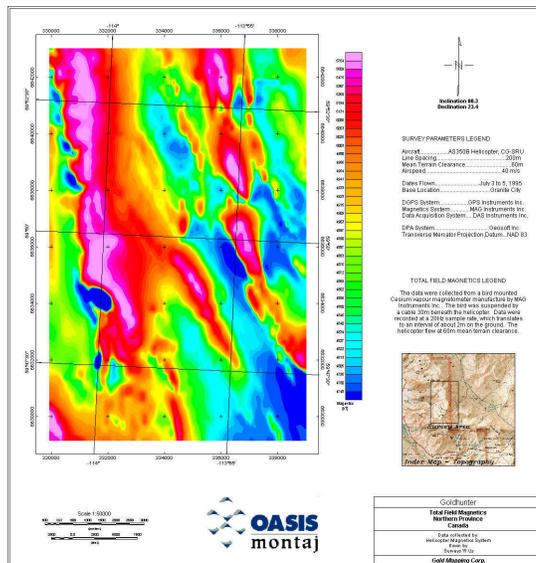
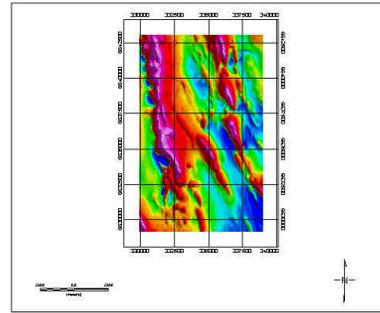


Producing High-Quality Maps Efficiently

In Geosoft's OASIS montaj™ Data Processing and Analysis (DPA) system, professional mapping is considered to be a basic requirement – the standalone platform provides capabilities for editing and imaging maps, and you can extend your capabilities with the Mapping Toolkit.



By design, the software provides a system of “intelligent defaults” that you can use to quickly produce a basic map without having to learn about the entire mapping system, which is quite extensive. The map above shows the result of using the default settings to produce a simple map with a grid.

While the default settings are adequate for quick mapping, Geosoft's mapping capabilities let you create very advanced maps. The objective of this Technical Note is to help you achieve results like the map on the left.

Table of Contents

Maps: Overview of Problems and Solutions	2
Identifying the Problems.....	2
Identifying Solutions.....	2
The Elements of Map Design	3
Creating a Design Strategy.....	3
Presenting Relevant Information on a Map.....	4
Planning Maps, Laying out Maps and Placing Map Elements	5
Geosoft Map File Structure.....	5
Creating and Editing Maps in OASIS montaj™.....	7
Using a Map Template to Create a Map in OASIS montaj.....	7
Editing Maps Manually.....	9
Quick Tips for Designing and Printing Maps.....	11
Using Control Files to Customize and Automate Map-Making	12
Customizing System-Supplied Control Files.....	13
Re-Using Program Description Files Developed for V4.1b, V4.1a and SUSHI.....	14
Final Tips on Map Automation and Sample Files.....	14
Mapping References	14

Maps: Overview of Problems and Solutions

Maps. They are an essential part of our professional lives. We use them in many ways – for recording data, relating information, transferring knowledge and making decisions. They help us describe spatial relationships and they help us solve problems.

Maps can also represent one of our greatest frustrations. Incomplete or inaccurate maps can hinder as much as they can help us. Poor map appearance reduces our ability to communicate our ideas and persuade decision-makers to act on our ideas. And we can spend many hours on tedious, repetitive tasks – time that we would rather spend solving our Earth Science problems.

Identifying the Problems

From talking with our users, we find three key areas of concern when creating maps:

- **Loss of information context.** Missing and incomplete map elements, such as survey specifications, map projections, title block details or grid names, can make it difficult to understand data acquisition parameters and survey limitations. Loss of context makes interpretation a much more difficult task.
- **Poor appearance.** As with any professional product, poor planning and design (i.e. map layout) is obvious at a glance. Poor appearance diminishes confidence in the underlying work and overall persuasiveness of the map. The bottom line is that, “Presentation does matter!”
- **Reduced productivity.** Each individual, company and project requires its own set of map products with custom logos, title blocks, extents, etc. But when performed manually, customization and production of maps can be a repetitive, tedious process.

