Files

All aspects of using files in EarthVision® are covered under the following sections in this document:

- File Default Suffixes
- ASCII File Default Formats
- File Types and Formats
- Preparing a File Header
- The File Pull-down Menu
- File Selection
- File Selection Window Functions

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Introduction

Files used in EarthVision are self-describing. ASCII files can either match program default formats or contain header records describing a unique format. Files types are identified by their suffix or header record.

The use of self-describing files allows much flexibility, including

- using files from any directory, not just the current working directory
- free-format files, where the fields are not arranged in aligned columns but merely separated by spaces, tabs, or commas
- no program limits for the file name, file description, field names, number of fields in a scattered data file, number of files in a project directory
- file headers describing the file contents facilitate projects involving multiple users working with the same files

In addition, the file handling facilities in EarthVision include a number of useful tools that significantly simplify the use of files throughout the program. Many functions (e.g., copying, renaming, deleting, browsing, and editing) can be accessed when a file is selected.

File Suffixes

File types, in EarthVision, are determined in one of two ways. EarthVision first checks the file suffix. If suffixes other than the ones defined for EarthVision are used, the file type is determined from the file header. In EarthVision, files either need to contain a file header or conform to the program file format defaults. The file's suffix takes precedence over the file's header.

The following lists the program default suffix for each of the available file types:

File Type	Suffix
2D grid	*.2grd*
2D grid report	*.2grpt*
2D grid vue	*.2gvue*
2D volumetrics report	*.2vrpt*
3D grid	*.3grd*
3D grid report	*.3grpt*
3D grid vue	*.3gvue*
3D indicator grid	*.3igrd*

File Type	Suffix
3D volumetrics report	*.3vrpt*
Annotation attributes	*.attr*
Annotation data	*.ann*
AutoCAD® DXF™	*.dxf*
Computer graphics metafile	*.cgm*
Digital elevation model	*.dem*
Digital terrain elevation data	*.dted*
Digitizer setup	*.dis*
Directed well database	*.dwd*
EarthVision exchange format	*.evx*
Faces cross-section parameters	*.fxpar*
Faces file (sliced)	*.faces*
Faces file (unsliced)	*.unsliced.faces*
Faces vue	*.vue*
Fault data prefix list	*.datalist*
Fault list	*.fltlist*
Feature color table	*.fclr*
Formula	*.fml*
GeoLink® GLK-format	*.glk*
GRIDGENR™	*.gtf*
Grid stack	*.stack*
Horizon table	*.htbl*
HP® graphic language	*.hpgl*
Hypertext markup language	*.html*
Image registration points	*.imreg*
Intelligent plot	*.iplt*
Isochore table	*.itbl*
Landmark 3D seismic data	*.3dv*
Legend annotation	*.lgd*
Lithology file	*.lith*
Log	*.log*
Log ASCII standard	*.las*
Merge list	*.mlist*
Non-vertical fault polygons	*.nvflt*
Plot	*.plt*
Polygon data	*.ply*
Polygon label data	*.lbl*
Polygon line data	*.line*

File Type	Suffix
PostScript®	*.ps*
Program settings	*.set*
Property color table	*.pclr*
Property data	*.pdat*
RESCUE model	*.bin*
Reservoir parameter file	*.res*
Rock type list	*.rxlist*
Scattered data	*.dat*
Scattered data vue	*.dvue*
Screen annotation	*.sann*
Section list	*.seclist*
SEG-Y file	*.segy*
Seismic base map	*.bmap*
Seismic section	*.sec*
Sequence	*.seq*
SGI image	*.rgb*
Shell script	*.sh*
Simulation grid	*.sim*
Subroutine library log	*.log*
Surface annotation	*.ann*
Text file	*.ext*
Time color table	*.tclr*
Transform file	*.trans*
Traverse	*.trv*
Variogram file	*.var*
Variogram model	*.mod*
Vertical fault data	*.vflt*
Volumetric polygon	*.vply*
VRML 1.0	*.wrl*
Vue script	*.script*
Well bore annotation	*.wba*
Well database	*.dwd*
Well dip/dip-azimuth data	*.dip*
Well display	*.wd*
Well fault picks	*.flts*
Well horizon tops	*.tops*
Well list file	*.wlist*
Well lithology	*.lith*

File Type	Suffix
Well logs	*.wlg*
Well paths	*.path*
Well template	*.wtmp*
WorkFlow Manager™ project	*.wfp*
X window dump	*.xwd*
Z color table	*.zclr*
Zone color table	*.znclr*

Suffix	File Type
.2grd	2D grid
.2grpt	2D grid report
.2gvue	2D grid vue
.2vrpt	2D volumetrics report
.3dv	Landmark 3D seismic data
.3grd	3D grid
.3grpt	3D grid report
.3gvue	3D grid vue
.3igrd	3D indicator grid
.3vrpt	3D volumetrics report
.ann	Surface annotation data
.attr	Annotation attributes
.bin	RESCUE model
.bmap	Seismic base map
.cgm	Computer graphics metafile
.dat	Scattered data
.datalist	Fault data prefix list
.dem	Digital elevation model
.dip	Well dip/dip-azimuth data
.dis	Digitizer setup
.dted	Digital terrain elevation data
.dvue	Scattered data vue
.dxf	AutoCAD® DXF™
.evx	EarthVision exchange format
.ext	Text file
.faces	Faces file (sliced)
.fclr	Feature color table
.fltlist	Fault list

Suffix	File Type
.flts	Well fault picks
.fml	Formula
.fxpar	Faces cross-section parameters
.glk	*GeoLink®* GLK-format
.gtf	GRIDGENR
.hpgl	HP® graphic language
.htbl	Horizon table
.html	Hypertext markup language
.imreg	Image registration points
.iplt	Intelligent plot
.itbl	Isochore table
.las	Log ASCII standard
.lbl	Polygon label data
.lgd	Legend annotation
.line	Polygon line data
.lith	Well lithology
.log	Log file of computation
.mlist	Merge list
.mod	Variogram model
.nvflt	Non-vertical fault polygons
.path	Well paths
.pclr	Property color table
.pdat	Property data
.plt	Plot
.ply	Polygon data
.ps	PostScript®
.res	Reservoir parameter file
.rgb	SGI image
.rxlist	Rock type list
.sann	Screen annotation
.script	Vue script
.sec	Seismic section
.seclist	Section list
.segy	SEG-Y file
.seq	Sequence
.set	Program settings
.sh	Shell script
.sim	Simulation grid

Suffix	File Type
.stack	Grid stack
.tclr	Time color table
.tops	Well horizon tops
.trans	Transform file
.trv	Traverse
.unsliced.faces	Faces file (unsliced)
.var	Variogram file
.vflt	Vertical fault data
.vply	Volumetric polygon
.vue	Faces vue
.wba	Well bore annotation
.wd	Well display
.wfp	WorkFlow Manager™ project
.wlg	Well logs
.wlist	Well list file
.wrl	VRML 1.0
.wtmp	Well template
.xwd	X window dump
.zclr	Z color table
.znclr	Zone color table

ASCII File Default Formats

ASCII formatted files must either match the program definition for field location and projection (always Local Rectangular), or contain a header record describing this information. ASCII files can be in free or fixed formats. Fields within free-format files must be separated by blank space or tabs. Fields separated by commas are allowed only in cases where a value exists for each field (e.g., 0, 2, , 1, where the third field is blank, is not supported; however, 0, 2, 1E+20, 1 is supported and is essentially equivalent).

File Type	Default Field Order
Generic polygon	X,Y,ID
Legend annotation	X,Y
Non-vertical fault data	X,Y,ID
Property data	X,Y,Z,P
Scattered data	X,Y,Z
Surface annotation	X,Y
Traverse	X,Y,Traverse #
Vertical fault data	X,Y, Fault #
Volumetric polygon	X,Y

EarthVision Null Value Specification

The EarthVision null value is 1.0E + 20 by default. The value can be specified on a field basis in the header record to any other value. For example, the header record *GR 21 31 -999* would set the null value for the *GR* field to *-999* instead of 1.0E + 20.

File Types and Formats

This section discusses the various types of files used in or created by EarthVision and their required format (data organization).

EarthVision files can be grouped into two main categories:

- Input Data Files. . . . . .are from other sources or created within EarthVision. Scattered data, vertical fault, polygon, and grid files are examples that fit this category.
- Output Data Files . . . . .are created within EarthVision. These include grid files, plot files, faces files and other miscellaneous files.

Input Data Files

The following lists file types that can be input data files from other sources or created within EarthVision:

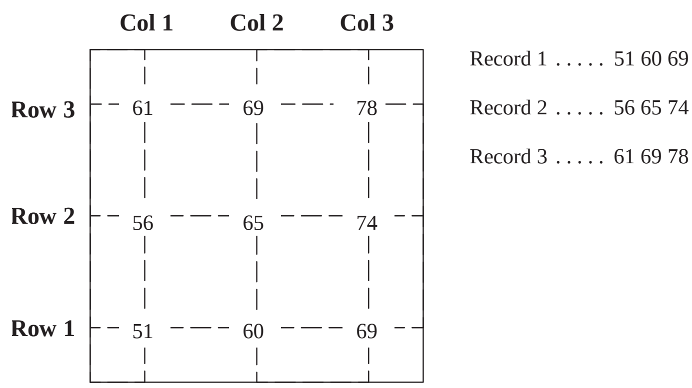
File Type	Suffix
2D Grid Files	*.2grd*
3D Grid Files	*.3grd*
AutoCAD DXF Files	*.dxf*
Color Files	*.zclr*, *.fclr*, *.znclr*, *.pclr*, *.tclr*
Digital Elevation Model Files	*.dem*
Digital Terrain Elevation Data Files	*.dted*
ESRI® ARC/INFO® Coverages	na
LAS Files	*.las*
Legend Annotation Files	*.lgd*
Merge List Files	*.mlist*
Polygon Files: Generic, Volumetrics, Non-vertical Faults	*.ply*, *.vply*, *.nvflt*
Polygon Line and Label Files	*.lbl*, *.line*
Property Data Files	*.pdat*
Scattered Data Files	*.dat*
Screen Annotation Files	*.sann*
Section List Files	*.seclist*
SGI Image Files	*.rgb*
Surface Annotation Files	*.ann*
Traverse Files	*.trv*
Vertical Fault Files	*.vflt*
Vue Script Files	*.script*
Well-Bore Annotation Files	*.wba*
Well Dip/Dip Azimuth Files	*.dip*

File Type	Suffix
Well Fault Pick Files	*.flts*
Well Horizon Tops Files	*.tops*
Well Lithology Files	*.lith*
Well Log Files	*.wlg*
Well Path Files	*.path*

2D Grid Files (.2grd)

2D grid files are written in an EarthVision-specific format. The first record (the header) contains the grid file description, date of creation, number of rows and columns, X and Y pivot locations, X, Y range information, the grid rotation angle in degrees, and the scattered data file and field from which the grid was created. The header also contains names of the associated vertical fault and non-vertical fault polygon files. The records following the header are in binary with each record containing the Z-values at the grid nodes for one row of the grid, ordered left to right. The first of these binary records contains the node values of the bottom row, and each subsequent record contains the next row moving up. The following illustration gives a graphic display of the file organization.

Grid Rows and Columns

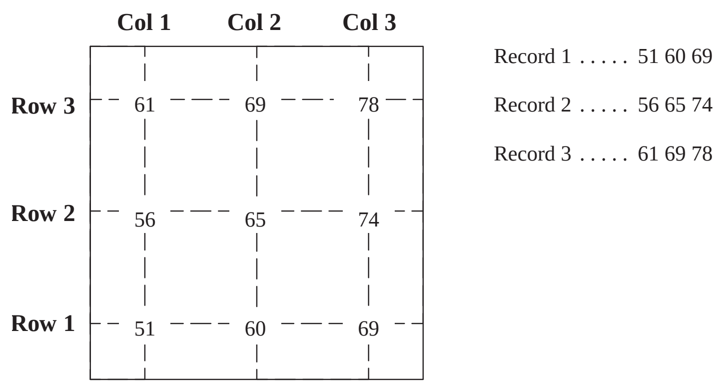


Surface models from sources outside EarthVision are frequently organized in the form of regular grids, but not in the format described above, as is required for use in EarthVision. It is therefore necessary to write a program that reformats the data for EarthVision. Dynamic Graphics provides guidelines for grid reformatting (refer to Appendix H). For information on 2D grid file limits, please refer to Appendix J.

3D Grid Files (.3grd)

A 3D grid file contains an ASCII header followed by binary records. The grid header contains the grid file description, date of creation, number of rows, columns, and levels, the X, Y, and Z pivot locations, the X, Y, and Z ranges, the grid rotation angle in degrees, and the property scattered data file and field from which the grid was created. The header also contains information on the Z and property units, and conformal gridding parameters. The binary records contain the node value (the P-value) at each grid node location. The binary records contain the grid node values in a specific order. For each Z-level, record 1 contains all the grid values from row 1; row 1 begins with the (Xmin,Ymin) grid node value, then continues to the value for (Xmin+1,Ymin) until (Xmax,Ymin) is reached. Record 2 begins with (Xmin,Ymin+1) and continues to (Xmax,Ymin+1). The final record for a level begins with the Xmax,Ymin grid node value and ends with the Xmax,Ymax value. All records for level 1 are stored first, followed by records from level 2, level 3, etc.

Grid Rows and Columns of Level 1



3D grids used in EarthVision must be in the specific format as described above. Grids from sources other than Dynamic Graphics' software may need to be reformatted to be used in EarthVision. To reformat these grids, it is necessary to write a conversion program; Dynamic Graphics provides the necessary subroutines (refer to Appendix H). For information on 3D grid file limits, please refer to Appendix J.

AutoCAD DXF Files (.dxf)

AutoCAD DXF files are imported by EarthVision as annotation or data files. Annotation files can be used in 2D and 3D displays, and data files can be used for creating 2D grids. Since the AutoCAD drawing database is written in a very compact format that changes significantly from time to time as new features are added, Autodesk does not recommend that the drawing database file be read or written directly. To assist in interchanging drawings between AutoCAD and other programs, a "Drawing Interchange" file format (DXF) has been defined by Autodesk. All implementations of AutoCAD accept this format and are able to convert it to and from their internal drawing file representation. Refer to *AutoCAD DXF Import* (page UTIL-50) for more information.

Color Files (.zclr, .fclr, .pclr, .tclr, .znclr)

Z color files store information for defining pen numbers 9–72 (colors 1–8 are hard coded; refer to Appendix C). These definitions can be used to accommodate the wider range of colors supported by graphics terminals and plotting devices, such as color electrostatic, ink-jet, and thermal plotters. Color files for features (*.fclr*), time (*.tclr*), zones (*.znclr*), and properties (*.pclr*) are discussed in the *3D Viewer* document.

The file is ASCII formatted and can be created or modified in any text editor outside EarthVision, or may be graphically created or edited using the Color Table Editor program.

Each record in a color file has five fields containing the following information:

- The color index or level (9–72).
- Three values (0–255) representing the proportions of red, green, and blue (RGB) that define each color. Regardless of the color system used to define a color, the values associated with that color are always translated into RGB.
- A user-chosen color code. Some hardcopy devices reference their own proprietary color table instead of using RGB values to define colors. The color code fields could contain these “device-dependent” color indices. A value of –1 in this field is a dummy value indicating no valid value has been assigned.

A default color file is automatically loaded when starting EarthVision. (Refer to Appendix C for a table of the default colors.) These default colors can be overridden by loading a custom color file from any color palette. Custom color files support up to 256 colors.

The following is an example of a portion of a color file:

```
9       53      3       77      -1
10      81      3       117     -1
11      107     3       157     -1
12      127     3       185     -1
13      151     5       221     -1
14      163     7       238     -1
15      173     7       253     -1
.       .       .       .       .
.       .       .       .       .
.       .       .       .       .
67      249     47      1       -1
68      253     1       1       -1
69      233     1       1       -1
70      213     1       1       -1
71      193     1       1       -1
72      173     1       1       -1
```

Digital Elevation Model Files (.dem)

A digital elevation model (DEM) is one of several types of digital cartographic data distributed by the United States Geological Survey (USGS). A DEM consists of a sampled array of elevations for ground positions at regularly spaced intervals. Two different coverages of DEMs are available: 7.5 minute and 1 degree. Both coverages come in a standard (binary) or optional (ASCII) format. EarthVision supports only the optional format; a DEM import funnel reads an optional-format DEM and imports it as a 2D grid (refer to *Digital Elevation Model Import*, page UTIL-45, for more information).

Digital Terrain Elevation Data Files (.dted)

Digital terrain elevation data (DTED) is a product of the U.S. Defense Mapping Agency. A DTED consists of a rectangular array of elevation values at specific increments of longitude and latitude. DTEDs come in two different resolution models: Level 1 (approximately 100 meter resolution) and Level 2 (approximately 30 meter resolution). Only Level 1 DTEDs are supported in EarthVision.

Level 1 DTEDs are bounded by constant longitude and latitude coordinates, providing a 1 degree by 1 degree quadrangle coverage. The data locations are in longitude, latitude (decimal seconds) coordinates based on the World Geographic System 1972 Datum.

Elevation values are in meters relative to mean sea level. The data are stored as profiles ordered east to west, with an elevation sample spacing of 3 arc-seconds along and between each profile. Each DTED contains 1201 profiles with 1201 elevations per profile. A DTED import funnel reads a Level 1 DTED and imports it as a 2D grid (refer to *Digital Terrain Elevation Data Import*, page UTIL-48, for more information).

ESRI ARC/INFO Coverage Files

The ARC/INFO product from ESRI (Environmental Systems Research Institute, Redlands, California) stores and manipulates spatial data while using relational database software to store and retrieve attributes associated with the spatial data. Each project is typically contained in a single workspace, which contains coverages. For example, a selected workspace for a particular city may contain coverages for streets, buildings, property boundaries, street light locations, tree locations, powerpole locations, and so on.

The points, lines, and/or polygons in the ARC/INFO coverages are imported into Earth-Vision as either an annotation (*.ann*) file, polygon (*.ply*) file, or scattered data (*.dat*) file. Numerous options exist for import with regards to colors, labels, symbol types, symbol sizes, line types, line widths, pattern types, pattern factors, etc. The ARC/INFO funnel is discussed under *ARC/INFO Coverages Import*, page UTIL-43.

Label Annotation Files (.labels)

The Well Display File Editing program uses label annotation files to allow the placement of labels perpendicular to the well path at the specified measured depth values. The Well Display File Editing program is accessed via *Visualization –> Well Display*; for more information, please refer to the Well Display document (page WD-8).

```
# Type: scattered data
# Version: 6
# Description: Created with formula processor (mike, 05 Nov
2001)
# Format: free
# Field: 1 md meters
# Field: 2 wellid non-numeric
# Field: 3 borelabel non-numeric
# Projection: Universal Transverse Mercator
# Zone: 15
# Units: meters
# Ellipsoid: Clarke 1866/NAD27
# End:
0       side1   0
100     side1   100
200     side1   200
300     side1   300
400     side1   400
500     side1   500
600     side1   600
700     side1   700
800     side1   800
900     side1   900
```

Legend Annotation Files (.lgd)

Legend commands allow placement of map legend information via an editable file (map legend information can also be added interactively in the Graphic Editor, although it does not create a *.lgd* file). All legend entries are made within a previously defined legend box, which is attached to a legend frame. Existing plot files can be drawn in legend boxes for the creation of montages. Legend annotation files can include attribute sets (a grouping of parameters) or plot setting commands (SETxxx) as well as the following annotation commands. In addition, legend commands can take variables that allow the information to change based on current calculation. Refer to Appendix B for more information on the legend commands and legend text variables.

LGDBOX. . . . . defines a legend box position relative to LGDFRM

LGDCFC . . . . draws a color-filled contour key

LGDFRM. . . . . defines a legend frame (references map neatline)

LGDHDL. . . . . defines a horizontal divider line across a legend box

LGDLNE . . . . draws a line key (line type with explanatory text)

LGDMRG . . . . defines left and right margins in a legend box

LGDNOR. . . . . draws an annotated north arrow

LGDPAT . . . . draws a pattern key (shading pattern or solid color-fill with explanatory text)

LGDSCB . . . . draws an annotated scale bar

LGDSYM . . . . draws a symbol key (symbol type with explanatory text)

LGDTXT . . . . draws 1–5 lines of horizontal text

LGDZFL . . . . places a plot into a legend box (“zoom” file)

Log ASCII Standard (LAS) Files (.las)

Log ASCII Standard (LAS) files were developed by Canadian Well Logging Society (CWLS) and are commonly used for reading and displaying well log data. LAS files, up to version 2, can be used as input to EarthVision through the Well Display File Editing program; refer to the internet address *www.cwls.org* for more information about the organization and the file format standards. LAS files can only contain logs for one well; however, the Well Display File Editing module allows multiple LAS files of the same type to be displayed. For a discussion on Well Display, please refer to the *Well Display* document (page WD-8). EarthVision requires a file header on all LAS files. A sample LAS file is shown below.

```
~VERSION INFORMATION
 VERS.                 2.0:   CWLS LOG ASCII STANDARD - VERSION 2.0
 WRAP.                  NO:   ONE LINE PER DEPTH STEP
~WELL INFORMATION BLOCK
#MNEM.UNIT        DATA              DESCRIPTION OF MNEMONIC
#---------    -------------         ------------------------
 STRT.M         1670.0000:    START DEPTH
 STOP.M         1660.0000:    STOP DEPTH
 STEP.M           -0.1250:    STEP VALUE
 NULL.          -999.2500:    NULL VALUE
 COMP.     EXAMPLE OIL AND GAS COMPANY LTD.     :COMPANY NAME
 WELL.     ANY ET AL OIL WELL #12               :WELL NAME
 FLD .     WILDCAT                              :FIELD NAME
 LOC .     XX DEGREES N,YYY DEGREES W           :LOCATION
```



```
 PROV.     N.W.T.                              :PROVINCE
 SRVC.     ANY LOGGING COMPANY LTD.            :SERVICE COMPANY NAME
 DATE.     01-FEB-1988                         :DATE
 UWI .     400XXXXXXXXXXXXX                    :UNIQUE WELL IDENTIFIER
~CURVE INFORMATION
#MNEM.UNIT      API CODE      CURVE DESCRIPTION
#---------    -------------   -----------------------------
 DEPT.M                      :  1  DEPTH
 DT  .US/M                   :  2  SONIC TRANSIT TIME
 RHOB.K/M3                   :  3  BULK DENSITY
 NPHI.V/V                    :  4   NEUTRON POROSITY
 SFLU.OHMM                   :  5  RXO RESISTIVITY
 SFLA.OHMM                   :  6  SHALLOW RESISTIVITY
 ILM .OHMM                   :  7  MEDIUM RESISTIVITY
 ILD .OHMM                   :  8  DEEP RESISTIVITY
 SP  .OHMM                   :  9  SPONTANEOUS POTENTIAL
 GR  .GAPI                   : 10  GAMMA RAY
 CALI.MM                     : 11  CALIPER
 DRHO.K/M3                   : 12  DENSITY CORRECTION
~PARAMETER INFORMATION
#MNEM.UNIT        VALUE       DESCRIPTION OF MNEMONIC
#---------    -------------   -----------------------------
 BHT .DEGC         35.5000:   BOTTOM HOLE TEMPERATURE
 BS  .MM          200.0000:   BIT SIZE
 FD  .K/M3       1000.0000:   FLUID DENSITY
 MATR.           SANDSTONE:   NEUTRON MATRIX
 MDEN.              2650.0:   LOGGING MATRIX DENSITY
 RMF .OHMM          0.2160:   MUD FILTRATE RESISTIVITY
 DFD .K/M3       1525.0000:   DRILL FLUID DENSITY
~OTHER INFORMATION SECTION
```

This is an example LAS version 2.0 file.

```
~A  DEPTH      DT         RHOB       NPHI       SFLU       SFLA
ILM        ILD        SP         GR         CALI       DRHO
1670.0000   406.0000  2334.7658     0.3948     2.5262     2.5262
2.4769         2.0758    -0.5005    78.1250   328.9724     5.9473
1669.8750   406.0000  2329.4088     0.3892     2.5262     2.5262
2.4769         2.0742    -0.0930    78.1250   336.1309     6.4924
1669.7500   406.0000  2319.4548     0.3839     2.5262     2.5262
2.4769         2.0752    -0.0005    78.1250   329.6516     6.7535
1669.6250   406.0000  2314.5724     0.3918     2.5262     2.5262
2.4769         2.0783     0.2272    78.1250   322.2677     8.9939
1669.5000   406.0000  2315.0783     0.4009     2.5262     2.5262
2.4769         2.0810     0.4995    78.1250   319.6201    11.0514
1669.3750   406.0000  2316.9758     0.3927     2.5262     2.5262
2.4754         2.0811     0.4516    78.1250   321.2740     9.7426
1669.2500   406.0000  2325.6233     0.3957     2.5262     2.5262
2.4625         2.0848     0.0415    78.1250   321.4790    10.3931
1669.1250   406.0000  2329.7305     0.3911     2.5262     2.5262
2.4744         2.0917    -0.3686    78.1250   319.6594    11.3626
1660.6250   406.0000  2286.9143     0.4004     2.3512     2.3512
2.2994         2.1834    -2.7572    73.6499   334.9039     9.9517
1660.5000   406.0000  2289.2898     0.4021     2.3333     2.3333
2.3551         2.1888    -3.0020    65.8799   338.1516    13.2247
1660.3750   406.0000  2301.3688     0.4043     2.3549     2.3549
2.3764         2.1954    -3.0020    55.8120   342.7169    19.5346
```

Merge List Files (.mlist)

Merge list files can be used as input to the Faces File Merging *(ev_merge)* program. A merge list file is an ASCII file that lists a series of faces files to be merged (the faces files *must* be sliced faces files; for more information refer to the *Faces File Generation and Merging* document). An existing merge list file can be specified instead of entering each faces file to be merged. A merge list file consists of three fields: first, the faces file name, second, the zone number of each faces file, and third, a field containing the object (used as the fault block in the 3D Viewer) number, by default the value “1.” These fields can be separated by tabs or spaces. An example is shown below:

```
t_layer1.faces    1     1
t_layer2.faces    2     1
t_layer3.faces    3     1
t_layer4.faces    4     1
t_layer5.faces    5     1
```

The faces files are merged in the order given in the list file, so they should be ordered such that the faces file with the lowest Z-values is first in the list. Each faces file is assigned the zone number specified in the second field of the same line. It is highly recommended that the top faces file in the list be assigned zone number “1” and so on.

Merge list files have a limit of 500 faces files representing a total of 64 zones and 178 blocks.

When merging a previously merged faces file with a new zone, a zero or blank zone number (specified as a set of double quotes (“”)) can be used to preserve the zone numbers in the merged faces file. For example, if the previous merge list was used to create a five zone model named *merge.faces* and the user now wishes to merge a faces file of a sixth zone with *merge.faces,* the merge list file would be as follows:

```
merge.faces       ""          1
layer6.faces      6           1
```

The double quotes after *merge.faces* preserves the zone numbers 1–5 and adds *layer6.faces* as a sixth zone.

Polygon Files: Generic (.ply), Volumetrics (.vply), Non-vertical Faults (.nvflt)

Polygon data files contain boundary coordinates and descriptive information regarding polygons that can be used for volumetrics calculations (*.vply*), as non-vertical faults (*.nvflt*), for 2D grid operations where grid nodes inside or outside polygons can be set to specified values, for limiting the 3D gridding region, and for limiting the faces file region (*.ply*). These files are stored in ASCII format.

The format of the polygon file is the same for any of these uses, although the file type (suffix or header description) is different. The same file could be used for each purpose, although reasons for doing that are not often encountered.

The first record of any polygon must begin with the word “POLYGON.” The “POLYGON” entry indicates that a new polygon definition is beginning. This can be followed by a space, a character string in double quotes, a space, another character string in double quotes, a space, and a number.

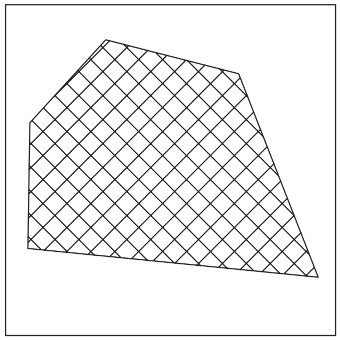
```
POLYGON "Leaseblock" "Jones Ranch" 1.35
```

The first text string in double quotes is a polygon identifier or polygon ID. The second text string in double quotes is the “class” of the polygon, and the final number is the yield factor.

The polygon ID, its class, and the yield factor are relevant only to volumetrics calculation. The polygon ID is useful in editing tasks, but only the word “POLYGON” need be present when the file is not being used for volumetrics.

Following the polygon header record are the pairs of X,Y coordinates that define the polygon boundary. Although polygons created in the Graphic Editor automatically have the last point the same as the first, it is not required; EarthVision automatically closes polygons. The following example shows a simple polygon and the polygon file which describes it.

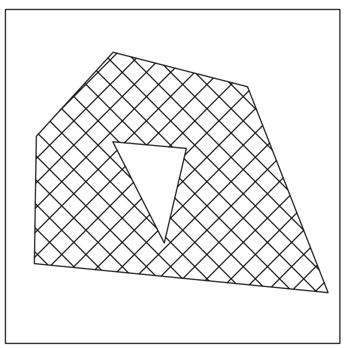
Polygon



```
POLYGON    " "   " "
41101.66   33073.17
24999.42   37171.17
15809.96   27153.84
 15561.6   11962.26
50746.45   8485.174
41101.66   33073.17
```

Polygons can have "holes." These are areas completely inside a polygon that are not part of the polygon. In the polygon file, holes are described after the coordinates for the outer boundary are complete. After the last point of the outer boundary, there must be a null value, 1.E+20, in the X field and Y field of the next record. This null value is called a hole delimiter and indicates that coordinates for a hole follow. A polygon may have numerous holes, each preceded in the file by the delimiter. The following example has a hole added to the previous polygon.

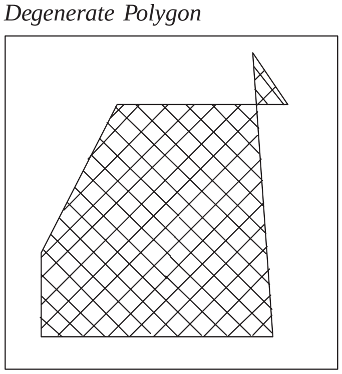
Polygon with Hole



```
 POLYGON  " "   " "
41101.66  33073.17
24999.42  37171.17
15809.96  27153.84
 15561.6  11962.26
50746.45  8485.174
41101.66  33073.17
    1E20      1E20
24958.02  26491.54
33774.93  25705.05
31125.72  14404.51
24958.02  26491.54
```

A brief warning is appropriate regarding "degenerate" polygons. EarthVision can behave unpredictably when the boundary of a polygon crosses itself. If there are problems with processes using polygons, check the polygons for occurrences similar to the next example

Degenerate Polygon



```
 POLYGON  " "   " "
812.7454  737.1706
 319.382  737.1706
99.59711  303.8774
99.59711  58.39393
769.7106  58.39393
711.3063  888.0098
812.7454  737.1706
```

A polygon file, in general, can contain an unlimited number of polygons. In addition, there is no fixed limit to the number of holes a polygon may have. When a polygon is used as a non-vertical fault file in 2D gridding, it may contain no more than 10,000 segments (20,000 coordinate pairs) and a single polygon may not exceed 5,000 coordinate pairs. This is a combined limit (vertical fault line segments plus non-vertical fault polygon segments). In addition, a SRFPLY command in an annotation file cannot contain more than 20,000 vertices.

Polygon Data Files (.lbl, .line)

Polygon Line Data Files (.line)

The input line data file contains the X, Y, line, and number data columns for each line that is to be used in polygon formation. The file name extension must be either *.line*, *.vflt*, or *.trv* to qualify it as a permissable line data file type.

Polygon Label Data Files (.lbl)

The input label data contains the X, and Y label data columns for each label that is to be applied during polygon formation. The X, Y coordinate given for a label can be for any location interior to the corresponding polygon but should be preferably be near the polygon center. The file name extension of the label data file must be either *.dat* or *.lbl*.

Property Data Files (.pdat)

Property data files are the primary input to the 3D gridding process. The file must contain at least four fields of information: X-coordinates, Y-coordinates, Z-coordinates, and P-values. X, Y, and Z typically define the spatial point location. Additional P-value fields or other information can also be identified in the header record. The files have a supported limit of a maximum of 2,000,000 valid entries in any P-field (limits are fully discussed in Appendix J).

In addition to X, Y, and Z, the names “wellid” or “lineid” are special fields for line identifiers. Points with a common line ID number/letter can be connected by a line when displayed as a binary scattered data file in the *3D Viewer* program.

A number of other special field names in scattered data files are recognized by the *3D Viewer* program when ASCII scattered data files are displayed. Refer to the *3D Viewer* document, Chapter 2, *3D Viewer File Types*, for more details.

An example of a property scattered data file is shown below.

X	Y	P	WELLID	Z
-1165.0	743	0.95	2001	-20.0
-1165.0	763	4.65	2002	-20.0
-1165.0	763	0.33	2002	-80.0
-1140.0	743		2003	-20.0
-1140.0	743	0.06	2003	-80.0
-1165.0	718	0.13	2004	-20.0
-1200.0	743	0.13	2005	-20.0
-1200.0	743	0.09	2005	-140.0
-1200.0	743	0.33	2005	-200.0
-1175.0	600	0.14	2006	-140.0
-1175.0	600	1.0E+20	2006	-200.0
-1175.0	625	0.09	2007	-140.0

X	Y	P	WELLID	Z
-1175.0	625	0.05	2007	-200.0
-1148.0	600	0.03	2008	-80.0
-1148.0	600	0.06	2008	-140.0
-1148.0	600	0.06	2008	-200.0
-1175.0	575	0.14	2009	-140.0
-1200.0	600	0.09	2010	-140.0

If a record contains any alpha characters, internal blanks (such as "1.53 82" instead of "1.5382"), or blank fields, that record is considered invalid, is not used for gridding, and is excluded from the binary scattered data file. A record that contains the EarthVision null value of 1.0E+20 is considered a valid record but not a valid point. It is not used in gridding but is included in the binary scattered data file.

Data records that have a number other than 1.0E+20 to indicate absence of data are treated as valid points. Those special numbers should be replaced with the null value, 1.0E+20.

Rock Type List File

The *Rock Type List File* is an optional ASCII file containing a listing of all the available zone names followed by the rock type for each. If specified, the output file will contain a Rock_Type field in which the names of the rock type will be inserted for each point along the well path. Zone and rock type names containing embedded blanks must be surrounded by double quotes.

Scattered Data Files (.dat)

Scattered data files contain data in the form: X, Y, Z1...Zn. The data can consist of randomly distributed points, line data, or data on regular centers. These data are the primary input to the 2D gridding (surface modeling) process.

Scattered data files are stored in ASCII format. The files can have a supported maximum of valid 2,000,000 records (lines) and 8192 characters per record; refer to Appendix J for more information on limits. The minimum number of fields is three: one containing X coordinates, one containing Y coordinates, and one containing Z coordinates. Additional fields can contain other Z-values representing different surfaces, their characteristics, or identification information regarding the X,Y location.

Field Names	X	Y	ID	Shale	Sand
Scattered Data Records	32000	87015	101	-7935	-8185
	38600	87030	103	-8067	-8120
	44000	86400	105	-7990	
	48200	87060	106	-8050	-8060
	30650	82200	107	-7965	-8050
	35030	80970	108	-7947	
	39476	80970	109	-7947	-7975
Field Positions	Field 1	Field 2	Field 3	Field 4	Field 5

The fields (including X and Y) may be in any order. As in the example above, blank fields indicate absence of data for that field. If a special number is used to indicate an absence of data, those numbers are treated as valid data points by EarthVision. The exception to this is the EarthVision null value (1.0E+20) which is always treated as an invalid number. If a file contains a special value that is to be ignored, 1.0E+20 should be substituted for that value before the file is used in EarthVision.

The following formats are supported for scientific notation: 1.8e12, 1.8E12, 1.8E-12, and 1.8E+12.

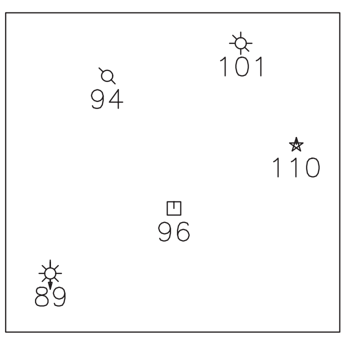
If any record has non-numeric characters in the X or Y fields, the record is ignored in processing, but does not cause a processing failure. If non-numeric characters occur in a Z-field that is identified as numeric, the characters are also ignored in processing, but are displayed when posting or editing that field of the scattered data file. Informational comment lines, such as the field names and a description, can be included in the data file and are automatically ignored in processing.

Special Fields in Scattered Data Files

If, at the time of creating the file header, the user assigns the following names to appropriate fields in a scattered data file, additional automatic data posting capabilities can be used.

- If a field is named “X” or “Y,” the field value is interpreted as the X-coordinate or Y-coordinate, respectively, locating the data point. The X and Y units are labeled “(special)” and are related to the coordinate system for the file (e.g., State Plane units are feet). Each file must have an X and Y field in order to be used in many of the EarthVision operations. If desired, other field names can be specified with the X or Y designated in parentheses and the entire string in double quotes, e.g., “Northing (Y)”.
- If a field is named “Z,” the field value is interpreted as a Z-value (e.g., elevation, depth, temperature) at the X,Y location of the data point. The Z-field is the gridded field in 2D normal minimum tension gridding. Note: Z can increase upward or downward depending on whether the project is in elevation or depth. By default, Z values increase upward (elevation). Depth fields *must* be specified as downward when creating the header; refer to *Units of Measure* (page FL-56) for more information. Any numeric field other than a special field can be used as a Z-field for gridding or many other processes.
- If a field is named “Symbol,” each record for that field is read when posting the data point. The number in that field is an index to the symbol that is plotted at the X,Y location of the record. Refer to the symbol table in Appendix C for indices and their corresponding symbols.

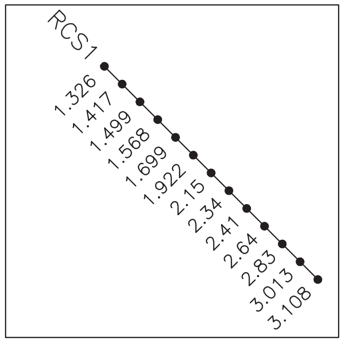
Symbol Field Posted



X	Y	Symbol	Z
1	2	33	89
3	8	16	94
5	4	6	96
7	9	19	101
9	6	32	110

- If the scattered data are organized in the form of points along lines, and a line identifier is available for each record, the user can assign the name “Lineid” to that field. A line is drawn between all points having the same line ID. The “Lineid” field is posted at one end or the other of the line (depending on space), and the user can specify Nth (e.g., every 1st, 2nd, 5th, Nth) for posting Z-values.

Line ID Posted



X	Y	LineID	Z	Symbol
2.5	11	RCS1	1.326	11
1	10.5	.	1.417	11
1.5	10	.	1.499	11
2	9.5	.	1.568	11
2.5	9	.	1.699	11
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
6.5	2.1	RCS1	2.0	11

- If the file has a "Lineid" field and each record in the file also has a point identifier, the point identifier field can be named "Datpt" or "Shotpt." Doing so allows the user to specify Nth data point identifier when automated line posting is used. The Nth values chosen for the Z-values and the point identifiers need not be the same.
- If a file has a "wellid" field, points with the same ID are considered connected. They are displayed in the 3D Viewer along lines.
- Additional special fields (e.g. "radius," "linecol," "symcolor," "symsize," and "symtrans") are recognized by the 3D Viewer only. For a discussion of these special fields, please refer to the *3D Viewer* document, chapter 2, *3D Viewer File Types.*
- The special field name *fathoms* must always be specified as *downwards* in the Z direction.
- The special field name *borelabel* is recognized by the Well Panel Display program. It is used as the default field for labeling path data. The labels are positioned perpendicular to the well path. In addition, any field in a *.dat* file can be posted as long as the field is enclosed in braces < >.
- Scattered data files used as *tops* or *horizon* data files are not required to have the *measured depth* field if the data file contains a *Z* field, such as TVDSS<2>. For a discussion of the special field used for display well data, please refer to *Well Panel Display* in the *Well Display* document (page WD-1).

Screen Annotation Files (.sann)

Screen annotation files contain keywords and parameters (similar in setup to vue files (refer to FL-51)) for displaying annotation on EarthVision's 3D Viewer background. The types of screen annotation include text, rectangles (filled or empty), circles (filled or empty), and lines. The color, position, line type, font, and size are all user-specified. This file must be created in a system editor, but can be modified and saved in the 3D Viewer. Refer to the *3D Viewer* document (page 3DV 2-20) for more information on screen annotation files.

The following is an example of a screen annotation file:

```
rgbcolor       190 190 0
rectanglefill  95 35 295 135

rgbcolor       190 0 190
rectanglefill  112 51 312 151

rgbcolor       250 250 250
circlefill     354 101 70

rgbcolor       190 0 190
circle         359 103 50

rgbcolor       190 0 190
linewidth      2
line           804 679 937 843

rgbcolor       190 0 190
linewidth      2
line           937 843 1031 843

rgbcolor       250 250 250
txtxcenter     0
txtpos         940 855
txtfont        Helvetica-Bold
txtpntsize     14
txtstr         ”Railway Station”

rgbcolor       0 0 0
txtpos         100 100
txtstr         ”Rails Unlimited”
```

Section List Files (.seclist)

A section list file, which is used in the Seismic Line Merge program, contains a listing of the shotpoint base map file and the seismic section files that are to be merged together. The file can be created and/or edited in the Seismic Line Merge program; refer to the *Seismic Utilities* document for more information. A sample section list file is shown below.

```
dgbas.bmap
dg1226.sec
dg1233.sec
dg1230.sec
dg1224.sec
dg1223.sec
dg1228.sec
dg1225.sec
dg1221.sec
```

SEG-Y Files (.segy)

SEG-Y files are in the *Society of Exploration Geophysicists* Y-format. SEG-Y files can be imported to EarthVision using the SEG-Y Data Import program accessed via *Utilities –> Data Import*. Many different types of SEG-Y formats exist; therefore, the SEGY Data Import program can be customized (for an extra cost) to read a particular format, if necessary. For a discussion of the utility, please refer to the *Utilities* document (page UTIL-33).

Seismic Base Map and Section Files (.bmap and .sec)

Most seismic base maps and section files are created in the Graphic Editor; however, they can be imported from Dynamic Graphics’ Seismic Line Program (SLP, a precursor to EarthVision). For a discussion of importing these files, please refer to the *Seismic Utilities* document. For a discussion of the seismic base map and section file formats, please refer to these sections later in this document, starting on FL-47.

SGI Image Files (.rgb)

Silicon Graphics® (SGI) image file format is a raster file that contains color information for every pixel in the image, as opposed to a vector file, which stores information only on the geometry of the image. Red, green, and blue color values, ranging from 0 to 255, are stored for each pixel.

Scanned images, which can be draped on a surface of a faces file in the 3D Viewer program, must be in the SGI image file format. Pixels on the image are interactively picked and correlated to data scale (i.e., real world) coordinates. The image file can then be accurately positioned with respect to the surface on which it is draped.

Surface Annotation Files (.ann)

Annotation files contain annotation keywords, parameters, and X,Y coordinates to draw points, lines, polygons, and text on any 2D or 3D displays. There is no limit to the number of annotation commands contained in an annotation file. Annotation files are discussed fully in Appendix B, *Annotation*.

Surface Annotation Formats

Two formats are supported for surface annotation: attribute-style annotation and ISM™-style annotation (ISM is Interactive Surface Modeling™, a predecessor to EarthVision). The main difference between the two is the method for specifying the annotation parameters (e.g., font, symbol type, color, etc.). Attribute-style annotation uses “attribute sets” (a grouping of parameters) to define annotation attributes. In this way, one (or more) sets can be defined and then reused throughout the file without having to be redefined (refer to Appendix B for more information on attribute sets). On the other hand, ISM-style annotation, which is command-driven, includes a variety of SETxxx commands and SRFxxx commands and parameters to set the annotation attributes, each having to be restated in the file whenever a change is necessary.

Surface (SRFxxx) Commands

Surface commands (keywords) annotate the gridded surface as drawn in two-dimensional maps or in three-dimensional perspectives, utilizing data scale coordinates. SRFxxx commands can be entered or edited in an external editor (e.g., vi), or in the EarthVision Graphic Editor.

SRFGEL. . . . . draws longitude/latitude labels and tick marks on any side of map neat line

SRFLLG. . . . . draws longitude/latitude graticule in map area

SRFLLL . . . . draws longitude/latitude labels and tick marks at all four sides of map neat line

SRFLNE. . . . . draws line(s) on a surface (9 types)

SRFPLY . . . . draws polygon(s) on a surface (patterns, and text label)

SRFPST . . . . draws a symbol (72 types) and up to five lines of text directly below the symbol

SRFSYM . . . . draws symbol(s) (72 types, plus user-defined symbols) and one line of text with text rotation

SRFTXT. . . . . draws text on a surface (6 fonts)

LABEL .... label for a line, symbol, or polygon drawn using SRFLNE, SRFSYM, and SRFPLY commands, respectively

GROUP .... specifies the beginning of a group of objects that are treated as one entity

ENDGRP........... specifies the end of a group of objects

VERSION .... specifies the version number of the annotation command set

Plot Setting (SETxxx) Commands

Plot setting commands control pen usage, and text font and size that remain in effect until changed. They may occur anywhere within an annotation file. SETxxx commands can be entered or edited in a system editor, (e.g., vi) or in the EarthVision Graphic Editor.

SETATR............ specifies the attribute set to be used

SETCHR .... sets the character and symbol heights (equates size 1–6 to plot measurement units)

SETPBD .... sets the line type for SRFPLY and LGDPAT boundaries

SETPEN............ sets pen numbers (1–72) for light lines, bold lines, and text

SETTXT .... sets text attributes (font, size, line spacing, weight)

SETWID .... sets the line width for annotation lines

Parameters

Parameters, which occur on the annotation command line along with the keyword, provide specific information about how a keyword is to be implemented (e.g., SETPEN 1, 2, 1*)*. Following the keyword SETPEN are three values which assign pen numbers to be used for light lines, bold lines, and text. The parameters are described fully in Appendix B, *Annotation*.

X,Y, Coordinates

X,Y coordinates locate the annotation feature being drawn. If the coordinates follow a point plotting command then the point is posted at each location according to the command parameters. When X,Y or X, Y, Z entries follow a line plotting command (i.e., SRFLNE), they define a single line composed of line segments connecting the points. When a polygon command is given, the coordinates define the polygon boundary.

Unlike the annotation keywords and parameters, which are not placed in user defined fields, the location of the X and Y fields in the record either match the defaults or must be identified in an annotation file header.

Annotation files are stored in ASCII format, and can be edited and created inside or outside of EarthVision.

The following is an example of an attribute-style annotation file:


```
#  Version_of_Attributes: 6
#  Plotting_Units: inches
#  Attributes: ”Text 22”
#  type: text
#  kind: line
#  color: 3
#  visibility: yes
#  Attributes: ”Line 1”
#  type: line
#  color: 3
#  width: 0.03
#  pattern: 2
#  End_Attributes:
setatr ”Line 1”
group
srflne
   -7265.132   -2666.541
   -7263.038   -2827.749
   -7551.956       -2811
   -7604.296   -2951.271
   -7865.997   -3011.986
   -7997.894   -2850.778
setatr ”Text 22”
label 0
 ”DGI-101”
endgrp
```

Traverse Files (.trv)

Traverse data files contain X,Y coordinates defining the line along which a cross section or fence diagram is calculated. Traverse coordinates can be picked graphically, or entered from the keyboard.

Traverse files are stored in ASCII format and must contain three fields of information: X,Y coordinates and the traverse number. A change in the traverse number indicates the start of a new traverse. Cross sections can use only one traverse containing any number of points, using the first traverse in a file. Fence displays can use any number of traverses and data points.

Traverse files may also contain a label field. The label field can be used by the WorkFlow Manager or the Cross Section programs to label the crease lines displayed along a cross section. The label field must be identified as a non-numeric field in the file header.

The following is an example of a traverse file:

```
34171.43      74228.57      1      Well 1
37542.86      74590.48      1      Well 5
46095.24      80514.29      1      Well 6
44247.62      84571.44      2      Well 8
32533.33      75371.43      2      Well 11
32419.05      76457.14      3      Well 22
36095.24      85352.38      3      Well 31
44914.29      84990.48      3      Well 45
```

Vertical Fault Files (.vflt)

Vertical fault files are stored in ASCII format and contain fault data in one of two forms:

- X, Y, Fltnum
- X1, Y1, X2, Y2

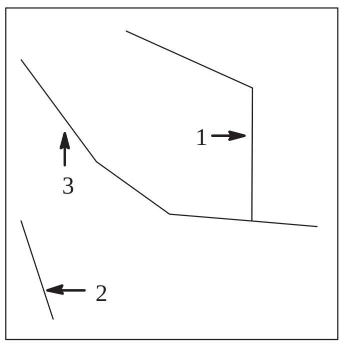
The X,Y, Fltnum format is the default if no header is added to the file.

This information defines fault line segments used in the gridding process to delineate a slope and elevation discontinuity in the surface at the fault line. Once the grid is calculated, the first few records of the grid file (the grid file header) contain the name of the associated vertical fault file. The fault file is later used to properly display the gridded surface in plots and to calculate volumes.

A fault segment is defined by two X,Y coordinate pairs. Up to 10,000 fault segments (i.e., up to 20,000 coordinate pairs) can be used in gridding (this is a combined total for both vertical and non-vertical faults).

The following is an example of the X,Y,Fltnum format:

Vertical Faults




```
26888.57    40192.93    1
42461.51    33167.14    1
42398.49    16728.30    1
17857.22     4573.95    2
13890.17    16728.30    2
13901.66    36633.05    3
23193.83    24049.29    3
32231.42    17550.45    3
42372.19    16722.57    3
50433.89    16018.87    3
```

The change in Fltnum indicates a break in a series of connected fault line segments. The illustration above shows the faults represented by this data.

The same file is shown in X1,Y1,X2,Y2 format below:

```
26888.57    40192.93    42461.51    33167.14
42461.51    33167.14    42398.49    16728.30
17857.22     4573.95    13890.17    16728.30
13901.66    36633.05    23193.83    24049.29
23193.83    24049.29    32231.42    17550.45
32231.42    17550.45    42372.19    16722.57
42372.19    16722.57    50433.89    16018.87
```

In this format, each record contains an X,Y coordinate pair representing the endpoints of a fault segment. When two line segments are on the same fault, the second endpoint of the first line segment has the same X,Y coordinate as the first endpoint of the next line segment. This file is functionally identical to the previous example.

VRML 1.0 Files (.wrl)

Nearly anything that can be displayed in the 3D Viewer can be saved as a World Wide Web-viewable file in VRML 1.0 (Virtual Reality Markup Language, version 1.0) format. The WebSpace™ Netscape™ plug-in from Silicon Graphics®, for example, displays a VRML 1.0 file. Sliced and chair-cut faces files, 2D and 3D grids, scattered data, and surface annotation are all examples of models that can be saved to the VRML 1.0 output. Scattered data points are saved as cubes, with lines or well tubes included, if they are displayed. The 3D Viewer's wire frame is saved, without tick marks or scale values. Screen annotation, the 3D cursor, the color key, and the outlines of the faults, zones, and properties cannot be saved, however.

Saved from the Capture Data menu, if the `gunzip` utility is found in the user's path, the file is saved with the *.wrl.gz* extension, since it is a more compact way to store VRML files. If the `gunzip` utility is not found in the user's path, the file is saved with the *.wrl* extension.

Vue Script Files (.script)

Vue script files are used to sequence through a series of faces files, 2D grids, and/or ASCII scattered data files. Each script file can contain any number of vue files, thereby creating, essentially, a movie of views, or a script. Script files are ASCII files containing keywords and parameters (refer to the *3D Viewer* document, page 3DV 2-14, for more information on vue script files).

The following is an example of a vue script file:

```
scriptcycle     0
facesfile       intvel1.faces
vuefile         intervel1.vue
vuefile         intervel2.vue
vuefile         intervel3.vue
vuefile         intervel4.vue
vuefile         intervel6.vue
vuefile         intervel7a.vue
vuefile         intervel8.vue
autoscreendump  1
scatfile        silca.dat
zfield          silca
vuefile         silca1.dvue
screendumpfile  silca1.rgb
vuefile         silca2.vue
screendumpfile  silca2.rgb
autoscreendump  0
facesfile       vel1.faces
facesfile       vel1a.faces
vuefile         vel1a.vue
vuefile         vel2a.vue
```

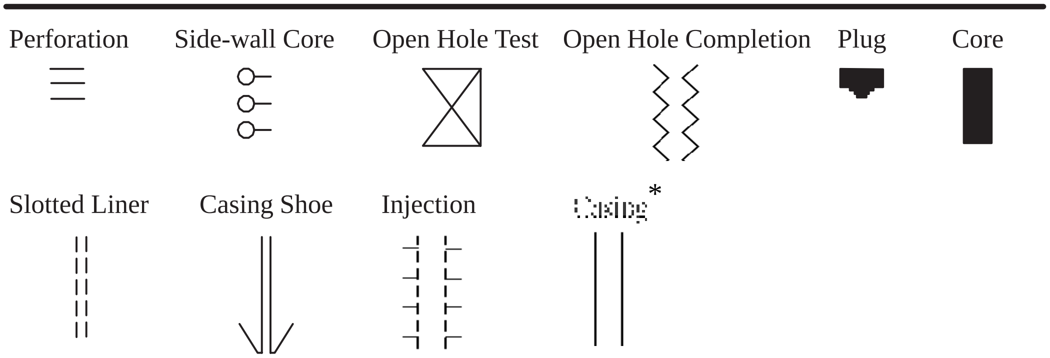

Well-Bore Annotation Files (.wba)

A well-bore annotation file[†] contains the top and bottom depths for well bore annotation markers. These data can be used to post well bore annotation columns on well-panel and cross-section displays. A well-bore annotation file must either match the default format or have a file header describing the file contents. The default well-bore annotation format is free-format, with the fields in the following order: wellid, bore annotation, top MD, base MD, top TVDSS, base TVDSS. As a minimum, the file must contain the required fields, which are listed next.

Required Fields	Optional Fields	Notes
Wellid		Usually a well name
Top MD *or* Top Depth		Distance measured down the well hole to the top of the interval
Base MD *or* Base Depth		Distance measured down the well hole to the bottom of the interval
Bore Annotation		Name of annotation interval (e.g., core or perforation)
	Top TVDSS (top Z)	True vertical depth sub-sea of top of interval
	Base TVDSS (base Z)	True vertical depth sub-sea of bottom of interval
	Symcolor	Color of annotation symbol (1 – 72; refer to Appendix C)
	CommonID	Common well name

Nine well-bore annotation types or symbols are available

Well-Bore Annotation Type and Symbol



A scattered data file can also contain well bore annotation data.

For the casing symbol, the top MD in the data file is ignored; the top MD value is calculated using the base MD and the symbol width specified in the well template (*.wtmp*) file.

†. This file type is only used as input to the Well Display File Editing program. It is essentially read-only (it is not generated anywhere in EarthVision).

The sample well bore annotation file shown below contains the top measured depth (top MD), bottom measured depth (base MD), well ID, and bore annotation type.

```
5900.000  6000 HR6       Injection
6001.000  6100 HR6       Perforation
6100.000  6150 HR6       SlottedLiner
6200.000  6300 HR6       OpenHoleTest
6300.000  6400 HR6       OpenHoleCompletion
6400.000  6500 HR6       Plug
6500.000  6600 HR6       Core
6600.000  6700 HR6       SideWallCore
6700.000  6800 HR6       CasingShoe
```

Well Dip/Dip-Azimuth Files (.dip)

A well dip/dip-azimuth file† contains well path locations (specified as a well ID and measured depth) with dip and dip-azimuth values. These files, similar to horizon tops files with dip/dip-azimuth data, can be used to post dip/dip-azimuth symbols and values on cross sections. A dip/dip-azimuth file must either match the default format or have a file header to describe its format. The default well dip/dip-azimuth format is free-format, with the fields in the following order: well ID, MD, TVDSS (Z), dip, dipazm. As a minimum, the file must contain the required fields, which are listed next.

Required Fields	Optional Fields	Notes
Wellid		Usually a wellid
MD		Distance measured down the well hole
Dip		The measure of the maximum angle of inclination (in degrees, 0° to 90°) of the bed from the horizontal
Dipazm		The compass direction of the DIP (0° to 360° with 0° and 360° pointing due North, 90° due East)
	Z *or* TVDSS (Z)	True vertical depth sub-sea of dip/dip azimuth
	Common ID	Common well name

The sample well dip/dip-azimuth file shown below consists of measured depth, well ID, dip azimuth, and dip fields.

```
4025.000  HR6   42.230   21.740
4500.000        42.000   21.770
6030.000        41.110   39.590
3487.000  W16  251.380    1.800
3970.000       245.980    2.880
5512.000       226.070    8.510
6551.000       223.840   14.390
3446.00   W36  232.270   11.750
```

†. This file type is only used as input to the Well Display File Editing program. It is essentially read-only (it is not generated anywhere in EarthVision).

Well Fault Pick Files (.flts)

A well fault file[†] contains information on the intersections of well paths with various faults. A well fault file must either match the default format or have a file header describing the file contents. The default well fault file format is free-format, with the fields in the following order: well ID, fault name, MD, TVDSS, symbol, dip, dipazm, missing data. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
Wellid		Well name
"Fault name"		Fault name
MD		Distance measured down the well hole to the fault intersection
	Symbol	Symbol type for the fault location (1–72; refer to Appendix C)
	Dip	The measure of the maximum angle of inclination (in degrees, 0° to 90°) of the fault from the horizontal
	Dipazm	The compass direction of the DIP (0° to 360° with 0° and 360° pointing due north, 90° due east)
	Symcolor	Color of fault symbol (1–72; refer to Appendix C)
	TVDSS	True vertical depth sub-sea of the fault intersection
	"Missing Data"	Section of data that is missing due to fault displacement

The sample well fault file shown below consists of measured depth, well ID, fault name, symbol, dip azimuth, and dip fields.

```
4226.000  HR6    Stark      22   42.230    21.740
4620.000         Purple     22   42.000    21.770
5080.000         Green      22   41.110    39.590
3572.000  W16    Stark      22   251.380    1.800
3820.000         Purple     22   245.980    2.880
4917.000         Green      22   226.070    8.510
6249.000         Orange     22   223.840   14.390
3361.000  W36    Stark      22   232.270   11.750
```

†. This file type is only used as input to the Well Display File Editing program. It is essentially read-only (it is not generated anywhere in EarthVision).

Well Horizon Tops Files (.tops)

A well tops file† contains the location of the intersections of the well paths with any horizons. A well tops file must either match the default format or have a file header describing the file contents. The default well tops file format is free-format, with the fields in the following order: wellid, horizon, MD, TVDSS (Z), dip, dipazm, symbol, symcolor. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
Wellid		Name of well
Horizon		Horizon/top name
MD		Distance measured down the well hole
	Symbol	Symbol type of top location (1–72; refer to Appendix C)
	Dip	The measure of the maximum angle of inclination (in degrees, 0° to 90°) of the top from the horizontal
	Dipazm	The compass direction of the DIP (0° to 360° with 0° and 360° pointing due north, 90° due east)
	Z *or* TVDSS (Z)	True vertical depth sub-sea of the top location
	Symcolor	Color used to draw symbol (1–72; refer to Appendix C)
	CommonID	Common well name

A scattered data file can also contain horizon top data. Refer to FL-18 for more information.

The sample well horizon tops file shown below consists of a measured depth field followed by the well ID, horizon name, symbol, dip azimuth, and dip fields.

```
4025.000  HR6    Muddy       22   42.230   21.740
4500.000         Sundance    22   42.000   21.770
6030.000         Dinwoody    22   41.110   39.590
3487.000  W16    Muddy       22   251.380   1.800
3970.000         Sundance    22   245.980   2.880
5512.000         Dinwoody    22   226.070   8.510
6551.000         Madison     22   223.840  14.390
3446.000  W36    Muddy       22   232.270  11.750
```

†. This file type is only used as input to the Well Display File Editing program. It is essentially read-only (it is not generated anywhere in EarthVision).

Well Labels Files (.labels)

Well label files contain labels to be posted along a well at specific measured depths. A well label file must either match the defualt format or have a file header describing the file contents. The default well labels file format is free-format, with the fields in the following order: wellid, borelabel, MD, TVDSS(z), dip, dipazm, symbol, symcolor. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
Wellid		Name of well
Borelabel		Well label text
MD		Distance measured down the well hole
	Symbol	Symbol type of top location (1–72; refer to Appendix C)
	Dip	The measure of the maximum angle of inclination (in degrees, 0° to 90°) of the top from the horizontal
	Dipazm	The compass direction of the DIP (0° to 360° with 0° and 360° pointing due north, 90° due east)
	Z *or* TVDSS (Z)	True vertical depth sub-sea of the top location
	Symcolor	Color used to draw symbol (1–72; refer to Appendix C)
	CommonID	Common well name

The sample well labels file below consists of a measured depth field followed by the well ID, well label, symbol, dip azimuth, and dip fields.

```
4025.000  HR6       Muddy         22      42.230      21.740
4500.000            Sundance      22      42.000      21.770
6030.000            Dinwoody      22      41.110      39.590
3487.000  W16       Muddy         22     251.380       1.800
3970.000            Sundance      22     245.980       2.880
5512.000            Dinwoody      22     226.070       8.510
6551.000            Madison       22     223.840      14.390
3446.000  W36       Muddy         22     232.270      11.750
3963.000            Sundance      22     232.090      13.310
5595.000            Dinwoody      22     231.320      17.330
5623.000  W94       Dinwoody      22      42.110      13.530
6572.000            Madison       22      47.690       9.660
```

Note: A scattered data (.dat) or property data (.pdat) file can be used as a label file, provided it has MD and WELLID fields. The user then specifies which field to use for labels.

Well Lithology Files (.lith)

A well lithology file[†] contains the top and bottom depths for user-defined lithologic markers. These data can be used to post lithology columns on well panel and cross section displays. A well lithology file must either match the default format or have a file header describing the file contents. The default well lithology file format is free-format, with the fields in the following order: top MD, base MD, top TVDSS, base TVDSS, lithology, pattern, symcolor. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
Wellid		Usually a well name
Top MD *or* Top Depth		Distance measured down the well hole to the top of the lithologic unit
Base MD *or* Base Depth		Distance measured down the well hole to the bottom of the lithologic unit
Lithology		Name of the lithologic unit (e.g., shale or sandstone) (20 characters or less)
	Top TVDSS (top Z)	True vertical depth sub-sea of the top of the lithologic unit
	Base TVDSS (base Z)	True vertical depth sub-sea of the bottom of the litho-logic unit
	Pattern	Pattern of lithologic unit (–1 – 43; refer to Appendix C)
	Symcolor	Color of lithologic unit (1–72; refer to Appendix C)
	CommonID	Common well name

A scattered data file can also contain lithology data. Refer to FL-18 for more information.

The sample well lithology file shown below contains the top measured depth (top MD), bottom measured depth (base MD), well ID, lithology, pattern, and pattern color fields. The lithology name is defined by the user and is restricted to 20 characters in length. All lithologies of the same name are considered identical for the purposes of plotting or in any database operations. If no value for the pattern or symbol color is provided, the default of 1 is used for each.

```
5900.000  5960 HR6       Sandstone       22    43
6100.000  6130 HR6       Sandstone       22    43
6130.000  6180 HR6       Shale           12     1
6180.000  6200 HR6       Sandstone       22    43
6200.000  6450 HR6       Limestone       22     9
6450.000  6500 HR6       Sandstone       22    43
6700.000  6750 HR6       Sandstone       22    43
6750.000  6770 HR6       Shale           12     1
6770.000  6825 HR6       Sandstone       22    43
```

†. This file type is only used as input to the Well Display File Editing program. It is essentially read-only (it is not generated anywhere in EarthVision).

Well Log Files (.wlg)

A well log file contains the log information associated with wells. A well log file must have a file header describing the file contents. The default well log file format is free-format, with the fields in the following order: wellid, MD, TVDSS (Z), log1, log2, etc. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
Wellid		Well name
MD *or* XYZ		Distance measured down the well hole *or* XYZ coordinates of point
Log Name(s)†		Amplitude of the specified log at each depth; field name is the log name (e.g., GR)
	X	X coordinate of data point
	Y	Y coordinate of data point
	Z *or* TVDSS (Z)	True vertical depth sub-sea of the log amplitude
	CommonID	Common well name

† Each field of log data should have a header name which reflects the log name (e.g., GR or “gamma ray”).

Log ASCII Standard (LAS) files and property data files can also contain well log data. Refer to pages FL-13 and FL-17, respectively, for more information. Within the Well Display File Editing program, *.las* and *.wlg* files can be used interchangeably.

The sample log file shown below consists of the measured depth, two log fields, and the well ID. Only one name appears in the well ID field (HR6). The program assumes that the subsequent points are associated with HR6 until another entry in the well ID field is found in the file. Blank log data fields are considered no data and a blank field is written out upon export of the data.

```
5945.000    45.438    10.586  HR6
5946.000    27.453    10.430
5947.000    20.734    10.539
5948.000    18.313    10.477
5949.000    15.445    10.492
5950.000    13.375    10.438
5951.000    14.078    10.570
5952.000    11.672    10.430
```

The null value can be specified at the end of the field description in the EarthVision header, as shown in the example below, where –999.25 is used as the null value for the `DT` and `RHOB` fields.

```
# Type: property scattered data
# Version: 6
# Format: free
# Field: 1 MD meters
# Field: 2 DT -999.25
# Field: 3 RHOB -999.25
```


Well Path Files (.path)

A well path file contains the coordinates of the well. The well path file format must match the default format or the file must contain a header that describes the file format. The default well path file format is free-format, with the fields in the following order: well ID, common ID, X, Y, TVDSS, MD, linecol, symbol. As a minimum, the file must contain the required fields, which are listed below.

Required Fields	Optional Fields	Notes
X†		X coordinates
Y†		Y coordinates
TVDSS†		True vertical depth sub-sea
Wellid or lineid		Usually a well name or number
	Commonid	An additional unique name for a well
	MD	Distance measured down the well hole
	Symbol	Symbol type of well location (1–72; refer to Appendix C)
	Linecol	Color of the well path and symbol (1–72; refer to Appendix C)
	TSD	True Stratigraphic Depth
	TVD	True Vertical Depth
	Z	True Vertical Depth Subsea

† The TVDSS units must match the X/Y units if automatic scaling for logs and paths is desired.

The sample well path file shown below contains X, Y, well ID, TVDSS, symbol, line color (linecol), and common ID fields. Where a well ID, symbol, line color, or common ID field is blank on following records, EarthVision uses the previous value. If no symbol or line color is specified, a default value of 1 (black/white) is used. The optional common ID is useful where the well ID is the registration or API number of a well, and the common ID is the generic name of the well. All associated data for a well path (e.g., tops, faults, logs, etc.) are tied to the well path data via the well ID and must share the same well ID. The TVDSS depths of all associated data are calculated from the measured depth down the well path. If a measured depth is loaded with the well path data, the program uses those depths to correlate other data with measured depth values (tops, faults, logs, etc.). If a measured depth field is not present, a calculation is made for the measured depth from the TVDSS. A measured depth of 0 is at the top of the well.

The *wellid* or *lineid* fields can be used in *.path* files. If line ID is used, the Graphic Editor will post the line ID at one end of the line. If Well ID is used in the Graphic Editor, the well id will be posted at each of the points along the well path, unless there is only one text entry specified for each well.

Note: *Well path data must include the top of the well for accurate calculation of measured distances. It is recommended that the entire well path is loaded.*

```
11479.498   12682.500  HR6       6875. 13  2    CommonHR6
11478.498   12681.500            6575.
11476.498   12679.500  HR6       6480.
11473.498   12676.500  HR6       6362.
11470.498   12673.500  HR6       6280.
11468.498   12671.500  HR6       6223.
```

Output Data Files

Data files created as output from EarthVision processing include the following types:

- 2D/3D Grid Files (*.2grd*, *.3grd*)
- 3D Indicator Grid Files (*.3grd*)
- Annotation Attributes Files (*.ann*)
- Computer Graphics Metafiles (*.cgm*)
- Digitizer Setup Files (*.dis*)
- EarthVision Exchange Files (*.evx*)
- Faces Cross-Section Parameter Files (*.fxpar*)
- Faces Files (sliced) (*.faces*)
- Faces Files (unsliced) (*.unsliced.faces*)
- Fault List Files (*.fltlist*)
- Formula Files (*.fp*)
- GeoLink GLK Files (*.glk*)
- GRIDGENR (*.gtf*)
- Grid Report Files (2D/3D) (*.2grpt*, *.3grpt*)
- Grid Stack Files (*.stack*)
- Horizon Tables (*.htbl*)
- HP Graphics Language Files (*.hpgl*)
- HTML Files (*.html*)
- Image Registration Files (*.imreg*)
- Intelligent Plot Files (*.iplt*)
- Isochore Tables (*.itbl*)
- LAS Files (*.las*)
- Log Files (*.log*)
- PostScript Files (*.ps*)
- Program Settings Files (*.set*)
- RESCUE Mode Files (*.bin*)
- Reservoir Parameter Files (*.res*)

- Seismic Base Map Files (*.bmap*)
- Seismic Section Files (*.sec*)
- Sequence Files (*.seq*)
- Shell Script Files (*.sh*)
- Variogram Model Files (*.mod*)
- Vector Plot Files (*.plt*)
- Volumetrics Report Files (*.2vrpt*, *.3vrpt*)
- Vue Files (*.vue*, *.2gvue*, *.3gvue, .dvue*)
- Well Display Files (*.wd*)
- Well List Files (*.wlist*)
- Well Template Files (*.wtmp*)
- WorkFlow Manager Project Files (*.wfp*)
- X Window Dump Files (*.xwd*)

2D/3D Grid Files (.2grd, .3grd)

Grid files can be output in many ways, for example: 2D grids are calculated from a scattered data file; 3D grids are calculated from property data files and/or 2D slice grids; slices may be extracted from a 3D grid to create a 2D grid; grid operations may be performed to create new grids (such as adding two grids or evaluating a complex formula). The format of these grids do not differ from input grids in any way, although the specification and content do differ.

Annotation Attributes Files (.attr)

An attributes file contains display attributes that control data display in the Graphic Editor. Each object in a file has certain display attributes. These attributes include line type and width, text font type and size, symbol type and size, pattern type, and object color for text, lines, symbols, and polygons. The use of an attributes file in the Graphic Editor is discussed under *Attributes Menu* (page GE-34).

An annotation attributes file consists of attribute keywords and parameters, as shown below; refer to *Attribute Set Keywords* (beginning on B-9) for information on the attribute keywords. An attributes file can contain multiple attribute sets, each of which is given a name. The keyword ATTRIBUTES is followed by the name of the attribute set (e.g., “Seismic line label default” in the file below).

3D Indicator Grid Files (.3igrd)

In addition to 3D grids, a 3D indicator grid can be created where each node represents the fault block and zone location within a geologic structural or property model. These grids, generated in the Geologic Structure Builder and in the WorkFlow Manager, allow the display of portions of a 3D grid on a zone- or fault-block basis in the 3D Viewer. The display of the primary 3D grid is filtered based on the zone and/or fault block location as indicated by the 3D indicator grid.

3D indictor grids are particularly useful for displaying seismic information on a zone/fault-block basis against an existing calculated model, for model and interpretation verification. In addition, for property models, the calculated faces file may be quite large or take a long time to calculate or to display. Displaying the 3D property grid, with the indicator grid, is much faster, but allows the similar capabilities (such as display on a zone/fault-block basis) as displaying the faces file.

The use of named attribute sets is a powerful capability in the Graphic Editor which enables a familiar name to be applied to a particular set of display attributes for an object. Thus, when an object is to be created with or changed to a particular attribute set, only the familiar name has to be selected rather than having to individually set the necessary multiple display attributes.

```
# Version_of_attributes: 3.0
# Attributes: ”Seismic line label default”
#       type: label
#       kind: symbol_line
#      color: 2
#       size: 0.15
#    spacing: 0.5
#   position: 6
# follow_line: no
# Attributes: ”Text 1”
#       type: text
#       size: 0.07
# Attributes: ”Text 2”
#       type: text
#       size: 0.07
#     anchor: 8
# Attributes: ”Line default”
#       type: line
# Attributes: ”Polygon boundary default”
#       type: line
#       kind: polygon
# Attributes: ”Line 1”
#       type: line
#      width: 0
# Attributes: ”Polygon default”
#       type: polygon
# Attributes: ”Symbol default”
#       type: symbol
# Attributes: ”Symbol 1”
#       type: symbol
#       size: 0.07
#    pattern: 13
# Attributes: ”Seismic line default”
#       type: symbol_line
# End_attributes:
```

Computer Graphics Metafiles (.cgm)

The binary Computer Graphics Metafile (CGM) format is a vendor- and hardware-neutral storage format for graphics images. This form of the CGM is the most commonly used. It is reasonably compact and is easy for programs to generate and decode. EarthVision can output graphics in Computer Graphics Metafile format (refer to the *Base and Contour Maps* document (page MAP-11)).

Digitizer Setup Files (.dis)

Digitizer setup files contain information about a previous digitizer setup, that is, where the digitizer menu and the map being digitized are positioned on the digitizer tablet. Also included in the digitizer setup file are the data scale coordinates of the control points and statistics on how accurately the digitizer was setup. A digitizer setup file is used whenever digitizing is resumed and the map and digitizing menu are in their exact original position on the digitizing tablet. For example, digitizing is in progress but must be interrupted, say, for a lunch break. Digitizing is resumed without having to re-register the map and menu on the digitizing tablet, by simply having EarthVision read the digitizer setup file. The map and menu must be re-registered if either the map or digitizing menu is moved on the tablet.

Digitizer setup files should only be created by EarthVision; they should *not* be edited or created using a system editor (e.g., vi).

EarthVision Exchange Files (.evx)

EarthVision exchange files *(.evx)* are created by the Export for Simulator Preprocessors program, which exports a model or part of a model from the Geologic Structure Builder. The exchange format is suitable for production reservoir flow simulation preprocessor software such as *Grid* (from GeoQuest Reservoir Technologies) and *GridGenr*™ (from Landmark Graphics®). EarthVision exchange files are in binary format.

Faces Cross-section Parameter Files (.fxpar)

Faces cross-section parameter files (*.fxpar*) contain commands to set the parameters for extracting cross-section annotation, using the Cross Sections from Faces Files program. The parameters define such settings as the faces file name, the pattern type, color, and factor for each zone, and each zone's name, ID, and use. The file contains all of the information displayed in the main window except the names of the traverse, path, property, and scattered data files; in addition, the parameter file includes the color table name. Using the parameter file to set up a collection of parameters allows multiple cross sections to be easily made from the same faces file using consistent patterns and colors for the zones.

A parameter file consists of keywords followed by a colon, then by data in the form of letters, numbers, and file names. Each keyword and its associated parameters are on a separate line followed by a carriage return. The following is a sample parameter file, followed by a description of each line.

```
#START_PARAMETER
Faces: zonevol.faces
Zones: 5
Crease: Y 1 0.03 1
Fault: Y 1 0.04 4
CTable: bw.zclr
Use: 1 1 1 1 1
Color: 5 4 3 2 1
Pattern: 5 4 3 2 1
PatternF: 1.00 1.00 1.00 1.00 1.00
#END_PARAMETER
```

Parameter	Description	Input 1	2	3	4
Faces	Name of faces file	Local file name or full path			
Zones	Number of zones	Integer (1–21)			
Crease	Information about crease lines	Displayed? (Y or N)	Color number (1–72)	Width (>0)	Line type (1–9)
Fault	Information about fault lines	Displayed? (Y or N)	Color number (1–72)	Width (>0)	Line type (1–9)
CTable	Name of color table used (full path)	Local file name or full path			
Use	For each zone, 1 = Use; 0 = Don't Use	List of 1's and 0's			
Color	One color number for each zone	List of integers in the range 1–72			
Pattern	One pattern number for each zone	List of integers (0–43, –1)			
PatternF	One pattern factor for each zone	List of decimal numbers			

Faces Files (.faces)

Faces files are designed solely for the display of the 2D and/or 3D grids in the *3D Viewer* program. Faces files contain X, Y, and Z coordinates for each isovalue shell specified. These files are stored as binary files and are displayed graphically using the 3D Viewer. Three types of faces files exist: sliced, unsliced, and fence. All types should have the *.faces* suffix; the unsliced faces files frequently are given the ending ".unsliced.faces" although "unsliced" is not required.

Sliced versus Unsliced Faces Files

A faces file can be created with or without slices in both the Faces File Generation and the Geologic Structure Builder programs. Slices define where a model can be cut orthogonally (along the X, Y, and Z axes) in the 3D Viewer. Sliced faces files have predefined slices at even intervals. Unsliced faces files have no predefined slices but can be sliced arbitrarily in the 3D Viewer.

The choice of whether to make a sliced or unsliced faces file depends primarily on the intended use of the file in other EarthVision programs, namely, the 3D Viewer, Faces File Merging, and Faces to Cross Section programs.

Unsliced faces files are smaller, take less time to calculate, and can be sliced arbitrarily in the 3D Viewer (although the file must be run through a program, invisible to the user, which can take a few seconds to a few minutes depending on the complexity of the model). Unsliced faces files can be sliced later using the underlying module, *ev_slice* (or the gift program, *evslice*). Unsliced faces files are necessary for creating a cross section from a faces file, performing well-path/structure queries, and for arbitrarily slicing an already sliced file. Whenever a sliced faces file is to be calculated, an unsliced faces file is also automatically generated, so that these other functions can be performed.

Sliced faces files take longer to calculate, but offer better slicing performance in the 3D Viewer. Only sliced faces files can be merged in the Faces File Merging program.

Fault List Files (.fltlist)

Fault (or fault relationship) list files store all the fault information generated by the automatic fault tree builder in the Geologic Structure Builder. These files must be saved after all the fault data files are entered and fault options set, prior to calculating the actual fault tree. The files can be loaded in subsequent sessions for quick updating. A sample fault list file is shown below.

```
FaultNum 6
Fault f41 {
        GridFile f41.2grd
        PointFile f41.dat
        PolyFile f41.ply
}
Fault f42 {
        GridFile f42.2grd
        PointFile f42.dat
        PolyFile f42.ply
}
Fault f43 {
        GridFile f43.2grd
        PointFile f43.dat
        PolyFile f43.ply
}
```

Formula Files (.fml)

A formula file contains a formula and any associated comments, as entered in the Formula Processor. A formula file can be created with variables in place of a file, a field, or a constant, so that it can be used multiple times, making different substitutions for the variables each time. A sample formula file, including variables, is shown below.

```
# Thickness calculation
# top:the top grid
# bottom:the bottom grid
# thick:the thickness grid
$thick = lt (($top - $bottom), 0, 1.0E+20)
```

GeoLink Files (.glk)

GeoLink files (*.glk*) are created by the Export for Simulator Preprocessors program, which exports a model or part of a model from the Geologic Structure Builder. The *GeoLink*- or GLK- format is suitable for the production reservoir flow simulation preprocessor software *GeoLink* (from Landmark Graphics). *GeoLink* files are in binary format.

GRIDGENR Files (.gtf)

GRIDGENR files are ASCII files used for import to and export from GRIDGENR. GRIDGENR is a Landmark product that is used to create and edit reservoir grids for use in the VIP reservoir simulator.

Grid Report Files (.2grpt, .3grpt)

Grid report files contain information about a gridding process and the fit of the output grid, and are created whenever a 2D or 3D grid is calculated. Grid reports can be examined as a method of evaluating the quality of the grid (i.e., how closely it fits the data). Refer to the *2D Grid Calculations* document (page 2DG-26) for a discussion of 2D grid report files, and to the *3D Grid Calculations* document (page 3DG-34) for a discussion of 3D grid report files.

The following is an example of a 2D grid report file:

```
GridName:       sfo.2grd
ScatZmean:      -4995.417
ScatZstdDev:    118.2183
NumInput:       156
NumOutside:     0
NumNull:        0
NumFaults:      0
NumMxDP:        0
NumUsed:        156
ScatX:          1417204 1448610
ScatY:          768371  813948
ScatZ:          -5439   -4862
GridX:          1415634 1450180
GridY:          766092.2        816226.8
GridZ:          -5805.494       -4876.285
GridMean:       -5192.918
GridStdDev:     271.9513
GridNullNodes:  0
AvgAbsZerror:   2.124621 (0.2286485%)
StdDevOfZerror: 2.863852
MaxZerror:      19.01172 (2.046012%)
XYZMaxZError:   1441580 781908  -4862
```

Grid Stack Files (.stack)

Grid stack files contain a group of 2D grid file names and their associated parameters (e.g., pattern, pattern factor, and color) in ASCII format. Grid stack files, which are used when calculating cross sections, fence displays, layer volumes, and property volumes, quickly specify a list of 2D grids and parameters without having to individually enter each grid file name and its associated display parameters.

