breaks to the unburned islands where indicated by a new waypoint. Use labels to help you locate and attribute the Branch and Division assignments. All of the Islands are assigned to Branch V.

Tutorial: Generating Fire Line Fire Perimeter Reports

The FIMT Fire Mapping Tools include the ability to generate reports for fire perimeters and for fire lines. These reports can be copied to the Windows clipboard and pasted into any text editor and they can be pasted into a ArcMap layout for inclusion in a hardcopy map.

1. Click the "**Perimeter Report"** button . Examine the contents of the report.
2. Click the Copy button on the Perimeter Report and close the dialog.
3. From the Windows Start menu, click Start > Programs > Accessories > WordPad.
4. In WordPad, click Edit, then click Paste. The contents of your report are now pasted into the WordPad document.

Next, you will include a report in your ArcMap layout.

5. Click the "**Fire Line Report"** Button Examine the contents of the report.
6. Click the Copy button on the Fire Line report.
7. In ArcMap, toggle to the map Layout view. 
8. Click Edit, and then click Paste.
9. The text from the Fire Line report is now pasted into the map layout.
10. Double click on the pasted text to activate the text property sheet.
11. Modify the properties of the text to best fit the report on the map layout.
12. Save the map document and close ArcMap.

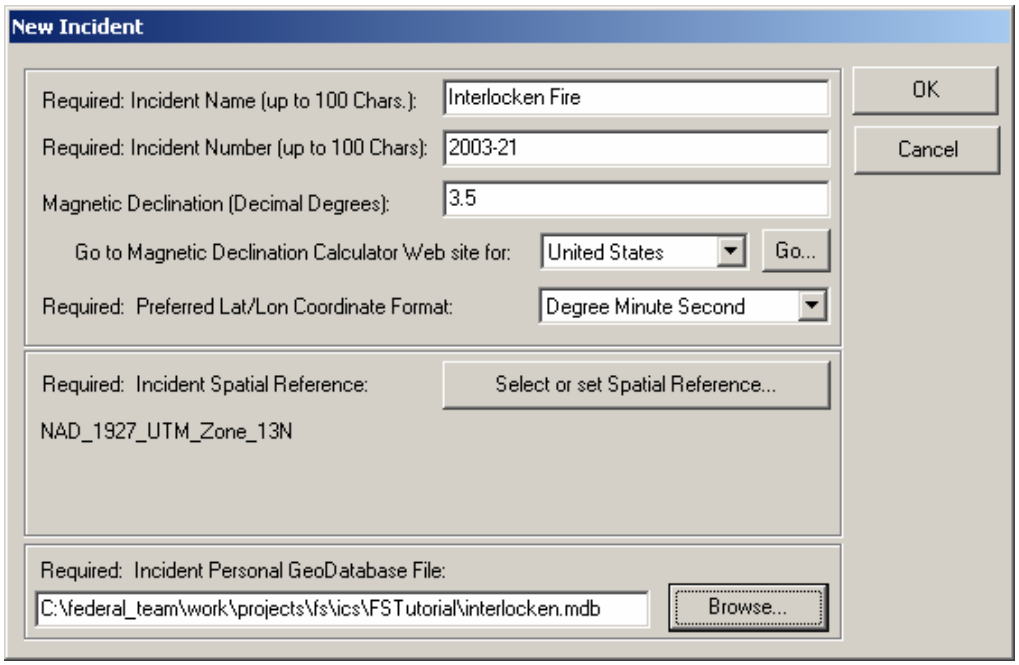
Appendix:

Appendix I: Tool Usage

Group 1. Incident Tools

Create Incident

This tool creates a completely new FIMT Incident and its corresponding Geodatabase. When you click this button, the following dialog will be displayed:



- Type the name of the Incident into the Incident name field.
- Type the Incident number into the Incident number field. This can be any text string – not just numeric.
- If you know the magnetic declination for the area of the fire, type this into the magnetic declination field. (This information is not currently used – it may be used for the mapping tools, to be developed later). If you have an active Internet connection, the "GO" button and corresponding region pull down list will take you to a web page that will let you determine your magnetic declination.

The magnetic declination is not required to operate the FIMT Fire Mapping Tools.

- Select the coordinate format you would like to use for entering latitude/longitude coordinates for this project. This will become the default coordinate format, used whenever you are asked to enter lat/long input. You can change this later if you want, or you can override it on the lat/long input dialogs for one-time exceptions.

- Select the spatial reference you want to use for the Incident database. This is required only because ArcMap needs to know: a) How to store the data you are going to create through the application, b) How to project raw lat/long and GPS coordinates into your Incident database, and c) How to project your Incident data to match other data you may have, or to match the spatial reference of your ArcMap display.

  To set the spatial reference, click the Set Spatial Reference button. This will bring up the Spatial Reference Properties dialog (the same one as used in ArcCatalog). From here, you can select a standard spatial reference, or define your own. (**Note**: When in doubt, use the UTM projection for the Incident area).

- Specify the name of your new FIMT database and where it should be stored using the Browse button next to the geodatabase name field.

- Click OK and the new Incident database will be created for you. The standard FIMT Incident layers will be created from this database and loaded into your current data frame automatically.

Open Incident

This tool lets you browse the file system and open a geodatabase that contains Incident data. Simply select the appropriate geodatabase, and the application will load the FIMT layers it contains into your current data frame automatically, and you can begin working with the Incident tools.

If you load an Incident into a document that already has layers in the map, such as background layers or images, the Incident layers will be added to those in your active data frame.

If you have loaded one Incident into your document then load another, the second Incident becomes the active Incident. Anything you do with the FIMT Fire Mapping Tools will apply only to that Incident.

If your map document already contains the layers for an Incident, opening the Incident a second time will not create another set of layers. The newly opened Incident will become the active Incident, and anything you do with the FIMT Fire Mapping Tools will apply to that Incident. The FIMT Fire Mapping Tools will use the existing layers from that Incident.

Switch Incident

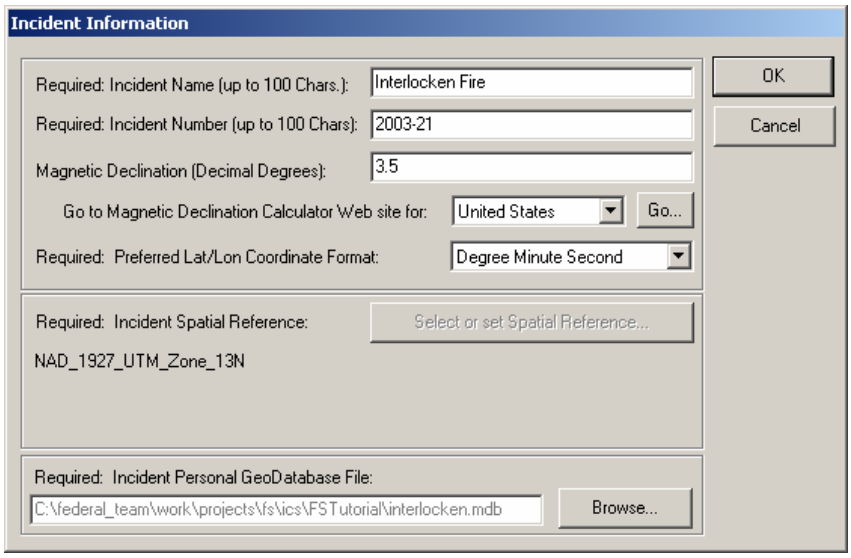
This tool allows you to switch from one Incident to another when more than one Incident has been loaded into the current ArcMap document. The button is only active when editing is not taking place. You cannot switch to a different Incident with an active edit session taking place. To switch to a different Incident you must save your edits (if appropriate) and then stop editing.

Edit Incident

This tool starts an ArcMap Edit session for the active incident. You can verify the active Incident by using the Incident Information button described below. This tool performs the same task as selecting "Editor" > "Start Editing" from the standard ArcMap Editor tool bar. To stop editing, you must select "Stop Editing" from the Editor menu on the Editor tool bar.

Incident Information

This button displays the FIMT Incident information dialog (the same dialog that you used to create the Incident), but only some of the fields can be modified:

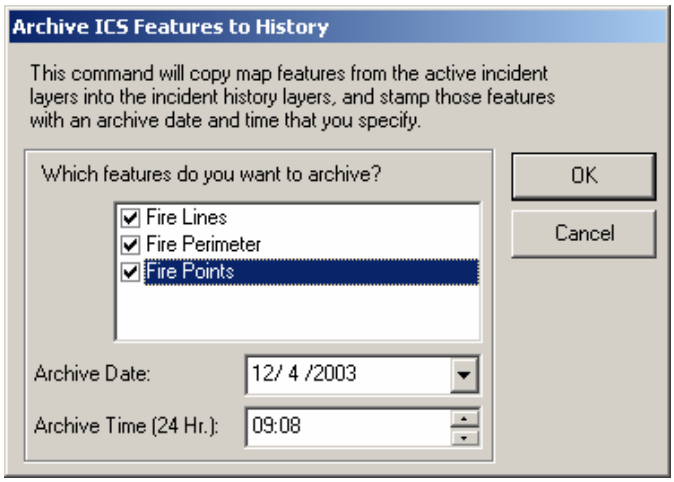


You can change the name, the Incident number, the magnetic declination, and the default lat/long coordinate format, but you cannot change the spatial reference or the geodatabase file.

Copy to History

This button saves a snapshot of the current fire layers into the history layers contained in the Incident geodatabase. Use this tool if you want to preserve a record of the Incident including fire lines, fire perimeters, and fire points at a particular point in time.

The button is enabled if you are editing the Incident geodatabase, and the perimeter layers are present in the active data frame. When you click the button, you will be asked to specify the date and time you want to record with the fire perimeter. The current date and time are filled in by default:



A date and time stamp is recorded in the history feature classes. These values can be used to query the history layer to view previous versions of the fire perimeter or other fire layers.