Identifying Solutions

Based on the problems identified above, basic solutions include:

- **Creating design strategies for clearly presenting all relevant information.** The goal is to ensure that another professional is able to review the map and understand its significance in moments.
- **Developing approaches for planning (laying out maps and placing map elements).** The objective is to standardize title blocks, logos, north arrows and their placement for maximum information delivery and visual appeal.
- **Automating the map production process.** The goal is to reduce work by setting up a process for volume production and knowing how to change parameters for special jobs.

The Elements of Map Design

The primary function of a map is to communicate information. A well-designed map promotes communication by leading the eye and presenting only the essential information on the map. Poorly designed maps are ambiguous and confusing.

Design can either refer to a plan for creating a map, or to the appearance of the map. As a plan, design is a systematic, problem-solving exercise. As visual trigger, design refers to the arrangement of various elements on a page. A successful visual design is one that achieves the following goals:

- Clarity:** Clarity is important to avoid overloading the reader with information. Clarity is achieved by evaluating the design plan objectives to emphasise important map elements and eliminate unnecessary detail.
- Order:** Are the map elements placed logically? The arrangement of shapes on a map should lead the eye and avoid noise clutter and confusion. Grouping similar map elements helps achieve order.
- Balance:** Are the map elements visually balanced? Location, size, colour, shape and orientation determine the visual weight of an object on a page. Map elements are given increased weight when they are located to one side or in the top half of a page. Increased size, bright colours, regular shapes and a vertical orientation also increase visual weight.
- Contrast:** Contrast has three functions: to increase clarity, establish a visual hierarchy, and to improve aesthetics. Contrast is achieved through the variation of light and a dark, thick and thin line, heavy and light objects.
- Unity:** Ensure that the map elements appear related. Colours, fonts and symbols should not conflict with one another. All elements should be legible.
- Aesthetics:** Is the map pleasing to the eye? Is there anything on the map that doesn't look right? The map elements should compliment one another.

Creating a Design Strategy

A map design strategy establishes what type of map will be created. The design plan establishes how a map will be used and what information it will communicate. The information you wish to communicate will influence the visual design you will use. The list of questions below will help you formulate a mental plan for designing your map.

1. What is the purpose of the map?
2. Who is the audience?
3. What will the map show?
4. What will the page size and orientation be?
5. What is the scale of the map?
6. How will the map be printed? Will this include colour?

Presenting Relevant Information on a Map

The information on a map must be useful and relevant. All maps have certain elements that are essential to understanding the context of a map. The following provides a basic checklist of some of the information that is key to maintaining map context.

Information Checklist

- Scale Bar (not just a ratio scale because maps are often reduced on a photocopier or scaled to fit on a smaller page size)
- North arrow
- Title block (including client name, country, project, map type)
- Map projection (including things like UTM zone number, central meridian etc.)
- Datum (e.g. Clarke 1880 spheroid Cape Datum)
- Local offset (quite often the UTM grid is quoted in kilometres or has a different tie point)
- Colour scale bar
- Legend (including instruments, survey contractor, processing parameters etc.)
- Date/version number
- Map/grid file names (*.map, *.grd)

Planning Maps, Laying out Maps and Placing Map Elements

Before you can start planning and designing maps using **OASIS montaj™**, you require a basic understanding of Geosoft's map-making approach and the map elements and controls available to you.

Introduction to Geosoft Maps

Maps are a fundamental concept in OASIS montaj but there are certain key concepts to grasp before you can use them to full advantage. In this section, we define the key concepts of a map, view, group and item and explain their purpose in the system.

By definition, an OASIS montaj map is a 2-dimensional drawing area. It contains a coordinate system and any number of views.