Grid stack files can be saved by EarthVision after the grid(s) and parameters are entered. The parameters included in a grid stack vary depending upon the calculation (i.e., cross section, fence display, or volumes). A grid stack file is, therefore, much more easily created by EarthVision than using a text editor (e.g., vi). Grid stack files are discussed in the *Cross Section* document (page XSEC-19), and the *Volumetrics* document (page VOL-19).

The following is an example of a grid stack:

```
rt.2grd 10      1.000000        30      d
rb.2grd 12      1.000000        38      d
st.2grd 6       2.000000        51      d
ct.2grd 30      1.000000        61      d
cb.2grd 24      1.000000        67      d
sb.2grd 11      2.000000        72      d
```


Horizon Tables (.htbl)

Using the Base and Contour Maps program, a horizon table can be generated from a single horizon in a Geologic Structure Builder sequence file. After selecting a sequence file and a horizon, the program calculates a horizon table, which is then used to calculate the horizon contour map. In addition to horizon tables being used to generate contour maps of a horizon, they are also used to graphically edit a horizon. Generally, horizon tables are invisible to users, although they can be optionally saved, thereby saving computation time for any subsequent maps.

A horizon table contains a list of grids associated with a specific zone as it exists within each fault block, as well as the annotation and polygon files (which are used to define the faults) generated during the horizon table calculation. A sample horizon table is shown below.

```
# SEQUENCE FILE: gridhrz.seq
# X-RANGE      :  495800.0000000      501000.0000000
# Y-RANGE      :  4217500.000000      4222500.000000
# MIN VALUES   :  416.1600000000      2.550000000000
# HIDDEN FAULTS: 0
surf/cpf_0001.ply  surf/sxl_0001.ann
Horizon_A_above_Flt3.2grd.2grd \
   ”above Flt3” ”Horizon A” ”Top” 1
surf/cpf_0002.ply  surf/sxl_0002.ann  Horizon_A_below_Flt3.2grd \
   ”below Flt3” ”Horizon A” ”Top” 1
surf/cpf_0003.ply  surf/sxl_0003.ann  flt3.2grd ”below Flt3” \
   ”Horizon A” ”Flt” 1
surf/cpf_0004.ply  surf/sxl_0004.ann  Horizon_A_below_Flt3.2grd \
   ”below Flt3” ”Horizon A” ”Top” 0
surf/cpf_0005.ply  surf/sxl_0005.ann  Horizon_A_below_Flt3.2grd \
   ”below Flt3” ”Horizon A” ”Top” 0
```

HP Graphics Language Files (.hpgl)

HP graphics language (HPGL) is a universally-accepted graphic (i.e., plot) format that is commonly used to drive a hardcopy plotter. HPGL files are produced via *plotev*, which is EarthVision’s device-independent plot driver. Simply described, *plotev* reads an EarthVision plot file and converts it to a graphics language that is then automatically sent to a hardcopy device (i.e., plotter) to produce a hardcopy. Refer to the *EarthVision Site Administrator’s Guide* for more information on device independent plotting.

Image Registration Files (.imreg)

Image registration files contain information to correlate pixels on a scanned image, which is in Silicon Graphics image (RGB; red, green, blue) format, to data scale (i.e., real world) coordinates. An image registration file contains the image file name, and three pairs of data scale coordinates, which are correlated with three pairs of pixel coordinates. Image registration files are used in the 3D Viewer program (*evview*), when draping an image on a faces file (refer to the *Utilities* document, page UTIL-36).

The image file name must be the first record in the file. Following the image file name is the world coordinate and pixel coordinate for each reference point. The following is an example of an image registration file:

```
islay.rgb
37916.000000 76250.000000
527 497
42500.000000 77500.000000
516 482
43333.000000 70416.000000
526 429
```

Intelligent Plot Files (.iplt)

Intelligent plot files are produced by the Graphic Editor and provide for two very different capabilities: graphic editing of a plot’s graphic components; and creating montages of many different plots and graphic components (refer to the *Graphic Editor* document, page GE-114, for more information). Intelligent plot files are in a binary format and cannot be edited using a system editor (e.g., vi).

Isochore Tables (.itbl)

Using the Base and Contour Maps program, an isochore map can be generated from a single horizon in a Geologic Structure Builder sequence file. After selecting a sequence file and a horizon, the program calculates a temporary isochore table, which is then used to calculate the isochore map. The temporary isochore table can optionally be saved, saving computation time later for any subsequent maps.

An isochore table contains the zone name, sequence file name, names of the horizon tables that define the top and bottom of a horizon, an Allan diagram table name, annotation and polygon file names (which are used to define the faults), the X and Y ranges, and a list of grids defining the top and bottom of the horizon. A sample isochore table is shown below.

```
# ISOCHORE TABLE
# ZONE NAME    : ct
# SEQUENCE FILE: ck.seq
# UPPER HZN TBL: ct.htbl
# LOWER HZN TBL: cb.htbl
# ALLAN DIA TBL: (none)
# CPF NAME     : isoc/icpf_0001.ply
# SXL NAME     : isoc/isxl_0001.ann
# OVLP ZONE RPT:
# OZ PLAN ANNOT:
# OZ FRNT ANNOT:
# OZ SIDE ANNOT:
# X-RANGE      :  30000.00000000      50000.00000000
# Y-RANGE      :  70000.00000000      90000.00000000
# ENTRY COUNT  : 0002
0001 1 2 ”ALL” ”ct” Top  ct.2grd ”cb” Top  cb.2grd
0002 2 1 ”ALL” ”ct” Top  ct.2grd ”cb” Top  cb.2grd
```


LAS Files (.las)

LAS files can be created from the *ev_wellprofile* and the *ev_lineprofile* programs. The *.las* file is created using the LAS Version 2 format. Las files can contain only data for one well; however, multiple LAS files can be specified for well panel display. Refer to the *Well Display* document (page WD-1) for more information on Well Panel Displays.

Log Files (.log)

Log files contain general information about a calculation. EarthVision produces log files when performing a calculation in, for example, the Geologic Sequence Builder program (*ev_seq*) or the Faces File Generation program (*ev_faces*). In general, log files are not used by the user except as a reference.

The following is an example of a log file that was generated as a result of a faces file calculation:

```
 Starting X slice calculations
   5 Slices:  .....  done
 Starting Y slice calculations
   5 Slices:  .....  done
 Starting Z slice calculations
   5 Slices:  .....  done
 Starting isovalue surface calculations
13 Surfaces:  ..... ..... ...  done
```

PostScript Files (.ps)

PostScript, a page description language, is used by many hardcopy devices such as laser and thermal wax printers. Encapsulated PostScript follows conventions set forth by Adobe Systems Incorporated to enable the interchange of graphics among many desktop publishing software packages. EarthVision can output graphics in PostScript format (refer to the *Base and Contour Maps* document (page MAP-12)).

Program Settings Files (.set)

Program-settings files are ASCII-format resource files that contain certain program parameters. Program settings can be saved to a file and loaded in subsequent program sessions, saving the time of re-specifying program settings. The *Load Settings* and *Save Settings* selections on the EarthVision program module File pull-down menu interactively load and save program parameters from and to a user-selected file, respectively.

When selecting *Save Settings*, most but not all program parameters are saved to the program-settings file. For example, the contents or settings of text boxes, toggle buttons, scales (sliders), and option menus are all saved. The contents of the *Additional Files* list widget in the Base and Contour Mapping program is saved also. Parameters that are not saved include window position, information about which windows are open, the color table name, contour lists, and color-filled contour colors.

A sample program settings file from the Base and Contour Maps module is shown next. Due to the complexity of the file, it may be easier to change a program setting in the file by changing it interactively in the program interface and then saving the new program settings rather than editing the original program settings file by hand.

```
! Settings saved from evmap by cindy on 07/31/95 at 13:46:19.
evmap.mainw.pane.form.fileFrame.form.radio.contourToggle.set: True
evmap.mainw.pane.form.fileFrame.form.radio.baseMapToggle.set: False
evmap.mainw.pane.form.fileFrame.form.gridText.value: ct.2grd
evmap.mainw.pane.form.fileFrame.form.otherListSW.otherList.itemCount: 1
evmap.mainw.pane.form.fileFrame.form.otherListSW.otherList.items: \
   case.dat
evmap.mainw.pane.form.limitsFrame.rc.xmin.value: 30000
evmap.mainw.pane.form.limitsFrame.rc.xmax.value: 50000
evmap.mainw.pane.form.limitsFrame.rc.ymin.value: 70000
evmap.mainw.pane.form.limitsFrame.rc.ymax.value: 90000
evmap.mainw.pane.form.etcFrame.form.sizeLine.xSizeText.value: 20
evmap.mainw.pane.form.etcFrame.form.sizeLine.ySizeText.value: 20
evmap.mainw.pane.form.etcFrame.form.sizeLine.pmuOptionMenu.value: inches
evmap.mainw.pane.form.etcFrame.form.scaleLine.repFracText.value: unknown
evmap.mainw.pane.form.etcFrame.form.scaleLine.plotScaleText.value: 1000
evmap.contourParms.pane.form.leftHalfRC.regularContourToggle.set: True
evmap.contourParms.pane.form.leftHalfRC.form.contourIntText.value: 5
evmap.contourParms.pane.form.leftHalfRC.form.zminText.value: -8126.252
evmap.contourParms.pane.form.leftHalfRC.form.zmaxText.value: -8021.244
evmap.contourParms.pane.form.leftHalfRC.form.labelIntText.value: 5
evmap.contourParms.pane.form.leftHalfRC.form.indexIntText.value: 5
evmap.contourParms.pane.form.leftHalfRC.form.lightColorText.value: 1
evmap.contourParms.pane.form.leftHalfRC.form.indexColorText.value: 2
evmap.contourParms.pane.form.rightHalfRC.variableContourToggle.set: True
evmap.contourParms.pane.form.rightHalfRC.cfcRadio.cfcOffToggle.set: False
evmap.contourParms.pane.form.rightHalfRC.cfcRadio.cfcRegularToggle.set: True
evmap.contourParms.pane.form.rightHalfRC.cfcRadio.cfcVariableToggle.set: False
evmap.contourParms.pane.form.rightHalfRC.contourInsidePolysToggle.set: True
evmap.contourParms.pane.form.rightHalfRC.cfcInsidePolysToggle.set: True
```

RESCUE Model Files (.bin)

The *.bin* file is the main RESCUE export file that can be used for import to reservoir simulation programs that accept RESCUE format files. The *.bin* file is created in a user-defined sub-directory during the export process.

Seismic Base Map Files (.bmap)

A seismic base map file contains shotpoint locations along seismic lines, and is usually created by digitizing a shotpoint base map in the Graphic/Digitizer Editor. The file contains shotpoint values, X and Y locations for each shotpoint, the line ID, and the symbol to be posted at the shotpoint. A shotpoint base map file can be merged with a seismic section file using the Seismic Line Merge program to create a merged scattered data file, containing both the seismic line coordinates and the horizon information. A sample shotpoint base map file is shown below.

```
# Type: base map
# Version: 3
# Format: free
# Field: 1 shotpt non-numeric
# Field: 2 x
# Field: 3 y
# Field: 4 lineid non-numeric
# Field: 5 symbol non-numeric
# Projection: State Plane
# Zone: 406  -- California (VI)
# Units: feet
# Ellipsoid: Clarke 1866
# End:
124     1834200.183097  407310.7855118  dg1225  1
148     1830480.604177  403731.895886   dg1225  1
193     1823668.021889  397053.8349806  dg1225  1
112     1834604.380408  410665.3269834  dg1224  1
148     1829262.944314  405145.222334   dg1224  1
184     1823876.689366  399707.4785964  dg1224  1
124     1832002.801279  409668.1303605  dg1223  1
136     1830179.354533  407968.2452974  dg1223  1
100     1834717.639475  414518.0598731  dg1222  1
196     1820294.065501  399871.2800739  dg1222  1
208     1818488.42571   398100.0095944  dg1222  1
100     1833927.168642  415438.7502377  dg1221  1
214     1816824.118141  397954.1686592  dg1221  1
100     1832950.426944  416374.8340641  dg1220  1
220     1815218.818043  397778.4364357  dg1220  1
112     1830376.002678  415412.2363884  dg1219  1
124     1828560.062998  413550.836387   dg1219  1
135     1826938.189326  411923.6915792  dg1219  1
149     1824839.999244  409817.3899559  dg1219a 1
160     1823255.680736  408027.6536175  dg1219a 1
172     1821495.771377  406145.2876509  dg1219a 1
184     1819720.771147  404242.1588823  dg1219a 1
192     1818548.189553  403101.1833906  dg1219a 1
```

Seismic Section Files (.sec)

The SLP™ Section Import program reads a binary seismic section file from the Seismic Line Program™ (SLP, a precursor to EarthVision), and imports it as an ASCII seismic section file. A seismic section file contains seismic line information, specifically the line ID, horizon name, shotpoint, time value, and break information (i.e., fault break, pinchout, "no-value" areas). The seismic section file can be merged with a shotpoint base map file to create a merged scattered data file, containing both the seismic line coordinates and the horizon information.

```
# Type: section
# Version: 3
# Description: Converted from SLP-format file: dg_slp.xsec (cindy, 07/
31/95)
# Format: fixed
# Field: lineid 1 20 non-numeric
# Field: horizon 21 28 non-numeric
# Field: shotpt 29 44 non-numeric
# Field: time 45 60
# Field: break 61 61 non-numeric
# Field: faultid 62 67 non-numeric
# End:
DG1221              GREEN         206.540320        1.237493F3
DG1221              GREEN         200.820548        1.266070
DG1221              GREEN         194.296108        1.300834
DG1221              GREEN         187.594061        1.329359
DG1221              GREEN         181.399729        1.359282
DG1221              GREEN         177.016543        1.369078
DG1221              GREEN         170.787268        1.392909
DG1221              GREEN         164.096534        1.412961
DG1221              GREEN         163.272552        1.412657F1
DG1221              GREEN         159.862626        1.316758F1
DG1221              GREEN         158.785208        1.316542
DG1221              GREEN         156.593194        1.320653
DG1221              GREEN         153.737069        1.327161
DG1221              GREEN         151.597126        1.324952
DG1221              GREEN         149.480415        1.321751
DG1221              GREEN         147.244380        1.317606
DG1221              GREEN         144.992611        1.313663
DG1221              GREEN         141.939777        1.307833
```

Sequence Files (.seq)

Sequence files, which are created by the Geologic Structure Builder, contain information used to build complex geologic structures. The sequence file includes information such as the X, Y, and Z range, fault-block arrangement, fault names, horizons within the fault block, horizon arrangement, horizon names, zone names, property input and output restrictions, and geologic operation (i.e., depositional, erosional, unconformity). Refer to the *Geologic Structure Builder* document (page GSB-97) for more information.

Shell Script Files (.sh)

A shell script file, which contains all of the necessary information to run an EarthVision calculation, can be saved for any calculation, such as minimum tension gridding, contour mapping, or volumetrics. The shell script can be used, in these examples, to recalculate the grid, map, or volumes using the exact same parameters. It can, alternatively, be edited to make parameter changes prior to recalculation (refer to Appendix G, *Scripting*, for more information). A shell script file also provides a summary of the calculation parameters. The *Keep Script* option menu, which is on the Calculate window in each of EarthVision's program modules, controls whether a shell script file is saved.

The following is a sample shell script file used to calculate a fence display:

```
#!/bin/sh -e

ev_fence -F EV-GMX/SVP -t newsample.trv -g mddy.2grd -G \
10,1.000000,69,d,mddy -g snde.2grd -G 28,1.000000,64,d,snde -g \
dnwy.2grd -G 15,2.000000,51,d,dnwy -g mdsn.2grd -G \
13,1.000000,40,d,mdsn -o fence2.faces  evview fence2.faces
rm fence2.faces

rm ev0.sh
```

Variogram Model Files (.var)

A variogram file (*.var*) contains all the variables needed to define the curve that models the scattered data in a semivariogram and the ellipse/ellipsoid of anisotropy. It also stores the name of the scattered data file. This file is generated in the Kriging program and must be created before generating a kriged grid.

Below is an example variogram file for a property data set.

```
Model     {
     Sill     43.049999
     Nugget     0.011614
     Anisotropy     { Azimuth 0.000003 }
     ModelEle     {
     Power 1.990000
     Contribution     1.000000
     Range     6.783810
     Anisotropy     { Azimuth 44.999991/
          Dip -54.500002 Major 2.500000 Minor 1.100000 }
}
}
Range      {
x 3.000000 8.000000 6
y 7.000000 12.000000 6
z 11.00000 16.00000 6
}
OpMan     { 0 }
DatMan0     { ”plane.pdat”:x,y,z,”p” }
```

The terms in the variogram file are defined as follows:

File Term		Comments
Model		The semivariogram model
Sill		Maximum value of g(h)
Nugget		g(h) at h = 0.0, given as a ratio of the Sill
Anisotropy		First occurrence is the global value; refer to anisotropy below for further details.
ModelEle		The model element; values of which are defined beneath. There can be up to four model elements.
Spherical		Semivariogram function
Exponential		Semivariogram function
Gaussian		Semivariogram function
Power		Semivariogram function; adjacent value is the value for the exponent.
Contribution		The model contribution as a ratio of the Sill minus Nugget
Range		Model range in the direction of the minor axis
Anisotropy	Azimuth:	Direction of model element principal axis with azimuth defined on a bearing system of East-West equal zero, +180 counter-clockwise, –180 clockwise
	Dip:	Defines the inclination; 0 is horizontal, –90 is vertically down.
	Major:	The ratio of the ellipse with the largest area, defined as the longest axis divided by the shortest axis.
	Minor:	The ratio of the ellipse with the smallest area within the ellipsoid, defined as the longest axis divided by the shortest axis.
Range		Grid range specifications
X min, max		EarthVision grid size
Y min, max		EarthVision grid size
Z min, max		EarthVision grid size (only in 3D calculations)
OpMan{#}		(0 = Classical, 1 = Pairwise)
DatMan0 {".pdat",x,y,z,"p"}		"input data file name," x,y,z, "column title of variable"

Note: Each model element has an entry.

Vector Plot Files (.plt)

EarthVision plots are stored in binary format files containing coordinates describing line segments and commands that determine how they are to be drawn. This information is read by an external program which translates it into a form suitable for a plotter or other graphics device. This information can also be used to display the plot on a workstation graphics monitor terminal using the *Plot Viewer* (*evplot*) program on the Visualization menu of the main EarthVision window. All maps, cross sections, and 2D fence displays generated in EarthVision can be written to a plot file.

Volumetrics Report Files (.2vrpt, .3vrpt)

Volumetrics report files, which are produced by the Layer, Property, and Sequence Volumetrics program, contain the calculated volumes and associated information. The volume, area, and input parameters (e.g., grid and polygon file names, yield factors, unit conversion factors) are all included in the volumetrics report file. This ASCII file can be edited using a system editor (e.g., vi) and printed on a hardcopy printer.

The following file is a sample 2D volumetrics report file:

```
                         VOLUMETRICS REPORT

                         Run by: nicolia
                        Version: 4.0
                           Date: 03/09/97
                    Report file: jj.2vrpt

                   Polygon file: casevol.vply
                Zone definition: Operational
         Unconformity operation: uncf.2grd
           Deposition operation: rt.2grd
                  Primary field: Polygon Class
                 Sorting method: Alphabetically
                    Input units: unknown
  Volumetrics conversion factor: 1
                   Output units: Same as input
       Global minimum thickness: 0.0

-------------------- Zone name: uncf    --------------------

                      Minimum z: none
                      Maximum z: none
              Minimum thickness: 0.0
                   Yield factor: 1.0


                            Volumetrics Report


                 Zone name: uncf
   Polygon Class
        Polygon ID
                                  Polygon Area       Volume      Positive Area
-----------------------     --------------  --------------  --------------
   EDWARDS OIL
        LEASE 103                 42,000,000.   1,458,060,800.    35,118,056.

   HENDERSON OIL
        LEASE 101                 42,000,000.   1,802,561,920.    41,527,776.

   JOHNSON OIL
        LEASE 104                 42,000,000.     559,097,984.    14,055,556.

   SMITH OIL
        LEASE 102                 42,000,000.     689,010,752.    24,506,944.
```

Vue Files (.vue, .dvue, .2gvue, .3gvue)

Vue files contain keywords and parameters that specify viewing positions for faces files, ASCII scattered data, and 2D and 3D grids in the 3D Viewer. These specifications define settings such as slice locations, displayed isovalue shells, color files, displayed auxiliary files, as well as some settings that cannot be changed interactively in the *3D Viewer* (e.g., background color). Vue files allow the user to save a complete set of instructions to, for example, set up a default display of a 3D model or data set, or set up a series of displays. Only those settings specified in a vue file are changed when the file is read.

Vue files can be created in the 3D Viewer or using a system editor (e.g., vi). Refer to the *3D Viewer* document (page 3DV 2-14 and 3DV 4-28) for more information on vue files.

The following is a portion of a sample vue (*.dvue*) file:

```
datafile            marshall.dat
initmenu            lighting

xlookpoint          19.391991
ylookpoint          16.140285
zlookpoint          -99.763428
azimuth             35.0
inclination         45.0
zexag               0.003200

colorkeytype        off
colorkeyinfo        111111100000011
propcolorfile       defaults
lithcolorfile       defaults
cfccolorfil         default
revpropcolors       0
revlithcolors       0
revcfccolors        0
scatdatcolors       elevation

datacubefactor      1.000000
bincubergb          255 255 0

maintitle           "marshall.dat"
maintitlepos        default
fullscreen          0
```

Well Display Files (.wd)

Well display files are created by the Well Display File Editing program (*evwdedit*), which is one of the Well Display modules. Well display files are used by all programs that display wells, e.g., Well Panels, Cross Sections, and the 3D Viewer. The file contains the names of the files used in the Well Display File Editing program (the well data files selected for display, well template file, and well list file); these files determine all the well display parameters. A well display file lacks a file header. A sample well display file is shown below.

```
sample_explogs.pdat
sample.path
sample.tops
sample.wba
sample.wlg
sample.lith
sample.wtmp
sample.wlist
```


Well List Files (.wlist)

Well list files are created by the Well List Editing (*evwlistedit*) module, which is part of the Well Display File Editing module. A well list file contains a list of well IDs and/or common IDs to be displayed whenever wells are displayed. The well list file is referenced by the well display (*.wd*) file. A well list file lacks a file header. A sample well list file is shown below.

```
# common names and unique IDs
CommonHR6 (HR6)
CommonW144 (W144)
CommonW16 (W16)
CommonW36 (W36)
CommonW94 (W94)
```

Well Template Files (.wtmp)

Well template files are created by the Well Template Editing (*evwtmpedit*) module, which is part of the Well Display File Editing module. A well template file contains well display parameters such as whether or not certain elements are posted, plotting units, colors, line types, and pattern types. Well template files are referenced by well display (*.wd*) files and lack a file header. A sample well template file is shown below.

```
colorfile: $DGIHOME/ev6/etc/dgi.zclr
colordef: 0/0/0
colordef: 255/255/255
colordef: 0/255/0
colordef: 193/0/0
colordef: 173/0/0
plotting_units: inches
path_line_style: 4 zone=2
path_line_style: 3 zone=2 behind
track_plot: true
borelabel_symbol_post: true
```

WorkFlow Manager Project Files (.wfp)

WorkFlow Manager Project Files (*.wfp*) are ASCII files that contain all the setttings for the WorkFlow Manager module. These files are saved and loaded via the WorkFlow Manager interface. They contain information such as the types of models to be calculated, the input files to fault, horizon, and property gridding, map and cross-section specifications, and all output file information. A portion of a *.wfp* file is shown below.

```
# Project saved by carol on 03/20/01 at 20:53:17.
theConfiguration.version        "6.0, 03/09/2001"
theConfiguration.file /usr/ohlone2/dgi/ev6/etc/evflow/evflow.config.6.0
theProject.propSetupCheck       0
theProject.hrzEstimChangedForProp       0
theProject.propConformalLight   unknown
theProject.checkPropLight       1
theProject.propMethodLight      unknown
theProject.propWinAlreadyOpened 1
theProject.rescueFaces  ./demo.ijk.faces
theProject.rescueFile   ./demo.bin
theProject.propZcellSize        11.564245810056
theProject.propZnodeNbr 180
theProject.propYcellSize        116.66666666667
theProject.propYnodeNbr 37
theProject.propXcellSize        116.66666666667
```

```
theProject.propXnodeNbr 61
theProject.hgReconSave  ./demo_v6.recon.faces
theProject.outputSeqFile        demo_v6.seq
theProject.outputSeqOnOff       on
theProject.strcFacesWinVisit    1
theProject.transFile    ./demo.temp_unfaulted/fault.trans
theProject.hgReconFaces ./demo.recon.faces
theProject.hrzDataTolerance     0
theProject.hgTransformZ 40
theProject.hgTransformY 31
theProject.hgTransformX 52
theProject.runEstimHrz  0
theProject.hrzDataChanged       0
theProject.horizonChanged       0
theProject.treeFacesSave        1
theProject.treeFacesCompute     1
```

X Window Dump Files (.xwd)

X window dump files contain information that specifies the graphic contents of an X window using red, green, and blue pixel values. Whenever EarthVision displays a graphic (i.e., plot) on the screen, an X window dump file can be saved, provided that the client site's resource are set up to do so (refer to the *EarthVision Site Administrator's Guide*).

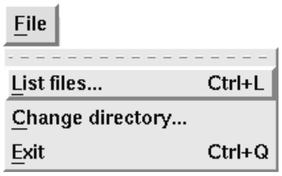
An X window dump file can be displayed in EarthVision by selecting the file in the File Selection window and then selecting the *Plot* button.

File Header Preparation

For files that have a suffix different than the default suffix for the particular file type, and/or whose format is different than the defined format for field order, a file header record must be added to the file. Refer to Appendix F, *Field Oriented Headers*, for more detailed information on file headers than is covered in this section.

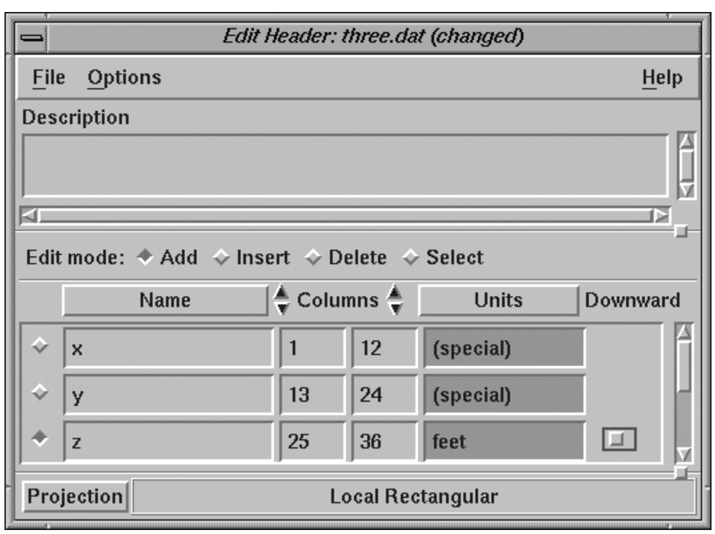
Some files used in the *3D Viewer* program require a specific format but do *not* require an ASCII header be added:

- Faces files
- Vue files
- Screen annotation
- Scripts
- Z, Zone, Property, 3D Grid, Time, and Feature color files



To prepare a header for a file, *File –> List Files* is selected in the main EarthVision window. The File Selection window shown below appears, listing all of the files in the current directory.

Selecting the desired file name and then the *Header* button produces the Edit Header window shown on the next page. The window contains File and Options pull-down menus in the menu bar, a box for entering a file description, a row of format and edit function buttons, a scrolling window for entering field name and column information for fixed format files, and an area for specifying the projection system.



Note: *The File and Options menus are discussed in detail on 3DV 2-61.*

File Description

The description can be multiple lines long and can include whatever information is desired. File descriptions are optional; their use, however, is recommended. File description information serves as an “on-line” notebook for the file describing its contents and importance which is useful as time passes by, or when other individuals are required to use the file.

Row Editing Functions

The *Add*, *Insert*, *Delete*, and *Select* buttons located below the description box and above the scrolling window provide means by which rows (field names) can be altered, added to, or deleted from the window. A row is selected by clicking on the radio button to the left of the field name. When the *Add* button is active, a new row is added below the selected row. When the *Insert* button is active, a new row is inserted above the selected row. When the *Delete* button is active, the selected row is deleted from the window. When the *Select* button is active, the field name and units can be altered for the selected row.

Special Field Names

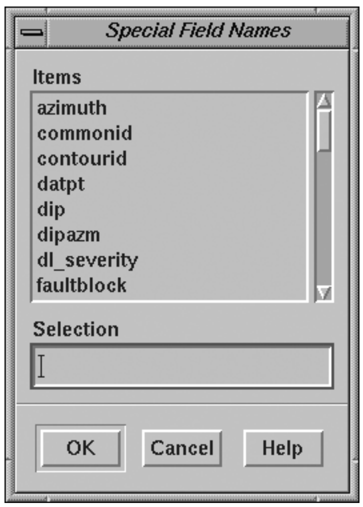
In EarthVision, scattered data files can contain unique fields names that have a special meaning such as additional automatic data posting capabilities. The following special field names are available:

- azimuth
- contourid
- datpt
- dip
- dipazm
- dl_severity
- dogleg
- fault block
- feature (used in 3D Viewer only)
- featurecol (used in 3D Viewer only)
- featureid (used in 3D Viewer only)
- inclination
- inline (lineid)
- line (lineid)
- linecol (used in 3D Viewer only)
- lineid
- md
- p
- radius (used in 3D Viewer only)
- relative_dip
- shotpt
- straight
- symbol
- symcolor (used in 3D Viewer only)
- symsize (used in 3D Viewer only)
- symtrans (used in 3D Viewer only)
- trace (shotpt)
- traverse

- wellid
- x
- xline (shotpt)
- y
- z
- zoneid

These special field names and their functions are discussed in *Special Fields in Scattered Data Files* (page FL-19) and in the 3D Viewer document, in Chapter 2, *3D Viewer File Types*.

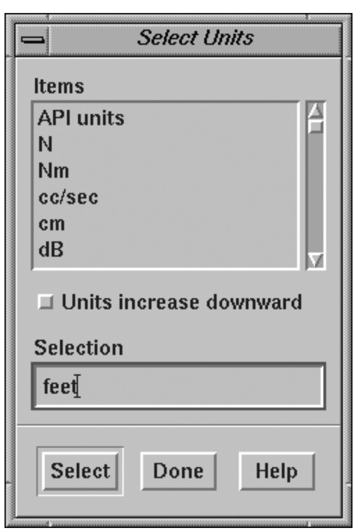
While in *Select* mode, selecting the *Names* push button produces a window listing the unique field names.



Selecting the desired field name and the *OK* button places that name in the field name box for the selected row.

Units of Measure

Units of measure for a field is defined by first selecting the row and then the *Units* button. A window listing the units of measure shown below appears.

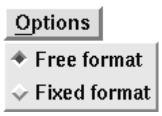


Fields with a "(special)" label in the units column cannot have their units changed. Fields containing non-numeric characters should be identified as non-numeric. A full listing of all available units is given in Appendix F (page F-9).

Note: The Parts Per Billion unit of measure refers to a U.S. billion (1,000,000,000) rather than a British billion (1,000,000,000,000).

Fields containing depth data, in which the field data values increase in the downward direction, should be specified as *downward* by selecting the toggle button below the units window.

Options Menu

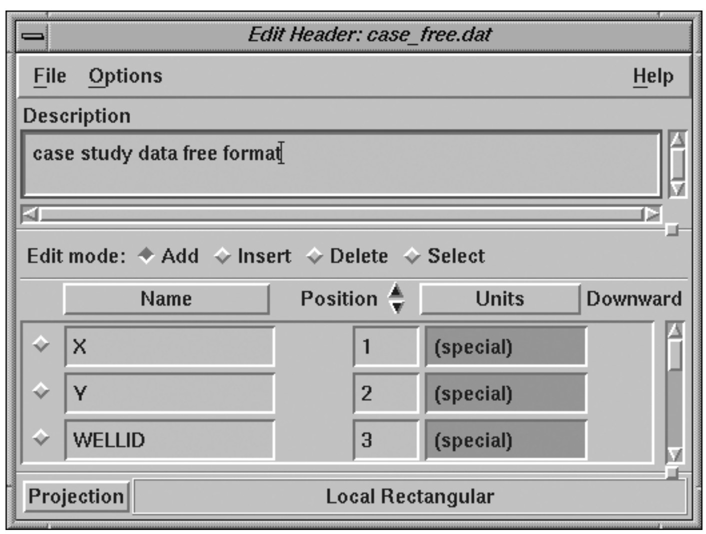


The Option menu contains functions for specifying the format of the file. Free-format files contain fields in each record arranged in a consistent order and are separated by blank spaces. The *Free Format* option is the default. Fixed-format files, on the other hand, contain fields in each record arranged in a consistent order and occupy a fixed position in terms of starting and ending columns.

Free-Format Files

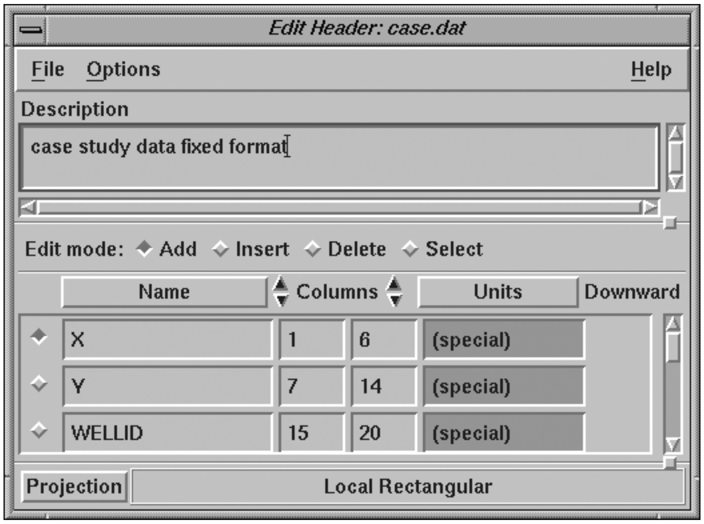
Files in EarthVision can be in free or fixed formats. Free-format files contain fields in each record arranged in a consistent order and that are separated by blank spaces. If a field in a free-format file is to be left blank, a set of double quotes ("") must be used as a place-holder for the field. The *Free Format* option is the default layout, and it can be set via the Options pull-down menu.

The position of a field in each record is identified in the text box to the right of the field name. The position number can be incremented up or down in steps of one by selecting upward or downward pointing arrow buttons to the right of the word "Position." The order of the fields within a file can be determined by viewing the file using the *Show File* function on the File pull-down menu



Fixed-Format Files

Fixed-format files contain fields in each record arranged in a consistent order and that occupy a fixed position in terms of the starting and ending columns. To specify a fixed format, *Fixed Format* is selected from the Options menu. The window is updated to reflect the necessary layout for fixed formats



The starting and ending column positions of a field in each record are identified in the text boxes to the right of the field name. These values can be incremented up or down in steps of one by selecting the upward or downward pointing arrow buttons to the left (starting column) or right (ending column) of the word "Columns."

The starting and ending columns of the fields in the file can be determined by viewing the file using the *Show File* function on the File pull-down menu.

Coordinate System Information

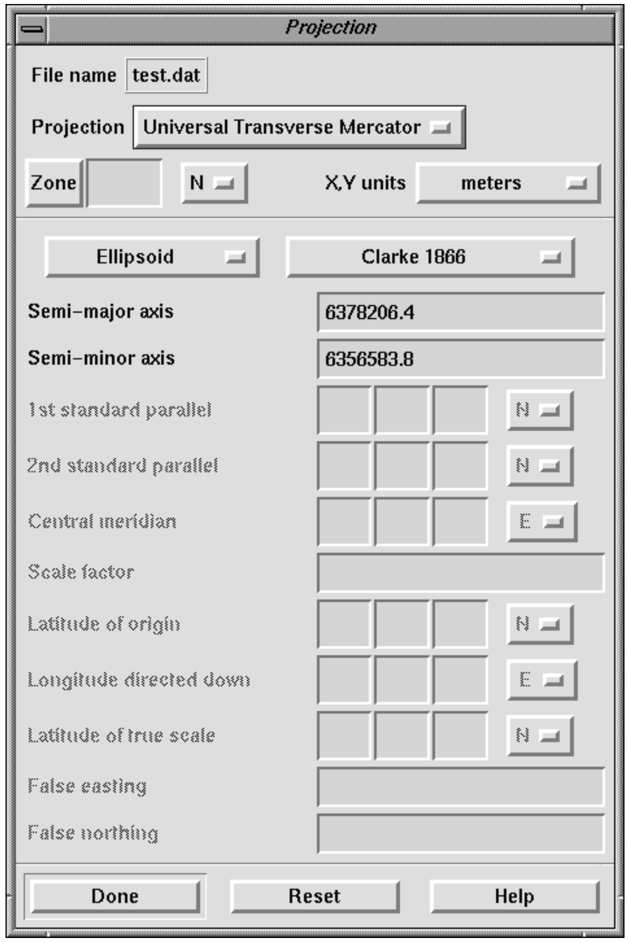
Coordinate system information is recorded for all ASCII files containing X and Y coordinates (e.g., scattered data, polygon data).

When plotting multiple data files on one map, EarthVision checks that all of the files have the same projection system. If the projection system is not the same for all files, EarthVision prevents the user from posting those files on a single map. Projection information is also used to project longitude, latitude locations for ticks and graticule lines into data scale coordinate locations on the map, and to calculate the angle between true north and grid north when plotting longitude, latitude annotation.

If the data file has no known projection system, *Local Rectangular* can be specified. In this case, the file cannot be plotted with longitude, latitude or north-arrow annotation.

Note: Using longitude, latitude coordinates for flat mapping is incorrect and will result in a significant amount of distortion. Data files with longitude, latitude values for the X and Y coordinates should be transformed to one of the supported projection systems before mapping. This transformation can be performed with Coordinate Transformation *under the Utilities pull-down menu.*

Coordinate system information for the X and Y coordinates is specified by selecting the *Projection* push button located in the lower left part of the window. The projection window shown below appears on the screen.



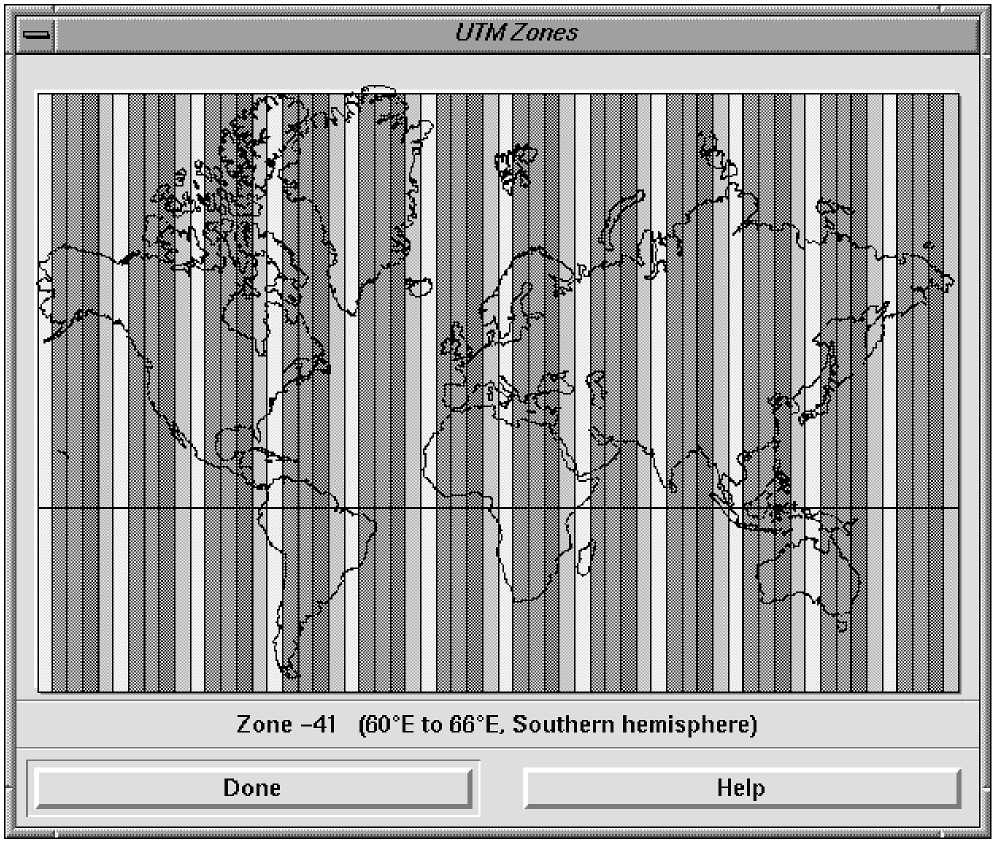
Projection System

The coordinate system is selected from the *Projection* option menu. If the file has no known projection system, *Local Rectangular* (the default) should be used.

The supported projection systems listed on the option menu are discussed in detail in the *Coordinate Transformation* document.

Zone

If the projection requires a zone number (State Plane and UTM), the *Zone* button becomes active. Selecting the *Zone* push button produces a zone map of the United States. Clicking on the appropriate zone (the zone number appears at the bottom of the map as the mouse cursor moves over the zone) enters the number in the zone box.



X, Y Units

Units for the X and Y coordinates of the new file are specified with the *X/Y Units* option menu, which lists all of the X/Y units of measure supported by EarthVision.

Ellipsoid

The type of surface (ellipsoid or equivalent sphere) on which the projection was developed must be specified. The ellipsoid defines the surface of rotation, on which the supported map projections are developed. Usually, the dimensions of the ellipsoid are chosen so that its surface closely matches that of the Earth in a particular region. EarthVision supports ten of the more commonly used ellipsoids throughout the world. The ellipsoids listed on the option menu (to the right) have predefined dimensions (the semi-major and semi-minor axes). The user can alternatively define an ellipsoid by specifying the semi-major and semi-minor axes (an equivalent sphere). An equivalent sphere has the same surface area as the ellipsoid. For a user-defined equivalent sphere, the radius of the sphere is entered in place of the semi-major axis, and the year is entered for the semi-minor axis.

Finally, a standard model for the ellipsoid or equivalent sphere must be selected. Clarke 1866 ellipsoid (the default) is commonly used to map the North American continent. The additional ellipsoids are used for mapping throughout the rest of the world.

Additional Parameters

If the selected projection has other required parameters, they become active and must be entered. Parameters are greyed out if not used by the selected projection. For a discussion of each projection system and the required parameters, refer to the *Coordinate Transformation* document.

File Menu

The File pull-down menu contains several useful functions. The *Show File* function produces a window showing the contents of the selected file. This window is useful for verifying column start and end locations for fields, as well as the order of fields in the file.

The *Copy Header* function copies a header from another file and replaces the existing header of the selected file. This function is a quick way to prepare a header for a new file that is identical to another. A window pops up on the screen requesting the name of the file from which to copy the header. The copied header is not written to the file until the *Save* or *Save As* function is used.

The *Standard Header* function inserts a standard header in the selected file. Any commonly used header can become one of the standard headers for a client site. Files that contain commonly used headers (with or without data attached) can be placed in the directory *$DGIHOME/ev6/etc/standardHeaders.* Selecting *Standard Header* produces a window listing the files or headers in the standard headers directory.

Note: EarthVision does not confirm that the file type is compatible with the standard header selected; for example, a fault file header could be attached to an annotation file.

Once a file's header has been edited or created, the file and its new header can be saved back to itself with the *Save* function. The function is immediate and has no pop-up window.

The *Save As...* function is used to save a file and its edited or new header to another file name. This function saves the changes to a new file and does not alter the original file.

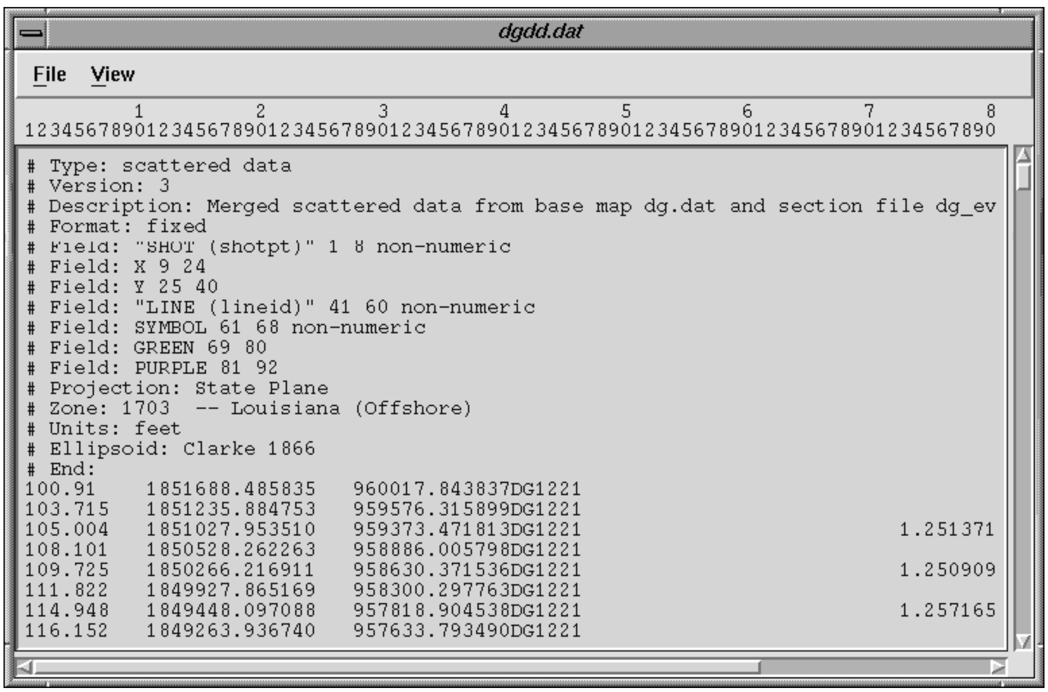
The *Strip Header* function strips an existing header from a file so that the file can be used with another program that may not understand or be able to skip over the EarthVision header. A window appears asking the name of the file to which the "headerless" data are to be saved. The data without the header are saved to the supplied file name.

Save a File Header

After all of the necessary header information for the field has been supplied, the header can be written to the file with the *Save* function from the File pull-down menu. The header is placed at the beginning of the file. The *Save As...* function writes the header and the original data file to another file.

Sample File Header

Using the *Show File* function from the File pull-down menu on the Edit Header menu bar, a file's header and contents can be viewed, as shown in the example below.



All of the header records are added to the top of the file and are preceded with a pound sign (#).

The File Pull-down Menu

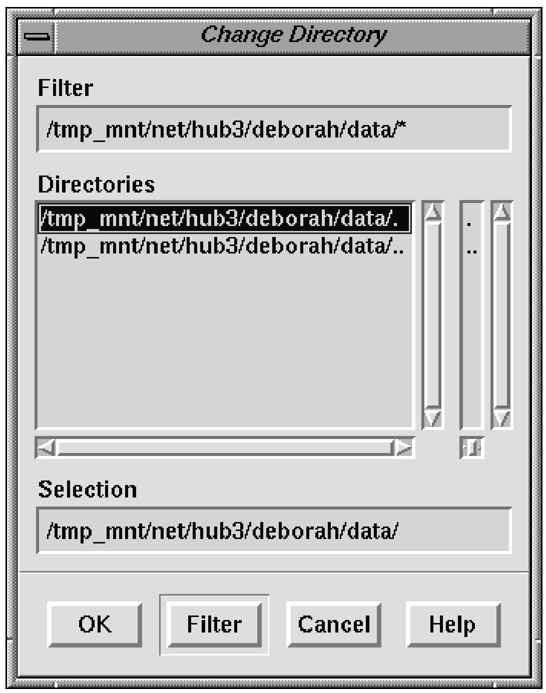
A File pull-down menu exists in each EarthVision module. Certain functions, such as *New, Change Directory,* and *Exit,* appear on the File pull-down menu for each module, while other functions appear only for a particular module. Functions on the File pull-down menu that are common to all modules are discussed below. Functions specific to a particular EarthVision module are discussed in the document covering that module.

New

Selecting the *New* function clears any specified parameters so that new parameters may be entered. Parameters with default values are reset to the default value.

Change Directory

The *Change Directory* function moves from the current working directory to another directory. Selecting *Change Directory* produces the window shown below, in which a directory can be specified.



Exit

Selecting *Exit* closes the program window and exits the program. No output is calculated by the program unless it was explicitly specified prior to exiting the program.

File Selection

Whenever a file name needs to be supplied to EarthVision for processing, the File Selection window, shown below, appears on the screen. The window contains a filter box at the top, two scrolling windows listing all files in the current directory and all subdirectories, a group of file function buttons, a selection box, and a group of action buttons at the bottom of the window.

The File Selection window contains two scrolling lists. The one on the left shows the current directory and all subdirectories (and ".." indicating the directory above the current one), and the one on the right shows all files residing in the directory. A selection from either list can be made in one of three ways:

- Enter the file or directory name from the keyboard in the box labeled *Selection.*
- Click on the desired entry and then the *Select* button. The selected file is loaded in EarthVision.
- Rapidly double click on the desired entry. This causes the selected file to be automatically entered into EarthVision.

In some cases, when only one file is needed, the File Selection window disappears when the file is selected. In most other cases (e.g., when more than one file may be selected for processing), the *Select* button only loads the selected file into EarthVision; the File Selection window does not disappear until the *Done* button is selected.

File List Filter

The list of files in the scrolling window labeled “Files” can be shortened by specifying a filter. The *Filter* box contains the current directory listing.

By default, the filter is “*.*” which lists all files in the directory. Once a new wildcard string is entered from the keyboard, entering a <carriage return> or selecting the *Filter* button updates the list. For example, the wildcard character “well*” lists all files in the current directory beginning with “well.”

In addition to standard UNIX expressions (e.g., **.[2,3]grd* matches all files ending with *.2grd* and *.3grd*), EarthVision supports the vertical bar as a method for indicating “or.” For example, entering the expression **.2grd|*.3grd|*.dat|*.pdat* lists all files ending with *.2grd*, *.3grd*, *.dat*, and *.pdat*. While such an expression can be achieved using regular UNIX expressions, the vertical bar is much easier to use.

Selection of Files from Another Directory

Files residing in another directory can be selected from the File Selection window. To move up one level from the current directory, the directory entry that ends with two periods must be selected (always the second entry in the directory window). The next higher directory is now the current directory selection, and the Directory list now displays all subdirectories. Selecting any subdirectory displays all files within the newly selected directory. Once a file selection is made, the File Selection window automatically resets itself back to the directory in which EarthVision is currently operating.

Files from other directories can also be specified by entering the full path including the file name in the *Selection* text box. The default directory for listing files whenever the File Selection window comes up can also be changed via the *Change Directory...* function from the File pull-down on the top menu bar of each program.

File Selection Window Functions

Once a file is selected from the File Selection window, several file function buttons become active. Functions greyed out (inactive) are not applicable for the type of file chosen. The File Selection window functions are discussed in the following locations:

Function	Page Location
Copy	FL-66
Rename	FL-66
Delete	FL-66
Header	FL-67 to FL-69
Types	FL-69
Browse	FL-69 to FL-72
Plot	FL-72 to FL-73
3D View	FL-73
Statistics	FL-73
Edit	FL-80
Text Edit	FL-80
EDA	FL-80

Copy

A disk copy of the selected file can be made by selecting the *Copy* button. The window shown below appears requesting a file name for the copy of the selected file.

If an existing file name is entered, the user is queried whether or not to overwrite it.

Rename

The name of the selected file can be changed by selecting the *Rename* button. The window shown below appears requesting the new name of the selected file.

If an existing file name is entered, the user is queried whether or not to overwrite it.

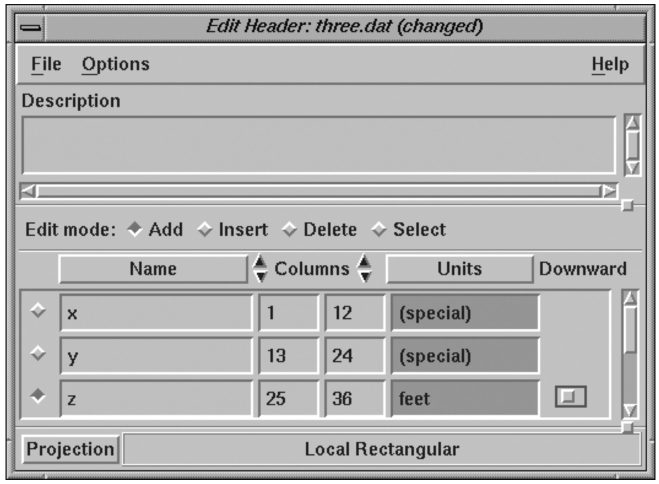
Delete

The selected file can be removed from the directory disk by selecting the *Delete* button. The window shown below appears asking for verification that the selected file should be deleted.

A file will not be deleted if it is protected against deletion by operating system security measures. *Caution*: this operation is not reversible; a deleted file can only be recovered if another copy exists in another directory or on tape.

File Header Addition and Modification

A file header can be added or edited by selecting the *Header* button. The Edit Header window shown below appears on the screen.

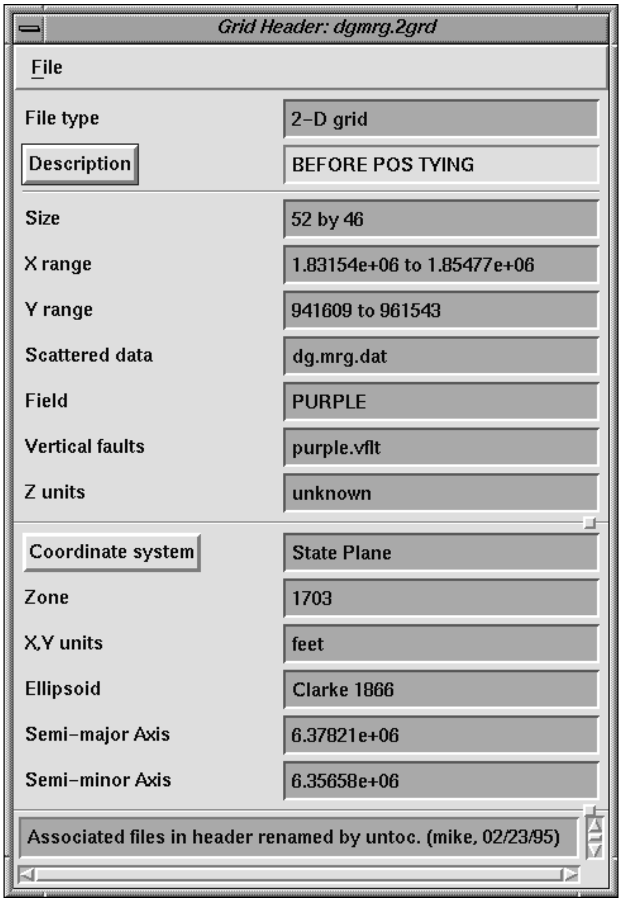


Files that have a suffix different from the default for the particular file type, and/or whose format is different from the defined format for field order, must have a file header record before it can be used in EarthVision. For a complete discussion on how to add a header, refer to the section on *File Header Preparation* (page FL-53).

Header Modification for Grid Files

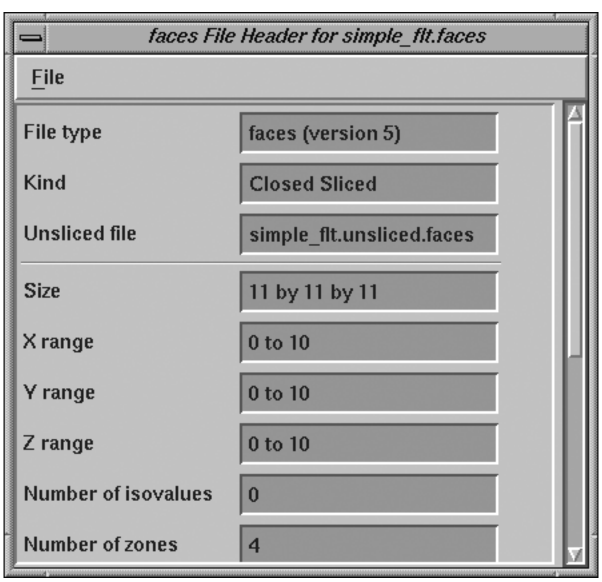
If the selected file is a 2D or 3D grid file, the grid file header is displayed. Grid file headers consist of the file type, description, scattered data file name and field name from which the grid was calculated, the Z units, the grid size (i.e., the number of X-columns, Y-rows, and Z-levels), the X, Y, and Z ranges, and the projection and units. Only the grid file description and projection can be edited. Use extreme caution when changing the grid's projection, as only the header information is changed; the coordinates are not transformed.

A sample grid header window follows:



Header Display for Faces Files

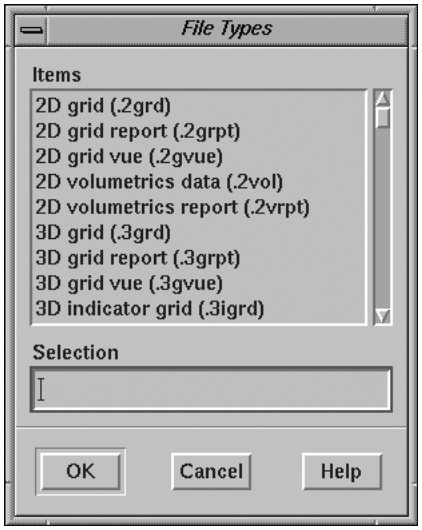
If the selected file is a faces file, the faces file header is displayed (similar to the one shown below). The faces file header contains the file type (always faces file, plus the EarthVision version number), the slicing size, the X, Y, and Z ranges, the number of isovalues, zones, and fault blocks, and the name of each of the fault blocks. None of this information can be modified via the Faces File Header window.



Note: Faces files generated in EarthVision 3.1 or earlier cannot have their headers displayed unless they are converted to the current format. Refer to the Utilities *document for a discussion of the conversion program.*

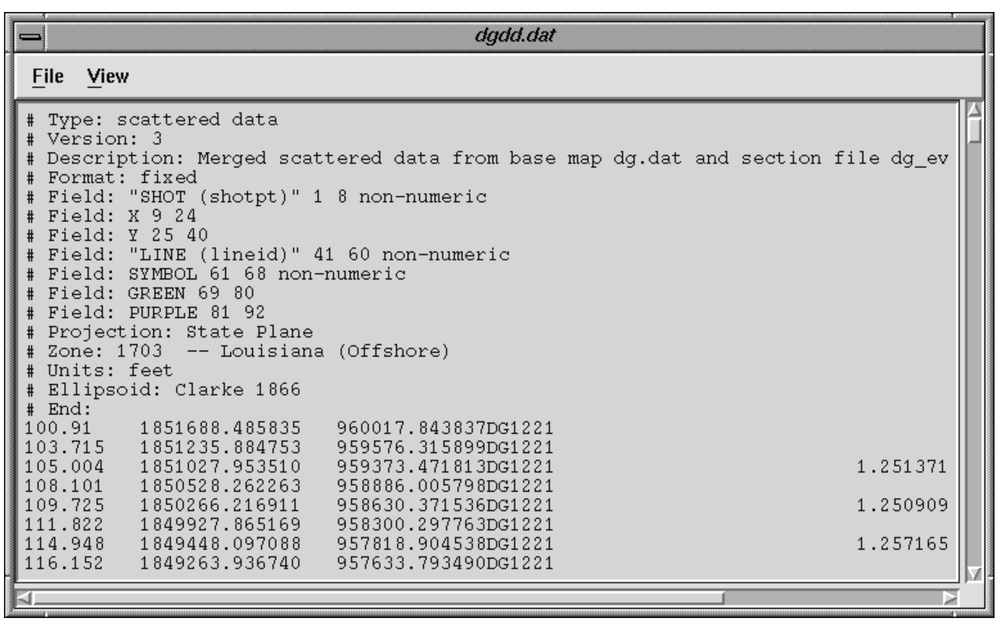
File Types

The types of files displayed in the Files scrolling list can be quickly filtered to include only files of a particular type. Selecting the *Types* button produces a window listing all of the file types supported by EarthVision (as shown below). Once the desired file type is selected, the list is immediately updated to include only files of the selected type ending with the appropriate suffix.



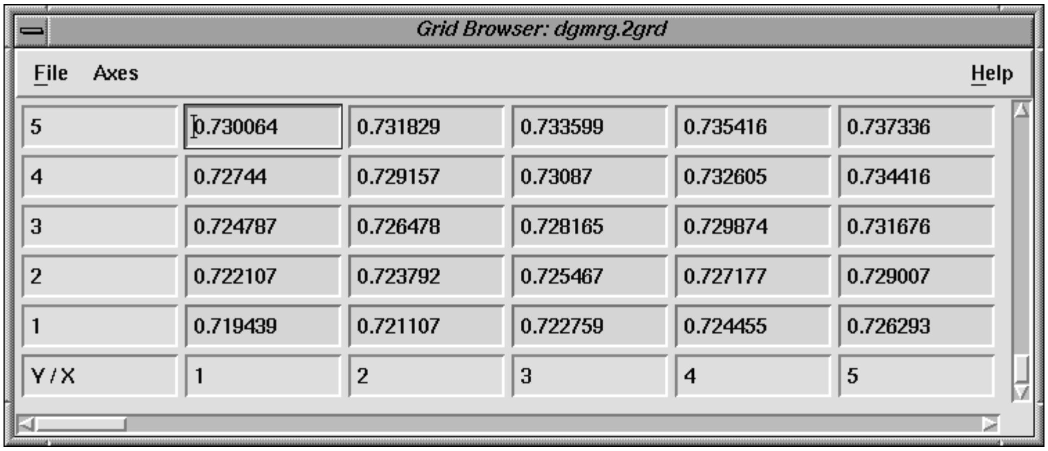
Browse

The contents of a file can be displayed by selecting the *Browse* button. If the selected file is in ASCII format, the window lists the contents of the file. The *Browse* function can display up to the first Mbyte of a file.



Browse a 2D Grid

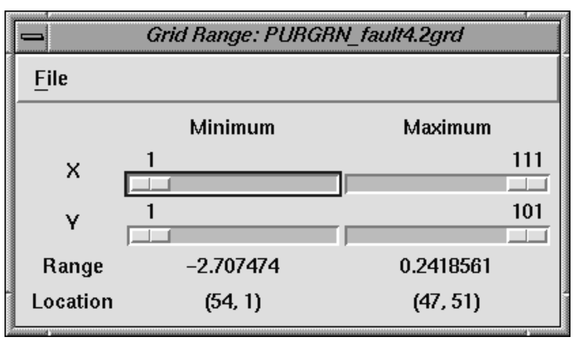
If the selected file is a 2D grid, the window shown below is displayed.



This window contains a spread sheet showing values of grid nodes for five rows and five columns. Row and column indices are displayed by default. Selecting *Coordinate Axes* from the Axes pull-down menu displays the X and Y coordinates of the rows and columns instead.

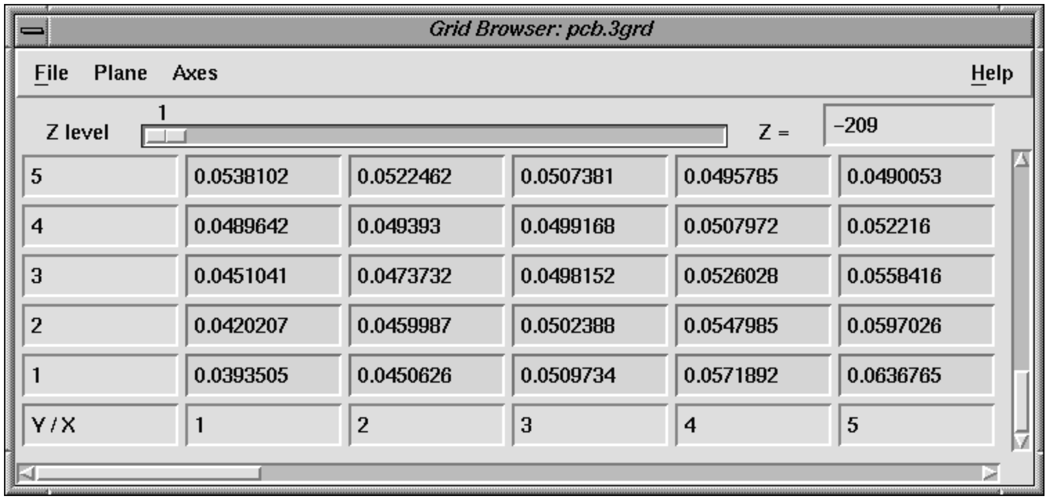
Moving the vertical or horizontal scroll bars moves the node value displays through the grid. The default position for node value display is the grid origin at the lower left corner. Individual node values can be changed by highlighting the numbers to be changed, and entering the new number via keyboard, although editing a grid in this manner is *not* recommended. Once all node editing has been completed, the 2D grid can be saved back to itself using *File –> Save* or to another file with the *Save As...* command.

The *File –> Grid Range* function lists a 2D grid's X, Y, and Z-ranges. The exact locations of the minimum and maximum Z-values are also listed.

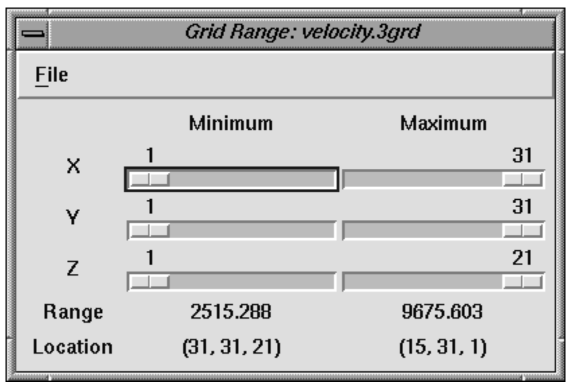


Browse a 3D Grid

If the selected file is a 3D grid, the browse is similar to that for a 2D grid except for the added ability to select a plane perpendicular to one of the principal axes in which the grid node values are displayed. Moving the slider bar located in the upper left part of the window performs this function. The Grid Browse window also contains the *Plane* function in the top menu bar for selecting the plane on which the grid node values are viewed. If the *X/Y Plane* option is selected, moving the slider bar changes the Z level the 3D grid. If the *X/Z Plane* option is selected, moving the slider bar moves the viewing plane to different Y rows. Likewise, selecting the *Y/Z Plane* sets the viewing plane to different X columns in the 3D grid.



The *File –> Grid Range* function lists a 3D grid's X, Y, Z, and P-ranges. The exact locations of the minimum and maximum P-values are also listed.



Plot (2D)

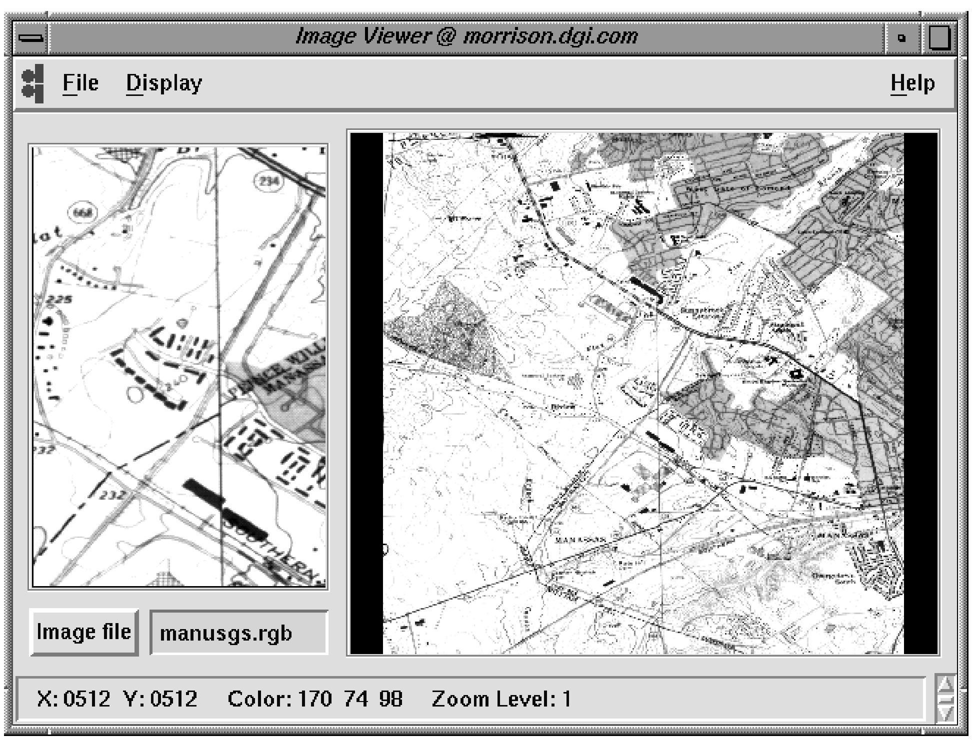
Two-dimensional files can be plotted by selecting the *Plot* button. This facility can be used to quickly verify the validity of the file or that it is indeed the one needed for the particular processing function. When *Plot* is selected, a window appears displaying information in the file.

Scattered data are displayed as a group of crosses indicating the locations of the contained data points, or as lines, if a line ID is specified. Fault files are displayed as lines and unfilled polygons. Volumetrics polygons are also drawn as unfilled polygons. Cross section and fence display traverses are displayed as lines. Annotation data are plotted as thin, solid lines, crosses, unfilled polygons, and plain text font. 2D grids are displayed as color-filled cells using a default color table to indicate changes in value.

The graphic window can be zoomed in on by pressing the middle mouse button at the upper left corner of the sub-area desired and releasing the button at the lower right corner. The new sub-area is redisplayed at the full graphic window size. Holding down the <shift> key while doing the same mouse functions produces a separate graphic window of the new sub-area. The area can be “panned” through via the horizontal and vertical scroll bars, as well. Zooming in and out, redisplaying the full range of the data, redrawing the window, and changing the background color from black to white can also be performed from the View pull-down menu.

Plot an SGI Image File

If the selected file is a Silicon Graphics (SGI) image file, the *Plot* button starts the *Image Viewer* program. Two views of the image file are displayed: a view of the full image on the right; a zoomed-in view (of the center) on the left. The center point of the zoomed window is enclosed with a black (or white, depending on the color of the center point) outline box.



The currently outlined pixel's coordinates and its color (in amounts of red, green, and blue) is displayed in the message area at the bottom of the window. The "zoom level" indicates how closely the window is zoomed in. One is the minimum level and shows the most area; there is no fixed maximum. The following controls are used to change the current zoomed in view:

Function	Controls
Change the Center Point of the Zoom	Left Button
Zoom In	Middle Button
Zoom Out	Control-Middle Button

The controls can be used in either the full image window or the zoom window. With these functions, three points with known real world coordinates can be selected to determine equivalent pixel coordinates for registering the image for display in the 3D Viewer. Information on the new center pixel is updated for the new zoomed in view.

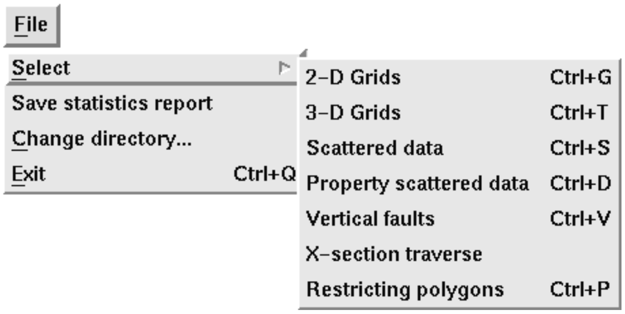
The pixel information can be used in the 3D Viewer program when draping a scanned image (in the SGI image file format) to correlate the image file pixels to data scale (i.e., real world) coordinates. Pixel location information must be noted, an image registration file created, and then the 3D Viewer program entered. A more sophisticated Image Registration program is available (from the Data Import function on Utilities menu) that displays an image file and a data file (refer to the *Utilities* document, page UTIL-36). Coordinates can be interactively selected from both the image file display and data file display, and saved to an image registration file (refer to page FL-42 for information on image registration files).

3D View

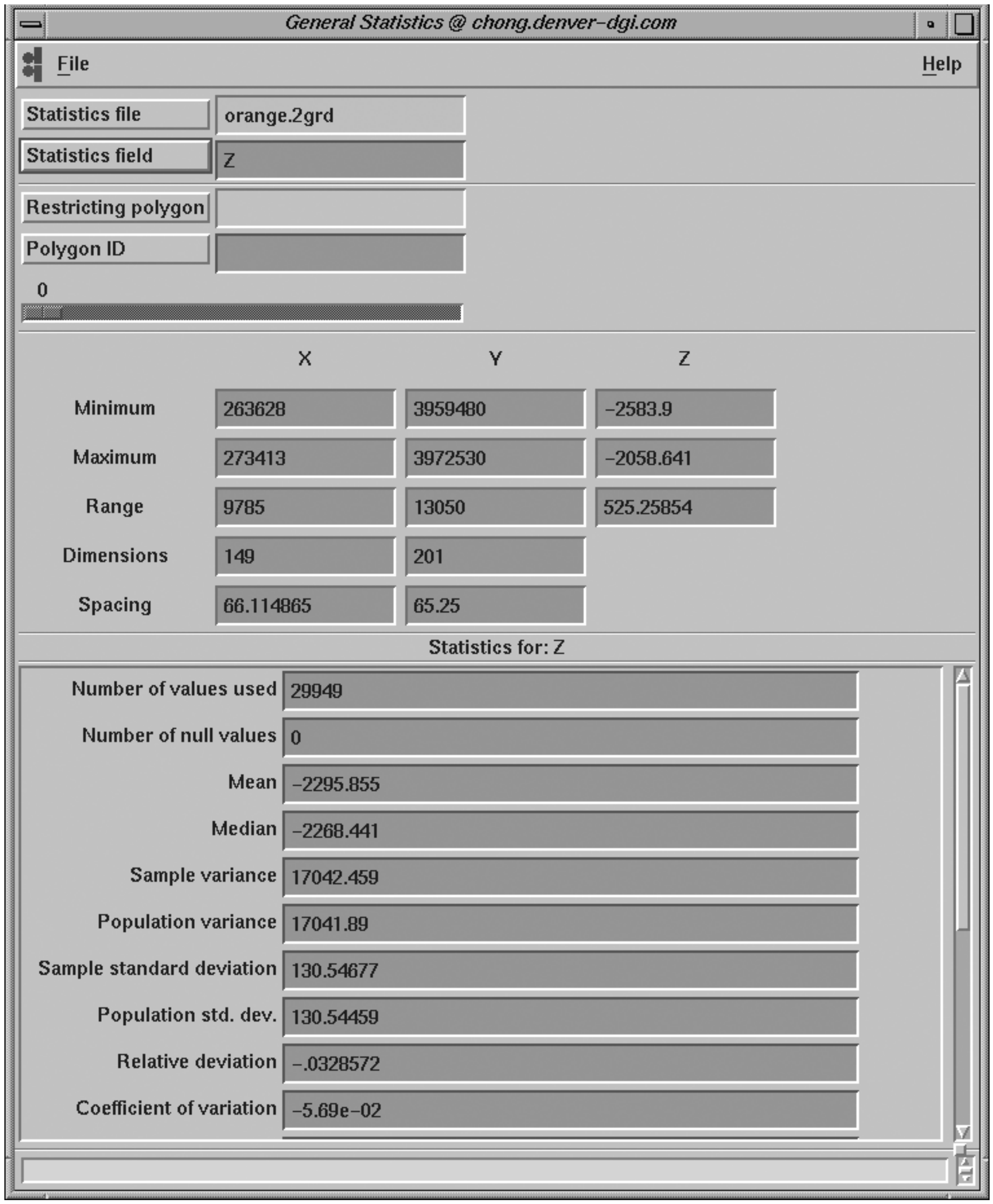
Two- and three-dimensional grids, scattered data, and property data can be displayed and interactively manipulated with a 3D viewing capability by selecting the *3D View* button. The interactive *3D Viewer* program is activated and the selected file is displayed in three dimensions. Scattered and property data files are displayed as colored points floating in space. The color of the points is controlled by the elevation, property, or selected Z-value or P-Value. Two-dimensional grids are displayed as "zero-thickness" smooth, shaded surfaces floating in space. The grid surface can be of a single-shaded color or can display color-coded elevation values at a user-specified interval. The surface can be rotated in any direction or sliced to examine a particular area. 3D grids are "contoured" similar to a faces file display but slices are available only along the grid node locations; for conformal 3D grids, the slicing is also conformal to the surfaces used in the original calculation.

Statistics

The *Statistics* function brings up the interface on the next page, which computes and displays data ranges and statistics for scattered data, property scattered data, 2D grids, 3D grids, vertical faults, and cross-section traverses. The data or grid nodes can be restricted by a specific polygon in a polygon file. For a data file (i.e., scattered data, property scattered data, vertical faults, and cross-section traverses), statistics are displayed for a specified field.



The *File –> Select* function or the *Statics File* push button or textbox can be used to select a file for which statistics are calculated. The desired field is selected via the *Statistics Field* push button or text box. Statistics can be saved to an ASCII report file by selecting *File –> Save Statistics Report*. If a restricting polygon file is specified, the statistics report file lists the statistics within each polygon in the restricting polygon file. The example on the next page shows the statistics computed for a 2D grid.

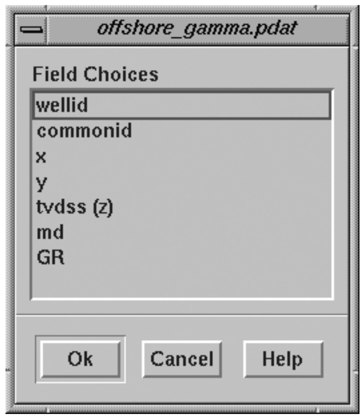


Each of the parts of the window and each of the statistics that appear in the report are described next.

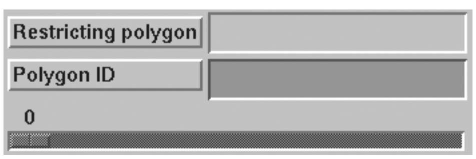
Statistics File

Selecting the Statistics file button opens a File Selection window, which allows you to pick from a list of available scattered data, grids, traverse files, or vertical fault files.

Choosing the Statistics field button opens the Field Choices window. Select from this list the variable for which the statistics are to be calculated. An example Field Choices list is displayed below.



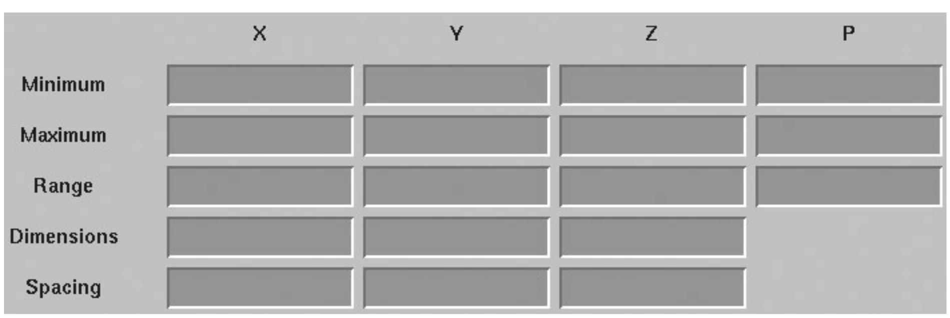
Restricting Polygon



The data or grid nodes used to determine the statistics can be restricted by a polygon. A restricting polygon file is selected via the Restricting polygon button. If the polygon file contains more than one polygon then the active polygon is selected using either the Polygon ID button or the scroll bar.

Range

The Range portion of the Statistics window displays the coordinate and/or variable limits of the data, grid, fault, or traverse file. When the restricting polygon is changed, the range of the data used in calculating the statistics is updated.



Number of Non-Null Values

The *Number of Non-Null Values* is the total number of data points with valid values in the selected field. A valid value is numeric, and contains neither alphabetical characters nor blanks.

Number of Null Values

The *Number of Null Values* is the total number of data points whose value in the selected field contains either alphabetical characters, blanks, or equals the EarthVision null value of 1.0E20.

Mean

The mean is obtained by summing the observed values and dividing by their number.

$$m = \frac{1}{n} \sum_{\alpha=1}^{n} Z(u)_\alpha$$

The mean is used to characterize the central value of a data set. It should be noted that the mean is sensitive to outliers (extreme values).

Mean estimates at geological sites can be strongly biased by selective sampling. For example, samples taken only in the contaminated interval at groundwater pollution sites, or samples taken only in the oil producing interval at petroleum sites.

Median

The median is the middle value of the data points when they are ranked in order, i.e.:

$$Z(u)_1 \leq Z(u)_2 \leq .... \leq Z(u)_n$$

When n is an odd number:

$$M = \frac{Z(u)_{n/2} + Z(u)_{n/2+1}}{2}$$

When n is an even number:

$$M = Z(u)_{(n+1)/2}$$

For example the median of the data set {0.4, 0.5, 0.6} is 0.5, and for the data set {0.3, 0.4, 0.5, 0.6} is 0.45.

The median, like the mean, is a measure of central tendency. The median is less sensitive than the mean to outliers (extreme values).

Variance

The variance measures the spread of the data from the mean via the square of the distance.