Copy Incident Layers to Data frame

There may be times when you want to have several data frames containing your FIMT Incident layers. For example, you may want to have your Incident layers displayed over two different sets of background images. Or, you may want to have one data frame that contains an overview of the entire fire area, and another that is zoomed in on a particular location. This tool lets you copy the Incident layers into the current data frame. To use it:

Create a new data frame, using the Insert > Data Frame menu option. Or, select an existing data frame and make it active by right clicking on its name in the table of contents, and selecting Activate from the context menu.

Click the **Copy FIMT Layers to Data Frame** button. The Incident layers will be added to your active data frame.

Export to Shape file

This tool creates a set of output shapefiles from the active Incident database. The user specifies the output directory where the files will be written. There is no control over the names of the output shape file names. All of the attribute items that belong to a geodatabase domain will be exported with both the domain code and description text as matching attribute columns.

Group 2. Utility Functions

Auto Update Measures

This command watches in the background and detects when a new feature is added or the shape of an existing feature is modified by any edit operation (not just the fire tools). The command operates as an environment setting and is either on (appears indented) or off (appears similar to other buttons). The command scans for certain fields on features, and if it finds one of more of the fields, it populates it with a specific measurement calculated from the feature's shape. The following table lists the fields it looks for and the measurements that are calculated:

Field Name	Applies to	Contents
AutoXCoord	Points only	X-coordinate of point features, in the spatial reference of their GDB.
AutoYCoord	Points only	Y-coordinate of point features, in the spatial reference of their GDB
AutoLatitude	Points only	Point feature latitude, calculated by projecting point if necessary. Datum is WGS84
AutoLongitude	Points only	Point feature longitude, calculated by projecting point if necessary. Datum is WGS84

AutoFeet	Lines and Polygons	Length of line or perimeter of polygon in feet. Calculated by projecting feature to localized equal area projection.
AutoMeters	Lines and Polygons	Length of line or perimeter of polygon, in meters. Calculated by projecting feature to localized equal area projection.
AutoAcres	Polygons	Area of polygon feature in acres; calculated by projecting feature to localized equal area projection.
AutoHectares	Polygons	Area of polygon feature in hectares; calculated by projecting to localized equal area projection.

To calculate lengths and areas, the tool constructs a localized equal-area projection using the center of the feature's envelope as the projection origin. The tool then projects the feature into that coordinate system on-the-fly and gets the necessary measurements. This process insures consistent values regardless of the source projection. The process returns accurate measurements, but because the shapes are projected out of their native coordinate system, the returned measurements will not match exactly the ones user's would get if they take the shape out of the database and get its area, length, or perimeter.

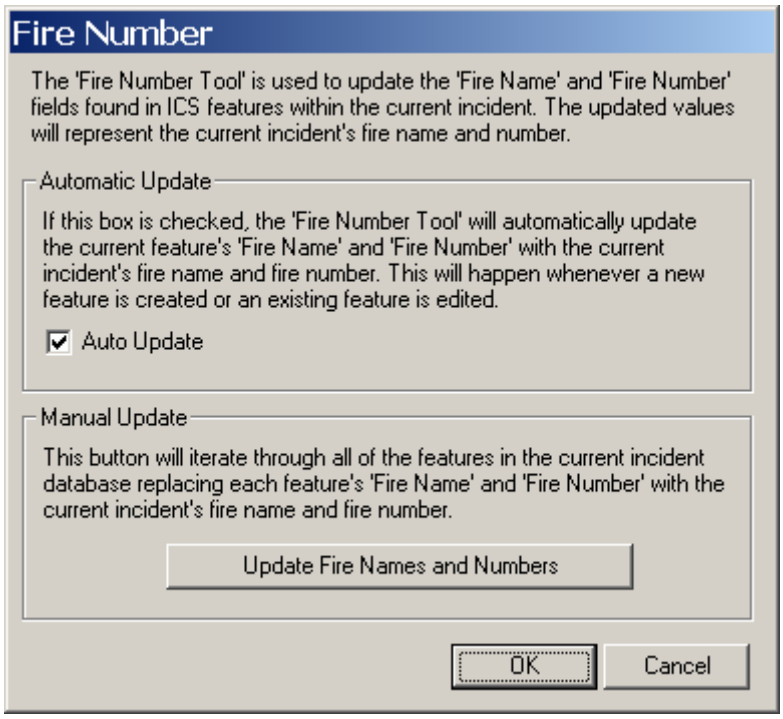
The tool will calculate these values for any features (not just FIMT fire features) that have the fields that correspond with the feature's geometry type, as listed above. It will calculate values for a subset of the fields if they are not all present on a particular feature. (e.g, if the perimeter length fields are missing from a polygon feature, it will still calculate the areas).

When the tool button is "pressed in", the tool is monitoring feature changes and automatically calculating the measurements. When it is not pressed in, the tool is ignoring all feature changes and will not update measures. When it is reactivated, it will not go back and recalculate measures for features that were modified while it was inactive. Users should leave the tool turned on all the time if they're working on a fire Incident, since the reports generated by the fire tools use these fields to report lengths and areas. They can turn the tool off if they're doing non-fire Incident work, a small performance increase while editing may be observed when the tool is turned off however, performance should not be a determining factor when using the tool.

Update Fire Names and Numbers

This command button operates in the background controlling the population of the Fire Name and Number fields for all newly created fire features (fire point, fire lines, and fire perimeters). There are three

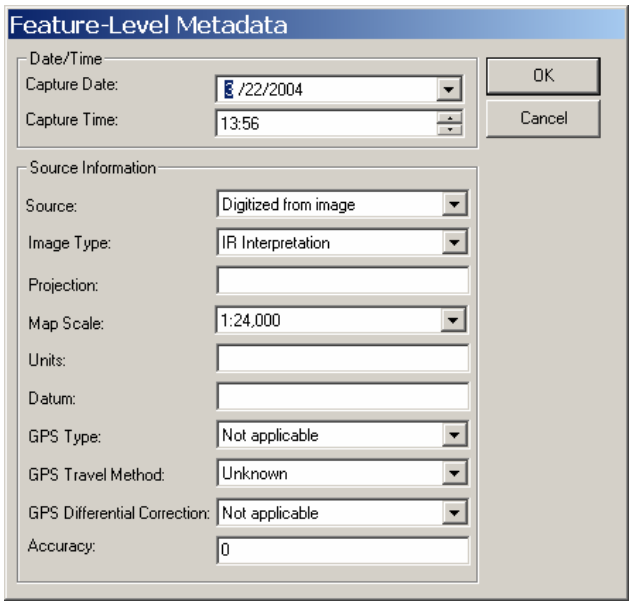
setting options that control the automatic update of the Incident number field. Clicking on the button opens the following dialog:



The tool allows turning the Auto update on or off. The automatic update could affect performance during certain processes so the user has the option to turn off the Auto Update feature. The user also has the option at any time to run a manual update of the fire name and number values.

FIMT Feature Metadata

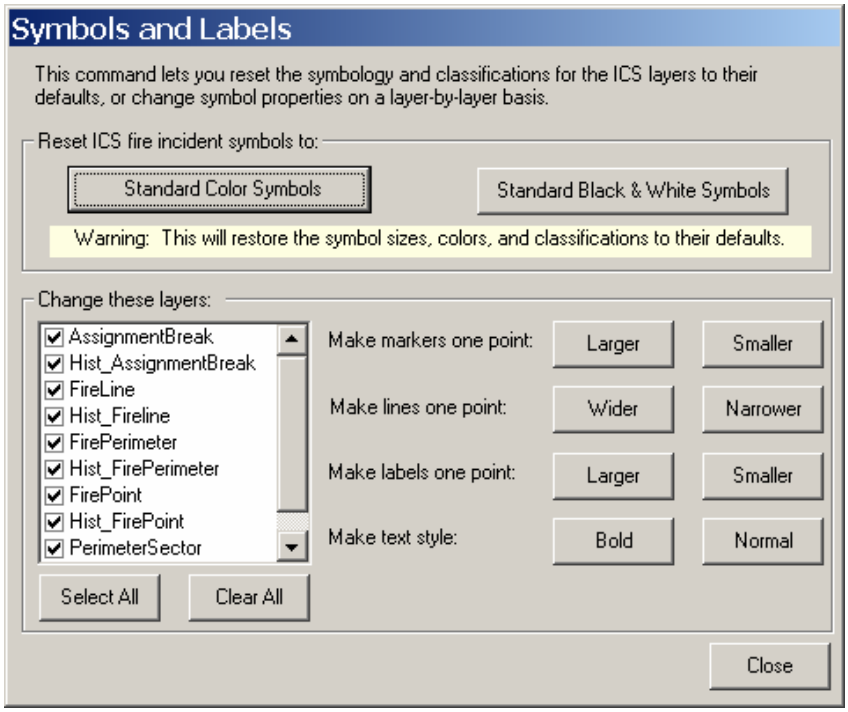
This button opens a form that allows the user to enter feature level metadata attributes for the selected features. The following form is opened:



All of the attribute fields that contain a list of valid values appear with a pull down list on the form. The remaining fields are free form text field. The user must know their local data standards to input the appropriate values.

Change FIMT Symbol Properties

This button brings up a dialog that lets you set some overall properties of the symbols used for mapping Incident data. The dialog contains two buttons that switch between color and black/white symbol sets. The symbol color settings will always reset symbol properties to the default values for either color choice. Any user defined customizations to layer symbol properties will be lost if the color choice is switched.



