TdhGIS Tutorials

21.10.18

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Find a specified Entity in the drawing

The objective in this tutorial is to find a particular polygon, multiline, or pt within the TdhGIS drawing.

- Select Edit | <group type> | Select from the Main menu.
- Within the group selection dialog, click on the desired group and click on the Select button.
- Within the edit dialog, click on the Goto button and enter the ID for the desired entity.
- Within the edit dialog data grid, right click and then click on Goto Map from the popup menu.

The specified entity will now be centered and zoomed on within the drawing window.

Creating and Editing Polygon/MultiLine Points Graphically

The purpose of the tutorial is to graphically create and edit the points defining a polygon. The same procedures apply to multilines.

- Select or create a polygon group by selecting Edit | Polygon Groups from the Main menu.
- From the Edit dialog navigate to the desired polygon or create a new polygon by clicking the Insert button. If an existing polygon is being edited, display it by right clicking within the data grid and selecting Goto Map.
- From the Edit dialog click on the Edit Pts button to display the Points dialog.
- If adding points to an existing polygon, find the point prior to which new points will be added by clicking near that point on the display and then clicking on the Find Pt button on the Points dialog. If you're unsure whether the points are going clockwise or counter clockwise, use Find Pt on an adjacent point to determine whether the adjacent point is listed before or after the first point.
- To start adding multiple points, hold a shift key while clicking on the Insert button in the Points dialog. New points can be added by left clicking and dragging on the display. The last point can be added by double left clicking or right clicking.
- To add a single point, click the Insert button in the Points dialog and left click and drag on the display.
- To reposition an existing point:
    - Click on the display near the point and click on the Find Pt button in the Points dialog.
    - Click on the the Drag Pt button in the Points dialog.
    - Left click and drag on the display to set the point to the desired position.

- To delete points:
    - Click on the display near the point and click on the Find Pt button in the Points dialog.
    - To delete multiple points, click near a second point on the display and hold a shift key while clicking on the Find Pt button in the Points dialog. All points between the 2 found points will be selected.
    - Click on the Delete button in the Points dialog,
- Use the Edit | Undo option to undo changes.

Polygons with Concurrent Segments

The purpose of this tutorial is to create 2 polygons (A and B) that share a segment, as occurs, for example, with polygons representing state borders.

1. Create Polygon A, including the concurrent segment. (see tutorial: Creating and Editing Polygon/MultiLine Points Graphically)
2. Right click on Polygon A and select Polygon Data, then click the Edit Pts button in the edit dialog.
3. For the segment of Polygon A that is to be concurrent with Polygon B, click on the drawing at the beginning of the segment, then click the Find Pt button on the Points dialog.
4. Click on the drawing at the end of the concurrent segment, then hold the shift key and click the Find Pt button on the Points dialog. All points between along the concurrent segment should now be selected.
5. Click on the Copy Pt button on the Points dialog. You will be asked whether the copied points should be shared. If the points are shared, a single point value will be used for both polygons; if the value is changed for either polygon, it will affect the other polygon. If the points are not shared, separate, identical points will be created, each of which can be changed without affecting the other.
6. Start Polygon B by creating 2 points, one just before the start of the segment concurrent with Polygon A and the other just after the end of the concurrent segment.
7. Click on the drawing near the point in Polygon B after the concurrent segment. Click the Find Pt button in the Points dialog.
8. Click on the Paste Pt button on the Points dialog. To add the the copied points in reverse order, press a shift key while clicking the Paste Pt button. All points for the concurrent segment should now be included in Polygon B.
9. To continue adding points to Polygon B by clicking on the drawing:
    - Left click on the row label for the empty row after the last point.
    - Click on the Insert button on the Points dialog while pressing a shift key.
    - Add points to Polygon B by left clicking on the drawing.
    - Stop adding point by double left clicking or right clicking.

Setting the User Data Fields

Pts, Polygons and MultiLines all have a user data field, for containing data to be manipulated in various spatial operations. Prior to performing such operations, the user data field should be filled with the data of interest. This tutorial discusses various methods for setting the user data field. (It should also be noted that TdhGIS provides the information from spatial operations to manipulate user data with 3rd party tools such as spreadsheets and database managers).