Population Variance

$$\sigma^2 = \frac{\Sigma_{\alpha=1}^{n} (Z(u)_\alpha - m)^2}{n}$$

Sample Variance

$$s^2 = \frac{\Sigma_{\alpha=1}^{n}(Z(u)_\alpha - m)^2}{n-1}$$

The term “sample” has a precise meaning in statistics. The sample is the set of measurements that was actually recorded. A sample is a subset of the population. While the population is the entire set of entities from which samples are drawn.

In geological studies it is rare to collect the entire population. Geological studies usually deal with samples, and the samples are used to make estimates about the population.

A population can be infinite or finite. Examples of geological populations are the porosity values of a geologic formation, the permeability values of shale lenses as distinct from the surrounding sandstone, and the background concentration of chemicals as opposed to the plume or pay zone concentrations.

There are no definitive rules as to what defines a population. Some questions that can be asked are: Is it meaningful to subdivide the population based on the coordinates of the data and/or the geology ? After subdividing are there enough data within each population ? What are the goals of the study ?

- Standard Deviation . . . . measures the spread of the data from the mean, and is in the same units as the measured quantity, unlike variance. The standard deviation is derived from the square root of the variance.

Population Standard Deviation

$$\sigma = \sqrt{\sigma^2}$$

Sample Standard Deviation

$$s = \sqrt{s^2}$$

For normally distributed data:

- One standard deviation . . . . . 68.27% of the data points fall between m-s and m+s
- Two standard deviations . . . . 95.45% of the data points fall between m-2s and m+2s
- Three standard deviations . . . 99.73% of the data points fall between m-3s and m+3s

Relative Deviation

The relative deviation is a measure of the variation within a data set. It scales the standard deviation by the sum of all data points, and is expressed as a percentage. It is calculated via:

$$Rd = \frac{s \cdot 100}{m\sqrt{n}}$$

Coefficient of Variation

The coefficient of variation is measures the demensionless variation within a data set. Because the Coefficient of Variation is independent of the units used, it is useful for comparing between distributions where the units are different. It is defined by:

$$V = \frac{s}{m}$$

Quartiles

Quartiles divide the data based on their distribution into four portions. The first and third quartiles are the values such that 25% and 75% of the data values fall below that value, respectively.

The interquartile range is a measure of the spread of the data and is defined by:

Interquartile Range = I.Q.R = 3rd Quartile - 1st Quartile

Geometric Mean

The geometric mean is a measure of central tendency. For geological data sets it is useful for characterizing the average of samples that display geometric progression characteristics. In earth science applications the geometric mean is frequently used to characterize the average rate of fluid flow.

$$m_g =^n \sqrt{Z_1 \times Z_2 \times Z_3 \ldots Z_n}$$

Harmonic Mean

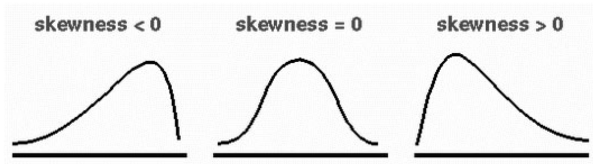
The harmonic mean is the reciprocal of the arithmetic mean of the reciprocals of the numbers, which in mathematical notation is:

$$m_h = \frac{n}{\Sigma_{\alpha=1}^{n} \frac{1}{Z_\alpha}}$$

For the harmonic mean to be calculated, all values must be positive. The harmonic mean is frequently used as a measure of average (effective) permeability.

Skewness

Skewness describes whether the distribution of data points is symmetrical about their mean. If skewness equals zero, the distribution is symmetrical. If the distribution of data points has a longer tail to the right of the distribution peak value than to the left, the data have positive skewness. If the tail is to the left of the peak value, then the data have negative skewness.

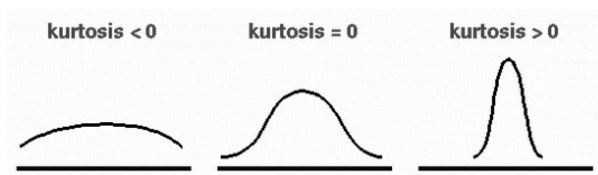


Skewness is calculated via:

$$skewness = 3\frac{m - median}{s}$$

Kurtosis

Kurtosis measures the concentration of data points around their mean. If kurtosis is equal to zero, the distribution is normal. When kurtosis is positive, the data points are concentrated around the mean and the distribution has a high peak. If kurtosis is negative then the distribution is flattened.



EarthVision measures the Fisher kurtosis, which is defined by:

$$kurtosis = \frac{\Sigma_{\alpha=1}^{n}(Z(u)_\alpha - m)^4}{n \cdot s^4} - 3.0$$

Center of Gravity

Center of gravity measures the centroid of the data or grid. If the values represented weights, then the center of gravity is the balancing point. For grids, each node value is weighted by its column, row, and level (the level is constant for 2D grids); this is the position vector. The center of gravity for a data set or grid is determined from:

$$Cg = (X, Y, Z) = \frac{\Sigma_{\alpha=1}^{n} V_\alpha \hat{r}_\alpha}{\Sigma_{\alpha=1}^{n} V_\alpha}$$

This method can be used to estimate the center of an irregular object.

Notation

α	- count, value between 1 to n
m	- mean of the data set
M	- median of the data set
n	- number of points within a data set
$\hat{r}$	- a vector
σ	- population standard deviation
s	- sample standard deviation
σ^2	- population variance
s^2	- sample variance
u	- coordinate (X,Y) or (X,Y,Z)
$Z(u_\alpha)$	- value of the data point at location u_α

Editing a File

The *Edit* function brings up a different editor depending upon the file type of the selected file. The Graphic Editor is invoked for non-vertical fault polygons (*.nvflt*), polygon data (*.ply*), scattered data (*.dat*), surface annotation (*.ann*), traverse data (*.trv*), vertical fault data (*.vflt*), 2D grids (*.2grd*), vector plot files (*.plt*), and volumetrics polygon data (*.vply*); refer to the *Graphic Editor* document. The Well Display File Editing program is run for well display files (*.wd*); refer to the *Well Display* document (page WD-8). The *Color Table Editor* is invoked for Z color files (*.zclr*); refer to the *Color Table Editor* document. Once in the editor, various edits can be made to the file.

EDA—Exploratory Data Analysis

The *EDA* push button brings up the EDA (Exploratory Data Analysis) from which data can be examined for duplicate data points, for statistical properties, and for errors in sampling and data division. The analysis of the data is based on graphical representations of the information. The graphs available are histograms, probability plots, p-p and q-q plots, and scatterplots. The graphs are interactive so that data within the graphs can be queried, subdivided on the basis of class intervals or correlation, and modeled using linear and nonlinear functions. The graphs generated by the EDA program can be saved and incorporated into reports or maps (via the Graphic Editor or Base and Contour Maps programs). Links are also provided to the Graphic Editor, Plot Viewer, and 3D Viewer.

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3D Viewer

The EarthVision® 3D Viewer allows interactive visualization and manipulation of 3D models in the form of faces files and 3D grid volumes, and of 2D models in the form of 2D grid surfaces. The 3D Viewer also allows the display, editing, and creation of scattered data, property data, and well path files. The 3D Viewer can be synchronized on more than one screen, so that both screens display the same image and manipulation. These capabilities are covered under the following chapters of this document:

- 3D Viewer Color Figures
- 3D Viewer File Types
- 3D Viewer Interface
- 3D Viewer Menus
- Color Editors
- Glossary of Terms
- Appendices

Documentation Release Date: August 1, 2002

To run the 3D Viewer program, a site must be licensed for one of the following license feature codes: ev_2dsvp, ev_2dxsvp, ev_2d3dsvp, ev2dx3dxsvp, ev_gmsvp, ev_gmxsvp, ev_3dvx. The ev_wd license code is also required to run the well database functions from the 3D Viewer. Any of these license codes could also have an _net or _win at the end of it.

In addition, the 3D Viewer can be run with any one of the following discontinued license feature codes: ev_2d3d, ev_2dx3dx, ev_gm, ev_gmx, ev_3d, ev_3dx, ev_3ddsv, ev_3dxdsvx, ev_3dv. Any of these license codes could also have an _net or _win at the end of it.

A Sun™ or SGI™ workstation or a Windows® or Linux® PC with 3D graphic capabilities is required to run the 3D Viewer. Check with the local Dynamic Graphics representative for a list of specific hardware models and requirements.

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Glossary

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Chapter 1: Introduction

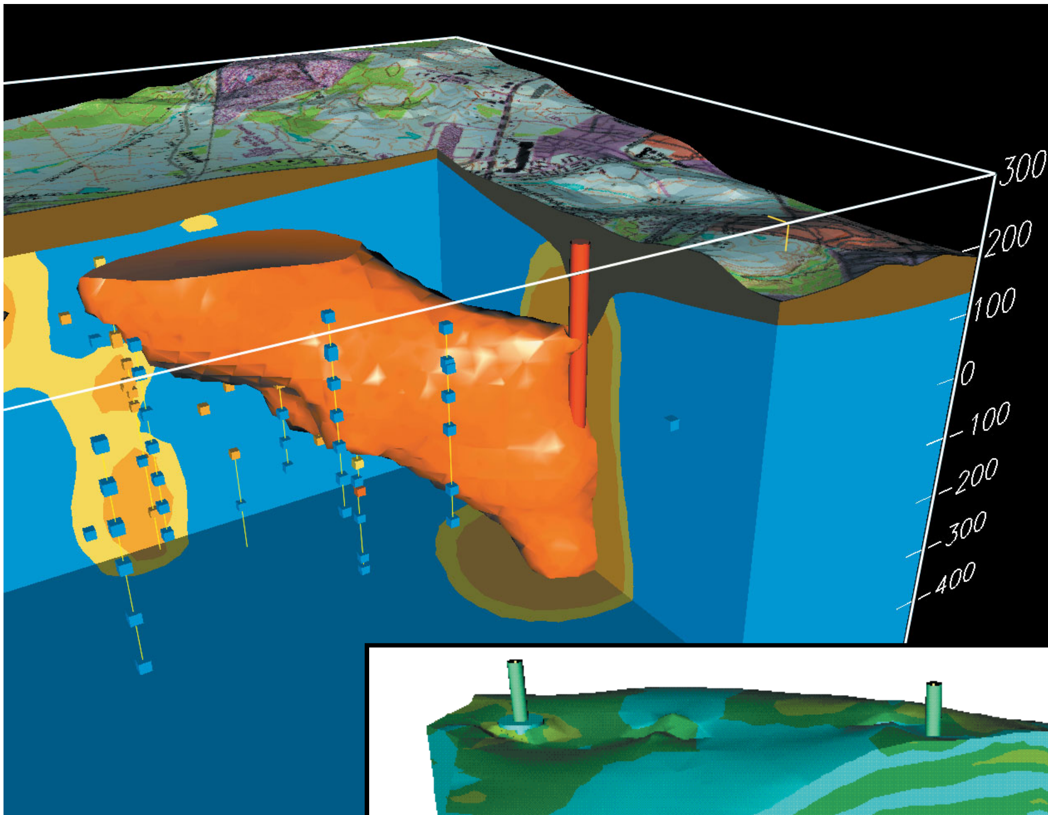
The 3D Viewer is used to view and manipulate input data (for example, well data, well logs, seismic data, and horizon and fault picks), 2D grid surfaces and 3D grid volumes after calculation, complex geologic structures, and finally the full 3D model, once this file is created. Examples of some of these data types are shown in the color figure pages, starting on 3DV Fig-1 (following this introduction). This document discusses how to use the 3D Viewer interface, as well as how to get the most out of the 3D Viewer. How to input the data, calculate a model, and create files for display in the 3D Viewer is discussed under the appropriate sections in the rest of the *EarthVision User's Guide*. Appendices and a glossary of terms specific to the 3D Viewer are available at the end of the 3D Viewer document.

The 3D Viewer: 3D Display, Visualization, and Editing

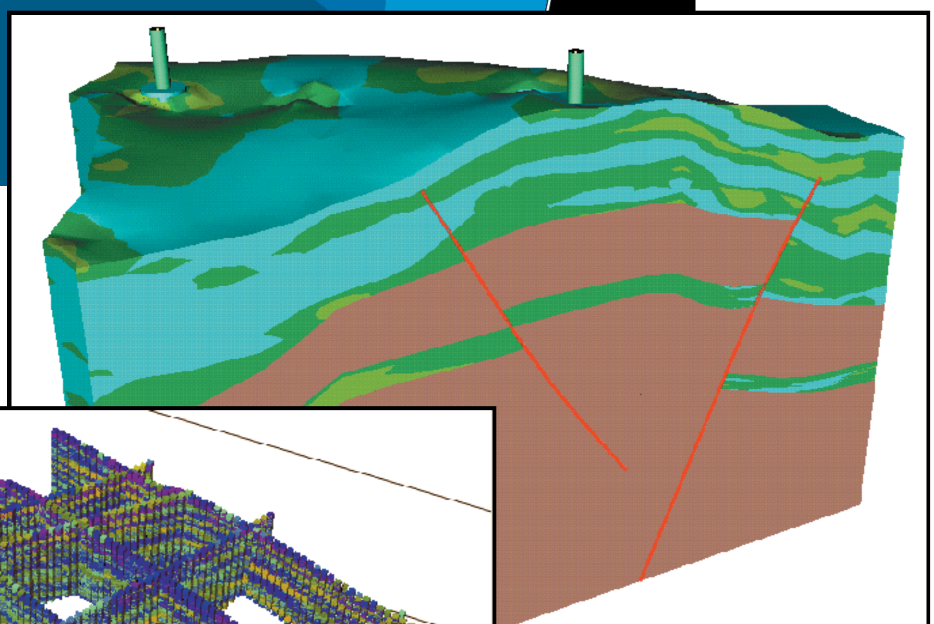
The 3D Viewer interactively displays scattered data files (*.dat*, *.pdat*, and *.path* files), vertical and non-vertical fault files, polygon files (both *.vply* and *.ply* files), 2D grids, 3D grids, and 3D models (known as faces files), providing the user with numerous display, editing, and capture functions. The initial display includes a command menu, the model or ASCII data, and a key, known as the color key. Once in the 3D Viewer, graphic aspects of the display can be altered, such as the view angle, vertical exaggeration, and ranges of the X, Y, Z, and P values displayed, and fault files or polygon files can be displayed. A host of menus are available that can be used to obtain a multitude of different images. Hot keys, which are single keystrokes representing commands, are also available for nearly every menu command.

These capabilities offer powerful tools for analysis, enabling the user to visualize the data prior to modeling, as well as view the final modeled surface, structures, or property. Beyond the basic capabilities of rotation and slicing, some of the more powerful analytical tools include:

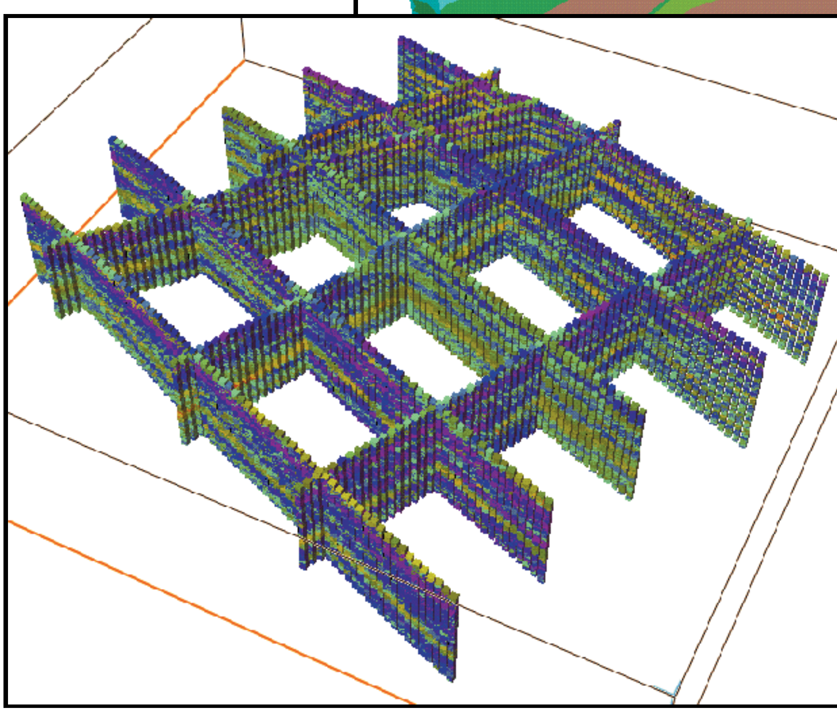
- Viewing and editing scattered data files prior to calculating a model
- Editing or creating additional scattered data files based on the model
- Displaying seismic data along with models for model and interpretation verification
- Calculating instant volumetrics
- Saving screen displays
- Creating a movie of views that can be played back later



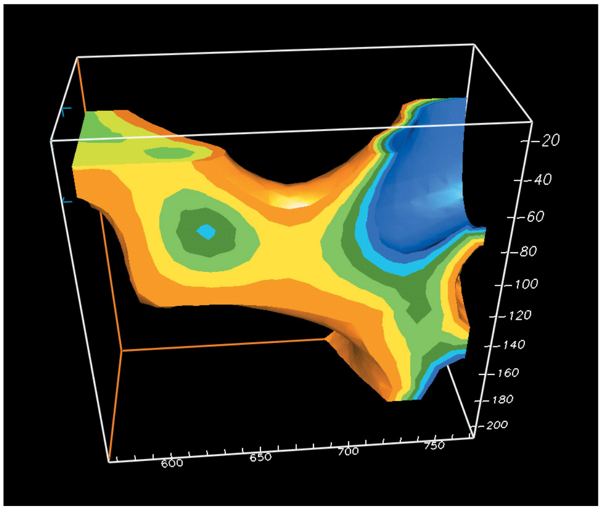
Chair mode view of a two-layer model with an isosurface, well tube, and well data displayed, along with an image overlay



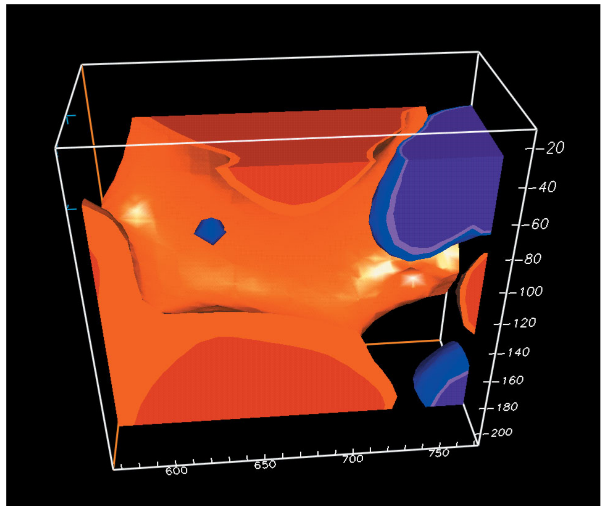
Faulted 3D property model, derived from data at left



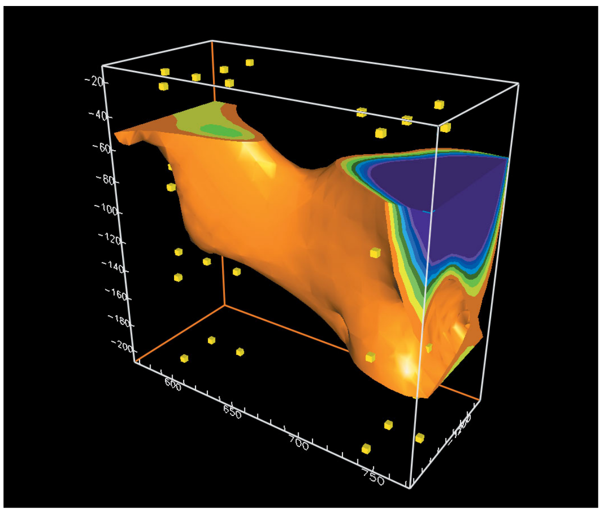
Two-dimensional impedance data shown in property colors

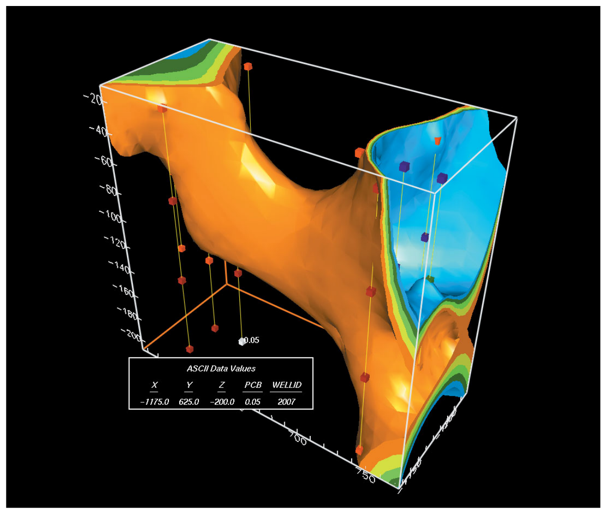


Isosurfaces inside a range
displayed for a sliced model

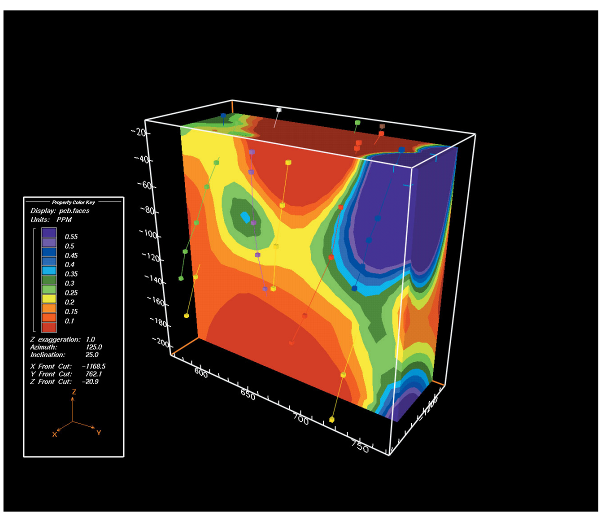


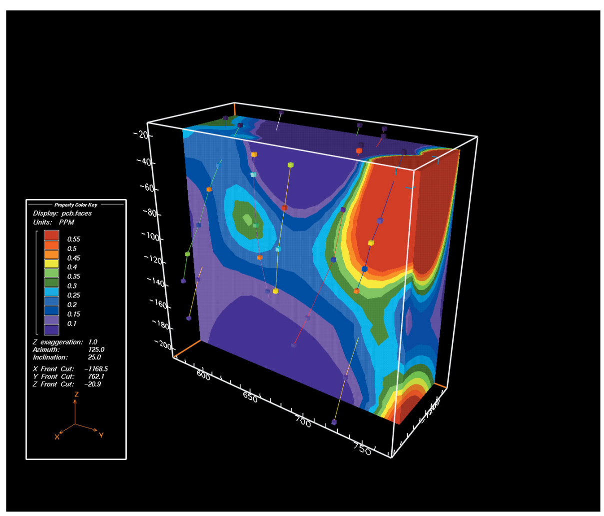
Isosurfaces outside a range
displayed for the samemodel

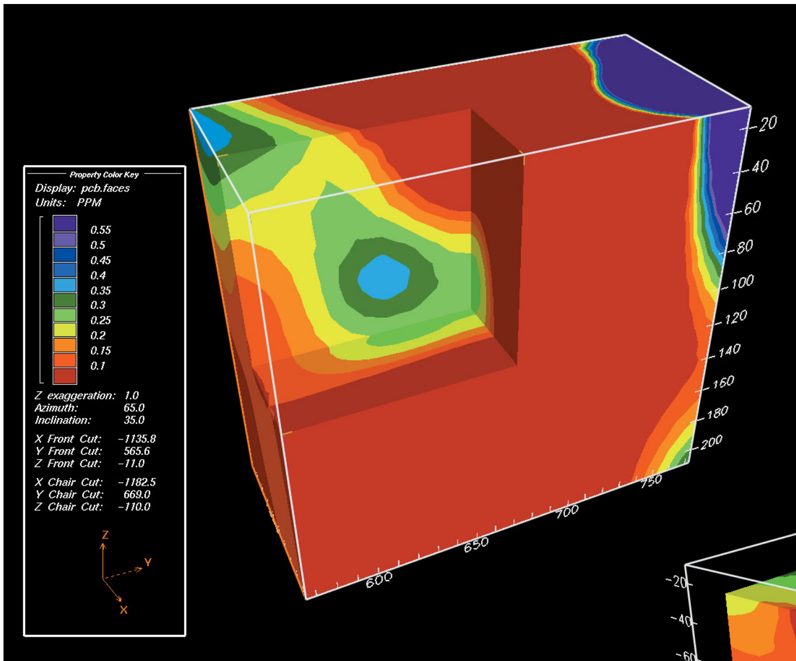

Data displayed in uniform colors
without lines



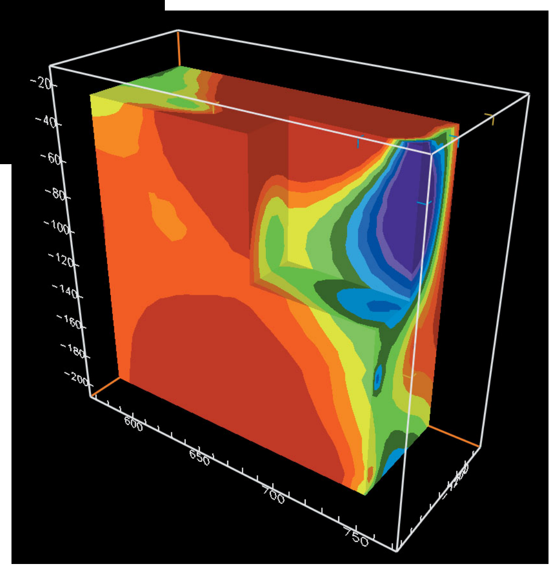
Lines, data, and values displayed
in property colors


Model with ASCII data
in uniform, line colors

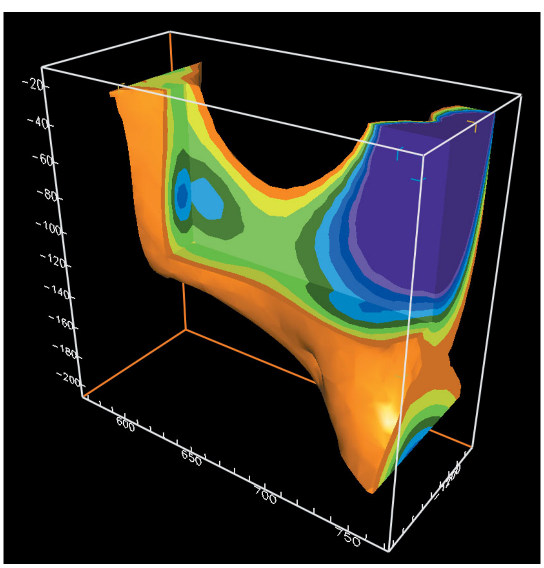

Model in reversed colors
with data in Z colors



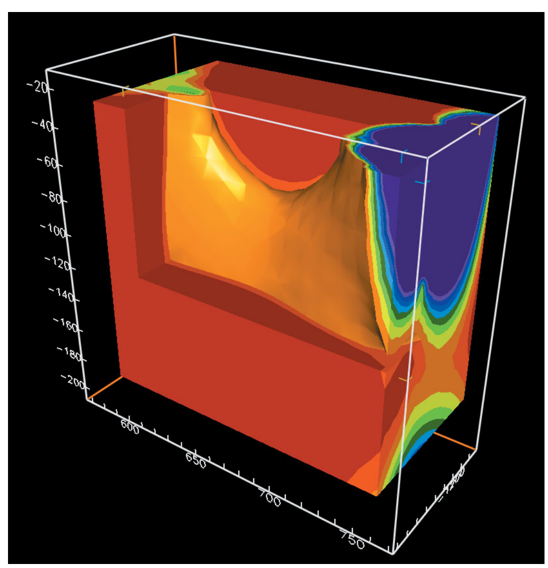
Default chair view of a concentration model



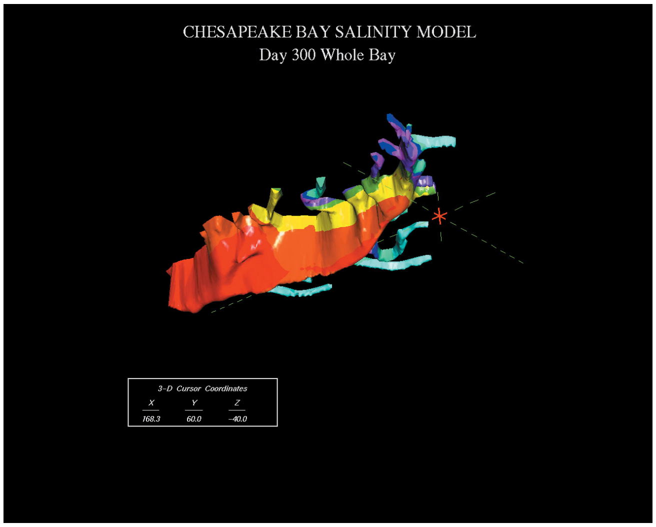
Chair view rotated with chair freeze off



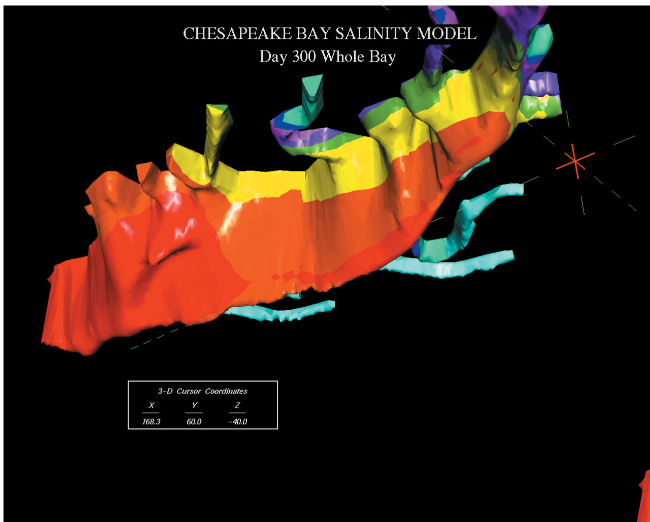
Model shells on with chair view



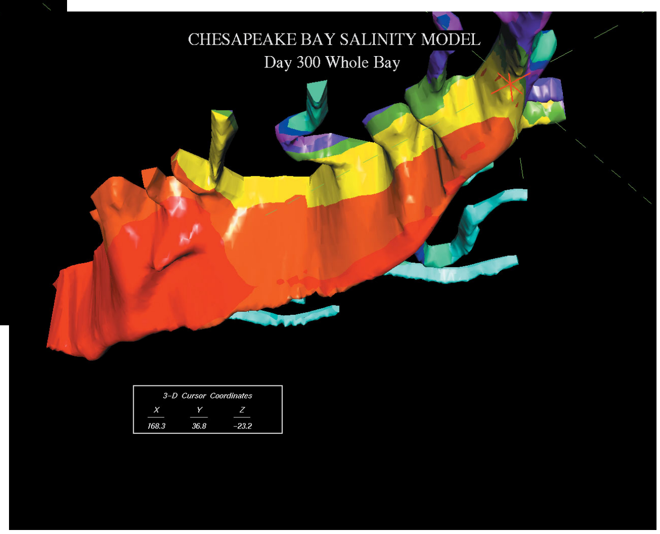
Chair shells on



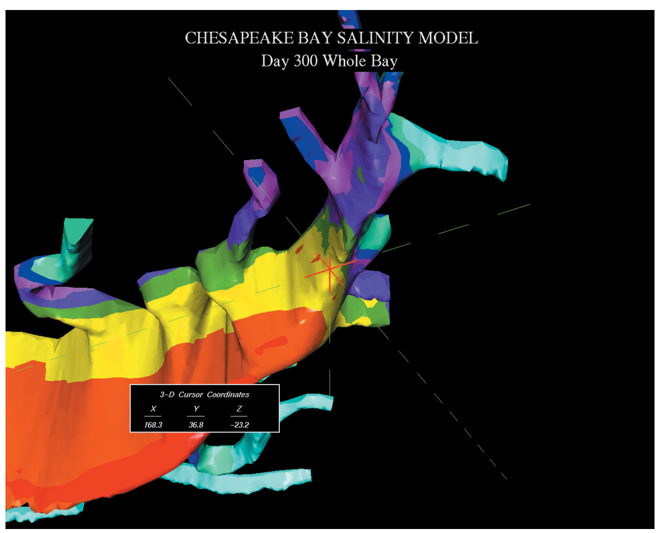
Default model with 3D cursor on



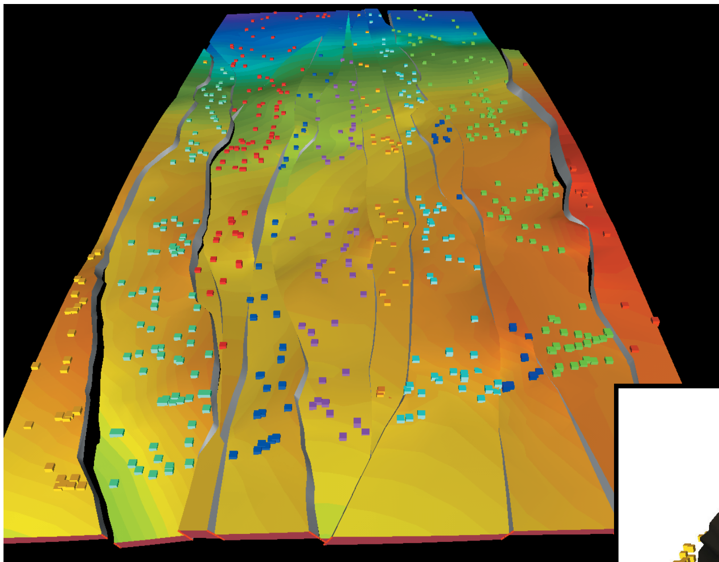
Zoomed model



3D cursor moved to desired look point

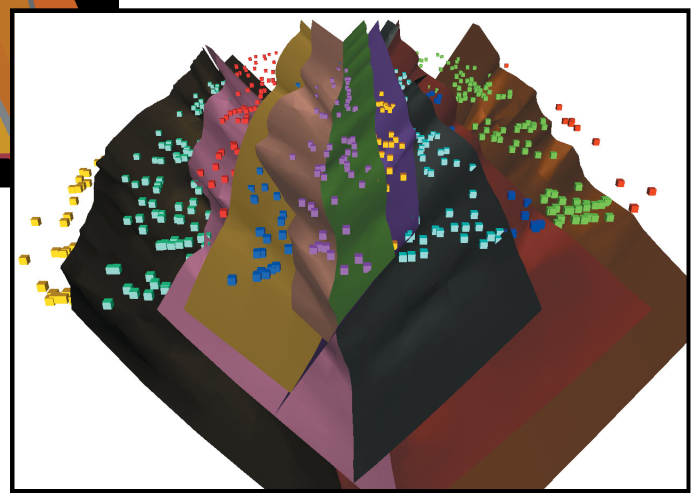


Look point changed

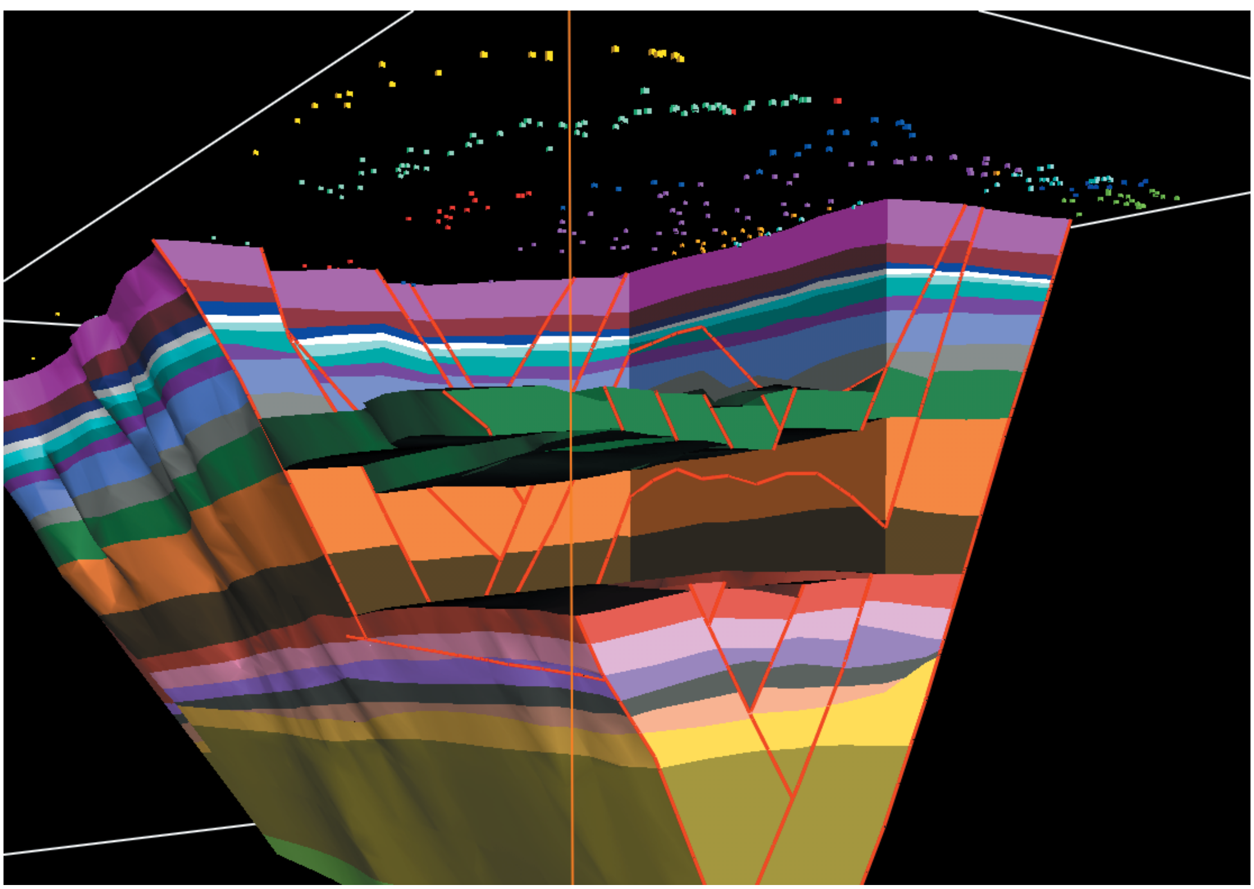


Color-filled contour map of elevations displayed, along with data, on top of a single faulted zone

Fault surfaces displayed with data color-coded by fault block

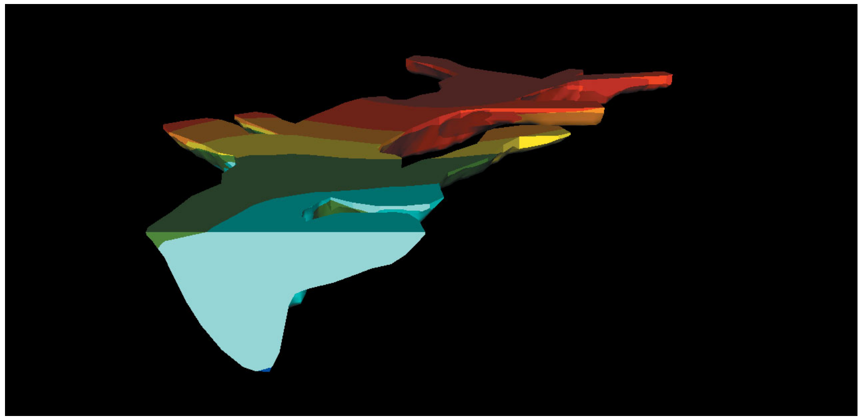


Full 20-layer, faulted model displayed, with data, with chair mode off in one zone

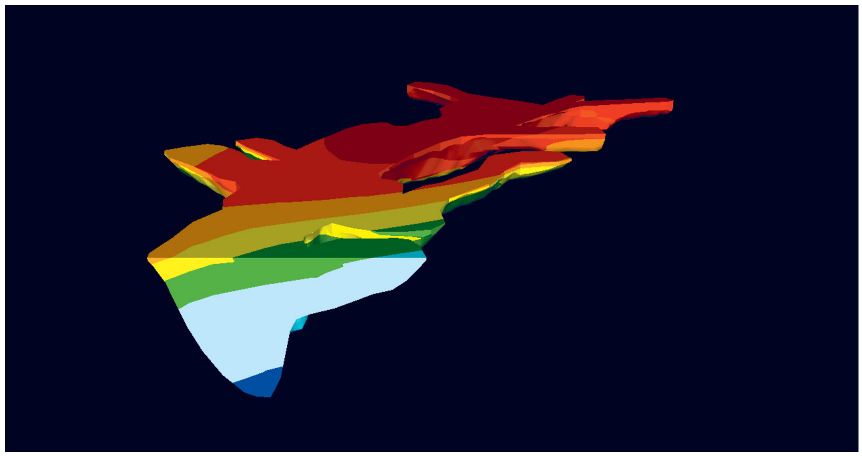


Time sequence of salinity on the following days:

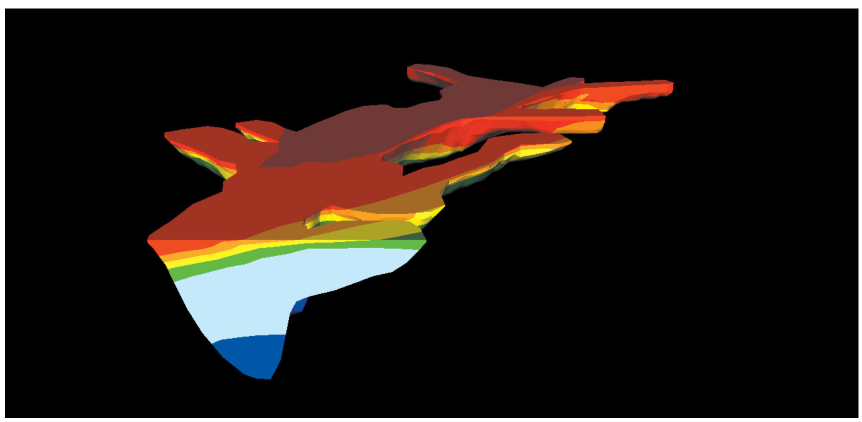
Day 320



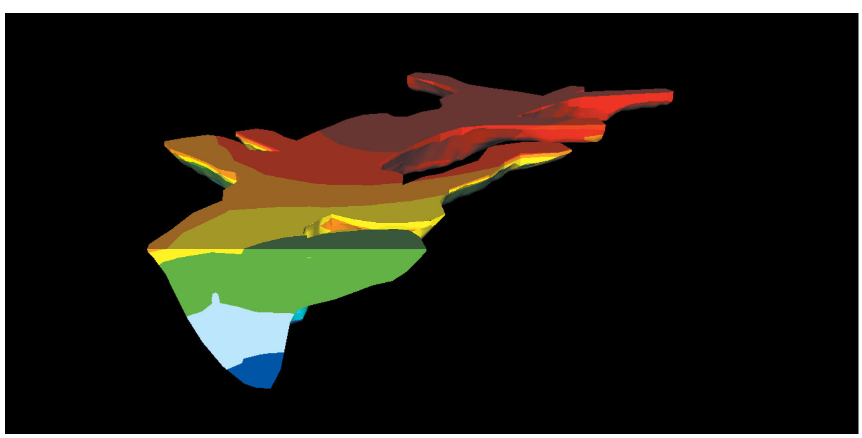
Day 326

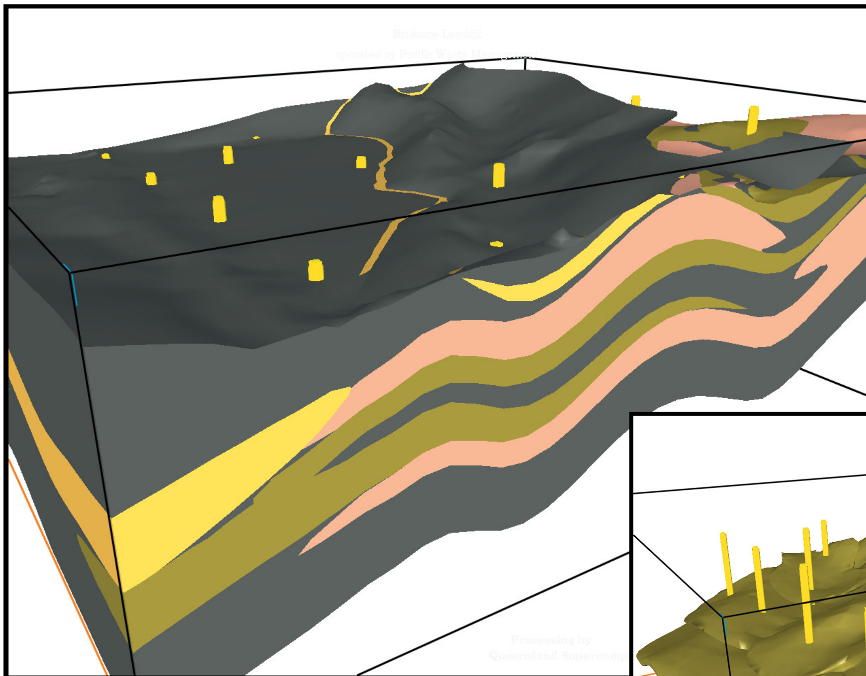


Day 330

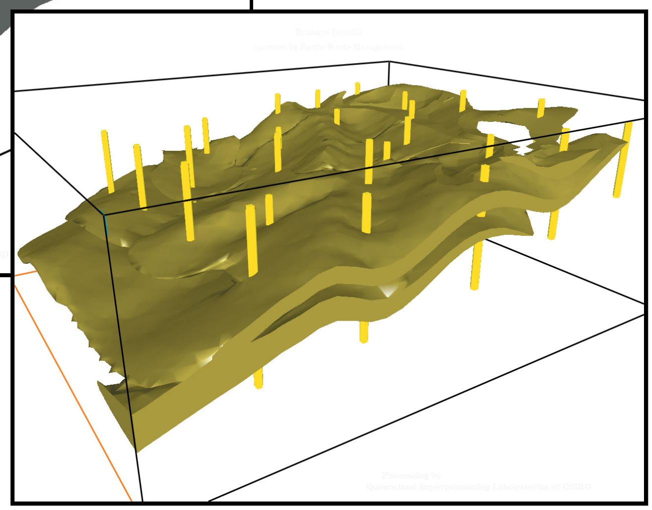


Day 338

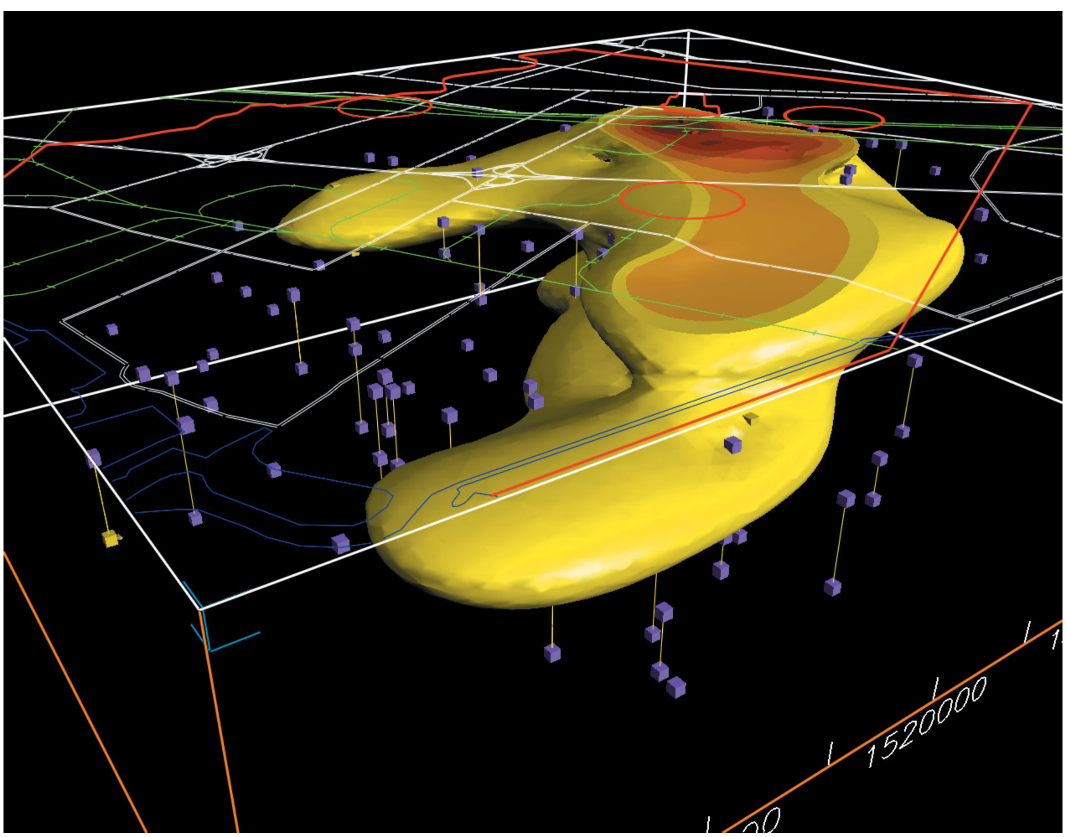




Brisbane Landfill:
Four-layer model of deformed, interfingered, lithologic units



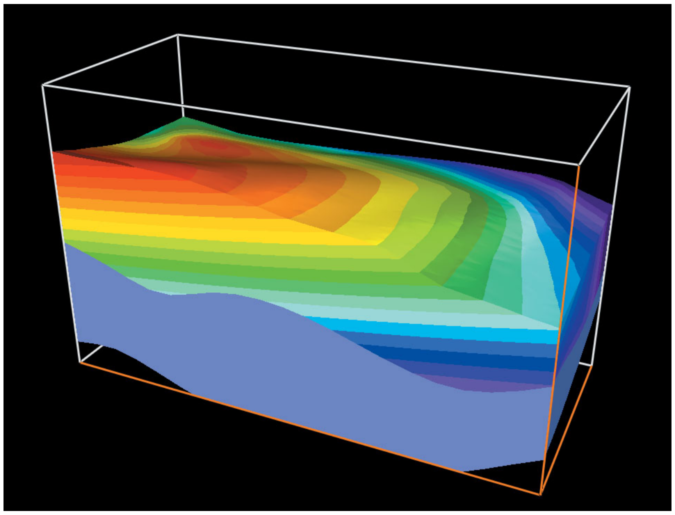
Processing by Queensland Supercomputing Laboratories of CSIRO. The Brisbane Landfill is operated by Pacific Waste Management. Well tubes are for display purposes only.



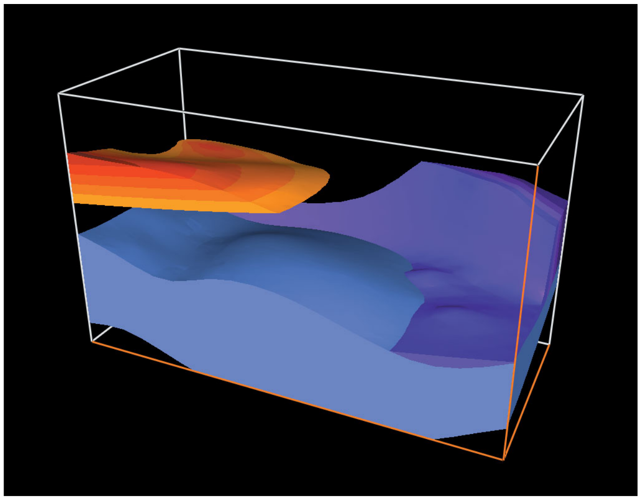
Site annotation displayed above contaminant plume and input data

Two Layer Model

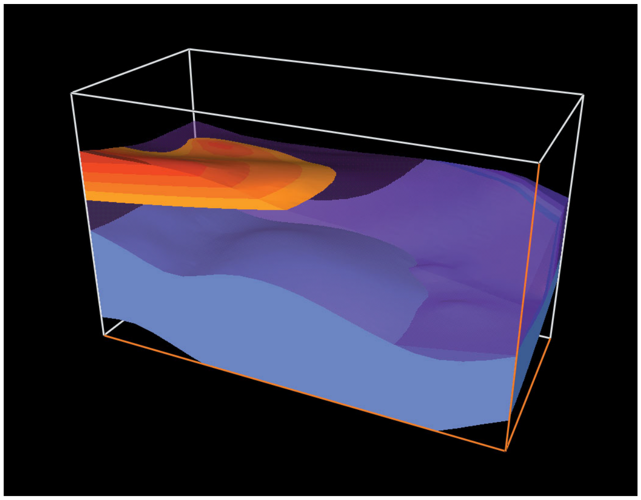
Zone 1 Property Colors
Zone 2 Zone Colors



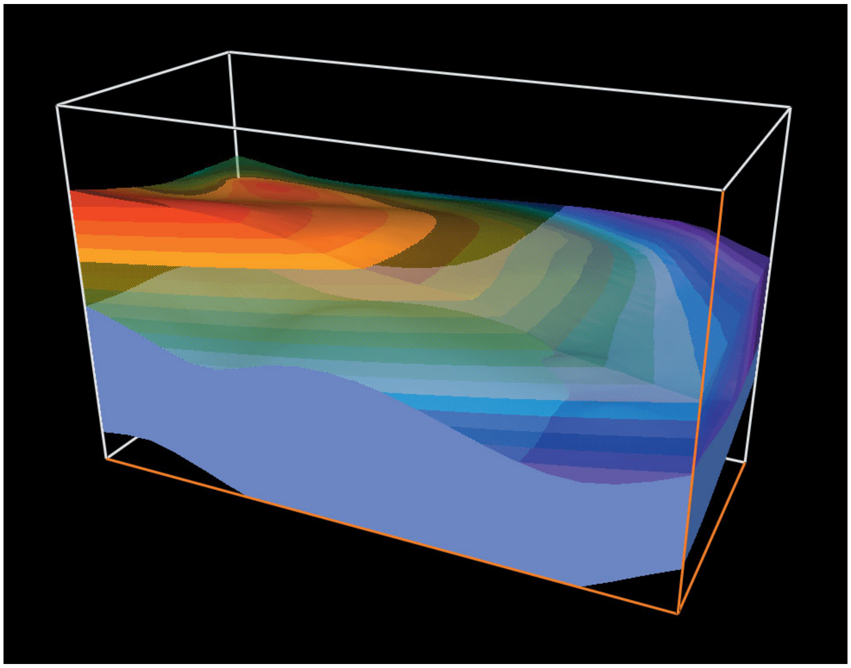
Selected Isosurfaces in Zone 1

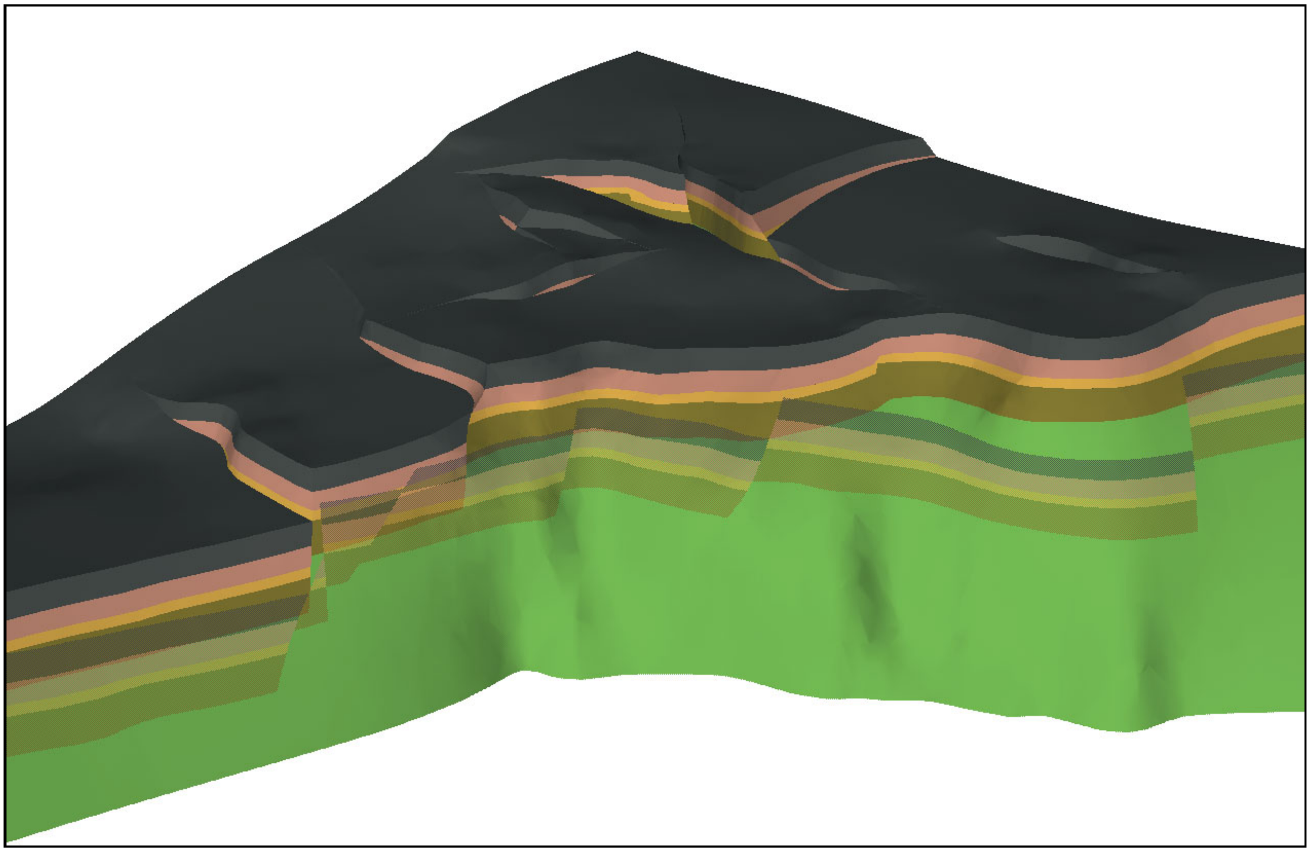


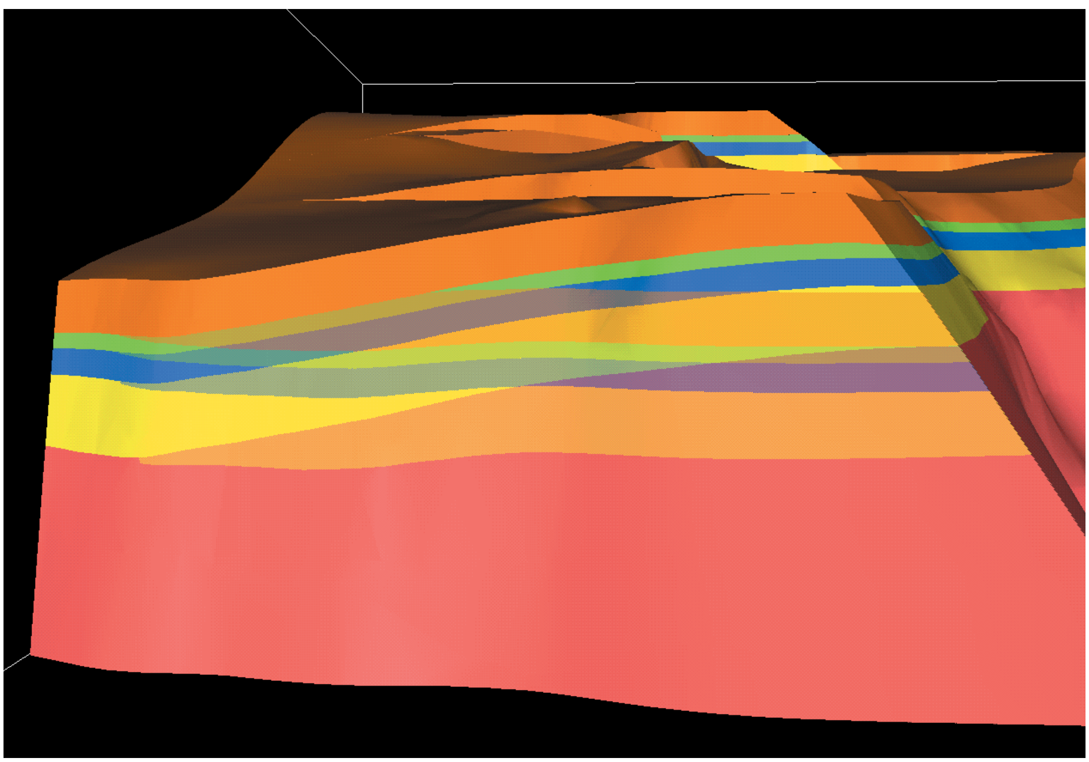
Zone Transparency in Zone 1



Property Transparency
on in Zone 1







Allan fault plane zone displays on an extensionally faulted model

Chapter 2: 3D Viewer File Types

Several different file types are used and/or created in the 3D Viewer. Most of these files are initially created elsewhere in EarthVision (e.g., in faces file generation). All of the files fit into at least one of the following categories:

- Input Data Files . . . . such as faces files and list files
- Output Data Files . . . . such as vue files and color files

Input Files

Input files to the 3D Viewer consist of faces files, scattered data files, 2D grids, 3D grids, surface annotation files, scattered and property data files, well path files, vertical and non-vertical fault files, vue files, color files, script files, list files, and well database files. These files are created either in the 3D Viewer, EarthVision, or by using a system editor. The 3D Viewer input files are not used to "calculate" other data files, rather they are used for display purposes: either to be viewed, or in some way determine the view. Each file type is discussed in more detail next.

Faces Files (.faces)

Faces files are created in Faces File Generation, Faces File Merging, the Geologic Structure Builder, or the WorkFlow Manager and are designed for display of 2D and 3D grids in the 3D Viewer. These binary files contain X, Y, and Z coordinates for each user-specified isovalue level, making them essentially 3D contour maps. Faces files also have a header record that contains information such as its title, data units, and associated scattered data file. Two types of faces files exist: sliced and unsliced. Unsliced faces files can be sliced at any arbitrary location (refer to the *Manipulate Menu* section of this document, page 3DV 4-12) and can be generated by the Geologic Structure Builder (page GSB-16), the WorkFlow Manager, or in Faces File Generation (page FFG-5). All faces file names must end with the suffix *.faces*.

Scattered Data, Property Data, and Well Path Files (.dat, .pdat, .path)

ASCII scattered data, property data, and well path files can be displayed and, if desired, edited in the 3D Viewer either with or without a faces or grid file. These files could, for example, represent either scattered data that were used as input to gridding or points along lines of any kind, such as well bores or seismic lines. Refer to the main EarthVision *Files* document for a more detailed definition of the scattered data file type and an example of a scattered data file.

These data files can be used to view input data prior to gridding, for editing, as a reference file unrelated to the faces file, and to view any Z- or P-field for an entire data set.

Multiple Z-fields can be selected when displaying a scattered data file. The default colors used for each Z-field differ: yellow is used for the first Z-field selected, then (in order) green, red, blue, orange, magenta, brown, and white for subsequent fields, cycling back through the colors. Z-fields with line IDs or well IDs are drawn with lines connecting each point along a given X,Y path, as appropriate. Data editing and data animation cannot be performed when multiple Z-fields are selected.

The file must, at minimum, contain an X, Y, and Z field. A P-field is optional. Other optional fields are also available. The 3D Viewer recognizes the following field names in scattered data, property data, and well path files:

Field Name	Definition
x	The spatial X location of the data point.
y	The spatial Y location of the data point.
z†	The spatial Z location of the data point. *Note*: *Z by default increases upward; depth field values must be indicated by setting the Z field units as “downward” (e.g., “feet downward”)*
p†	The property value at the X,Y,Z location.

† In addition to the Z-field and P-field names (Z and P), any fields that do not have one of these “special” names (e.g., X, Y, feature, etc.) are considered to be potential Z- or P-fields, and any of the P-fields can be edited in the 3D Viewer.

comment	A comment field is available so that text strings associated with a data location can be posted when clicking on a data point (refer to Display File N*ame, P, Z, and Other Field Values*, page 3DV 4-150).
lineid, wellid	Data points with the same value in this field are located along the same line; if the field is absent or blank, the 3D Viewer assumes that the points are not connected by any kind of line. Up to 20 characters are allowed.

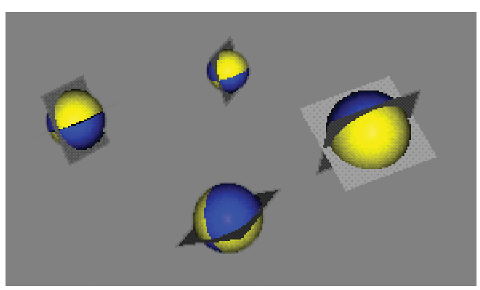
Note: *If a line ID field is blank, then the points are drawn as individual points. When a line ID is present and a line color field is not specified, the lines connecting the data points are drawn in a default color of yellow. If the line color, dip, dip azimuth, or any symbol fields are not in the file’s header, then this information is not asked about when editing points nor can it be added to the file using the 3D Viewer. These fields have to be defined first, even if they were left blank.*

linecol	The color with which to draw the line; valid values are between 1 and 72 (see EarthVision Appendix C for the available colors); if this value varies from point to point (when the points have the same line ID), the line connecting the points is drawn in the color of the first point in the segment (hence, a line may be drawn in multiple colors).
radius	Data points with the same line IDs that have a *radius* field can have a tube of varying radius (as defined by the values in this field) drawn along the length of the line; this tube is displayed by selecting the *Edit Tube* function on the Edit Data Menu (refer to *Create/Edit Tubes*, page 3DV 4-101).
dip	The measured dip at that data location; valid values are from 0 to 90; data locations that have associated dip and dip azimuth values have a disk displayed at that location in the direction of the values given.

Field Name	Definition
dipazm	The compass direction or azimuth of the dip; valid values are from 0 to 360; data locations that have associated dip and dip azimuth values have a disk displayed at that location in the direction of the values given.
featureid	An alphanumeric description (up to 20 characters), such as “ABC Fault” or “Top Zone”; points with the same value are considered to be along the same feature (such as a fault plane, or located within the same zone); can be used in conjunction with featurecol.
featurecol	Points that have the same value (1–64) are drawn in the same color (as defined by the feature color table) and are located along the same feature or fault plane (this number could be used to represent any kind of continuous feature; refer to *Edit Data Menu*, page 3DV 4-83); can be used in conjunction with featureid.
symbol	The symbol to draw at the data (X,Y,Z) location; valid values are 1 = cube[default] 2 = cross 3 = diamond 4 = hourglass 5 = column 6 = sphere 7 = bi-colored sphere or earthquake foci symbol* (shown on page 3DV 2-4). 8 = elliptic disk** (shown on page 3DV 2-5). 9 = ellipsoid† (shown on page 3DV 2-5). 10 = round disk†† (shown on page 3DV 4-42). * Requires fields TPLUNGE, TAXIM, PPLUNGE, PAZIM, NPLUNGE, and NAZIM; otherwise, the default cube is drawn. ** Requires fields DIPMIN, DIPAZMMIN, DIPMAX, DIPAZM MAX, AXISLENMIN, AXISLENMAX, DISKTHICKNESS; otherwise, the default cube is drawn. † Requires fields DIPMIN, DIPAZMMIN, DIPMAX, DIPAZMMAX, AXISLENMIN, AXISLENMID, AXISLENMAX; otherwise, the default cube is drawn. †† Drawn at specified DIP and DIPAZM. If DIP and/or DIPAZM are not specified, 0.0 is assumed; if DIP and DIPAZM are present, symbol 10 is assumed, unless another symbol value is specified.
symsize	Determines the scale factor (or size) with which the symbol is drawn; the default is 1.0; any number between 1 and 100 is valid; this field can also be used to change the symbol size based on the passage of time (refer to 3DV 4-115).
symdatasize	Although required for the earthquake foci symbol or bi-colored sphere (symbol 7), this field can be applied to any symbol type; it specifies half the width of the symbol in XY (the effective “radius”). For the dip/dipazm disks (symbol #10), it specifies the radius of the disk (regardless of orientation). The radius is specified in data scale units. This field differs from the symradius in that as the Z-exaggeration is increased or decreased, the Z height of the symbol will increase or decrease, respectively; with symradius, the Z height always maintains a proportional size to the XY width.

Field Name	Definition
symradius	Similar to symdatasize, the setting specifies half the width of the symbol in XY.For the dip/dipazm disks (symbol #10), it specifies the radius of the disk (regardless of orientation). The radius is specified in data scale units. This field differs from the symdatasize in that as the Z-exaggeration is increased or decreased, the Z height of the symbol changes so that it appears to maintain the same proportional size to the XY width.
symcolor	The color with which the symbol is drawn; valid values are between 1 and 8 (refer to the EarthVision Appendix C for the available colors).
symtrans	Determines whether the symbol is drawn as a solid object (a value of 0) or if it is drawn transparent (a value of 1).
time	Determines the time sequence of the data points when using the data animation capabilities; for a given line or well ID, the time values must be in increasing order in order to be used for data animation (refer to 3DV 4-113); time field can also be selected as a Z field.
zoneid	The alphanumeric ID (up to 20 characters) of the zone where the data point is located. This value is often assigned by the Geologic Structure Builder or by the *ev_label* utility.
zonecol	The assigned color (1–72) of the zone in which the data point is located. This can be assigned by the user.
faultblock	The alphanumeric ID of the fault block where the data point is located. Like the zone ID, this value is often assigned by the Geologic Structure Builder or by the *ev_label* utility.
straight	Determines whether the segment that precedes the current point should be constrained to be straight (nonzero value) or not (0 or blank).
shotpt	The shotpoint ID (up to 20 characters) for the current point. This field is used in seismic data files.

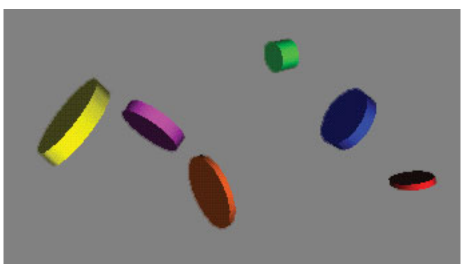
Earthquake foci symbol field names additionally recognized (SYMBOL field 7 required):

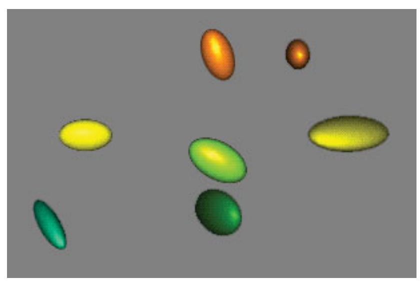


tplunge	The measured plunge angle of the tensional axis; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.
tazim	The measured azimuth angle of the tensional axis; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.

Field Name	Definition
pplunge	The measured plunge angle of the compressional axis; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.
pazim	The measured azimuth angle of the compressional axis; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.
nplunge	The measured plunge angle of the neutral axis, that is, the axis of intersection of the tensional and compressional axes; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.
nazim	The measured azimuth angle of the neutral axis, that is, the axis of intersection of the tensional and compressional axes; valid values are 0.0 to 360.0. This field is required for symbol 7 to be drawn.
symdatasize	Determines the radius of the earthquake foci symbol or bi-colored sphere, symbol 7. Radius is specified in data scale units. This field can be applied to any symbol type; it specifies half the width of the symbol in XY (the effective “radius”). For the dip/dipazm disks (symbol #10), it specifies the radius of the disk (regardless of orientation).
eqtsymcolor	The color with which to draw the tensional quadrant of the earthquake foci symbol (bi-colored sphere).The default color is blue; valid values are 1 to 72 (refer to the EarthVision Appendix C for the available colors).
eqpsymcolor	The color with which to draw the compressional quadrant of the earthquake foci symbol (bi-colored sphere).The default color is yellow; valid values are 1 to 72 (refer to the EarthVision Appendix C for the available colors).
eqfltplane1	Toggles whether or not a fault plane is drawn bisecting the tensional and compressional axes on earthquake foci symbols; valid values are 0 (not drawn) or 1 (drawn).
eqfltplane2	Toggles whether or not a fault plane is drawn whose normal bisects the tensional and compressional axes on earthquake foci symbols; valid values are 0 (not drawn) or 1 (drawn).

Elliptical and Ellipsoid disk symbol fields names additionally recognized (SYMBOL field 8 or 9, respectively, required):

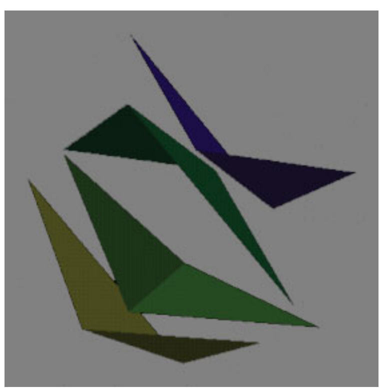


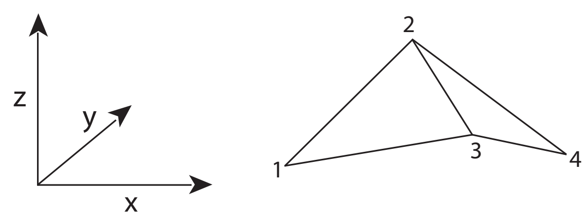


dipmin	The measured dip angle of the minimum principle axis of symbols 8 or 9; valid values are 0.0 to 360.0. This field is required for symbols 8 or 9 to be drawn.

Field Name	Definition
dipazmmin	The measured dip azimuth of the minimum principle axis of symbols 8 or 9; valid values are 0.0 to 360.0. This field is required for symbols 8 or 9 to be drawn.
dipmax	The measured dip angle of the maximum principle axis of symbols 8 or 9; valid values are 0.0 to 360.0. This field is required for symbols 8 or 9 to be drawn.
dipazmmax	The measured dip azimuth of the maximum principle axis of symbols 8 or 9; valid values are 0.0 to 360.0. This field is required for symbols 8 or 9 to be drawn.
axislenmin	Determines the radius or length of the minimum principle axis of symbols 8 or 9. Value is specified in data scale units. This field is required for symbols 8 or 9 to be drawn.
axislenmid	Determines the radius or length of the intermediate principle axis of symbol 8, an elliptical disk. Value is specified in data scale units. This field is required for symbol 8 to be drawn.
axislenmax	Determines the radius or length of the maximum principle axis of symbols 8 or 9. Value is specified in data scale units. This field is required for symbols 8 or 9 to be drawn.
diskthickness	Determines the thickness of symbol 8, the elliptic disk symbol, in data scale units. This field is required for symbol 9 to be drawn.

Four coordinate surface fields names additionally recognized:





fourc_x1 fourc_y1 fourc_z1	Defines the first X, Y, or Z coordinate for four-coordinate surfaces. A special symbol type is not required, but will be drawn if the all twelve four-coordinate X,Y,Z values are specified. The four-coordinate surface is drawn as two triangles composed of vertices (1,2,3) and (2,3,4), which results in a crease occurring between vertices 2 and 3. Specified in data scale units.
fourc_x2 fourc_y2 fourc_z2	Defines the second X, Y, or Z coordinate for four-coordinate surfaces. A special symbol type is not required, but will be drawn if the all twelve four-coordinate X,Y,Z values are specified. The four-coordinate surface is drawn as two triangles composed of vertices (1,2,3) and (2,3,4), which results in a crease occurring between vertices 2 and 3. Specified in data scale units.

Field Name	Definition
fourc_x3 fourc_y3 fourc_z3	Defines the third X, Y, or Z coordinate for four-coordinate surfaces. A special symbol type is not required, but will be drawn if the all twelve four-coordinate X,Y,Z values are specified. The four-coordinate surface is drawn as two triangles composed of vertices (1,2,3) and (2,3,4), which results in a crease occurring between vertices 2 and 3. Specified in data scale units.
fourc_x4 fourc_y4 fourc_z4	Defines the fourth X, Y, or Z coordinate for four-coordinate surfaces. A special symbol type is not required, but will be drawn if the all twelve four-coordinate X,Y,Z values are specified. The four-coordinate surface is drawn as two triangles composed of vertices (1,2,3) and (2,3,4), which results in a crease occurring between vertices 2 and 3. Specified in data scale units.
3D vector display	
The user specifies the XYZ coordinates of the vertex head and tail, and the vector is drawn as a 1-pixel width line with a shaded cone for the vector head. The length of the vector head can be optionally specified (as a decimal fraction of the total vector length).	
vec_x1, vec_y1, vec_z1	Specifies the XYZ coordinate (in data scale units) for the tail of the vector.
vec_x2, vec_y2, vec_z2	Specifies the XYZ coordinate (in data scale units) for the head of the vector.
vec_lenpct	Specifies the length of the head as a decimal fraction of total vector length.

For well path files, in addition to X, Y, wellid, symbol, and linecol, the following fields are recognized:

TVDSS (required)	True vertical depth sub-sea
Commonid	An additional unique name or a well (20 characters or less)
MD	Distance measured down the well hole

Well interpolation fields; these fields are posted by the 3D Viewer and generated as output from the Well Positioning Toolbox programs

AZIMUTH	The angle between the well path and the Y-axis (clockwise)
INCLINATION	The angle between the well path and a vector pointing straight down
DELTA_AZIMUTH	The change in azimuth between the current data point in the well path and the previous data point (real)
DELTA_INCLIN	The change in inclination between the current data point in the well path and the previous data point (real)
RADIUS_OF_CURV	The radius of curvature is proportional to the reciprocal of the dog-leg severity (real)

Field Name	Definition
DOGLEG	The dog-leg angle is the angle between the tangent at the point and the tangent at the previous point (real)
DL_SEVERITY	Dog-leg severity is the number of degrees of dog-leg angle per 30 meters or 100 feet (real)
ORIG_PT	A flag indicating that the point is an original data point (1) or an interpolated point (0)
DX	The change in X between the current data point in the well path and the previous data point (real)
DY	The change in Y between the current data point in the well path and the previous data point (real)
DZ	The change in Z between the current data point in the well path and the previous data point (real)
RELATIVE_DIP	The angle between the well path and the normal to the surface (fault or horizon) it intersects

Vertical Fault and Traverse Files (.vflt, .trv)

Vertical fault and traverse files are used for display in the 3D Viewer while viewing a 2D grid, 3D grid, scattered data, or a faces file. Faults and traverses can be displayed as lines at the top of the model or as vertical transparent curtains. The display of vertical fault and traverse files is controlled by the Post Data Menu; refer to *Vertical Fault Display* (page 3DV 4-43) for more information on posting this file type.

Vertical fault files must have names that end with *.vflt*. Traverse files must have names that end with *.trv*. Refer to the main EarthVision *Files* document, *Vertical Fault Files* (page FL-25) and *Traverse Files* (page FL-24), for more information.

Polygon Files (.ply, .nvflt, .vply)

Polygon files are used strictly for display in the 3D Viewer while viewing a 2D grid, 3D grid, scattered data, or a faces file. These files are displayed as polygons at the top Z-level of the model or as vertical transparent curtains. The display of polygon files is controlled by the Post Data Menu; refer to *Polygon Display (*page 3DV 4-44) for more information on posting this file type.

Polygon files must have names that end with *.nvflt*, *.ply*, or *.vply*. Refer to the main Earth-Vision *Files* document, *Polygon Files* (page FL-15), for more information.

2D Grid Files (.2grd)

A 2D grid file is displayed in the 3D Viewer as a Z surface that floats in space at the proper values on the Z-axis, similar to a flying carpet. The 2D surface can be manipulated and analyzed using the many tools available in the 3D Viewer.

2D grid files must have names that end with *.2grd*. Refer to the main EarthVision *Files* document, *2D Grid Files* (page FL-9), for more information.

3D Grid Files (.3grd)

A 3D grid file is displayed in the 3D Viewer as cubes, isosurfaces, volumetric clouds, or as an X, Y, and/or Z plane. Cubes are blocks color-coded based on each grid node’s value. Isosurface rendering is displayed as a solid volume that contains X, Y, and Z coordinates for each user-specified isovalue level, making it essentially a 3D contour map, similar to a faces file, (therefore, it is not necessary to create a faces file from a 3D grid in order to view smooth isoshells). Sixty-three isosurfaces (representing 64 isovalues) are calculated, with the 3D Viewer calculating the boundaries based on the P-range of the 3D grid. When rendered as volumetric clouds, the semi-transparent “clouds” surround each node.

In all cases, the 3D grid can be sliced in the X, Y, or Z direction along its grid-cell boundaries, so that conformal grids are sliced parallel to their conformal surfaces. 3D grids can be manipulated and analyzed in a number of other ways using the various 3D Viewer tools.

If a 3D grid file contains null nodes, when the grid is displayed in the 3D Viewer, the null area is blank.

3D grid files must have names that end with *.3grd*. Refer to the main EarthVision *Files* document, *3D Grid Files* (page FL-10), for more information.

3D Indicator Grids (.3igrd)

In addition to 3D grids, a 3D indicator grid, where each node represents the fault block and zone location within a model, can be displayed in the 3D Viewer, allowing the display of portions of a 3D seismic or property grid on a zone- or fault-block-basis. The display of the primary 3D grid is filtered based on the zone and/or fault block location as indicated by the 3D indicator grid.

3D indicator grid files must have names that end with *.3igrd*. Refer to the main EarthVision *Files* document, *3D Indicator Grid Files* (page FL-36), for more information.