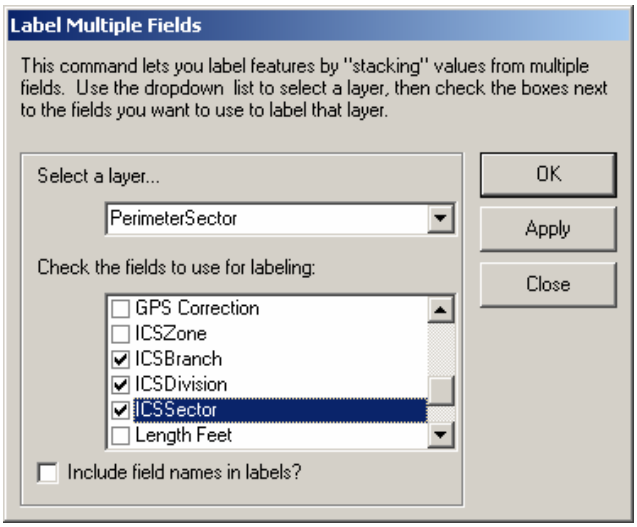
The dialog also controls resizing marker, line, and label sizes by incrementing the size one point larger or smaller. Text labels can also be toggled between bold and normal text. To control symbol size properties:

- Select the appropriate check box to indicate which layer(s) are to be changed.
- Use the “Select All” button to select all of the Incident layers, or the “Clear All” button to clear all Incident layers from the list of layers to modify.
- Use the “Larger” or “Smaller” buttons to the left of “*Make markers one point*” text on the form to increment the point marker symbols for the selected layers.

- Use the “Larger” or “Smaller” buttons to the left of “*Make lines one point*” text on the form to increment the line symbol width for the selected layers.
- Use the “Larger” or “Smaller” buttons to the left of “*Make labels one point*” text on the form to increment the size of text labels for the selected layers.
- Use the “Bold” or “Normal” buttons to the left of “*Make text style*” text on the form to switch text labels between bold and normal text.
- Click “Close” to close the dialog. **Note**: Changes made using the form are applied immediately and can be undone by applying the opposite operations.

Label Multiple Attributes

This command allows users to create simple “stacked” labels using any number of fields in an FIMT feature class. It works directly on the label properties of the feature layer, so the user can go into the labels dialog and further modify the label format if they wish. The button pops up the following form containing the following features.



- Select a layer… Allows the user to select the layer to label. Select the layer from the dropdown list of layers in the current ArcMap document.

- Check the fields to use for Labeling: A list of fields found in the layer selected from the Select a layer dropdown list. Check the fields you want to use for the stacked labels. Each field selected will be a separate line in the stack.

- Include field names in labels? Use this check box to include or exclude field names in the labels. If this is checked, the labels

will look like *"Fieldname = Value"*. If it's not checked, only the values will be shown.

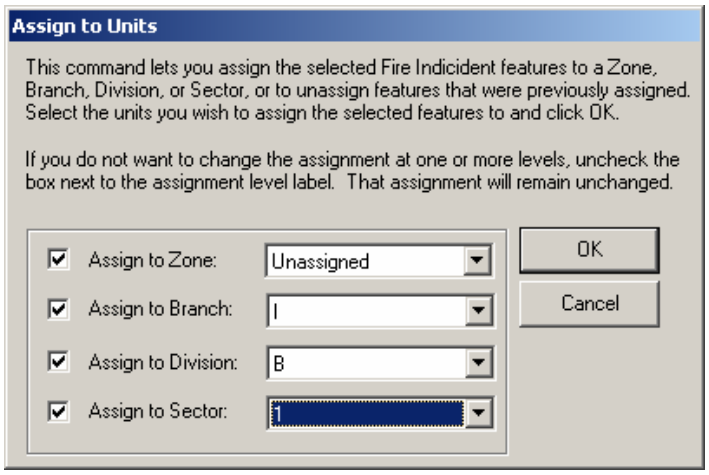
- OK button to keep the settings and closes the form. Use this when you want to modify just one feature class.

- Apply button to create the labels for the selected feature class but leaves the form open so you can set up labels for another feature class.

- Cancel button to close the form without applying the current settings. Any settings you applied with the "Apply" button will still be in effect and will not be undone by the Cancel button.

Assign to Unit

This command button displays a form that lets the user assign the selected features to any combination of zone, branch, sector, or division. The form allows the user to control which of these levels is affected by checking or un-checking the checkbox for each level. For example, the checkboxes let the user assign all the affected features to a different zone, while leaving the branch, division, and sector assignments unchanged.



The form contains a series of relate checkboxes and dropdown lists. Each pair represents a "level" at which the features can be assigned, (i.e, Zone, Branch, Division, or Sector). Check the box for a particular level if you want to change that assignment for the selected features. Select the assignment from the corresponding dropdown list. Uncheck the box if you do not want to change the assignments at that level. For example:

To reassign all the features to a particular zone, but keep the lower level assignments the same, check the zone box, uncheck the remaining boxes, and select a zone from the dropdown list.

To change just the sector assignment for a feature, uncheck all but the sector box, and select a sector. The feature(s) will remain in the same zone, branch, and division, but will be reassigned to a new sector.

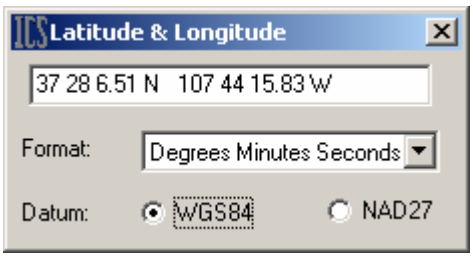
Press the OK button to apply the settings.

Press the Cancel button to close the form without applying the settings.

Get Latitude/Longitude

Click this button to activate the tool, then click anywhere on the map display. A message box will pop up showing you the latitude and longitude of the location where you clicked. The coordinates will be formatted according to the preferred coordinate you specified in the Incident properties dialog, above. You can also select a different coordinate format by selecting from the pull down list activated from the drop down arrow on the dialog.

You can also switch between NAD27 and WGS84 using the radio buttons on the form. The Latitude/Longitude values will be automatically converted between the selected datums.

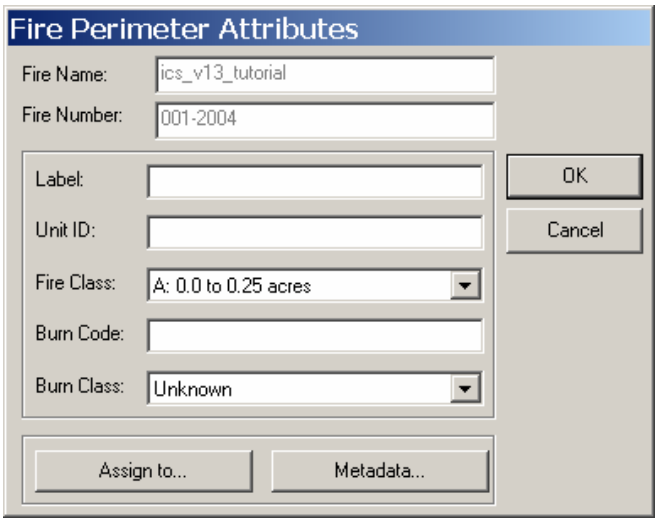


Group 3. Perimeter Tools

Create Fire Perimeter

This command allows the user to create a new fire perimeter polygon by drawing it on the map. Users can activate the edit task by clicking this button, or by selecting the "Create Perimeter Polygon" task from the edit task list, then selecting the perimeter layer as the target layer.

The fire perimeter polygon can be created using any ArcMap edit sketch tools. When the polygon is completed, a pop-up form is displayed that lets the user enter attributes for the new fire polygon feature. The standard attributes for fire perimeter polygons include the "Label" field, which is a general-purpose, optional field. The label field can be used to store text used for labeling or any other documentation purposes. Other free form attributes include the "Unit ID", and the "Burn Code". These fields are used specifically by certain organizations that participated in the development of the FIMT tools and may not be required by all users. The form also includes pull down lists for the fields: "Fire Class", and "Burn Class".



The Fire Perimeter Attributes form contains a button that let the user assign the perimeter to an organizational unit. These organizational units are set in the same manner as the "Assign to Units" command documented in the Group 2 tools. The "Assign to Units" button is available whenever a fire perimeter, line or point feature is created. (See "Assign to Units" at the end of this appendix for more information).

The Fire Perimeter Attributes form contains another button that lets the user enter feature-level metadata describing the source of the fire perimeter polygon feature and the date and time it was collected (See "Feature Level Metadata" at the end of this appendix). Both the unit assignment data and the feature-level metadata are optional as far as the application is concerned.

Every time a fire perimeter feature is created, a corresponding "sector line" feature is also created. The Sector lines are stored in the Incident PerimeterSector feature class. The sector line feature is used to manage the assignment of portions of the perimeter to different operational units. The management of the sector lines contained in the PerimeterSector feature class is transparent to the user. The user should not any direct editing interaction with lines in the PerimeterSector feature class except splitting the lines into two or more pieces. In fact, the FIMT Fire Mapping Tools application is designed to prevent the user from changing the geometry of a sector line if it is associated with a perimeter polygon. The application also synchronizes the shape of the sector line with changes to the shape of the perimeter polygon, so it remains coincident in spite of moving, modifying, or reshaping the perimeter polygon.

Copy to Perimeter Layer

This tool copies any polygons selected in other map layers into the perimeter layer. You can use this tool to copy perimeter boundaries from a shapefile or any other feature source. The tool becomes enabled when you are in an edit session, the perimeter layers are in your map, and you have at least one feature selected. It will only copy polygon features – it will ignore lines and point features if they are selected.

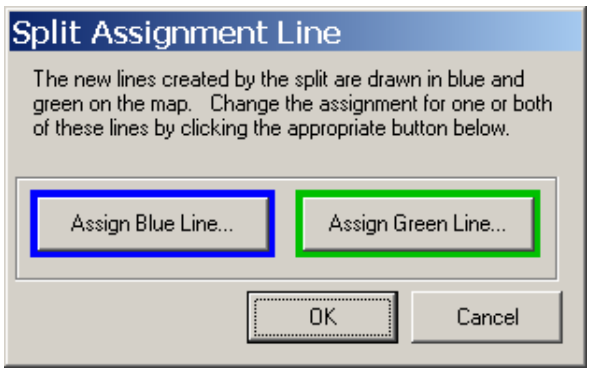
Change Perimeter

This command is used to modify the attributes ("Label", "Unit_ID", "Fire_Class", "Burn_Code", "Burn_Class", Assignment, or metadata) for the currently selected perimeter polygon. It pops up the same form that is used to set the perimeter attributes, assignments, and metadata when a new fire perimeter polygon feature is created.