- User Data can be entered manually using the data Edit dialogs.
- If the data resides in a shapefile, use File | Import | Shapefile Info | Shapefile Polygon Data from the Main menu, selecting the appropriate data field when prompted.
- If the data is contained in an Sqlite database or to set all user data fields to the same value, select File | Import | Data Dialog and:
    - Click on the data type radio button.
    - Click on the button Select Group and select the target group.
    - Click on the button Select Input Data and specify the database file and table containing the desired data.
    - Select the Key Field containing the ID data for the entities.
    - If desired, filter the input data by filling in the parameters for the If statement.
    - Click on the Set User Data button and select the field containing the desired data. Or just specify the value that all user data fields are to be set.
    - Click on the Execute button.
- Otherwise, using File | Import | CSV Files | Polygon Data CSV to import the data from a prepared CSV file is probably the best option. The file may contain any number of records in the format: ID, user_data. Existing user_data values will be overwritten only when the ID matches a record in the CSV file. (Tip – Use a third party database manager to select the data to be imported. For example, run a query to select the data that meets a desired criteria, then send the results of the query to CSV file.)
- It is also possible to update the User Data field by using a 3rd party database manager. The Code value for the polygon group should be obtained from the appropriate Group table. (It is strongly suggested that backups of the database files be created before any user manipulation).

Allocate Data from a Polygon Group to a Polygon Group

In this tutorial the objective is to allocate data from one Polygon Group to another, e.g. allocate population data from census blocks to political boundaries. There are 2 methods for accomplishing this using TdhGIS. The first method involves fewer steps but allocates only one data field at a time. The second method involves more steps but can be used to allocate any number of fields with a single execution.

For both methods:

- Import the Polygon Group from which data will be allocated (group1).
- Import the Polygon Group to which data will be allocated (group2).

Method 1: .

- Import the data for group1 that will be allocated to group2 using one of the methods described in the tutorial Setting the User Data Fields.
- Perform the data allocation by selecting Operations | Allocate Data | Polygons to Polygons from the Main menu and then group1 and group2 when prompted. The data for group2 will then be the data allocated from group1.
- The results can be saved to a CSV file by selecting File | Export | Reports | Polygon Group Report and selecting group2 when prompted.

Method 2:

- Select Operations | Intersect | Intersect Polygons from the Main menu and select group1 and group2 when prompted. Save the results to group3.
- Select File | Export | Reports | Polygon Group Report from the Main menu and select group3 when prompted. A report will be written to a user specified CSV file.
- Using a 3rd party database manager, import the fields from the CSV file into a database table (table1).
- Import the Polygon ID's and the data from group1 that will be allocated to group2 into a second database table (table2).
- Create a query selecting the desired data fields from table2 and multiply the data by the corresponding Allocate_Factor in table1, using the Parent1 field from table1 and the Polygon ID field from table2 to match polygons (i.e. join the tables). Sum the query by the Parent2 field from table1. The results of the query will be data allocated to group2 for every data field included in the query.

Allocate Data from Pt Group to Pt Group

The objective of this tutorial is allocate data from one Pt Group to another, e.g. allocate all buildings to the nearest fire station. There are 2 methods for accomplishing this using TdhGIS. The first method involves fewer steps but allocates only one data field at a time. The second method involves more steps but can be used to allocate any number of fields with a single execution.

- Import the Pt Group from which data will be allocated (PtGroup1).
- Import the Pt Group to which data will be allocated (PtGroup2).
- Define a polygon that includes all Pts from PtGroup1 and store this polygon is in a new Polygon Group (PolyGroup3). This can be accomplished using the Operations | Polygons from Pts | Auto Boundary option or by creating a polygon with the maximum bounding rectangle for PtGroup1.
- Select Operations | Polygons from Pts | Create Thiessens from the Main menu and select PtGroup2 when prompted for a Pt Group and PolyGroup3 when prompted for a boundary. The results will be stored in a user specified Polygon Group (PolyGroup4), in which the polygons will have the same ID as the Pts for PtGroup2.

Method 1:

- Import the data from PtGroup1 that will be allocated to PolyGroup4 using one of the methods

described in the tutorial Setting the User Data Fields.

- Perform the data allocation by selecting Operations | Allocate Data | Pts to Polygons from the Main menu and then select PtGroup1 and PolyGroup4 when prompted. The User_Data for PolyGroup4 will then be the data allocated from PtGroup1.
- Results can be exported to a CSV file by selecting File | Export | Reports | Pt Group Report and selecting PolyGroup4 when prompted.