Annotation Files (.ann, .sann)

Two types of annotation files can be displayed in the 3D Viewer: ASCII surface annotation files (*.ann*) and screen annotation files (*.sann*). Surface annotation files are the same as those used for posting on 2D displays, e.g., a base map. This annotation file displays text, lines, symbols, and polygons relative to X,Y locations of the displayed ASCII scattered data, 2D or 3D grid, or faces file; i.e., surface annotation is displayed on a Z-plane or draped on a surface of a model or 2D grid. Screen annotation files are ASCII files, created by the user, that display text, filled or non-filled rectangles and circles, and lines. These annotation objects are displayed relative to X,Y locations on the screen, not the model. Each of these file types is discussed next.

Surface Annotation Files (.ann)

A surface annotation file can contain lines (drawn via SRFLNE commands), text (SRFPST, SRFTXT commands), symbols (SRFSYM commands), polygons (SRFPLY commands), polygon boundary information (SETPBD commands), color information (SETPEN commands), and font and size specification (SETTXT and SETCHR commands, respectively). Other surface annotation commands can be in the file; however, these commands are ignored. The annotation can be displayed on the top, bottom, or top and bottom Z-plane or can be draped on a surface in the 3D Viewer.

The naming convention for surface annotation is *filename.ann*.

Refer to the main EarthVision Appendix B for more information on the contents of the ASCII annotation files.

Note: Due to screen limitations, annotation line widths are drawn based on the following rules:

Line Width (in inches/cm)	Pixel Width
≤0.01/0.025	1
>0.01/0.025; ≤0.02/0.05	2
>0.02/0.05; ≤0.03/0.075	3
>0.03/0.075	4

Surface Annotation Formats

Two formats are supported for surface annotation: attribute-style annotation and ISM™-style annotation (ISM is Interactive Surface Modeling, a predecessor to EarthVision). The main difference between the two is the method for specifying the annotation parameters (e.g., font, symbol type, color, etc.). Attribute-style annotation uses “attribute sets” (a grouping of parameters) to define annotation attributes. In this way, one set (or more) can be defined and then reused throughout the file without having to be redefined (refer to the main EarthVision Appendix B for more information on attribute sets). On the other hand, ISM-style annotation, which is command-driven, includes a variety of SETxxx commands and SRFxxx commands and parameters to set the annotation attributes, each having to be restated in the file whenever a change is necessary.

Screen Annotation Files (.sann)

Screen annotation files, used to display annotation such as company logos or model captions, contain keywords and parameters (similar in setup to vue files; page 3DV 2-14) for displaying annotation on the 3D Viewer background. The types of screen annotation available include text, rectangles (filled or empty), circles, (filled or empty), and lines. The color, position, line type, font, and size are all user-specified. This file must be created in a system editor, but can be modified and saved in the 3D Viewer. The file name must end in*.sann* to be recognized as a screen annotation file.

A screen annotation file can be displayed in the 3D Viewer by using the *Select Screen Annotation* command on the Screen Menu or by specifying the file name in a vue file (using the keyword *screenannfile*, followed by the file name). That vue file is then read in using the *Read Vue* command on the View menu. (Refer to *View Menu*, page 3DV 4-22, for more information on these commands.) If desired, a screen annotation file can be automatically loaded by specifying the file name in one of the default vue files; refer to *Automatically Loaded Vue Files* (page 3DV 2-15.) Only one screen annotation file can be displayed at a time. Once read in, the positions of the annotation specified in the file can be modified and saved; refer to *Screen Menu* (page 3DV 4-55) and *Additional Mouse Button Features* (page 3DV 4-149) for more information. (A sample file is shown on 3DV 2-12.)

The following commands are available:

Keyword	Parameter	Meaning
rgbcolor	(3 integers) between 0 & 255	The color of the annotation specified using (Red,Green,Blue) values; this color stays in effect for all following screen annotation, until it is changed. If not specified, the default color is black (0,0,0).
txtpos	(2 integers)	The X and Y position of lower left corner of the text string, specified in pixels (discussed later). (The use of this parameter is dependent on the *txtxcenter* setting.)
txtxcenter	(0 or 1)	Specifies whether the text extends to the right of the X location specified in *txtpos* (0) or is centered in X along the screen (thereby ignoring the X position specified in *txtpos*, but honoring the Y position) (1).
txtfont	(string)	The font of the text (discussed later).
txtpntsize	(1 integer)	The point size of the font, between 2 and 24 (discussed later).
txtstr	("string")	The text string (up to 132 characters).
rectangle	(4 integers)	The lower left and upper right corner positions of the rectangle, specified as Xmin, Ymin, Xmax, Ymax in pixels.
rectanglefill	(4 integers)	The lower left and upper right corner positions of the solid-filled rectangle, specified as Xmin, Ymin, Xmax, Ymax in pixels.
circle	(3 integers)	The X,Y location of the center, and the radius of the circle, specified in pixels.
circlefill	(3 integers)	The X,Y location of the center, and the radius of the solid-filled circle, specified in pixels.
linewidth	(1 integers)	The pixel width of the line (the default for 3D Viewer axes is 1 pixel, for reference).
line	(4 integers)	The beginning and ending locations of the line, specified as X1, Y1, X2, Y2 in pixels.

Note: The order in the file is important: annotation later in the file is always placed on top of earlier annotation. When "moving" annotation, if the cursor is placed where two objects overlap, pressing the middle mouse button moves the object on top (that is, the object last found in the file). Text, however, is always placed on top of the other object types.

Pixel Specifications

Pixels are the "dots" that make up a screen; screen resolution is generally described by the number of pixels across the width and height of the screen. A common screen resolution for large-screen monitors is 1280 by 1024 pixels; for small-screen monitors, a resolution of 1024 by 768 is common. For screen annotation, the location of 0,0 is in the lower left-hand corner of the *graphic display window* (not of the screen) for all machines and screen types.

Text Specifications

For the *txtfont* command, the following list shows the font parameters that are available*. The fonts (which must be entered as shown below) are relatively standard fonts, available on all 3D Viewer platforms and in most other software packages that support additional fonts (e.g., Apple® Macintosh® software). Samples of each font type are shown in Appendix C.

```
Courier                             Helvetica-Narrow-Oblique
Courier-Bold                        Helvetica-Narrow
Courier-BoldOblique                 NewCenturySchlbk-Roman
Courier-Oblique                     NewCenturySchlbk-Bold
Helvetica                           NewCenturySchlbk-Italic
Helvetica-Bold                      NewCenturySchlbk-BoldItalic
Helvetica-BoldOblique               Times-Roman
Helvetica-Oblique                   Times-Bold
Helvetica-Narrow-Bold               Times-Italic
Helvetica-Narrow-BoldOblique        Times-BoldItalic
```

For the *txtpntsize* command, not all point sizes are available for all fonts*. If a requested point size is not available for a particular font, the nearest available point size is selected. A point size of 2 is the smallest, and, generally, 24, the largest. Sample point sizes are shown in Appendix C.

Sample Screen Annotation File

The following is a sample screen annotation file.

```
rgbcolor           190 190 0
rectanglefill      95 35 295 135

rgbcolor       190 0 190
rectanglefill  112 51 312 151

rgbcolor       250 250 250
circlefill     354 101 70

rgbcolor       190 0 190
circle         359 103 50

rgbcolor           190 0 190
linewidth          2
line               804 679 937 843

rgbcolor       190 0 190
linewidth      2
line           937 843 1031 843

rgbcolor       250 250 250
txtxcenter     0
txtpos         940 855
txtfont        Helvetica-Bold
txtpntsize     14
txtstr         "Railway Station"

rgbcolor       0 0 0
txtpos         100 100
txtstr         "Rails Unlimited"
```

* The *txtfont* and *txtpntsize* commands are not currently supported under Windows NT.

Color Files (.fclr, .pclr, .tclr, .zclr, .znclr)

Several different ASCII-formatted color files (using three slightly different formats) are used in the 3D Viewer and can be created in the 3D Viewer's five color editors. These files are:

- Property color files . . . . defines the colors used for property ranges, including seismic colors.
- Zone color files. . . . . defines the colors used for zones.
- Z color files. . . . . defines the colors used for Z color-filled contour maps on 3D models.
- Feature color files . . . . defines the colors used for data points with assigned feature values.
- Time color files. . . . . defines the colors used for data points with assigned time values.

These files could also be created using a system editor, or, in the case of Z color files, using EarthVision's Color Table Editor. Defaults are hard coded; however, files located in the `$DGIHOME/ev#/etc` named *dgi.pclr, dgi.znclr, dgi.zclr, dgi.tclr,* and *dgi.fclr* take precedence.

Property, feature, and time color files contain 64 lines with three values on each line; zone color files can contain up to 256 colors. These three values represent the amount of Red, Green, and Blue (commonly known as RGB values) used to make up the desired color. The valid values for each one are between 0 and 255. Property, zone, feature, and time colors are ordered starting with 1 at the top of the file, but are displayed in the 3D Viewer with 1 at the bottom.

Z color files contain 64 lines with five values on each line. The second, third, and fourth values are the RGB values, respectively. The valid values for each one are between 0 and 255. The first and fifth values are ignored by the 3D Viewer; they are required for use elsewhere in EarthVision. The first value is an index between 9 and 72; the fifth value is a color code for plotting and can be set to any value (so long as there is a value) for 3D Viewer purposes. The colors are ordered from 9 at the bottom to 72 at the top in the file and when displayed in the 3D Viewer Color Editors.

The following file naming conventions exist for color files:

- Feature color files . . . . <*file*>.fclr
- Property color files . . . . <*file*>.pclr
- Time color files. . . . . <*file*>.tclr
- Z color files. . . . . <*file*>.zclr
- Zone color files. . . . . <*file*>.znclr

If <*file*> is replaced with *cf0*, the 3D Viewer uses that color file for its default colors, rather than the colors that are hard-coded in the software or available in the `$DGIHOME/ev#/etc` directory (e.g., *cf0.pclr* would be used as the default color table for property colors).

The following could be a portion of a property, zone, feature, or time color file:

```
 35   3 149
 35  37 185
 35  71 221
 35 103 255
100  53 251
163   3 247
163   3 175
163   3 103
120   3 103
 78   3 103
 :  :  :
 :  :  :
 :  :  :
 13 171 255
 21  95 255
  1   1 255
 97  13 255
145   9 255
173   7 255
127   3 185
 77   5 129
```

The following is a portion of a Z color file:

```
 9  53   3  77  -1
10  22   6   92 -1
11  10  38 108  -1
12  14  98 122  -1
13  18 136 106  -1
14  24 148  56  -1
15  60 160  32  -1
16 132 172  38  -1
17 182 156  46  -1
18 192 100  56  -1
19 164 208  42  -1
20  30 226  68  -1
21  18 210 240  -1
22  27   8 255  -1
23  24 152 236  -1
 .   .   .   .    .
 .   .   .   .    .
 .   .   .   .    .
63  16 118 244  -1
64  14  14 248  -1
65 117  11 253  -1
66   2  50 248  -1
67   2 196 236  -1
68   2 222 120  -1
69  22 210   2  -1
70 146 198   2  -1
71 184 118   2  -1
72 173   1   1  -1
```

Vue Files (.vue, .dvue, .2gvue, .3gvue)

Vue Files

Vue files contain keywords and parameters that specify viewing positions for faces files, scattered and property data, and 2D and 3D grids in the 3D Viewer. These specifications define settings such as slice locations, displayed isovalue shells, color files, displayed auxiliary files, as well as some settings that cannot be changed interactively in the 3D Viewer (e.g., the background color). Vue files allow the user to save a complete set of instructions to, for example, set up a default display of a 3D model or data set, or set up a series of displays. Only those settings specified in a vue file are changed when the file is read.

A vue file consists of a series of keywords each followed by parameters. Each keyword and its associated parameters are on a separate line followed by a carriage return. Comments may be added to these files by placing a pound sign (#) in the first column of a new line, causing the rest of that line to be ignored. In general, keywords can be listed in any order. A portion of a vue file is shown on 3DV 2-16; Appendix C describes vue files and keywords in detail.

Vue files can be created in the 3D Viewer (refer to *Save Vue*, page 3DV 4-28) or using a system editor. The 3D Viewer recognizes any file with a name ending in *.vue*, *.dvue*, *.2gvue*, and *.3gvue* as a vue file and lists the appropriate ones when a user requests to read a vue file.

The Vue File Suffixes

The different vue files are used to set up viewing parameters for the different file types, as shown below:

Vue File Name	File Type
*.*vue*	Faces file (*.*faces*)
*.*dvue*	ASCII scattered data files (*.*dat*, *.*pdat*, *.*path*)
*.*2gvue*	2D grid file (*.*2grd*)
*.*3gvue*	3D grid file (*.*3grd*)

A few minor differences exist between the vue files: for example, *.dvue* files have the parameter “scatfile” while *.vue* files have the parameter “facesfile.” When using the View Menu to read in a vue file, the pop-up menu list contains only those files appropriate for the file being displayed (e.g., *.2gvue* files for a 2D grid). Due to file differences, it is not recommended, currently, to use a file other than a *.dvue* file with ASCII scattered data.

Automatically Loaded Vue Files

A vue file can be created and automatically loaded for individual models and data files or on a site basis. The following chart shows the naming conventions, directory location, and priority (with the vue file with the highest priority at the top of the table) given different file types (with sample names):

File Name	Vue File Name	Location	Default Basis
oil.faces	oil.vue	data file directory	by file, by directory
gamma.3grd	gamma.3gvue	data file directory	by file, by directory
res.2grd	res.2gvue	data file directory	by file, by directory
gas.dat	gas.dvue	data file directory	by file, by directory
prop.pdat	prop.dvue	data file directory	by file, by directory
all files	defaults.vue	data file directory	by file, by directory
all files	defaults.vue	*$DGIHOME/ev#/etc*	all files, by site

Each time the 3D Viewer loads or resets the view of a file, the vue files are read in a particular order, if they exist: first *$DGIHOME/ev#/etc/defaults.vue*, then *./defaults.vue* (in the local directory), then the vue file for the individual file, with parameters in this last file taking precedence over the parameters set earlier.

Series of Vue Files

A series of vue files can be created to display, for example, a sequence of views of a model. These files can then be loaded one at a time from the View Menu in the 3D Viewer or they can be entered in a script file for automatic cycling (see below for a description of script files; refer to *View Menu*, page 3DV 4-22, for a more detailed description of reading vue files).

A Sample Vue File

The following is a small portion of a vue file. Appendix B contains descriptions and specifications for all the available vue file commands.

```
#This view file was created within the 3D Viewer.

#modelload        pcb.faces

initmenu    manipulate

xmincutgrid   1
xmaxcutgrid   9
ymincutgrid   1
  . .
  . .
  . .
zmincutdata   -210.000000
zmaxcutdata   -15.000000

isosurfminlev  min
isosurfmaxlev  max

inclination   35.0
zexag      1.000000
zoom      1.0

colorkeytype  property
propcolorfile  defaults
zonecolorfile  defaults
zcolorfile        defaults
bckgrndrgb        0 0 0
  . .
  . .
  . .

fullscreen        0
```

Script Files (.script)

Script files allow users to sequence through a series of faces files, 2D grids, 3D grids, property data, and/or scattered data files. Each script file can contain any number of vue files, thereby creating, essentially, a movie of views, or a script. Script files are ASCII files containing keywords and parameters. Several commands are available:

Keyword	Parameters	Meaning
scriptcycle	0 or 1	Specifies whether the script should be cycled through continuously (1) or only once (0) 0 = script cycling is off 1 = script cycling is on [default]
facesfile	filename	Specifies the faces file to be read.
scatfile	filename	Specifies the ASCII scattered data file to be read.
grid2dfile	filename	Specifies the 2D grid file to be read.
grid3dfile	filename	Specifies the 3D grid file to be read.
pfield	fieldname	Specifies the P-field for an ASCII scattered data file that will be displayed (this command, which can also be included in a vue file, avoids having to specify the P-field during scripting).
zfield	fieldname(s)	Specifies the Z-field(s) for an ASCII scattered data file that will be displayed (this command, which can also be included in a vue file, avoids having to specify the Z-field(s) during scripting).
vuefile	filename	Specifies the vue file to be read.
minframetime	integer	Specifies the minimum amount of time that a file is shown on a screen (in seconds; default = 0).
sleep	integer	Specifies an additional amount of time to display a file before reading the next view (in seconds; default = 0).
screendumpfile	filename	Specifies a file name to which a screen dump is sent.
autoscreendump	0 or 1	Specifies whether or not a screen dump is made from the current and subsequent views: 0 = no screen dump [default] 1 = create a screen dump
vrmlfile	filename	Specifies the name of output VRML file created when *autovrml* is set to 1.
autovrml	0 or 1	Specifies whether or not a VRML file is made from the current and subsequent views: 0 = no VRML file created [default] 1 = create a VRML file
interrupt		Interrupts the script so that the 3D Viewer can be run interactively; the script can be restarted at the point following the *interrupt* line by selecting *Resume Previous Script* on the Animation menu or on the *Run Script* pop-up menu or using the hot key “pad 0”; no parameters are required.
quit		Indicates that the script should be exited, and quits 3D Viewer; no parameters are required.

The 3D Viewer sequences through the views, reading in each vue file for the specified faces, grid, or scattered or property data file, using the other parameters as described above. Setting *autoscreendump* to 1, the *scriptcycle* to 0, and adding in *screendumpfile* commands and the *quit* command allows users to display a series of views once, create a screen dump from each of those views, and then exit the 3D Viewer. The *minframetime* is useful if several of the views draw too quickly for viewing, since it keeps those views on the screen for a longer period of time.

The following is an example of a script file that is run once, with two screen dumps made of one of the files, and then remains in the 3D Viewer:

```
scriptcycle      0
facesfile        intvel1.faces
vuefile          intervel1.vue
vuefile          intervel2.vue
vuefile          intervel3.vue
vuefile          intervel4.vue
vuefile          intervel6.vue
vuefile          intervel7a.vue
vuefile          intervel8.vue
autoscreendump   1
scatfile         silca.dat
zfield           silca
vuefile          silca1.dvue
screendumpfile   silca1.rgb
vuefile          silca2.vue
screendumpfile   silca2.rgb
autoscreendump   0
facesfile        vel1.faces
facesfile        vel1a.faces
vuefile          vel1a.vue
vuefile          vel2a.vue
```

Note: The automatically loaded vue files are read when running a script file; however, the file named after the "vuefile" command is read last, thereby taking precedence over the other vue files (see Automatically Loaded Vue Files, *described previously). If no "vuefile" command is listed (as is the case for* vel1.faces, *in the example above), then the automatically loaded vue files set the display parameters, if those files exist.*

Script files must be named *<filename>.script*. The 3D Viewer can be started using the script file name as a command line argument:

```
evview filename.script
```

where *filename.script* is the script file name. The 3D Viewer uses the files listed in the script as the input to the 3D Viewer; the user does not select files at the beginning of the 3D Viewer session. The first file name in the script file is the first model that is displayed in the 3D Viewer. A script file can also be read in using the Animation Menu. Refer to *Read Vue* (page 3DV 4-29) and to *Vue File Usage to Change the Initial Model Display (*page 3DV 3-9*)* for more detailed descriptions of running script files.

List Files (.dlist)

A list file is an ASCII file containing a list of faces file, 2D and 3D grid file, and ASCII scattered data file names. The 3D Viewer can be started using the list file name as a command line argument:

```
evview filename.dlist
```

where *filename.dlist* is the list file name. The files listed in the list file are used as the input to the 3D Viewer; the user does not select files at the beginning of the 3D Viewer session. The first file name in the list file is the first display viewed in the 3D Viewer.

The list file, created using a system editor, contains the names of the desired faces files, 2D and 3D grid files, and scattered and property data separated by at least one space. The order of the files in the list is the order in which the files appear in the 3D Viewer. For example, if a list file contained the following:

```
pcb.faces /usr/otherdir/minefire1.faces
minefire2.faces minefire.dat
minefire3.faces
```

pcb.faces is loaded first and appears on the screen; the other three faces files and the scattered data file would be listed as selected files. Note that a full path can be specified.

List files must be named with the ending *.dlist*. Refer to Chapter 3 for information on starting the 3D Viewer with this and other command line arguments.

Output Files

Output files in the 3D Viewer are limited to ASCII scattered data files, color files, vue files, and screen dump files. Each of these file types is discussed next.

ASCII Scattered Data Files

If desired, an ASCII scattered data file can be created and/or edited in the 3D Viewer using the Edit Data Menu. ASCII scattered data files are described in detail under *ASCII Data Files* (page 3DV 4-84).

If a file is edited in the 3D Viewer, the file's header is not altered (except if featureid and featurecol fields are added). When a file is created in the 3D Viewer, the file is given a default header based on the fields selected. An example file is shown below:

Sample File

```
# Type: property scattered data
# Version: 1
# Format: free
# Field: 1 X
# Field: 2 Y
# Field: 3 Z
# Field: 4 P
# Field: 5 LINEID
# Field: 6 LINECOL
# Field: 7 DIP
# Field: 8 DIPAZM
# Field: 9 FEATURE
# Field: 10 SYMBOL
# Field: 11 SYMSIZE
# Field: 12 SYMCOLOR
# Field: 13 SYMTRANS
# Projection: Local Rectangular
# Units: unknown
# End:

3.5 5      3.2    0.82   ”line 1”  6 30  29  1 5  2.000000  7  1
3.5 7.545455 6     0.934  ”line 1”  6 ””  ””  1 4  3.000000  3  1
3.5 9.363637 8.818182 0.62   ”line 1”  6 ””  ””  ”” 2  3.000000  4  1
```


Capture Files

Capture files are created in the 3D Viewer by saving model information to an ASCII file. The locations of picked scattered, displayed scattered data, the 3D cursor, and the polygon vertices that compose displayed isosurfaces can be saved. Refer to *Capture Data Menu* (page 3DV 4-49) for more information.

Color Files

Five different types of color files can be created, edited, and saved in the 3D Viewer's five color editors. These files are: property color files, feature color files, time color files, zone color files, and Z color files. Refer to *Color Files* (page 3DV 2-13) for more information.

VRML 1.0 Files

Nearly anything that can be displayed in the 3D Viewer can be saved as a World Wide Web-viewable file in VRML 1.0 (Virtual Reality Markup Language, version 1.0) format. The WebSpace™ Netscape® plug-in from SGI™, for example, displays a VRML 1.0 file. Sliced and chair-cut faces files, 2D and 3D grids, scattered data, and surface annotation are all examples of models that can be saved to the VRML 1.0 output. Scattered data points are saved as cubes, with lines or well tubes included, if they are displayed. The 3D Viewer's wire frame is saved, without tick marks or scale values. Screen annotation, the 3D cursor, the color key, and the outlines of the faults, zones, and properties cannot be saved, however.

Saved from the Capture Data menu, if the `gunzip` utility is found in the user's path, the file is saved with the *.wrl.gz* extension, since it is a more compact way to store VRML files. If the `gunzip` utility is not found in the user's path, the file is saved with the *.wrl* extension.

Vue Files

Vue files can be created in the 3D Viewer using the View Menu. The commands and parameters associated with the current view are saved to a user-specified file. This file can be read back in later. Refer to *Vue Files* (page 3DV 2-14) and Appendix C for more details on the file type and *Save Vue* (page 3DV 4-28) for information on how to save the files.

Screen Dump Files (.rgb, .gif, .jpg, and .tiff)

A computer "picture" of a model display on the screen can be saved to a file using the Screen Menu functions (refer to *Screen Menu*, page 3DV 4-55). This picture is saved to one of several binary file types. The available formats are an SGI rgb, a gif, a jpeg, or a tiff. The file can later be displayed on the screen or sent to a printer (refer to the *EarthVision Site Administrator's Guide* for information on sending these files to a printer).

Screen Annotation Files

Screen annotation files are used to display specific types of annotation in the 3D Viewer, and must be created using a system editor; refer to *Screen Annotation Files* (page 3DV 2-9) for a more detailed description of screen annotation files. These files, however, can be altered in the 3D Viewer and saved to the same or a new file; refer to *Post Data Menu* (page 3DV 4-41) for more information on manipulating these files.

Well Display Files

In order to display well paths, log curves, well-bore annotation, etc. in the 3D Viewer, all parameters for display are specified in a well display (*.wd*) file created by the Well Display File Editing program. These files include the well path information, display parameters, and a list of the well IDs to be displayed. For more information on well display files and the Well Display File Editing program, refer to the *Well Display File Editing* in the *Well Displays* document.

Chapter 3: Using the 3D Viewer Interface

The 3D Viewer's graphical user interface allows users to easily manipulate a 3D model, 2D or 3D grid, or an ASCII scattered or property data file with very little experience. This chapter specifically discusses the 3D Viewer interface: what to expect upon entering the 3D Viewer, as well as how to use all aspects of the interface, for example, different mouse button capabilities, usage of menu items, etc. The actual menu functions are discussed in Chapter 4, *3D Viewer Menus*.

This chapter is comprised of the following sections:

- Using the Mouse Buttons
- Entering the 3D Viewer
- The Initial Screen Display
- Using the 3D Viewer Interface

Mouse Button Functions

Each of the mouse buttons are used for different functions in the 3D Viewer. With regard to using the interface, the following mouse button functions are available:

- The left mouse button is used to click on all menu buttons and pop-up menus.
- The left mouse button can be used to directly enter a setting for a slider bar or dial by clicking on the box below the slider or dial, or to enter a value in a box. For example, the contour interval for color-filled contours can be changed by clicking on the "Z Contour Interval" box below the *Z Color-Filled Contours* push button (shown on 3DV 4-34).
- The middle mouse button is used to display online help by clicking on any menu item (refer to 3DV 2-13).
- The middle mouse button is used to move informational boxes, the color key, and screen annotation in the model window (refer to page 3DV 4-132).
- The right mouse button toggles between data scale units and increment units for the incremental slider bars by clicking on the value box below the slider.
- The right mouse button is used to change the increment on slider bars and dials. For example, by default the azimuth hot keys and arrows change the display by 10° at a time; however, if a user clicks on the arrows using the right mouse button, a prompt is displayed requesting the arrow value.
- The right mouse button is used to select data points for feature point picking and for data point editing.

In addition to using the mouse button for interface functions, certain mouse buttons can be used to manipulate the model display. These additional capabilities are discussed in detail under *Additional Mouse Button Features* (page 3DV 4-149).

Note: On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`*, can be used to assign the functionality of the middle mouse button to the right mouse button (refer to Appendix B, page 3DV B-37)*

Entering the 3D Viewer

The 3D Viewer can be executed from the main EarthVision window, from the File Selection window, or from within several of EarthVision's programs. The 3D Viewer can also be started by using the command `evview` at an operating system prompt.

Command Line Arguments

The 3D Viewer can be started using file names or command line arguments to indicate the files to be displayed in the 3D Viewer and to control window borders. Using these commands means that the user does not have to select files at the beginning of the 3D Viewer session when starting the 3D Viewer from an operating system prompt. Several command line arguments are available:

File Names or Command Line Arguments	Purpose
<filename>.script	loads the specified script file
<filename>.dlist	loads the specified data list file, which contains a list of all data files to be loaded in the 3D Viewer
<filename>.faces	loads the specified faces files (refer to the Faces File section on 3DV 2-1); each faces file must be loaded separately, but a faces file can be loaded with a 3D grid file and/or multiple data or path files
<filename>.dat <filename>.pdat	loads the specified ASCII scattered or property data file; multiple files can be displayed in the same model space. Surrounding the file names (with or without a faces or grid file) with double quotes, indicates that the files should be loaded together within the same model space, rather than as separate files.
<filename>.path	loads the specified well path file; multiple files can be displayed in the same model space. Surrounding the file names (with or without a faces or grid file) with double quotes, indicates that the files should be loaded together within the same model space, rather than as separate files.
<filename>.2grd	loads the specified 2D grid file; each 2D grid file must be loaded separately, but a grid file can be loaded with multiple data or path files
<filename>.3grd	loads the specified 3D grid file; each 3D grid file must be loaded separately, but a grid file can be loaded with a faces file and/or multiple data or path files
<filename>.vue <filename>.dvue <filename>.2gvue <filename>.3gvue	loads the specified vue file; the vue file parameters apply to the appropriate file which precedes it. this vue becomes the default view for that file.
–c	provides a larger cursor (useful for demonstrations)
–dir <directory name>	changes the current working directory (from which all 3D Viewer files are read) to the specified directory
–dual	enables dual-screen display, if available
–feature <feature name>	starts the 3D Viewer by checking out the specified license feature

File Names or Command Line Arguments	Purpose
–h	displays the command line arguments and their usage
–hd	displays the recognized scattered data fields; on Windows machines, this command takes an additional file name for the output, since the output is too large to display
–he	displays all 3D Viewer environment variables
–hk	displays all available hot keys and their functions
–hs	displays information regarding how to run and create scripts for the 3D Viewer
–hv	displays the available vue file keywords and parameters and their usage; under Windows, this command requires an output file name, since the output is too large to display
–m	omits the menu panel display
–ml	displays the menu panel on the left side of the screen
–mr	displays the menu panel on the right side of the screen
–new	displays a listing of all of the 3D Viewer 7.0 new features; under Windows, this command requires an output file name, since the output is too large to display
–si <directory>†	specifies the input directory to be used for synchronization of 3D Viewers. Automatically loads *.vue* files found in the specified directory, deleting afterward. The *.vue* files are loaded in alphanumeric order, but files containing the string "ev<pid>" (where <pid> is the process ID of the 3D Viewer process) are omitted to avoid a process outputting and inputting the same file.
–so <directory>†	specifies the output directory to be used for synchronization of 3D Viewers. Automatically generates a new *.vue* file (using the 3D Viewer process ID and a counter (i.e., *ev<pid>00001.vue*) each time the viewer display is changed and places the files in the specified directory.
–symbolFile <filename>	loads the specified user-defined symbol file (otherwise, will default to the `$DGIHOME/ev#/etc/symbols.def` file, if available)
–tmpdir <directory path>	specifies the directory in which all temporary files will be created; by default all files are created in `/tmp`
–v	sets the specified vue file keyword to the specified value (e.g., –v "azimuth 10")
–V	prints 3D Viewer version number and version date
–vo <vue file name>	outputs the specified vue file after each redraw

† These two functions synchronize two different 3D Viewer programs, so a change in the viewer display on one screen causes the same change in the viewer display on another screen.

where the <*filename*> portion is replaced with the appropriate file name (full path names are allowed). The suffixes specified *must* be used in order for the 3D Viewer to interpret the file correctly. The appropriate file name(s) and/or the command line argument(s) can be entered on the same line as the *evview* command, for example,

```
evview pb.faces pb.vue zn.faces zn.pdat zn.dvue cu.faces
```

loads two faces files separately, a data file separately, followed by a faces file. The first model to be viewed would be *pb.faces* (with viewing parameters from the file *pb.vue*), the second *zn.faces*, the third *zn.pdat* (with viewing parameters loaded from the file *zn.dvue*), and the fourth *cu.faces*. In the following example,

```
evview pb.faces “zn.faces zn.pdat” zn.dvue cu.faces
```

only three models are loaded: first pb.faces, then zn.faces together with zn.pdat in the same model display (with viewing parameters from the file zn.dvue loaded), and finally cu.faces; the first display would be of pb.faces.

Note that a list file, faces files, ASCII data files, and 2D or 3D grid files can all be given at the same time (with the caveats specified in the table above), and in any order. Only a script file must be given without any other file names, since it runs a script.

Script files and list files, their format and uses, are discussed in *3D Viewer File Types*, (pages 3DV 2-17 and 3DV 2-18, respectively). Refer to that chapter for more information.

Resizing the 3D Viewer Windows

As the menu window is resized, the 3D Viewer attempts to compensate for the smaller windows by scaling down the text. Only certain text sizes are available, therefore the text stays a certain size, until it becomes too large or small for the window size, at which point a smaller or larger font is used. As such, the sizing may not look as neat as in the default size window; however, the window is still usable at the smaller sizes.

As the graphic display window is resized, the axes scale numbers are resized. All other text (e.g., the color key, titles, volumetrics window), however, is not scaled down. These features, including screen annotation, are kept in the same X,Y window location relative to the window origin at the lower left-hand corner of the graphic display window (with the exception that titles that are in the default centered positions are repositioned to stay in the window and centered screen annotation remains centered). Keeping the same location means that, depending on how the window is resized, some of these features could “disappear” from the display. All of these features, however, can be moved (using the middle mouse button) so that they stay within the window boundaries; refer to *Additional Mouse Button Features* (page 3DV 4-149) for more information.

Environment Variables

Various 3D Viewer environment variables are available. They must be typed at the command line before entering the 3D Viewer. Type “evview –he” to display the environment variables available for the 3D Viewer.

Environment Variable	Purpose
setenv DGIDEBUG	Displays all command line arguments passed to other programs called from the 3D Viewer; used for debugging
setenv DGIPRINTER <printer>	Specifies printer, bypasses popup menu listing available printers
setenv DGI_DEFAULT_BOLD_WIDTH <num>	Specifies default bold line width for annotation lines
setenv DGI_DEFAULT_LINE_WIDTH <num>	Specifies default light line width for annotation lines
setenv EV_DATAPOINT_CLIP	Adds *Point Clip* and *Point Cap* push buttons to Data Post menu
setenv EV_DISABLE_OVERLAY	Disables overlay plane usage for colorkey outline movement and full screen status window messages. This can aid in hardware and software bug detection.
setenv EV_DISABLE_SAVEUNDER	On Sun™ SparcStation ZX machines (using Template Graphics OpenGL), the “saveunder” feature, used when removing a pop-up menu from the model window and restoring that portion of the window's graphics without requiring a full screen redraw, can be slow. This setting disables this restore and leaves the area under the pop-up window untouched, which normally results in a black rectangular area.
setenv EV_DISABLE_SLICE	When loading an unsliced faces file, the slicing program is called to calculate the exterior slices of the model. If an error occurs while slicing the model, continue loading the faces file.
setenv EV_ENABLE_FLOWVEC	Enables Flow Vector menu
setenv EV_LOGGING_FILE <filename>	Copies all status window messages to the designated log file.
setenv EV_MODELWIN_GEOM <geom>	Sets the window geometry of the 3D Viewer's model window; used for stereo3D mode; <*geom*> format is widthxheight+-xoff+-yoff
setenv EV_MENUWIN_GEOM <geom>	Sets the window geometry of the 3D Viewer's menu window; used for stereo3D mode; <*geom*> format is widthxheight+-xoff+-yoff
setenv EV_STEREOINWIN_FORMAT <format>	On SGI systems that allow separate stereo buffers, also known as stereo-in-window, this setting specifies the video format to use when entering stereo3D mode. The default format is 1024x768_96s, indicating a screen resolution of 1024 by 768 pixels and a frequency of 96 HZ.

Environment Variable	Purpose
setenv EV_STEREONONE_FORMAT <format>	On SGI systems that allow separate stereo buffers, also known as stereo-in-window, this setting specifies the video format to use after leaving stereo3D mode. The default format is 1280 x 1024_72.
setenv EV_STEREO_NOVIDEOCHANGE	Do not change the monitor video setting when entering or exiting stereo3D mode.
setenv EV_SYNC_DEFAULT_IP	Sets the default IP address to be used when establishing a connection for synchronized viewing, instead of prompting the user.
setenv EV_SYNC_DEFAULT_PORT	Sets the default port number to be used when establishing a connection for synchronized viewing, instead of prompting the user.
setenv EV_TMPDIR <directory path>	Specifies the directory in which all temporary files will be created; by default all files are created in *`/tmp`*.
setenv EV_ZBUF_PRIORITY	If the 3D Viewer is zoomed in on a surface or a point, so that the eye point is very close to the look point, setting this parameter gives the best Z-buffer resolution at the expense of possibly clipping points far in the distance.
setenv PRINT_SCRIPT <scriptfilename>	Specifies a printer script for use when printing the screen image to a printer, rather than the default *`$DGIHOME/bin/printer_script`*.

Faces File, 2D Grid File, 3D Grid File, and ASCII Data File Selection

Upon entering the 3D Viewer, a description of how to select files for display appears on the left-hand side of the screen. The 3D Viewer Main Menu (although not available at this point) appears on the right-hand side of the screen, with the file selection pop-up menu in the center of the screen.

The file selection pop-up menu lists all the faces files, 2D grid files, 3D grid files, and ASCII scattered data, property data, and well path files in the current directory. The file selection menu lists all files in the current disk directory with names ending in the string *.faces*, *.2grd, .3grd, .dat, .path,* and *.pdat*.

The File Selection menu is composed of two parts: on the left side is a directory listing; on the right side is a files' listing. The files listing is composed of several menus, one for each of the following file types:

- Faces files (this one is displayed first, if faces files are in the working directory)
- Scattered data
- Property data
- Well path files
- 2D grids
- 3D grids

The user can toggle back and forth between the four menus using the selections, labeled .dat menu, .pdat menu, .path menu, .2grd menu, .3grd menu, or .faces menu, depending on which file type is already being shown.

As the cursor is moved over the different file names, that name is shown in reverse video (i.e., white on black, instead of black on white). Click on a file name to select it; a number appears to the left of the file name. The files can be selected in any order (all file types can be mixed together for sequential display), and the order in which they are selected is the order in which they will be displayed. The numbers next to the selected files indicate their order. Each file, however, is displayed in separate displays; to select multiple files for a single display, refer to 3DV 3-8

A file that is in another directory can be chosen by selecting the directory in the list on the left. The 3D Viewer remains in the same directory. To move the 3D Viewer's working directory to a new directory, select *Change Directory.*

If a faces file is selected that is in the old format (EarthVision 3.1 or earlier), the user is prompted as to whether the file is to be converted to the new format. If so, the user is prompted for a new file name, and, after converting, the new file is added to the list of files to display. If the user does not wish to convert the old-format faces file, the file is not converted and the faces file is not added to the list of files to display. Files can be converted outside of the 3D Viewer using the conversion program *evconv.*

No more than 10 files are displayed on a pop-up menu at a time. If more than 10 files of a given type are available, a scroll bar appears on the right side of the menu. This scroll bar allows the user to scroll the list through the window (refer to *Scroll Bar Usage*, page 3DV 3-15).

File Selection Limits

Any number of files can be selected for display, in any order. Although the 3D Viewer defaults to displaying the files in the order selected, the user can request any file at any point. In addition, once in the graphic display portion of the 3D Viewer, files can be added to or canceled from the file selection list (refer to *File Menu,* page 3DV 4-37).

Multiple File Selection

Each selected file is considered a primary model and is displayed separately in the model window. You can cycle from file to file using the hot keys or buttons on the File menu, page 3DV 3-37. In order to select multiple files (secondary files) for a single display, the faces file (if desired) must be selected first from the opening File Selection Menu; if a faces file is not needed for the display, then a 3D grid, 2D grid, or a data (*.dat*, *.pdat*, or *.path*) file can be selected. Once in the 3D Viewer, a 3D grid can be added to the display of a faces file or a data file (refer to the 3D Grid menu discussion, page 3DV 3-137). Multiple scattered data, property data, and/or well path files can be added to the display of any of the file types (refer to the Edit Data menu, page 3DV 3-84).

In addition, multiple files can be loaded at one time by specifying them on the command line (refer to page 3DV 3-2). Additional secondary files, such as vertical fault (*.vflt*) files, non-vertical fault (*.nvflt*) files, polygon (*.ply*) files, annotation (*.ann*), screen annotation (*.sann*), can be selected for display as well, once in the 3D Viewer. Neither a 2D grid nor a faces file can be added to the display of any other file type (they must serve as the primary model).

File Selection Cancellation

During the selection process, a selected file can be canceled by simply clicking on the desired file name. The number is removed next to the name, and the other numbers are re-issued. In this way, the order of the files can also be altered.

Ending the File Selection Process

Once the desired files are selected, the user must select the line *No More Files*. The first file selected is then shown in the initial display on the screen.

The Initial Screen Display

The initial display screen contains three main elements:

- The 3D model, 2D grid, 3D grid, or scattered data, presented within a rectangular wire frame with different colors representing ranges of P or zone colors.
- A color key that indicates some of the current viewing parameters; the default color key depends on the type of model displayed and the type of information it contains (e.g., a zone model that does not contain property information would have a zone color key displayed (which indicates the zone number and name for each color); a property faces file would have a property color key.) The color key is discussed in detail on page 3DV 3-10.
- The Main Menu with buttons for each of the other menus. These menus can be selected by clicking with the left mouse button on the menu button or typing specific keys (hot keys) as indicated in the recessed box on the menu.

The menus are shown on pages 3DV 4-2 to 3DV 4-5; examples of color keys are shown on page 3DV Fig-2.

Initial Model Display

The initial model shown is the first primary model (either a faces, 2D grid, 3D grid, or data file) selected when entering the 3D Viewer (and any secondary models, if they were specified on the command line; see 3DV 3-2). The default 3D Viewer colors are used for the display, unless a vue file with other colors specified was loaded. These colors, based on the primary model's information, can be altered or reversed (e.g., the color that previously represented the highest P-value would then represent the lowest). Color table changes are discussed later under *Color Menu* (page 3DV 4-72).

The X- and Y-axes are labeled on the lower front of the model and the Z-axis is labeled on either the left or right side of the model, whichever is closer to the viewer. The three coordinate axes are highlighted in orange.

If the faces file, 2D grid, or 3D grid displayed is in rotated space, an additional rotated wire frame is drawn with its coordinate axes drawn in red (X), green (Y), and blue (Z).

The model is scaled to fit within the portion of the screen not occupied by the menus. The Z- or vertical-exaggeration is automatically calculated to provide a reasonably proportioned block or wire frame that contains the complete model. (The illustrations on 3DV Fig-2 show the wire frame surrounding the model.) This scaling is necessary since the Z measurement units are often different than those of X and Y. Additionally, it is not unusual for the X- and Y-ranges to be many times greater than the Z-range even when the X- and Y-units and the Z-units are the same. Refer to *Z-Exaggeration* (page 3DV 3-11) for more information on Z-Exaggeration.

Vue File Usage to Change the Initial Model Display

A file containing default positions for a particular faces file, grid file, or ASCII scattered data file can be created inside or outside of the 3D Viewer for display inside the 3D Viewer. These files, called “vue” files, are used to automatically load custom settings for the initial model display, i.e., set up the initial view of the file. The file consists of keywords followed by parameters (e.g., a keyword for the azimuth, followed by the value of the azimuth). The file is ASCII, with each keyword and parameter on one line, separated from others by a carriage return.

To automatically load a vue file, the file name must have the following form:

File Type	Vue File Name
faces file (*.faces*)	<*file*>.vue
3D grid (*.3grd*)	<*file*>.3gvue
2D grid (*.2grd*)	<*file*>.2gvue
Scattered data (*.dat*), property data (*.pdat*), path data (*.path*)	<*file*>.dvue

where <*file*> is the prefix of the file being displayed. Vue files, their format, naming convention, usage, and default vue files are discussed in detail in Chapter 2, *3D Viewer File Types* (page 3DV 2-14). A list of the keywords and their parameters is given in Appendix B.

The Color Key

The color key, located in the lower left-hand side of the screen, contains information about several aspects of the display. The amount of information shown in the color key can be modified (refer to *Screen Menu*, page 3DV 4-56) and not all of the information is displayed by default. The information available on the color key is described next.

Color Key Label

The color key type is shown at the top of the color key. Several different color keys are available in the 3D Viewer: the property, the zone, the feature, the time, the Z, and, the uniform data color key. The only differences between the color keys is the color table displayed the labels (if any) displayed, and the number of colors. Examples of the property color keys are shown in the figures on 3DV Fig-2. [default: on]

Active P

Multiple files with different (or the same) properties can be loaded into the same display; however, only one of these properties can be displayed in the color key at any given time. The Active P caption indicates which set of properties are currently displayed in the color key (if a property color key is displayed). The active property also indicates on which files the P/Isosurface slicing acts (refer to XXX). [default: on]

P Units

The P units caption given during the creation of the faces or 3D grid file is displayed near the top of the property color key. Generally, this caption refers to the units of the modeled property. [default: on]

Color Table

The portion of the color file being used for the current display is shown in the key. When the property color key is displayed, the color table relates the colors of the property model, 3D grid, or the data points to the numeric P-values. The numbers next to the color tables displayed in the figures on 3DV Fig-2 represent the values of the isosurface boundaries. Property label strings can also be displayed next to the color table (specified during faces file generation or in a vue file). If the zone, Z, time, or feature color key is displayed, the colors refer to the different zones, color-filled contour Z levels, the varying times of the data, or the available features, respectively. When a 3D seismic grid is displayed, a seismic color table can also be displayed. When the uniform data color key is displayed, a single color is assigned to each file and displayed in the key, along with the file names. These color tables are discussed in *Screen Menu* (page 3DV 4-55) and in *Using the Color Editors* (page 3DV 5-1). [default: on]

Primary Model

The current faces, 2D grid, 3D grid, or data file name is shown after the word *Primary.* [default: on]

Active Edit File

Although multiple data files (*.dat*, *.pdat*, and *.path*) files can be displayed at one time, only one of the files can be actively edited at time. The file that can be edited is listed in the color table as the Active Edit File. [default: on if more than one data file is loaded in the same display]

XY Units

The XYunits of the data, grid, or faces file can be displayed. This label is especially useful if the XYunits do not match the Z units. [default: off; on for models with mixed XY and Z units]

Z Units

The Z units of the data, grid, or faces file can be displayed. This label is especially useful if the Z units do not match the XY units. [default: off; on for data with mixed XY and Z units]

Z-exaggeration

The Z-exaggeration is the factor by which the Z-axis has been multiplied to create a well proportioned model in relation to the X and Y axes (refer to *View Menu*, page 3DV 4-22). [default: off]

Azimuth and Inclination

The azimuth and inclination indicate the current rotation of the model. These two features are discussed in detail under *View Menu* (page 3DV 4-22). [default: off]

Axis Orientation Diagram

The axis orientation diagram, located at the bottom of the color key, shows the current direction of the principle X, Y, and Z axes (joining at the minimum X, Y, and Z point). The three principle axes of the model's wire frame correspond to the orientation diagram and are drawn in the same color. The axis orientation diagram rotates with model rotation. [default: on]

X, Y, and Z Front Cuts

The X Front Cut, Y Front Cut, and Z Front Cut values indicate the coordinates in data scale units of the front-most X, Y, and Z surfaces. The 3D Viewer allows users to slice through layers of the model or within the data point volume, cutting in from the front or back face along each axis (refer to *Adjust Slices—Cutting Away the Property Model*, page 3DV 4-13). Only the cuts along the faces closest to the user's eye (regardless of rotation) are reflected in the values in the color key. [default: off]

X, Y, and Z Chair Cuts

The X Chair Cut, Y Chair Cut, and Z Chair Cut values indicate the coordinates in data scale units of the chair X, Y, and Z surfaces. The 3D Viewer allows users to remove a subsection of the model, creating what is known as a "chair" (as shown in the top figure on 3DV Fig-1). Refer to *Chair Mode—Removing a Subsection of the Model* (page 3DV 4-15). When a chair subsection is removed from a model, the coordinate values of the chair slices are posted on the color key. By default, the model does not appear with the chair removed, so the user does not see these values upon entering the 3D Viewer. [default: off]

Color Key Borders

By default, the information in the color key is displayed without the borders. When the borders are on, anything displayed behind the color key's rectangular box (e.g., the model) is not visible. When the borders are off, anything behind the color key region is displayed. [default: off]

The Main Menu

The Main Menu appears first, allowing access to all other 3D Viewer menus. The 3D Viewer contains over 20 menus (including the Main Menu) to accommodate the 3D Viewer commands. The user can access any menu from any other menu by using the associated hot keys, shown in recessed boxes on the Main Menu. The Main Menu is hot key "1." In addition, the Main Menu, Manipulate Menu, View Menu, Zone Menu, and/or Well Positioning Menu are also available by clicking on the appropriate button in the Menu Choices section on each menu, space permitting.

Each menu is composed of three parts:

- Status Window . . . . used for message display and keyboard input display
- Command section . . . . contains all menu buttons, slider bars, dials, toggle bars, and boxes
- Menu Choices section . . . . . used to allow access to some of the other menus directly without going to the Main Menu first; always allows access to the Main Menu and exiting the 3D Viewer

Each of the menus is discussed separately in Chapter 4, *3D Viewer Menus*.

The Status Window

The Status Window is used to display help, error messages, and messages designed to keep the user updated on what is happening within the program. The Status Window is also used to prompt for, display, and accept keyboard input. When keyboard input is required (e.g., when the 3D Viewer prompts for an output file name), a prompt appears in the Status Window. To enter an answer, merely type at the keyboard; **the cursor need not be in the Status Window to enter an answer** (the cursor can be in either the graphic display or menu portions of the screen). When keyboard input is required in full-screen mode, the prompt and user response appear in the upper right-hand corner of the screen, where the Status Window would be if the display were in partial-screen mode.

The 3D Viewer Interface

Online Help

The middle mouse button is used to display help in the Status Window at the top of each menu. Clicking on any 3D Viewer menu button, slider bar, toggle bar, dial, or box with the middle mouse button displays the help information. Reading through the 3D Viewer document prior to entering the 3D Viewer, however, is encouraged.

The 3D Viewer Cursor

The 3D Viewer cursor can take on several forms; each of these forms indicates a state to the user. Most of the time, the cursor is in the shape of a left-slanting arrow; the other shapes are an hour glass, a book, and a right-facing arrow. Each is described below:

- Left-slanting arrow . . . . ready for user input
- Hour glass. . . . . working on performing the current command
- Book . . . . reading a file from disk
- Right-facing arrow . . . . waiting for a selection from a pop-up menu

The cursor can be made larger than the default using the "*-c*" command line option, i.e., *evview -c*.

Menu Commands

Invoking menu commands can be accomplished in several ways:

- Clicking the left mouse button on a menu button
- Typing a hot key on the keyboard
- Setting the handles of a slider bar to the desired position
- Setting the buttons of a toggle bar to the desired position
- Setting the pointer of a dial to the desired position

3D Viewer Menu Buttons, Boxes, and Hot Keys

To select a particular command (for example, selecting the View Menu from the Main Menu), the left mouse button must be clicked on the appropriate 3D Viewer menu button. Next to each menu button is the command name followed by a single letter, number, a letter and number combination, or a control character enclosed in a recessed box. These letters and numbers are the hot keys; typing the letter, number, specified key (such as the HOME key or the F1 key), or control sequence (e.g., the control key and the number 1, indicated as ^1) invokes the command the same way as would clicking on the menu button. The command takes effect when the key is pressed, and does not require the "return" or "enter" key to be pressed. The layout of the keyboard and all associated hot keys and commands are shown in Appendix D. The user is encouraged to review the hot key diagram, even if already familiar with previous versions of the 3D Viewer.

Menu Buttons and Boxes

The following types of menu buttons and boxes are available:

Menu Button Type	Function	Example
Push buttons	Causes something to happen (e.g., to go to another menu or to bring up a pop-up menu)	
Toggle buttons	Toggles a function on or off	
Radio buttons	Specifies one of several functions (e.g., specifying output to go to a file, a printer, or a file and a printer)	
Value boxes	Enter a value by clicking on box	
Text boxes	Displays information; non-editable, but can be changed by clicking on the box, which brings up a pop-up menu.	

When a toggle button or a radio button appears indented, it is active or on. When a toggle button or radio button appears pushed out, it is inactive or off. Push buttons only appear pushed in while they are being clicked on.

Pop-up Menus and Scroll Bars

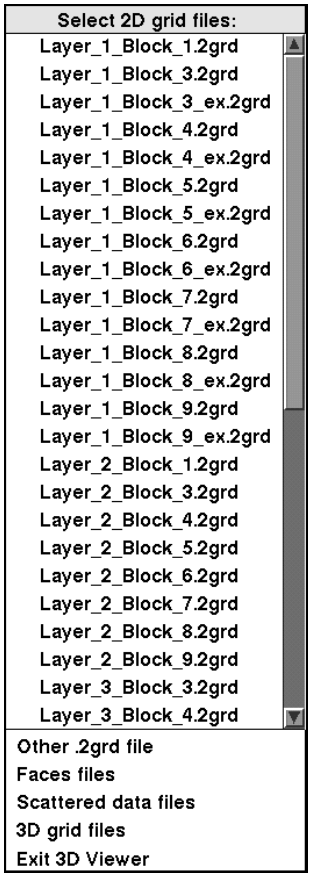
Pop-up menus (shown on 3DV 3-15) are used throughout the 3D Viewer, whenever one of several options, file names, settings, or functions needs to be selected. They are used, for example, for editing the file selections, choosing which parts of the color key are visible, and selecting save file (after editing a file) options. The specific functions of each pop-up menu are discussed in Chapter 4, wherever the corresponding command is mentioned.

Pop-up Menu Usage

The left mouse button is used to select the item desired on the pop-up menu. In many cases, selecting the item causes the pop-up menu to disappear and the command to be invoked (e.g., when selecting a color file for display). In other cases, such as editing the color key information, the user can turn on or off the items (e.g., leave on the display of the color table, file name, and axes orientation diagram, but turn off everything else in the color key). An asterisk appears next to, or disappears from, each menu item as it is selected. In general, an asterisk indicates that the item is "on" or will be displayed; the lack of an asterisk indicates that the item is "off" or will not be displayed. In many cases, a menu item is available for turning on or off all of the items at once, if appropriate. After all the selections are made, the item *No More Selections* (or similar) must be clicked on to invoke the command.

If no selections or changes are desired, selecting the *No More Selections* (or similar) as soon as the pop-up menu comes up causes it to disappear without invoking any commands (in some cases, this may still cause a screen redraw, depending on the type of commands on the menu). In addition, clicking off of the menu (i.e., anywhere outside the pop-up menu) causes it to disappear without invoking any commands (this action does not cause a redraw).

Scroll Bar Usage



If a pop-up menu has more than 25 possible menu selections, the first 25 items are shown with a scroll bar on the right-hand side of the menu. The scroll bar is used to search through the list of menu items.

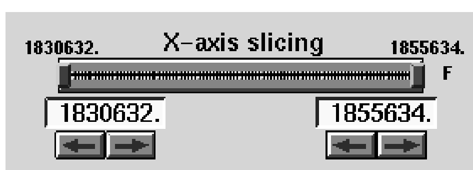
The scroll bar is shown to the left. The scroll bar consists of a long rectangle with an arrow at each end. The rectangle is known as the scroll region. Within the scroll region is a smaller rectangle called the slider. The scroll region represents the full extent of the list, while the size and placement of the slider determines the portion of the list being viewed. The ratio between the two is the same as the ratio of the total length of the entries to the length of the viewing area.

Several methods are available for using the scroll bar; all methods can be performed using any of the mouse buttons:

- Clicking once on one of the arrows at either end of the scroll bar causes the slider (and, hence, the viewed area) to be moved in the direction of the arrow one item at a time.
- Clicking within the scroll region (but not on the slider) causes the slider and the viewed area to be scrolled up or down to the region centered around the cursor location (i.e., the slider moves to be centered around the cursor location, hence changing the displayed portion).
- Holding down the mouse button with the cursor on either arrow continues the slider movement in the desired direction, one item at a time.
- Holding down the mouse button, while either on the slider or in the scroll region, allows the user to drag the slider up or down. (If the mouse button is depressed in the scroll region, but not on the slider, the slider first moves to the cursor location, then, with the mouse button held down, the slider can be dragged.) As the slider is dragged, the viewing area changes.

Slider Bars

Slider bars control display attributes such as the X, Y, and Z slicing plane, and the isovalue levels displayed. Six possible types of slider bars exist within the 3D Viewer: slider bars with one handle, slider bars with two handles, and slider bars with three handles, each with or without tick marks. An example of a slider bar is shown below.



The slider bars consist of four components:

- The bar itself, with or without tick marks
- The handle(s) that slides along the bar
- The value box(es) below the bar that shows interval or data unit values
- The arrows below or next to the boxes

The Bar

The slider bar itself is a graphical representation of the range of the data (e.g., the X or P range of the data) or the range of possible values (e.g., the material specularity range). For example, if a bar represents the material specularity of the model, the range of that bar is from 0.0 to 1.0. When the slider handle is at one end, the specularity or reflectivity of the model is 0.0 (low reflectivity); when it is at the other end, the model reflectivity is 1.0 (highly reflective).

Slider Bar Range Units

The range of a slider bar may be represented either in the data scale units of the model or as an incremental value (only for incremental sliders; discussed next). The type of units is toggled by clicking with the right mouse button on any one of the value boxes below the bar. The change in units is only reflected in what is displayed in the value boxes; the minimum and maximum values displayed at either end of the bar are always shown in the default units.

Incremental versus Continuous Sliders

Slider bars can come with or without tick marks-bars with tick marks are incremental bars; ones without tick marks are continuous slider bars. If tick marks are present, they represent the smallest increment of change that can be executed using that bar. For example, if the scene ambience bar had nine tick marks on it (i.e., every 0.1, starting with the .1 tick mark), then the ambient light could only be changed by .1 at a time. In other words, the model could only be displayed with 0, .1, .2, etc., ambient light. If, on the other hand, the bar does not have any tick marks, as is the actual case for the scene ambience bar, then the user can select any value up to the default precision (in this case, one one-hundredth). The model, in this case, could be displayed with whatever is the most appropriate light, for example, 0.65. (Scene ambience is discussed in *Scene and Material Properties*, page 3DV 4-106.)

Handles

The setting of the slider bar is changed by sliding the purple, yellow, and/or red handles along the bar. (The difference between purple, yellow, and red handles is discussed in Chapter 4, where applicable.) The current setting for the slider bar attribute (e.g., the X 3D cursor location or the value of the Z slicing plane) is shown in the value box(es) below the bar. The set of arrows below or next to each box can also be used to change the value of the attribute. If a slider bar has two (or three) handles, then two (or three) sets of value boxes and corresponding left and right arrows appear underneath the bar. The left value box and corresponding arrows pertain to the left handle; the right value box and corresponding arrows pertain to the right handle (and the middle value box and corresponding arrows pertain to the middle handle).

The handles are moved (and hence the setting changed) by dragging the handle along the bar. The cursor can be placed on or near the handle to drag the handle. While the handle is dragged along the bar, the numbers in the value boxes below the bar change according to the current handle position, so the user instantly knows the value of the attribute. If the bar has two or three handles, the handles can be moved anywhere on the bar, with the exception that the two end handles cannot be dragged past one another nor past the middle handle, if one exists. The middle handle, however, can be dragged past either end handle, effectively turning off its function. If the bar has only one handle, that handle can be moved anywhere on the bar.

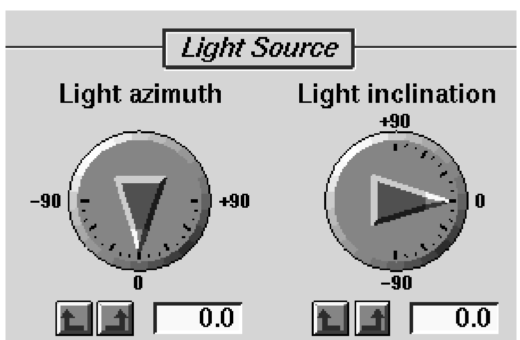
The handle position can be moved directly to a location, by clicking the cursor at the new position desired for the handle. The *handle closest to the cursor position* then moves immediately to the place where the mouse button was clicked. If, after pressing down, the mouse button is not released, the handle is "tied" to the position of the cursor and can be dragged to any position. In this way, the cursor does not need to be placed directly on the handle in order to move the handle. With two or three handles, care should be taken to place the cursor closest to the handle to be moved.

Value Boxes, Arrows, and Hot Keys

Three other methods exist for changing the attribute setting of a slider bar. The settings can be changed incrementally by clicking on the arrows below the box(es). Clicking on the right arrow moves the corresponding handle to the right; clicking on the left arrow moves it to the left. A value can also be entered directly for the setting by clicking with the left mouse button on the value box below the bar. A message appears in the Status Window prompting the user to enter a value. (Clicking on the left box changes the value for and the position of the left handle; clicking on the right box changes the right handle; and similarly for the middle box and middle handle.) The user can enter values in either data units or in incremental units (for an incremental slider) depending on which is displayed in the value box. As noted previously, the units can be toggled by clicking with the right mouse button on any value box. If the user enters a value that is not available, the 3D Viewer either rounds to the nearest available value, if within the slider bar's range, or displays a message in the Status Window indicating an error in the value entered. The third method for changing a slider bar's setting is to use its associated hot keys if available; these hot keys are discussed under *Additional Hot Key Features* (page 3DV 4-156).

Dials

Dials are used to control display attributes such as the azimuth and inclination of the model and the directional light sources. An example of two dials is shown below.



The dials consist of four components:

- The dial itself
- The pointer that rotates on the dial
- The value box below the dial that shows the current value
- The arrow buttons below or next to the boxes

The Dial

A dial is used as a graphical representation of the range of values for a function. For example, the dial that represents the azimuth of the model ranges from 0° to 360°. When the yellow tip of the pointer is at 0, the model is displayed with an azimuth of 0°; when it is pointing to 180, the model is displayed at 180°. (Azimuth is discussed in *View Angle—Rotating the Model*, page 3DV 4-23).

The Pointer

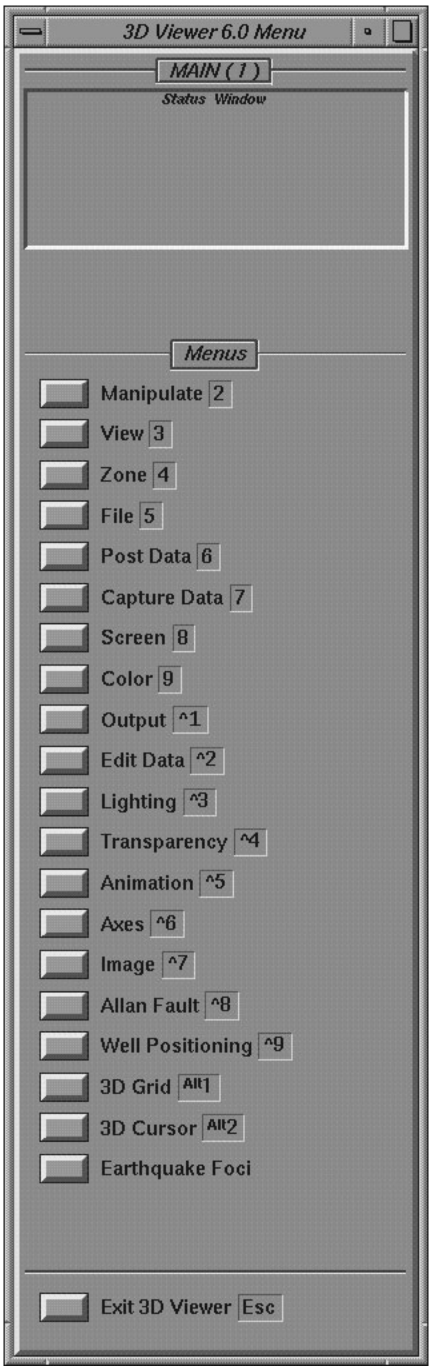
The setting of a dial is changed by rotating the yellow-tipped pointer. The current setting for the dial attribute (e.g., azimuth or inclination) is shown in the value box below the dial. The pointer is moved (and hence the setting changed) by dragging the pointer along the dial. The cursor can be placed on or near the pointer to drag the pointer; the pointer "pops" to the cursor location. Once the desired setting is achieved, the mouse button is released. While the pointer is dragged around the dial, the number in the value box below the dial changes according to the current pointer position, so the user instantly knows the value of the attribute. On dials that do not have values up to 360°, the pointer cannot be dragged past the minimum or maximum value shown.

The pointer position can be moved directly to a location, by placing the cursor at the new position desired for the pointer, and clicking at that point with the left mouse button. If, after pressing down, the mouse button is not released, the pointer is "tied" to the position of the cursor and can be dragged to any position. In this way, the cursor does not need to be placed directly on the pointer in order to move the pointer.

Value Boxes, Arrows, and Hot Keys

Three other methods exist for changing the attribute setting of a dial. The settings can be changed incrementally by clicking on the arrows next to the value box. Clicking on the right arrow moves the corresponding pointer counter-clockwise; clicking on the left arrow moves it clockwise. A value can also be entered directly for the setting by clicking with the left mouse button on the value box below the dial. A message appears in the Status Window prompting for a value to be entered. If a value is entered that is not available, the 3D Viewer either rounds to the nearest available value, if within the dial's range, or displays a message in the Status Window indicating an error in the value entered. The third method for changing a dial's setting is to use its associated hot keys, if available; these hot keys are discussed under *Additional Hot Key Features* in (page 3DV 4-156). (A listing of all available hot keys is given in Appendix D of the 3D Viewer.)

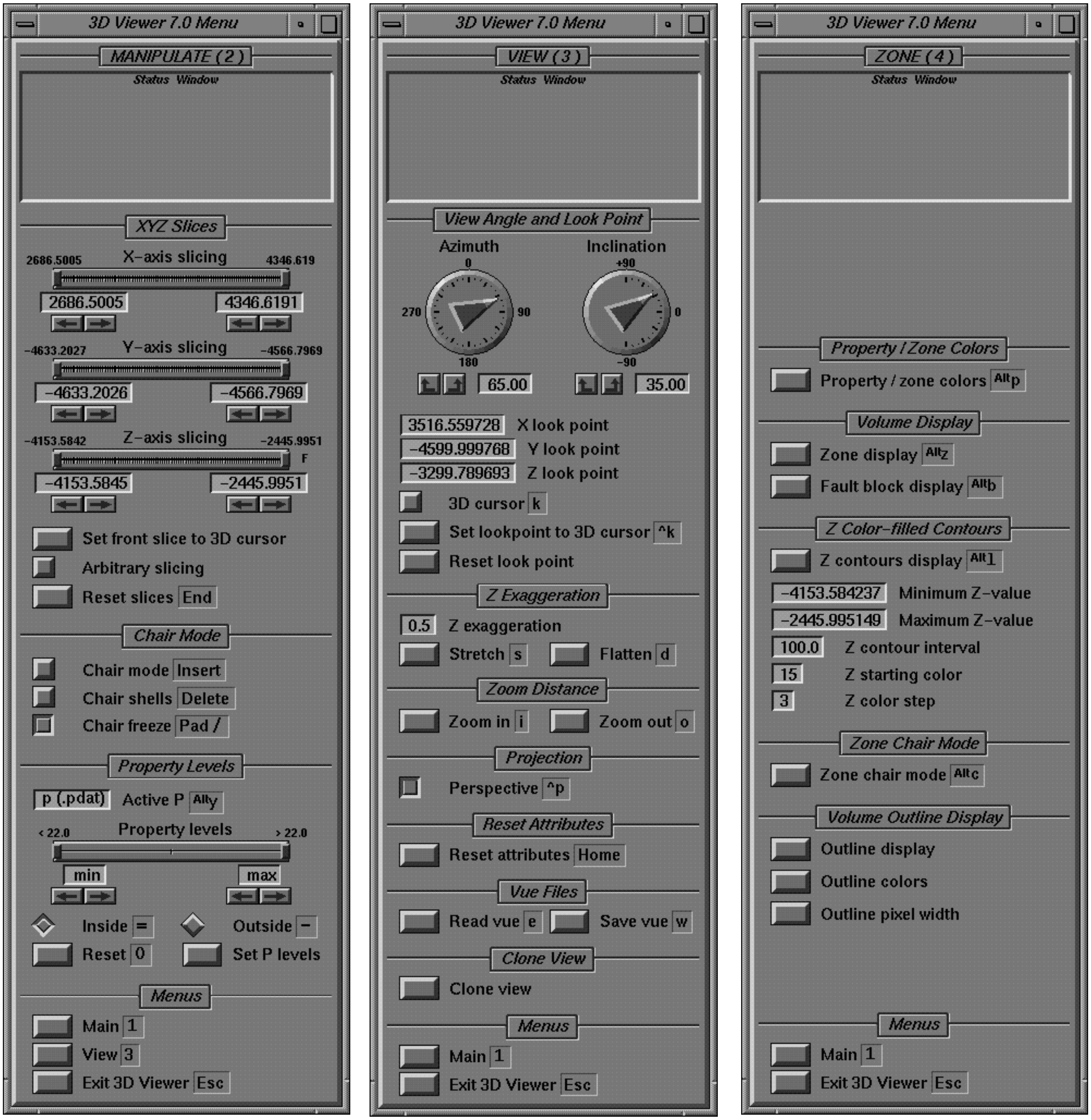
Chapter 4: 3D Viewer Menus

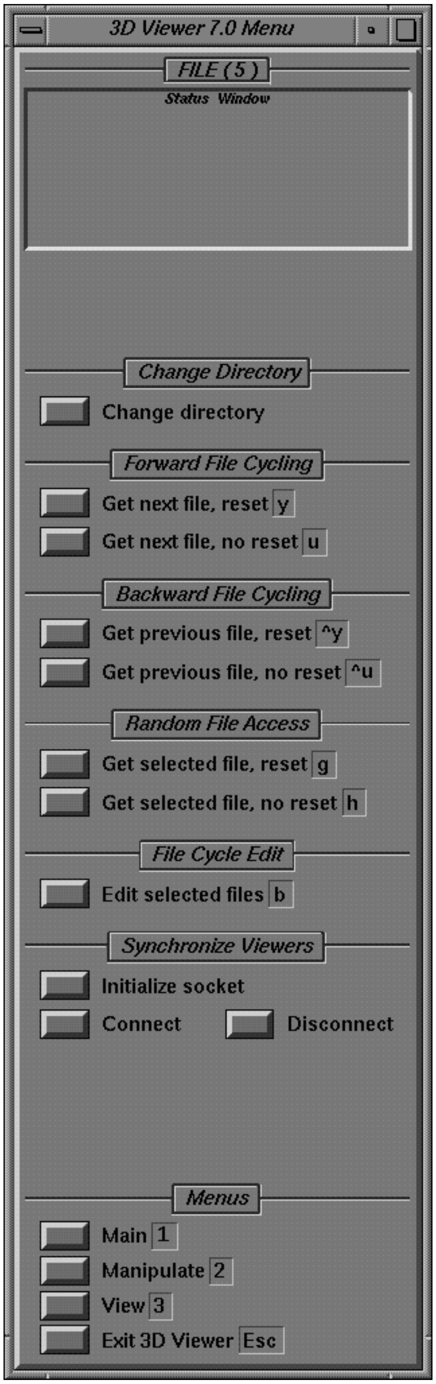


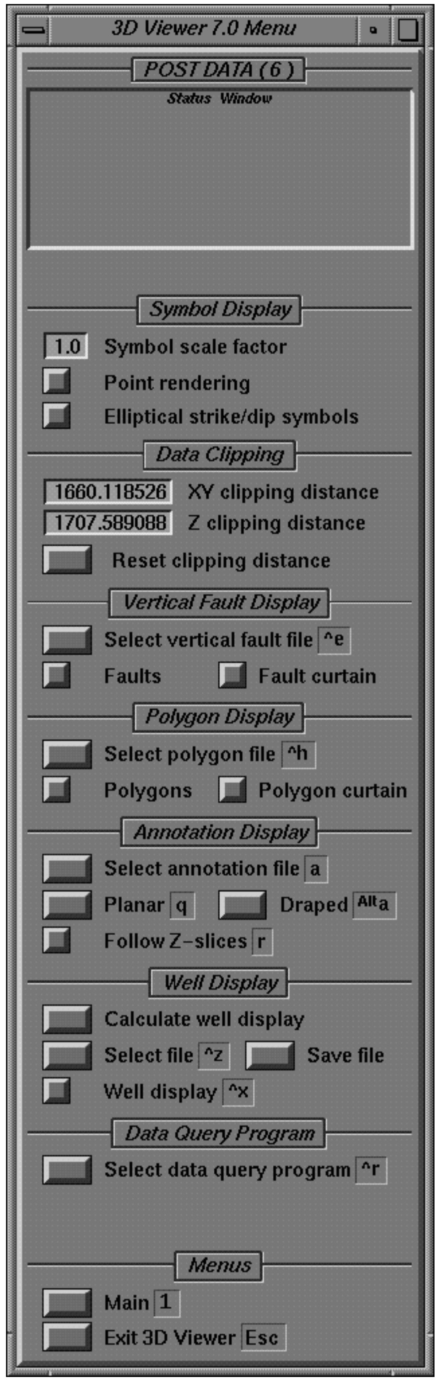
The 3D Viewer's graphical interface is centered on 22 menus, including a Main Menu that contains access to all of the other menus. Each menu is dedicated to particular functions. Dividing the functions into separate categories and, hence, separate menus, allows the user to more easily find desired commands.

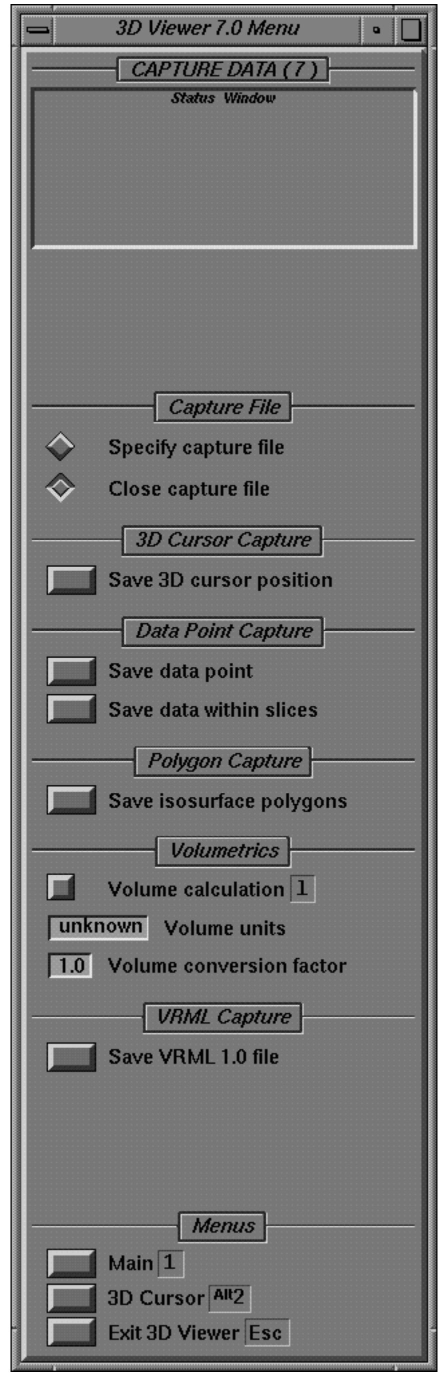
Each menu is composed of three parts (e.g., the menu shown on 3DV 4-12): the Status Window, which displays messages, requests, and keyboard input when necessary; the sections of available commands; and the Menu Choices section, which allows access to some of the other menus directly and to exit the 3D Viewer without having to go to the Main Menu first. Using the 3D Viewer interface, including how to use the menu buttons, slider bars, dials, and hot keys, and how to enter keyboard input, is discussed fully in Chapter 3, *The 3D Viewer Interface*. Each of the menus is shown on the following pages and is discussed separately next.