Split Assignment Line

This tool is used to split the FirePolygon into units for assignment to Zone, Branch, Division, and Sector code if appropriate. The tool

operates by drawing a line across an existing FirePolygon using the “knife icon. At the point the split line intersects the FirePolygon, temporary **Blue** and **Green** PerimeterSector lines are drawn to indicate the location or side to receive the assignment attributes. The following dialog appears that is used to make the appropriate assignments. Once the assignments are made, and OK is clicked, the temporary graphics are removed. Once a split is completed the tool will automatically generate the appropriate AssignmentBreak symbology at split.



Update Perimeter Assignment Breaks

This command runs as both a background process that listens for changes to perimeter polygons, perimeter assignment (sector) lines, or perimeter assignment break points and as an interactive process. When used interactively, it regenerates the point features used to represent breaks in assignments of sections of a perimeter boundary.

Background process operations:

If a perimeter polygon moves or has its shape changed, the command resynchronizes the PerimeterSector feature class lines to keep them coincident with the FirePolygon polygon(s), and regenerates the break points between perimeter assignments.

If a sector line moves and it is associated with a FirePolygon polygon, the command restores the original geometry of the feature preventing the user from undoing the coincidence between the PerimeterSector line and the FirePolygon polygon.

If an AssignmentBreak point moves, the command restores the original geometry of the point preventing the user from moving the point off the perimeter boundary.

NOTE: Users can create PerimeterSector lines and/or AssignmentBreak points that are not associated with a FirePolygon polygon by simply creating features in these classes. Those features will not be affected by this command.

Interactive Process operations:

The user may modify the assignments of the PerimeterSector lines associated with a FirePolygon polygon by selecting them and using the "**Assign to Unit**" command, by editing the attributes directly, or other means in ArcMap. When manual edits are performed, the AssignmentBreak points between unit assignments may no longer be accurate. When the button is clicked, ArcMap will re-evaluate the junctions between all PerimeterSector lines, merge any adjacent lines that have the same assignments breaks, regenerate break points at the new line ends, and set the rotation angle of those points to match the orientation of the lines. Perimeter lines and break points the user has added directly that are not associated with a perimeter polygon are not affected by this command.

Create Island

This tool is used to create island or (donut) polygons inside an existing FirePolygon. The tool activates the FIMT Create Island edit task on the FirePolygon target feature class. No other ArcMap editing tools should be used to create island polygons. Due to the complexity of the relationships between FirePolygon, PerimeterSector, and AssignmentBreak feature classes, unpredictable behavior could be encountered.

Once the Create Island tool is invoked, any valid ArcMap drawing tool can be used to create the actual geometry of the island. This included using the sketch tool or the trace tool to trace existing features selected in other layers.

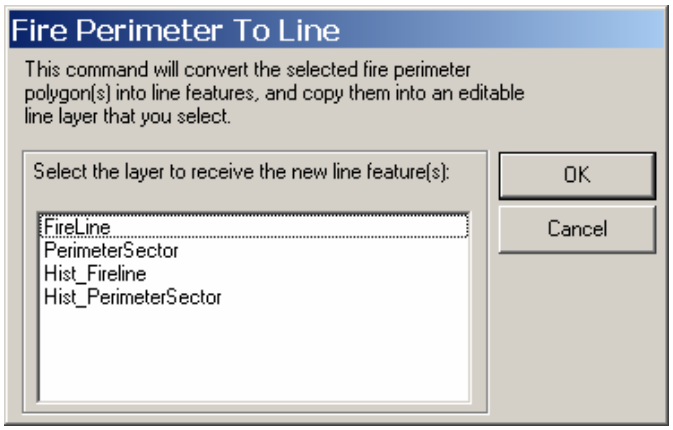
Remove Island

This tool is used to remove island polygons from an existing FirePolygon. This tool is the only method that should be used to remove or delete island polygons. Do not use any other ArcMap methods. The tool operates by deleting all island geometry that is contained completely inside a temporary polygon drawn by the user.

An error message will be displayed if the polygon is drawn outside the outer boundary of the FirePolygon or if the island polygon intersects the polygon.

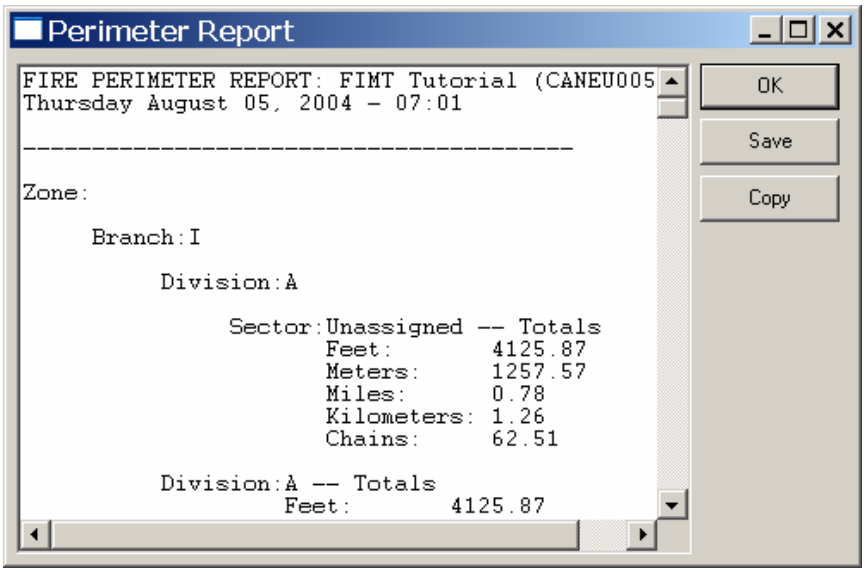
Convert Perimeter to Line

This command converts selected perimeter polygon(s) into a line and adds it to the editable line feature class of the user's choice. For example, it could be used to convert the selected fire perimeter into a Fire Line feature. The command pops up a list of all editable line layers in the current map document and lets the user select the target layer. The selected polygons are converted into polylines and written to the selected target featureclass.



Perimeter Report

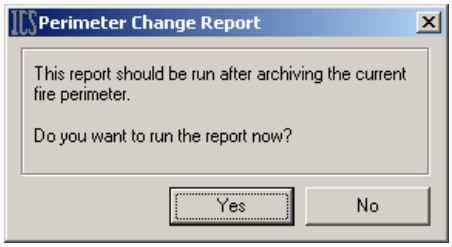
This button produces a text report containing the area of the fire, and the lengths assigned to the divisions and branches. This button is only enabled if Incident perimeter layers are present in the active data frame.



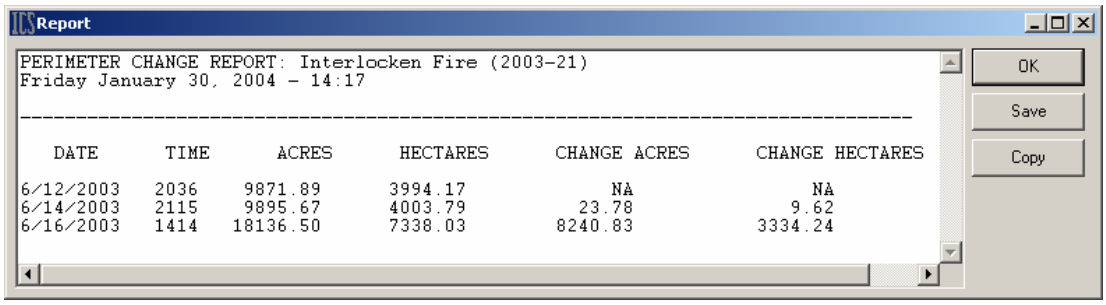
The Copy button on the Perimeter Report dialog is used to copy the text contents to your Windows clipboard. The text can then be pasted into other applications or pasted into a map layout.

Perimeter Change Report

This button produces a text report that displays a list of area, perimeter, etc. for perimeter polygons stored in the Incident's history layers. The report shows the change from each archived polygon to the next, so it is easy to see the rate of progression of the fire. The report only looks at the features in the history layer, not the current perimeter layer. Therefore, the report should be run immediately after archiving the perimeter polygon if possible, so that the current perimeter is included in the report. The following message will prompt the user to archive the current fire polygon before producing the report.



The History report contains the Date, Time, Acres, Hectares and the change Acres, and change hectares for the Hist_FirePolygon feature class.



The Copy button on the History Report dialog is used to copy the text contents to your Windows clipboard. The text can then be pasted into other applications or pasted into a map layout.

Draw History

This command draws the polygons from the perimeter history in reverse order, using a red color ramp, to show the progression of the fire on the map. The reverse order results in the larger most current fire perimeter polygons being draw underneath the older smaller fire

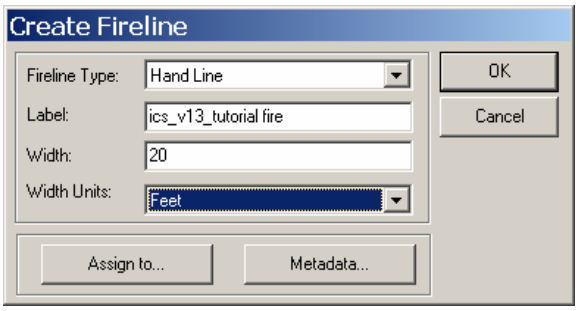
perimeter polygons. The button operates exclusively on the polygons from the fire perimeter history layer (Hist_FirePolygon feature class). The “Copy Incident to History” button should be used prior to drawing the history to insure that the most current perimeter is included in the display.