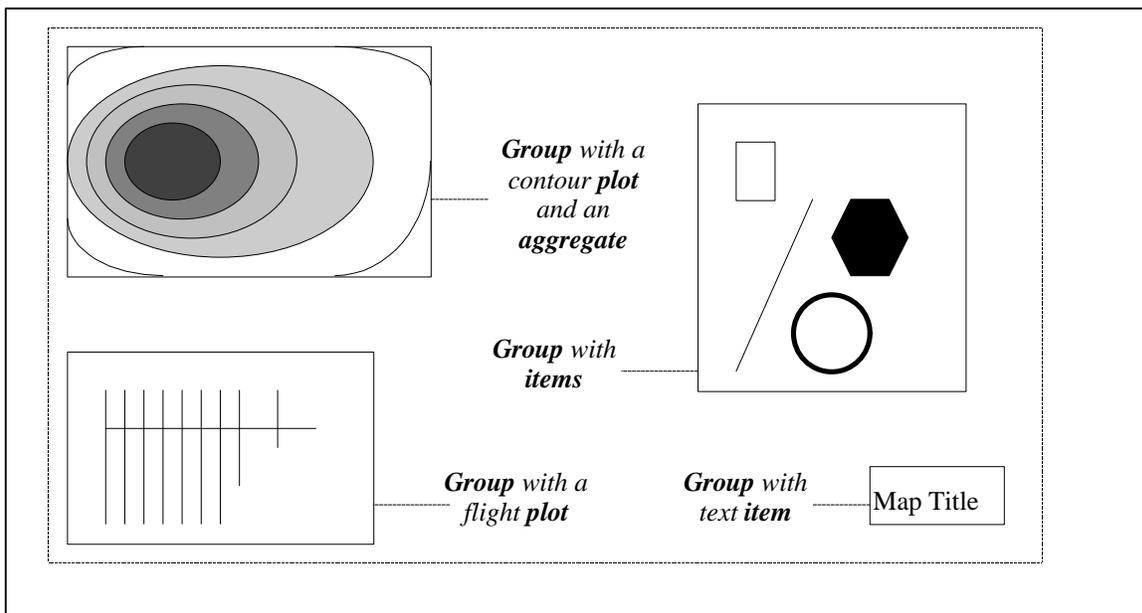
Geosoft divides views into two basic types – data and base views. This design is significantly different from other graphical software systems and it takes time to learn how to manipulate each type of view. However, the advantage of the design is that it enables you to:

- Logically separate elements that they draw on a map (north arrows, legends, etc.) from components that are related to data (contours, symbols, etc.)
- Locate positions on maps. The dynamic linking functionality built into the system uses views to keep track of where a specific location is in space.
- Develop complex maps. You can construct complex maps using multiple views, for instance, by opening a window, duplicating maps in other views, and then positioning them in the new map. Each individual view is internally referenced with its own coordinate system. This means that the dynamic linking mechanism is still enabled even within a complex map.

Understanding Maps

In Oasis montaj you can think of a map as a sheet of paper. It is two-dimensional and you can use a two-dimensional Cartesian co-ordinates (X and Y in map millimetres) to describe the location of things on the map relative to a map origin, which you can think of as the close to the bottom left corner of the sheet.

The figure below illustrates some of the basic components that can be included in a map.



Views

However, in **OASIS montaj**TM, we need to maintain the connection between drawn objects and their original data co-ordinates, which is usually based on some projected map co-ordinate system, such as UTM Zone 17 in the NAD 83 datum. To accomplish this, **OASIS montaj**TM maps are simply containers of one or more named **Views**. A View has the following characteristics:

1. Views have names, such as “Base” View or “Data” View.
2. Each View has its own co-ordinate system, which can be arbitrary or can be a specific projected map co-ordinate system.
3. A View may have a defined clip region, which can be used by Groups that are drawn in the View for clipping purposes. A clip region can be made up of any number of polygons, each of which can define an inclusion or exclusion area for clipping. Note that items drawn in a view are not necessarily clipped.
4. A View contains any number named Groups, which in turn contain drawing items.