Manipulate
View
Zone
File
Post Data
Capture Data
Screen
Color
Output
Edit Data
Lighting
Transparency
Animation
Axes
Image
Allan Fault
Well Positioning
3D Grid
3D Cursor
Earthquake Foci

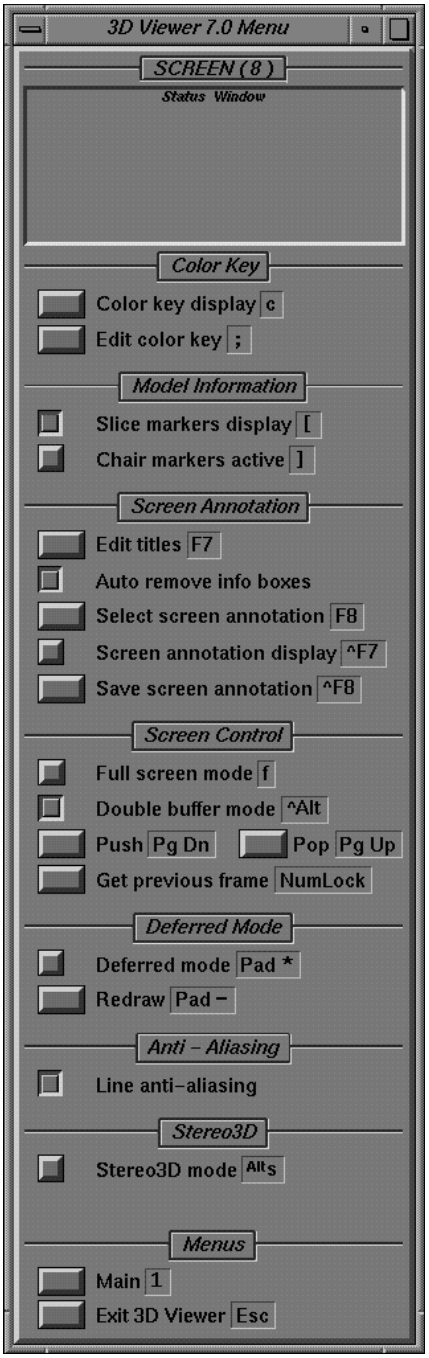

3D Viewer 7.0 Menu
MANIPULATE (2)
Status Window
XYZ Slices
X-axis slicing
2686.5005
4346.619
2686.5005
4346.6191
Y-axis slicing
-4633.2027
-4566.7969
-4633.2026
-4566.7969
Z-axis slicing
-4153.5842
-2445.9951
F
-4153.5845
-2445.9951
Set front slice to 3D cursor
Arbitrary slicing
Reset slices End
Chair Mode
Chair mode Insert
Chair shells Delete
Chair freeze Pad /
Property Levels
p (.pdat) Active P Alty
Property levels
< 22.0
> 22.0
min
max
Inside =
Outside -
Reset 0
Set P levels
Menus
Main 1
View 3
Exit 3D Viewer Esc
3D Viewer 7.0 Menu
VIEW (3)
Status Window
View Angle and Look Point
Azimuth
Inclination
0
270
90
180
+90
0
-90
65.00
35.00
3516.559728 X look point
-4599.999768 Y look point
-3299.789693 Z look point
3D cursor k
Set lookpoint to 3D cursor ^k
Reset look point
Z Exaggeration
0.5 Z exaggeration
Stretch s
Flatten d
Zoom Distance
Zoom in i
Zoom out o
Projection
Perspective ^p
Reset Attributes
Reset attributes Home
Vue Files
Read vue e
Save vue w
Clone View
Clone view
Menus
Main 1
Exit 3D Viewer Esc
3D Viewer 7.0 Menu
ZONE (4)
Status Window
Property / Zone Colors
Property / zone colors Altp
Volume Display
Zone display Altz
Fault block display Altb
Z Color-filled Contours
Z contours display Alt1
-4153.584237 Minimum Z-value
-2445.995149 Maximum Z-value
100.0 Z contour interval
15 Z starting color
3 Z color step
Zone Chair Mode
Zone chair mode Altc
Volume Outline Display
Outline display
Outline colors
Outline pixel width
Menus
Main 1
Exit 3D Viewer Esc

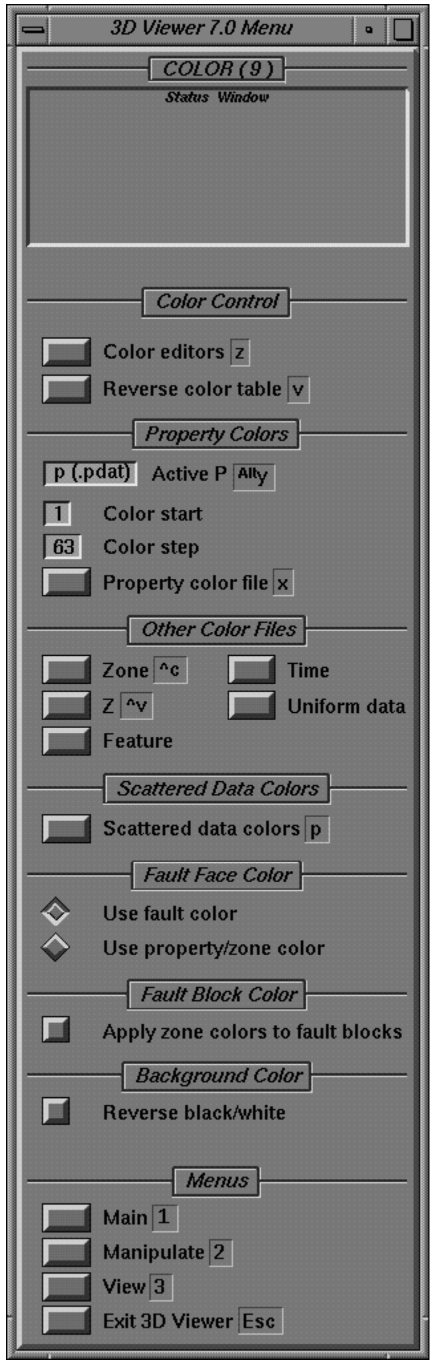


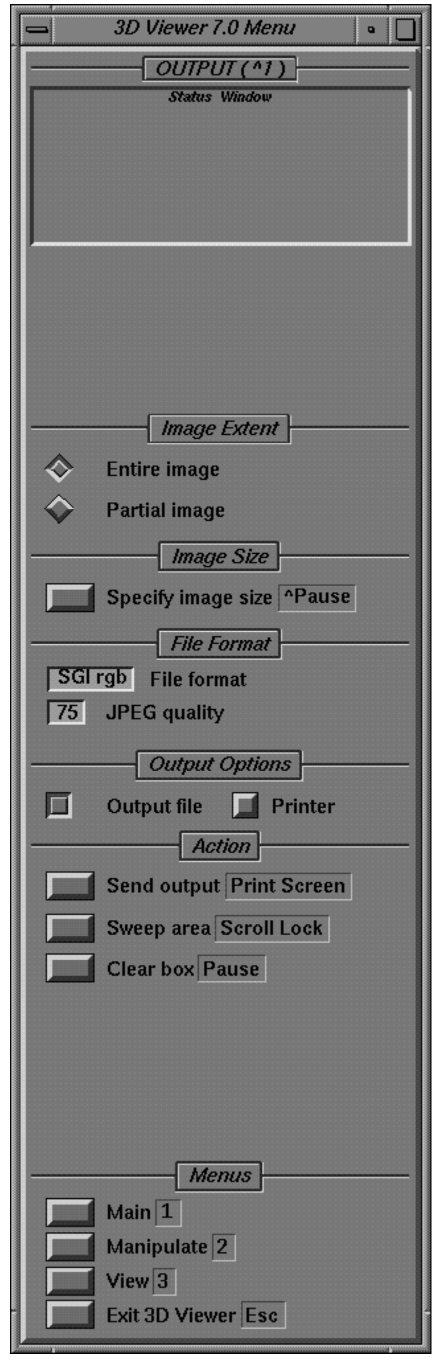


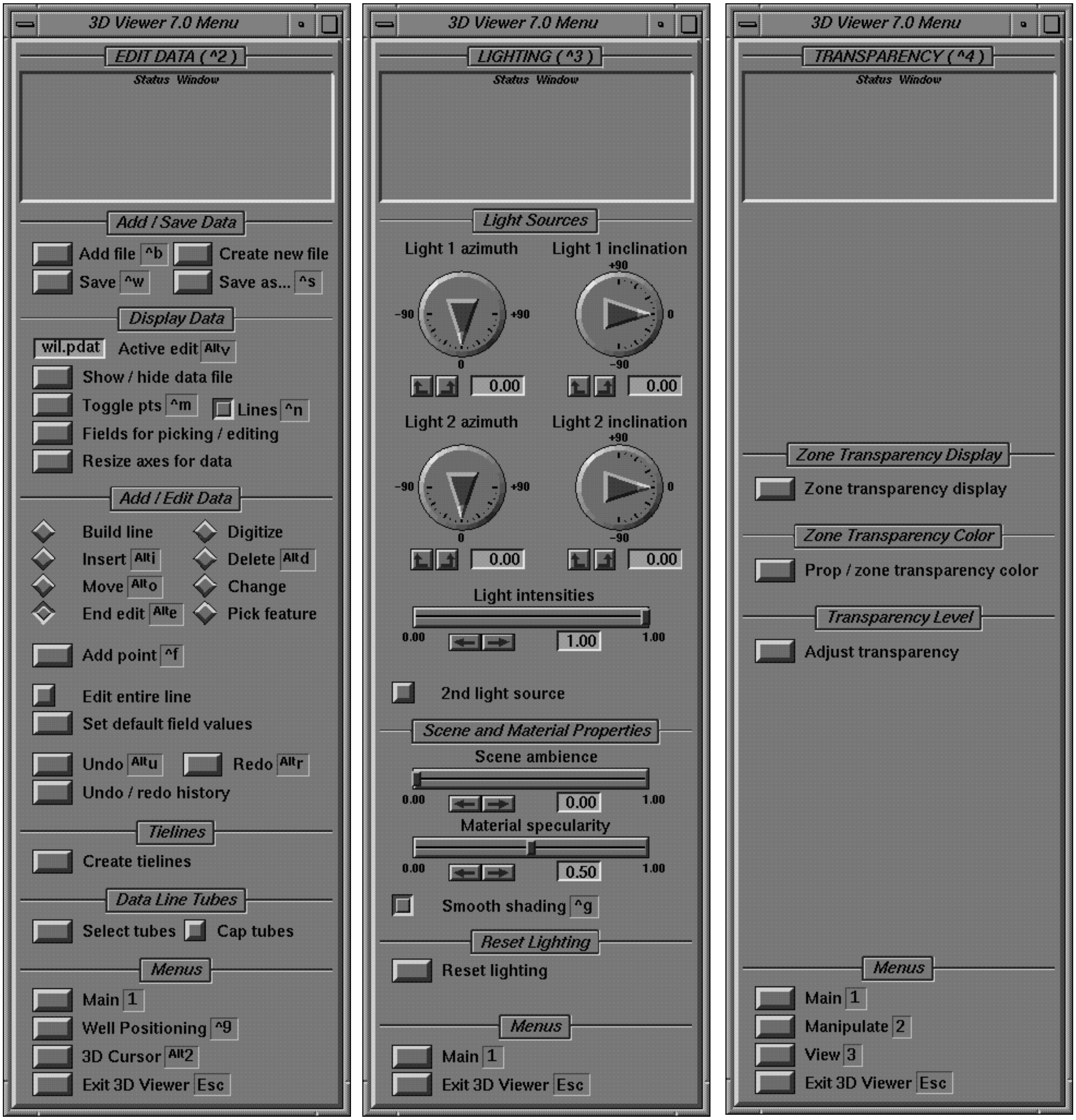


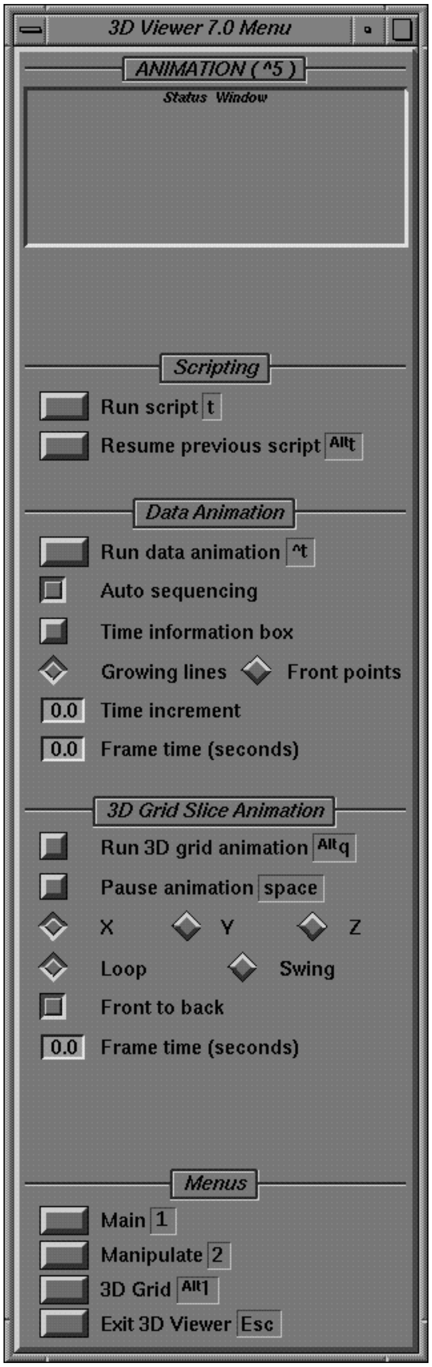
Manipulate *Post Data* *Output* *Transparency* *Image* *3D Grid*
View *Capture Data* *Edit Data* *Animation* *Allan Fault* *3D Cursor*
Zone *Screen* *Lighting* *Axes* *Well Positioning* *Earthquake Foci*
File *Color*

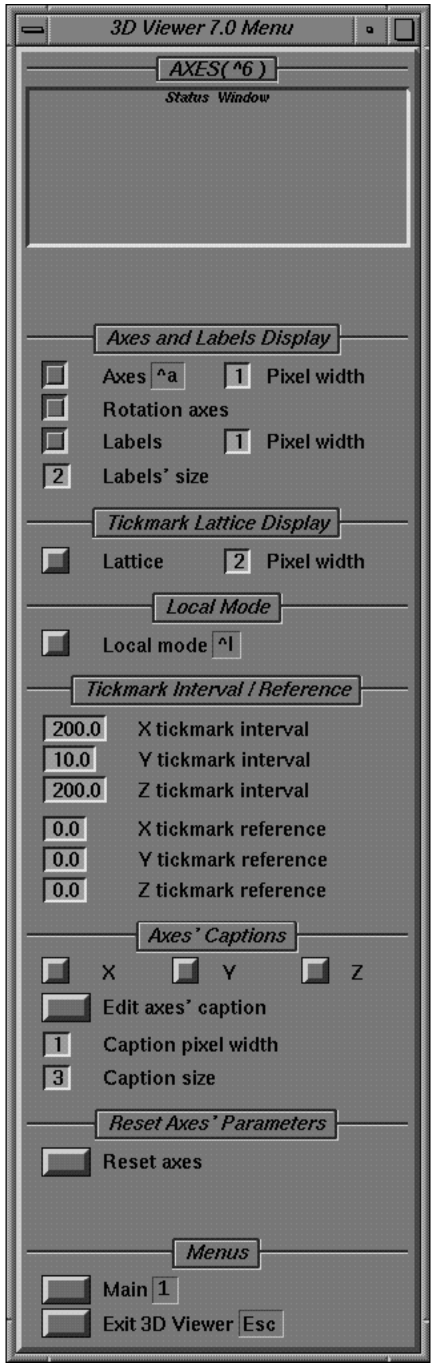

3D Viewer 7.0 Menu
SCREEN (8)
Status Window
Color Key
Color key display c
Edit color key ;
Model Information
Slice markers display [
Chair markers active]
Screen Annotation
Edit titles F7
Auto remove info boxes
Select screen annotation F8
Screen annotation display ^F7
Save screen annotation ^F8
Screen Control
Full screen mode f
Double buffer mode ^Alt
Push Pg Dn
Pop Pg Up
Get previous frame NumLock
Deferred Mode
Deferred mode Pad *
Redraw Pad –
Anti – Aliasing
Line anti–aliasing
Stereo3D
Stereo3D mode Alt s
Menus
Main 1
Exit 3D Viewer Esc

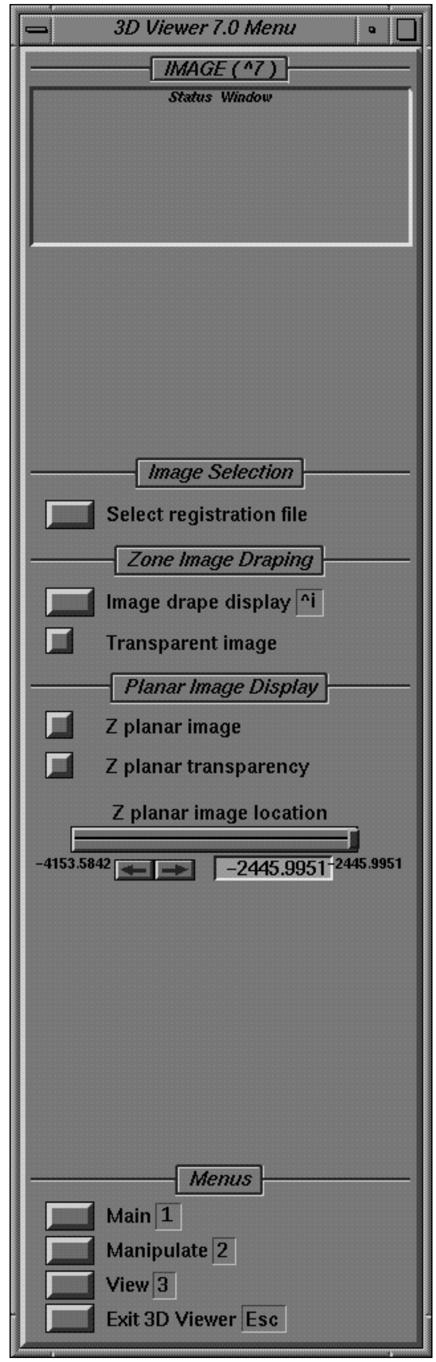

3D Viewer 7.0 Menu
COLOR (9)
Status Window
Color Control
Color editors z
Reverse color table v
Property Colors
p (.pdat)
Active P Alt y
1
Color start
63
Color step
Property color file x
Other Color Files
Zone ^c
Time
Z ^v
Uniform data
Feature
Scattered Data Colors
Scattered data colors p
Fault Face Color
Use fault color
Use property/zone color
Fault Block Color
Apply zone colors to fault blocks
Background Color
Reverse black/white
Menus
Main 1
Manipulate 2
View 3
Exit 3D Viewer Esc

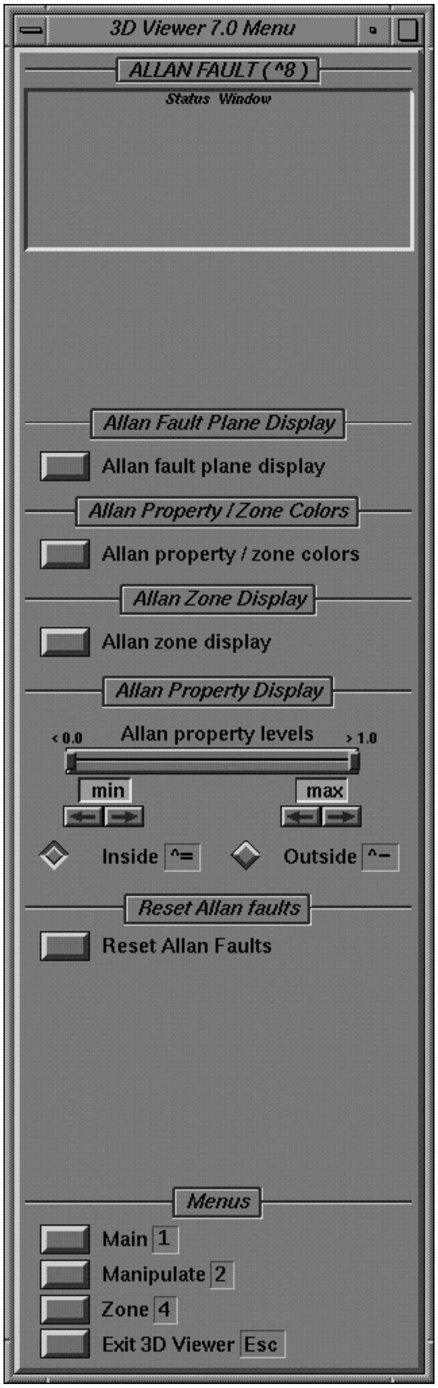

3D Viewer 7.0 Menu
OUTPUT (^1)
Status Window
Image Extent
Entire image
Partial image
Image Size
Specify image size ^Pause
File Format
SGI rgb
File format
75
JPEG quality
Output Options
Output file
Printer
Action
Send output Print Screen
Sweep area Scroll Lock
Clear box Pause
Menus
Main 1
Manipulate 2
View 3
Exit 3D Viewer Esc

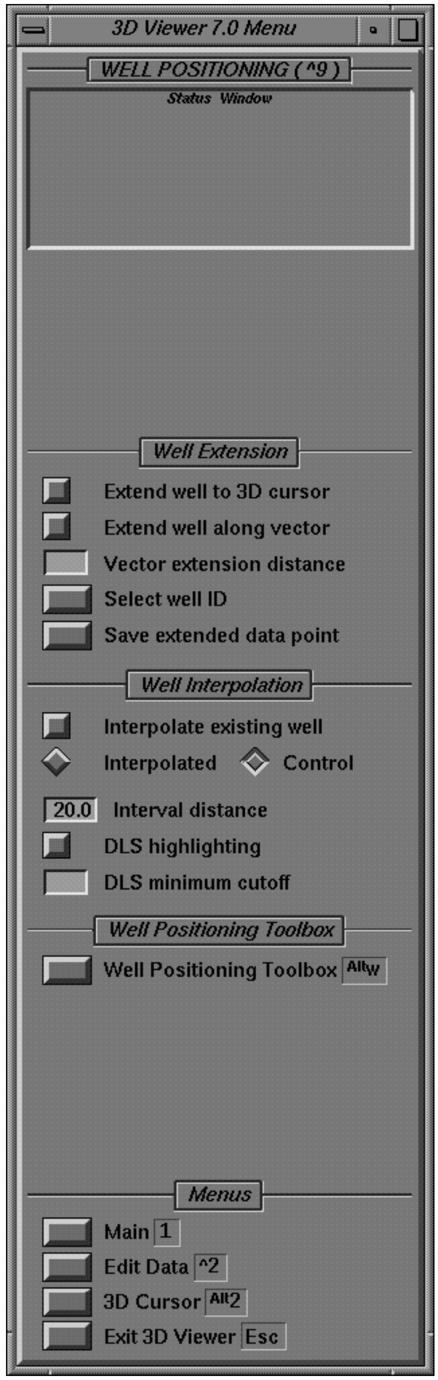

3D Viewer 7.0 Menu
EDIT DATA (^2)
Status Window
Add / Save Data
Add file ^b
Create new file
Save ^w
Save as... ^s
Display Data
wil.pdat
Active edit Alt y
Show / hide data file
Toggle pts ^m
Lines ^n
Fields for picking / editing
Resize axes for data
Add / Edit Data
Build line
Digitize
Insert Alt i
Delete Alt d
Move Alt o
Change
End edit Alt e
Pick feature
Add point ^f
Edit entire line
Set default field values
Undo Alt u
Redo Alt r
Undo / redo history
Tielines
Create tielines
Data Line Tubes
Select tubes
Cap tubes
Menus
Main 1
Well Positioning ^9
3D Cursor Alt 2
Exit 3D Viewer Esc
3D Viewer 7.0 Menu
LIGHTING (^3)
Status Window
Light Sources
Light 1 azimuth
Light 1 inclination
0.00
0.00
Light 2 azimuth
Light 2 inclination
0.00
0.00
Light intensities
1.00
2nd light source
Scene and Material Properties
Scene ambience
0.00
Material specularity
0.50
Smooth shading ^g
Reset Lighting
Reset lighting
Menus
Main 1
Exit 3D Viewer Esc
3D Viewer 7.0 Menu
TRANSPARENCY (^4)
Status Window
Zone Transparency Display
Zone transparency display
Zone Transparency Color
Prop / zone transparency color
Transparency Level
Adjust transparency
Menus
Main 1
Manipulate 2
View 3
Exit 3D Viewer Esc

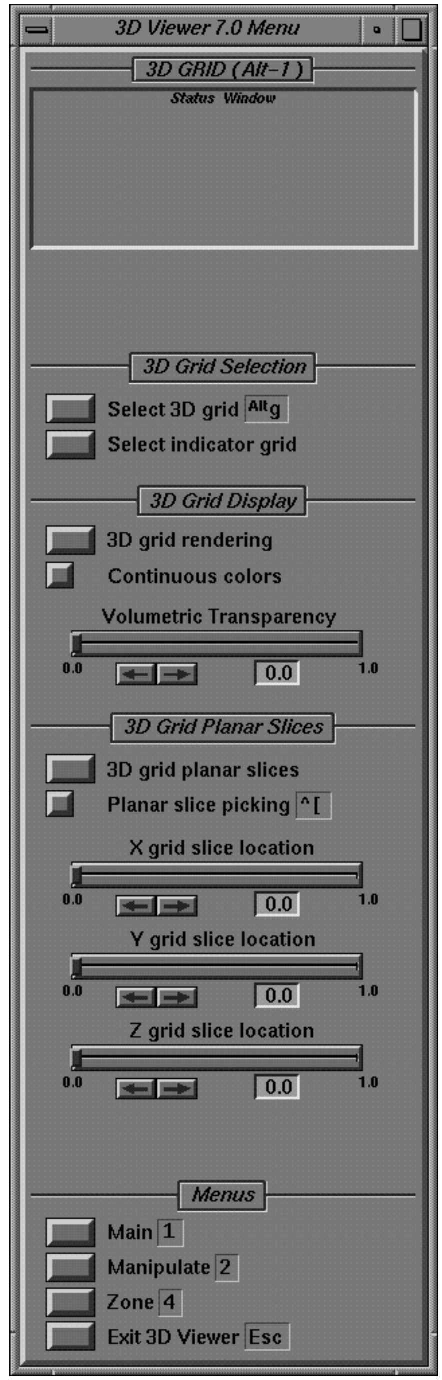

3D Viewer 7.0 Menu
ANIMATION (^5)
Status Window
Scripting
Run script t
Resume previous script Alt t
Data Animation
Run data animation ^t
Auto sequencing
Time information box
Growing lines
Front points
0.0 Time increment
0.0 Frame time (seconds)
3D Grid Slice Animation
Run 3D grid animation Alt q
Pause animation space
X
Y
Z
Loop
Swing
Front to back
0.0 Frame time (seconds)
Menus
Main 1
Manipulate 2
3D Grid Alt 1
Exit 3D Viewer Esc

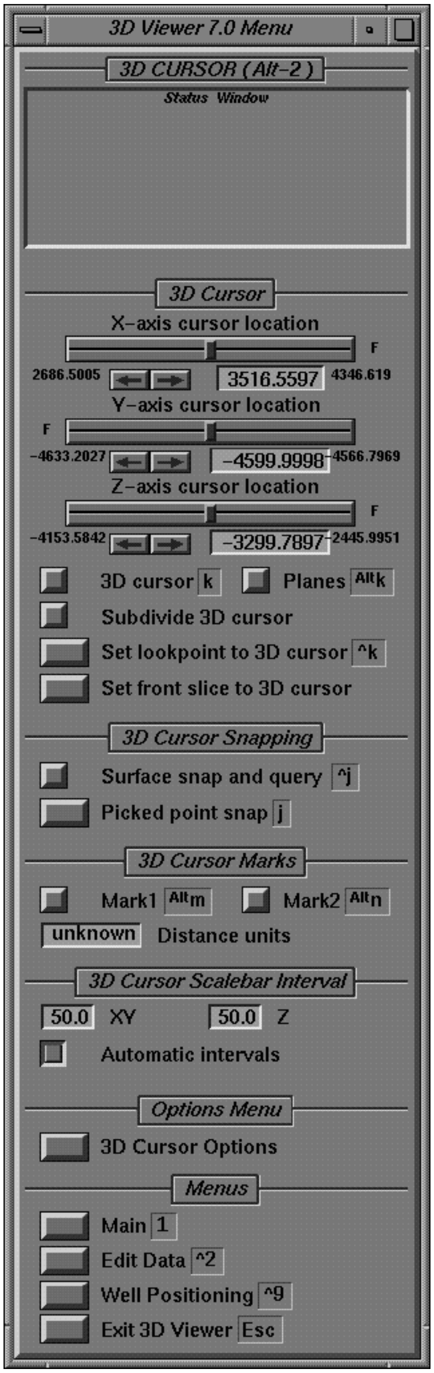

3D Viewer 7.0 Menu
AXES(^6)
Status Window
Axes and Labels Display
Axes ^a
1 Pixel width
Rotation axes
Labels
1 Pixel width
2 Labels' size
Tickmark Lattice Display
Lattice
2 Pixel width
Local Mode
Local mode ^l
Tickmark Interval / Reference
200.0 X tickmark interval
10.0 Y tickmark interval
200.0 Z tickmark interval
0.0 X tickmark reference
0.0 Y tickmark reference
0.0 Z tickmark reference
Axes' Captions
X
Y
Z
Edit axes' caption
1 Caption pixel width
3 Caption size
Reset Axes' Parameters
Reset axes
Menus
Main 1
Exit 3D Viewer Esc

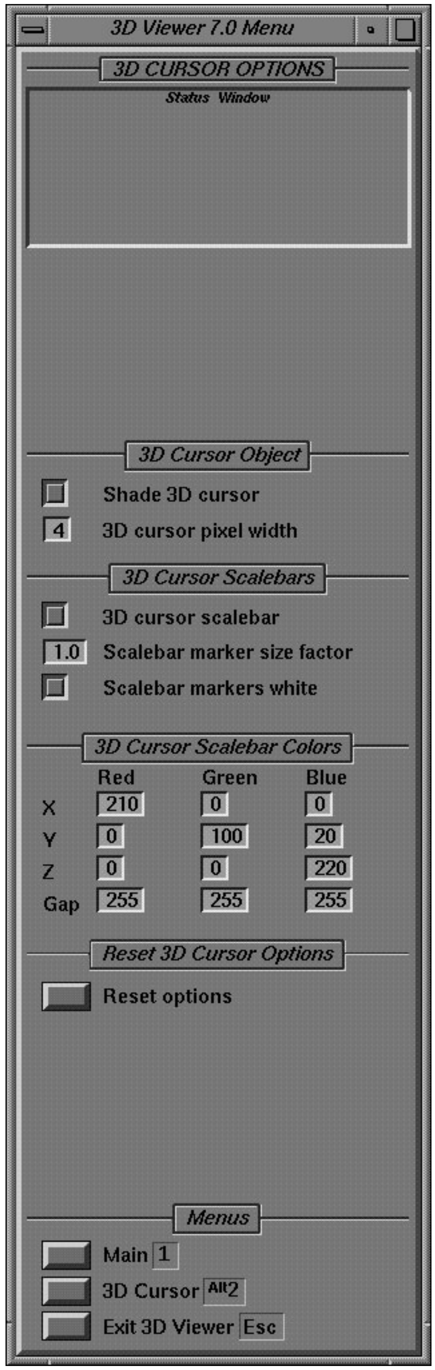

3D Viewer 7.0 Menu
IMAGE (^7)
Status Window
Image Selection
Select registration file
Zone Image Draping
Image drape display ^i
Transparent image
Planar Image Display
Z planar image
Z planar transparency
Z planar image location
-4153.5842
-2445.9951
-2445.9951
Menus
Main 1
Manipulate 2
View 3
Exit 3D Viewer Esc

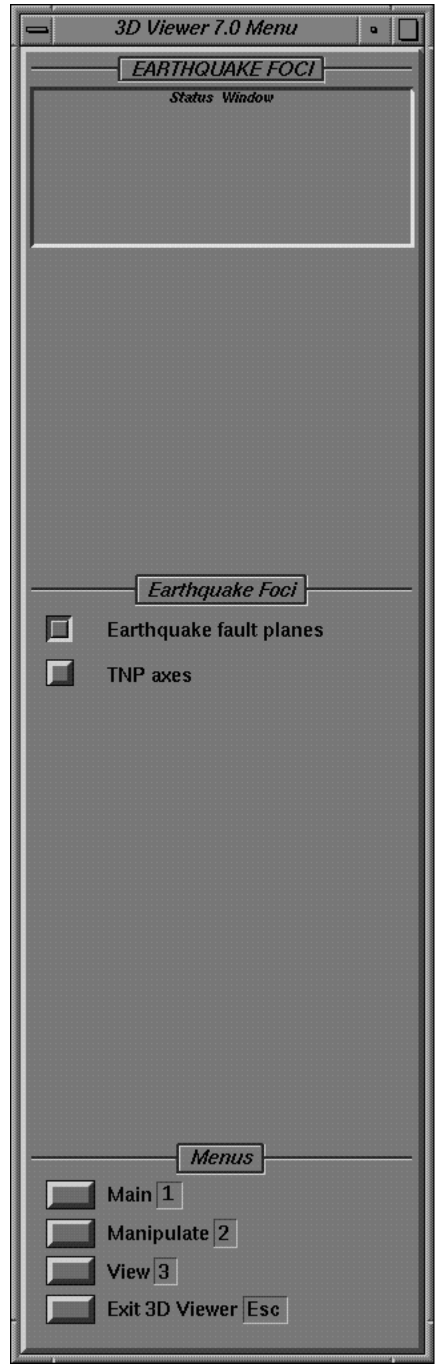

3D Viewer 7.0 Menu
ALLAN FAULT (^8)
Status Window
Allan Fault Plane Display
Allan fault plane display
Allan Property / Zone Colors
Allan property / zone colors
Allan Zone Display
Allan zone display
Allan Property Display
< 0.0
Allan property levels
> 1.0
min
max
Inside ^=
Outside ^−
Reset Allan faults
Reset Allan Faults
Menus
Main 1
Manipulate 2
Zone 4
Exit 3D Viewer Esc


3D Viewer 7.0 Menu
WELL POSITIONING (^9)
Status Window
Well Extension
Extend well to 3D cursor
Extend well along vector
Vector extension distance
Select well ID
Save extended data point
Well Interpolation
Interpolate existing well
Interpolated
Control
20.0
Interval distance
DLS highlighting
DLS minimum cutoff
Well Positioning Toolbox
Well Positioning Toolbox Altw
Menus
Main 1
Edit Data ^2
3D Cursor Alt2
Exit 3D Viewer Esc

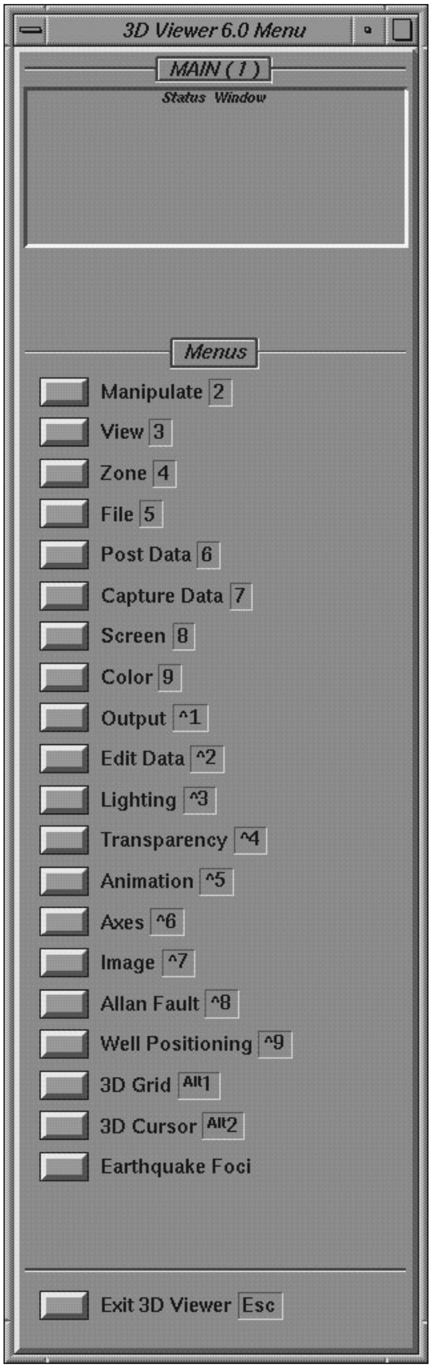

3D Viewer 7.0 Menu
3D GRID (Alt−1)
Status Window
3D Grid Selection
Select 3D grid Altg
Select indicator grid
3D Grid Display
3D grid rendering
Continuous colors
Volumetric Transparency
0.0
0.0
1.0
3D Grid Planar Slices
3D grid planar slices
Planar slice picking ^[
X grid slice location
0.0
0.0
1.0
Y grid slice location
0.0
0.0
1.0
Z grid slice location
0.0
0.0
1.0
Menus
Main 1
Manipulate 2
Zone 4
Exit 3D Viewer Esc


3D Viewer 7.0 Menu
3D CURSOR (Alt-2)
Status Window
3D Cursor
X-axis cursor location
F
2686.5005
3516.5597
4346.619
Y-axis cursor location
F
-4633.2027
-4599.9998
-4566.7969
Z-axis cursor location
F
-4153.5842
-3299.7897
-2445.9951
3D cursor k
Planes Altk
Subdivide 3D cursor
Set lookpoint to 3D cursor ^k
Set front slice to 3D cursor
3D Cursor Snapping
Surface snap and query ^j
Picked point snap j
3D Cursor Marks
Mark1 Altm
Mark2 Altn
unknown
Distance units
3D Cursor Scalebar Interval
50.0 XY
50.0 Z
Automatic intervals
Options Menu
3D Cursor Options
Menus
Main 1
Edit Data ^2
Well Positioning ^9
Exit 3D Viewer Esc


3D Viewer 7.0 Menu
3D CURSOR OPTIONS
Status Window
3D Cursor Object
Shade 3D cursor
4
3D cursor pixel width
3D Cursor Scalebars
3D cursor scalebar
1.0
Scalebar marker size factor
Scalebar markers white
3D Cursor Scalebar Colors
Red Green Blue
X 210 0 0
Y 0 100 20
Z 0 0 220
Gap 255 255 255
Reset 3D Cursor Options
Reset options
Menus
Main 1
3D Cursor Alt2
Exit 3D Viewer Esc


3D Viewer 7.0 Menu
EARTHQUAKE FOCI
Status Window
Earthquake Foci
Earthquake fault planes
TNP axes
Menus
Main 1
Manipulate 2
View 3
Exit 3D Viewer Esc

The Main Menu



The Main Menu (hot key “1,” shown at left) allows access to the other 3D Viewer menus, and includes the menu button for exiting the 3D Viewer. The user can access the other menus using the menu buttons or the associated hot keys, shown in the recessed box to the right of each menu name on the Main Menu. The following menus and capabilities are available in the 3D Viewer:

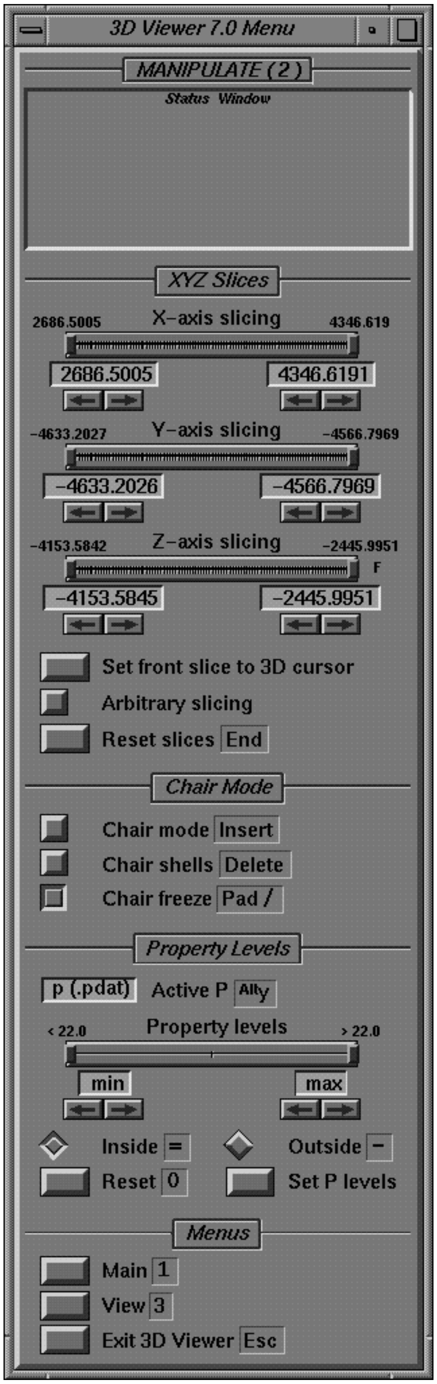
- Manipulate Menu . . . . .controls X, Y, Z slicing, isosurface and P-level display, and chair mode (hot key “2”)
- View Menu . . . . .controls the model azimuth and inclination, the look point location (with some 3D cursor controls), Z-exaggeration, zoom factor, vue files, and resetting attributes (hot key “3”)
- Zone Menu . . . . .controls property/zone display, zone removal, Z color-filled contours, zone chair mode, and the display of fault blocks and volume outlines (hot key “4”)
- File Menu . . . . .controls the working directory location, cycling through files and selecting files, and synchronized viewing (hot key “5”)
- Post Data Menu. . . . . . .controls posting of scattered data points and symbols, vertical and non-vertical faults, polygons, annotation, and well logs, as well as the data clipping distance, and incorporating external data query programs (hot key “6”)
- Capture Data Menu . . . .controls data point capture, polygon capture, volumetrics, and VRML 1.0 output (hot key “7”)
- Screen Menu . . . . .controls the color key, display titles, screen annotation, full versus partial screen, previous frame retrieval, single versus double buffer display, scripting, pushing and popping of the 3D Viewer display, anti-aliasing for lines, and stereo3d mode (hot key “8”)
- Color Menu . . . . .controls the colors used for properties, zones, Z-levels, 3D grids, scattered data, and fault faces via access to the color editors, color file selection, and color file reversal; also controls the screen background color (hot key “9”)
- Output Menu . . . . .controls the selection and sending of images to files or printers (hot key “^1”)
- Edit Data Menu . . . . . . .controls the display, editing, and creation of scattered data, property data, and well path files, the line data, and data tube display (hot key “^2”)

- Lighting Menu . . . . controls the azimuth, inclination, and light intensity for two light sources, the amount of ambient light, and the reflectivity and shading of the model (hot key “^3”)
- Transparency Menu . . . controls the transparency of the X, Y, and Z planes and zone surfaces (hot key “^4”)
- Animation Menu. . . . . . controls scripting and data animation (hot key “^5”)
- Axes Menu . . . . controls the XYZ range of the axes (when only data are displayed), display parameters (e.g., pixel width) for the default and rotated axes, tickmarks, and labels, as well as the posting of the axes’ tick mark lattice, axes’ caption, the tickmarks, axes, and labels (hot key “^6”)
- Image Menu . . . . controls the display of draped and planar images, image chair mode, image transparency, and a Z-offset for the draped image (hot key “^7”)
- Allan Fault Menu . . . . . controls the display, color, zone, and property display of Allan fault diagrams (hot key “^8”)
- Well Positioning Menu . controls interactive well positioning, including interpolating and adding points to wells and dogleg severity highlighting (hot key “^9”)
- 3D Grid Menu. . . . . controls the display of a 3D grid (either a property or seismic grid) and a 3D indicator grid (which specifies the fault block and zone location of each grid node) when viewed with any other file type (hot key “Alt-1”)
- 3D Cursor Menu . . . . . . controls the display and use of the 3D cursor, which can be used to mark locations, slice the model, snap to surfaces to determine locations, and measure distances and the dip and dip azimuth of planes (hot key “Alt-2”)
- 3D Cursor Options Menu . . . . controls the display parameters for the 3D cursor, including its color, its shape, and the 3D cursors scalebar display markers and color. This menu is accessed only from the 3D Cursor menu.
- Earthquake Foci Menu . controls posting of earthquake foci symbols, displayed from a scattered data file. The menu is available only when a data set is displayed that contains earthquake foci symbol information.
- Exit the 3D Viewer . . . . exits the program (hot key “^q” or “Esc”)

Menu Function Hot Keys

"Hot keys," discussed in Chapter 3, are one-key or two-key strokes that are available in order to quickly perform a command. They allow users to perform commands without moving to the appropriate menu, to move from menu to menu without selecting the Main Menu, and to work in full-screen mode without the menus showing. Hot keys are displayed in the recessed box to the right of each menu item that has a hot key. (A few hot keys are available that are not tied to menu commands; these are listed in *Additional Hot Key Features* at the end of this chapter.) All two-stroke hot keys are typed using the control key or the Alt key simultaneously with another key. The control key is always shown in the program and in the documentation using the caret sign (^); the Alt key is shown as "alt." The complete list of hot keys is shown in Appendix D of this document. Each hot key is also listed at the time the function is discussed.

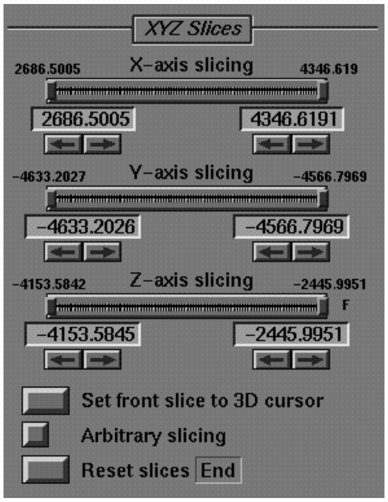
Manipulate Menu



The Manipulate Menu (hot key "2"), shown at left, contains menu commands used to change the following model attributes:

- X, Y, and Z Slicing (hot keys "F1" through "F6")
- Adjust Isosurface Levels (hot keys "F9" through "F12", "0," "–," and "+")
- Chair Mode (hot keys "Insert," "Delete," and number pad "/")

Adjust Slices—Cutting Away the Property Model

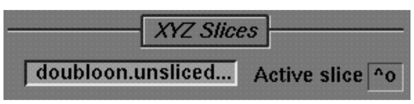


The XYZ Slices functions remove sections from the sides of the faces file or grid. Using the slider bar, the user can slice in along the front or rear facing plane directly to any X-column, Y-row, or Z-level, thereby removing any size of section at a time. When slicing a conformal model, the slices are parallel to the surface used for conformal gridding. The model is sliced starting at the full extent of the wire frame, even if a model has been limited laterally by a polygon. Slicing through a data file removes the data outside the slicing range (as based on the *Data Clipping* value, page 3DV 4-43); refer to the *Scattered Data Slice Adjustment* (page 3DV 4-15). Blue L-shaped brackets appear on each of the three closest axes to indicate the locations of the slices. The top and bottom figures on page 3DV Fig-2 illustrates the ability to slice in along the X, Y, and Z axes front and rear faces of a faces file. The bottom two figures on page 3DV Fig-2 show slicing in on the front X- and Y-faces while displaying a scattered data file.

The slider bar handle that controls the front face is shown in red (and that end of the slider bar has an “F” next to it indicating the front); the handle for the rear face is purple. Depending on the inclination and azimuth (controlled on the View Menu), the front face could be on the left or right end of the slider bar.

If a user wishes to view a particular face, the slider handle can be moved to the desired position. For a discussion of how to use slider bars, change units, and change increments, please refer to *Slider Bars*, page 3DV 3-15.

Active Slice Model



When only one faces file, grid, or data file is displayed, the *Active Slice* text box is not visible. If, however, a secondary 3D grid is displayed (via the 3D Grid Menu, page 3DV 4-136), the *Active Slice* text box is available to select for which file the XYZ Slicing and Chair Mode functions apply. The model that is active is displayed in the text box. By default, the primary model (the first model, grid, or data file selected) is active. Clicking on the text box toggles between the primary and secondary models; the new file name is displayed in the text box. The ^o hot key toggles between the primary and secondary model. Switching between the two here also changes the selection on the Zone menu (if an indicator grid is loaded; refer to the Zone menu’s *Active Volume*, page 3DV 4-32).

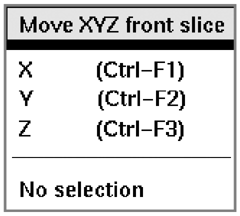
Front Face Slicing Short Cuts

Front face slicing can be accomplished using three additional methods: using the associated hot keys, interactively selecting the location using the mouse, or setting the front slice to the location of the 3D Cursor.

To slice the X front face in or out using hot keys, the F1 or F2 hot key is used, respectively; for the Y front face in or out, the F3 or F4 hot key is used, respectively; and for the Z front face in or out, it is the F5 or F6 hot key, respectively.

Alternatively, the front face can be sliced by clicking with the left mouse button along the axis closest to the user; refer to *Additional Mouse Button Features* (page 3DV 4-149). The front face can also be set the location of the 3D cursor; refer to *Set Front Slice* (page 3DV 4-14)

Set Front Slice



When the 3D cursor is on, the *Set Front Slice* command can be used to set the front X, Y, or Z slicing plane of the primary model (refer to *Model Selection*, page 3DV 4-13) to the X, Y, or Z coordinate of the current 3D cursor position. Selecting *Set Front Slice* brings up a pop-up menu, from which the X, Y, or Z front slice can be selected. Alternatively, the "^F1", "^F2", or "^F3" hot keys can be used to set the X, Y, or Z front slice (respectively) to the 3D cursor location.

When viewing a rotated model, it is important to remember that the front slice is set to XYZ location of the cursor and not where the cursor's axes hit the wireframe (since the cursor's location is in real world, not rotated coordinates).

Arbitrary Slicing

Arbitrary slicing allows the user to slice orthogonally into a model along the X, Y, or Z axes at any point. Faces files generated without slicing, known as unsliced faces files, can be arbitrarily sliced at any X, Y, or Z location. Faces file models that already contain slicing information can be sliced only along the previously calculated slicing planes, unless the unsliced model is available (if it is, then the unsliced model is automatically loaded when arbitrary slicing is turned on). For 3D grids, slicing can *only* be performed along any grid cell. Each time arbitrary slicing is requested via the *Arbitrary Slicing* toggle button, the 3D Viewer loads the unsliced model (if not already loaded), calculates the desired slice (using the underlying program, *ev_slice*), and then displays the newly sliced location. This process takes a short, but noticeable, amount of time. If a sliced model was originally loaded, turning *Arbitrary Slicing* off reloads the sliced model with the same viewing parameters, except the slices are set to the nearest available location. The *Incremental versus Continuous Sliders* discussion (page 3DV 3-16) explains the difference between incremental (for sliced models) and continuous (for unsliced faces files) slider use.

When a scattered data, property data, or well path file is loaded without a faces or grid file, the data can be sliced through at any location (i.e., arbitrarily).

Reset Slices

The *Reset Slices* button (hot key "End") sets all slices (including the chair slices) back to the full extent of the model (chair mode stays on, but the chair slices return to their default position; the corresponding slider bars reflect all of these changes). When a model has been extensively cut, it is quicker to use the *Reset Slices* function to restore each of the cut faces than to reset each slider bar.

3D and 2D Grid Slice Adjustment

The region displayed for a 3D or a 2D grid can be limited by changing the X, Y, and or Z slices. Slicing can be performed along any of X, Y, or Z (3D grids only) grid cells. When a 3D grid is displayed with a faces file or scattered data file, the slicing tools only apply when the model selection is set to the 3D grid file; refer to *Model Selection* (page 3DV 4-13) for more information. Slicing affects only 3D grids displayed as cubes, isosurfaces, or volumetric clouds (controlled by the 3D Grid Menu, discussed starting on page 3DV 4-136); slicing has no effect on 3D grid planar slices, if they are displayed.

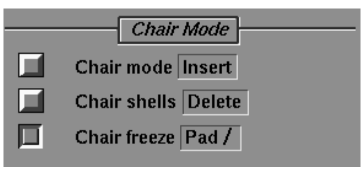
Scattered Data Slice Adjustment

Slices can also be made when displaying scattered data files with or without a faces file or grid to limit the data points displayed on the screen. When viewed without another file, if the data points are connected by lines and the slicing cuts through those lines, the lines are dashed up to the slicing plane. (Slices can be made at intervals of 1/100 of the X, Y, or Z ranges when a faces file is not displayed.) These lines can be turned off entirely, if desired (refer to *Edit Data Menu*, page 3DV 4-83).

When multiple scattered data files are displayed (without a faces file or 3D grid), changing the X, Y, or Z slices affects all of the data files displayed.

When viewed with a faces file or grid, slices may or may not affect the data displayed, depending on the setting for the data clipping distance (refer to *Data Clipping*, page 3DV 4-43).

Chair Mode — Removing a Subsection of the Model

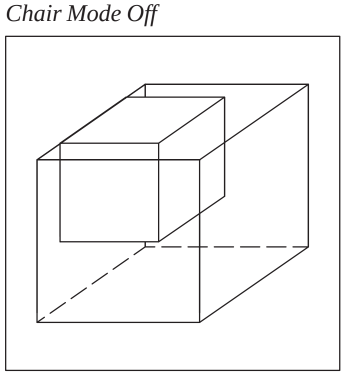


The three menu buttons available in the Chair Mode section of the Manipulate Menu are toggle buttons that alternate between turning chair mode on or off, turning the chair shells on or off, and freezing the chair section (on or off). Each of these commands is discussed below. The figures on page 3DV Fig-3 show different forms of the same model with chair mode turned on.

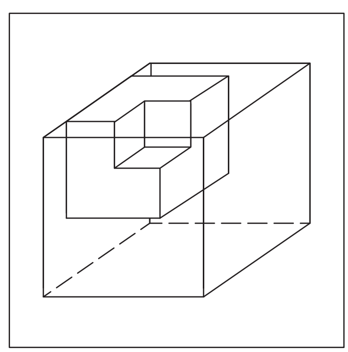
Chair Mode

Chair mode is invoked by selecting the toggle button *Chair Mode* or typing the "Insert" hot key. Once this is done, a subsection of the model or 3D grid† is removed at the corner nearest the viewer's eye. The amount removed (one-eighth of the portion of the model shown) is determined by the current X, Y, and Z slicing positions (front and back)-the chair slices come up halfway between each of the current minimum and maximum slicing planes (see diagrams below).

Chair Mode Off



Chair Mode On



The top figure on 3DV Fig-3 shows a full model with chair mode turned on. Note that the chair subsection is removed from the front, upper, left-hand corner. The second figure on page 3DV Fig-3 shows the same model, only the front and rear X, Y, and Z slicing planes have been changed. Notice that the portion of the model removed for the chair has been

†. Currently, the chair mode can be applied to 3D grids, but not to 3D grids with an indicator grid on.

changed to the front, upper, right-hand corner, because that corner is now closest to the user's eye (due to a change in the model's azimuth).

Chair mode can be applied or ignored on a zone-by-zone basis. Refer to *Zone Menu* (page 3DV 4-31) for more information.

Chair Location Adjustment

Yellow slider handles appear on each of the slider bars at the locations where the chair slices come up (an associated box and arrow buttons also appear below each slider in between the already existing boxes). These yellow handles can be used to change how much of the model is removed in the chair subsection. Yellow brackets also appear on each of the three closest axes to indicate the location of the chair slices on the model. (The chair slice location can be changed using the left mouse button as well; refer to *Additional Mouse Button Features*, page 3DV 4-149, for more information.)

Chair Shells

If the isosurface level display is changed while chair mode is on, the default is to show the selected isovalue ranges within the supersection of the model (i.e., the chair section (or subsection of the model) is still "empty"). The bottom left figure on 3DV Fig-3 illustrates the default setting.

By turning chair shells on, the user elects to have the isovalue shells displayed *only* within the chair subsection of the model, and have the supersection of the model shown to the fullest extent of the current X, Y, and Z slicing settings. Chair shells are turned on by selecting the *Chair Shells* toggle button (or the "Delete" hot key). The last figure on the bottom of page 3DV Fig-3 shows the chair shells on for the same model as in the third figure on the same page; another example is shown in the top figure on 3DV Fig-1, where the isosurface of a plume is displayed within a chair view.

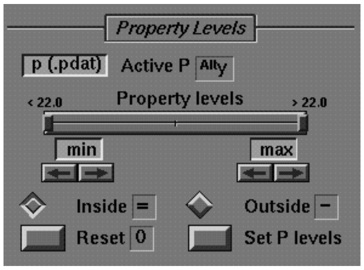
Note: This command cannot be activated unless chair mode is on. In addition, chair shells only appear in zones where the P-values are displayed; if zone color is displayed, the full extent of the zone is shown (refer to Zone Menu, *page 3DV 4-31, for a discussion of zones and property values).*

Chair Freeze

By default, when the azimuth and/or inclination is changed while chair mode is on, the chair subsection that is removed remains the same, regardless of the angle; this is known as having the "chair freeze" on. Alternatively, the chair subsection can change such that the portion closest to the user's eye is removed as the rotation angle is changed. In other words, the portion of the model that is the chair changes as the azimuth and/or inclination is changed, but it is always the section closest to the user. This concept is illustrated by the top two figures on page 3DV Fig-3 that have different angles of azimuth. Freezing the chair subsection in place is activated by either selecting the *Chair Freeze* toggle button or the slash (/) hot key, on the number pad to the right of the main portion of the keyboard (this is *not* the slash/question mark key on the main portion of the keyboard).

Note: This command cannot be activated unless Chair Mode is on.

Adjust Property Levels



The Property Levels section contains menu commands to change which property surfaces or levels are displayed. Up to 64 property intervals (created from 63 user-specified P-values) and two property surfaces can be displayed. The user has the option to display all values, only those values within a chosen range, or only those values outside a chosen range. For 3D grids and scattered data files, the property levels available for display can be changed via the *Set P Levels* command.

The two alternatives, inside or outside the isosurface level range, are shown in the top two figures on page 3DV Fig-2. Both figures have X, Y, and Z slices at the same locations and are shown in the same colors; the only difference is the range of values shown. The ranges shown for each figure are indicated in the color key by the white brackets to the left of color table. The top figure shows the region of the model where the P-values are between 0.15 and 0.45. The lower figure shows the regions where P-values are less than 0.15 and greater than 0.45.

Active P—Property Group Selection

Changing the property levels is applied on a property group basis. Property groups are determined by the property name and, in the case of 3D grids, whether the property type is property or seismic. (Seismic grids even with the same property name are not considered part of the same group as faces file or data file.) When a secondary property file is added in the 3D Viewer, if the property name is the same as a previously loaded file then they automatically “share” the same property colors and levels, becoming a property “group.” If the file has a new property name (e.g., if one data file has a P-field of “porosity” and another has a P-field of “por”) or, in the case of a 3D grid, is of a different property type, then the file automatically starts a new property group; its property levels and colors are determined separately from those in other property groups. (For information on how this occurs, refer to the 3D Grid menu, page 3DV 4-136, and to the Edit Data menu, page 3DV 4-83.)

While the property colors (discussed on page 3DV 4-74) and the values of the property levels (discussed on page 3DV 4-20) for all files in the same property group use the same values, the display of the property levels for each file type (i.e., whether it is a faces file, 3D grid, or a property data file) in the same property group can be set to different values via the *Property Levels* slider (discussed next). In addition, property levels for different property groups (e.g., the “por” versus “porosity” group) can be set to different values. The *Active P* text box is used to change which property group and/or property file type is active; any changes of the Property Levels apply to all files in that group.

If only two property groups are in the 3D Viewer, clicking on the *Active P* text box toggles between the two files. If more than two property groups or property file types are available, then a pop-up menu appears. The “Alt-y” hot key can be used to bring up the pop-up menu or toggle between two property models, as well. The setting on this menu is also tied to the setting on the Color menu, in the Property Colors section (refer to page 3DV 4-74).

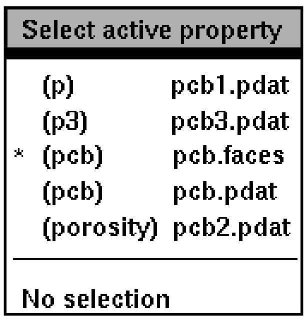
The criteria for property groups is as follows:

Faces files . . . . A faces file, since it has a different property file type, can always be selected separately for property level manipulation, even if it shares its property group with a property data file or a 3D grid has been loaded.

3D grid files . . . . As with a faces file, a grid file has a different property file type and can always be selected separately for property level manipulation, even if it shares its property group with a property data file or a faces file.

Property data files . . . . If a property data file (or files) shares its property group with a 3D grid or faces file (i.e., they have the same property name), the property can still be manipulated separately. All property data files with the same property field name have the same property group and, therefore, are manipulated together. Property data files with different property names are listed as separate groups.

Selecting the Active P Group



If more than two property groups are available, then clicking the Active P text box brings up a pop-up menu, as shown at left. Each file name is listed with its property group name shown in parentheses next to the file. The files that are part of the active property group are shown with an asterisk next to them. Selecting any one file in a property group selects that entire group for Property Level manipulation. As indicated above, different file types (i.e., a 3D grid, faces file, or data file) even within the same property group (i.e., they have the same property name and type) are listed separately, since the display of the Property Levels can be performed separately, even if though the values of those levels are shared.

Property Level Display

The slider bar is used to set the minimum and maximum property level that is displayed. When a faces file or 3D grid is displayed, the property shell corresponding to the set level is displayed along with whatever other surface values are less than or greater than the reference level, depending on the settings (described next). As described in the *Active P* section, the settings on the *Property Levels* slider are applied on a property group by group basis. The values and settings on the slider reflect only the active property group, but can be changed to another group using the *Active P* text box; refer to that section (page 3DV 4-17) for more details.

In addition to the slider bar, the Property Level section has three menu buttons: *Inside Property Levels*, *Outside Property Levels*, and *Reset Levels*. *Inside Property Levels*, labeled *Inside* on the menu, displays only those isovalues within the minimum and maximum levels selected, as indicated by the handles on the slider bar. By default, *Inside* is in effect (as evidenced by the menu button being depressed), with the slider bar handles at the minimum and maximum; therefore, all isovalues are displayed (no surfaces, however, are shown). The top left figure on 3DV Fig-2 is an example of an *Inside Property Levels* display. *Outside Property Levels*, labeled *Outside* on the menu, displays only those isovalues outside the minimum and maximum levels, as indicated by the handles on the slider bar. An example of an *Outside Property Level* display is shown in the top right figure on page 3DV Fig-2. The *Inside* and *Outside* functions are mutually exclusive; clicking on either menu button invokes that command. The *Reset Levels* button resets the levels so that all values are displayed to the fullest extent of the *current* X, Y, and Z slices (the handles are set to *min* and *max*) and the *Inside* button is in. Using this command, or any of the property level commands, does not affect any of the other 3D Viewer settings. Any slicing, rotation, changes in the Z exaggeration, etc. that have been done are taken into consideration when the property levels are adjusted.

Note: Property shells only appear in zones where the property values are displayed; if zone colors are displayed, the full extent of the zone is shown. Refer to Zone Menu, *page 3DV 4-31, for a discussion of zones, property values, and zone colors.*

Examples of Setting Property Levels

If a user wants to see all isovalue shells with values greater than 0.5, the slider can be adjusted so that the minimum handle is on the 0.5 contour level and the maximum handle is on *max* with the *Inside* menu button selected. This setting displays all values between 0.5 and the maximum, hence all values greater than 0.5. Alternatively, the maximum handle could be set on 0.5, with the minimum handle on *min*, and the *Outside* button selected.

Setting both handles to the same location allows the user to see a single, isovalue boundary. This type of setting is useful when wanting to analyze a single boundary in space.

Property Level Hot Keys

Hot keys can also be used to adjust the property levels.

Hot Key	Action
F9	decreases minimum property level by 1
F10	increases minimum property level by 1
F11	decreases maximum property level by 1
F12	increases maximum property level by 1
(0)	resets property levels to the minimum and maximum
(=)	sets the model to display all property shells inside the current property level settings
(–)	sets the model to display all property shells outside the current property level settings

3D and 2D Grid P-Level Adjustment

Even when a 3D grid does shares the property group with a data or faces file, the property levels displayed for a 3D grid can be limited independently by changing the *Property Level* sliders. Although 64 colors are displayed by default, the sliders can be set to any value; hence, any isosurface or property level (if cubes are displayed) can be displayed. Changing the property levels affects only 3D grids displayed as cubes, isosurfaces, or volumetric clouds (controlled by the 3D Grid Menu, discussed starting on page 3DV 4-136); the property levels settings have no effect on 3D grid planar slices, if they are displayed. When a 3D grid is displayed with a faces file or property data file, the Property Level tools only apply when the Active P file is set to the 3D grid file; refer to *Active P* (page 3DV 4-17) for more information.

For 3D grids and scattered data files, the number of property levels available can be changed from the defaults using the *Set P Levels* command (discussed on page 3DV 4-20).

For 2D grids, changing the property level has no effect. A faces file of a 2D grid would have to be created with property information (supplied during the faces file generation) in order for property information to be set. Refer to the *Faces File Generation* document for more information on generating faces files with property information of 2D grids.

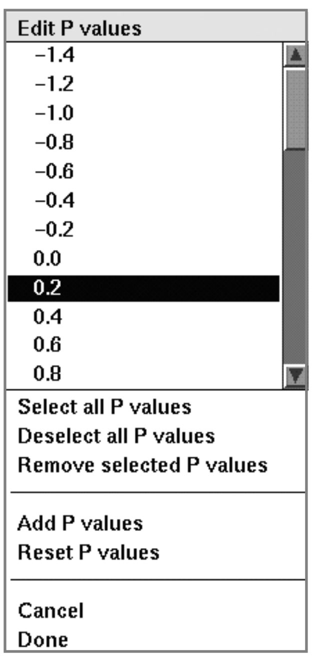
Property-Data P-Level Adjustment

Even when a property data file shares its property group with a 3D grid or faces file, the data points can be limited independently inside or outside of a P-range, in the same way the property shells are displayed. If the property levels are set to *Inside*, then only the scattered data points with P-values within the range are displayed; if the property levels are set to *Outside*, then only the scattered data points with P-values outside the specified range are displayed. (If a data point has the same value as the level specified, it is displayed in both cases.) When lines are displayed between data points, segments of those lines are dashed if one or both endpoints of the segment are no longer displayed because of the isosurface level set. Dashing the lines indicates that some of the data is no longer displayed. These lines, however, can be turned off entirely, if desired, using functions available on the Edit Data menu (refer to *Edit Data Menu*, page 3DV 4-83).

When a property data file is loaded by itself or if it has its own property group independent of a 3D grid or a faces file, the 3D Viewer calculates a reasonable P-value interval (e.g., a multiple of 2, 4, 5, or 10) that creates the maximum number of intervals, with a cap of 64 intervals. If the data have the same property group as a faces file or 3D grid, then the levels used are the same as the ones specified in the faces file or 3D grid. (Property grouping is discussed in the *Active P* section, page 3DV 4-17.)

Set P Levels

The *Set P Levels* button is used to modify the P-level values available for display for a 3D grid, a data file, or a property group containing either kind. The *Active P* setting determines to which group the *Set P Levels* applies. For more information on that and property grouping, refer to the *Active P* section (page 3DV 4-17).



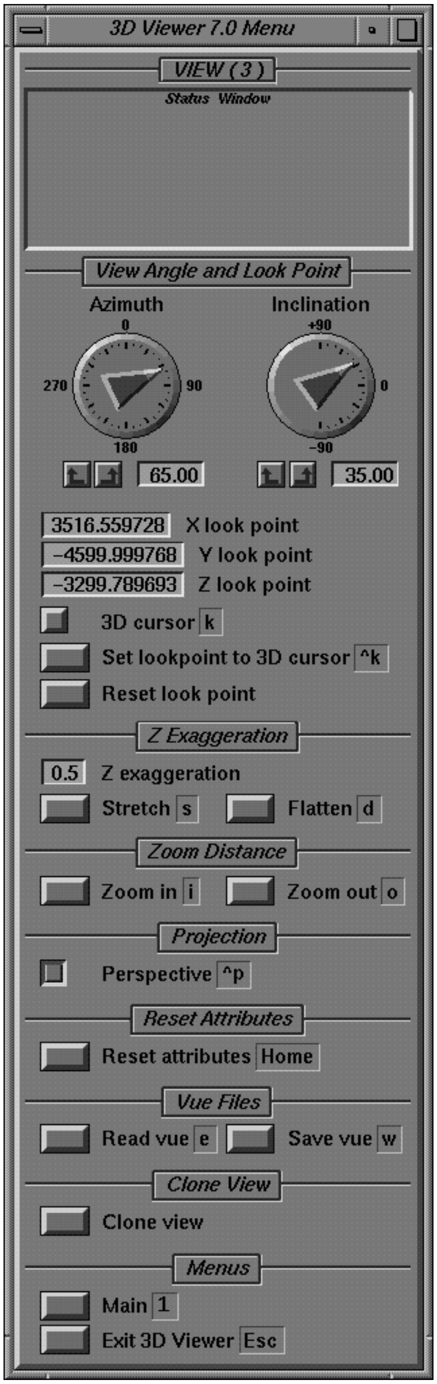
If either the 3D grid or data file share their property group with a faces file, then the *Set P Levels* button is not available; in this case, they also share the P-levels that were specified when the faces file was created. If, however, the 3D grid or property data file(s) do not share a property group then the P-levels can be set separately. Clicking on the *Set P Levels* push button brings up a pop-up menu, shown at left, with a list of all the currently available property levels (the actual display of the property levels is controlled by the *Property Levels* slider, discussed above). If the 3D grid and data file share the same property group, then changing the P Levels for one changes them both. For more information on property grouping, refer to the *Active P* section (page 3DV 4-17).

From the pop-up menu, the follow functions are available:

- Clicking on a value puts an asterisk next to it; when *Done* is selected all values with asterisks are removed from the P-list.
- Clicking on a value with an asterisk removes the asterisk; those P-values will remain on the P-list.
- *Select All P Values* puts asterisks next to all P values, but P-list is not updated until *Done* is selected.
- *Deselect All P Values* removes all asterisks.
- *Remove Selected P Values* removes all P-values with asterisks from the list; the model display is not updated, however, until *Done* is selected. The removed P-values can be redisplayed by selecting *Reset P Values*.

- *Add P Values* allows additional P-values to be added to the list; the 3D Viewer prompts for the values via the Status Window. Each P-value is entered individually, followed by a carriage return. *Once all the values have been added, a carriage return must be entered to return to the pop-up menu.*
- *Reset P Values* sets the list of P-values to the original list available when the model was first loaded in the 3D Viewer. If a custom P-list was entered (either via the command line or a default vue file), the P-list is reset to that list.
- *Cancel* closes the pop-up menu and ignores any changes made to the P-list.
- *Done* closes the pop-up menu and modifies the model display to reflect the changes in the P-list, if any were made. Any P-values marked with asterisks will be removed, and any new P-values will be added.

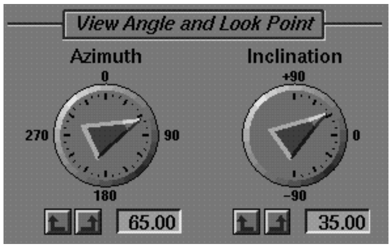
View Menu



The View Menu (hot key “3”), shown at left, contains the following menu items that change how the user views the model:

- Azimuth and Inclination (arrow hot keys)
- Look Point Position (hot keys “^k,” “k,” and control-arrows)
- Z-exaggeration (using Stretch and Flatten) (hot keys “s” and “d”)
- Zoom In and Zoom Out (hot keys “i” and “o”)
- Perspective (hot key “^p”)
- Reset Attributes (hot keys “Home” and “^Home”)
- Vue File Settings (hot keys “e” and “w”)
- Clone View

View Angle—Rotating the Model



The model can be rotated on either a horizontal or vertical plane. Any series of vertical or horizontal rotations can be made using the dials, arrow menu buttons, arrow hot keys, or dragging the cursor in the desired direction using the left mouse button with either the Shift, Control, or Alt key held down (refer to *Additional Mouse Button Features,* page 3DV 4-149). In any of these cases, the direction indicated by the azimuth and inclination applies to the front of the model which, by default, moves as if it were pivoted on its center point, the look point. (The look point and, hence, the pivot point, can be changed; refer to *Look Point Position,* page 3DV 4-24.) The inclination and azimuth can be modified using the appropriate dials, the menu arrow buttons, or the keyboard arrow keys as hot keys.

View Angle Measurement

The azimuth and inclination are measured from the eye point to the look point as described below:

- Azimuth. . . . . .The heading or direction in the horizontal plane of the positive Y-axis starting from the origin where 0.0 is pointing North, 90.0 is pointing East, etc.
  – Permissible range: 0 to 360
  – Default: 65
- Inclination . . . . .The angle above the horizon or horizontal plane that includes the eye point and the look point, measured as degrees.
  – Permissible range: –90 to 90
  – Default: 35

Azimuth

Moving the pointer clockwise on the azimuth dial rotates the model clockwise if looking down from above the model. It has the same effect as clicking on the left arrow menu button below the dial and as typing the left arrow key on the keyboard. Moving the pointer counter-clockwise rotates the model counter-clockwise (again while looking down from above the model). The right arrow menu button below the dial and the keyboard's right arrow have the same effect. The user can also enter a specific azimuth from the keyboard by clicking with the left mouse button on the value box below the dial and typing in the desired value (the 3D Viewer prompts for the input in the Status Window). By default, however, the dial arrow buttons and the keyboard arrows change the azimuth by 10° at a time (although this can be changed; refer to *The 3D Viewer Interface,* page 3DV 3-13). The smallest increment for the dial, and allowed as input, is 0.1°. The middle figures on 3DV Fig-2 shows the model in the default azimuth of 65°. The bottom two figures have an azimuth of 126°. (The azimuth and inclination are indicated in the color key.)

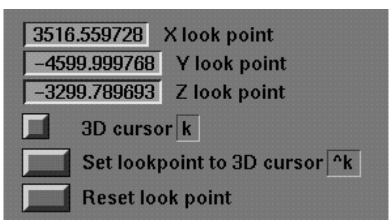
In addition to the left and right arrow hot keys, using the left mouse button with either the Shift, Control, or Alt key held down (refer to *Additional Mouse Button Features,* page 3DV 4-149) rotates the model.

Inclination

When modifying the inclination, moving the pointer clockwise (towards –90) on the dial rotates the model up; when the inclination equals –90, the minimum Z-plane is facing forward. Decreasing the inclination has the same affect as clicking on the left arrow menu button below the dial and as typing the up arrow key on the keyboard. Moving the pointer counter-clockwise (towards 90) rotates the model down, as does the right arrow menu button below the dial and the keyboard's down arrow. When the inclination equals 90, the maximum Z-plane is facing forward. As with the azimuth, the inclination can be set to a specific value by clicking with the left mouse button on the value box below the dial and typing in the new, desired inclination. By default, however, the dial arrow buttons and the keyboard arrows change the inclination by 10° at a time (although this can be changed; refer to *The 3D Viewer Interface,* page 3DV 3-13, for more information). The smallest increment for the dial, and allowed as input, is 0.1°. The middle two figures on 3DV Fig-2 shows the model with the default inclination of 35°. The bottom figures have an inclination 28°.

In addition to the up and down arrow hot keys, using the left mouse button with either the Shift, Control, or Alt key held down (refer to *Additional Mouse Button Features,* page 3DV 4-149) rotates the model.

Look Point Position



The "look point" is the X,Y,Z location that is used as the rotation point for the model, and for defining the zoom distance (discussed later). It is considered to be the point at which the user is looking. By default, the look point is at the center of the model (half-way along the X, Y, and Z axes). The look point is always placed in the middle of the graphic display screen, regardless of its location within the model.

Changing the look point results in essentially a panning of the model. It is especially useful when a user wants to zoom in on particular area. For example, if the area of interest is near an outer edge, as the zoom distance is decreased (zooming in), the area may disappear off the screen. Moving the look point closer to the area of interest repositions that area to the center of the screen. Examples of changing the look point are shown on 3DV Fig-4.

Look Point Position Adjustment

The look point can be changed in several ways. The easiest method for changing the look point, however, is to use the right mouse button with either the shift or control key. Refer to *Additional Mouse Button Features,* page 3DV 4-149, for more information.

In addition, the *X Look Point*, *Y Look Point*, and *Z Look Point* value boxes indicate the current X, Y, and Z locations, respectively, of the look point. A new location can be entered by clicking on any of the boxes, and entering a new value. The new location can be within or outside the range of the model, indicated by the wire frame.

Alternatively, the 3D cursor can be turned on (using the menu button on this menu or on the 3D Cursor Menu, or the "k" hot key) and moved to the desired look point location. The 3D cursor is moved using either the slider bars available on the 3D Cursor Menu, or the middle mouse button, by clicking on the cursor's axes at the desired location or by snapping the cursor to a surface (refer to the *3D Cursor Menu* section, 3DV 4-140, and to *Additional Mouse Button Features,* page 3DV 4-149, for more information). The look point can then be set to the 3D cursor location by clicking on the button *Set Lookpoint to 3D Cursor* or by typing the "^k" hot key. (The figures on 3DV Fig-4 illustrate this process.) The boxes are updated to reflect the new look point location.

Look Point Hot Keys

Hot keys are also available for moving the look point. Using the control key with the up, down, left, and right arrows moves the look point. The control-right arrow is used (i.e., the control (or ctrl) key and the right arrow key simultaneously) to move the model to the right (hence, moving the look point to the left, since it is always placed in the middle of the screen). Similarly, ctrl-left arrow moves the model to the left (the look point to the right); ctrl-up arrow moves the model up (the look point down); ctrl-down arrow moves the model down (the look point up).

In addition, the right mouse button in conjunction with the shift or control keys can be used to change the look point (refer to *Additional Mouse Button Features,* page 3DV 4-149). Also, when a scattered data point has been selected (refer to *Additional Mouse Button Features,* page 3DV 4-149), the 3D cursor can be moved to its location by typing the "j" hot key (refer to *3D Cursor Display and Location Controls*, page 3DV 4-141). Then the "^k" hot key can be used to change the lookpoint.

Look Point Reset

The look point can be returned to the center of the model by clicking on the *Reset Look Point* button. Again, the value boxes are updated to reflect the new look point location. Alternatively, the look point can be reset by using the "Home" hot key or the *Reset Attributes* command, discussed later in this section.

Z-exaggeration

Three commands are available to change the vertical- or Z-exaggeration from the default value. The default value, which appears in the Z exaggeration text box, is automatically calculated by the 3D Viewer to give a reasonable display, close to a cube. If the model contains mixed units (e.g., if the XY units are feet and the Z units meter), the 3D Viewer adjusts the Z exaggeration accordingly. For example, if the XY range is 1 foot and the Z range is 1 meter, then the Z-exaggeration would be set to 1/3 so that display would be a cube.

A Z exaggeration value can be entered in this box to either stretch or flatten the model. The *Stretch* command (hot key "s") increases the Z-exaggeration by a factor of 1.25, while the *Flatten* command (hot key "d") decreases the Z-exaggeration by a factor of 1.25. The actual ratio of the Z scaling to the X/Y scaling is shown both in the Z-exaggeration text box and in the color key. When these commands are invoked, the 3D Viewer changes the width *and* the height of the displayed model to reflect the change in the ratio of the two scales while still maintaining a reasonable display. The Z-exaggeration is displayed in the Color Key box.

Zoom

The zoom function has the effect of changing the viewer's position along the line of sight. Zooming in moves the eyepoint closer to the look point, resulting in the model becoming larger on the screen. Zooming out has the opposite effect. As the eyepoint is moved closer to the model, the axes' labels are turned off as they can become significantly distorted. When the model becomes larger than the screen, it is truncated at the screen limits. The rotation functions, as well as all other functions, are always available even when zoomed in very close or zoomed out very far.

Since the property models are generally displayed in perspective (this can be turned off; refer to *Projection,* page 3DV 4-27), parallel lines converge front to back. This effect can be seen by looking at the wire frames surrounding the models on 3DV Fig-2. As the eyepoint moves closer to the model, the angle of convergence increases consistently with the rules of perspective. The visual effect is the same as moving a zoom lens from a wide-angle to a telephoto setting.

Each time a user enters a *Zoom In* command, either by selecting the *Zoom In* menu button or using the "i" hot key, the eyepoint is moved 15% of the current distance closer to the look point, which, by default, is the model center (although this can be changed; refer to *Look Point Position,* page 3DV 4-24). Each inward move covers a smaller distance, although it is the same percentage amount. Thus, the eyepoint can approach, but not move onto the model's look point or center. The *Zoom Out* command (and its hot key "o") moves approximately 18% of the distance away from the model's look point each time.

It is also possible to zoom in or out using the middle mouse button with the Shift, Control, or Alt keys; refer to *Additional Mouse Button Features* (page 3DV 4-149) for more information.

The illustrations on 3DV Fig-4 highlight the zoom feature. In the top illustration, the viewer is zoomed out from the default distance away from the model (the default distance is 1.5 times the radius of a sphere that encloses the entire model). In the subsequent figures, the viewer is zoomed in much closer to the model surface. Notice how the model is clipped.

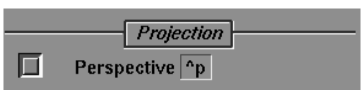
Rotation While Zoomed In

When viewing a model from a very close viewpoint, the rotation commands may seem as though they are working in a reversed manner. This occurs when most of the visible portion of the model is behind the look point because the direction indicated by the rotation command always applies to the part of the model in front of the look (pivot) point.

Zoom In on an Exact Location

Sometimes it is desirable to zoom in on a particular location. In addition, sometimes a portion of a model moves off the screen while zooming. Under both of these circumstances using the right mouse button along with the shift or control keys (to pan) and the middle mouse along with the shift, control, or Alt keys (to zoom) allows the user to view the desired area (refer to *Additional Mouse Button Features* (page 3DV 4-149) for more information). Alternatively, the 3D cursor can be used in combination with changing the look point to view the desired area: First, the 3D cursor must be turned on and moved to the center of the desired location. Then the look point is moved to the 3D cursor location (using the menu button or "^k" hot key). Refer to *Look Point Position Adjustment* (page 3DV 4-24) for more details on this feature. The series of figures on 3DV Fig-4 show how this task can be completed.

Projection

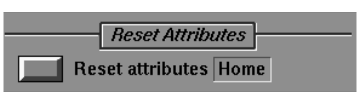


Two types of projection are available for viewing the current display: a perspective projection or an orthographic projection. By default, the model is displayed with the perspective projection.

The perspective projection causes the model to look more realistic because objects that are further away appear smaller than objects that are closer. The "parallel" lines of the wire frame (the axes), although they appear parallel, actually converge at some distant point behind the model.

When the perspective projection is off, the orthographic projection is used. This projection draws all objects of the same dimensions at the same size regardless of the distance from the eye point. In this case, the "parallel" lines of the wire frame are truly parallel on the screen.

Reset Attributes



The *Reset Attributes* button is used to reset any changes back to the original settings. The associated hot keys are the "Home" and "^Home" keys. The following parameters can be set to the 3D Viewer default values either individually or together:

- X, Y, and Z Slices
- Chair Mode
- Isosurface Level Display (to show all isovalue shells)
- Azimuth and Inclination
- Look Point Location
- Z-exaggeration
- Distance to the Eyepoint (changed by *Zoom In* and *Zoom Out*)
- Zone Menu
- Color Menu
- Lighting
- Transparency

- Animation Menu
- Axes Menu
- Image Menu
- Allan Fault Menu
- Well Positioning Menu
- 3D Cursor Menu

Clicking on the *Reset Attributes* menu button or the “Home” hot key brings up the pop-up menu to reset the parameters individually. The left mouse button is used to click on the desired attribute to be reset (e.g., *XYZ Slices*). An asterisk appears next to the attribute, indicating that it will be reset. Click on as many items as desired. Once all the attributes have been selected, clicking on *No More Resets* then resets the selected attributes. Clicking on *All Program Attributes* resets all of the attributes listed, as well as all settings in the program (e.g., single/double buffer mode). Again, an asterisk appears next to this item. Any items previously selected are shown without asterisks to indicate that the reset is not limited to these features. Again, clicking *No More Resets* activates the changes.

In addition, the “^Home” hot key is available to automatically reset all attributes to the program defaults. This hot key bypasses the pop-up menu.

Note: *The initial settings can be changed using a vue file, as discussed in* Vue Files *(page 3DV 2-14). The reset functions, however, do not look at this file; the parameters are reset to the 3D Viewer defaults,* not *to the faces file’s default vue file. If a user wants to reset a file to the settings in a vue file, the* Read Vue *command can be used (discussed next).*

Vue File Settings

The parameters that define a particular view of a model or data can be saved and reread from within the 3D Viewer using a vue file. The specifications in a vue file define settings such as slice locations, displayed isovalues, color files, auxiliary displayed files, as well as some settings that cannot be changed interactively in the 3D Viewer (e.g., setting a custom background color). Using vue files can save time, for example, when comparing different views, different files, or for bringing up specific views for colleagues. Vue files can also be cycled through using a script file to create a “movie” of views (discussed under *Animation Menu,* page 3DV 4-111). Script and vue files are discussed in detail in *Script Files* (page 3DV 2-17) and *Vue Files* (3DV 2-14), respectively (vue files are also discussed in Appendix B).

Save Vue

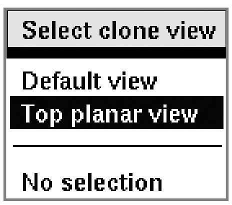
Once the model or data are in the desired view, the *Save Vue* button or the “w” hot key can be used to write the settings to a vue file with a user-specified name. The 3D Viewer supplies the suffix *.vue* when viewing a faces file, *.dvue* for a scattered data file, *.2gvue* for a 2D grid file, and *.3gvue* for a 3D grid file. This naming convention is not mandatory if a vue file is created outside of the 3D Viewer, as the 3D Viewer offers an option for entering a vue file name not found on the list; it is, however, strongly recommended.

If a new data file has been created, but not saved (refer to *Create a New File*, page 3DV 4-85) or if wells have been displayed (refer to *Well Display*, page 3DV 4-46), but not saved, when the *Save Vue* command is used, the 3D Viewer prompts as to whether the data file and a binary well display file (*.bwd*) (discussed on page 3DV 2-21) should be saved first. If new files are created, then the file names will be written to the vue file.