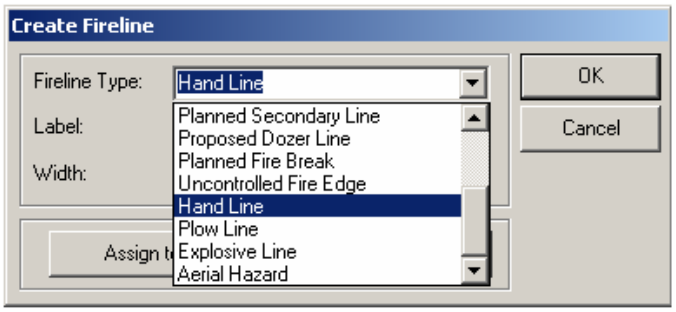
Group 4. Fire Line Tools

Create Fire Lines

This button activates the **Create Fire Line** edit task and sets the Target layer to Fire Line. You can do these same steps using the standard ArcMap user interface by selecting the edit Task and Target layer.

With the **Create Fire Line** edit task selected, you can create a new fire line using any of the standard ArcMap edit sketch tools, such as the sketch tool (pencil icon) for drawing free-form lines, the curve tool for drawing parametric curves, and any other drawing tools you have available. When you complete the line by either double-clicking on its last point, or by right-clicking on the map display and selecting Finish Sketch, the **Create Fire Line** task pops up a dialog used to set the fire line’s type and other properties.





Copy to Fire Lines

This button lets you copy the selected line features from another layer into the Fire Line layer. For example, you may have a layer containing streams or roads. Select the features from that layer that you want to use as fire lines, then click this button. The selected features will be added to the fire line layer and given a fire line type of Miscellaneous. You can use the **Change Fire Line Type** control to set them to an appropriate type. Any attributes the imported lines have in common

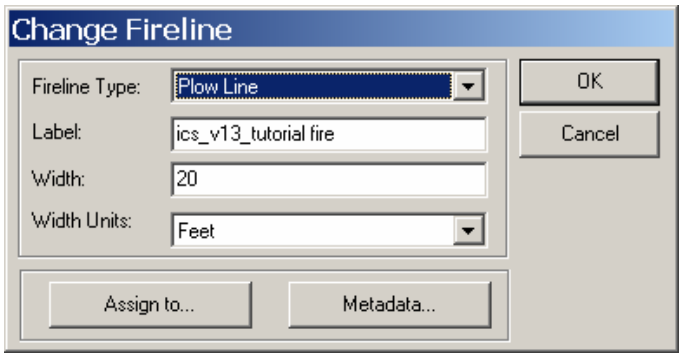
with the fire line feature class will also be copied. Lines copied from another incident will retain their type, etc.

This control only copies line features. Any selected polygon or point features are ignored.

Change Fire Line

This control lets you change the type of a fire line. For example, you can change a proposed dozer line to a completed dozer line. The control is activated if you are editing the Incident database, the fire line layer is present in the map display, and you have exactly one fire line selected.

Click on the button, and the fire line type dialog is displayed:



Select the new fire line type from the first dropdown list, and assign it to a division if you wish.

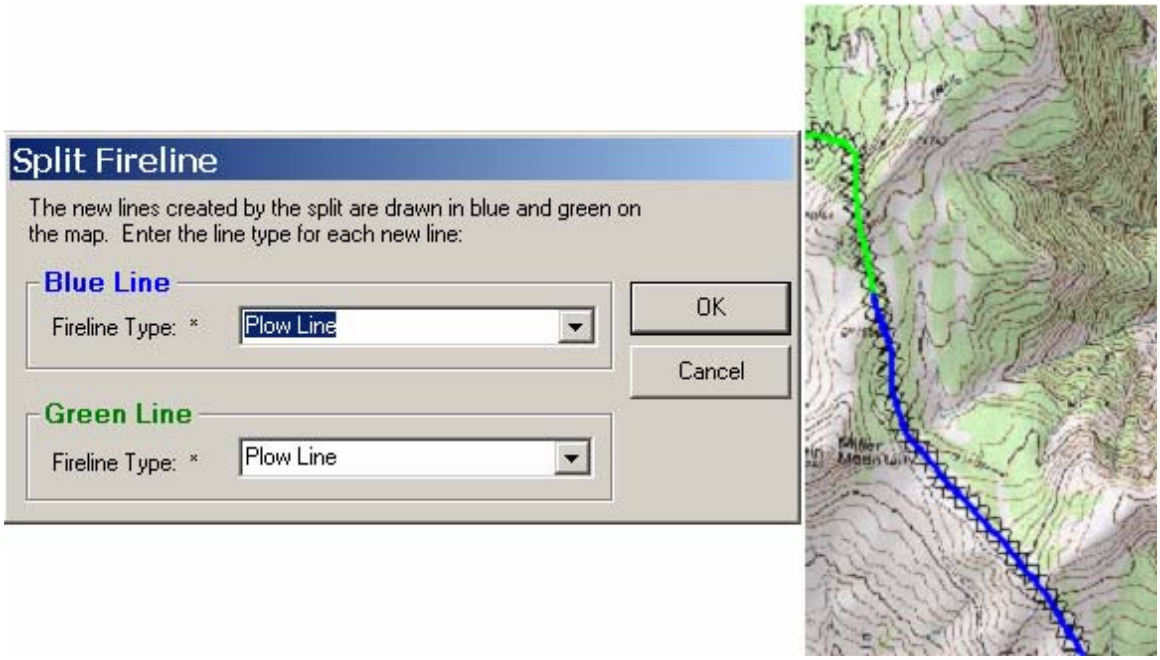
Split Fire Line

This tool lets you split a fire line into two separate lines. You can then assign a different type to one or more of the new lines. To use the tool you need to be editing the Incident geodatabase, and the fire lines layer must be present in the map display. You do not need to have any features selected – If you do, the selection highlight will obscure the blue and green highlighting that is used to designate the two new fire lines resulting from the split.

This control is a tool, just like the drawing tools or pan and zoom tools. You activate it by clicking on its icon and then use the tool to interact with the map display. When you activate this tool, the cursor icon turns into a knife. To split a Fire Line, click once on one side of the split point. Then, move the knife to the other side of the line, so the feedback line crosses the Fire Line at the point where you want to split

it. Click a second time. The picture below shows a line split in progress:

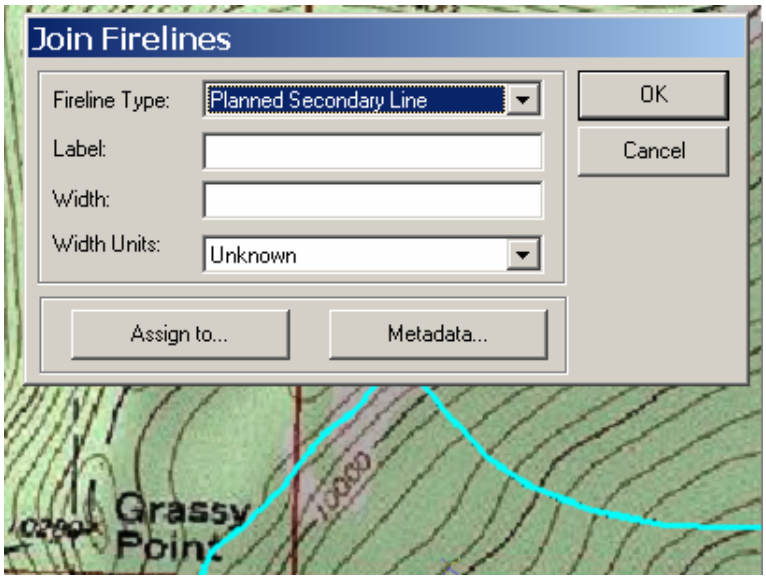
After you click the second time, the line will be split, and the two halves will be drawn in green and blue. A dialog will open in which you can set the Fire Line types and division assignments for the blue and green sections:



Join Fire Lines

This control takes two adjacent fire lines and merges them to create a single fire line. To activate the control, you must be editing the Incident database, the fire line layer must be present in the map, and you must have exactly two fire lines selected.

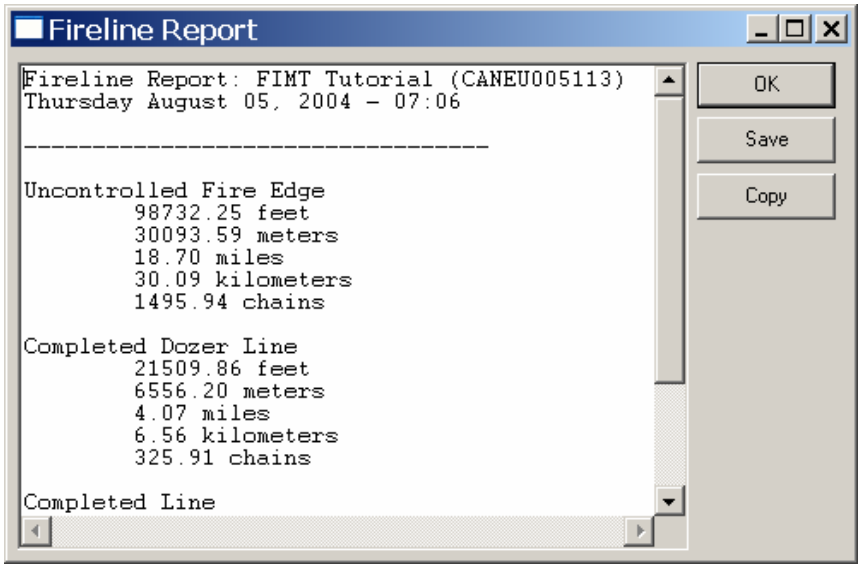
When you click on the tool, the two fire lines will be joined into a single line, and a dialog will pop up to let you set the type of the new fire line:



Select the fire line type from the drop-down list, and assign it to a division if you wish. Input the Label field value, and the line width if desired. Click OK to replace the two original fire lines with the new merged one.