Method 2:

- Select Operations | Allocate Data | Pts to Polygons from the Main menu and then select PtGroup1 and PolyGroup4 when prompted.
- Export results to a CSV file by selecting File | Export | Reports | Pt Group Report and selecting PtGroup1 when prompted.
- Using a 3rd party database manager, import the fields from the CSV file into a database table (table1).
- Import the Pt ID's and the data from PtGroup1 that will be allocated to PtGroup2 into a second database table (table2).
- Create a query selecting the desired data fields from table 2 and the AllocatedTo field from table 1 using the ID fields for to match polygons (i.e. join the tables). Sum the query by the AllocatedTo field. The results of the query will be data allocated to PtGroup2 for every data field included in the query.

Overlays

The purpose of this tutorial is to provide an example for Overlays. For this example, we have 2 groups of polygons:

- Group 1 is defined by zip codes.
- Group 2 is defined by election district boundaries.

And we have 2 Sqlite databases:

- Db1 contains population by zip code.
- Db2 contains the name of the elected representative for each election district.

We want to obtain the population for each elected representative. To do this we will perform an Overlay operation as follows:

- Perform a Polygon Intersect operation for the 2 groups by selecting Operations | Intersect | Intersect Polygons and then selecting the 2 groups. The result of the Intersect operation will be a new Polygon group we will name Intersect1.
- Open the Overlay dialog by selecting Operations | Intersect | Overlay Data.
- Click on the button Select Polygon Group and select the group Intersect1. The fields below the button will be automatically filled in.
- Click on the button Select Data Related Parent 1 and select the Db1 file. Then select the table and fields within Db1 containing the zip code ID and the zip code population.

    - For the field holding the zip code ID, select “key” for the method.
    - For the field holding the population data, select “count” for the method. (“count” indicates that the data should be allocated by area to the results).
- Click on the button Select Data Related Parent 2 and select the Db2 file. Then select the table and fields within Db2 containing the election district ID and the elected representative.
    - For the field holding the district ID, select “key” for the method.
    - For the field holding the representative’s name, select “attrib” for the method. (“attrib” indicates the data is copied “as is” to the results).
    - Specify any filtering by including the relevant field, selecting Filter for the method and providing the desired operator and value (e.g. party = independent).
- Click on the button Select Results DB and select an existing Sqlite database.
- In the Results Table text box, specify a new table name to contain the overlay results.
- Click on the button Execute. The results table will contain a row for each polygon in the Intersect1 group with population, as allocated by area, and the name of elected representative.

Spatial Analysis Outside of Buffers

The objective of this tutorial is perform spatial analysis on data outside of buffers surrounding a set of Points.

- Import a Polygon Group (PolyGroup1) for which data will be analyzed (e.g census block polygons).
- Import a Pt Group (PtGroup1) for which buffers will be created.
- Select Operations | Polygons from Pts | Pt Polygons from the Main menu. Within the Pt Polygon dialog, specify PtGroup1, the desired radius for the buffers, the number of sides for the buffer polygons and a circle relation (probably Equal Area). Click on the Execute button and specify an ID for the new Polygon Group (PolyGroup2).
- Select Operations | Subtract Polygons from the Main menu and select PolyGroup1 then PolyGroup2 when prompted. Specify an ID for the new Polygon Group (PolyGroup3).
- PolyGroup3 will now contain a set of polygons which are the polygons from PolyGroup1 minus the buffers surrounding PtGroup1. PolygGroup3 can be allocated data from PolygGroup1 by following the tutorial Allocating Data from Polygons to Polygons. PolyGroup3 can be allocated data from a Pt Group by selecting Operation | Allocate Data | Pts to Polygons.

Determine the area of a parcel of land from a map or aerial photo

In this tutorial the objective is to determine the area of a parcel of land from a map or aerial photo. The map or photo must be available in a digital file and at least 3 points on the map or photo must have known coordinates.

- Import the map or photo by selecting File | Image | Read Image from the Main menu.
- If the file does not already have associated coordinate data, you will be prompted for an assumed aspect ratio and 3 calibration points.