Read Vue

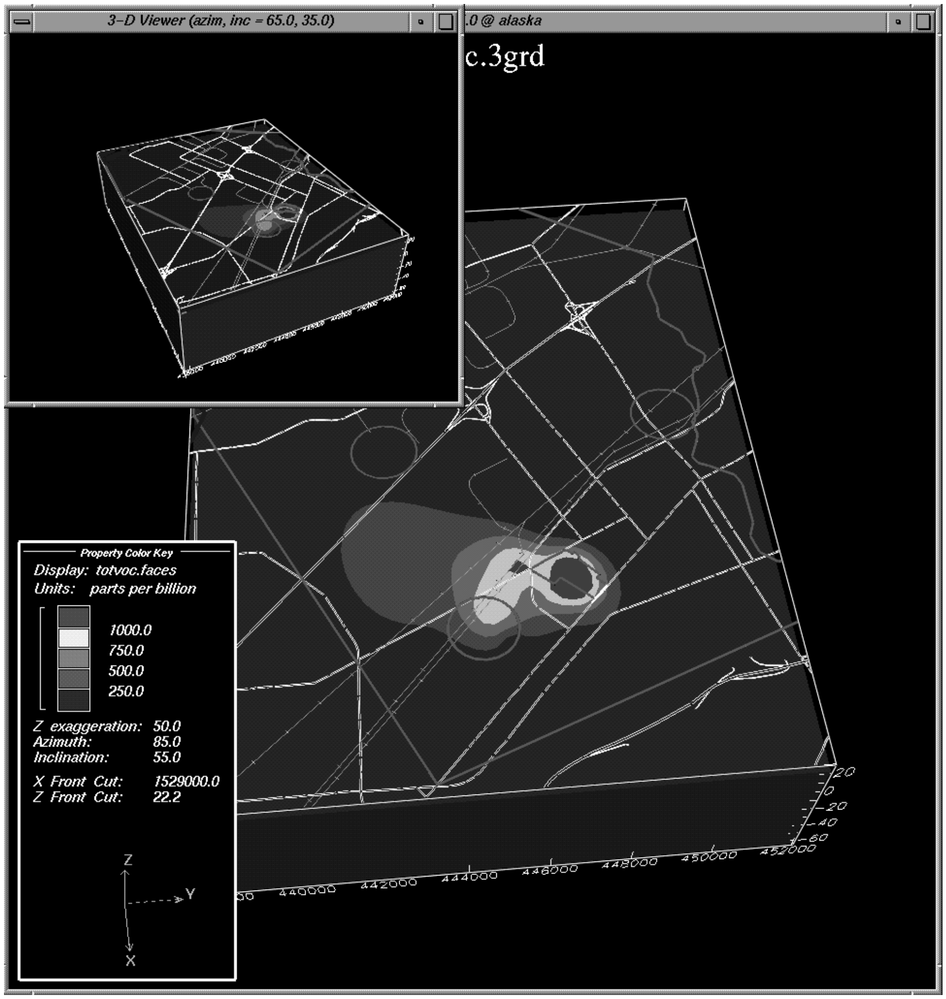
Once a vue file has been created either within the 3D Viewer or outside of the 3D Viewer (using a text editor), a vue file can be read in using the *Read Vue* button or the "e" hot key. Using either one of these brings up a pop-up menu listing all of the files in the directory that end with *.vue*, *.dvue*, *.2gvue*, or *.3gvue*, whichever is appropriate. The pop-up menu also has an "other" entry so that a file name can be entered that does not have the appropriate endings.

Clone View

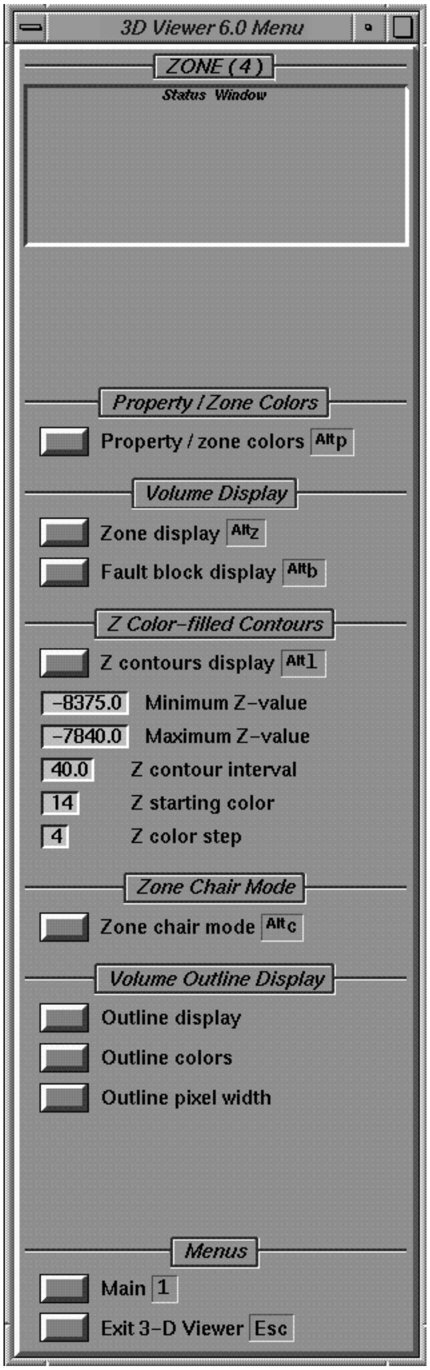


The *Clone View* function produces a copy or clone of the 3D Viewer model window. The cloned window is a smaller window initially displayed with the same viewing and model parameters as the main 3D Viewer model window except either the azimuth and inclination are set to the defaults (65º and 35º respectively) or for a top planar view (azimuth = 0º, inclination = 90º). Selecting the *Clone View* button produces the window at left. After selecting the display (either the default or top planar), the cloned window is displayed in the upper left corner. Thereafter, however, changes made to the viewing parameters in each window affect only that window. The following parameters are unique for each model window: azimuth; inclination; zoom; X,Y,Z lookpoint; color key display (e.g., property, zone); color key information (e.g., color table, color key borders); and color key position within the window.

Setting these parameters from one of the 3D Viewer menus or from a view (*.vue*) file apply only to the main 3D Viewer model window. A cloned window will not display the color key or titles by default. The title bar of the cloned window displays its current azimuth and inclination. Pressing the ESCAPE key in a cloned window closes only that cloned window, but pressing the ESCAPE key in the main 3D Viewer model window or menu exits the 3D Viewer. If more than two display screens (monitors) are present, the user is prompted with a popup menu asking on which screen to display the cloned window. The local screen number is indicated with the label "local" on the popup menu.


3-D Viewer (azim, inc = 65.0, 35.0)
.0 @ alaska
c.3grd
Property Color Key
Display: totvoc.faces
Units: parts per billion
1000.0
750.0
500.0
250.0
Z exaggeration: 50.0
Azimuth: 85.0
Inclination: 55.0
X Front Cut: 1529000.0
Z Front Cut: 22.2
Z
Y
X
440000
442000
444000
446000
448000
450000
452000
20
0
-20
-40
-60

Zone Menu

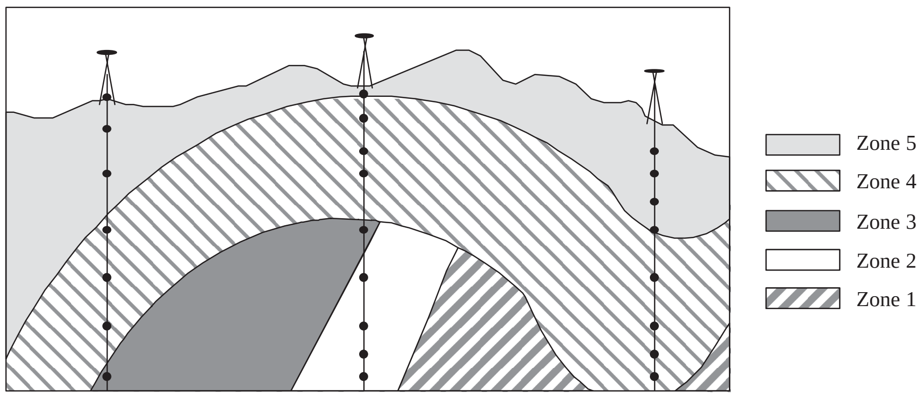


The Zone Menu (hot key "4") is used to change certain attributes within separate zones of a faces file or a 3D grid file if an indicator grid is also loaded. The following commands are available on the Zone Menu; each is discussed separately, following a discussion of zones:

- Property and Zone Color Display
- Zone Removal
- Color-Filled Contours Display
- Zone Chair Mode
- Fault Block Display
- Volume Outline Display

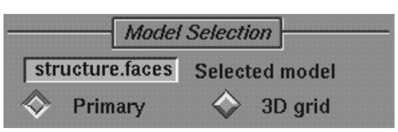
Zones and Blocks

Faces files can be calculated with only one or with many zones, in a variety of ways in EarthVision. When a faces file is created using Faces File Generation, the property modeled in the output file is considered to relate to one, single zone. Sometimes, however, even though a data set may be collected all at one time, the different data locations may be within different geologic zones, temperature zones, or pressure zones, for example. In these cases, the user might want to model the data within each zone separately, using a top and/or bottom structure grid to separate the zones during gridding and faces file creation. The diagram below shows an imaginary cross section through the earth, as an example where the data would be collected from different zones.



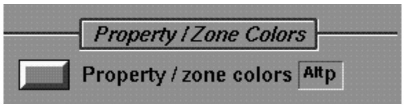
Two methods exist for calculating such a model. Either the separate zones are calculated and the different faces files are then merged together using EarthVision's Faces File Merging program, or the entire model is created at one time using EarthVision's Geologic Structure Builder. In either case, the resulting zoned model can be viewed as one model. An example of a faces file with several different zones is shown on 3DV Fig-5. Zones and how they are created is discussed in the *3D Grid Calculations*, *Faces File Generation and Merging*, *Geologic Structure Builder,* and *3D Viewer* documents, as well as the online help for the WorkFlow Manager.

Model Selection



When only one faces file, grid, or data file is displayed, the Model Selection section is not visible. If, however, a secondary 3D grid is displayed *and* an indicator 3D grid has been selected (both set via the 3D Grid Menu, page 3DV 4-136), the Model Selection section is available to select for which file the Zone Menu functions apply. The model that is active is displayed in the *Selected Model* text box. By default, the primary model (the first model, grid, or data file selected) is active. Selecting the *3D Grid* radio button makes the secondary 3D grid active; the new file name is displayed in the *Selected Model* text box. The "^o" hot key toggles between the primary model and the 3D grid as being active. Changing the active model here also changes the active model for the Manipulate menu (and vice versa), as described under the Manipulate menu's *Model Selection* section (page 3DV 4-13).

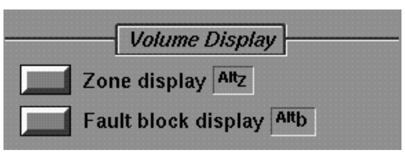
Property/Zone Colors



The user can view each zone in either the colors for the property that was modeled or as a solid color representing the single zone. Two separate, distinct color tables are available for properties and zones (refer to *Screen Menu* (page 3DV 4-55) and *Using the Color Editors* (page 3DV 5-1) for more information on the different types of color tables). The *Property/Zone Colors* push button (hot key “Alt-p”) brings up a pop-up menu that allows the user to alternate between property value colors (the P-value) being displayed within a zone (the zone name is marked with an asterisk) and a single zone color being displayed (no asterisk is displayed next to the zone name). By default, zones are displayed in property colors, if property information is available in any of the zones. If a zone does not have property information and property colors are turned on, the zone is shown in a salmon color (this color can be changed via the *nonproprgb* vue file parameter, discussed on page 3DV B-34.) Menu selections are also available that change the display to property colors in all zones or zone colors in all zones. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

Zone colors are shown in all 20 zones of the model shown on 3DV Fig-5. The top figure on page 3DV Fig-8 has property displayed in zone 1 and the zone color displayed in zone 2.

Volume Display



Fault blocks and zones provide two means of partitioning a model. Zones are essentially layers within the model. A zone can occur within many fault blocks. A fault block can contain many zones. Combining the *Fault Block Display* and the *Zone Display* functions provides the ability to display selected zones in a selected number of fault blocks. This ability to pick and choose which components of a model are displayed can provide a wealth of understanding regarding internal geometries.

Zone Display

Any zone can be removed from the model display, while leaving the remaining zones showing; removing the zone only affects the 3D Viewer display and not the actual faces file. The *Zone Display* push button (hot key “Alt-z”) invokes a pop-up menu that allows the user to alternate between showing the zone (the zone name is marked with an asterisk) and completely removing a zone (no asterisk). All zones are displayed by default. A menu selection is available to remove all zones at once, leaving only the wire frame; a second selection is available to restore all zones for display. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen. The top right illustration on 3DV Fig-7 has all of the model’s zones displayed, while the top left illustration shows the model with all but one zone removed.

Fault Block Display

Faces files can be partitioned into separate fault blocks by using faults as bounding surfaces or when merging faces files. Each fault block can be displayed by itself or in combination with others. The fault block number can be different or the same as the zone number. For example, a zone can extend across several fault blocks; within each fault block that zone has the same zone number, but may have different fault block numbers. Within each fault block, each zone has the *same* fault block number, but a different zone number. Turning fault blocks on and off can provide a clearer understanding of the relationships between different parts of the model. In addition, the display of the fault outlines that separate these fault blocks can be accentuated by changing the color and/or thickness of the outlines.

Note: Fault blocks within a faces file can only be generated using the Geologic Structure Builder or the WorkFlow Manager or by specifying different fault block numbers when merging several faces files. The capabilities described here do not affect the display of fault surfaces within a 2D grid file (i.e., those surfaces in a 2D grid created as a result of gridding with a vertical and/or non-vertical fault file). For a 3D grid, an indicator 3D grid must also be loaded (refer to 3D Grid Selection*, 3DV 4-137).*

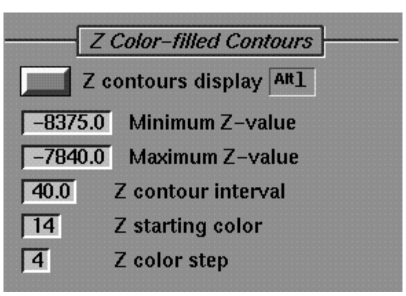
Fault Block Display

If a faces file is partitioned into fault blocks or a 3D grid with an indicator grid containing fault block information is displayed, the blocks visible on the screen can be selected using the *Fault Block Display* push button (hot key “Alt-b”). When this menu button is selected, a pop-up menu appears, listing all the fault blocks in the faces file in numeric order. All visible fault blocks are denoted by an asterisk (*). Fault blocks that are turned off do not have an asterisk. Selecting a fault block’s menu item changes its visibility. All fault blocks are displayed by default. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

The color of the fault blocks can be controlled via the *Apply Zone Colors to Fault Blocks* toggle button on the Color menu (discussed on 3DV 4-78). By default, fault blocks are displayed in the color(s) of the zone(s) that comprise the block. Selecting the *Apply Zone Colors to Fault Blocks* toggle button allows each block to be displayed in its own color, regardless of its zones.

Note: If a faces file or 3D grid with indicator grid contains no zones but includes fault blocks (i.e., it is a fault-block volume model), the fault blocks are all considered to be part of the same zone. In addition, if a faces file or 3D grid with indicator grid contains zones and fault blocks (i.e., it is a zone volume model), but one (or more) of the fault blocks does not contain any zones, those “empty” fault blocks are not displayed.

Z Color-Filled Contours



A color-filled contour map of the Z-values can be displayed on the top surface of any zone truncated with a 2D grid. If the top of zone 1 is the top of the wire frame, then a color-filled contour map cannot be displayed on top. An example of a color-filled contour map is shown in the top figure on page 3DV Fig-5.

Z Contours Display

Color-filled contour maps can be turned on or off for any surface, although they are only visible if the top surfaces of the zones are visible. The *Z Contours Display* push button (hot key “Alt-l”) brings up a pop-up menu from which to select zones for contouring. By default, color-filled contouring is turned off for all zones. The zone name is marked with an asterisk when color-filled contouring is shown for a zone; the zone name is not marked when color-filled contouring is not shown for a zone. Color-filled contours can be displayed for all zones at one time by selecting the *Display All Contours* menu selection. All color-filled contour maps are removed when *Remove All Contours* is selected. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

Z Contour Range

The *Minimum Z-value* text box and the *Maximum Z-value* text box show the minimum and maximum Z-values of the wire frame, and, hence, the Z-range of the model. By default, all of the contouring parameters are based on contouring the entire Z-range. A new value can be entered by selecting one of the text boxes, thereby limiting the range over which the filled contours are displayed. By limiting the Z-range, a smaller contour interval can be used.

Z Contour Interval

The contour interval and the range that are specified for the color-filled contour map cannot exceed 63 contours for a total of 64 colors. The default contour interval creates approximately 20 intervals. The contour interval can be changed from the default by clicking on the *Z Contour Interval* text box and entering the interval value in the Status Window. The 3D Viewer displays an error message if 63 contour levels are exceeded. The 3D Viewer then sets the contour interval to the minimum reasonable value that creates 64 colored contour intervals. In all cases, 0 is used as the reference value; e.g., if a contour interval of 50 is entered, and the minimum Z-value setting is 128, then the first contour line is at 150, the second at 200, and so on.

Z Starting Color

The *Z Starting Color* controls which color within the Z color table is associated with the value entered for the *Minimum Z-value*. This control allows a particular color to be associated with a particular Z-level. Selecting the value box causes the 3D Viewer to prompt for a new start color. The default value is system calculated based on the Z-range of the surface; the default is generally within the purple range of the default Z color table.

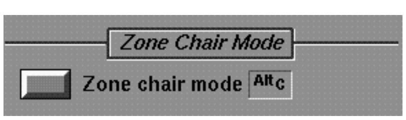
Z Color Step

The *Z Color Step* allows the user to skip colors in the Z color table, since the default Z color table changes color very gradually. In this way, if only a few color-filled contours are shown, the colors can still span as much or as little of the Z color table as desired. By default, the *Z Color Step* is set to a value to use the maximum amount of the color table. The *Z Color Step* can be changed by clicking on the value box and entering a new value.

Z Color-Filled Contours Color Table

A distinct color table is available for color-filled contours; this table is different from the property and zone color tables. Modifying the Z color table can be useful, for example, to emphasize a particular Z-level. Refer to *Screen Menu* (page 3DV 4-55) and Chapter 5, *Using the Color Editors*, for more information on the different types of color tables.

Zone Chair Mode

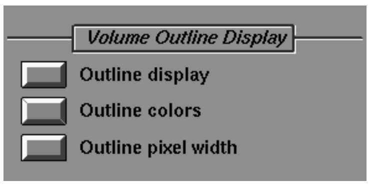


By default, when chair mode is turned on, the chair subsection is extracted from all zones, where applicable. An example of this is shown in the top illustration on page 3DV Fig-1. Using the *Zone Chair Mode* pop-up menu, selected via the *Zone Chair Mode* push button (hot key “Alt-c”), chair mode can be turned off within any zone(s). The lower illustration on page 3DV Fig-5 shows chair mode on, but the chair is not applied to the green zone.

When chair mode is being applied to a zone, the zone name is marked with an asterisk (the default); no asterisk appears next to the zone name when chair mode is not applied to a zone. Chair mode is not shown in any of the zones if the user selects the menu entry *Ignore in All Zones* (equivalent to turning chair mode off). If the user selects the menu entry *Apply in All Zones*, chair mode is displayed in all appropriate zones based on the chair slice settings on the Manipulate Menu. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

Note: Chair mode must be turned on (using the Manipulate Menu or the "Insert" hot key) prior to changing the Zone Chair Mode *pop-up menu settings.*

Volume Outline Display



The Volume Outline Display section can be used to customize (as well as remove) the outlines of fault blocks, zones, and properties. When a faces file is partitioned into fault blocks and zones, the outline of the zone and fault surfaces that create the model are drawn in black and red, respectively, by default. The outlines are shown along the X, Y, and Z slices, including chair slices, and on any lateral clipping polygon. An example of fault outlines is shown in the middle figure on page 3DV Fig-1 and the lower figure on page 3DV Fig-5.

Note: Faces files that are converted from previous versions cannot be displayed with zones or properties outlined.

Outline Display

Fault, zone, and property outlines can be turned on or off with the *Outline Display* push button, which invokes a pop-up menu. Displayed outlines are denoted by an asterisk (*). By default, only fault and zone outlines are turned on; property outlines are off.

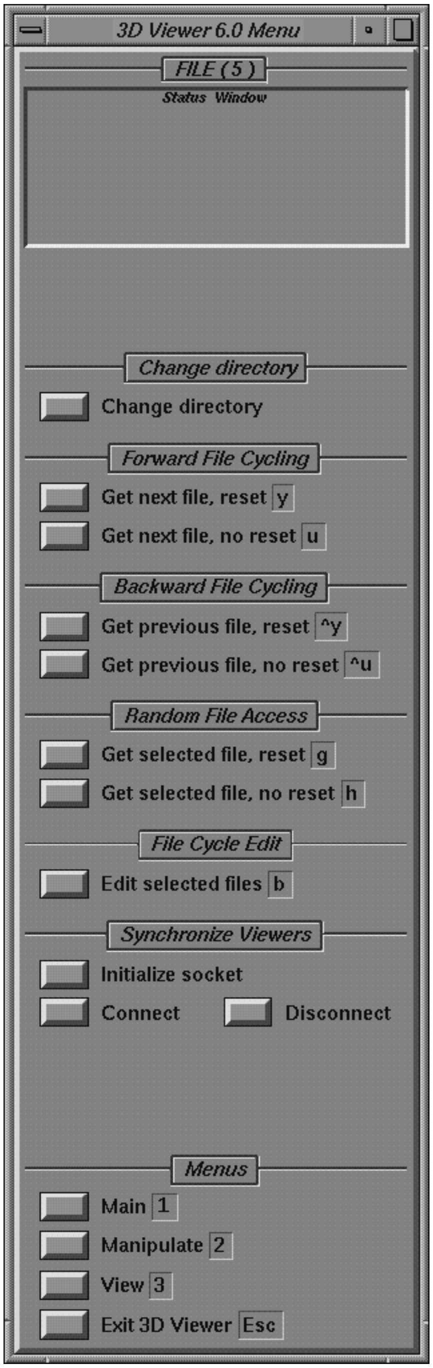
Outline Colors

Selecting the *Outline Colors* push button brings up a menu consisting of choices for customizing the colors of fault blocks, zones, or property outlines. Selecting *Fault Blocks*, *Zones*, or *Property* brings up another pop-up menu listing the first eight colors (white, black, green, blue, red, brown, purple, yellow, orange) and a user-entered selection that allows the color values 1 – 72 to be selected. The EarthVision default color table is used for these colors; refer to the EarthVision Appendix B, *Colors*, to see samples of these colors.

Outline Pixel Width

By default, fault block outlines have a pixel width of 2; zone and property outlines default to a pixel width of 1. Selecting the *Outline Pixel Width* button brings up a pop-up menu consisting of choices for customizing the pixel widths of fault blocks, zones, or property outlines. Selecting *Fault Blocks*, *Zones*, or *Property* brings up another pop-up menu with the selections 1 through 5 on it. An asterisk (*) next to one of the numbers indicates the current width of the outlines.

File Menu



The File Menu (hot key “5”), shown at left, contains the commands used to change which model or data file is displayed, or the list of files that can be displayed. The functions allow

- Changing the current working directory
- Forward file cycling (with or without resetting the display attributes)
- Backward file cycling (with or without resetting the display attributes)
- Selected file access (with or without resetting the display attributes)
- Editing the list of selected files for cycling
- Synchronizing two 3D Viewers at different locations

By default, files are displayed in the same order as chosen initially, including both faces files and scattered data files. A previously displayed file, or any new file, however, can be displayed using commands available on the File Menu. Files may be viewed in the order originally selected, in reverse order from the original selections, or at random.

The Synchronize Viewers commands allow 3D Viewers to be synchronized across platforms, between UNIX® and/or Windows® computers via a TCP/IP network connection. This synchronized visualization capability allows for users in the office and at the drill site to view the same model and manipulations at the same time for greatly increased drilling safety and accuracy with communication between drill site and office location.

The File Menu commands are

- Change directory
- Get next file, reset (hot key “y”)
- Get next file, no reset (hot key “u”)
- Get previous file, reset (hot key “^y”)
- Get previous file, no reset (hot key “^u”)
- Get a selected file, reset (hot key “g”)
- Get a selected file, no reset (hot key “h”)
- Edit selected files (hot key “b”)
- Synchronize Viewers

Change Directory

The *Change Directory* function allows a new working directory to be selected. All subsequent work and file selection will be done in the new directory. Files previously selected are still available and remain in the original directory.

Reset vs. No Reset

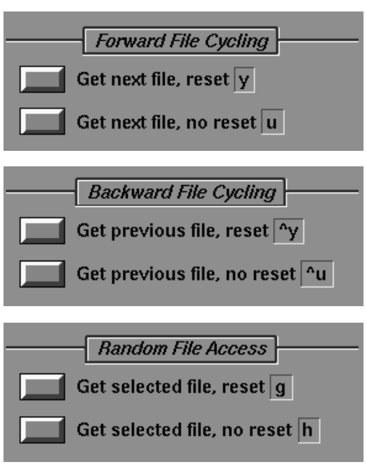
“Reset” refers to resetting display attributes. If a file is selected without resetting, all current attributes remain intact. If a file is selected and reset, all attributes are reset to the default values.

Unlike the *Reset Attributes* command available on the View Menu (refer to *Reset Attributes*, page 3DV 4-27, for a discussion of the command), requesting “reset” here causes the 3D Viewer to reset to the settings given in a vue file (refer to *Vue Files*, page 3DV 2-14). Retrieving a file without resetting should be done only between files with the same data ranges and grid size; if it is used with files with different ranges, an error message is displayed in the Status Window and the new model does not appear. Selecting one of the reset commands is recommended in this situation.

All hot keys regarding file selection are listed on 3DV 4-37.

Note: The “no reset” commands cannot be used to go from a faces file to a scattered data file or vice versa. Also, they cannot be used to go between two scattered data files.

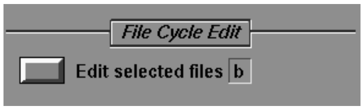
Forward, Backward, and Random File Cycling



All files, by default, are displayed in the order they were selected when first entering the 3D Viewer, synonymous to the files being put onto a conveyer belt one after another. When the last one is displayed, the 3D Viewer returns to the first one again. Keeping this in mind, Forward File Cycling (the *Get Next File* commands) means get the next file on the conveyer belt-the next file in line. Backward File Cycling (the *Get Previous File* commands) tells the 3D Viewer to go backwards along the belt-if the first file is displayed, then the 3D Viewer brings up the last file selected when entering the program; if on the second file, the 3D Viewer brings up the first file, and so on. Random File Access (the *Get Selected File* commands) allows selection of a file from anywhere on the conveyer belt. A pop-up menu appears with a list of the files selected when entering the 3D Viewer; selection of the desired file is accomplished using the left mouse button.

All hot keys regarding file selection are listed on 3DV 4-37.

Edit File Selection



Selecting the *Edit File Selection* button (or typing the associated hot key “b”) brings up a pop-up menu similar to the one used to initially select files when entering the 3D Viewer; all faces files, 2D and 3D grids, and scattered and property data files in the directory are listed on the menu. Files can be added to or deleted from the selection list using this menu in the same way as when initially entering the 3D Viewer (refer to *Entering the 3D Viewer*, page 3DV 3-2).

All hot keys regarding file selection are listed on 3DV 4-37.

Viewing Multiple Related Property Models

When multiple related faces files are selected, the “no reset” commands can be very useful for comparing the models. The “no reset” commands attempt to keep all the display specifications as constant as possible, including the viewing angles, slices, shell selections, data posting and annotation on or off, etc. Remember that the models must be related as discussed previously in the *Reset vs. No Reset* section.

The four illustrations on page 3DV Fig-6 are four different models of the same area. The data show the salinity concentration within a bay on different days of the year. The top model is derived from data collected on day 320. The second figure is derived from data collected on day 326. The third model is from data collected on day 330 and the last model from day 338. The four views were taken using *Get Next File*, *No Reset* so that the level of isovalue shells and the model position would stay the same. This method allows for easier and faster comparison of the four models.

Synch ronize Viewers

The Synchronize Viewers commands allow 3D Viewers to be synchronized across platforms, between UNIX and/or Windows computers via a TCP/IP network connection. This synchronized visualization capability allows for users in the office and at the drill site to view the same model and manipulations at the same time.

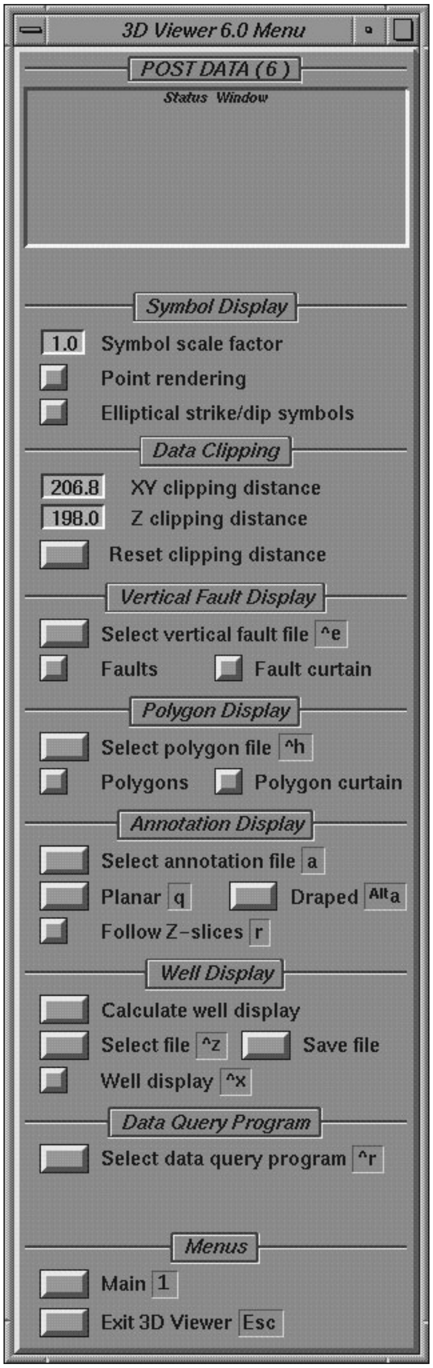
To run the synchronized viewing capability, the same model must be brought up on both machines. The following commands are available:

Initialize Socket . . . Before two 3D Viewers can be synchronized, the IP address or hostname of the machine to which the Viewer will connect, as well as the port number for it to connect through (usually a value over 2000), must be specified via the *Initialize Socket* function. Both machines *must* use the same port number. Once the first machine has been initialized, the second machine can be as well, using the same port number. In order to use the hostname, it must be listed in the hosts file (in `/etc/hosts` on UNIX systems or typically `\Winnt\system32\drivers\etc\Hosts` on Windows NT systems), or in DNS or NIS/YP. The IP address of a host can be found by either using the ping command (`ping hostname`), or by looking in the hosts file.

Connect . . . . Once both machines have been initialized, selecting the *Connect* push button allows any model manipulation performed on either machine to be viewed on the other machine. The model manipulation is "passed" from one machine to the other via saved vue files. Thus, only commands available via vue files can be communicated (i.e., data editing commands would not be passed). The *Connect* push button must be selected on both machines in order to run.

Disconnect . . . . Selecting the *Disconnect* push button ends the connection between the two machines. In order to start it up again, the socket must be reinitialized.

Post Data Menu

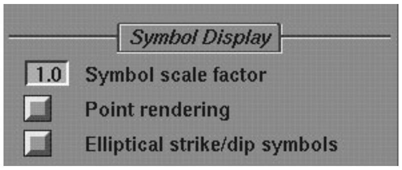


The Post Data Menu (hot key “6”), shown at left, contains the menu commands or hot keys that control the following display attributes:

- Symbol Scale Factor, Rendering Technique, and Strike/Dip Symbols
- Data Clipping
- Vertical Fault Display
- Polygon Display
- Annotation Display (hot keys “a,” “q,” “r”, and “Alt-a”)
- Well Display (hot keys “^x” and “^z”)
- Data Query Program (hot key “^r”)

Symbol Display

Symbol Scale Factor



The size of all cubes or symbols representing scattered data points can be changed. By default, the *Data Point Scale Factor* is set to 1. Increasing the value makes the cubes larger; decreasing the value makes the cubes smaller. For example, if the *Data Point Scale Factor* is set to 2, the width, height, and depth of the cube doubles, therefore the cube is 8 times larger. If a value of .5 is given, the width, height, and depth of the cube is halved, and the cube is 8 times smaller. The figures on page 3DV Fig-2 illustrate use of this scale factor; data points in these figures have a larger scale factor than the default.

Point Rendering

By default, for files with less than 10,000 points, data points are displayed as small, lit cubes, although the cube size can be changed based on the symbol field, if one is present (refer to 3DV 2-8 for a list of available symbols). Alternatively, when *Point Rendering* is turned on, the data points can be displayed as flat, non-lit dots or points. The points are displayed the same size regardless the distance to the eyepoint (i.e., how far the view is zoomed in or out). Such rendering is quicker to display. Point rendering is the default for data sets with 10,000 points or more, or if the combined number of data points, when multiple files are displayed, reaches 10,000 or more.

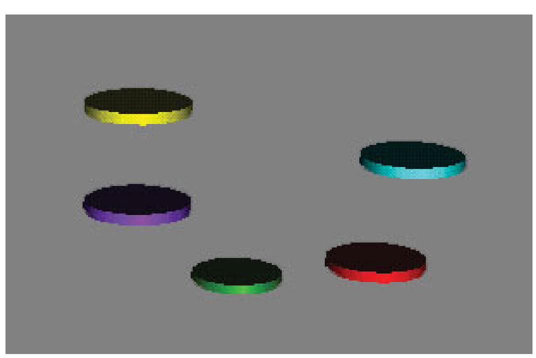
Elliptical Strike/Dip Symbols

Scattered data fields containing dip and dip azimuth information are automatically displayed as tilted circular disks. Using the *Elliptical Strike/Dip Symbols* toggle, these locations can be displayed as elliptical, tilted disks with a strike/dip symbol posted. The disks are tilted to line up with the strike and dip at that data point, and the strike/dip symbols show the line of strike and the dip magnitude.

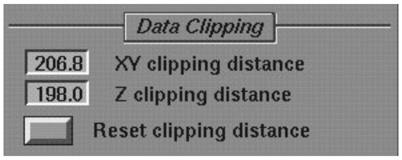
Dip and dipazm (dip azimuth) fields should be present in the file. If dip and dipazm are present, the circular or elliptical strike/dip symbols are automatically drawn. If a symbol field is present, then a value of 10 must be specified. If 10 is specified and dip and dipazm are not specified, the disk is drawn with both values default to 0.0.

The size of the elliptical symbols is not related to the value of the dip or azimuth; the direction of the major axis, however, is oriented along the dip azimuth direction.

In order to display elliptical disks or ellipsoids of certain sizes and shapes, symbol 8 or 9 (respectively) must be specified; additional fields must be specified. Refer to page 3DV 2-5 for more information.



Data Clipping



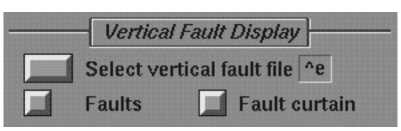
The data clipping distance defines the distance away from the X, Y, or Z slicing plane that the scattered data are posted (this parameter only affects the data when they are displayed with a faces file; all data files are affected). Data outside this distance from the plane are "clipped"; that is, they are not displayed. One value is given for both the X and Y planes and one value for the Z planes. The default distances are the maximum X or Y range (for the *XY Data Clipping Distance*) and the Z-range (for the *Z Data Clipping Distance*). Having these values as the defaults ensures that all the data points are always displayed, regardless of the slice.

To change one of the data clipping distance values, click with the left mouse button on the value box to the left of the label. A prompt appears in the Status Window requesting the new value; enter the new value followed by a carriage return. The *Reset Clipping* button returns the data clipping distance values to the defaults.

Examples of data not being clipped by slicing planes are shown in the top figure on 3DV Fig-1, the figures on page 3DV Fig-2, and the bottom figure on page 3DV Fig-5.

Two additional buttons, *Point Clip* and *Point Cap*, appear in the Data Clipping section when the environment variable EV_DATAPOINT_CLIP is specified before the 3D Viewer is started. (Refer to *Environment Variables,* page 3DV 3-5, for more information.) When *Point Clip* is off (the default), all data point symbols are either displayed or not displayed, depending upon where the model is sliced. When *Point Clip* is on, the symbols are sliced along the current X, Y, or Z slicing plane, so that a portion of a symbol may be displayed. If the symbol is a cube, for example, the sliced cube appears as a box with its lid cut off and the inside of the box visible. Selecting *Point Cap* places a cap or lid on any sliced or clipped symbols, so the inside is not displayed.

Vertical Fault Display



A vertical fault or traverse file can be displayed in the 3D Viewer when viewing a 2D grid, 3D grid, scattered data, or a faces file. These faults or traverses can be displayed as lines at the top of the model or as vertical transparent curtains.

Select Vertical Fault File

Vertical faults or traverses can be displayed in the 3D Viewer. The *Select Vertical Fault File* button brings up a pop-up menus listing all the available vertical fault files (*.vflt*) and traverse files (*.trv*) in the directory. Once a file is selected, it is automatically displayed. By default, the vertical faults or traverses appear as lines at the top of the display with vertical transparent curtains or panels extending downward.

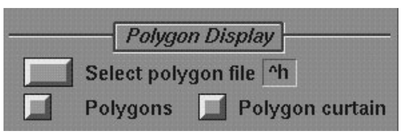
Faults

The selected vertical faults or traverses can be turned on or off by selecting the *Faults* toggle button. Turning off the vertical fault display automatically turns off the vertical fault curtains, if on.

Fault Curtain

In addition to lines drawn at the top of the display, vertical faults or traverses may also be displayed as vertical curtains or panels extending downward. These panels are drawn as transparent objects and do not obscure objects behind them. The curtains are turned on or off by clicking on the *Fault Curtain* toggle button.

Polygon Display



A polygon file can be displayed on a 2D grid, 3D grid, scattered data, or a faces file. Polygons are displayed at the top Z-level of the model. (Polygon files include non-vertical fault files (*.nvflt*), polygon files (*.ply*), and volumetrics polygons (*.vply*).)

Select Polygon File

Selecting the *Select Polygon File* button brings up a pop-up menu that lists all the available polygon files (those files with names ending in *.nvflt*, *.ply*, and *.vply*) for display. After selecting a file, the polygons are automatically drawn on the top Z-plane of the model display.

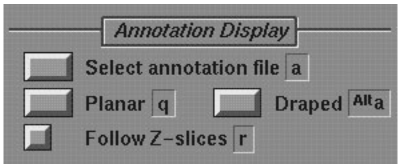
Polygons

The polygons can be turned on or off by clicking on the *Polygon* toggle button. Turning off the polygon display automatically turns off the polygon curtains, if on.

Polygon Curtains

In addition to polygons drawn at the top of the display, polygons can also be displayed as vertical curtains or panels extending downward. These panels are drawn as transparent objects that do not obscure objects behind them. The curtains are turned on or off by clicking on the *Polygon Curtain* toggle button.

Annotation Display



An ASCII annotation file can be displayed on a model. The annotation SET and SRF commands, along with a series of X,Y coordinate pairs, result in colored lines, text, symbols, and polygons being posted at the top and/or bottom of the property model, or draped on the top of a zone. This annotation might represent political boundaries, project boundaries, roads, etc. Refer to the *Graphic Editor* document and EarthVision Appendix B for a discussion on how to create an annotation file and for more information on the annotation commands. The bottom illustration on page 3DV Fig-7 shows an example of displayed surface annotation.

Note: *SRFLLL, SRFLLG, SRFGEL, and LGDxxx commands are not currently supported in the 3D Viewer and are ignored, if present.*

The following four commands are available in the Annotation Display section on the Data Posting Menu:

- Select Annotation File (hot key “a”)
- Planar Display (hot key “q”)
- Draped Display (hot key “Alt-a”)
- Follow Z-slices (hot key “r”)

For any of the annotation commands to be performed, the annotation file must first be selected.

Select Annotation File

Select Annotation File (or the “a” hot key) brings up a pop-up menu of all files ending with *.ann* in the current directory. A file must be in the directory at the *start* of the 3D Viewer session in order to be included on the menu, as the 3D Viewer only checks the directory once, at the beginning of the session. Once a file is selected, either planar or draped display must be selected, via the *Planar* or *Draped* buttons, respectively.

Planar Display

Planar Display (or the “q” hot key) brings up a pop-up menu with the four choices for the annotation display: top, bottom, top and bottom, and off. The current selected position is indicated by an asterisk (*). “Top” indicates that the annotation is displayed only on the maximum or top Z-plane, regardless of the model’s inclination (the default setting). “Bottom” indicates that the annotation is displayed only on the minimum or bottom Z-plane (regardless of the model’s inclination). “Top and Bottom” indicates that the annotation is displayed on the minimum and maximum Z-plane. The annotation file can be turned off temporarily, by clicking on “Annotation off.” An annotation file must be selected (using *Select Annotation File*) before any of these commands are meaningful.

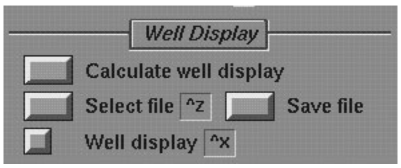
Draped Display

Draped Display (or the “Alt-a” hot key) brings up a pop-up menu with the zones for the annotation display. The current selected zone is indicated by an asterisk (*). Alternatively, the annotation can be draped on all zones or all draped annotation removed. An annotation file must be selected (using *Select Annotation File*) before any of these commands are meaningful.

Follow Z-Slices

Follow Z-Slices (or the “r” hot key) determines whether the annotation is displayed at the current Z-slicing plane or is always displayed on the Z-plane of the wire frame (as shown in the bottom figure on 3DV Fig-7). When *Follow Z-Slices* is on, the annotation remains in close proximity to the portion of the model currently displayed. The default is to have the annotation remain on the top or bottom of the wire frame.

Well Display

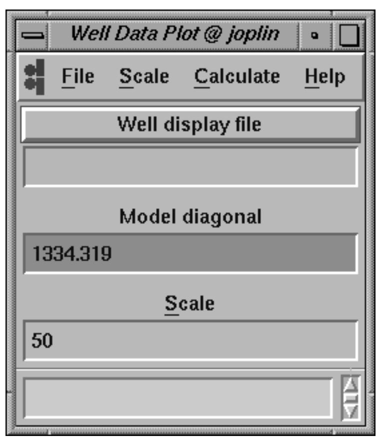


Various types of well information can be displayed n the 3D Viewer along side a displayed well path. Well path display can be customized to include well log curves, well path labels and symbols, top picks, lithology, and well bore annotation.

Note: A site must be licensed for ev_wd or ev_ps to customize well display in the 3D Viewer.

Calculate Well Display

The *Calculate Well Display* button produces the Well Data Plot interface for accessing well display customization, as shown in the example below.

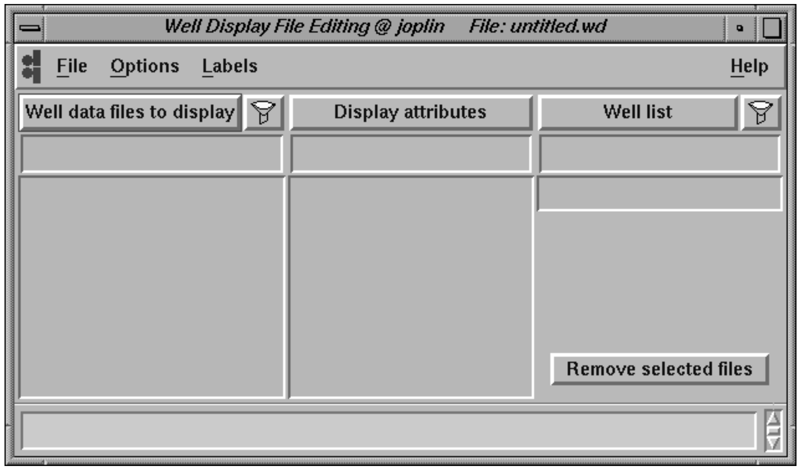


From the Well Data Plot interface, a well display file name and scale can be specified (each of these are discussed next). These parameters, along with the model diagonal, are saved to a file named *.evwellplot3d* in the current working directory. Subsequent sessions of Well Data Plot then use the *.evwellplot3d* file to automatically load the previous well display file and parameters.

Well Display File

From the Well Data Plot interface, a well display file (*.wd*) that controls the display of well information in the 3D Viewer can be selected. Well display files (*.wd*) include all the information necessary for specifying and plotting well paths, horizon tops, well log curves, property data, LAS data, lithology, and well bore annotation files, as well as the display parameters for each of these.

The *Well Display File* button produces the Well Display File Editing window (shown below), from which any number of well data files can be specified. Well data files can include well path, scattered data, horizon tops, well log curves, property data, LAS data, lithology, and well bore annotation files. The display parameters for these data types can be customized from the *Display Attributes* button on the Well Display Editing interface. Refer to the *Well Display File Editing* section of the *Well Tools* document for a complete discussion.



After setting up the desired parameters, the well data file names and custom display attributes are saved to a well display (*.wd*) file whenever the cursor leaves the Well Display Editing window or the window is exited. The default well display file is named *untitiled#.wd*, where # is an incremented number beginning with zero, and is automatically supplied to the *Well Display File* text box in the Well Data Plot window.

Model Diagonal

The *Model Diagonal* value represents the diagonal distance in data scale units across the model or data file that is currently loaded in the 3D Viewer.

Scale

The *Scale* is used to translate all factors set in the Display Attributes section of the Well Display File Editing program (e.g., translate track width from inches/cm to model units). The default scale is calculated from the model diagonal.

Calculate

Once all the well display files and display options have been set in the Well Display File Editing window, and have been saved to a well display file, the 3D Viewer must convert the information to a binary form for faster display. Selecting *Calculate –> Display* produces a window for specifying a script file name for this calculation.

When the calculation completes, the 3D Viewer display is redrawn with the selected well display attributes. A temporary binary file (*temp_xxx.bwd*) is created that can be saved in the 3D Viewer interface via *Save File* and redisplayed in subsequent sessions with *Select File*.

Select File

The *Select File* button (hot key “^z”) brings up a pop-up menu that lists all the available binary well display files (*.bwd*). After selecting a file, the well display attributes are drawn along the well paths.

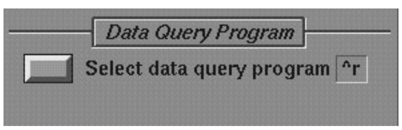
Save File

When a well display has been calculated, a temporary binary file (*.bwd*) is created and then deleted at the end of the 3D Viewer session. The *Save File* button can be used to save this binary well display file. The 3D Viewer prompts for the new name in the Status window and supplies the suffix *.bwd*. This file can be redisplayed in subsequent sessions using the *Select File* button.

Well Display

Once a binary well display file has been calculated and displayed, the *Well Display* toggle button (hot key “^x”) turns the well display attributes on or off.

Data Query Program



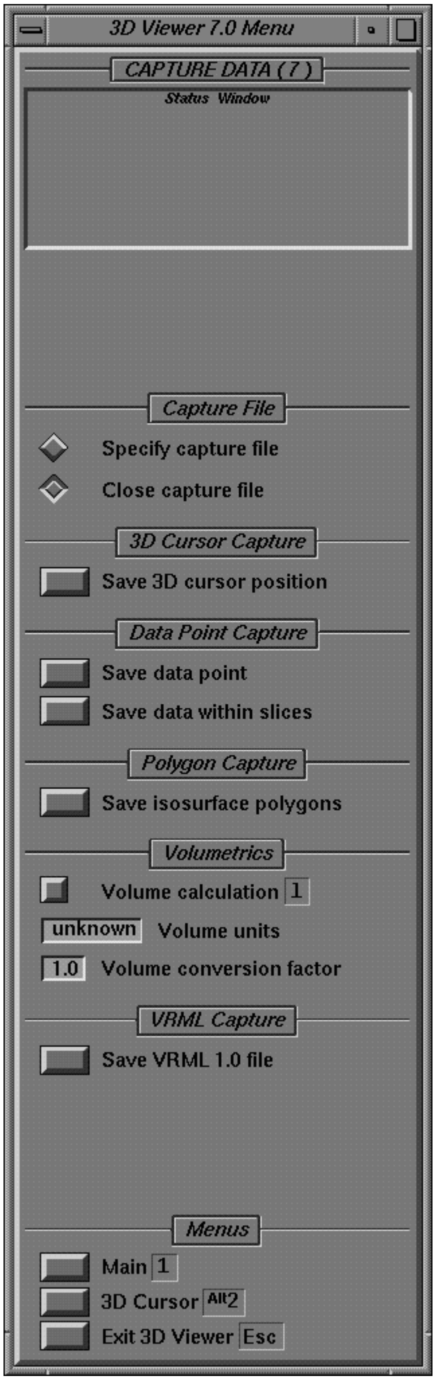
The information typically displayed on the screen when a data point is selected (e.g., the X-, Y-, Z-, and P-values of a data point), plus any other fields in the files, can be sent from the 3D Viewer to a user-specified program. The program must be expecting standard input. When the *Select Data Query Program* push button (or “^r” hot key) is selected, the user is prompted in the Status window for the program’s name. Once entered, the program is started, and an active link is made between the 3D Viewer and the program. Whenever a data point is selected with the right mouse button, the information sent to the screen is also sent to the program. The information is sent in the format of FILE=NAME, FIELDNAME=VALUE, FIELDNAME=VALUE,... where NAME is the name of the scattered data file, FIELDNAME is the name of the field as displayed in the file’s header, and VALUE is the value of the field for that data point. The fields are separated by commas without any white space. An example is shown below.

```
File=pcb.pdat,X=-1165,Y=743,Z=-11,PCB=,WELLID=2001,dip=0,dipazm=0
```

Every field in the data file is passed by the 3D Viewer.

By using the vue-file parameter *queryprog*, a program can be specified as the data query program prior to entering the 3D Viewer. Using the *queryproglist* vue file parameter, a list of potential programs can be specified; the list appears on a pop-up menu when the *Select Data Query Program* push button is selected.

Capture Data Menu

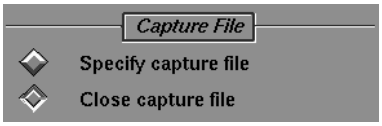


The Capture Data Menu (hot key "7") is used to retrieve information from the model, hence, the name "data capture." The following features are available from the Capture Data Menu (shown at left):

- Capture File Specification
- 3D Cursor Location Capture
- Data Point Capture
- Polygon Capture
- Volumetrics Calculations (hot key letter "l")
- VRML 1.0 File Output

Capture File

Specify Capture File



The *Specify Capture File* radio button is used to open a new or existing file on disk to which all of the information will be saved. If an existing file is specified, the 3D Viewer prompts whether or not the file should be overwritten. The information cannot be appended to an existing file.

The type of information saved is typically the X, Y, Z, and sometimes P-values related to a data point, polygon, or the 3D cursor location. Each line in the file consists of the following information:

- A keyword (either 3dcursor, datapoint, or polygon) that indicates what type of information was captured
- The X, Y, and Z locations (in that order), all right justified and in the same columns regardless of the type of information being saved (columns 11 to 22, 23 to 34, and 35 to 46, respectively)
- The P-value and well ID, in that order (except for polygon information; refer to *Polygon Capture*, page 3DV 4-53), if appropriate, again right justified and always in the same columns regardless of the type of information being saved (columns 47 to 58 and 59 to 72, respectively)

The optional comment, if given, is written preceded by a # sign (the comment character) on its own line prior to the other saved information. The name of the file follows the optional comment (if given).

A sample of a capture file is shown below, with each of the individual types of data discussed under the appropriate sections of this menu.

```
#location 1
3dcursor  -1184.62   659.6  -115.4

#location 2
3dcursor   -1167.2  624.82   -78.5

#unusually high value
#myfile.pdat
ascdatapt   -1165    763    -20    4.65   2002

#full model
#myfile.pdat
ascdatapt   -1165    743    -20    0.95   2001
ascdatapt   -1165    743    -80    0.94   2001
ascdatapt   -1165    743   -140    0.43   2001
ascdatapt   -1165    743   -200    0.2   2001
ascdatapt   -1165    763    -20    4.65   2002
ascdatapt   -1165    763    -80    0.33   2002
....             ....          .          .           .        ...
....             ....          .          .           .        ...
....             ....          .          .           .        ...
....             ....          .          .           .        ...
ascdatapt   -1225    600    -80    0.33   2011

#isovalue shells above .2
polygon          "0.25"          "4"
        -1198.09   593.169    -70.4
        -1197.73    596.62   -72.9598
        -1196.53   594.109   -72.804
        -1198.09   593.169    -70.4

polygon          "0.25"          "4"
        -1196.53    596.62   -78.5113
        -1197.73    596.62   -72.9598
```

```
        -1196.53   594.109   -72.804
        -1196.53    596.62   -78.5113

polygon         "0.25"           "4"
        -1198.08    596.62    -70.4
        -1198.09   593.169    -70.4
        -1197.73    596.62   -72.9598
        -1198.08    596.62    -70.4
....              ....          ....          ....
....              ....          ....          ....
....              ....          ....          ....
....              ....          ....          ....
```

Close Capture File

The *Close Capture File* radio button closes the previously specified capture file. All saved information is written to the originally specified file. Closing the file allows a new file name to be specified.

3D Cursor Capture

The 3D cursor is used in conjunction with several 3D Viewer features, including specifying the look point (refer to *Look Point Position*, page 3DV 4-24), editing and creating ASCII scattered data (refer to *3D Cursor Display and Location Controls*, page 3DV 4-141), and saving data point positions (this menu). The 3D cursor is shown in three of the figures on page 3DV Fig-4. Slider bar controls for the 3D cursor are located on the 3D Cursor Menu.

The *Save 3D Cursor Position* button is used to save the X, Y, and Z location of the current position of the 3D cursor, plus an optional comment. This feature could be used to save locations of special interest in the model, data busts, drilling locations, etc. A capture file name (discussed next) must be specified prior to trying to save the 3D cursor location, as that file is where the information is saved. The 3D cursor location can be saved as many times as desired within a single session. A sample of the saved information is shown below:

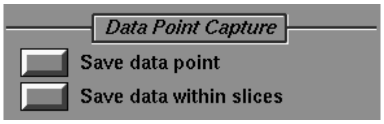
```
"location 1"
3dcursor   -1184.62    659.6    -115.4
"location 2"
3dcursor   -1167.2    624.82    -78.5
```

The comment, if added, is saved on its own line, followed by the keyword “3dcursor” (on the next line) to indicate the type of information and the X, Y, and Z coordinate values.

The 3D cursor is turned on and off using the 3D Cursor Menu button or the “k” hot key; by default, the cursor is off.

The 3D Cursor location can be changed using slider bars on the 3D Cursor Menu (refer to *3D Cursor Menu*, page 3DV 4-140) or by clicking with the middle mouse button anywhere along the green axes of the 3D cursor (refer to *Change 3D Cursor Location*, page 3DV 4-151).

Data Point Capture



The X, Y, and Z locations of a scattered data point, as well as its file name, P-value, well ID, and an optional comment, can be saved in two different ways, discussed next.

Save Data Point

The *Save Data Point* menu button is used to save the X, Y, and Z locations and the P-value of the most recently queried data point, in addition to a comment. Data points are queried by clicking with the right mouse button on the desired data point (refer to *Display P, Z, and Other Field Values*, page 3DV 4-150). Only the most recently posted value is saved to the file. A sample of the saved information is shown below:

```
”unusually high value”
#newdata.pdat
ascdatapt   -1165    763    -20    4.65   2002
```

Save Data within Slices

The *Save Data within Slices* function is used to save the X, Y, and Z locations, P-value, well ID, and file name for all of the data points within the volume defined by the current X, Y, and Z front and back slices, regardless of the contour levels settings. If multiple data files are displayed, then all the data points within the slices from all files are saved. The optional comment is saved on its own line, in double quotes, prior to the other lines of saved information. A sample of the saved information is shown below:

```
#”well 2001 ”
#remwell.pdat
ascdatapt   -1165    743    -20    0.95   2001
ascdatapt   -1165    743    -80    0.94   2001
ascdatapt   -1165    743   -140    0.43   2001
ascdatapt   -1165    743   -200    0.2   2001
```

Note: *The data file must be turned on, but need not be part of the active edit file, in order to save the data within the slices.*

Polygon Capture

The *Save Isosurface Polygons* menu button is used to save the X, Y, and Z locations and P-value for the polygons that make up an isosurface within the volume defined by the current X, Y, and Z front and back slices and at the minimum and maximum isosurface values indicated. If no isosurface levels have been set, then no polygons can be saved.

Note: *This method can create very large files, so it should be used with care.*

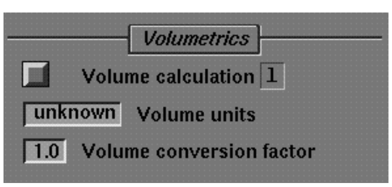
The information for each polygon is saved as follows: the first line contains the polygon keyword, along with the P-value of the polygon and the number (n) of vertices that describe the polygon. The next n number of lines are the X, Y, and Z locations for each of the polygon vertices. A sample of the saved information is shown below:

```
"P-values .25 and above  "
polygon     "0.25"     "4"
       -1198.09   593.169    -70.4
       -1197.73    596.62   -72.9598
       -1196.53   594.109   -72.804
       -1198.09   593.169    -70.4

polygon     "0.25"     "4"
       -1196.53    596.62   -78.5113
       -1197.73    596.62   -72.9598
       -1196.53   594.109   -72.804
       -1196.53    596.62   -78.5113

polygon     "0.25"     "4"
       -1198.08    596.62    -70.4
       -1198.09   593.169    -70.4
       -1197.73    596.62   -72.9598
       -1198.08    596.62    -70.4
```

Volumetrics Calculations



The 3D Viewer can perform a simple volumetrics calculation of the portion of the model on the screen by clicking on the *Volume Calculation* push button or using the “l” hot key (lower case “L”). The volume of the model displayed on the screen is then displayed in an information window. (As with all such boxes, the box location can be changed; refer to *Move Screen Objects*, page 3DV 4-151.) The volume calculated is based on the current X, Y, and Z front and back slices, the isosurfaces, and zones displayed-essentially a “what-you-see-is-what-you-get” type of calculation, although a conversion factor can be supplied.

The units for the calculated volumes are X-units times Y-units times Z-units. If the XY units do not match the Z units (which would resulting in, for example, meters^2-feet), the *Volume Units* box can be used to toggle between the type of units used in the calculation (either the XY units or the Z units).

The calculation is strictly a measurement of the physical volume; it is not in any way based on the P-value (for example, if pore volume is desired). The only exception to this is the *Volume Conversion Factor* function. The volume calculated is multiplied by the number entered as the conversion factor (the default is 1.0). The *Volume Conversion*

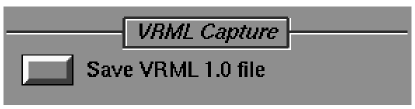
Factor can be changed by clicking with the left mouse button on the value box and entering a new value.

Note: Volumetrics information is not saved to a capture file.

For a discussion on the differences between calculations performed using the 3D Viewer and the Volumetrics program, refer to VOL-41 in the *Volumetrics* document.

Note: Volume calculation cannot be run in the 3D Viewer on merged or converted faces files. These calculations can be run on the original sequence file and grids in the Volumetrics module.

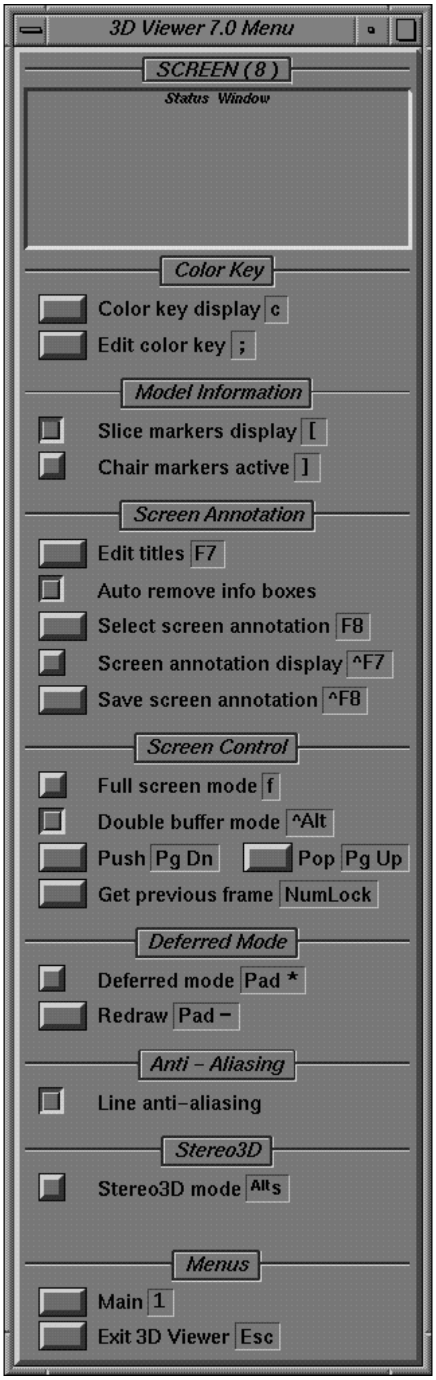
VRML Capture



Nearly anything that can be displayed in the 3D Viewer can be saved as a World Wide Web-viewable file in VRML 1.0 (Virtual Reality Markup Language, version 1.0) format. The WebSpace™ Netscape® plug-in from SGI™, for example, displays a VRML 1.0 file. Cosmo Player, also from SGI, is not compatible with VRML 1.0. The *Save VRML 1.0 File* push button produces an ASCII file for viewing with a compatible web browser. The user is prompted for a VRML file name, which has the extension *.wrl* or *.wrl.gz*. If the `gunzip` utility is found in the user's path, the file is saved with the *.wrl.gz* extension, since it is a more compact way to store VRML files, and since VRML-compatible viewers can read both types of files. If the `gunzip` utility is not found in the user's path, the file is saved with the *.wrl* extension.

Examples of models that can be saved to VRML 1.0 include sliced and chair-cut faces files, 2D and 3D grids, scattered data, and surface annotation. Scattered data are modeled as cubes; if lines or well tubes are present, they are also drawn. Wire frames are drawn, but without axis tick marks or values. Other aspects of a displayed model that cannot be saved to VRML 1.0 include outlines of faults, zones, and properties, screen annotation, the 3D cursor, and color keys.

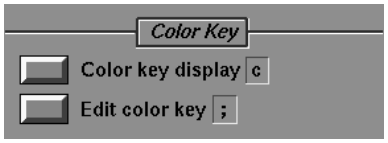
Screen Menu



The Screen Menu (hot key “8”), shown at left, contains menu commands regarding the following attributes:

- Color Key (hot keys “c” and “;”)
- Slice and Chair Markers (hot keys “[” and “]”)
- Display Titles (hot key “F7”)
- Screen Annotation (hot keys “F8,” “^F7,” and “^F8”)
- Full Screen vs. Partial Screen (hot key “f”)
- Double Buffer vs. Single Buffer Display (hot key “^Alt”)
- Pushing/Popping Graphics (hot keys “Page Down” and “Page Up”)
- Retrieving the Previous Screen Display (hot key “NumLock”)
- Deferred Mode (hot key number pad “*”)
- Redraw Display (hot key number pad “–”)
- Line Anti-aliasing
- Stereo3D viewing (“Alt-s”)

Color Key Control



Two functions are available for controlling the color key: the first selects whether or not the color key is displayed along with which color key is displayed, and the second controls what information is displayed within the color key.

Color Key Display

Several color keys are available for display: property, zone, feature, time, Z (for color-filled contours), and uniform (a single color for every point within the same file). The color key that is displayed by default depends on the file type and what parameters are appropriate:

- Faces Files . . . . The Property color key is displayed if the file contains property information, otherwise the Zone color key is displayed. The Z color key can be displayed (useful if color-filled contours are on).
- 3D Grid Files . . . . The Property color key is displayed; the Zone color key can be displayed if an indicator 3D grid that contains zone information is displayed.
- 2D Grid Files . . . . The Zone color key is displayed by default. The Z color key can be displayed (useful if color-filled contours are on).
- Property data files. . . . . The default color key depends on the fields in the file. In order of priority: If a *time* field is present, the Time color key is displayed by default. If a *featurecol* field is present or if feature picking is turned on, the Feature color key is displayed by default. If neither of these fields is present, then the Property color key is displayed by default. If a *zonecol* field is present, the Zone color key can also be displayed. Also, the Z color key can be displayed (useful if the data points are displayed in Z colors).
- Scattered data files . . . . The default color key depends on the fields in the file. In order of priority: If a *time* field is present, the Time color key is displayed by default. If a *featurecol* field is present or if feature picking is turned on, the Feature color key is displayed by default. If neither of these fields is present, then the Z color key is displayed by default. If a *zonecol* field is present, the Zone color key can also be displayed.

The color key displayed can be changed to any of the other color tables if appropriate. A title at the top of the color key indicates which color table is currently being displayed.

The color key can be turned off or changed to any of the different color keys by choosing the *Color Key Display* command or typing the “c” hot key. When this command is selected, a pop-up menu appears with several choices: property color key, zone color key, Z color key, feature color key, time color key, uniform color key, or no color key at all. Only appropriate color key choices are displayed (e.g., if a model does not have property information that color key choice will not be displayed). If no other color key is appropriate, then this function simply turns the color key on or off.

The following table shows which color keys are available for which file types:

Color Key	*Faces*	*3D Grid*	*2D Grid*	*Property Data*	*Scattered Data*
Property	x*	x		x	
Zone	x**	x***		x****	x****
Z	x		x	x	x
Feature				x†	x†
Time				x††	x††
Uniform				x	x

* if the faces file has property information
** if the faces file has zone information
*** if the 3D grid has an indicator grid displayed
**** if the data file has a ZONECOL field
† if the data file has a FEATURE field
†† if the data file has a TIME field

The colors displayed in the color key depend on the Color Key type (e.g., property versus zone colors), but also on the *Active P* file at the time (discussed on page 3DV 4-17). The differences between the color keys are:

- The Property Color Key displays the portion of the property color table that relates to the current model (e.g., if the model has 15 isovalue intervals, then the first 15 colors of the current property color table are displayed in the Property Color Key). The P-values are listed to the right of the associated colors. A sample Property Color Key is shown in the figures on 3DV Fig-2. Up to 64 property colors can be displayed.
- The Zone Color Key displays the portion of the zone color table that relates to the current model (e.g., if a model has five zones, then the first five colors of the current zone color table are displayed in the Zone Color Key). The names of the zones are displayed next to the colors if the faces file was generated using the WorkFlow Manager or the Geologic Structure Builder. Otherwise, if the user wants to have text listed to the right of the associated zone colors, a vue file must exist for the displayed file (e.g., a *.vue* file for a faces file). Vue files are discussed in Chapter 2 (page 3DV 2-14) and, with examples, in Appendix B. Alternatively, this information can be included at the time of creation; refer to the *Faces File Generation and Merging* document for more information. Up to 256 zone colors can be displayed.

- The Z Color Key displays the portion of the Z color table that relates to the current model (e.g., if the model has a Z-range that results in 40 contour intervals, then the first 40 colors of the current Z color table are displayed in the Z Color Key). Up to 64 contour intervals can be displayed. The Z-values are listed to the right of the associated colors.
- The Feature Color Key displays the portion of the feature color table that relates to the current data displayed (e.g., if a data file has 7 different feature colors specified, as defined in the *featurecol* field, then the 7 colors that correspond to the values in the field are displayed in the Feature Color Key). Up to 64 different colors can be displayed. Currently, no text can be displayed next to the colors.
- The Time Color Key displays the portion of the time color table that relates to the time values of the current active data file displayed. A *time* field must be present in the data file in order for a proper time color key to be displayed. The time color table interval is automatically calculated based on the range of the *time* field. The same color file is used for all files with a time field; however, the time interval changes for whichever file is the active edit file. Up to 64 different colors can be displayed (the default color table is identical to the Z color table). The time values are listed to the right of the associated colors.
- The Uniform Color Key displays the uniform color for each data file loaded along with the name of the data file. Each color is assigned based on the order in which the data files were loaded: yellow first, then green, red, blue, orange, magenta, brown, cyan; cycling, by default, through the colors if more than eight data files are loaded. Up to 64 different colors can be specified. (These colors are editable via the Uniform color editor (and the defaults can be changed), discussed in *Using the Color Editors*, Chapter 5.)

Changing between any of these color keys does *not* affect the displayed model. For example, if the user has properties displayed and switches to the Z Color Key, the model still has properties displayed. For more information on displaying properties or zones, refer to *Property/Zone Colors* (page 3DV 4-33). For more information on color-filled contours, refer to *Z Color-Filled Contours* (page 3DV 4-34). For more information on features, refer to *Pick/End Feature* (page 3DV 4-91). For more information on time fields, refer to *Data Animation* (page 3DV 4-113) and to *ASCII Scattered Data Files* (page 3DV 2-19). For more information on the different color tables, refer to *Color Menu* (page 3DV 4-72).

For more information on secondary 3D grids, refer to *3D Grid Menu* (page 3DV 4-136)

Edit Color Key

Any portion of the color key can be omitted or subsequently added back in, including the borders that make the color key opaque. When selecting *Edit Color Key*, (hot key “;”), a pop-up menu appears with a list of items that can be added or omitted. Each item already shown in the color key is indicated by an asterisk (*) to the left of the item—that item is “turned on.” Clicking with the left mouse button on an item turns that item “off”—the asterisk disappears. The user can add or omit as many items as desired. Once all of the edits have been made, clicking on *No More Edits* causes the 3D Viewer to make the desired changes.

The color key can be set back to its original default state by selecting *Set to Default* on the pop-up menu.

The following items can be omitted or subsequently added back into the color key:

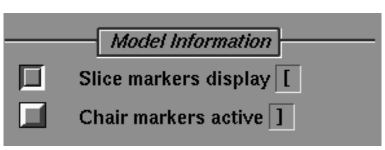
- Color Key Label [default: on]
- Active Property [default: on, if a property color key is on]
- Color Key Label [default: on]
- Active Property / P Units Label [default: on]
- Color Table [default: on]
- Primary / Active Edit File Names [default: on]
- XY Units [default: off; on if the file contains mixed XY and Z units]
- Z Units [default: off; on if the file contains mixed XY and Z units]
- Z-exaggeration [default: off; on if the file contains mixed XY and Z units]
- Azimuth [default: off]
- Inclination [default: off]
- X Front Cut [default: off]
- Y Front Cut [default: off]
- Z Front Cut [default: off]
- X Chair Cut [default: off; appears in color key only if chair mode is on]
- Y Chair Cut [default: off; appears in color key only if chair mode is on]
- Z Chair Cut [default: off; appears in color key only if chair mode is on]
- Coordinate Axes [default: on]
- Color Key Borders [default: off]

Each of these items is described under *The Color Key* (page 3DV 3-10).

Note: By omitting the color key borders, the color key becomes transparent and does not block out portions of the model. Omitting any of the other items shrinks the size of the color key and, hence, the amount of the model that is blocked out.

Model Display Information

Slice Markers Display



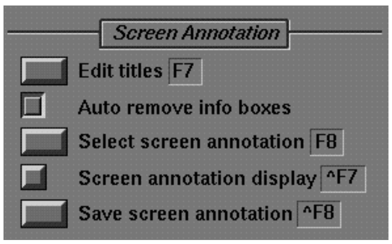
This command toggles on or off the blue and yellow “L” shaped symbols that are displayed along each of the three axes (both shown in the figures on page 3DV Fig-3). The position of the blue marker represents the current X, Y, or Z slicing plane for the **front face only**. The position of the yellow marker represents the current X, Y, or Z chair cut. The arms of the marker define the slicing plane. For example, a marker on the X-axis has the arms of the “L” parallel to the Y and Z axes; the X-slicing plane is parallel to the Y and Z axes. The axis that the marker is displayed on is significant as it is the one axis that is available for mouse-controlled slicing (refer to *Additional Mouse Button Features*, page 3DV 4-149). The hot key for turning the slice markers on or off is the left bracket (“[”). The markers are on by default.

Chair Markers Active

When chair mode is on, yellow “L” shaped brackets are displayed along each of the three axes at each of chair slices. The yellow axes markers can be used for slicing the chair in the same manner that the blue markers are used for slicing the front X, Y, and Z faces (refer to *Slice the Model*, page 3DV 4-150). This means that when chair mode is on, two sets of markers are displayed—the blue slice markers and the yellow chair markers—with only one set available for mouse-controlled slicing at any given time. By default, when the user clicks along an axis (using the left mouse button), it is the blue marker that moves, thereby changing the front X, Y, or Z slice of the supersection of the model. If the user wants to move the chair slices by clicking on the axes, the yellow chair markers must be enabled. This is done by selecting *Chair Markers Active* on the Screen Menu (or selecting the "]" hot key). This menu item toggles between the chair axis markers and the slice axis markers being active.

Screen Annotation

Edit Titles



Editing titles can be useful when the user wishes to use the Output Menu to create a hard copy of the current display, when photographing the screen, or when creating a series of vue files. The title and subtitle can be altered. The *Edit Titles* command (or the "F7" hot key) allows the user to alter the main title or add a subtitle. The main title is originally entered when creating the faces file in EarthVision. If the faces file does not have a stored title, this command can be used to add one. Using *Edit Titles* also allows the user to enter and edit a subtitle beneath the main title display. Any edits, however, are temporary and are not reflected the next time the file is displayed, either in the current or subsequent 3D Viewer session, unless a vue file is saved and later retrieved.

The main title and subtitle are, by default, drawn at the top center of the screen. They can, however, be moved; refer to *Move Screen Objects* (page 3DV 4-151) for more information.

Auto-remove Info Windows

When the *Auto-remove Info Windows* toggle is set on, the default, if the model window is resized such that the height or width is less that 600 pixels, the color key, display titles, 3D cursor information window, and Time-animation information windows are automatically turned off. Setting this toggle to off means that those windows will remain up (if displayed) even when the model window is resized.

Select Screen Annotation

Screen annotation files contain keywords and parameters (similar in setup to vue files) for displaying annotation on a 3D Viewer background. The types of annotation that can be displayed are shown in the following table:

Annotation	User-Specified
Text	Color, Position, Font Type, and Point Size
Rectangles	Color, Position, and Filled/Not Filled
Circles	Color, Position, and Filled/Not Filled
Lines	Color, Position, and Line Width

This file, currently, must be created in a system editor, but can be modified and saved in the 3D Viewer. Refer to *Screen Annotation Files*, (page 3DV 2-20) and to Appendix C for a more detailed discussion and examples of screen annotation files.

The *Select Screen Annotation* menu button or the “F8” hot key is used to display a screen annotation file. A pop-up menu appears, listing a *No Selection* menu item and all the files in the directory with names ending in *.sann* (the suffix indicates to 3D Viewer that the file is a screen annotation file). Alternatively, a file name can be specified in a vue file using the keyword *screenannfile*, followed by the file name (this method allows the user to specify files with names that do not end in *.sann*; refer to Appendix B for more information on vue file commands and parameters). That vue file can then be read in using the *Read Vue* command on the View Menu (refer to 3DV 4-22). In either case, only one screen annotation file can be displayed at a time.

Screen Annotation Display

After a screen annotation file has been selected, it is immediately displayed on the screen. The file display can be turned temporarily on or off, using the *Screen Annotation Display* command or the “^F7” hot key; this command is a toggle.

Modifying Screen Annotation

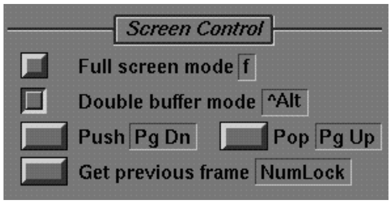
Once read in, the positions of the annotation specified in the file can be modified interactively using the middle mouse button. Place the cursor over the annotation object that is to be moved, and press the middle mouse button. A red rectangular outline appears indicating the X,Y extent of the annotation object. With the middle mouse button pressed, the object can be moved to the desired location. Text, lines, rectangles, and circles can be moved in this manner. Color, font type and size, fill, and line width cannot be changed interactively, although RGB (red, green, blue) values for colors can determined using any one of the 3D Viewer Color Editors (refer to 3DV 5-1).

Note: *The order of the annotation commands in the file is important for the movement and placement of the annotation. Annotation that comes first in the file is drawn first on the screen. If, for example, two rectangles overlap, the first rectangle in the file is drawn behind the second. This hierarchy is true for all screen annotation, regardless of type, with the one exception: text annotation is always drawn on top of other annotation forms (although this rule does apply when only dealing with other text objects). When two annotation objects overlay one another, the object on top is selected when the cursor is placed such that it is on both objects.*

Save Screen Annotation

After the screen annotation has been modified, the new positions can be saved to the same file or a new file, by clicking on the *Save Screen Annotation* command, or using the “^F8” hot key. The 3D Viewer then prompts for a file name, which can be a new or existing name. If an existing file name is given, the 3D Viewer asks for confirmation whether or not the file should be overwritten.

Screen Control



The Screen Control section contains the following five commands:

- Full Screen Mode (hot key “f”)
- Double Buffer Mode (hot key “^Alt”)
- Get Previous Frame (hot key “NumLock”)
- Push (3D Viewer windows) (hot key “Page Down”)
- Pop (3D Viewer windows) (hot key “Page Up”)

Full Screen

By default, the model display in the 3D Viewer is shown on a portion of the terminal screen; this is referred to as partial screen mode. When the 3D Viewer is in partial screen mode, the menus appear on the right-hand side of the screen. If desired, the display model window can be expanded to fill the entire screen; this is known as full screen mode. The command menus are not shown on the screen while in full screen mode, although all the hot keys are available so the user can still manipulate the model and/or screen display.

The command *Full Screen* and the “f” hot key toggle between full and partial screen views. If a user wishes to use full screen mode, the most important hot key to remember is the “f” hot key, as using it returns the user to partial screen mode and brings back the menus. In addition, typing any of the hot keys for a menu (1–9, ^1–^9, Alt-1, or Alt-2) also returns the user to partial screen mode with that menu displayed.

Double Buffer Mode

By default, the file(s) shown on the 3D Viewer screen is drawn in double buffer mode, except on 8-bit color workstations. Double buffer mode means that if any changes are made to the display (for example, changing the azimuth or bringing in a new file), the new display is drawn in the background (in the back buffer) until it is complete. Once complete it is brought to the foreground (the front buffer), so the user can see the display.

Sometimes it is useful to see the display while it is drawing: to view the interior of a model, or, if the model takes a long time to redraw, to monitor its progress. To view the redraw, double buffer mode must be turned off (putting the display in what is known as single buffer mode).

The menu toggle button is on by default, indicating that double buffer mode is on. Clicking on this button or using the “^Alt” hot key turns off double buffer mode (hence, turning on single buffer mode).

Note: *When a model is in single buffer mode, the* Get Previous Frame *command (described below) cannot work; this feature is overridden.*

Get Previous Frame

The *Get Previous Frame* command or the “NumLock” hot key (part of the number key pad on the right hand side of the keyboard) can be used to toggle back and forth between the most recent model image drawn to the screen and the image just previously drawn. This capability is very useful when comparing the similarities and differences between two slices, two isovalue shells, or two related models-especially if it takes a long time to get the next image or file. This command is only available when the 3D Viewer is in double buffer mode.

When the user retrieves the previous image, a message appears in the Status Window stating that the back buffer image is being displayed. If the user selects the *Get Previous Frame* command again, a new message appears in the Status Window stating that the front buffer image (the original frame) is being displayed. Each time the model display is changed, the screen image prior to the change becomes the new back buffer image.

Note: *Only the front buffer image can be altered; if the back buffer image (model 1, for example) is displayed and the user modifies the display, it is the front buffer image (model 2) that is modified, even though the model 1, the back buffer image, is currently shown on the screen. Model 1 remains the back buffer image, though, since it was the last image on the screen prior to the latest modification.*

Push

Push allows the user to access any system text windows or icons that were available prior to entering the 3D Viewer. The 3D Viewer graphics display and menu window are "pushed" behind the windows and icons the user had showing on the screen prior to entering the program.

Once the graphics are pushed behind the system windows, the user can use any of the windows for editing a file, listing a directory, etc., by simply moving the cursor into any of the open windows and typing. The user can do almost anything that could be done prior to entering the 3D Viewer. Restrictions are: (1) the amount of swap space that is available (i.e., the computer must have enough memory to keep the 3D Viewer running, as well as whatever other process the user wishes to run) and (2) that any commands that need to use the screen's background area (where there are no windows), such as logging out, cannot be performed (because the 3D Viewer display is shown in the background).

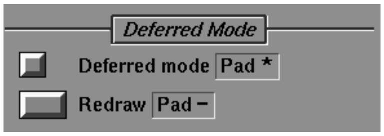
The *Push* hot key is the "Page Down" button to the left of the number key pad, *not* the "PgDn" key on the number key pad.

Note: *Even though the graphics are pushed back, the 3D Viewer is still active. By moving the cursor off all the system windows and on to the 3D Viewer display or menu window, the user can type any hot key or select any menu command, and that command is performed.*

Pop

Pop is used to return the 3D Viewer display to the front of the screen—the 3D Viewer graphics are "popped" to the front. All windows and icons that were brought to the foreground by using the *Push* command are pushed to the back. The cursor must be on the 3D Viewer screen display or menu window to use the *Pop* command (either by selecting the menu command or using the hot key). The *Pop* hot key is the "Page Up" button to the left of the number key pad, *not* the "PgUp" key on the number key pad.

Deferred Mode and Redraw Display



Deferred mode allows a user to make multiple setting changes without updating the model screen display after each command, saving the time needed to calculate each individual view. For example, the *Deferred Mode* command can be selected, then the azimuth changed (three or four times, if desired), the color key turned off, data and annotation added, the color key turned back on again, etc. Once all the changes are finished, selecting the *Redraw Display* button displays all the changes made (and keeps the 3D Viewer in deferred mode) or selecting *Deferred Mode* again redraws the display and turns deferred mode off. When the 3D Viewer is in deferred mode, a small box with the words “Deferred Mode” in it appears in the upper right hand corner of the Status Window.

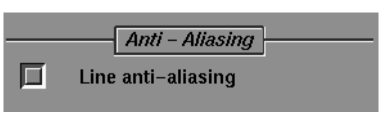
Deferred mode is especially useful when making changes on the Zone Menu. For example, *Deferred Mode* can be selected, then zone 1 removed, the color-filled contours displayed in zone 2, chair mode turned on and ignored in the bottom four zones, and then the current settings can be displayed using either *Redraw Display* or *Deferred Mode*.