By convention, most Geosoft maps will contain two Views, although special purpose maps of figures may contain any number of Views:

1. The “Base” View uses the Map co-ordinate system with an origin at the map origin, and locations defined in map millimetres. This View is intended for drawing map surround information, such as title blocks, scale bars and other map legend information.
2. The “Data” View uses the projected map co-ordinate system of the data that is the subject of the map. This co-ordinate system is usually shared with the primary co-ordinate system of the database or a displayed grid image. All Groups drawn in the “Data” View use the projected co-ordinate system units.

Groups

A **Group** is a named set of graphic items (lines, polylines, polygons, text, symbols etc.) that make up a related set of drawing information. For example, a scale bar and its annotations will be drawn in a “Scale_Bar” Group of the “Base” View, or contours of a “Mag” grid will be drawn in the “Mag_Contours” Group of the “Data” View. Individual items in a Group may or may not be clipped to the clip region of the View.

Groups may also contain a **Maker**, which contains the process information that was used to draw the Group from the Oasis montaj environment. When a Group is selected in a Map displayed in Oasis montaj, the Maker will be displayed in the pop-up that appears when the right mouse button is pressed. Selecting the Maker will allow the user to recreate the Group with different data or parameters.

While most Groups contain basic drawing items, there are two special Groups called **Aggregate** and **CSYMB** Groups. An Aggregate Group contains an aggregation of grid images and the information required to display those images in colour on the map. These are used to display simple one-grid images and multiple grid images such as shaded-colour maps or colour ternary plots. By convention, Aggregate Groups names will have a prefix “AGG_”. Aggregate Groups from all Views are always drawn before any other Groups. Oasis montaj provides a special “Image Colour Tool” for working with the display properties of Aggregates on a map. This tool will let you manipulate colours interactively, or perform interactive shading if the Aggregate contains a shaded image.

An aggregate Group is used to contain located data values (X, Y and Z) together with colour symbol display information. By convention, Aggregate Groups names will have a prefix “CSYMB_”. Oasis montaj provides a special “Symbol Colour Tool” for working with the display properties of CSymb Groups on a map. This tool will let you manipulate colours symbol sizes interactively. Note that colour symbols can also be drawn as normal graphic items in a normal Group, but such symbols do not provide access to the Symbol Colour Tool.

Creating and Editing Maps in OASIS montaj™

There are two ways to create and edit your maps in **OASIS montaj™**. The first method is to create a map interactively using the *Mapping* menu commands. You can customise this process via templates that specify the orientation and page size of your map. The second method is to automate the map making process via Geosoft control files.

The following is a short tutorial that guides you through the process of:

- Using a map template to create a map
- Adding a grid image and colour legend
- Editing maps manually

The tutorial also provides some quick tips for designing and printing maps.

Using a Map Template to Create a Map in OASIS montaj

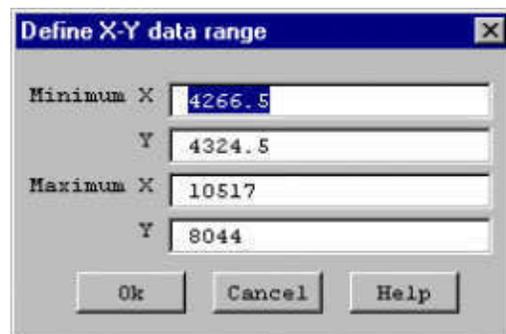
In **OASIS montaj™**, map templates represent default map settings that define page size, page orientation and the position of the elements on the map. The system provides a Template Manager that contains a variety of default templates.

You can modify the default templates or create your own standard maps with logos, custom layouts and other elements as required. For example, you may type a new template name, such as TEST, and your own layout that you use regularly for map-making.