    - If you don't know the aspect ratio (width/height) of the image, accept the default. (it won't normally affect the results).
    - When prompted for a calibration point, click on the image at a point of known coordinates and then enter the coordinates.
    - When satisfied that the image has properly calibrated coordinates, you can save the information by selecting File | Image | Write World File from the Main menu.
- Zoom on the image to the desired parcel. If the image disappears when zooming in, you can increase the Max Scale value using File | Image | Options, although this may result in display delays.
- Follow the tutorial for Creating and Editing Polygons/Multilines Points Graphically to create a polygon outlining the desired parcel. The area and perimeter for the polygon will be displayed as read only fields in the Edit dialog.

Create a colored, translucent overlay using Contour Polygons

In this tutorial the objective is to create a colored, translucent map overlay showing the area where water system pressure is between 20 and 30 psi. The required input data is a set of points with water pressure data and, optionally, a map boundary.

- Create a Pt Group containing the water pressure data.
    - If the data resides in a shapefile, use File | Import | Shapefile Info | Shapfile to import the geometeric data and File | Import | Shapefile Info | Shapefile Data to import the pressure data.
    - Otherwise, the most convenient method for accomplishing this is to import the data from a CSV (comma separated variable) file using the File | Import | CSV | Points CSV option from the Main menu. CSV files can be created from a wide variety of software, including spreadsheets and database managers. The file may contain any number of records in the format: ID, x, y, user_data (pressure data, in this example).
    - It is also possible to insert data into the PtData and PtOwner tables by using a 3rd party database manager. Unique ID and Code values must be generated for the PtOwner table and the Code value must be used as the OwnerCode for each pressure point added to the PtData table. Each pressure point must be given a unique User_ID and pressure data should be included in the User_Data field for the PtData table. (It is strongly suggested that backups of the database files be created before any user manipulation).
- If using a map boundary, import the boundary into a Polygon Group using one of the import options. The boundary polygon should be within the limits of the Pt Data.
- Create 2 sets of contour polygons, one for pressure less than 30 and one for pressure less than 20. This is accomplished using the Operations | Contours | Contour Polygons option of the Main menu to access the Contour Polygon dialog. Select the Pt Group containing the pressure data and the Polygon Group containing the map boundary. Alternatively, a boundary can be automatically defined based on the point data by checking the AutoBoundary box. Enter the target contour value, select the “<” operator and click on the Create button. Enter IDs for the new Polygon Groups, such as Contour30 and Contour20.
- Subtract the Contour20 polygons from the Contour30 polygons. Select Operations | Subtract

Polygons from the Man menu and select Contour30, then Contour20. Enter an ID for the new Polygon Group, such as Contour20To30.

- Select Operations | Display Parameters | Polygon Colors from the Main menu. Select the Contour20To30 Polygon group. In the Color Polygons dialog, specify a value of >= 0 and a desired Color and Alpha value (the lower the Alpha, the more transparent). Click on the Apply Discrete button and then click on the Execute button under Commands.
- To use the overlay with other graphic images, it can be exported to a SVG file. First, change the dimensions and coordinates of the TdhGIS window to match the desired coordinates for the map. Then, select File | Export | SVG from the Main menu. When prompted, enter the desire paper dimension (in inches) for the map. SVG files can be imported by a wide variety of graphic editing software and merged with other images.

Create a Map of Election Results Indicating Vote Totals and Percentages

In this tutorial the objective is create a map indicating vote totals represented with transparency and candidate percentage with a color gradient.

- Create a polygon group for the desired voter districts.
- Import the vote percentages into the user data field. (this can be accomplished using either a csv file and the File | Import function or through the use of rd party database managers.)
- Select Operations | Display Parameters | Colors | Polygons and select the districts polygon group. If the Script text contains any text except “Clear Color Flags”, click on the Clear button.
- For the Gradient options, set set_point = Low, value = 0, and select the desired color for a zero value. Click on the Apply Gradient button.
- For the Gradient options, set set_point = High, value = 100 (or 1, depending on how percentages are represented), and select the desired color for a maximum value. Click on the Apply Gradient button.
- Click on the Execute button. The polygons should be colored as specified.
- Import the vote totals for the districts into the user data field.
- Select Operations | Display Parameters | Colors | Polygons and select the districts polygon group.
- In the Script text box, delete all text including the text “Clear Color Flags”.
- For the Gradient options, set set_point = Low, value = 0, select Alpha Only and set the alpha value = 0. Click on the Apply Gradient button.
- For the Gradient options, set set_point = High, value = max, and set the alpha value = 255. Click on the Apply Gradient button.
- Click on the Execute button. The polygons should be transparent as specified.