A Word of Caution: It is easy to forget that *Deferred Mode* is turned on and wonder why the model display does not change after entering a command. The cursor display can be used as an indication of the program’s activity. If the cursor shape is an arrow, the program is inactive. If the cursor is shaped like an hourglass or a book, the program is performing some command or reading a file. If a command is selected, and the cursor stays as an arrow, the program is most likely in deferred mode. Remember to check the Status Window.

Hot Keys for Deferred Mode and Redraw Display

The hot key for the *Deferred Mode* command is the “*” sign on the number pad (not the asterisk on the 8 key, above the alpha keys). The hot key for *Redraw Display* is the “-” sign on the number pad (not the one above the alpha keys).

Line Anti-aliasing



Anti-aliasing is a technique that allows normally jagged lines to be drawn as smooth lines. The *Line Anti-aliasing* toggle button turns on or off this capability. By default, *Line Anti-aliasing* is set to on, except during rotations (it is turned off to speed up the rotation and then turned on again, all without any user intervention).

Stereo3D Display Mode

Note: The DISPLAY environment variable must not be used to redirect the 3D Viewer to a different monitor, whether that be separate machines or dual-headed displays on one machine.

The EarthVision 3D Viewer has the capability of being viewed in "stereo3D," which creates the impression of realistically viewing a three-dimensional scene. By presenting each eye of the user with a slightly different perspective of the scene, the user perceives depth in the same way in which we see the world around us in 3D.

Stereo3D is currently only offered on the SGI™ IRIX® platform, and requires a pair of StereoGraphics® CrystalEyes® liquid crystal goggles and an associated infrared emitter box. The infrared emitter box plugs into the back of the SGI workstation and is typically placed on top of the SGI monitor.

Stereo3D viewing is discussed under the following topics:

- Stereo3D Types, Formats, and Environment Variables
  - Two Types of Stereo3D
  - Video Formats
  - Determining the Correct 3D Viewer and Environment Settings
  - Setting Default Video Formats For Quadbuffer Stereo
  - Workstations with Stereo Video Format Always Available
  - SGI System Specifics
- Running Stereo3D in the 3D Viewer
  - Selecting Stereo3D Mode in the 3D Viewer
  - Stereo3D Options in the 3D Viewer

To set up a site properly for stereo3D viewing, it is recommended that users read through *Determining the Correct 3D Viewer and Environment Settings* to understand the basics of stereo3D viewing and to determine what information and settings are needed based on their individual site's configuration. The next three sections (*Setting Default Video Formats For Quadbuffer Stereo*, *Workstations with Stereo Video Format Always Available*, and *SGI System Specifics*) are necessary for specific configurations. The *Running Stereo3D in the 3D Viewer* covers information necessary for using stereo3D in the 3D Viewer.

Stereo3D Types, Formats, and Environment Variables

Two Types of Stereo3D

The 3D Viewer stereo3D capability comes in two varieties, depending on which type of SGI system it is run:

- Quadbuffer stereo (also known as "stereo-in-a-window") uses separate buffers for the left and right eye (in addition to the normal front and back, thereby still providing double-buffering). It displays square pixels, giving the highest image quality and screen resolution. It also allows full functionality in the 3D Viewer. It is not, however, available on every SGI system, but may be available on Onyx®, Octane®, Indigo2 IMPACT™, and O2® systems (the specific requirements for each of these systems is discussed under *SGI System Specifics*.)
- Split-screen stereo (also known as fullscreen stereo) gives a true stereo3D effect, but only renders a single window. It splits the screen into two halves, overlaying the left and right views, and stretches the subsequent view to fit the screen,

resulting in non-square pixels with roughly half the screen resolution and accompanying image quality. The 3D Viewer uses split-screen stereo on SGI systems such as Indy®, Indigo®, and Indigo2™ non-Impact systems. In addition, when stereo3D is started, the 3D Viewer switches to fullscreen mode (making the 3D Viewer menus inaccessible), and graphical picking (3D cursor, scattered data point, etc.) is disabled.

Video Formats

To run the 3D Viewer in stereo3D, the display device needs to use a stereo-ready video format. A video format is specified by the screen resolution (e.g., 1280x1024) and a refresh frequency rate (e.g., 72 HZ). Generally, switching to a stereo-ready video format results in an increase in the refresh rate and a corresponding decrease in screen resolution. On the SGI, a video format is described using the following notation:

```
<width>x<height>_<framerate>
```

For example, 1280x1024_60 implies a video format that is 1280 pixels wide by 1024 pixels high, with a frequency of 60 Hz. Video formats that support stereo mode also have an "s" appended at the end of the framerate portion, e.g., 1024x768_96s.

By default, the 3D Viewer assumes that it needs to make the video format change when the user enters stereo mode (using either the Alt-s hot key or the *Stereo3D Mode* button on the Screen Menu). It accomplishes this change with a call to */usr/gfx/setmon*. When leaving stereo mode (either by typing the Alt-s hot key or exiting the 3D Viewer), an additional call to setmon is made by the Viewer, returning the user's display device to the default video format. The 3D Viewer must be informed, however, if the display device was already in a stereo video format prior to startup, so that it does not attempt to change back to a non-stereo video format when exiting stereo3D (some SGI systems require a stereo video format to be used upon system startup for quadbuffer stereo usage). This topic is discussed under *Workstations with Stereo Video Format Always Available*.

Although it is not always possible to check the current video format settings, some possible methods do exist.

- The IRIX utility */usr/bin/X11/xscreen* can be used to determine the video format; an interface is displayed that contains the current and possible video-format settings.
- In addition, the */usr/gfx/gfxinfo* command can be used; in this case, the last line in the output may indicate the video format, as shown below:

```
Graphics board 0 is "CRM" graphics.
    Managed (":0.0") 1280x1024
    32 bitplanes
    board revision 2, CRM revision C, GBE revision B

     Monitor 0 type: SGX 512
    Channel 0:
     Origin = (0,0)
     Video Output: 1280 pixels, 1024 lines, 75.03Hz
()
```

In this case, the video format would be 1280x1024_75.

For additional information, the man page for setmon describes where the video format files are stored.

For those displays that use split-screen stereo, STR_RECT is always used (STR_RECT is actually a system alias to one of the video formats, depending on the system type; for example, on an Indigo2 High Impact™, it is 1280x492_120).

For 1280x1024 display devices that support quadbuffer stereo, the 3D Viewer uses the video format 1024x768_96s by default. If another format is being used (e.g., if the screen is larger than 1280x1024 or if multiple display channels are being used), then environment variables need to be set; refer to *Determining the Correct 3D Viewer and Environment Settings* for more information. When returning to non-stereo mode, the 3D Viewer uses the video format 72 HZ by default (aliased for 1280x1024_72); unless the workstation is set to always run in a stereo-ready video format (see *Workstations with Stereo Video Format Always Available*).

For more information on video formats, what configurations are available for which graphics system, and where the video format files are stored on an SGI file system, see the man page for setmon.

Determining the Correct 3D Viewer and Environment Settings

Different settings must be used depending on the type of stereo3D viewing (quadbuffer versus split-screen), the SGI workstation, and the current video format settings. This section discusses the different settings based first on whether split-screen or quadbuffer stereo3D is being used, and includes what other sections of this document are needed. A table is also included to help determine what information is needed.

Split-screen Stereo3D

If split-screen stereo3D is being used by default or by preference, no additional resources need be set, since, as discussed above, the STR_RECT is always used.

The following SGIs must use split-screen stereo3D; hence no other settings are necessary:

- Indigo (XS, XZ, Elan)
- Indy (XL, XZ, XGE)
- Indigo (XL, XZ, Elan, Extreme)

The following SGIs can use split-screen stereo3D and will use it by default, unless the 3D Viewer is given specific instructions by setting the X server in a stereo3D-ready format and by using 3D Viewer environment variables (refer to *Indigo2 Solid and High Impact/ Octane SI and SE* under *SGI System Specifics*:

- Indigo2 Solid Impact™/High Impact™
- Octane SI/SE
- O2

Quadbuffer Stereo3D

The following SGIs use quadbuffer stereo3D by default. (If using split-screen stereo3D is desired, contact Dynamic Graphics Technical Support). In some cases, however, the X server might have to be restarted and/or environment variables might have to be used (for example, if a screen larger than 1280x1024 is being used or if multiple screens are used); refer to the table for specific configurations.

- O2 (CRM)
- Impact (Solid, High, Max)
- Octane (SSI, MXI, SSE, MXE)
- Onyx2 (MXI)

- Crimson (RE)
- Onyx (VTX, RE”)
- Onyx (IR)
- Onyx2 (Reality, IR, RM)

The following systems use split-screen stereo3D by default, but can use quadbuffer stereo3D, if the 3D Viewer is given specific instructions by setting the X server in a stereo3D-ready format and by using 3D Viewer environment variables (refer to *Indigo2 Solid and High Impact*/*Octane SI and SE* under *SGI System Specifics*:)

- Indigo2 Solid/High Impact
- Octane SI/SE
- O2

Machine Type	Stereo Type	Method for Setting X Server	Environment Variables	What To Do Next
Indigo (XS, XZ, Elan) Indy (XL, XZ, XGE) Indigo? (XL, XZ, Elan, Extreme)	split-screen only	none necessary; stereo3D entered on the fly	none necessary; STR_RECT is always used	can enter 3D Viewer; refer to *Running Stereo3D in the 3D Viewer*
Indigo^2 Solid/High Impact Octane SI/SE O2	split-screen	none necessary	none necessary	can enter 3D Viewer; refer to *Running Stereo3D in the 3D Viewer*
Indigo^2 Solid/High Impact Octane SI/SE O2	quadbuffer	*/usr/gfx/setmon -x* or *xscreen*	must use: *EV_STEREO_NOVIDEOCHANGE*	refer to *Workstations with Stereo Video Format Always Available*, and either the *Indigo2 Solid and High Impact, Octane SI and SE,* or *O2* sections
With 1280x1024 screen				
Crimson (RE) Indigo^2 Max Impact Octane SSI, SSE, MXI, MXE Onyx2 (MXI) Onyx (VTX, RE?) Onyx InfiniteReality; single screen	quadbuffer	none necessary; stereo3D entered on the fly	none necessary, unless stereo3D mode is always available, in which case, the following must be used: *EV_STEREO_NOVIDEOCHANGE*	if stereo3D is always available, then refer to *Workstations with Stereo Video Format Always Available*; otherwise can enter 3D Viewer; refer to *Running Stereo3D in the 3D Viewer*
With screens greater than 1280x1024				
Crimson (RE) Indigo^2 Max Impact Octane SSI, SSE, MXI, MXE Onyx2 (MXI) Onyx (VTX, RE?) Onyx InfiniteReality; single screen	quadbuffer	none necessary; stereo3D entered on the fly	*EV_STEREOINWIN_FORMAT* and *EV_STEREONONE_FORMAT*	refer to *Setting Default Video Formats for Quadbuffer Stereo* and the *Onyx InfiniteReality* section
Onyx InfiniteReality; multiple display channels	quadbuffer	none necessary; stereo3D entered on the fly	*EV_STEREOINWIN_FORMAT* and *EV_STEREONONE_FORMAT*	refer to *Setting Default Video Formats for Quadbuffer Stereo* and the *Onyx InfiniteReality* section
Onyx InfiniteReality; multiple display channels	quadbuffer	use */usr/gfx/setmon -x* or *xscreen* if stereo video format selected outside 3D Viewer	must use: *EV_STEREO_NOVIDEOCHANGE*	refer to *Workstations with Stereo Video Format Always Available*, and the *Onyx InfiniteReality* section

Setting Default Video Formats For Quadbuffer Stereo

As mentioned above, when entering stereo3D on systems that support quadbuffer stereo, the 3D Viewer uses "1024x768_96s" as the video format and uses "72HZ" when exiting. If a workstation is set to use other formats (e.g., if a large screen or multiple screens are being used), these defaults can be changed using the two environment variables `EV_STEREOINWIN_FORMAT` and `EV_STEREONONE_FORMAT`.

To change the video format that the 3D Viewer uses when entering stereo3D, use the following command (before starting up the 3D Viewer);

```
setenv EV_STEREOINWIN_FORMAT <format>
```

Similarly, use the following command to instruct the 3D Viewer which video format to use when leaving stereo3D mode:

```
setenv EV_STEREONONE_FORMAT <format>
```

where <format> is in the form of <width>x<height>_<framerate> (1024x768_96s or 1280x1024_72, for example), as described under *Video Formats*, or can be an alias, as described under *Onyx InfiniteReality.*

Note: These environment variables do not change the actual video format being used by the display. They only change the assumed defaults used by the 3D Viewer to match those used by the display.

Workstations with Stereo Video Format Always Available

The 3D Viewer assumes that the display device is not normally run in a stereo video format, and that it needs to switch the display when stereo3D is entered. Some users, however, prefer to run their SGI displays in a stereo mode all the time, or on some SGIs stereo3D mode must be always set in order to run in quadbuffer (versus split-screen) stereo (refer to *Determining the Correct 3D Viewer and Environment Settings* and *SGI System Specifics*). In these cases, the 3D Viewer does not need to switch the display device back and forth; therefore, an environment variable is provided to instruct the 3D Viewer to not change the video format when entering and leaving stereo3D:

```
setenv EV_STEREO_NOVIDEOCHANGE
```

Note, however, that if the stereo-ready video format was selected without restarting the X server, the X server cannot provide correct information to the 3D Viewer. In this case, the 3D Viewer will likely start up with the wrong window geometry (i.e., its window sizes and positions will not be placed correctly to occupy the entire screen), because the 3D Viewer software queries the X server for its display size when starting. This disparity can be resolved in one of two ways:

1. Restart the X server to use current video format.

   If using the */usr/gfx/setmon* command to select the stereo-ready video format (requires root privilege), use the "–x" command line option (e.g., */usr/gfx/setmon -x 1024x768_96s*) to indicate that the change should be saved; then restart the X server (using the Vulcan death grip; see below). These changes allow the X server to state the correct display size. Alternatively, the IRIX utility */usr/bin/X11/xscreen* or, in some case, a function available on the SGI Irix toolbox can be used to set the video format (again requires root privilege); again the X server would have to be restarted.

2. Set 3D Viewer to use current geometry without permanently setting the video format.

Instruct the 3D Viewer to use a different default window geometry upon startup using the two environment variables:

```
setenv EV_MODELWIN_GEOM <geom>
setenv EV_MENUWIN_GEOM <geom>
```

where <*geom*> uses the format *widthxheight+-xoff+-yoff*, e.g., 954x982+0+0. These variables simply tell the 3D Viewer what the appropriate window sizes are for both the model and menu windows.

SGI System Specifics

Indigo2 Solid and High Impact

Octane SI and SE

The Indigo2 Solid/High Impact systems and the Octane SI/SE† systems support quadbuffer stereo but cannot switch into the stereo-ready video format without requiring a restart of the X server (i.e., they can switch into split-screen stereo on the fly, but cannot switch into quadbuffer stereo on the fly; to run quadbuffer stereo, they must be set to always run in a stereo-ready video format). To restart the X server with the correct stereo-ready video format, the /usr/gfx/setmon command with the *-x* option (which sets the new video format as the login default) can be used (requires root privilege), followed by restarting the X server. Logging out of the X session and back in is normally sufficient, but using the “Vulcan death grip” guarantees the proper restart; the “Vulcan death grip” is pressing the four keys [left Ctrl] + [left Shift] + [F12] + [/ on keypad] simultaneously. Alternatively, the IRIX utility */usr/bin/X11/xscreen* can be used to set the video format (again, requires root privilege); and again the X server would have to be restarted. In either case, however, since the workstation is now set to always run in stereo-ready mode, the 3D Viewer environment variable `EV_STEREO_NOVIDEOCHANGE` must be used (see above).

O2

The O2 is the only SGI system that requires an additional adapter card to run stereo3D. Using quadbuffer stereo requires the two IRIX 6.3 patches 2387 and 2447 (unless running IRIX 6.5). In addition, the framebuffer depth needs to be set to 32+32 using the IRIX utility */usr/bin/X11/xscreen* (must be set as root; see the man page). This is best accomplished in *xscreen* by setting 32+32 as the framebuffer depth, and either

1. selecting 1280x1024_75 as the video format and then setting the `EV_STEREOINWIN_FORMAT` environment variable to the correct stereo format (i.e., 1024x768_96s), in which case stereo mode would be entered in the 3D Viewer upon selecting the Alt-s hot key, or
2. selecting 1024x768_96s as the video format, in which case stereo mode would be on automatically and the `EV_STEREO_NOVIDEOCHANGE` environment variable would have to be set.

†. Octane SSI and SSE systems can switch into stereo video format on the fly.

Onyx InfiniteReality

On Onyx InfiniteReality systems, many different custom video formats can be combined into a single file using the IRIX utility /housr/gfx/ircombine. These formats are often used on very large resolution displays that can combine multiple display channels into one large virtual display area. This custom video format file name (minus the suffix) is then used as the <format> argument when using the 3D Viewer environment variables `EV_STEREOINWIN_FORMAT` and `EV_STEREONONE_FORMAT` (see *Setting Default Video Formats For Quadbuffer Stereo* above), since the default stereo video format used by the 3D Viewer will not be appropriate (e.g., if the combined file name for the non-stereo video format is *`megapixel3280.cmb`*, then the command *`setenv EV_STEREONONE_FORMAT megapixel3280`* would be used; the location of the files can be found listed in the man pages for the setmon command). If, however, the workstation is set to always run in stereo-ready mode, use the 3D Viewer environment variable `EV_STEREO_NOVIDEOCHANGE` (see above).

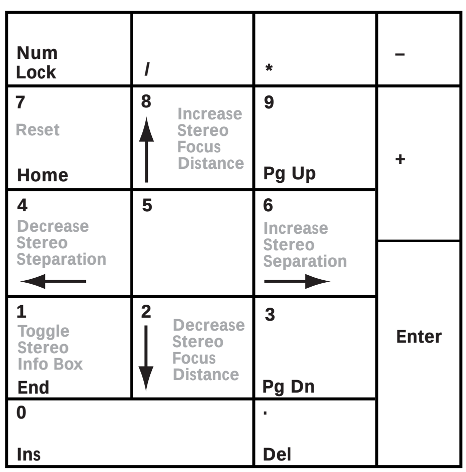
Running Stereo3D in the 3D Viewer

Selecting Stereo3D Mode in the 3D Viewer

After starting the 3D Viewer, selecting *Stereo3D Mode* on the Screen Menu, or using the “Alt-s” hot key combination, causes the 3D Viewer to change the display to a stereo video format, and begins to render the 3D model window with separate left and right eye point views. As described above, quadbuffer stereo allows access to the 3D Viewer menus, whereas split-screen stereo requires the 3D Viewer to switch to fullscreen mode. A second “Alt-s” hot key returns the 3D Viewer to non-stereo mode. Also, if exiting the 3D Viewer while in stereo mode, the 3D Viewer attempts to change the display setting back to non-stereo (unless the `EV_STEREO_NOVIDEOCHANGE` environment variable has been set).

Stereo3D Options in the 3D Viewer

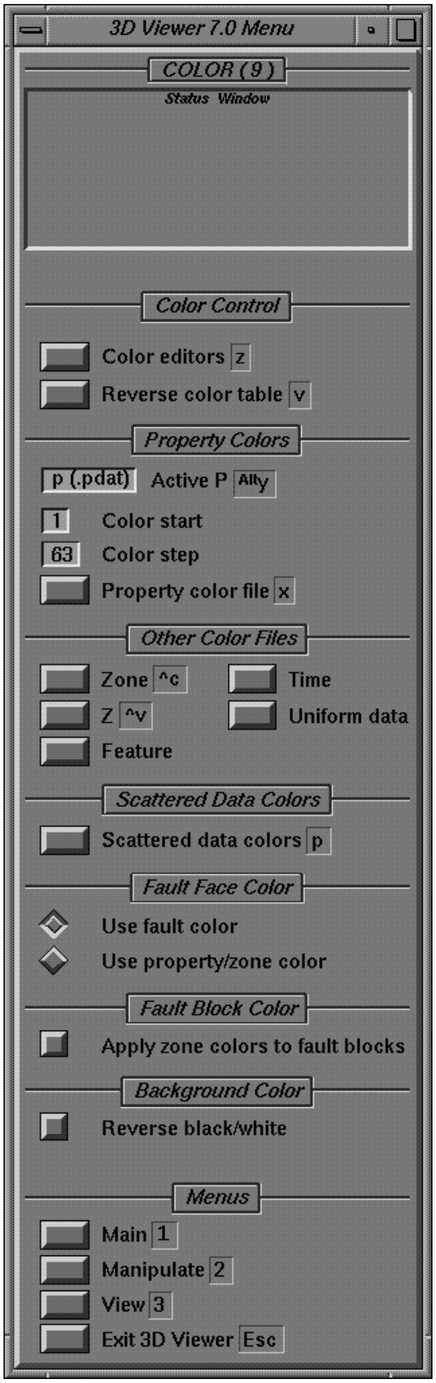
Since one set of stereo3D viewing parameters might look better to one person than another, additional hot keys are available for controlling some of the viewing parameters. These commands are available via the extended keypad on the right side of the keyboard:



- The left arrow (Pad 4) decreases stereo separation
- The right arrow (Pad 6) increases stereo separation
- The down arrow (Pad 2) decreases stereo focus distance
- The up arrow (Pad 8) increases stereo focus distance
- The “Pad 7” key resets the stereo viewing parameters
- The “Pad 1” key toggles the stereo parameters information box

It might be necessary to experiment to obtain the best viewing parameters, using the “Pad 7” hot key to return to the viewing defaults, if necessary.

Color Menu



The Color Menu (hot key "9"), shown at left, contains the commands that affect the following display color attributes:

- The Color Editors (hot key "z")
- Color Table Reversal (hot key "v")
- Property Colors (hot keys "alt-y" (active property) and "x" (property color file))
- The Color Files Selected (hot keys "^c" (zone) and "^v" (Z))
- Scattered Data Colors (hot key "p")
- Fault Face Color
- Fault Block Color
- Black/White Reversal

The 3D Viewer uses default color tables for the initial model display, but offers a great deal of flexibility. Colors can be changed, edited, or reversed using the functions available on this menu.

Color Control

The functions in the *Color Control* section allow access to the different color editors and the color table to be reversed.

Color Editors

The color editors allow for creation of alternate color files that can then be used for display (by choosing one of the *Select Color File* commands, discussed below). A different color editor is available for each of the color tables: property, zone, Z, time, feature, uniform data, and 3D grid (which is a secondary property color file). A brief discussion is included here regarding the color editors; a full discussion of the functions available within the color editors is included in Chapter 5, *The Color Editors*.

Any one of the color editors is entered by selecting the *Color Editors* button or the "z" hot key. A pop-up menu appears with several choices: Property Color Editor, Zone Color Editor, Z Color Editor, Feature Color Editor, Time Color Editor, Uniform Data Color Editor, or No Selection. (Color files for 3D grids and property data are created in the Property Color Editor; any changes in the color table are applied to the active property file (as indicated in the *Property Colors* section, 3DV 4-74).)

The same functions are available for each of the color editors. In a few instances, the same function in each editor might display slightly different information pertinent to the editor (e.g., displaying Z-values in the Z Color Editor and P-values in the Property Color Editor). Other than these minor differences, the editors are the same. The differences and related functions are discussed in detail in *Using the Color Editors*, Chapter 5.

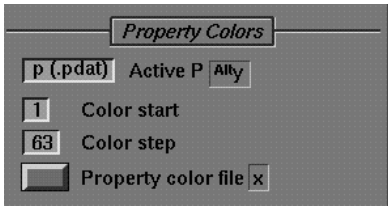
Reverse Color Table

The *Reverse Color Table* command, and its associated "v" hot key, switches the order of any color table such that the colors that previously represented higher numeric values now represent lower values and vice versa. Only the portion of the color table that is shown in the color key is reversed, not the entire color table. When this command is selected, a pop-up menu appears with the following possible selections: property, zone, Z and no selection. Only those selections that are appropriate are displayed. If only one selection is available, then this command simply reverses the displayed color table. The bottom-left illustration on 3DV Fig-2 shows a model with one color table; the bottom-right illustration shows the same model with the color table reversed.

Property Colors

The functions in the Property Colors section define how the property colors are displayed for faces files, data, and 3D grids.

Active P—Property Model Selection



Changing the property colors is applied on a property group basis. Property groups are determined by the property name and, in the case of 3D grids, whether the property type is property or seismic. (Seismic grids even with the same property name are not considered part of the same group as faces file or data file.) When a secondary property file is added in the 3D Viewer, if the property name is the same as a previously loaded file then they automatically “share” the same property colors and levels, becoming a property “group.” If the file has a new property name (e.g., if one data file has a P-field of “porosity” and another has a P-field of “por”) or, in the case of a 3D grid, is of a different property type, then the file automatically starts a new property group; its property levels and colors are determined separately from those in other property groups. (For information on how this occurs, refer to the 3D Grid menu, page 3DV 4-136, and to the Edit Data menu, page 3DV 4-83.)

Property colors, and their color start and step, for different property groups (e.g., the “por” versus “porosity” group) can be set to different values. The *Active P* text box is used to change which property group and/or property file type is active; any changes of the Property Colors apply to all files in that group.

If only two property groups are in the 3D Viewer, clicking on the *Active P* text box toggles between the two files. If more than two property groups or property file types are available, then a pop-up menu appears. The “Alt-y” hot key can be used to bring up the pop-up menu or toggle between two property models, as well. The setting on this menu is also tied to the setting on the Manipulate menu, in the Property Levels section (refer to page 3DV 4-17).

Selecting the Active P Group

If more than two property groups are available, then clicking the Active P text box brings up a pop-up menu, as shown at left. Each file name is listed with its property group name shown in parentheses next to the file. The files that are part of the active property group are shown with an asterisk next to them. Selecting any one file in a property group selects that entire group for Property Color manipulation.

Any changes to the property colors apply only to those models with the *Active P* group.

Color Start

The *Color Start* command controls which color within the property color table is associated with the lowest property value in the 3D grid, faces file, or property data. This control allows a particular color to be associated with a particular property interval. The *Color Start* can be changed by clicking on the value box and entering a new value between 1 and 64. The default lowest property color depends on the number of isosurface levels. (The Z Starting Color is controlled on the Zone menu since Z colors are controlled on a zone-by-zone basis; refer to *Z Starting Color,* 3DV 4-35.)

Color Step

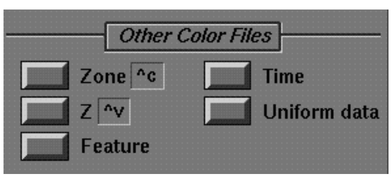
The *Color Step* allows colors in the property color table to be skipped, since the default property color table changes color somewhat gradually. In this way, if the model has only a few property levels, the colors can still span a large or a small portion of the property color table. By default, the *Color Step* is set to a value to use the maximum amount of the color table. The *Color Step* can be changed by clicking on the value box and entering a new value. (The Z Color Step is controlled on the Zone menu; refer to *Z Color Step,* 3DV 4-35.)

Property Color File

The *Property Color File* push button allows the selection of a new color file previously created in the Property Color editor (or using a system editor). When this button (or the corresponding "x" hot key) is used, a pop-up menu appears with the appropriate property color file names: any color files with the *.pclr* suffix in the directory are listed, plus a *Defaults* and *Other* listing. Selecting the *Defaults* item loads the 3D Viewer default color table (the hard coded default can be overridden by placing a color file in`$DGIHOME/ev#/etc`: *dgi.pclr* or *dgiseis.pclr*, for seismic grids).

Additional information about the property color file is discussed in the *Other Color Files* section, next.

Other Color Files



The push buttons in the *Other Color Files* section allows the selection of a new color file previously created in one of the color editors (or using a system editor). When a user selects these commands or uses the corresponding "^c" or "^v" hot keys, a pop-up menu appears with the appropriate color files for the zone, Z, time, feature, or uniform data, respectively. Any color files with the appropriate suffix in the directory (*.znclr* for zones, *.zclr* for Z-values, *.tclr* for time values, and *.fclr* for feature and uniform data, colors) are listed, plus a *Defaults* and *Other* listing. Selecting the *Defaults* item causes the 3D Viewer default color table to be used (a different default color table is available for each of the color types; the hard coded defaults are overridden by the following files if they are located in`$DGIHOME/ev#/etc`: *dgi.znclr, dgi.zclr, dgi.tclr, dgi.fclr,* and *dgiseis.pclr*).

Selecting the *Other* item allows entry of any color file name, for example:

- Automatically named property color tables can be used for zone colors, using the *Other* selection for zone colors, and vice versa.
- Automatically named time color tables can be used for feature colors, using the *Other* selection for feature colors, and vice versa.
- Color files from a different directory are selected via the *Other* selection, which allows entry of a full path name.

Default Color Files

It is possible to bypass the 3D Viewer default colors (used for the initial display and when selecting the default color table) on a directory or site basis by creating color files with specific names, using the appropriate color editor for each type of default color table.

Color Type	Directory-Basis Default Color File Name	Site-Basis Default Color File Name in `$DGIHOME/ev#/etc`
Property default colors 3D grid default colors	*cf0.pclr*	*dgi.pclr*
Zone default colors	*cf0.znclr*	*dgi.znclr*
Z default colors	*cf0.zclr*	*dgi.zclr*
Feature default colors	*cf0.fclr*	*dgi.fclr*
Time default colors	*cf0.tclr*	*dgi.tclr*
Seismic default colors	*none*	*dgiseis.pclr*
Uniform data default colors	*none*	*dgiunidata.fclr*

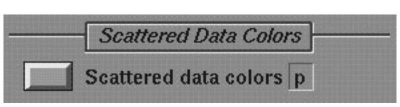
The 3D Viewer uses each of these files for the appropriate default, whenever the file exists in the current 3D Viewer directory, with the local directory's color file taking precedence.

Color File Format

Property, zone, feature, time, uniform data, and seismic colors can be used interchangeably. A property color table can be selected for displaying any of the other color tables and vice versa (as described above). The format for property, zone, feature, time, uniform data, and seismic color files is the same; all have 64 colors; except zone color files, which have 256 colors. These color files cannot, however, be used for Z colors and vice versa because the format for the Z color files is different. Z color files have 64 colors, plus some additional information necessary for other parts of EarthVision.

For more information on the format of the color files, automatically named color files, and how color files are created, please refer to *Using the Color Editors*, Chapter 5.

Scattered Data Colors



Scattered data points can be displayed in property, zone, feature, symbol/line, or Z colors or in a uniform color using the *Scattered Data Colors* button or the "p" hot key. Selecting this function brings up a pop-up menu with multiple selections: uniform colors, symbol/line colors, property colors, zone colors, Z colors, and no selection. An asterisk is drawn next to the current entry. The Z contour interval on the Zone Menu can be used to define the color contour intervals for the data. The colors can be altered using the appropriate Color Editor (refer to *Color Editors*, page 3DV 4-73).

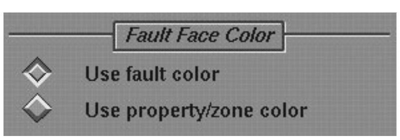
If multiple data sets are displayed in the 3D Viewer, the Scattered Data Color pop-up menu has two sets of entries. The first set of entries apply to the current active edit data file (set on the Edit Data menu, discussed on page 3DV 4-83). Only those color tables appropriate to the active edit file (as set on the Edit Data menu, discussed on page 3DV 4-83) are listed. The second set of entries are listed below the horizontal line. These entries list all possible settings for all data sets loaded; when selected, the setting is applied to every data set loaded.

The middle figures on page 3DV Fig-2 show a scattered data file in uniform and property colors, while the lower figures on page 3DV Fig-2 show a scattered data file in uniform and Z colors. In addition, the lower left figure on page 3DV Fig-1 shows the advantage of displaying data (especially prior to modeling) in property colors: data trends and possible data errors are very apparent.

Generally, by default, property data (*.pdat*) points are displayed in property colors with yellow lines and scattered data (*.dat*) and path data (*.path*) points are displayed with Z colors with yellow lines, except when viewed with a faces file or when multiple Z fields are selected, in which case, uniform colors are used for every point (yellow for the first Z field, then green, red, blue, orange, magenta, brown, cyan). If a line color (*linecol*) field is present in a data file, then the color values in that field are used for both the lines and data points (shown in the bottom-left figure on 3DV Fig-3), with any data points without line color values shown in light grey. If a data file has a *time* or *featurecol* field, the values in those fields are used by default instead, with the values in the *time* field taking precedence over those in the *featurecol* color field, *as long as* the *time* field is not selected as a Z field. (Refer to Chapter 2, *3D Viewer File Types*, for more information on these special fields, starting on page 3DV 2-2.) The figures on page 3DV Fig-5 show the data points in their feature colors, where those color values are varying based on the fault block location.

If a *.pdat* file is displayed in property colors, any data points within the file that do not have property value information (i.e., the P-field is blank, null, or alphanumeric) are displayed in a grey color. Similarly, if a *.pdat*, *.dat* or *.path* file is displayed in symbol colors, data points without symbol information are shown in grey.

Fault Face Color



When a fault face in a faces file is displayed, the fault surface can be drawn in a single gray color (known as the fault color) or in the colors of the geologic zones or property shells that intersect the fault surface. Using the gray fault color accentuates the presence of the fault and the truncation of layers against the fault surface. Using the zone or property colors emphasizes the geometry of layers in individual fault blocks, their relationship to each other, and their relationship to the faults.

Note: Fault surfaces within a faces file can only be generated using the WorkFlow Manager the Geologic Structure Builder. The capabilities described here do not affect the display of fault surfaces within a 2D grid file (i.e., those surfaces in a 2D grid created as a result of gridding with a vertical and/or non-vertical fault file).

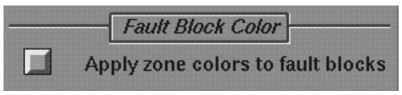
Use Fault Color

Selecting the *Use Fault Color* radio button causes the fault surfaces to be displayed in a gray color. The individual layers or property shells truncating against the fault surface cannot be seen along the fault face.

Use Property/Zone Color

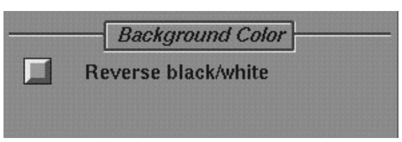
Selecting the *Use Property/Zone Color* radio button causes the fault surfaces to be displayed using the colors of the individual zones, or the properties within those zones, that intersect the faults. Whether the property colors or the zone colors are displayed is dependent on the settings for each zone; refer to *Property/Zone Colors* (page 3DV 4-33) for more information. This type of display is useful for examining the geometries of layers up against the fault surfaces. Examples of displaying zone colors on fault faces can be seen in the figures on pages 3DV Fig-5 and 3DV Fig-9.

Fault Block Color



The *Apply Zone Colors to Fault Blocks* toggle button allows the user to view each fault block in a different color when zone colors are displayed (controlled by the *Property/Zone Colors* push button on the Zone menu, page 3DV 4-33). If, for example, a model consists of one zone, but several fault blocks, when zone colors are turned on, the model would, by default, appear in all one color. By turning on the *Apply Zone Colors to Fault Blocks* function, each fault block would be displayed in a different color. The entire fault block (regardless of if it includes zone partitions) is displayed in one color, when this capability is turned on; so if, for example, the model contained 2 zones and 3 fault blocks, three different colors would be used (one for each fault block). The colors assigned are based on a mapping of the fault block numbers (internal to the faces file) to the zone color table. If more fault blocks exist than zone-color-table entries (256), then the colors wrap, with fault block 257 having the same color as fault block 1.

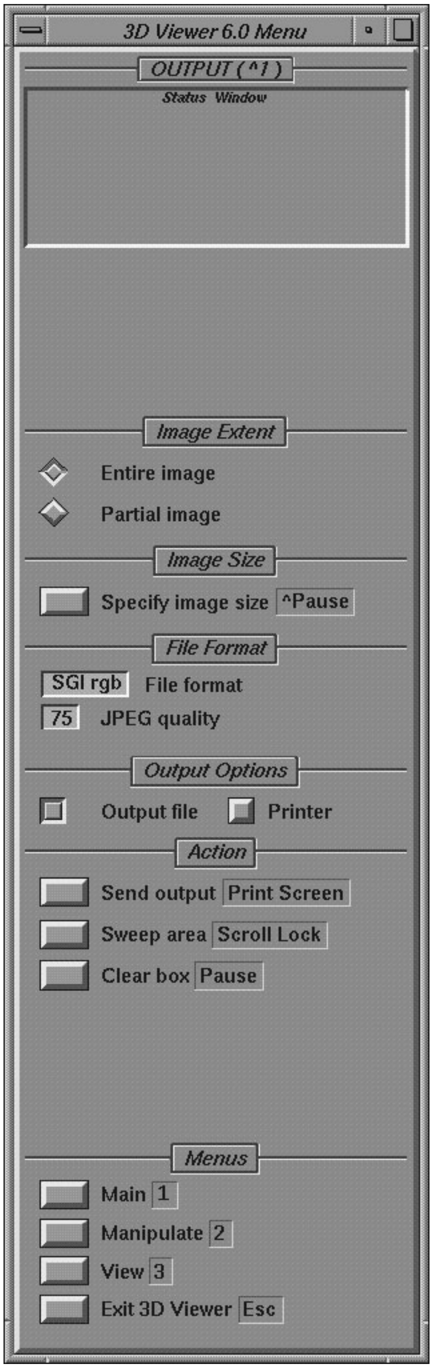
Reverse Black/White Background Color



The *Reverse Black/White* toggle button switches the default black background color to white and the default white foreground color to black (an example is shown in the middle figure on page 3DV Fig-5). If one of the colors is user-specified rather than the default color and the other color is the default, the user-specified color remains when *Reverse Black/White* is set on; however, the default color is reversed.

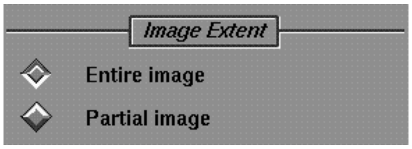
Note: This function works identically to the bwswap *vue file parameter, discussed on 3DV B-9.*

Output Menu



The Output Menu (hot key "^1") is used to send screen images of the faces, grid, or scattered data files to output files, a compatible printer, or both. The entire model image (including the Color Key and any annotation, if displayed, but excluding the menu display) or only a portion of the display can be output. The output image size (in pixels) can be specified. Supported formats included RGB, gif, tiff, and jpeg. The Output Menu is shown at left.

Image Extent

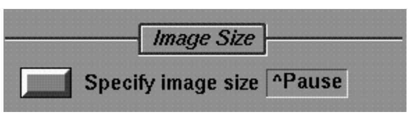


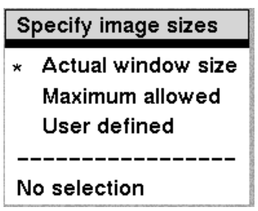
The two radio buttons in the Image Extent section are used to determine whether the entire model image or just a portion of the image is sent as output. These two buttons merely set the “type” of image extent; they do not send the output nor define the output portion when in *Partial Image* mode. The default setting is *Entire Image*. No hot key equivalents are available for either of these menu commands.

The image sent as output when using either *Entire Image* or *Partial Image* consists of the model itself, the color key, if displayed, and any other annotation when displayed. The menu window is not sent when *Entire Image* is selected, nor can it be selected when *Partial Image* is chosen.

Once the image mode has been selected, select the desired output form and then send the output. If *Partial Image* is selected, the window for the partial image must be chosen by selecting the *Sweep Area* command in the Action section (refer to *Sweep Area*, page 3DV 4-82).

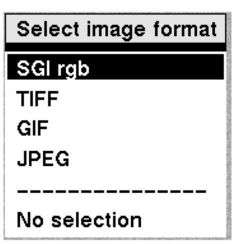
Image Size





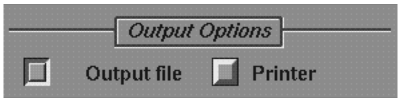
Selecting the *Specify Image Size* button produces the window shown below, from which the image size is specified. The screen size, typically 1280 pixels by 1024 pixels, is the default output size and is used when *Actual Image Size* is selected. Selecting *Maximum Allowed* checks the machine for the largest possible image width and height (which are machine dependent) and sets the larger dimension while keeping the aspect ratio of the current window. A specific width and height in pixels is specified when *User Defined* is selected. When *Maximum Allowed* is selected and an image saved, the pixel widths of the axes, axes labels, and scattered data lines are increased by one pixel, and the fonts are increased in size somewhat, when possible. The color key is scaled up proportionately and the placement of screen annotation is scaled in both size and location.

File Format



Clicking on the *File Format* text box allows the output image file format to be set to one of four types: SGI rgb, gif, jpeg, and tiff. For the jpeg format, there is a tradeoff between the image quality and the compression, which can be set via the *JPEG Quality* value box. The value can be set between 25 and 95, with higher values resulting in a higher image quality, but also larger file size. Settings between 50 and 95 generally work best, with the default of 75 often being about right.

Output Options



The screen output can be sent to either an output file, a printer, or both. (Software for driving the printer must be obtained from either the workstation (i.e., IBM®, SGI™, or Sun™) or PC vendor or the printer vendor; refer to the *EarthVision Site Administrator's Guide* for more information.) Two toggle buttons are available; one for *Output File* and one for *Printer*. Either or both can be selected. These commands only indicate where the output is sent; they do not actually send the output. The default setting is *Output File*. No hot key equivalents are available for these menu commands.

If *Output File* is selected, the user can specify an output file name; however, the 3D Viewer does not prompt for the name until the user actually sends the image as output. See the description below regarding the *Send Output* command.

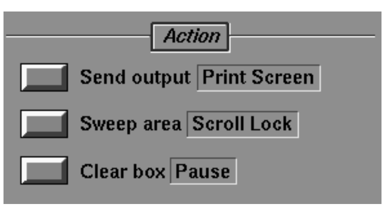
When the output is sent to a file, the user can look at the file image, prior to sending the output to the printer using an operating system command. It must be run at the operating system level (outside of the 3D Viewer). The commands are:

```
ipaste RGBfilename
xv   tifffilename
xv   giffilename
xv   jpegfilename
```

The image then appears on the workstation screen.

To send an output file to a printer from outside the 3D Viewer (at the operating system level), see the Site Technical Representative.

Action



The Action section contains the only commands that allow the user to actually output images. It includes the following commands and associated hot keys:

- Send Output (hot key "Print Screen")
- Sweep Area (hot key "Scroll Lock")
- Clear Box (hot key "Pause")

Send Output

Once the desired image and output have been selected, the image is not sent until the *Send Output* command or the "Print Screen" hot key is selected. If the output is to be sent to a printer, a pop-up menu appears with the available printer choices and a *Cancel* choice. If the output is to be sent to a file, a message appears in the Status Window prompting the user for an output file name each time *Send Output* is selected. Any name can be entered; the default suffixes (*.rgb*, *.tiff*, *.jpeg*, and *.gif*) are already provided. If the file already exists on disk, the 3D Viewer prompts whether it should be overwritten.

Sweep Area

When the 3D Viewer is in Partial Image mode, the window for the partial image must be selected using the *Sweep Area* command. When *Sweep Area* or the “Scroll Lock” hot key is selected, the 3D Viewer prompts to choose the region for output. This action is accomplished by sweeping out the desired area, using right mouse button, from one corner to the opposite corner. The cursor changes to an X and a white box indicating the selected region appears on the screen while the window box is defined.

The *Clear Box* menu button can be used to select a different region as output by removing the white window borders, and then the *Sweep Area* menu command can be used to sweep out a new window area, or *Entire Image* may be selected. (The *Clear Box* function is discussed below.) Alternatively, *Entire Image* or *Sweep Area* can be immediately selected (the white window box remains visible until the right mouse button is pressed to select the new window region).

If Entire Image mode is on when *Sweep Area* is selected, the 3D Viewer is immediately placed in Partial Image mode.

Once the desired region (and output form) has been selected, the output can be sent to a thermal printer or an output file, using the *Send Output* command.

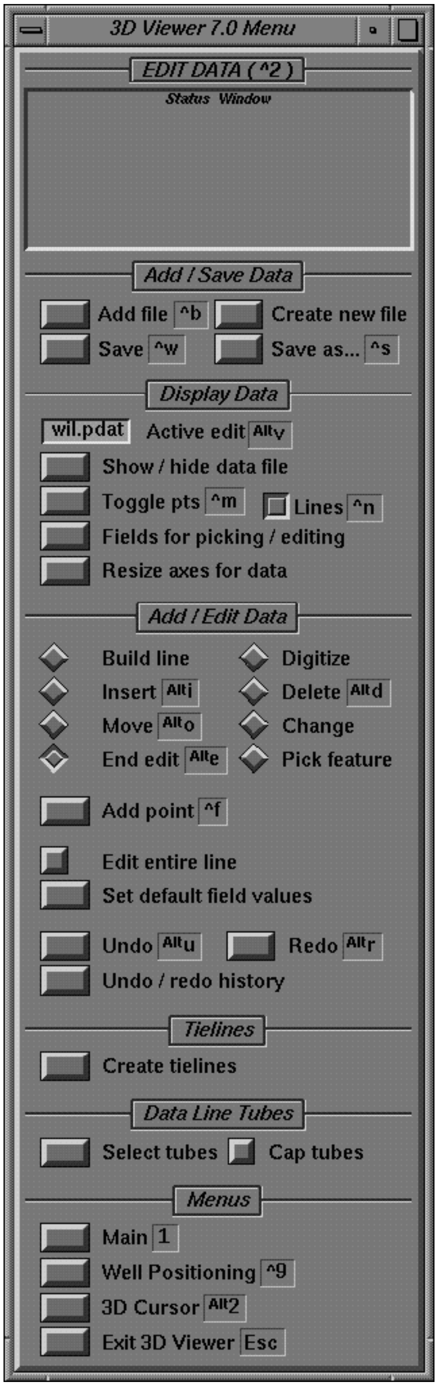
Clear Box

The *Clear Box* button (or the “Pause” hot key) can be used to cancel the *Sweep Area* command on the Output Menu. For example, if a partial window is defined, but it is decided that a different region should be sent instead, clicking on the *Clear Box* button causes the white box to disappear.

Single versus Double Buffered Screen Output

When creating screen images and sending them to a printer, the screen output rendition can be improved in certain circumstances by creating the screen image in single buffer mode. A checkerboard effect occurs sometimes in double buffer mode but not in single buffer mode. The default display mode for the program is double buffer mode; however, this setting is changeable by using the “^Alt” hot key or the menu button on the Screen Menu. Whether single versus double buffer mode affects the screen output depends on the printer, as well as the color, shape, lighting, and inclination of the model. It should also be noted that this checkerboard effect is frequently seen when creating screen dumps of views having a transparent surface. Generally, however, this effect is the same for a transparent surface regardless of whether the output was created while in single or double buffer mode.

Edit Data Menu



The Edit Data Menu (hot key “^2”) is used to display and edit scattered data, property data, and well path files. The following features are available from the Edit Data Menu (shown at left):

- Data File Adding/Creating/Saving (hot keys “^b”, “^w”, and “^s”)
- Data File Display (hot keys “Alt-v”, “^m”, and “^n”)
- Line and Point Editing and Creation (hot keys “Alt-i”, “Alt-d”, “Alt-o”, “Alt-e”, “^-f”, “Alt-u”, “Alt-r”)
- Feature Point Picking
- Field Editing
- Tieline creation
- Data-line Tube Display

Data Files

A scattered data, property data, or well path file containing an X, Y, and Z-field can be displayed and edited in the 3D Viewer. The file can optionally contain P-fields, as well as fields for numerous other fields. These fields, their appropriate names, and meanings are discussed in detail in *Scattered Data, Property Data, and Well Path Files* (page 3DV 2-1). These data files can also be created in the 3D Viewer or in the EarthVision Graphic Editor.

Add/Save Data

Add File

When a faces file, 3D grid, 2D grid, or a data file is displayed, additional scattered data files can be displayed on the screen by clicking on *Add File* or using the "^b" hot key. A File Selection menu is displayed containing all data file names ending in either *.dat*, *.path*, or *.pdat*; one of these three data types is displayed first and selections at the bottom access the other two data types. Files can be added by marking them with an asterisks; previously loaded files can be removed by clicking on the file name, thereby removing the asterisk. (If the primary model is a data file, that file cannot be removed using the *Add File* menu.

After selecting files, if a scattered data file has more than one Z- or P-field (for *.dat* and *.pdat* files, respectively), the user is prompted (via a pop-up menu) for which field to display (*.path* files can only contain TVDSS and MD fields; TVDSS is always used for Z). A data file cannot be edited if more than one Z-field is selected.

The *Add File* command (or "^b" hot key) is only used to display a data file when a primary model (either a faces file, 3D grid, 2D grid or data file) is being viewed. The File Menu must be used to view a scattered data file alone or to switch from one data file to another.

Sharing Property Groups

Multiple property models can be loaded in the 3D Viewer: Files with the same property "group" share the same property colors and levels. Property groups are determined by the property name and, in the case of 3D grids, whether the property type is property or seismic. Seismic grids even with the same property name are not considered part of the same group as faces file or data file. When a secondary property file (either a 3D grid or a property data file) is added in the 3D Viewer, if the property name is the same as a previously loaded file then they automatically "share" the same property colors and levels, becoming a property group. If the file has a property name not previously loaded into the 3D Viewer (e.g., if a data file has a P-field of "porosity" and a property 3D grid was created with a P-field of "por") or, in the case of a 3D grid, is of a different property type (seismic versus property), then the file automatically starts a new property group; its property levels and colors are determined separately from those in other property groups.

A faces file does not have a known property field, however. So when a secondary file is loaded, the 3D Viewer prompts whether the file's property should share the property colors and levels with the faces file (unless the file is a 3D seismic grid, which always has its own property group). If the answer is yes, then whatever P-levels and colors are used by the faces file are automatically used by the secondary file, and any subsequent files with the same property name. If the secondary file matches an already loaded property file, then the question is not asked (since it would automatically be part of the existing property group).

The XYZ Data Range

If the primary model is a data file, when any additional files are loaded, the range defined by the 3D Viewer's wireframe can be expanded to include all of the new data set by selecting the *Expand XYZ* selection on the pop-up menu. The wireframe will then be resized to include the new data points that are outside the previous XYZ range, plus an additional 5% in each direction. If *Expand XYZ* is not selected, then any data points in the secondary data file(s) that are outside of the wireframe's range are clipped. After a data file has been loaded, the range of the wireframe can be changed to any size using the *Resize Axres for Data* function, discussed on page 3DV 4-87.

Note: Any additional data files displayed must match the XY and Z units of the primary model.

Create New File

The *Create New File* push button is used to create a new file and to define what fields will be in the file. Once *Create New File* is selected, a pop-up menu appears containing the possible fields for the new file. For a full description of the available fields, please refer to *Scattered Data, Property Data, and Well Path Files,* starting on page 3DV 2-1. The X, Y, and Z-fields are added automatically. If any property data files are already loaded, the property field names in those files, plus P, are offered as possible property field names. In addition, by selecting *Specify P Field,* a user-specified field name can be entered.

Clicking on a field name causes an asterisk to appear to the left of the name, indicating that it has been selected. A field can be unselected by clicking on it a second time. When no more fields are desired, or if no additional fields are desired, clicking *No More Selections* closes the pop-up menu. (*Note*: Only one P-field can be added to this new file.) EarthVision then prompts for a file name. If a P-field was selected, the suffix *.pdat* is displayed (indicating a property data file); if TVDSS was selected, the *.path* suffix is displayed; otherwise, *.dat* is displayed. Typing a carriage return without entering a file name prefix cancels the file creation. If an existing disk file name is given, the 3D Viewer prompts whether the file should be overwritten.

If a P-field is selected that matches one already in the 3D Viewer, then the new file will be displayed using the existing property colors and levels for that property group. If a new P-field is specified, then the 3D Viewer prompts for a P-min and P-max so that a default set of P-levels can be calculated.

When a new data file is created, it is automatically loaded as the Active Edit file (page 3DV 4-86).

Save and Save As

The *Save and Save As* buttons (or the "^w" and "^s" hot keys respectively) should be used throughout the data edit session to save any modifications to the same or a new existing file.

Clicking *Save* (or using "^w") immediately writes the file to the same file name, over writing the older file on disk with the newer edited file in the 3D Viewer.

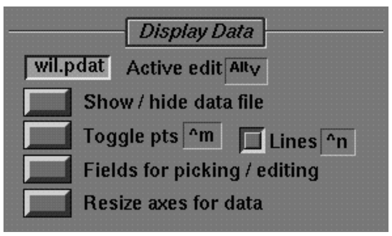
Clicking on *Save As* brings a pop-up menu with three choices. The user can: save to the same file (the file name is displayed), save to a new file, or not save at all, by choosing the *No Selection* entry. If the user selects to save to a new file, the 3D Viewer prompts for the new name in the Status Window. If an existing file name is entered, the 3D Viewer asks for confirmation before overwriting the file.

All newly created files are saved as free-format files.

Note: If edits or additions to a data file are not saved prior to attempting to exit the 3D Viewer or selecting a new file for display, the 3D Viewer prompts the user with a Save File pop-up menu (similar to the one described above) prior to exiting the program or retrieving the file. This feature is a safeguard; however, saving files prior to exiting the program or selecting a new file is encouraged.

Display Data

Active Edit File



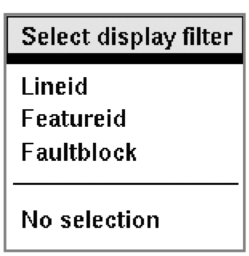
Only one file can be edited at a time; any edits (such as move, delete, or change) apply only to the *Active Edit* file. The file to be edited is selected via the *Active Edit* text box. When two data files are in the 3D Viewer, clicking on the *Active Edit* text box (or using the “Alt-v” hot key) toggles between the two files. If more than two data files are loaded, clicking on the *Active Edit* text box (or using the hot key) brings up a pop-up menu listing all the loaded data files. The active edit data file is listed with an asterisk.

Note: Because more than one data file can be displayed, but only one file can be edited at a time, when an edit mode is selected, the use of the right mouse button for picking data points is disabled for all files except the Active Edit file. If the right mouse button is used to click on any data points (or anything else) that is not in the Active Edit file, the 3D Viewer issues a statement that no point in the Active Edit file was selected.

Show/Hide Data

The display of each of the data file, including the Active Edit file (page 3DV 4-86), can be turned on or off individually by clicking the *Show/Hide Data File* button, which brings up a list of all data files displayed in the current 3D Viewer display. An asterisk indicates that the file is being displayed. Clicking on a file name toggles the asterisk (and the display) on or off. Once all the changes have been made, the 3D Viewer window is updated after *No More Selections* is clicked.

Toggle Points and Lines



Data within in the *Active Edit* file (page 3DV 4-86) can be turned on or off using the *Toggle Pts* toggle button or the “^m” hot key. Additionally, if the file contains a well ID, line ID, feature ID, or fault block field, the data points can be turned off individually, along single or multiple lines (along with the lines), based on specific feature IDs, or within specified fault blocks via a pop-up menu that lists all of the IDs. If two or more fields are available, the user is prompted for which field should be used to filter the data. Additionally, lines displayed connecting data points with the same ID can be turned on or off (leaving all data points on) using the *Lines* toggle button or the “^n” hot key.

Fields for Picking / Editing

Clicking on a data point with the right mouse button highlights the point in grey and an information box appears on the screen (this information box can be moved; refer to *Move Screen Objects*, page 3DV 4-151). (This mouse button capability and other similar features are discussed under *Additional Mouse Button Features*, page 3DV 4-149.) By default, the information box displays the file name plus most of the special fields available in the file (for a description of the special fields, please refer to *Scattered Data*, *Property Data, and Well Path Data* (starting on page 3DV 2-1)). In addition, by default, it is only special fields that can be edited.

It may be desirable, however, to post or edit other fields in the file that do not have special field names, or to not post all of the field names.

To change what fields are posted in the information box or to add any non-special field names to make their information editable, click on the *Fields for Picking/Editing* push button. A list of all special field names, plus all field names that are in the active edit file are listed. The fields that are listed for display have an asterisk next to them.

To set a field to not display, click on it so that there is no longer an asterisk. The field, if it is a special field name, is still available for editing. If it is a non-special field, then it is also no longer available for editing.

To set a field for display, click on it so that there is an asterisk. If the field hs a non-special field name, it will now be available for editing. The special fields are always available for editing, with a few exceptions (e.g., X, Y, Z, and MD cannot be “hand-edited”—their values are set by moving the point interactively).

Note: *The fields set to display are set for the Active Edit file (discussed on page 3DV 4-86). The list of fields must be set separately for each data file.*

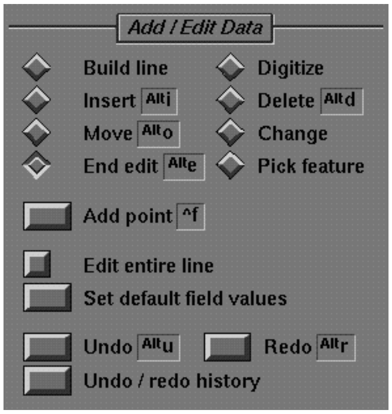
Resize Axes for Data

When only scattered data are displayed, the *Resize Axes for Data* can be used to change the range of the wireframe axes. (When a faces file or 3D grid file is displayed, the wireframe always fits the volume of the model and cannot be extended.) Only data within the wireframe are displayed, so changing the axes range can limit or expand the amount of data displayed. Clicking on the *Resize Axes for Data* button brings up a pop-up menu from which you can set the range for the X, Y, and/or Z axes to

- The exact range of all the data files displayed
- The data range of all the files plus 5% in each direction (both min and max)
- The data range of all the files plus 10% in each direction
- The data range of all the files plus 20% in each direction
- A user-specified minima and maxima

The pop-up menu allows the X, Y, and/or Z axes to be selected together or individually by marking each with an asterisk; the asterisk indicates which axis will be affected. If *Specify Absolute Range* is selected, the 3D Viewer prompts for the minimum and maximum for each of the axes selected; the current setting is displayed to aid in setting the new values. Entering only a carriage return leaves the value unchanged.

Add/Edit Data



The Add/Edit Data section contains commands for creating and modifying data files, individual data points, and lines of data points.

Although more than one data file can be displayed, only the Active Edit file can be edited at a time. To switch to edit a new file, select the *Active Edit* text box (discussed on page 3DV 4-86).

Note: Because more than one data file can be displayed, but only one file can be edited at a time, when an edit mode is selected, the use of the right mouse button for picking data points is disabled for all files except the Active Edit file. If the right mouse button is used to click on any data points (or anything else) that is not in the Active Edit file, the 3D Viewer issues a statement that no point in the Active Edit file was selected.

Several radio buttons are available for creating and editing data. Each radio button sets a mode, where multiple edits can be made. For example, selecting the *Delete* radio button allows multiple points to be deleted. The editing modes can apply to a point (the default) or to an entire line. Once all the edits are done, the *End Edit* radio button turns off the selected mode. Users can switch between the different editing modes without having to turn off the editing until all editing is done. *Undo, Redo, and Undo/Redo History* commands are available; any number of “undo” commands can be performed. Each of the commands is discussed next.

Note: All commands that add, insert, or move a data point location must be performed with the 3D cursor. In general, the 3D Viewer automatically turns on the 3D cursor when necessary. For information on how to move the 3D cursor, refer to 3D Cursor Menu *(page 3DV 4-140).*

Build Line

Build Line is used to create a series of points connected by a line. A new line is created, unless an existing well or line ID is entered, in which case *Build Line* is used to extend the existing line. The file must have a line or well ID in order to use *Build Line*. The points are added at the 3D cursor location using the *Add Point* push button or “^f” hot key.

When *Build Line* is selected, the 3D Viewer prompts for a line ID, and the 3D cursor is immediately displayed, if necessary. (For information on how to move the 3D cursor, refer to *3D Cursor Menu*, page 3DV 4-140.) Once the 3D cursor is in the desired location, *Add Point* (or “^f” hot key) is used to create new data points. The 3D Viewer prompts for values for all special fields each time a point is added, unless default values were previously set (refer to *Set Default Field Values*, page 3DV 4-94).

Setting different values at each point can be useful, for example, by setting different line colors or radius values (used for displaying well tubes) for each line segment. The *Set Default Field Values* command can be used, however, if the same value is desired for any field, for example, specifying the same P-value when creating a contour line.

Build Line can be used in conjunction with *Digitize* (discussed next). Points are added to the same line when switching directly between the two commands.

Once all the desired points are added, selecting *End Edit* or another editing command (other than *Digitize*) ends the line building process. The *Undo* command (discussed on page 3DV 4-95) can be used to remove the added points one point at a time. Using *Undo* to remove points added using *Build Line* turns the *Build Line* mode back on, even if *End Edit* was previously selected.

Digitize

The *Digitize* command allows quick data point entry or line building along a surface or a feature by combining the *Snap to Surface* feature with the *Add Point* command. When *Digitize* is selected, a line or well ID is requested; if none is entered, individual points (rather than a line of points) is entered using this function. Using the right mouse button, clicking anywhere on a faces file or 2D grid surface or along a 3D grid surface or plane, moves the 3D cursor to that location and automatically digitizes that location as a new point. In this way, as series of points can be quickly digitized, for example, along a particular feature of a seismic grid or 3D faces file model.

Because digitizing is performed with the right mouse button, the methods for moving the 3D cursor using the middle mouse button are still available (refer to *3D Cursor Menu*, page 3DV 4-140). In this way, the quick digitizing can be used in conjunction with adding points by moving the 3D cursor and clicking *Add Point* (if, for example, the snap-to-surface feature is not desired).

Note: *This function requires use of the right mouse button, which means that the usual right mouse button feature of posting values on the screen is inactive while editing points (refer to* Display P, Z, and Other Field Values, *page 3DV 4-150, for more information on posting values).*

Digitize can be used in conjunction with *Build Line* (discussed previously). Points are added to the same line when switching directly between the two commands.

Once all the desired points are added, selecting *End Edit* or another editing command (other than *Build Line*) ends the digitizing process.

The *Undo* command (discussed on page 3DV 4-95) can be used to remove the added points one point at a time. Using *Undo* to remove points added using *Digitize* turns the *Digitize* mode back on, even if *End Edit* was previously selected.

Insert

Note: Insert *is only available if a line or well ID field is present in the file.*

After selecting the *Insert* radio button (or the “Alt-i” hot key), move the 3D cursor to the desired position for the new point (refer to *3D Cursor Display and Location Controls*, page 3DV 4-141, for information on moving the 3D cursor). Using the right mouse button, click on the existing data point that is just above or below where the new data point will be located. The new data point will be placed within the same line. After selecting a point, the 3D Viewer highlights the selected data point plus one other (generally, the data point above the first), and prompts if the new data point should be inserted between the two highlighted points. If the answer is yes, click the right mouse button and a new point is inserted. If the answer is no, click the left mouse button; the 3D Viewer then highlights the original point and the point on the other side (if possible), and again prompts for confirmation (using the mouse buttons). Answering no effectively cancels the insertion. (If the data point selected is at the beginning (or the end) of the line, the 3D Viewer prompts as to whether the point should be added before (or after) the highlighted point.)

Once the user has answered yes to one of these questions, the 3D Viewer prompts for values for each of the available special fields (e.g., the P, dip, dip azimuth, fault number, or symbol fields, etc.) unless defaults were specified using the *Set Default Field Values* command (discussed on page 3DV 4-94).

Once all the desired points are inserted, *End Edit* or another editing command ends the insertion process. The *Undo* command (discussed on page 3DV 4-95) can be used to remove the inserted points.

Delete

After selecting *Delete* (or the "Alt-d" hot key), clicking (with the right mouse button) on the first data point that is to be deleted displays a data box with information on the data point (e.g., the X, Y, and Z locations, line ID, P-value, etc.) and deletes the data point, but leaves it highlighted. *Once the point is deleted, it remains highlighted*, until either *End Edit* is selected or until the next redraw.

A series of points can be deleted by clicking on the right mouse button on the desired data points. Each data point is highlighted, as described above.

To delete an entire line of points in one action, the *Edit Entire Line* function must be on (discussed on page 3DV 4-93).

Any points or lines that have been deleted can be restored using the *Undo* command (discussed on page 3DV 4-95).

Once all the desired points/lines are deleted, *End Edit* or another editing command ends the deletion process.

Note: This function requires use of the right mouse button, which means that the usual right mouse button feature of posting values on the screen is inactive while editing points (refer to Display P, Z, and Other Field Values, *page 3DV 4-150, for more information on posting values).*

Move

After selecting *Move* (or the "Alt-m" hot key), move the 3D cursor to the desired position for the new point (the cursor can be moved prior to selecting *Move* as well; refer to *3D Cursor Display and Location Controls*, page 3DV 4-141, for information on moving the 3D cursor). Using the right mouse button, click on the existing data point that is to be moved. The data point is immediately moved to the new location, and a data box with information on the data point (e.g., the X, Y, and Z locations, line ID, P-value, etc.) is displayed

To move an entire line of points in one action, the *Edit Entire Line* function must be on (discussed on page 3DV 4-93). The point that is selected for the move is moved to the 3D cursor location, with the rest of the line moved in the same relative position.

Once all the desired points/lines are moved, *End Edit* or another editing command ends the move process. The *Undo* command (discussed on page 3DV 4-95) can be used to restore a moved point or line back to its original location.

Change

Note: The Change *function is only available if the data file contains fields in addition to the X, Y, Z, and line/well ID fields.*

The *Change* function is used to change the field values (other than the X, Y, Z location or line/well ID) of a data point (e.g., P, dip, dip azimuth—all the other special field names in the file).

When *Change* is selected, the 3D Viewer prompts for which fields are to be changed. A pop-up menu displays all the available fields. Any field selected is given an asterisk (selecting a field again removes the asterisk). After clicking on *No More Selections*, only those fields with asterisks will be changed when a data point is selected with the right mouse button. If a field is selected that has a default value displayed in parentheses next to the field name on the pop-up menu, then when a point is selected, the default value is automatically given to the point. If a field with no default value previously assigned is selected, then when a point is selected, the 3D Viewer prompts individually for each point for values for each of the selected fields.

Default values are set by using the *Set Default Field Values* function (discussed on page 3DV 4-94).

Note: When using Change*, the feature ID and feature color can be edited independently. If the two values are tied together or it is desired to edit them as pairs, the* Pick Feature *function must be used (discussed on page 3DV 4-91).*

The field values for an entire line can be changed in one action using the *Edit Entire Line* function (discussed on page 3DV 4-93**)**.

Once all the fields have been changed, *End Edit* or another editing command ends the feature editing process. The *Undo* command (discussed on page 3DV 4-95) can be used to restore the previous field values.

Pick Feature

Note: When Pick Feature *is selected, the color key is automatically changed to the feature color key and the data points are shown in the feature colors.*

In many cases, it may be desirable to indicate points that have a common “thread,” e.g., points along the same feature such as a fault plane, points that have the same pressure when the P-value is representing temperature, etc. These points, all displayed in the same color for the same feature, add one more level of information obtainable when viewing a 3D Viewer model or data file. In addition, data points within a scattered data file (*.dat* or *.pdat*) can be selectively gridded based on their feature number; refer to the main EarthVision Appendix E, *Funnels*, for more information. Sixty-four distinctly colored features can be delineated in this manner. The *Pick Feature* command allows points that are on the same feature to have the same feature ID and color.

Once the data are posted, click on *Pick Feature*. If no features exist in the data file or if the *featureid* and *featurecol* fields have not been defined, the 3D Viewer prompts for an alpha-numeric ID and then a number (1–64) which is associated with a color via the feature color table. If features already exist in the file, a pop-up menu appears with the existing feature IDs (with the feature color numbers in parentheses) and the selections *User-Entered* and *No Selection*. These values represent an ID and color that indicate the points are along a feature of some sort. The ID is known as the *feature id* and can represent anything; e.g., it could be entered as “Hayward Fault” or “Zone 10 data.” Once a file has values in the feature fields, those values are displayed in the pop-up menu. Selecting any existing feature ID or selecting *User-Entered* causes the 3D Viewer to prompt for the feature number. The feature ID and color number determine the color in which the points are displayed, based on the 64 colors of the loaded feature color file.

After selecting or entering the feature ID and color number, the points are selected by clicking with the right mouse button on the desired data point. A box appears in the lower part of the screen displaying field information about the data points as they are selected.

Note: When using Pick Feature*, the feature ID and feature color must be entered as pairs. To change either independently from the other, the* Change *function must be used (discussed on page 3DV 4-91).*

Once all the points along the same feature have been selected, a new feature is begun by clicking on *End Edit*, and then on *Pick Feature* again. The same pop-up menu appears; however, any new feature IDs and color indices are also added to the list. (Alternatively, the *Set Default Field Values* (discussed on page 3DV 4-94) can be used to change the feature ID and color without selecting *End Edit* and reselecting *Pick Feature.*) Once all the feature picking is done, clicking on *End Edit* turns off the feature picking.

Note: This function requires use of the right mouse button, which means that the usual right mouse button feature of posting values on the screen is inactive while editing points (refer to Display P, Z, and Other Field Values, *page 3DV 4-150, for more information on posting values).*

To change the feature ID and color for an entire line in one action, the *Edit Entire Line* function must be on (discussed on page 3DV 4-93).

Once all the desired points/lines are moved, *End Edit* or another editing command ends the feature editing process. The *Undo* command (discussed on page 3DV 4-95) can be used to restore the previous feature ID and color to a point.

End Edit

The *End Edit* radio button ends the current editing process and returns the 3D Viewer to normal point-query mode.

Once all edits have been made or during a long edit session, the *Save Data File As* function (discussed on page 3DV 4-97) should be used to save the file.

Any edits can be undone by clicking on the *Undo* button (discussed on page 3DV 4-95).

Add Point

Add Point is used to save the data point location of the 3D cursor, as either a single point or a point along a line. The 3D cursor must be turned on first; it can be moved by clicking on its axes, or snapping it to a point along a surface, to a selected point, or to a point along the 3D cursor planes (for information on how to move the 3D cursor, refer to the *3D Cursor Menu* section, starting on page 3DV 4-140). When *Add Point* (or the “^f” hot key) is used, the 3D Viewer prompts for values for each of the special fields in the file (other than X, Y, and Z, which are determined by the 3D cursor location); entering a carriage return sets the field to be blank. *Set Default Field Values* (discussed on page 3DV 4-94) can be used to set up default values for all or some of the fields; defaults can be set to blanks, so that no value is given or prompted for. The 3D Viewer does not prompt for values for any fields with defaults.

To save an individual data point location (i.e., not on a line) at the current 3D cursor location, use the *Add Point* push button or the “^f” hot key. Once all the field values are entered (if necessary), a data point appears at the 3D cursor location.

A line of points can be saved in several ways, if a line or well ID is present in the file. A line is created when *Add Point* is used with *Begin Line* or *Digitize* (if a line or well ID is specified). Also, a line of points is created if *Add Point* is used on its own *and* the same line or well ID is used for each point added in succession (either by entering it at the prompt or by specifying a default line/well ID).

After the location and field values are specified, moving the cursor to a new location and using *Add Point* (or the “^f” hot key) adds more points or extends the line. When adding a line, the data points are connected to one another and to the 3D cursor with a line (in the appropriate line color, if specified).

Any points that are added can be removed by clicking on the *Undo* button (discussed on page 3DV 4-95).

Edit Entire Line

By default, the Add/Edit Data functions apply to a single point within a line, but not a line of data. (The exceptions are the *Build Line* and *Digitize* functions, which work with lines.) The *Edit Entire Line* command allows the Add/Edit Data functions to apply to a line.

When *Edit Entire Line* is off, the *Move*, *Delete*, *Pick Feature*, and *Change* functions work on the single point selected; i.e., they move the point, delete the point, assign a feature ID and color to the point, and assign new field values to the point.

When *Edit Entire Line* is on, the *Move*, *Delete*, *Pick Feature*, and *Change* functions work on the line within which the point is selected. With *Move*, the selected point is moved to the location of the 3D cursor *and* the entire line is moved as well. *Delete* removes the entire line. *Pick Feature* sets the feature ID and color of the entire line to the user-selected value. *Change* sets all the user-selected fields for all points in the line to the user-entered values.

Any edits can be undone by clicking on the *Undo* button (discussed on page 3DV 4-95).

Set Default Field Values

When adding new points (either via *Build Line*, *Digitize*, *Insert*, or *Add Point*), values for each point must be specified for each special field in the file (the "special" fields are listed in Chapter 2 under *Scattered Data*, *Property Data*, and *Well Path Files*, page 3DV 2-2). Default values can be specified, however, via the *Set Default Field Values* push button; the default values are used whenever a point is added, without prompting the user for the field values. Default values can be set for any number of fields, as desired.

In addition, *Set Default Field Values* sets up the default values used with the *Change* command, when changing the field values for a point or line (if *Edit Entire Line* is on).

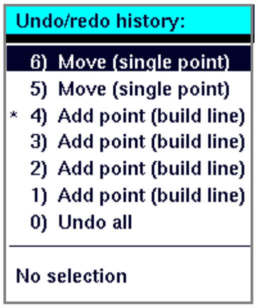
To set up default values, click on *Set Default Field Values*; a pop-up menu containing all the available special fields (other than X, Y, and Z) appears. If any of the fields already have defaults; those values are shown to the right of the field name (the first time the menu is displayed, no default values will be listed). The following functions are available from this menu:

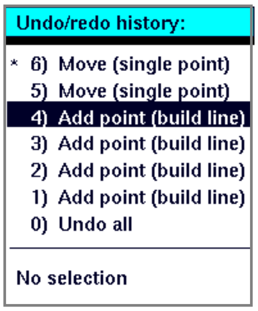
- Clicking on a field puts an asterisk next to it; once *No More Selections* is selected, the 3D Viewer will prompt for default values for all fields marked with asterisks.
- Clicking on a field with an asterisk removes the asterisk and clears the default value, if one was already specified; the 3D Viewer will not prompt for values for fields without asterisks (until a point is added or changed).
- *Select All (Specify Values)* puts asterisks next to all fields; if any fields previously had defaults, those defaults will remain.
- *Deselect All (Remove Values)* removes all asterisks *and* clears any default values that were previously specified.
- *Click Field to Set to Blank* sets a mode where any field that is selected is given a blank ("") as a default value (an asterisk and the "" automatically appear). In this way, default field values can be set to blanks without having to be prompted by the 3D Viewer. The mode is turned off by clicking on *Click Field to Set to Blank* again.
- *Set All Fields to Blank* gives every available field blank ("") default values (asterisks and ""s automatically appear next to every field). Any previously set defaults are changed immediately to blanks.
- *No More Selections* causes the 3D Viewer to prompt for default values for those fields with asterisks but no values specified yet.

In general, the defaults specified are used in all cases of adding or changing a point. Certain exceptions exist, however:

- Defaults for the *lineid* and *wellid* fields are only used with the *Change* command if *Edit Entire Line* is on.
- If a default line or well ID is specified and *Add Point* is used by itself (i.e., not in conjunction with *Build Line* or *Digitize*), a line is created.
- A default can only be specified for *feature* if one is specified for *featureid.*
- Defaults set for *featureid* and *feature* are used when adding or changing a point, but not for initially setting the *Pick Feature* command.
- If *Pick Feature* is on, its selection is used as the default and can be changed by the *Set Default Field Values* command.

Undo and Redo: Correcting Editing





The *Undo* and *Redo* commands (or the "Alt-u" and "Alt-r" hot keys respectively) and the *Undo/Redo History* commands are used for correcting editing errors made.

The *Undo* command reverses the most recent edit made. For example, if a point is deleted but it was the wrong point, selecting *Undo* restores the point at its original location. *Undo* works with all the editing commands, including *Change* which changes field values. If the edits were made to a line, then *Undo* restores the line to its previous state as well.

When a series of edits have been made, *Undo* reverses the most recent edit made first. If *Undo* is selected again, then the edit before that is reversed, and so on, back up the "edit tree."

The *Redo* command can be used to *Redo* the most recent edit that was previously undone using the *Undo* command. If *Undo* was used multiple times, then *Redo* can be used multiple times, as well.

Several edits can be undone or redone at one time using *Undo/Redo History.* Selecting *Undo/Redo History* displays a pop-up menu with all of the edits made to that point. The most recent edit is listed at the top (with the highest number and an asterisk next to it) and the first edit (edit #1) is listed at the bottom, as shown in the figure below, left. The asterisk indicates the current state of the edits, so selecting any edit, in the figure below, edit 4 is about to be selected, undoes all the previous edits from the top of the list down to but not including that edit. In this example, the two move points would be undone, but the entire "build line" would remain intact. Selecting *Undo/Redo History* again displays the pop-up menu with all the edits but now with an asterisk at the fourth edit, to indicate the current state (as shown below right). To undo all edits, the 0 entry, *Undo All*, would be selected.

If, however, several edits have been removed using *Undo (or Undo/Redo History)*, and then new edits are made, the edits that were undone are now lost and cannot be restored using *Redo (or Undo/Redo History)*.

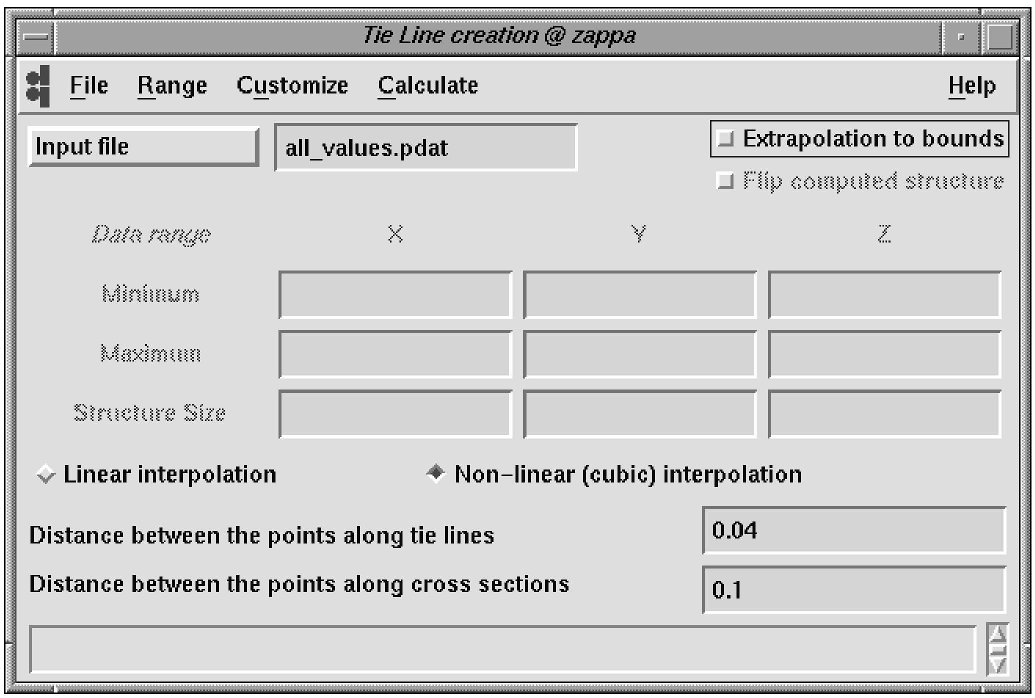
For example, let's say a user makes edit 1, then edit 2, edit 3, edit 4, and edit 5. If *Undo* is selected three times, then edits 3, 4, and 5 have been reversed. *Redo* could be used to restore edit 3, then edit 4, then edit 5. If *Redo* is not used, however, and new edits are made, e.g., edit 3a, edit 4a, and edit 5a, then *Undo* can be used to undo edits 1, 2, 3a, 4a, and 5a (starting with 5a), but the original edits 3, 4, and 5 are now lost.

Note: *Once the data file has been saved (to the same or a new file, using* Save Data File As*), previously made edits can no longer be reversed using* Undo *or remade using* Redo or using the Undo/Redo History. *This concept is especially important when using* Continuous Update *on the Well Positioning menu, since any edits are immediately saved to the temporary file, and, therefore, cannot currently be reversed.*

Create Tie Lines

For data digitized along cross sections that are not close to each other, it is frequently necessary to interpolate points between the lines of cross section, in order to have sufficient control for gridding. The Tie Line Creation program, accessed from the *Create Tie Lines* push button, creates interpolated points (known as "tie lines") both between and along user-supplied cross-sectional data (an ASCII scattered or property data file). The output data include all of the original points and lines, along with additional lines whose end points lie on the first and last input cross-section lines and whose intermediate points are tied to the intervening cross section lines; these new lines run perpendicular to the original input lines. The new file can then be used in 2D or 3D gridding or in any application in which scattered or property data files are used. When run in the 3D Viewer, the output data file created in the Tie Line Creation program is automatically displayed in the 3D Viewer.

Selecting the *Create Tie Lines* push button produces the window shown below:



To create a tie line data, the following parameters are required:

- Input file name
- Output file name
- Type of interpolation
- X, Y, and Z Ranges, if extrapolation is used
- Distance between points along the cross sections
- Distance between points along the tie lines

Each of these is discussed next.

Note: Currently, the Flip Computed Structure *and* Structure Size *functions, which are greyed out in the window, are not available.*

Input Data File Selection

The *Input File* can be a scattered data (*.dat*), property data (*.pdat*), or well path (*.path*) file. By default, the name of the ASCII data file being edited in the 3D Viewer is supplied in the *Input File* text box. Selecting the *Input File* push button produces a File Selection window from which any other available scattered or property data file can be selected.