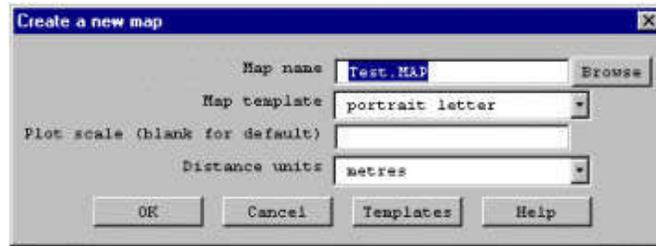
Map templates are currently saved permanently in your system. When you are learning the system, we suggest you experiment using the same template until you are ready to create a final version with a custom name. You may want to make up a testing template, called TEST, for example. The procedure for editing map templates is provided below.

EDITING MAP TEMPLATES TO CREATE CUSTOM MAPS

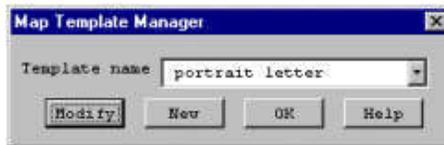
1. Select the *Mapping/New Map...* menu item. The system prompts you to select the database range to plot.



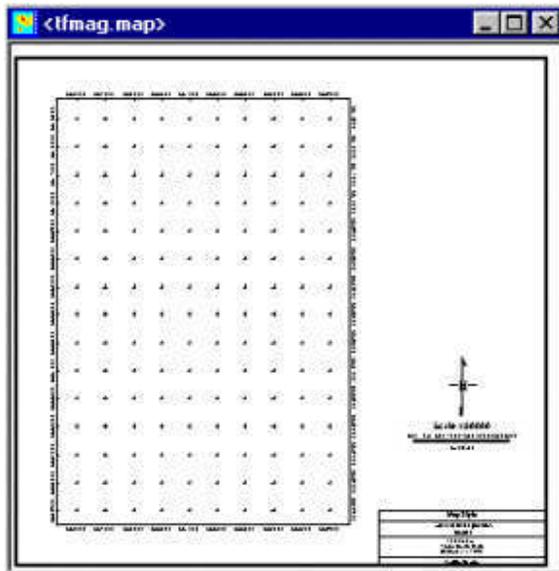
- Press <OK>. The system displays the *Create New Map* dialog box. Specify the map name, scale and distance units in the fields provided. You will notice there are several template options to choose from. Select the map template with the most suitable page orientation (portrait or landscape) and page size (A0, letter, etc.) for your data.



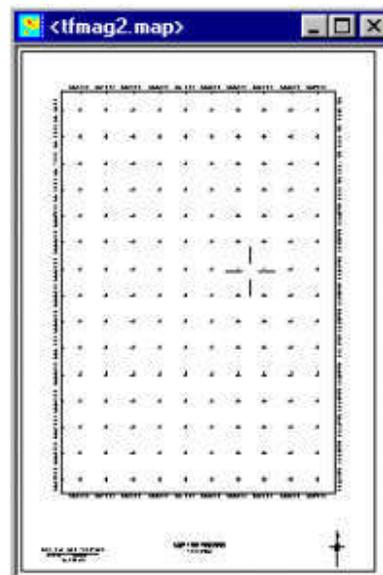
- Press <Templates> to edit the map template you selected. The system displays the *Map template Manager* dialog box. This dialog enables you to create a new template or modify the currently selected one. To avoid overwriting an existing template, we recommend changing the name of the template before modifying it.



- Press <Modify> to edit the template settings. The system displays the *Edit map template* dialog box. This dialog box lists the map elements and page settings. The most important setting is *Map Style*, which enables you to select either a **Full Map** (select Map) or **Figure** (select Figure) style map. For users who are familiar with Geosoft's DOS software, the **Full Map** style is the same as **Large Map** style and the **Figure** map style is the same as the **Small Map** style. The **Full Map** style is normally used for A1/A0 size maps, the **Figure** style map for A3/A4.