Fire Line Report

Click this button to get a brief report listing the lengths of various fire lines. This report can be saved to a file, or copy and pasted into a text document. Below is an example of the fire line report.



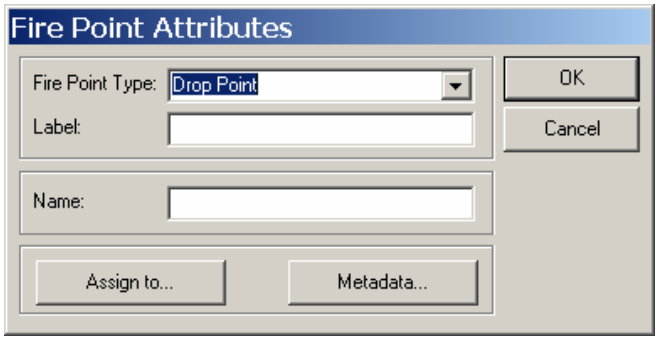
The Copy button on the Fire Line Report dialog is used to copy the text contents to your Windows clipboard. The text can then be pasted into other applications or pasted into a map layout.

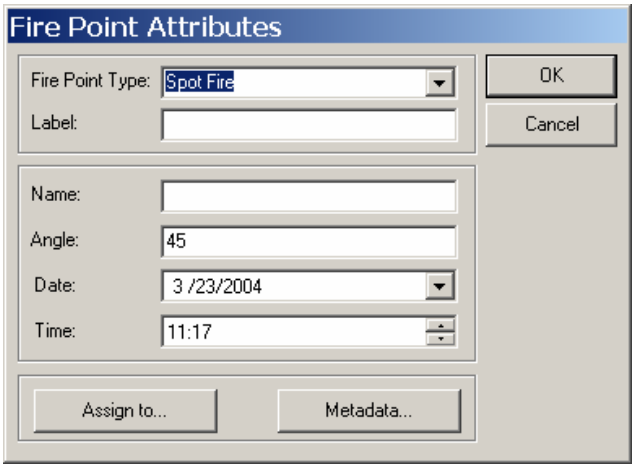
Group 5. Fire Point Tools

Create Fire Point

This button activates the **Create New Fire Point** edit Task and sets the Target layer to Fire Point with a “Unknown” type attribute. You can do these same steps using the standard ArcMap user interface by selecting the edit Task and Target layer. This control is just a shortcut to simplify the process.

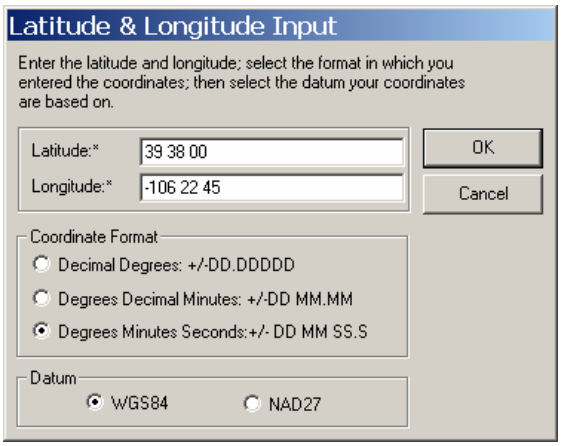
With the **Create New Fire Point** edit Task selected, you can create a new fire point using any of the standard ArcMap edit sketch tools, such as the standard sketch tool that lets you click to make a new point, or any other point input tool. When you enter the new point location, the **Create New Fire Point** task will pop up this dialog to allow you to set the point’s type and other properties. Depending on the point type, you may be asked for just a Label value and Name, or you may be asked for additional information, such as date, time, and direction:





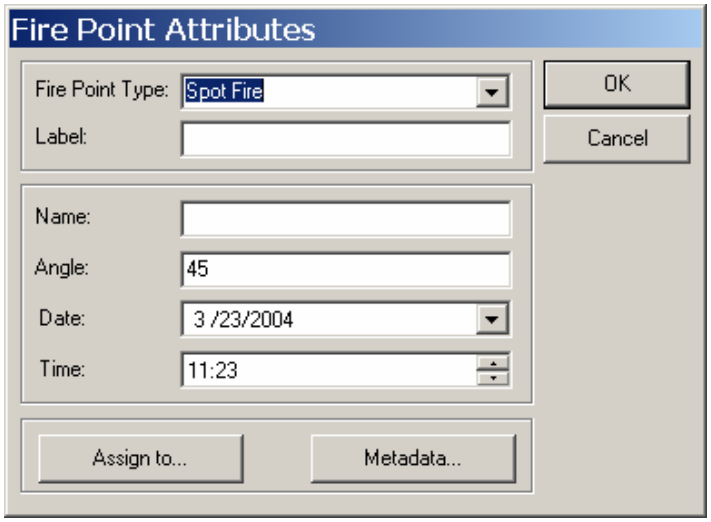
Create Fire Point by Latitude/Longitude

This tool lets you create a new fire point by entering a latitude and longitude. When you click this button, an input dialog will be displayed in which you enter the coordinates of the point.



- Use the radio buttons in the lower part of the dialog to specify the format in which you want to enter the latitude and longitude of the new point. The format you set for the Incident, either at the time it was created, or if you modified it using the Incident Information tool described earlier, will be selected by default.
- If you override the default format, the change will be only temporary. This allows you to make an entry using something other than the default format on a one-time basis.
- Use the radio buttons in the Datum control panel to specify the choice of datum's used for data input. The valid choices are WGS84 and NAD27.
- Enter the latitude and longitude of the new point, and click the OK button.

The tool will create the new point, and then display the fire point type dialog that allows you to specify the point type and other information about it. This is the same dialog that is used if you click on the map to create the new point, as described in the previous tool:



Copy to Fire Points

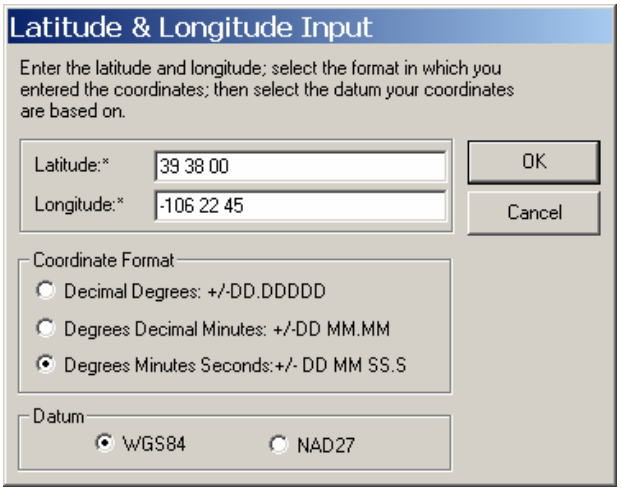
This button lets you copy the selected line features from another point layer into the Fire Point layer. For example, you may want to copy features from a layer of fire hydrants or other water sources into the FirePoint layer. Select the point features in the other layer that you want to copy to the FirePoint layer, and then click this button. The selected features will be added to the FirePoint layer and given a fire point type of Miscellaneous. You can use the **Change Point Information** control to set them to an appropriate type. Points copied from another incident of points that have matching attributes will retain their original attribute values.

This control only copies point features. Any selected polygon or line features are ignored.

Move Fire Point to Latitude/Longitude

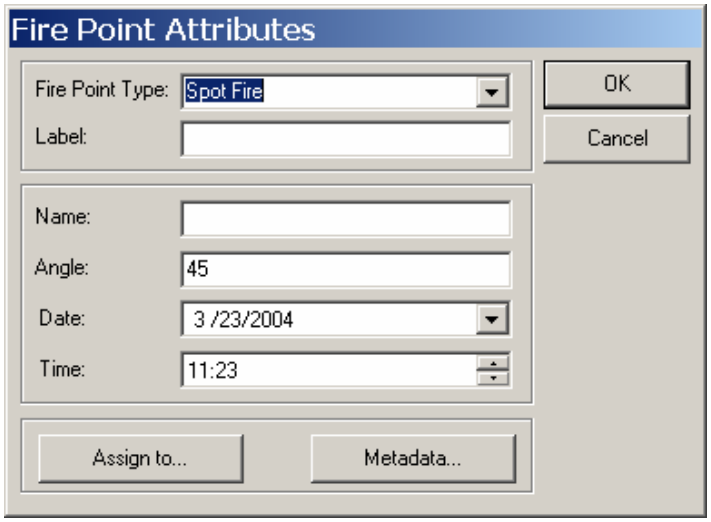
This control lets you move the selected fire point to a specific latitude and longitude. You might use this to move a point whose location was originally estimated from the map, for which GPS coordinates are now available. The control is enabled when you are editing the Incident geodatabase, the Fire Point layer is present in the map, and you have exactly one fire point selected.

When you click the button, the control will display the latitude/longitude input dialog shown below. This is the same dialog that is used by the **Create New Fire Point: Latitude/Longitude Coordinate Input** tool that was described previously, except that in this case, the current latitude and longitude of the fire point are displayed in the dialog. Simply type in a new latitude/longitude and click OK.



Change Fire Point

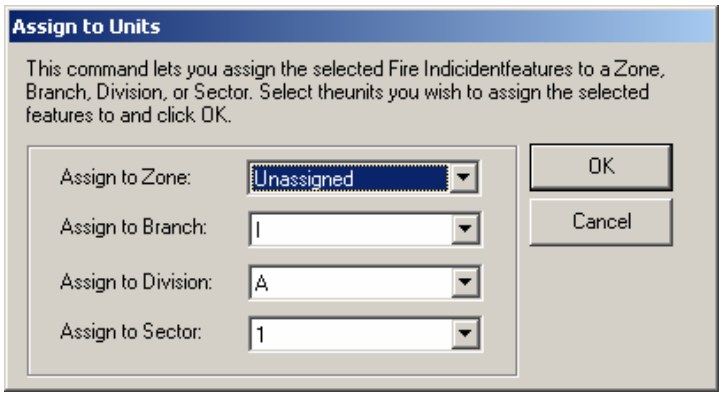
This control lets you change a fire point from one type to another. You would use this tool to change a staging area into a camp, for example. The control is enabled when you are editing the Incident database, the Fire Point layer is present in the map display, and you have exactly one fire point selected. When you click this button, it displays the fire point type dialog. This is the same dialog that is used when you **Create New Fire Point**, as described previously.