Set MultiLine Widths based on pipe diameter

The objective of this tutorial is to set the widths of multiline line group representing a pipe network based on the pipe diameters.

- Import a Multiline Group containing the pipe network data.
- Import the pipe diameter data. If the data resides in a shapefile, use File | Import | Shapefile Info | Shaefile Data. Otherwise, the most convenient method for accomplishing this is to import the data from a CSV (comma separated variable) file using the File | Import | CSV | MultiLine Data from the Main menu. CSV files can be created from a wide variety of software, including spreadsheets and database managers.
- Select Operations | Display Parameters | MultiLine Widths from the Main menu.
- Within the MultiLine Widths dialog specify the > operator and the first diameter value for increasing the line width and a desired width (e.g. for diameters greater than 6, specify a width of -3 and those pipe diameters will be drawn 3 pixels wide, regardless of zoom). Click on the Apply Width button For the next desired increase in line width, specify the > operator, the diameter and the desired width. Click on the Apply Width button. Continue this process for all desired increases in line width.
- Click on the Execute button. The MultiLine group will be drawn with the specified widths.
- If desired, save the script for later use by clicking on the Save button. Reuse the script by clicking on the Retrieve button.

Anonymize Research Data

The purpose of this tutorial is anonymize data that has specific coordinate information such that it can be distributed for spatial analysis without compromising confidentiality.

- Import the data containing coordinate information as a Pt Group.
- Develop a Grid specification that prevents the ability to locate individual data but provides sufficient resolution for the desired spatial analysis. Enter the specification by selecting Grid | Options from the Main menu.
- Select Operations | Create Polygons from Grid from the Main menu and provide a Polygon Group ID.
- Allocate the Pt Group to the Polygon Group. (see Allocate Data from Pt Group to Pt Group).

Import OpenStreetMap Data

The objective of this tutorial is to get OpenStreetMap data for land use in the June Lake, CA area and create TdhGIS polygons with that data.

- Use an application such as google maps to obtain bounding coordinates (left bottom, top right) for the June Lake area. In this case the longitude/latitude coordinates are:

  minlon="-119.0984880”, minlat="37.7390760"

  maxlon="-119.0501650”, maxlat="37.7700210"
- Construct a URL to extract all OpenStreetMap data within the bounding coordinates (see http://wiki.openstreetmap.org/wiki/Downloading_data):

  http://api.openstreetmap.org/api/0.6/map?bbox= minlon, minlat, maxlon, maxlat

- The results of the extract will be downloaded to a file named map.osm. Change the name of the file to JuneLake.osm and move it to a convenient directory.
- Start TdhGIS and go to or create the project of your choice.
- From the Main menu, go to File | Import | OpenStreetMap Data | Polygons from Ways. In the Way Tag Criteria, Included text box, enter the following text: landuse, meadow

This script imports every Way with a “landuse” tag and a corresponding key value of “meadow”. Since no name field is specified, the Way id will be used as the polygon id. The information needed to generate such scripts is obtained by examining the OSM data. For more information on generating scripts, see the TdhGIS help file.

- Click on the Continue button and select the file containing the downloaded OSM data.
- Select a unique Polygon Group ID.
- To enter a description for the Polygon Group, from the Main menu, select Edit | Polygon Groups. Click on the Group id and enter desired text in the Description box.

Obtain and Align a Background Map

The objective is to obtain a properly aligned background map for a project. While there are many potential sources for maps (search “raster map download”), this tutorial uses OpenStreetMap (OSM).

Note: If your raster file has an associated world file (.tfw), then the alignment process is handled automatically. Just import the file by following steps 8 and 9 below.