The **Full Map** style (above left) places the data co-ordinates on the left side of the page, and the scale bar, title block and north arrow to the right. Use this map style when you want to plot a vertically long colour legend bar on your map.



The **Figure** style map (above right) places the data co-ordinates across the top of the paper with the scale and north arrow below. The figure map maximizes grid space, but leaves little room for a colour legend.

5. For a description of each template setting, press the <Help> button to view the online help.
6. After specifying the settings for the map template, press <OK>. Press <OK> again to accept the settings for the previous two dialog boxes. The system will create a new map window with a blank map.
7. Select the *Mapping/Draw base map* menu item. The system displays either the *Full map style base map* or the *Figure map style base map* dialog box. The dialog boxes enable you to specify the drawing settings for the map elements.

Tip: When specifying the projection file to use, select a projection type that matches the projection of your data.

For a description of each setting, press <Help> to view the online help.

TO ADD A GRID IMAGE AND COLOUR LEGEND TO A MAP

1. To add a grid image to your basemap, select the *Mapping/Grid Image/Single Grid...* menu item. Specify the map name, select the current map, grid name, colouring options and contour interval. Press <OK>. The system draws the grid image on the map.
2. To add a colour legend bar to your basemap, select the *Mapping/Grid Image/Colour Legend bar...* menu item. The system prompts you to specify the symbol group and text settings for the legend. Press <OK>. The system draws the legend on the map. You can use the editing tools to change move and resize the colour legend.

Editing Maps Manually

Map groups represent the different elements on a map (Surround, North Arrow, Scale Bar). This section explains how to select a map group and edit its size, position, and attributes. Instructions on using the editing tools to draw new map groups are provided in the following procedures.

SELECTING A MAP GROUP

1. Press the *Select a Group Icon* () on the map toolbar.
2. Click the right mouse button and select the *Select any group* menu option.
3. Select the map element or object you want to edit (i.e. North Arrow) from the list. A square box with sizing handles will appear around the object you selected.

TO MOVE OR RESIZE MAP GROUPS (ELEMENTS)

The following procedure describes how to modify the size and placement of the different map elements (or groups) on a map.

1. Select the map group you want to edit (i.e. North Arrow).
2. To **move** the object, click the right mouse button and make sure there is a checkmark next to the *Movable* menu option. Once this option is selected, hold down the left mouse button on the object and drag it to a new location.
3. To **resize** an object, click the right mouse button and make sure there is a checkmark next to the *Clipped* menu option. Drag a sizing handle using the mouse until the frame is the size you want.

TO DRAW OR EDIT MAP GROUPS

The editing tools are used to draw shapes (lines, poly-lines, boxes, polygons, and symbols) or text on a map. These tools also allow you to edit the attributes (such as line thickness, font, colour, symbol size) of map elements. The example below shows you how to add a symbol to your map and modify its attributes.

1. Select the map group you want to edit. If you are drawing a symbol, select the *Surround* map group. A square box with sizing handles will appear around the object you selected.
2. Click the right mouse button and choose the *Edit Group* menu option.
3. The system displays the Editing Toolbar:



4. To **draw** a symbol, select the symbol button () on the toolbar and click the left mouse button where you want to place the symbol. Select the other buttons to draw lines, poly-lines, boxes, polygons and text.
5. To **edit** symbol attributes, click the left mouse button on the symbol to select it. The system displays sizing handles around the symbol.
6. Next, click the right mouse button and select *Attributes* from the menu.
7. The system displays the *Symbol Attributes* dialog box. This dialog box enables you to edit the line weight, colour, font, size, rotation and symbol type of the object (a symbol) you selected to edit.
8. Press <OK> to apply the attributes you have selected.
9. To **end editing** a symbol, click the right mouse button anywhere on the map and select *End Editing*.