Ancillary utilities used by FIMT Fire Mapping tools

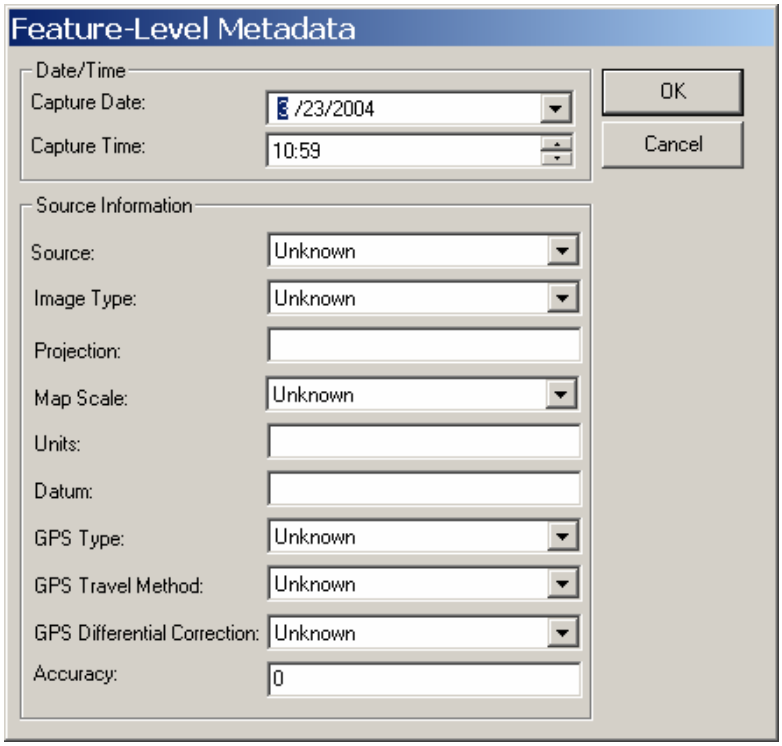
Unit Assignment

This button is available on the dialogs opened when a new fire perimeter, line, or point is created. This dialog is used to initially assign the appropriate units to new features.



Feature Level Metadata Form

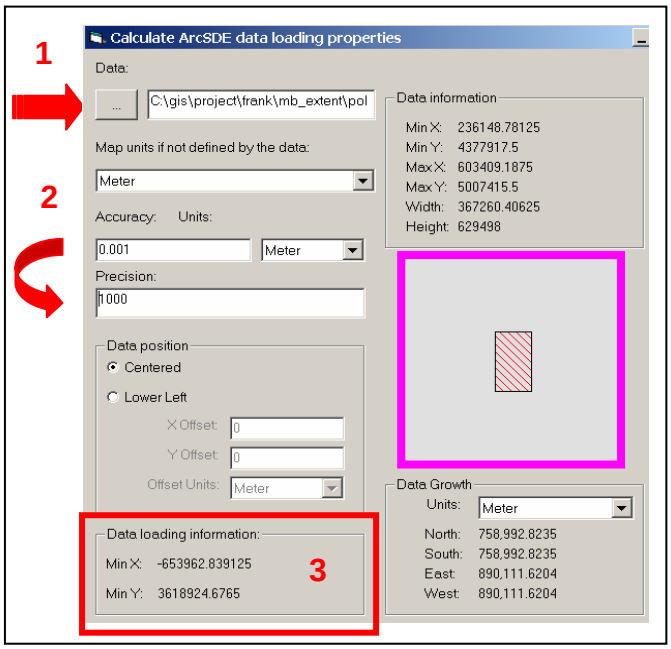
This button is available on the dialogs opened when a new fire perimeter, line, or point is created. The attributes collected on the Feature-Level Metadata form are written to the new features associated feature class. Select the appropriate attributes value from the pull-down list.



Appendix II CalcLoadingParams

This tool is very easy to use for determining the X/Y domain and precision, but only when your data is not tiled. The tool installs with the FIMT install and can be found under:

Start> Programs> FIMT> Calc Loading Parameters



Step 1: Click on the **Data** (…) button to browse for the coverage/shape file you intend to load. This data must be in the coordinate system you intend to use in the Geodatabase. Choose a value for map units if not defined by the data source.

Step 2: Test various values for **Precision** (2), increase the number while watching the allowable space indicator. As the precision value is increased, the amount of allowable space decreases.

Step 3: The **Data loading parameters** are calculated and appear in the lower left-hand corner (3). **IMPORTANT:** Record these numbers to use when setting a custom spatial reference.

IMPORTANT: **Selecting Spatial Extent**

The extent can only be set when first creating the Incident database. If you later need to include data that falls outside of the original extent of the dataset, you must delete the entire feature dataset, recreate it with a larger extent and reload all of the data. ESRI recommends a precision value equivalent to +/- 1 mm (precision = 1000) for data from the most accurate spatial data, a survey with theodolite.

Set Map Units & accuracy: choose **Centered** to allow for expansion.

Write down "**Precision**" value e.g. 1000.

IMPORTANT: Precision reflects data quality

The precision you choose when creating a new feature class should reflect the quality of the source coordinate data. Higher-resolution data requires a higher

precision value to preserve all of the known information recorded in the floating-point coordinate values.

Not all digits in a floating-point number represent actual data, though. A data capture device, such as a scanner, may be able to resolve coordinate locations within one foot when reading a 1:20,000 scale map. But on the scanned paper map, the pen used to draw a line representing a river may cover 40 feet on the ground. As a result, the computer would end up storing 40 times more data than is necessary to represent the actual information contained in the map. When converting that data to an ArcSDE feature class, you could intentionally shed some unnecessary digits from the floating point values in order to save space and improve performance.

Be aware that it is impossible for the computer to determine the quality of your data for you. For example, you may purchase an economical global positioning system (GPS) at most sporting supply stores. You could read the display on your GPS receiver and determine that your office is located at –120.4832765 degrees longitude and +34.5912634 degrees latitude. But, those values may only be accurate to four decimal places, not the seven displayed on the receiver. You could create a feature class with a precision of only 10,000 and still preserve all of the true information collected by your GPS receiver.

Without input from you, the ArcSDE software or a client application will calculate the largest precision possible for a given dataset, approximately, in order to preserve the most information from the source floating point numbers. This will result in unnecessarily large storage requirements and, as a result, decreased server performance. Information regarding data quality should accompany any data source, either digitally or as supporting hard-copy documentation. Without this metadata, neither you nor ArcSDE can choose an appropriate precision for a feature class which will store that data. You can use the CalcLoadingParams tool to try out various precisions and gain a better “feel” for the value.

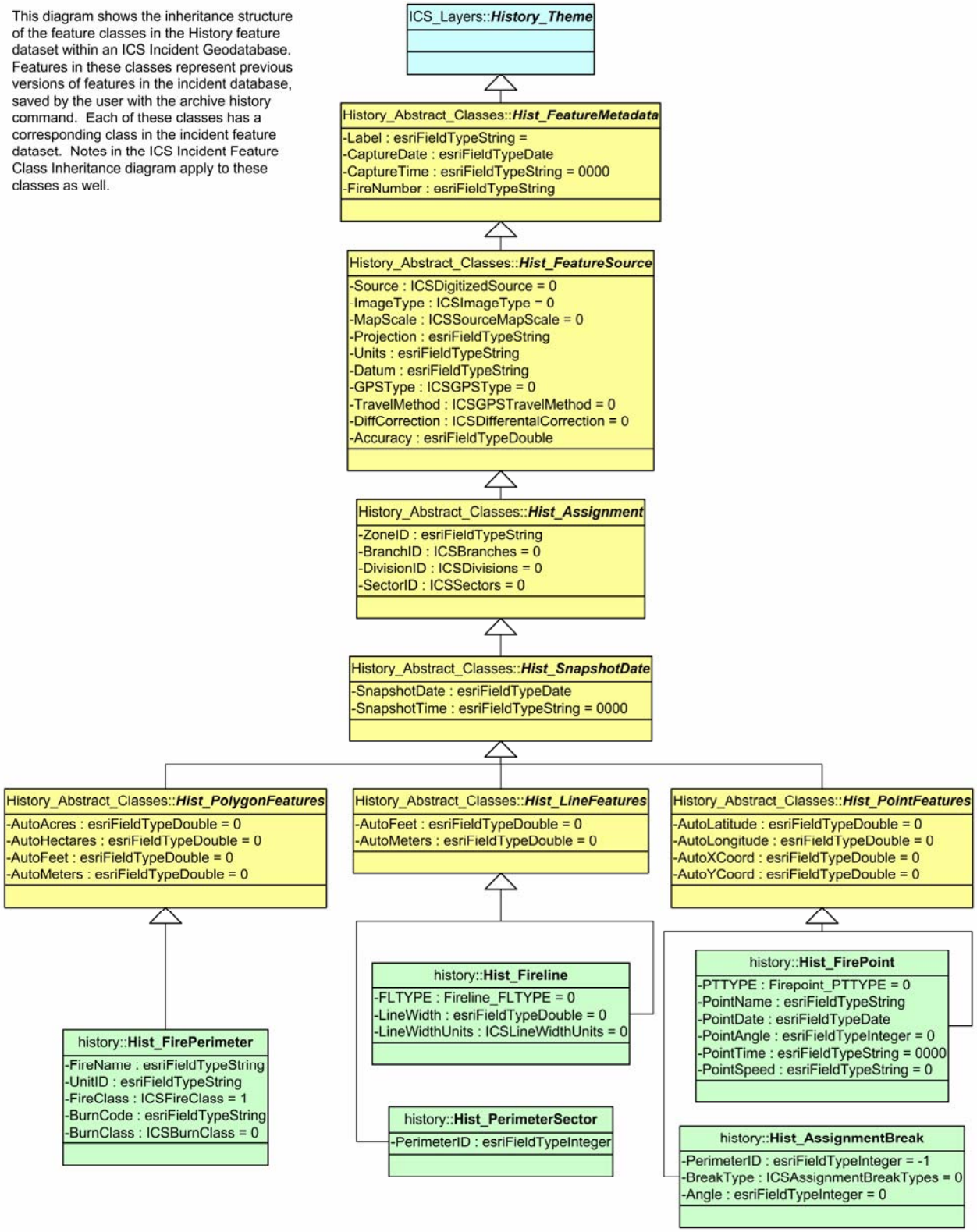
For Example:

Data collection method	Measurement units	Equipment precision	Minimum feature class precision	ESRI Recommended feature class precision
Digitize 1:250,000 map	Feet	+/- 416 ft	1 (one foot)	1 (one foot)
Professional GPS	Meters	+/- 0.5 m	2 (one half meter)	10 (one tenth meter
Survey with theodolite	Meters	+/- 0.005 m	200 (five millimeters	1000 (one millimeter)

Appendix III: Incident PGDB Data Model

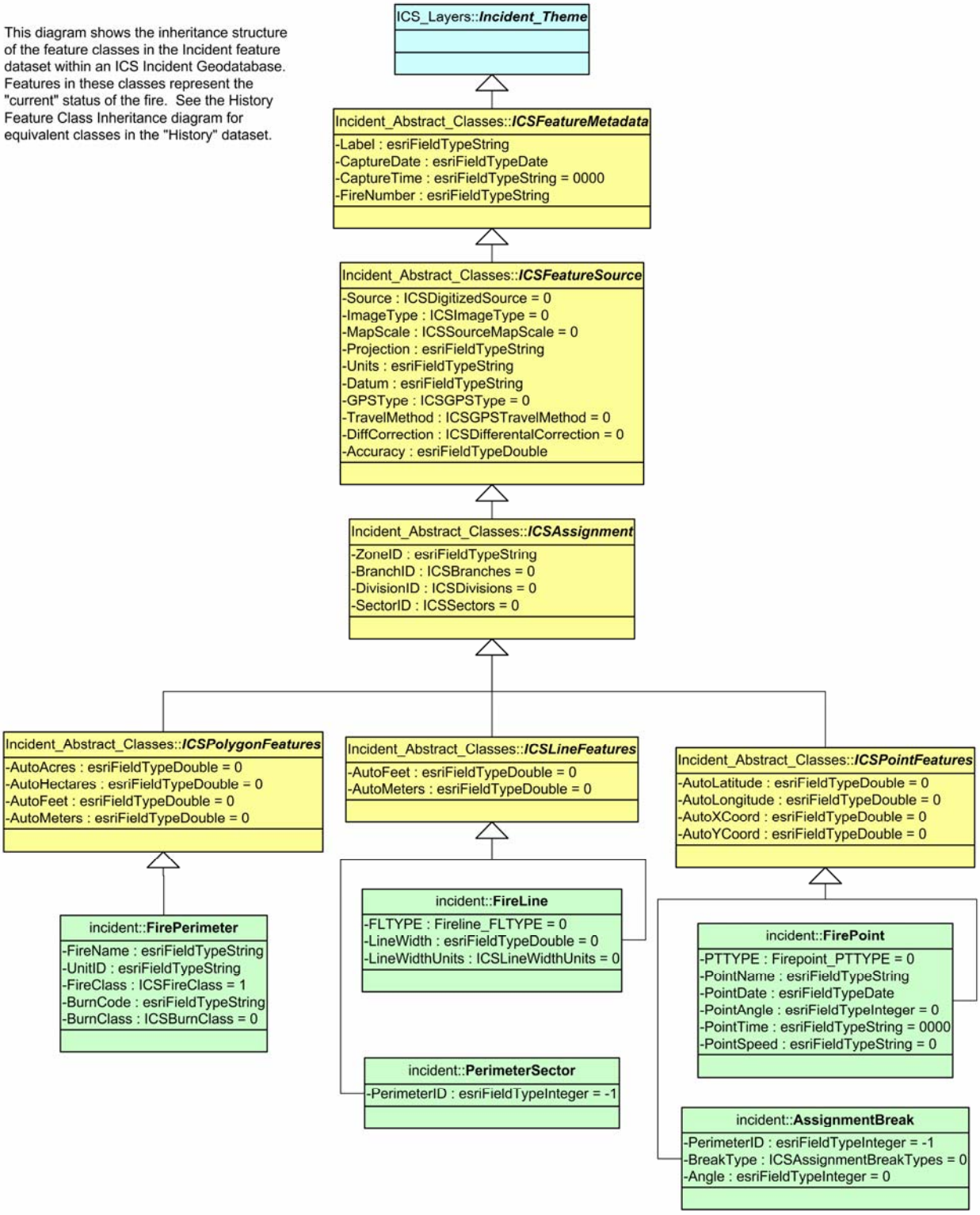
ICS Fire Tools - History Feature Class Inheritance

This diagram shows the inheritance structure of the feature classes in the History feature dataset within an ICS Incident Geodatabase. Features in these classes represent previous versions of features in the incident database, saved by the user with the archive history command. Each of these classes has a corresponding class in the incident feature dataset. Notes in the ICS Incident Feature Class Inheritance diagram apply to these classes as well.

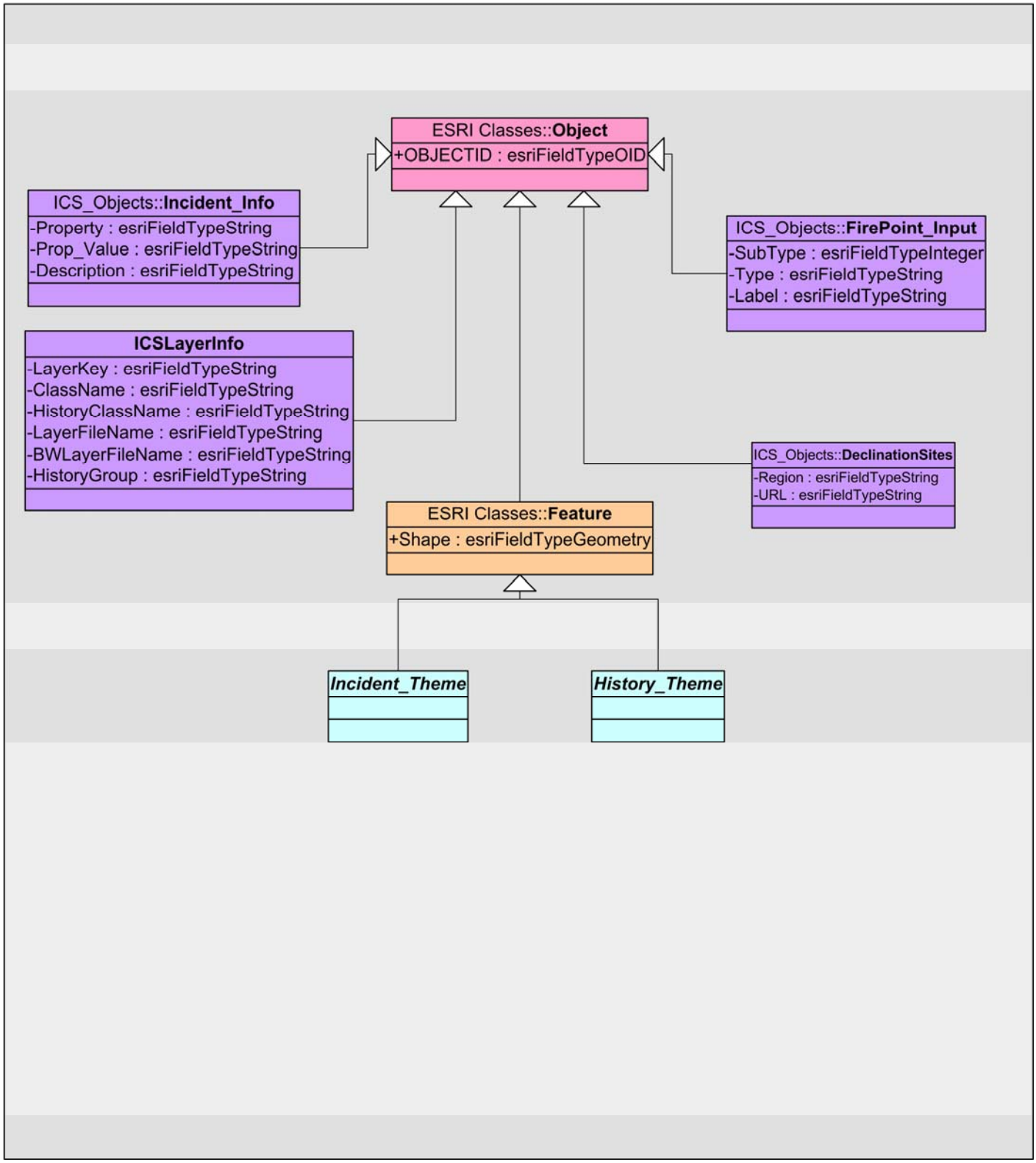


ICS Fire Tools - Incident Feature Class Inheritance

This diagram shows the inheritance structure of the feature classes in the Incident feature dataset within an ICS Incident Geodatabase. Features in these classes represent the "current" status of the fire. See the History Feature Class Inheritance diagram for equivalent classes in the "History" dataset.



Forest Service Incident Command System Themes



Coded Value domains