1. In a web browser, go to www.openstreetmap.com.
2. Zoom to the map image desired for your project.
3. Click on Export, at the top of the page. Note the longitude/latitude map extent coordinates displayed in the rectangle (left, right, top, bottom).
4. On the right side of the page, click on the Share icon. Select either the PNG or JPEG format and then click Download. The downloaded file will be named map.png or map.jpeg. Rename this file to describe the map.
5. Open TdhGIS and change the project, if desired, by selecting File | Projects from the main menu.
6. If the target project is to use longitude/latitude coordinates, as does the OSM map, then coordinate conversion is not needed. Just make sure the the options are set to LonLat coordinates = yes and FlipY = yes by selecting Edit | Options from the main menu.
7. If the coordinate system for the target project is not longitude/latitude:
    1. From the Main menu, select Operations | Transform Coordinates | Coordinate Info. Ensure that the Source and Destination coordinate definitions are properly defined. For a good reference on coordinate definitions, see spatialreference.org
    2. From the Main menu, select Operations | Transform Coordinates | Points. Enter the coordinates provided from OpenStreetMap; one line for the left bottom coordinate and one line for the the right top coordinate. Click the Transform button to obtain the map extents

coordinates in the Destination coordinate system.

8. From the Main menu, select File | Raster Images | Edit Images to display the Raster Image Edit Dialog.
9. Within the edit dialog, click on the Insert button. Respond to the prompt by selecting the downloaded map file.
10. When prompted to enter image calibration information, respond no*.
11. Within the edit dialog fields for MinX, MinY, MaxX, MaxY enter the map extents coordinate data for the left bottom and right top, respectively.

Note: when using longitude/latitude coordinates, images will be stretched along the x axis as the y axis moves away from its origin (the equator).

* If the map extents coordinate data is not otherwise available, the map can be aligned through the image calibration process, i.e. clicking on 3 points within the map with known coordinate values.

Create a Map Showing Pinned Locations

The objective is to create a map showing with “pins”, as might be used to show where one has traveled or where participants are from.

- The first step is to Obtain and Align a Background Map.
  - If you want a world map, a good source is naturalearthdata.com. When using a map of this large size, it is recommended to set the Max Scale to 1 or less (to prevent undesirable delays), using the Raster Image edit dialog.
- Next, we want to create a Pt Group specifying the locations to be pinned.
  - You can import the data for a Pt Group from a CSV file by selecting File | Import | CSV Files | Points CSV from the main menu.
    - Enter a name for the Pt Group, which must be unique within all data groups.
    - The file can contain any number of lines containing id, x, y (e.g. 1, -188.23, 37.63).
    - The id can be any user defined text but must be unique within the group.
  - You can create a Pt Group using the Pt Group edit dialog by selecting Edit | Pt Groups | New from the main menu.
    - Enter a name for the Pt Group, which must be unique within all data groups.
    - Create a new location by clicking on the Insert button from the edit dialog.
    - Enter a unique id and set the x, y coordinates by entering the coordinates or by clicking on the Set Pt button and then clicking on the map at the desired location.
    - When editing Pt data, the latest editing changes can be displayed by clicking on the Show button.
  - When using longitude/latitude coordinates:

    - Be sure the options are set to LonLat coordinates = yes and FlipY = yes by selecting Edit | Options from the main menu.
    - Longitude/latitude values can be specified as degree.decimal (e.g. 39.775), degree:minute:second (e.g. 39:46:30), or degree:minute.decimal (e.g. 39:46.5).
- When creating an new Pt Group, after entering a group id, the user will be prompted for a group color. You can enter a common color name or enter ‘select’ to select a color from a color dialog. The color can be subsequently changed by selecting Layers from the main menu, then selecting the layer named for the group and then clicking on the Color button.
- The size of the circles used to display Pt Data can be changed by selecting Edit | Pt Group | Pt Radius. The radius is in pixels and therefore is independent of the map units and the zoom.
- To display the Pt id’s on the map, select Operations | Display Parameters | Labels | Pt Labels from the main menu, then select the desire Pt Group. The size of the labels can be controlled by selecting Operations | Display Parameters | Labels | Set Max Size from the main menu, noting that a negative value specifies pixels and positive value specifies map units. To remove the labels, select Layers from the main menu and delete the Labels layer.
- To stop displaying a Pt Group select Layers and then go to the layer named for the group. The group can be hidden by checking the Hide box within the layer dialog or deleted by clicking on the Delete button in the dialog. Deleting the layer does not delete the data. The data can be subsequently displayed by unchecking the Hide box or by selecting the group using Edit | Pt Groups | Select.
- To permanently delete the data select Edit | Pt Groups | Select, then highlight the group and click on the Delete button.