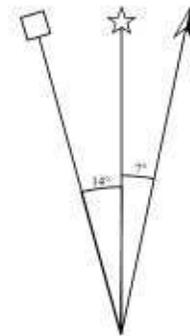
Quick Tips for Designing and Printing Maps

The following tips will help ensure that you create maps that are well-designed and easily interpreted:

- When placing a title block on a map, it is convention to place it in the lower right-hand corner. The full map option does this by default.
- Maximise the amount of the page that the grid takes up by minimising the border space around the grid.
- Try to avoid putting too many map elements on top of a grid. Profiles and line paths on the same grid can make your map cluttered and difficult to understand.
- Placing the scale bar under the map allows you to measure distances more easily.

North Arrows

There are three different north directions: grid north, magnetic north and true north. Some maps require several north arrows to aid in their interpretation. To show all three north arrows, you can plot a north arrow with three points, something like the figure on the right. The star (Polaris) indicates true north, the box indicates grid north, and the arrowhead (compass needle) indicates magnetic north.



If you would like to create custom objects like the figure on the right, there are two ways you can do this in **OASIS montaj™**. The first method is to create the graphic as a bitmap using a graphics program. You can then import the bitmap and plot it on your map using the AGGR command in MAPPLOT. The second method is to draw the object using the editing tools in **OASIS montaj™**.

Adding Logos and Bitmaps to Maps

Make sure to take the scale of the map into consideration when pasting raster images such as bitmaps onto maps. If you have a company logo that is 2 cm X 2 cm at 300 dpi, this graphic will be desampled and will look awful if you enlarge or reduce the scale. As a general rule, bitmaps should be the same size as the final hard copy map.

Printing Maps

Make sure that you check that the parameters in the printer driver (through the Windows 95 *Start/Settings/Printers* menu) are the same as those in the **OASIS montaj™** *File/Printer Setup* menu.

OASIS montaj™ only reads the Windows printer setup when it starts, and will not update the parameters if you change them. Set the page size to the minimum required to plot the full map, or the printer will produce an A0 map on a full A0 sheet with a lot of white space.

Using Control Files to Customize and Automate Map-Making

If you are always creating the same type of map with the same elements, we recommend that you create your own custom full map or figure map control file. Control files (*.con) are files used during the map creation process in **OASIS montaj™**.

The MAPPLOT GX is the main map creation tool provided in **OASIS montaj™**. The recent 4.1c release contains a 32-bit MAPPLOT application. The new MAPPLOT GX delivers faster plotting and lets you plot an unlimited number of points. It also enables internal map processing directly from a database -- removing a previous limitation that required users to export databases to an XYZ file before using MAPPLOT commands. For advanced users, there are new MAPPLOT commands that enable you to control views and an AGGR command that automates logo placement on maps.

The new 32-bit MAPPLOT implementation has 2 reference control files within the Geosoft directory. Called FULLMAP.con and FIGMAP.con, these files are default control that you can edit and modify to fit your requirements.

MAPPLOT GX uses a series of commands that control all the template and base map settings required to create a map. Some of the most commonly used MAPPLOT commands include:

AGGR	place an aggregate image on the map
ALAT	annotate latitudes
ALON	annotate longitudes
ANOX	Annotate the X-axis
ANOY	Annotate the Y-axis
DATT	Define an attribute table entry
LINA	Draw a line, or chain of lines on the map.
MGRP	Make a group
MDFP	Define the map layout from an MDF
NARR	Draw a north arrow
REFP	Set user reference point
SCAL	Draw a scale bar
TEXT	Plot text

Each MAPPLOT command includes a set of parameters that modify the command. The parameters for the MGRP command are shown below as an example:

MGRP	name, group, view
Name	name of the group
Group	0 for a new group, 1 to append a group
View	0 for base view, 1 for data view

A list of MAPPLOT commands and parameters is available in the online help system.

Customizing System-Supplied Control Files

The easiest method of creating a custom control file in **OASIS montaj™** is to modify an existing control file supplied by the system. Every time you create a new map, the system creates a temporary control file called **_basemap.con**. This file contains all the commands and parameters that the MAPPLOT GX used to create the last map.

CREATING A CONTROL FILE

1. Create a new map (using the usual interactive *Mapping/New Map* command) that resembles as much as possible the map you will want to create using a control file.
2. When you select the *Mapping/Draw base map...* menu item, the system will create a basemap and corresponding **_basemap.con** file.
3. Select the *File/Edit ASCII file...* menu item and select the **_basemap.con** file located in your current workspace directory. The system will display the file in a text editor.
4. Select *File/Save As...* to save the file to a new filename (for example, **mymap.con**). You have now created a new control file. If you like, you can edit the MAPPLOT commands and parameters in the control file.

EDITING A CONTROL FILE (AN EXAMPLE)

As there are too many MAPPLOT commands to list here, the following provides an example of how to edit a MAPPLOT command to modify a single map element. In this example, we will rotate the direction of the north arrow clockwise from 0 to 45 degrees.

1. The MAPPLOT command for plotting the north arrow is NARR and has the following parameters:

```
NARR      refp,xoff,yoff,direc,length,att,incl,decl,att,height,
width,space,slant,font
```

2. A typical **_basemap.con** file with the north arrow pointing at 0 degrees is would contain the following line:

```
NARR      3,-6,13,0.0,4,s1
```

3. The **direc** parameter indicates the north arrow direction clockwise from the map Y direction. The current value is 0.0. To change the direction to 45 degrees, replace 0.0 with 45:

```
NARR      3,-6,13,45,4,s1
```

4. When you are finished editing, save the file and exit the text editor.

RUNNING A CONTROL FILE

1. To run a control file, select the *Mapping/MAPPLOT Control File* menu. The menu provides you with the option to plot *To the current map* or *To create a new map*.
2. If you select the current map, enter the control file name and press <OK>.

We recommend that you plot to the current map because plotting to a new map requires that you first add information to your control file.

If you select to plot to a new map, you must have the MDFF command at the beginning of your control file. This command tells MAPPLOT to set the map scale and boundaries from the information contained in a MAP Description File (*.mdf). The easiest way access to the scale and boundaries is to

create a new map by selecting *Mapping/New Map*. When you do this, the system creates the MDFF line in the *_basemap.con* file. You can now view the MDFF line in the *_basemap.con* file and type the scale and boundary values in your control file.

Re-Using Program Description Files Developed for V4.1b, V4.1a and SUSHI

If you are already using PDFs in OASIS montaj or are considering moving from our old SUSHI technology to Windows, please note that you can re-use your PDFs. A new GX called MAPLPDF was developed specifically to protect your previous work. This GX creates a control file and then runs MAPPLOT using the new control file. If you think that you require this functionality, please call your Technical Support Representative. They will ensure that you receive a copy of the MAPLPDF GX promptly.

Final Tips on Map Automation and Sample Files

The control file system and MAPPLOT commands deliver a great number of options for automating the map production process. The best way to learn these commands is to create a custom control file and experiment with individual commands and parameters.

To help you get started, we have provided a special set of control files, and grid and other map elements. This set produces the advanced map shown on the cover page. To use these files, unzip the MAP04.zip file into a working directory and select the MAPPLOT GX in OASIS montaj™. Specify the MAP04.CON file and a map name.

If you have any questions, please contact a Geosoft Technical Support representative.

Mapping References

Snyder, J.P., 1982. Map projections used by the US Geological Survey, *Geological Survey Bulletin 1532*, 313p.

Tyner, Judith, 1992. *Introduction to Thematic Cartography*. Prentice-Hall: New Jersey, 297p.

Wood, D., 1992. *The Power of Maps*, Guilford Press: New York, 248p, ISBN 0-89862-493-2.

Geosoft Inc.
85 Richmond St. W.
Toronto, Ontario
M5H 2C9
Canada

Tel: (416) 369 0111
Fax: (416) 369 9599

Web Site: www.geosoft.com
e-mail: info@geosoft.com