Requirements

The input data file *must* contain X, Y, Z, line or well ID, and feature ID fields; a P field is optional. If other data fields exist, those fields are copied intact to the output file. Certain other requirements also exist:

- The cross-section lines must be in spatial order, with line IDs (or well IDs) increasing or decreasing from one side to the other. If this is not the case, the connection order can be specified via the Customize menu.
- Cross-section lines cannot intersect each other.
- The line ID field must contain a unique ID name for each cross-section line.
- The feature ID field is used to identify points on each cross section line that are to be tied to one another. These points are essentially control points used to determine how the tie lines are generated. It is recommended that control points are located at each peak and trough of a cross-section line.
- A minimum of two control points are required per cross-section line.
- Each cross-section line must have the same number of control points.
- If a non-linear (cubic) interpolation is desired, the file must contain at least four cross-section lines.

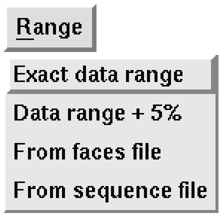
Control points can be created using the *Pick Feature* function on the Edit Data menu (refer to 3DV 4-91 for more information). It is between these control points that the initial interpolation is done to determine the location of the newly interpolated lines. Control points that are to be “tied” must have the same feature ID value.

Extrapolation to Bounds

By default, points are only calculated within the XYZ range of the data, and are added between the first and last cross-section lines. The *Extrapolation to Bounds* toggle button controls whether additional points are calculated outside of this range. When set to on, additional points are extrapolated to user-specified *Data Range* bounds, discussed next.

Data Range

The X-, Y-, and Z-minima and maxima define the range of the output tie-line data file. These ranges are only used if the *Extrapolate to Bounds* toggle button is set to on.



If extrapolation is turned on, in addition to entering an output data file range in the text boxes, the range of the tie-line data can be specified from the Range pull-down menu. The available settings are as follows:

- *Exact Data Range* sets the range to the exact range of the input cross-section data; this setting is equivalent to having extrapolation turned off.
- *Data Range + 5%* sets the range to the exact X, Y, and Z range of the input cross-section data plus an additional 5% in each direction.
- *From Faces File* and *From Sequence File* set the range to the X, Y, and Z range of an existing faces file or existing sequence file, respectively.

Linear versus Non-linear (Cubic) Interpolation

Two types of interpolation techniques are available via two radio buttons. The first, a linear interpolation, creates points between control points of different sections along straight-line segments. In other words, between any two control points, a straight line is “drawn” along which new points are interpolated. If the control points fall along a straight line from cross section to cross section or if only two lines of section exist, then this method should be sufficient.

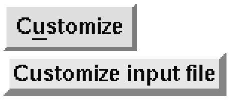
The second method, a non-linear (cubic) interpolation, creates points between control points along curved line segments. In other words, a curve is fit to the control points and then new points are interpolated along this curve. This method is recommended when the location of the control points are not along a straight line. The non-linear (cubic) interpolation method, which is the default, requires that the data file have at least four cross-section lines.

Distance Between Interpolated Points

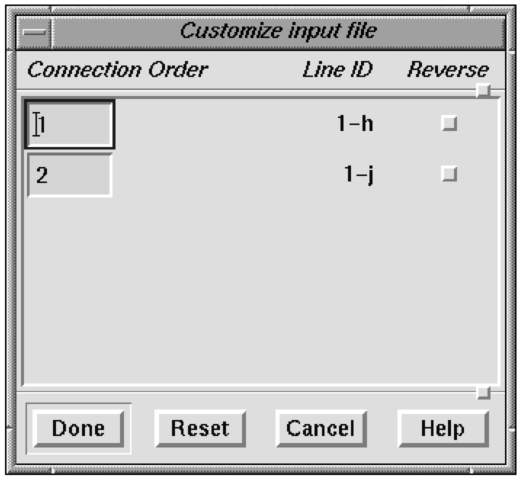
The Tie Line program takes as input a group of cross-section points. Tie points are first interpolated along the cross sections at a regular interval. Those tie points are joined to form tie lines along which additional points are interpolated. Once a file is selected, default system-calculated values are provided for the distance between tie-line points and the distance between points along cross sections.

The default *Distance Between Points Along Tie Lines* is approximately equal to taking the largest range of X, Y, and Z, and dividing that range by 30. The *Distance Between Points Along Cross Section Lines* is approximately equal to taking the length of the longest cross-section line and dividing that length by 75. Either distance, entered in data scale units, can be changed by entering a new value in the corresponding text box.

Customize



The order in which the cross-section lines are connected can be specified, as well as whether to reverse the order that points are read for each cross-section line. These features are available via *Customize –> Customize Input File*, which produces the window shown below.

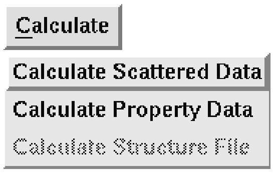


From the Customize Input File window, two parameters can be specified for each line ID: *Connection Order* and *Reverse*.

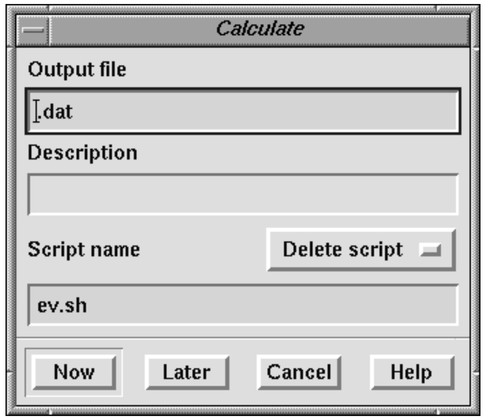
The values placed in the *Connection Order* text boxes determine the order in which the cross-section line IDs will be tied (with number 1 being the first line read). The *Line ID* column lists the line IDs in the order that they occur in the data file. Cross-section lines must be tied in increasing or decreasing spatial order from one side to the other and cannot intersect; the default line ID order may or may not correlate to this requirement. If default line ID order is not the correct connection order, the *Connection Order* values can be renumbered for each line ID to reflect the correct order.

The set of *Reverse* toggle buttons determine the order in which input points along a single cross-section line are read. By default, this toggle button is off, so that points are read in their order found in the input data file; alternatively, if this button is set on, the order is reversed. These points are used for interpolating the tie-line points so the order must be the same for each cross-section line (e.g., all points must be ordered from left to right).

Calculate Output Data File



Once all of the required parameters are specified, an output data file, suitable for gridding or other uses in EarthVision, can be calculated. Regardless of the input data type, either a scattered data (*.dat*) or property data (*.pdat*) file can be calculated by selecting *Calculate –> Calculate Scattered Data* or *Calculate –> Calculate Property Data*, respectively. (A scattered data (*.dat*) file is calculated from a well path (*.path*) file.) Selecting either produces a window similar to the one shown below.

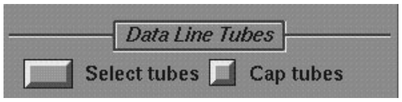


The output scattered or property data file name is entered in the *Output Data File Name* text box. If the input data file does not contain a P-field (i.e., it is a *.dat* file) and the output file selected is a property data file, the output file will not contain a P-field. A P-field can be added using the Formula Processor.

The rest of the Calculate window and succeeding Calculation Status windows function the same for all modules throughout EarthVision. Refer to Appendix A (pages A-7 to A-8) for an explanation of these functions.

After the calculation is finished, the Tie Line Creation program exits. The newly created tieline data file becomes the active file in the 3D Viewer.

Data Line Tubes



A tube of a constant radius can be drawn around the data lines in the Active Edit file (discussed on page 3DV 4-86), with the radius specified interactively. An example of a data line tube is shown in the top figures on page 3DV Fig-7. The data file must have a *radius* field in its header if the tube settings are to be saved. Otherwise, tubes can be added temporarily for display purposes only via the *Select Tubes* function. If a data file has a *linecol* or a *featurecol* field with different values at points along the same line (resulting in a multi-colored line), the tube displayed around the line will have the same multi-colors as the line would. A tube of varying radii can also be drawn around data lines, although the radii must be specified in the file prior to entering the 3D Viewer. The radius of the tube can then change at each data location in the line.

Note: *If the radius field is exists, but is blank, no tube will be drawn for the section of line before and after the point.*

Select Tubes

Selecting the *Select Tubes* function brings up a pop-up menu with four selections: Create/Edit Tubes, Delete Tubes, Toggle Tube Display, and No Selection. *No Selection* is used to cancel the function. Each of the other selections is discussed next.

Create/Edit Tubes

Select Tubes –> Create/Edit Tubes creates tubes for a file that does not have a radius field or if the user wants to add or edit the existing radii of the tubes. A listing of the available line IDs is then displayed on a pop-up menu. If a line already has a tube displayed, the radius of that tube is displayed in the pop-up menu next to the line ID. Clicking on a line ID selects (or deselects) it; an asterisk indicates it has been selected. Once all the desired lines are selected, clicking on the *No More Selections* entry causes the menu to disappear and the user to be prompted for the radius of the tube(s). *One radius is entered for all the lines selected.* If different radii are desired, then the lines must be added separately or edited later. If a line is selected that already has a radius associated with it, then that line's radius will be changed. In addition, although the 3D Viewer supports varying radii, only one value can be entered per line interactively via the *Select Tubes* function; however, the radius can be edited for a single point via the *Edit Point* function.

If any of the created tubes are completely clipped by the data range, an error message is generated.

Delete Tubes

Select Tubes –> Delete Tubes is used to delete the radius value for one or more lines at a time. Once selected, a listing of the available line IDs is displayed on a pop-up menu. Clicking on a line ID selects (or deselects) it; an asterisk indicates it has been selected. Once all the desired lines are selected, clicking on the *No More Selections* entry causes the menu to disappear and the tube to be removed from the selected lines. If it is desirable to just turn off the tube display without deleting the values from file, the *Toggle Tube Display* function (discussed next) should be used rather than *Delete Tubes*.

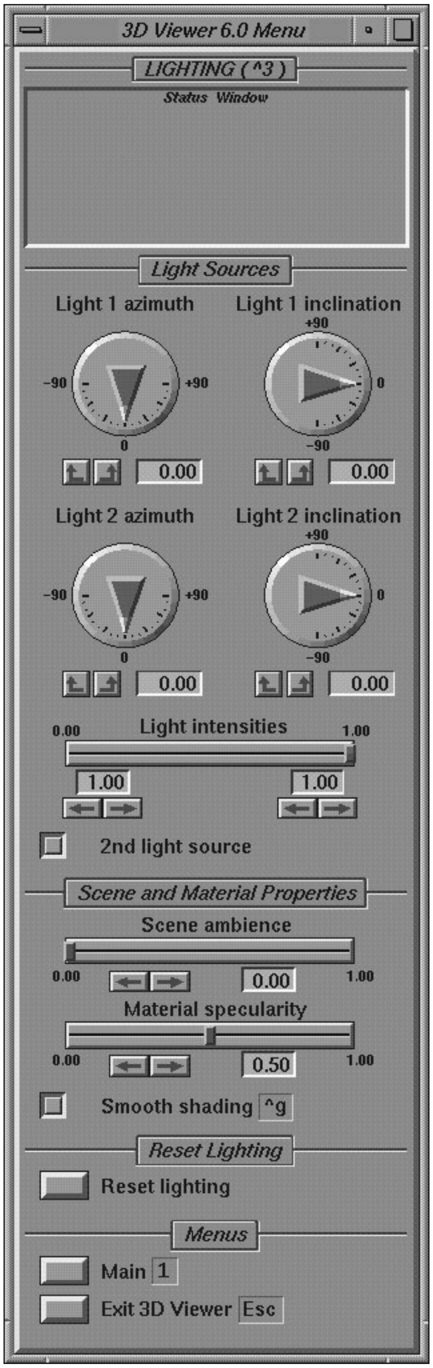
Toggle Tube Display

Existing tubes can be turned on or off by selecting the *Select Tube –> Toggle Tube Display.* Once selected, a listing of the available line IDs is displayed on a pop-up menu. All lines with tubes displayed have an asterisk next to the line ID. Clicking on a line ID selects or deselects the line; when the asterisk is removed, the tube for that line will not be displayed. Once all the desired lines are selected, clicking on the *No More Selections* entry causes the menu to disappear and the tubes to be removed from any unselected lines. In order to turn the tubes back on, the *Toggle Tube Display* function is selected again from the *Select Tubes* pop-up menu and the desired lines are selected as before. Unlike *Delete Tubes,* the tubes are retained in memory, so the radii do not have to be reentered in order to turn the display back on.

Cap Tubes

The *Cap Tubes* toggle button turns off and on a solid disk or cap at the top of the tube. By default, tube caps are off, so the line can be seen at the top of the tube.

Lighting Menu



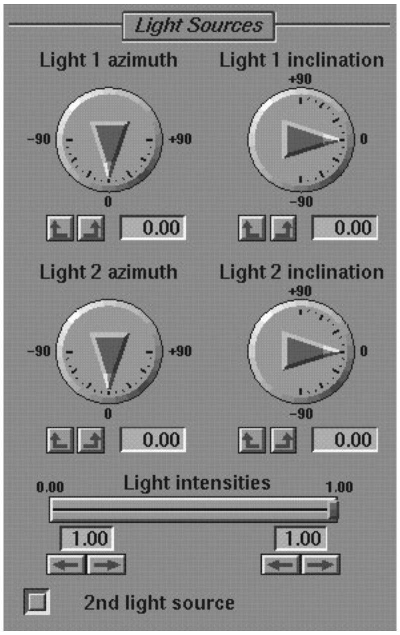
Any model or data displayed in the 3D Viewer is illuminated by one or two directional light sources and a non-directional or ambient light source. The appearance of the 3D model depends on the amount of ambient light, the material reflectance or specularity of the model, the positions of the directional light sources, and the position of the model. The position of the model can be adjusted using the *View Menu* (refer to page 3DV 4-22); however, the rest of these parameters are adjusted using the Lighting Menu.

The Lighting Menu (hot key "^3") allows the user to adjust some of these parameters, primarily regarding the lighting source and material properties, thereby changing the visual appearance of the 3D model. The following functions are available on the Lighting Menu (shown at left).

- Light Sources . . . . .adds a second light source and adjusts the azimuth, inclination, and intensity of the directional light sources relative to the eyepoint
- Scene and Material Properties . . . .adjusts the scene ambience, material specularity, and smooth (gouraud) shading (hot key "^g")

Light Sources

Light Angle



By default, the directional light sources are located at infinity behind the eye point, the position of the user's eye (locating the light source at infinity causes all the rays of light illuminating the model to be parallel). The light sources are always pointed directly towards the look point of the 3D model, which, by default, is the geographical center of the 3D model. (The look point, however, can be moved using functions available on the View Menu; refer to the *View Menu* section, page 3DV 4-22.) By default, only one light source is on.

Changing the inclination and azimuth of the light source changes how the user views the model, what parts of the model are illuminated, how much light is reflected back towards the eye point, etc. Changing the lighting position may leave parts of the 3D model unilluminated.

All changes in the light azimuth and light inclination change the position of the directional light source relative to the eye point.

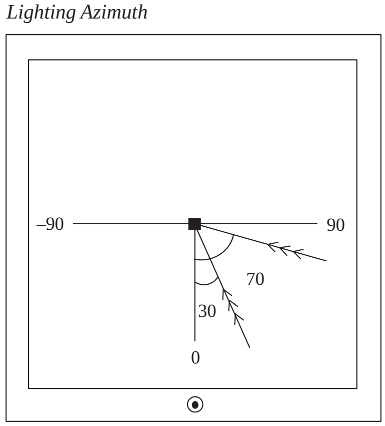
Lighting Angle Measurements

The azimuth and inclination of the directional light sources are measured from the eye point to the look point as described below:

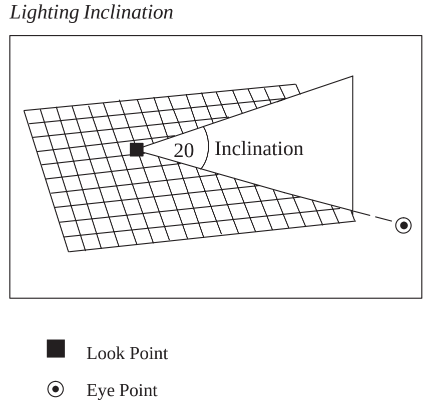
- Azimuth . . . . . . The heading or direction in the horizontal plane from the eye point to the look point (generally the center of the model), where 0.0 is looking from the user towards the workstation.
  – Permissible range: –90 to +90
  – Default: 0
- Inclination. . . . . The angle above the horizon or horizontal plane that includes the eye point and the look point, measured as degrees.
  – Permissible range: –90 to +90
  – Default: 0

When the azimuth and inclination are both at 0, the light sources are directly behind the eye point.

Lighting Azimuth



Lighting Inclination



Light Azimuth

Individual dials are used to change each light's azimuth. Any change in the light azimuth is relative to the eye point, when looking down on the model from above.

The table below indicates the position of the light source at different angles when the inclination is equal to 0° and how to achieve those positions from the default:

Angle	Light Source	Action
+90º	To the right of the eye point	Move dial pointer counter-clockwise or click on right arrow beneath dial
0º	Directly behind the eye point (default)	
–90º	To the left of the eye point	Move dial pointer clockwise or click on left arrow beneath dial

By default, the menu arrow buttons change the azimuth in 10° increments; this value can be changed, however. Refer to *Change the Look Point*, page 3DV 4-154, for more information. The light azimuth can also be changed by clicking with the left mouse button in the value box below the dial and typing in a new value; the 3D Viewer prompts for the new value in the Status Window. No hot key is available for changing the light azimuth.

Light Inclination

Individual dials are used to change each light's inclination. Any change in the light inclination is relative to the eye point.

The table below indicates the position of the light source at different angles when the azimuth is equal to 0° and how to achieve those positions from the default:

Angle	Light Source	Action
+90º	Raised to the top of the screen, pointed down perpendicularly to the eye point view	Move dial pointer counter-clockwise or click on right arrow beneath dial
0º	Directly behind the eye point (default)	
–90º	Lowered to the bottom of the screen, pointed up perpendicularly to the eye point view	Move dial pointer clockwise or click on left arrow beneath dial

By default, the menu arrow buttons change the inclination in 10° increments; this value can be changed, however. Refer to *Additional Mouse Button Features*, page 3DV 4-149, for more information. The light inclination can also be entered directly by clicking with the left mouse button in the value box below the dial and typing in a new value; the 3D Viewer prompts for the new value in the Status Window. No hot key is available for changing the light inclination.

Second Light Source

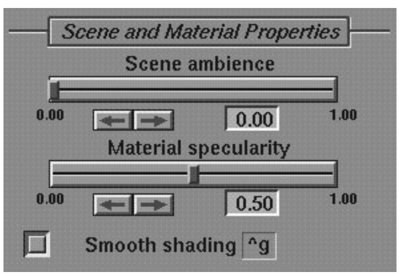
The *Second Light Source* toggle button controls whether one or two directional light sources are used. By default only one light source is available. When this command is on, a second light source illuminates the model and the second set of lighting controls becomes active. The second light source has an azimuth and inclination of 0°, by default.

Light Intensities

The *Light Intensities* slider bar has one slider handle (purple) on it if only one light source is on and two slider handles on it if two light sources are on (one in purple and one in red). The purple handle controls the intensity for the first light source; the red handle controls the intensity for the second light source. Text boxes and arrows are also available for controlling the light intensity; when two light sources are present, the left-most set controls the first light source and the right-most set controls the second light source. (For more information on using the slider bar controls, please refer to *Slider Bars,* page 3DV 3-15.) By default, both settings are at the highest intensity-a value of 1.

Scene and Material Properties

Scene Ambience



Ambient light is a non-directional light source meaning that it illuminates the model equally from all directions. Ambient light is also reflected equally in all directions. The effect on the model is independent of the position of the model and the orientation of the eye.

The default *Scene Ambience* value is 0.2 on Linux® machines and 0.0 on all other machines, on an arbitrary scale of 0 to 1. Moving the slider handle to the right, thus increasing the scene ambience, creates a highly lit, paler scene. Clicking on the right-arrow menu below the slider has the same effect. Decreasing the scene ambience (moving the handle to the left or clicking on the left-arrow menu button) creates a darker, richer scene. The left menu arrow decreases the scene ambience by 0.1, by default; the right arrow increases it by 0.1, by default. The arrow increment can be altered; refer to *Additional Mouse Button Features,* page 3DV 4-149. In addition, a value can be entered directly by clicking with the left mouse button on the value box below the slider and entering in the desired value. The smallest allowable increment is 0.01.

Material Specularity

Specularity describes to what degree the directional light is reflected by the 3D model. The reflected light tends to give the surfaces a three-dimensional quality, although in some cases the user may want to change the reflectivity (e.g., when a slice is pointed directly at the eye point, a high value for the material specularity causes the face to appear white).

When a surface reflects 0% of the directional light, the model appears to have a matte surface. No directional light is reflected back to the user; therefore, no highlights are seen on the model. This type of matte surface is sometimes desirable when highlights obscure details of the model.

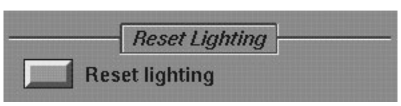
When a surface reflects 100% of the directional light, the user sees reflected highlights on the surface of the model, depending upon the model, the position of the light source, and the angle of view. A highly specular surface produces highlights that can add realism to a 3D model.

The default setting for the material specularity is 0.5 (the median amount of reflective light). Changing this setting decreases the reflectivity of the model, with a setting of 0 indicating 0% reflected light. The left and right menu arrows decrease and increase the material specularity by 0.1, respectively, by default. The amount of change can be altered; refer to *Additional Mouse Button Features*, page 3DV 4-149. In addition, a value can be entered directly by clicking with the left mouse button on the value box below the slider and entering in the desired value. The smallest allowable increment is 0.01.

Smooth Shading

All isosurfaces (whether part of a faces file or 3D grid) and 2D grids displayed in the 3D Viewer are made up of polygons that create a faceted model. By default, when viewing a faces file, a type of shading, known as Gouraud shading, is used that causes all the facets to appear as one smooth surface. Alternatively, the user can opt for flat shading, thereby seeing all of the polygons that make up the model. Since the Gouraud shading introduces a level of approximation via its smoothing, a user might want to view the polygons that were actually interpreted between the grid nodes. In addition, flat shading could be used to place or locate the 3D cursor at a particular point.

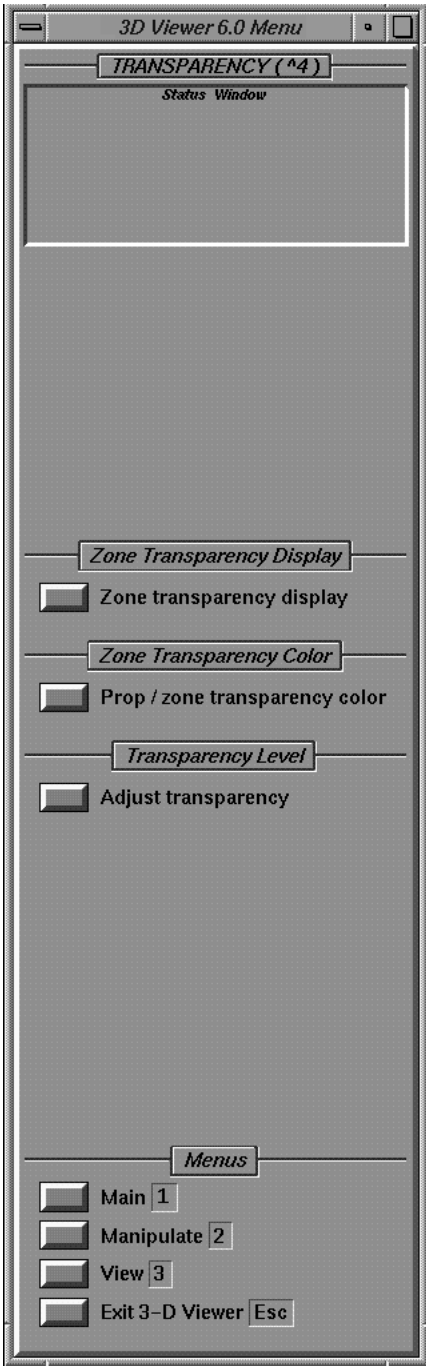
Reset Lighting



The *Reset Lighting* menu button (via a pop-up menu) resets the light azimuth and inclination, the scene ambience, the material specularity, and the smooth (gouraud) shading to the program defaults. Clicking on a lighting attribute in the pop-up menu selects or deselects the item; an asterisk indicates that feature will be reset. Once all selections are made, clicking on *No More Resets* causes the lighting to be reset. No hot key is available; however, the “Home” hot key can be used to bring up the *Reset Attributes* pop-up menu (using this feature would reset all of the lighting parameters). Refer to *Reset Attributes* (page 3DV 4-27) for more information.

By default, the *Smooth Shading* toggle button is on (i.e., Gouraud shading is on). Clicking on the toggle button, or typing the “^g” hot key, turns the Gouraud/smooth shading off.

Transparency Menu



Generally, the structure surfaces and X, Y, and Z planes of a faces file are viewed as solid surfaces; that is, the user cannot see what is behind the surface. Using the transparency feature, a 2D grid and/or the vertical boundaries of a 3D model can become transparent-the user can see through the surface to whatever is behind it. Only the top transparent surface is seen when transparency is selected for more than one zone.

Transparency is selected on a zone-by-zone basis; buttons are available on the Transparency Menu (hot key “^4”), shown at left, for each of the transparency features:

- Zone Transparency Display . . . . controls whether zone surfaces are displayed transparent
- Property/Zone Transparency Color . . . . controls the color of transparent isosurfaces or structure surfaces for each zone
- Transparency Level . . . controls the degree of transparency

Transparency Requirements

Two requirements must be met in order to view transparent surfaces; they are related to the following two issues:

- The isosurface levels set
- The display of property colors (versus zone color) within a zone

If these parameters are not met, a warning message appears in the Status Window indicating what the user needs to do in order to view transparency.

The four figures on 3DV Fig-8 illustrate the steps needed to view transparent surfaces. These steps are discussed next.

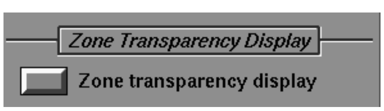
Isosurface Settings

Isosurfaces must be selected for display in order to see the transparent surfaces (refer to *Adjust Isosurfaces*, page 3DV 4-17, for more information on selecting the isosurface level range). When a zone is displayed using transparency, the top surface and sides of the zone, and only those regions that are outside of the isovalue range selected for display, appear transparent (that is, the isosurfaces set for display are displayed; everything else in the zone is transparent).

Property Settings

In addition, the Zone Menu must have property selected in the zone for which transparency is desired. The *Property/Zone Transparency Color* push button can be used to view a transparent zone in its zone color.

Zone Transparency Display



Selecting the *Zone Transparency Display* button brings up a pop-up menu that controls transparency. When off (as indicated by the absence of asterisks in the pop-up menu), the surfaces are shown as solid surfaces. Selecting any zone in the pop-up menu turns transparencies on or off; an asterisk (*) indicates that transparency is on for that zone. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

When more than one surface is transparent, the physically higher surface (presumably the highest numbered zone) takes precedence over any transparent surfaces that are lower; i.e., the highest surface is shown in the transparent zone color selected (discussed next), and, while the lower zones are transparent, the transparent color is only shown on the sides of the zone. This restriction is implemented so that the transparency of lower zones do not to interfere with the highest zone.

The middle-right figure and the lower figure on 3DV Fig-8 show transparency in zone 1.

Property/Zone Transparency Color

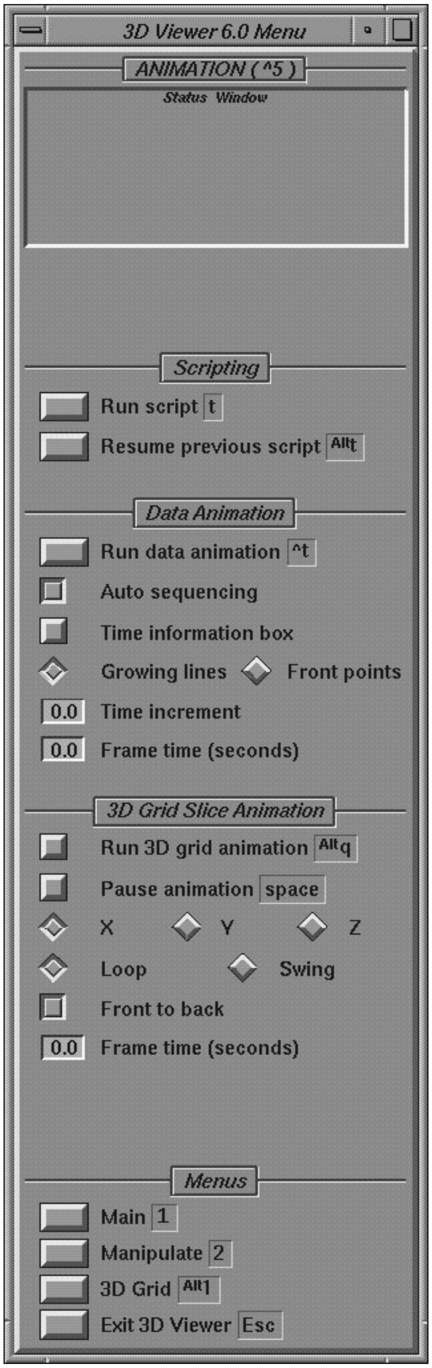
When a zone is displayed using transparency, the transparent region can either be displayed in a transparent version of the property colors that would have appeared if all the isovalue shells were displayed, or in a transparent version of the zone color. By default, zone transparency colors are turned on in all zones, as indicated in the *Prop/Zone Transparency Color* pop-up menu. Zone transparency colors are the default since sometimes viewing the transparent property colors can be confusing. As a first look, it is helpful to start off with transparent zone colors, then move to transparent property colors. The last two figures on page 3DV Fig-8 show transparency in zone 1. The middle-right figure shows transparency with zone colors while the bottom figure shows property transparency colors.

Selecting any zone name in the pop-up menu turns on or off property transparency colors; an asterisk (*) indicates property colors. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

Transparency Level

The degree of transparency is controlled by selecting the *Adjust Transparency* button on the Transparency menu. After clicking on *Adjust Transparency*, a menu appears with the three choices of *low*, *medium*, and *high*, and a *No Selection* entry. Low transparency is the most opaque (least transparent) of the three settings. Layers may be almost completely opaque if dark colors are displayed. Medium transparency is the default setting. High transparency is the most transparent of the three settings, and, depending upon colors displayed, the layers may be almost invisible.

Animation Menu

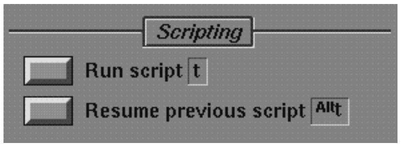


The Animation menu (hot key ^5), shown at left, contains commands controlling the ability to sequence through the information in certain file types:

- Script Files . . . . .A script file can be selected and cycled through, creating a movie of views of the faces, data, grid, and vue files it lists (*Run Script* command; hot key “t”).
- Scattered Data Files. . . .If a time field exists in a scattered data file, the data points can be drawn on the screen in time order, creating a movie sequence of the data points (*Data Animation* commands; hot key “^t”).
- 3D Grid Slices. . . . . . . .The planar slices of a 3D grid can be automatically cycled through in the X, Y, or Z directions (hot key “Alt-q”).

Script File Animation

Run Script



Vue files can be cycled through automatically by using a script file, thereby creating a “movie” of views. Script files are discussed in Chapter 2, *3D Viewer File Types* (page 3DV 2-17). Selecting the *Run Script* menu button (or the “t” hot key) runs the script file. The 3D Viewer supplies a pop-up menu of all files in the directory ending with *.script*, if a script file was not previously used in the current 3D Viewer session. If a script file has been run previously during the current 3D Viewer session, then the pop-up menu also includes the item *Resume Previous Script*. If *Other .script File* is selected, the user is prompted for a name of a new script file.

To run a script file without entering the 3D Viewer, the following command is used:

```
evview <file>.script
```

Refer to *Script Files* (page 3DV 2-17) for more information.

Script Commands

Several keystroke commands exist for manipulating a script. They are:

Key	Action
Space bar	Toggles between pausing and resuming the script
Right arrow key	Advances script one vue at a time (while paused)
Left arrow key	Reverses script one vue at a time (while paused)
Alt-t	Resumes previously interrupted script
Esc	Exits the script at any time
Esc, Esc	Exits the script, then the 3D Viewer

Pause or Interrupt Script

Once a script is running, it can be temporarily suspended either by pressing the space bar or by including the script file parameter *interrupt* in the *.script* file (refer to 3DV 2-17). These two techniques work differently, however. When pressing the space bar, the 3D Viewer will most likely be in the process of loading the next view already, so the space bar causes the pause to occur after the next vue file. The space bar acts as a toggle: once the script is paused, pressing the space bar again causes the script to resume. (The 3D Viewer can be made interactive by selecting the Esc key.)

Alternatively, using the *interrupt* script file parameter stops the script at the most recently loaded view (without starting to load the next view). It also automatically makes the 3D Viewer interactive. To continue with an interrupted script, *Resume Previous Script* must be selected from the Animation Menu, from the *Run Script* pop-up menu, or using the “Alt-t” hot key. The script then resumes at the line following the *interrupt* line.

Exit Script

Using the *interrupt* script file parameter automatically exits a script.

To exit pause mode and resume the script, use the space bar (again).

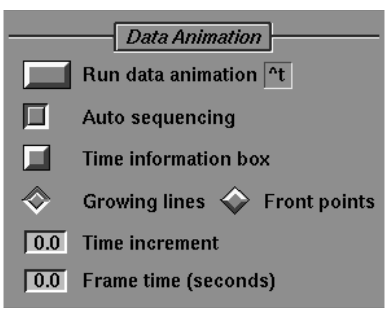
To exit pause mode or a running script and return to the 3D Viewer, use the Esc key. After exiting pause mode, the current view can be manipulated. When exiting from a running script, most likely the 3D Viewer will already be loading the next view, therefore the next view will be the one that the user can manipulate.

To exit the 3D Viewer entirely from either pause mode or a running script, press the Esc key twice. Again, the next view will most likely display prior to exiting the 3D Viewer, since it will already have begun to load.

Resume Previous Script

If a script file has been run within the current 3D Viewer session and it was stopped in any of the manners previously discussed, the script file can be restarted by selecting the *Resume Previous Script* function or the “Alt-t” hot key. (Alternatively, the *Resume Previous Script* function can be selected from the *Run Script* pop-up menu.) The script then resumes at the line following the interruption or pause.

Data Animation



The 3D Viewer can display data points from a file sequentially, based on a time field within the scattered data file. The required time field is discussed in *Scattered Data Files* (page 3DV 2-1). The data must be in increasing time order within each line or well ID (if the field exists). In addition, the data animation is run only on the active edit file (as defined on the Edit Data menu, page 3DV 4-83).

Run Data Animation

The *Run Data Animation* command or the “^t” hot key starts the cycling through the display of the data points in the active edit file (as defined on the Edit Data menu, page 3DV 4-83). The data points are cycled through only once. How the points are displayed is dependent on the other settings on this menu.

Once the data animation has started, it continues through all the data; it can, however, be interrupted using the Esc key, regardless of whether auto-sequencing is on or off. When *Auto-Sequencing* is off and data animation is run, the right arrow key on the keyboard is used to sequence through the time steps. Each time the user presses the arrow key, the new picture of the data (as controlled by the other settings) is displayed. When the data animation is running, a time bar indicates where within the data the animation is; refer to *Time Information Box* (page 3DV 4-115). All the data must be cycled through, or the interrupt character used to stop the animation.

Growing Lines, Front Points, and Growing Symbols

During data animation, the data points can be displayed in one of two ways:

- Growing Lines . . . . At each time step, the new points are drawn on the screen and the points previously drawn remain on the screen.Only existing points are drawn with whatever viewing parameters (e.g., symbol size, symbol transparency, etc.) are specified; no interpolated points are displayed.

  If the file contains a line ID or well ID field, the points are connected by lines. If no points exist at the specific time step, and a line or well ID is present, the 3D Viewer interpolates a location for the time step and a line is drawn (without an additional point) to that location.

  The addition of successive points and interpolated line locations has the effect of creating "growing lines."

- Front Points . . . . At each time step, *only* the new points are drawn on the screen; previously drawn points are erased. If no points exist at a specific time step, the 3D Viewer interpolates the position at that given time and draws a point. Drawing only the new points has the effect of seeing only the front points of the lines. Because the new points are added to the display and the old points must be removed, the entire display must be redrawn each time. These redraws mean that, given the same data animation parameters using *Front Points* will take longer than using *Growing Lines*. Changing the other data animation parameters can speed up this process.

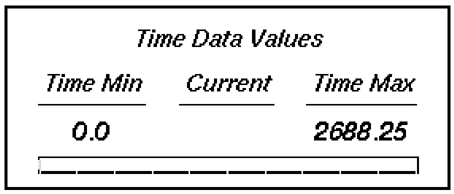
  Changing symbol size: When using *Front Points*, in addition to the XYZ location being interpolated at a given time, if a symbol size (`symsize`) field is present, the size of the symbol will also be interpolated. In this way, the symbol size can be used to show such characteristics as increasing or decreasing concentrations with time.

Auto Sequencing

By default, when data animation is run, the 3D Viewer automatically cycles through all the data points in the file. This process is known as "auto-sequencing." Auto-sequencing uses the time increment and frame time to determine the animation. When *Auto-Sequencing* is off, the user controls when the data are posted (i.e., the frame time control is not used). When auto-sequencing is off and data animation is run, the right arrow key on the keyboard is used to sequence through the time steps. Each time the user presses the arrow key, the new picture of the data (as controlled by the other settings) is displayed. The user must cycle through all the data. Regardless of whether *Auto-Sequencing* is on or off, the animation can be interrupted using the Esc key.

Time Information Box

By default, if a data file that contains a time field is selected for display and the time field is not selected to be displayed as a Z-field, the time field can be used for animation, and an information box regarding the time field is automatically displayed on the screen (shown below). The box displays the minimum and maximum time values found in the file, along with a time bar and a spot to show the current time step during data animation. While the data animation is running, the time bar fills from left to right; the bottom portion of the time bar is divided into tenths to give a visual idea of how far along an animation sequence is. As the animation is running, the *Current* entry in the *Time Information Box* is filled in with the time at that point in the animation. The *Time Information Box* function toggles on and off this information box.



Time Increment

The *Time Increment Value* specifies the time step between each display in the animation when *Auto-Sequencing* is on or off. The first display is always of the data with a time value of 0.0. After that the amount of data shown for *Growing Lines* or the interpolated location for *Front Points* is determined by the *Time Increment*. For example, if the times listed in the time field range from 1 to 10, then, when using *Growing Lines*, a time increment of 2 would result in the data between 1 and 2 being displayed in the first display (after the initial time = 0 display); 1 and 4 in the second display; 1 and 6 in the third; etc. If *Front Points* only were on, then the first display would show the points within each line/well ID with a time value equal to 2 if any exist or would interpolate points for each line/well ID if the time minimum for the line is less than 2 seconds (i.e., no points are interpolated prior to the time min or after the time max of a line). The second display would show the existing or interpolated points with a time value equal to 4, and so on.

The *Time Increment* can be changed by selecting the text box with the left mouse button. A message appears in the Status Window, prompting for the new time increment.

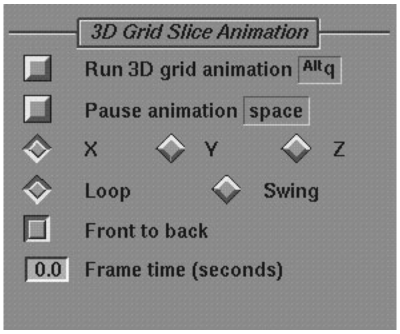
Frame Time (seconds)

The *Frame Time* specifies the minimum amount of time each display remains on the screen. The frame time is entered in seconds (a fraction of a second is allowed) and is used only when *Auto-sequencing* is on (when *Auto-sequencing* is off, the user determines how long a view is on the screen by when the right arrow key is pressed). The default is 0, meaning the animation is run as quickly as possible.

The *Frame Time* can be changed by selecting the text box with the left mouse button. A message appears in the Status Window, prompting for the new frame time.

3D Grid Slice Animation

Run 3D Grid Animation



The *Run 3D Grid Animation* function (or the "Alt-q" hot key) cycles through the planar slices of a 3D grid one at a time along any one user-specified axis. Once the animation is started, pressing the "Escape" key ends the animation; pressing the Spacebar pauses it (see below). Only one planar direction can be animated at a time.

The animation is restricted to the X, Y, or Z slicing ranges set prior to starting the animation.

During the animation, the rotate, zoom, and pan hot keys are still functional. These hot keys include the arrow keys (for rotation), the "i" and "o" keys (for zoom in and zoom out), the ctrl-arrow keys (for panning), and the ctrl/shift/alt + mouse button keys (for rotation, zooming, and panning). Refer to *Additional Mouse Button Features* (page 3DV 4-149) and *Additional Hot Key Features* (page 3DV 4-156) for more information on these functions.

Pause Animation

When the 3D grid slice animation is running, selecting the space bar pauses the animation. The 3D Viewer becomes active, and can be used to rotate, zoom, or pan the model to achieve a better view, for example. Pressing the *Pause Animation* button or the space bar again resumes the animation in the current viewing position from the planar slice at which the 3D Viewer left off.

X, Y, Z

The *X*, *Y*, and *Z* radio buttons select which set of planar slices will be cycled through for the animation.

Loop, Swing

The *Loop* and *Swing* radio buttons define the action when the animation reaches the end of the planar slice's range. *Loop* repeats the animation in the same direction, starting back at the beginning (or end) after the last (first) slice is reached (depending on the *Front to Back* setting, discussed next). *Swing* reverses the direction when the animation reaches the end.

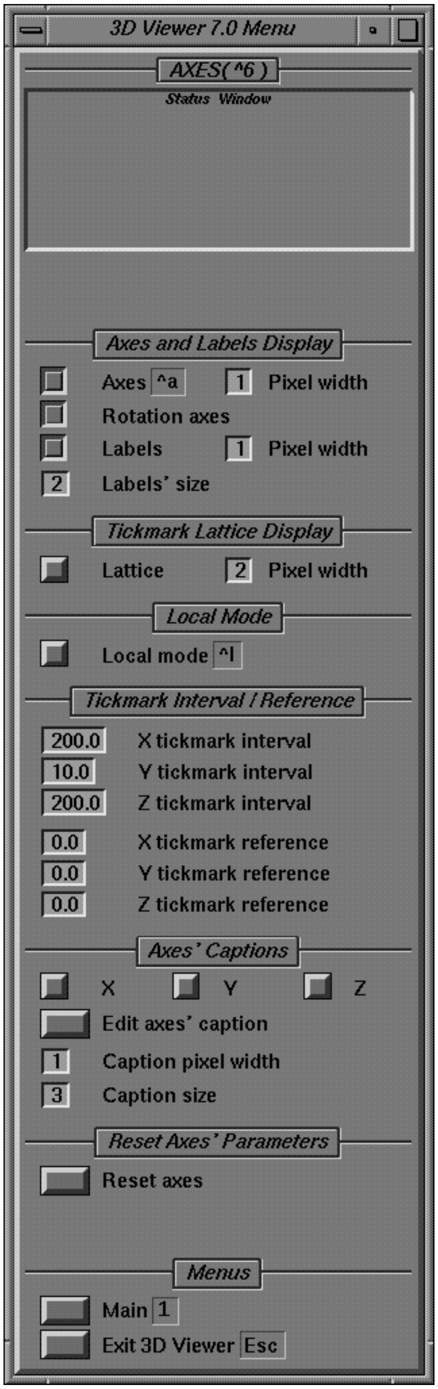
Front to Back

The *Front to Back* toggle specifies whether the first slice of the animation should be the one closest to the eye point (*Front to Back* is on, the default) or furthest (*Front to Back* is off).

Frame Time

The *Frame Time* is used to specify the minimum amount of time (in fractional seconds) each display remains on the screen. The default is zero, meaning the animation is run as quickly as possible.

Axes Menu

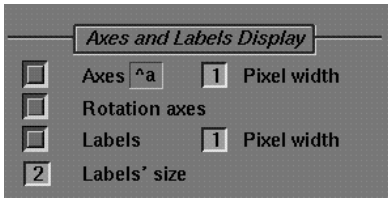


The Axes Menu (hot key "^6") controls the display of the axes, labels, tick marks, and captions that surround the model display. The following commands are available:

- Axes' Display On/Off (hot key "^a")
- Rotation Axes Display On/Off
- Axes' Pixel Width
- Labels and Tick Mark Display On/Off
- Labels' Pixel Width
- Labels' Text Size
- Tick Mark Lattice Display On/Off
- Tick Mark Lattice Pixel Width
- Local Mode (hot key "^l")
- Tick Mark Interval
- Tick Mark Reference Value
- Axes' Captions Display
- Axes' Captions Pixel Width
- Axes' Captions Text Size

Each of these commands can be controlled via this menu or via vue file parameters (discussed in Appendix B). Each command is described next.

Axes and Labels Display



A model is displayed within a wire frame, known as the axes, with tick marks and labels displayed along the three axes closest to the front of the screen. The commands in this section control the display (on/off) and width of the axes, labels, and tick marks, as well as the text size of the labels.

Axes

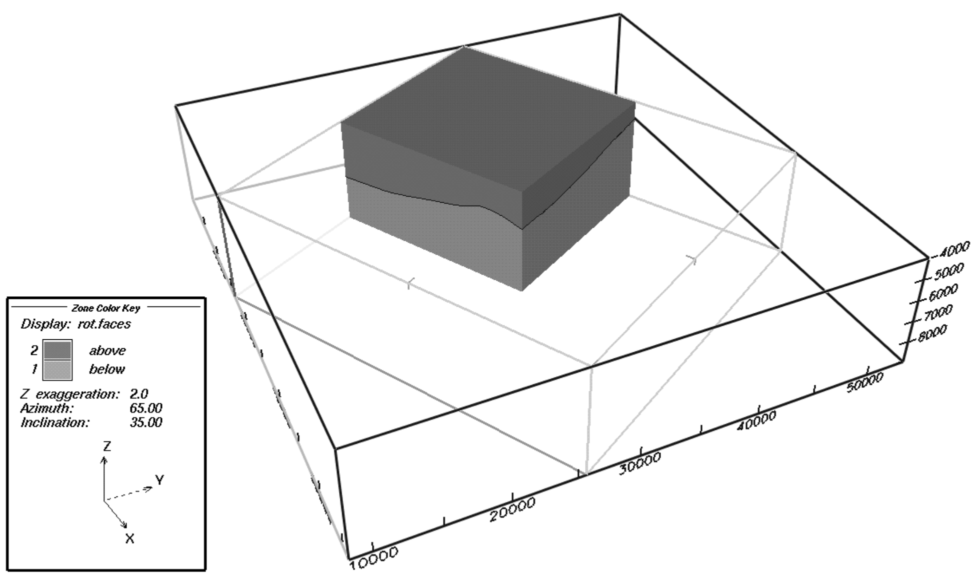
The *Axes* toggle button turns the model wire frame or axes on or off. By default, the axes are displayed. The thickness of the axes is controlled by the *Pixel Width* button, discussed next.

Axes' Pixel Width

The line thickness of the wire frame's axes can be changed via the *Pixel Width* value box. By default, the axes are drawn using only 1 pixel width (pixels are the dots that compose the screen); this command controls the thickness of the axes, allowing it to vary between 1 and 4 pixels wide. Changing the line thickness is useful when taking photographs or videos of the 3D Viewer screen display: the width can be increased so that the axes are more visible (or the axes can be turned off entirely). The width can be from 1 to 4 pixels. The current width of the axes is shown in the value box and is indicated by an asterisk on the pop-up menu.

Rotation Axes

When a rotated faces file or grid is displayed, an additional set of axes is displayed (as shown below). Axes are drawn around the rotated area, with the X, Y, and Z origin axes drawn in red, green, and blue, respectively. The *Rotation Axes* toggle button turns these axes on or off.



Labels

The *Labels* toggle button turns on or off the tick marks and numeric labels along the axes. The display of the labels and tick marks is, therefore, independent of the axes display. The thickness of the labels and the tick marks is controlled by the *Labels' Pixel Width* function, discussed next. By default, the labels and tick marks are on.

Labels' Pixel Width

The line thickness of the numeric labels and tick marks along the axes can be changed via the *Pixel Width* value box. By default, the numbers and tick marks are drawn using only 1 pixel (pixels are the dots that compose the screen). Clicking on the value box, the width can be changed from 1 to 4 via the pop-up menu. The current width of the labels is shown in the value box and is indicated by an asterisk on the pop-up menu.

Changing the line thickness can be useful when taking photographs, videos, or screen dumps of the 3D Viewer screen display.

Labels' Size

The height of the numbers of the tick mark labels is set via the *Labels' Size* value box. Selecting the box causes a pop-up menu to appear listing values from one (1) to six (6). An asterisk is placed by the current size value (and displayed in the value box), which, by default, is 2; a larger number produces larger characters.

Tick Mark Lattice Display

Tick Mark Lattice

The *Tick Mark Lattice* command toggles a see-through lattice on and off; by default, the lattice is off. The lines making up the lattice are spaced at each tick mark along each of the three axes. *These lines do not represent lines of grid nodes*. The color of the lines changes depending on which face they lie: the X plane has a gray lattice; the Y plane, a blue lattice; and the Z plane, a green lattice. The lattice can only be seen on the three front-facing planes.

Tick Mark Lattice Pixel Width

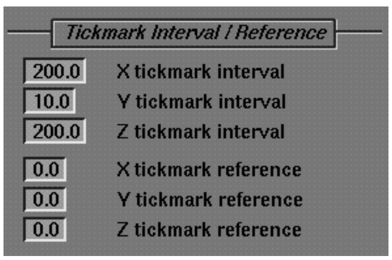
The line thickness of the tick mark lattice can be changed using the *Tick Mark Lattice Pixel Width* value box. By default, the lattice is drawn using only 1 pixel (pixels are the dots that compose the screen). The width can be set between 1 and 4 pixels via a pop-up menu selected from the *Tick Mark Lattice Pixel Width* box. The current pixel width is shown in the value box and is indicated by an asterisk on the pop-up menu.

Changing the line thickness can be useful when taking photographs, videos, or screen dumps of the 3D Viewer screen display.

Local Mode

The *Local Mode* command and the “^l” hot key toggles the X and Y coordinates displayed along the axes between Local Rectangular and data scale coordinates. Local mode, when on, puts the X and Y coordinate values into Local Rectangular coordinates by moving the (Xmin,Ymin) location to (0,0). The Z coordinates are not affected by the this command.

Tick Mark Interval / Reference



The data interval at which the tick marks are displayed along each of the three principal axes (X, Y, and Z) is controlled by the three functions in this section. Where the tick marks are placed is controlled by both these functions and the *Tick Mark Reference Values* functions.

X, Y, and Z Tick Mark Intervals

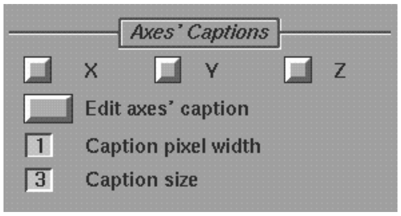
The intervals for the tick marks along the X, Y, and Z axes can be specified by clicking the cursor in the *X Tick Mark Interval*, *Y Tick Mark Interval*, *Z Tick Mark Interval* value boxes, respectively. A message in the Status Window prompts for the new value to be entered. Any value can be entered. The display is redrawn with the tick marks based on the new interval and the *X, Y,* or *Z Tick Mark Reference Value*.

X, Y, and Z Tick Mark Reference Values

The reference value, or starting point, for calculating the axes tick marks can be set to a number other than the default value of zero. For example, if the X tick mark interval is 10 and the X axis ranges from 100 to 150, with an X tick mark reference value of 0, the tick marks will be drawn at 100, 110, 120, etc. On the other hand if an X tick mark reference value of 5 is used, the tick marks will be drawn at 105, 115, 125, etc.

A new reference value for the X, Y, and Z axes can be entered by clicking on the *X Tick Mark Reference, Y Tick Mark Reference*, or *Z Tick Mark Reference* value box, respectively. A message in the Status Window prompts for the new value to be entered. Any value can be entered; the default value is 0. The display is redrawn with the tick marks based on the new reference value and the *X, Y,* or *Z Tick Mark Interval*.

Axes Captions



By default, no captions are displayed along the axes; however, a single line of text can be placed along each of the three axes closest to the viewer. The size, line width, and wording of this text can be controlled with the functions available in this section.

X, Y, and Z Toggle Buttons

These buttons control the display of the captions along the X, Y, or Z axes. By default, no caption is displayed along the axes. If no caption has been previously specified (either by using the button or via a vue file parameter), then turning on and off the toggle buttons causes a message in the Status Window to appear prompting for the caption. If a caption has previously been specified, then this command merely toggles the caption on or off for the specified axis (the caption can be edited using the *Edit Axes' Caption* menu button).

Edit Axes' Caption

The *Edit Axes' Caption* menu button is used to edit any of the captions along the axes. A pop-up menu appears on the screen listing the X, Y, and Z axes, and *No Selection*. After selecting the desired axis, a message in the Status Window prompts for the new caption.

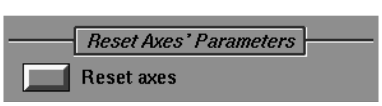
Caption Pixel Width

The line width of the caption text along the data axes can be controlled via the *Caption Pixel Width* value box. After clicking on the box, a menu appears listing 1 to 4. An asterisk appears next to the current width value; by default, it is 1.

Caption Size

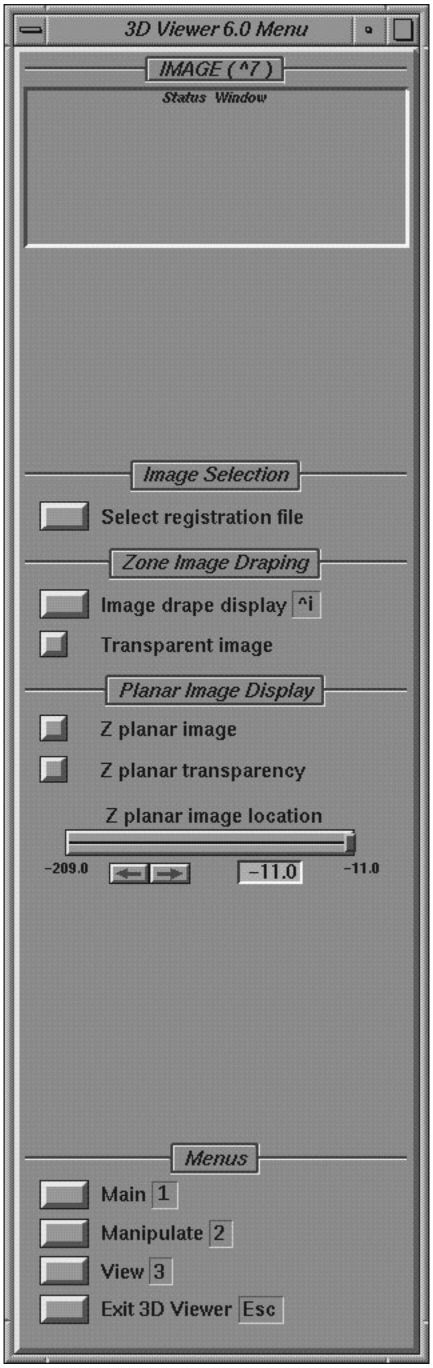
The height of the letters of the captions along the axes can be controlled via the *Caption Size* value box. Selecting this function causes a pop-up menu to appear listing values from 1 to 6. An asterisk is placed by the current size value, which, by default, is 3; a larger number produces larger characters.

Reset Axes Parameters



Any or all of the parameters set on the Axes Menu can be reset back to their default values using the *Reset Axes* command. Selecting this command causes a pop-up menu to appear, listing each of the parameters listed on the Axes Menu, along with entries for *Reset All Above*, *Retain All Above*, and *No More Resets*. Individual parameters can be reset by clicking on the item; an asterisk appears next to the items to be reset. When all the selections are made, clicking on the *No More Resets* entry causes the selected parameters to be reset. To reset all the parameters to their default values, click on *Reset All Above*, followed by *No More Resets*.

Image Menu



The Image Menu (hot key "^7"), shown at left, controls the display parameters of an image, if available, either draped on the top surface of any zone in a faces file or placed as a flat image within the display. It can be quite useful to drape a flat image onto a faces file; for instance, a heavily annotated map can be placed on a model of a region and show the placement of landmarks. A planar image can be set to honor or ignore chair mode. Both planar and draped images can be set to be transparent. An example of a draped image is shown in the top figure on page 3DV Fig-1. The available parameters are as follows:

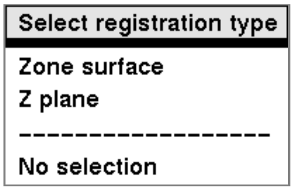
- Image Selection
- Zone Image Draping
- Planar Image Display

The functions are discussed next. For a discussion on creating an image registration file necessary for displaying an image file, please refer to the *Image Registration* discussion in the *Utilities* document.

Note: When draped on a zone, an image is always part of that zone and cannot be manipulated separately. If it is desired to manipulate the image separately (e.g., to display the complete image while in chair mode, or, if a zone is removed, floating in space), a 2D grid file representing the desired surface (or plane) for draping must be merged with the faces file; the image can then be draped on the new zone represented by the 2D grid file. Merging a faces file with a 2D grid file can be performed using the Faces File Merging program, discussed in the Faces File Generation and Merging document.

Image Selection

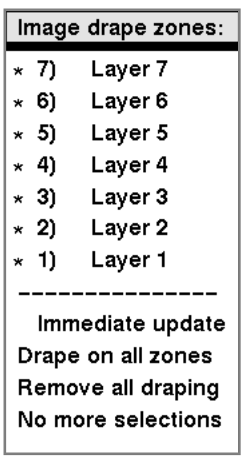
It is possible to display a flat or draped image with a faces file or 2D grid surface. An image is selected for display using the *Select Registration File* push button. An image registration file is required to locate the image pixels to real world X, Y coordinates, whenever an image file is to be displayed.



The *Select Registration File* push button displays a menu from which the type of registration surface is selected: either a zone surface or a Z plane.

Use *Utilities –> Data Import –> Image Registration* from the main EarthVision menu to create an image registration file. Image registration uses the SGI image (RGB) file (*.rgb*) and the surface with which it is to be displayed, and produces an image registration (*.imreg*) file that references the image file. The image file, when registered, must extend over some portion of the model. When displaying in the 3D Viewer, the image and registration files must exist in the current directory. The image registration file, containing the name of the image file and registration points, must be either selected using the *Select Registration File* push button or included in a *.vue* or *.2gvue* file (refer to Appendix B).

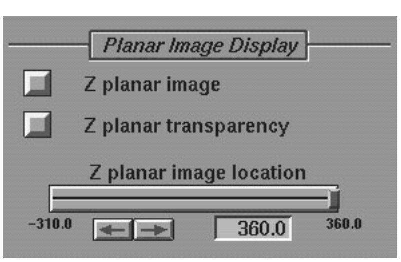
Zone Image Draping



The *Image Drape Display* push button (hot key "^i") invokes a pop-up menu of the zones in the current model with the following options:

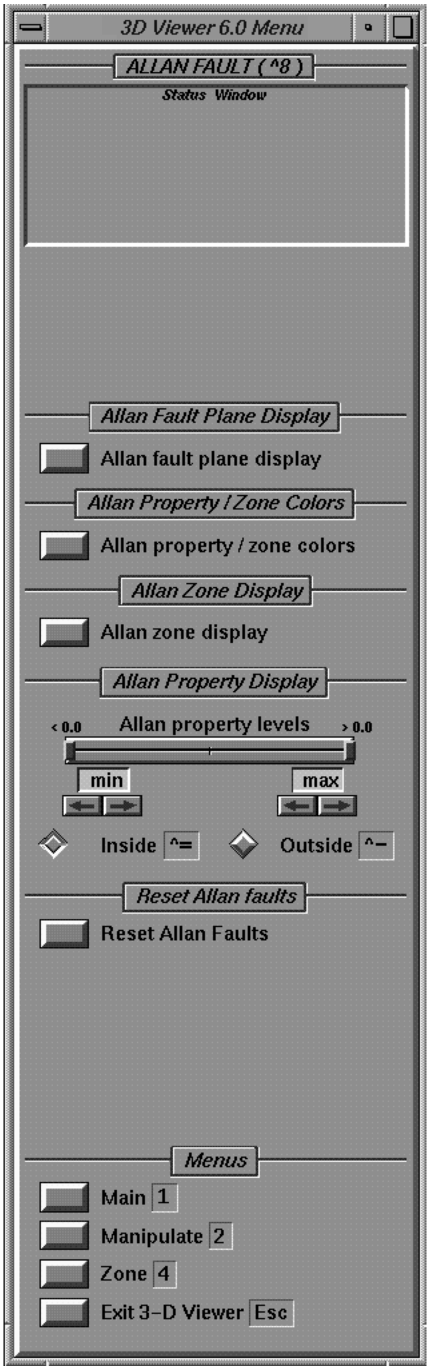
Menu Setting	Indicates
*	image is displayed
<empty>	no image displayed on zone
Immediate Update	change display immediately after each menu change, instead of after *No More Selections*
Drape On All Zones	turns image on in all zones at one time (default)
Remove All Drapings	turns image off in all zones at one time
No More Selections	removes menu and updates model display as appropriate with current settings

Planar Image Display



It may be preferable to display an image in a flat plane instead of draping it on a zone. Selecting the *Z Planar Image* toggle button turns on and off the selected image. The Z planar image can be displayed transparently by selecting the *Z Planar Transparency* toggle button, so that surfaces underneath or behind the planar image can be viewed. The Z position, in data scale units, can be modified using *Z Planar Image Location* slider bar or by selecting the value box and entering a new position.

Allan Fault Menu



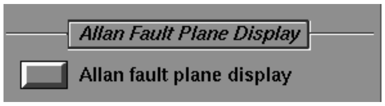
An Allan fault plane display is the ability to view the zone structures and/or properties on both sides of a fault simultaneously along the fault surface. Without the Allan Fault Plane display, the fault surface is viewed either as a solid grey surface or with only colors of the properties and/or zones from behind the fault surface displayed. Examples of Allan Fault Plane displays are shown on page 3DV Fig-9.

Note: Allan Fault Planes can only *be displayed on faulted zone volume faces files generated in EarthVision's Geologic Structure Builder, versions 2.0 or later.*

The Allan Fault Menu (hot key "^8") controls the display and attributes of the Allan fault plane diagrams. The following commands are available and discussed next:

- Allan Fault Plane Display
- Allan Property/Zone Colors
- Allan Zone Removal
- Allan Property Level Display

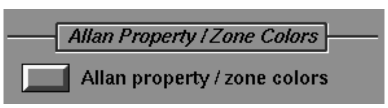
Allan Fault Plane Display



Allan fault planes can be displayed by selecting the *Allan Fault Plane Display* push button. Viewing both sides of the fault surfaces (i.e., the Allan fault plane) is, however, a two-step process: first, one of the two fault blocks on either side of the fault must be removed (via the *Edit Fault Block Display* function on the Zone menu; discussed on page 3DV 4-31), and then the fault is selected (by grid name) via the *Allan Fault Plane Display* push button. Selecting the push button displays a pop-up menu listing all of the 2D and 3D grid names used to construct the faults in the faces file, along with selections to *Display All Above*, *Remove All Above*, and *No More Selections*. An asterisk is displayed next to any grid whose Allan fault planes are to be displayed.

When Allan fault planes are turned on, the projection of the properties or zones of the removed fault-block are displayed transparently on the fault surface on top of the properties or zones of the remaining fault block. (The *Fault Face Color*, discussed on 3DV 4-77, is automatically set to *Property/Zone* if it was previously set to *Fault* color, so that both sides of the fault can be seen.)

Allan Property/Zone Colors



Allan fault plane displays can be drawn in colors representing either the properties modeled along the fault surface or the zones that intersect the surface. Two separate, distinct color tables are available for properties and zones (refer to *Screen Menu* (page 3DV 4-55) and *Using the Color Editors* (page 3DV 5-1) for more information on the different types of color tables). The *Allan Property/Zone Colors* push button invokes a pop-up menu from which zone or property colors can be selected on a zone-by-zone basis. By default, zone colors are displayed, denoted by the absence of an asterisk (*) next to each zone name. Property colors can be displayed on specific zones by selecting each zone name. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen. The figure shown on page 3DV Fig-9 displays zone colors on both sides of the fault.

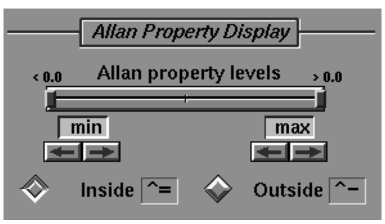
Note: *The* Allan Property/Zone Colors *pop-up menu only controls the color display of the transparent Allan fault display, i.e., the colors displayed on the missing side of the fault. The colors displayed on the remaining fault block are controlled by the* Property/Zone Colors *push button (hot key “Alt-p”) on the Zone menu (discussed on 3DV 4-31), just as they would be if the Allan fault plane display was not turned on.*

Allan Zone Display

Any zone can be removed entirely from the Allan fault plane display (regardless of whether property or zone colors are displayed in the zone), leaving the remaining zones showing. Removing the zone(s) only affects the 3D Viewer display and not the actual faces file. The *Allan Zone Display* push button invokes a pop-up menu from which zones can be removed. Zones selected for display are marked with an asterisk (*). By default, all zones are displayed. Removing all zones at once effectively removes the Allan fault plane display. Selecting *Immediate Update* causes selection changes to be carried out immediately, instead of when *No More Selections* is chosen.

Note: *The* Allan Zone Display *push button only controls the display of the transparent zones of the Allan fault display, i.e., the colors displayed on the missing side of the fault. The zone(s) displayed on the remaining fault block are controlled by the* Zone Display *push button (hot key "Alt-z") on the Zone menu (discussed on 3DV 4-31), just as they would be if the Allan fault plane display was not turned on.*

Allan Property Display



The Allan Property Display section contains menu commands to change which isovalue surfaces or levels are displayed on the Allan fault plane; property displayed for the remaining fault block is controlled by functions on the Manipulate Menu (discussed starting on page 3DV 4-12). Up to 64 isovalue intervals (created from 63 user-specified P-values) and two isosurface boundaries can be displayed. The user has the option to display all values, only those values within a chosen range, or only those values outside a chosen range.

Allan Property Levels

The *Allan Property Levels* slider bar is used to set the minimum and maximum isovalue level that is displayed. The property color corresponding to the level set is displayed along the fault surface, along with whatever other colors representing property values are less than or greater than the reference levels, depending on the settings (described next).

In addition to the slider bar, the Allan Property Display section has two menu buttons: *Inside* and *Outside*. *Inside* displays only those colors whose property values are within the minimum and maximum levels selected, as indicated by the handles on the slider bar. By default, *Inside* is in effect (as evidenced by the menu button being depressed), with the slider bar handles at the minimum and maximum; therefore, all colors are displayed. *Outside* displays only those colors whose property values are outside the minimum and maximum levels, as indicated by the handles on the slider bar. The *Inside* and *Outside* functions are mutually exclusive; selecting either menu button invokes that command.

Note: *Property colors only appear in zones where the property values are displayed; if zone colors are displayed, the full extent of the zone is shown. Refer to* Allan Property/Zone Colors, *page 3DV 4-125, for a discussion of property vs. zone colors. Property colors and isosurfaces for the rest of the model (excluding the Allan fault plane display) are controlled by functions on the Manipulate Menu, discussed under* Adjust Isosurfaces *on 3DV 4-17.*

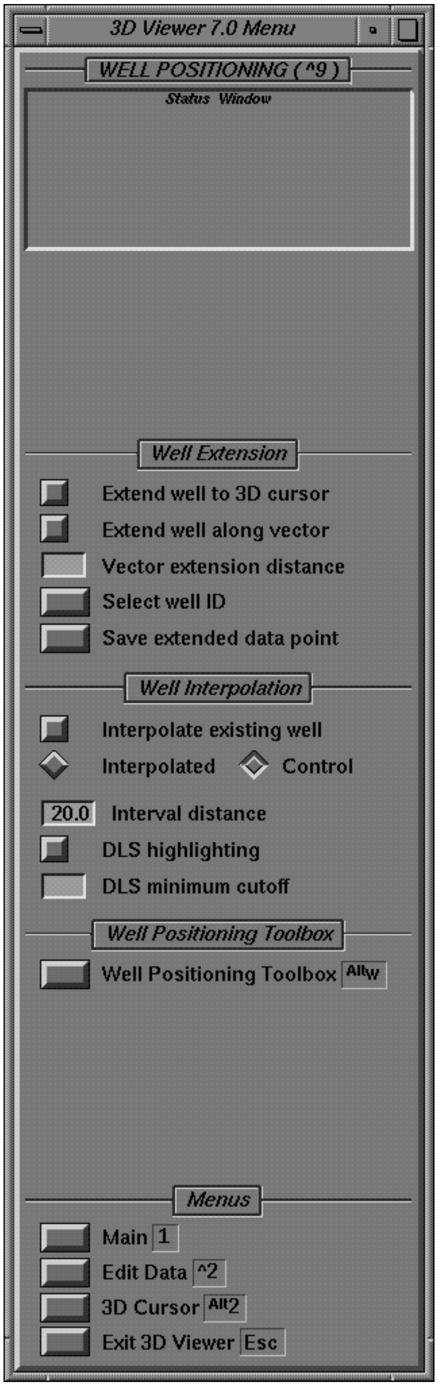
Property Level Hot Keys

Using the control key with the equals sign (^=) sets the model to the *Inside Property Level* settings; and using the control key with the minus sign (^–) sets the model to the *Outside Property Level* settings. These hot keys are analogous to the hot keys used for setting the isosurfaces for the entire model ("=" for inside and "–" for outside; refer to 3DV 4-19 for more information on these hot keys).

Reset Allan Faults

Each of the settings on the Allan Fault Menu can be reset to the program defaults by selecting the *Reset Allan Faults* push button. Selecting this button produces a pop-up menu that contains selections for: *Allan Fault Display, Allan Property/Zone Colors, Allan Zone Removal,* and *Allan Property Display*. Selecting any one of these items places an asterisk next to it, indicating that the menu item selected will be reset once the *No More Resets* function is selected. Any item can be unselected by simply reselecting it. In addition, two other menu items are available from the *Reset Allan Faults* pop-up menu: *Reset All Above*, which selects all of the Allan Fault functions to be reset, and *Retain All Above*, which sets all of the Allan Fault functions to remain in their current state.

Well Positioning Menu



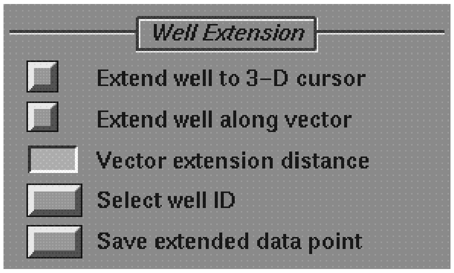
The Well Positioning menu (hot key "^9"), shown at left, contains commands controlling the placement of well path points. Positioning well paths in three dimensions can be a powerful and effective method for deciding on a proposed well path. Much more information can be readily used in three dimensions than in two. The sections on the Well Positioning Menu consist of the following:

- Well Extension
- Well Interpolation
- Well Positioning Toolbox

For a discussion of how to display a well path file along with a faces file or grid, please refer to the *Post Data Menu* discussion on 3DV 4-41.

Note: *Well paths generated by EarthVision's Well Positioning Toolbox are for planning tasks only and should not be used for drilling purposes without having their accuracy confirmed by directional drilling survey analysis programs.*

Well Extension

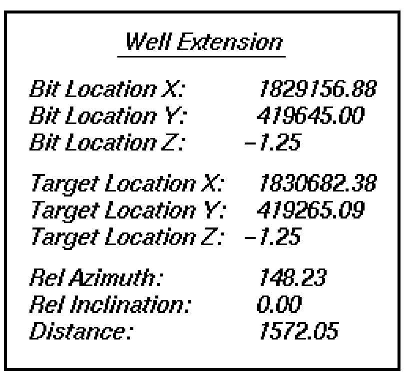


Two methods exist for extending a well: a well can be extended to the 3D cursor location or it can be extended in a straight line at a user-specified distance. A well path must first be displayed either by itself or with a faces or grid file (in which case, the *Add File* (hot key ^b) or the *Create New File* functions on the Edit Data menu must be used to display or create the file). The well path to be extended *must* be part of the active edit file (discussed on page 3DV 4-86).

Extend Well to 3D Cursor

Note: *Information of the 3D Cursor is discussed under the* 3D Cursor Menu *section (beginning on page 3DV 4-140).*

A proposed well path can be extended to the location of the 3D cursor with or without snapping it to the closest surface beforehand. After a data file is selected or created, and is designated as the active data file (see page 3DV 4-86) selecting the *Extend Well to 3D Cursor* toggle button sets an editing mode and turns on the 3D Cursor. Once the *Extend Well to 3D Cursor* toggle button is set on, a pop-up menu of all available well (or line) IDs is displayed. Once the well ID is selected, the user is prompted for which fields within the data file should be edited when a data point is saved (e.g., a P-value could be added at the new data point location). After selecting the desired well and fields, the well path is extended to include the current location of the cursor, although the point is not yet saved. In addition, certain information about the last point of the well (presumed to be the “bit location”) and the newly added point (presumed to be the “target location”) are displayed, as shown in the figure below.



The X, Y, and Z locations of the bit and target are displayed, along with the relative azimuth, relative inclination, and the distance between the two points.

Once all desired points are added and saved using the *Save Extended Data Point* function, the *Extend Well to 3D Cursor* toggle button can be turned off to end the extension session.

Note: *The point to which the well is extended is not saved until the* Save Extended Data Point *button is selected.*

The *Extend Well to 3D Cursor* and *Extend Well Along Vector* methods can be used in conjunction with one another: Once a method, a well or line ID, and the desired fields have been selected, choosing the other method retains the well ID and field information, allowing for easy extension of the same well. A new well (and fields) can be selected if desired via the *Select Well ID* push button.

Save Extended Data Point

If the location is not correct or needs to be modified, a new location can be specified by simply moving the 3D cursor to a new location (using either the middle mouse button on the cursor axes or functions on the 3D Cursor Menu). Once the desired location is arrived at, the point can be saved by selecting the *Save Extended Data Point* push button; at which point, the user is prompted for values for each of the previously selected fields. Once saved, a point is displayed at the 3D cursor location in the appropriate color based on the color setting for scattered data (e.g., property colors or elevation colors). If the point should not be saved or if the wrong well was selected, the *Extend Well to 3D Cursor* toggle button can be turned off (without selecting the *Save Data Point* function) and the point will not be added to the well.

After one point is added to a well, another point can be added by simply moving the 3D cursor to a new location. A new point is added at the 3D cursor location once the data point is saved.

Select Well ID

If a point needs to be added to a different well in the same active data file, the *Select Well ID* push button displays the list of well or line IDs, from which the user can select the new well. Whenever a new well ID is selected, the *Select Fields* pop-up menu appears, with the previously selected fields having asterisks next to them. If the well is part of a different file, then the active data file must be changed to the new file name (refer to page 3DV 4-86).

Extend Well along Vector

Another useful method for adding points to a well path is to extend it along the trajectory of the last two points in the well. The *Extend Well Along Vector* toggle button sets a mode so that any well can be extended in this fashion. Once the *Extend Well Along Vector* toggle button is set on, a pop-up menu of all available well (or line) IDs is displayed. Once the active data file (refer to page 3DV 4-86) and the well ID is selected, the user is prompted for which fields within the data file should be edited when a data point is saved (e.g., a P-value could be added at the new data point location).

After selecting the desired well and fields, the user is prompted to enter the distance value for which the well is extended; this value is then displayed in the *Vector Extension Distance* text box. At this point, the newly added point is displayed in white. If the location is not correct or needs to be modified, a new extension distance can be specified by simply entering in a new value in the *Vector Extension Distance* text box (the text box must first be selected and then the value entered, followed by a carriage return). Once the desired location is arrived at, the point can be saved by selecting the *Save Extended Data Point* push button; at which point, the user is prompted for values for each of the previously selected fields. Once saved, the point is displayed in the appropriate color based on the color setting for scattered data (e.g., property colors or elevation colors). If the point should not be saved or if the wrong well was selected, the *Extend Well Along Vector* toggle button can be turned off (without selecting the *Save Extended Data Point* function) and the point will not be added to the well.

As an extension location is specified, certain information about the last point of the well (presumed to be the "bit location") and the newly added point (presumed to be the "target location") are displayed, as shown below.

Well Extension

Bit Location X:	*1829000.88*
Bit Location Y:	*413844.31*
Bit Location Z:	*–1.35*
Target Location X:	*1829100.88*
Target Location Y:	*413844.31*
Target Location Z:	*–1.37*
Rel Azimuth:	*0.00*
Rel Inclination:	*0.00*
Distance:	*100.00*

The X, Y, and Z locations of the bit and target are displayed, along with the relative azimuth, relative inclination, and the distance between the two points. This information is the same as what is displayed when extending a well to a 3D cursor location, although since, in this case, the extension is always along the direction of the previous vector, the relative inclination and azimuth is always 0, and the distance is always the extension distance specified by the user.

After one point is added to a well, another point can be added by simply selecting the *Vector Extension Distance* text box and entering either a new value or a carriage return to use the same extension distance already shown in the text box. A new point is added at the specified distance; again, until the point is saved, its location can be modified by entering a new extension distance.

If a point needs to be added to a different well in the same file, the *Select Well ID* push button displays the list of well or line IDs, from which the user can select the new well. Whenever a new well ID is selected, the *Select Fields* pop-up menu appears, with the previously selected fields having asterisks next to them. The new extension distance can then be entered in the *Vector Extension Distance* text box. If the well is part of a different file, then the active data file must be changed to the new file name (refer to page 3DV 4-86).

Once all desired points are added and saved, the *Extend Well Along Vector* toggle button can be turned off to end the extension session.

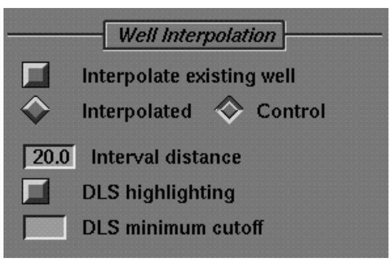
The *Extend Well Along Vector* and *Extend Well to 3D Cursor* methods can be used in conjunction with one another. Once a method, a well or line ID, and the desired fields have been selected, choosing the other method retains the well ID and field information, allowing for easy extension of the same well. A new well (and fields) can be selected if desired via the *Select Well ID* push button.

Specifying the Vector Extension Distance

The *Vector Extension Distance* is measured along, and is proportional to, the length of the vector defined by the last two points in the active well. If, for example, an extension distance of 10 meters is entered, and the vector length between the last two points of the well is 20 meters, then the new added vector would appear half the length of the previous vector. The length of the vector is calculated simply by taking the square root of the sum of delta-X (of the two points) squared, delta-Y squared, and delta-Z squared. If a well is vertical (no change in X or Y between the last two points of the well), the extension distance entered is simply specified relative to the Z scale and units (e.g., if the Z axis ranges from 0 to –1000 feet, entering in a value of 100 would extend the well exactly 100 feet and visually would appear to be 1/10th of the entire Z range). Similarly, if the well is horizontal (no change in Z between the last two points of the well), the extension distance entered is simply specified relative to the X and Y scale and units. If the well is neither perfectly horizontal nor perfectly vertical, then the distance between the last two points of the well can be taken into consideration to determine an appropriate extension distance. Generally speaking, however, a user will have some idea of how far the well should be extended. If the X and Y ranges differ by orders of magnitude from the Z, then keeping in mind the data sampling distance along the well can greatly aid in entering in an extension distance. (In some cases, setting the vertical exaggeration to 1 can visually aid in determining a reasonable distance.)

If the file has mixed units, the value entered will either be in the XY units or the Z units depending on which unit type is specified on the Capture Data menu (under Volumetrics in the *Distance Units* text box, discussed on page XXX) or on the 3D Cursor menu (under Marks in the *Distance Units* text box, discussed on page XXX).

Well Interpolation



If a smooth, gently curving path between points in an existing well path is desired, new values can be interpolated between the original points. The *Interpolation Process* section, discussed below, explains the process and the effects of various input fields.

Note: The well interpolation process can only be performed on well at a time and only within the active edti file, as defined on the Edit Data *menu (discussed on page 3DV 4-83).*

Interpolation Process

The process of interpolating wells produces a new data file containing old and new data points and a series of fields. The new well path follows a minimum curvature between the original points in the path. In addition to the X, Y, Z, and line ID values of the input file, if the file contains a field named "straight," the values in that field determine whether a straight path or a curved path is interpolated. If the value in the straight-path field is 1, the well segment from that point to the previous point is forced to be straight, instead of following the default minimum curvature method (which would be indicated by a 0 in the straight-path field).

Once complete, in addition to the input fields (X, Y, Z, well/line ID, straight, and linecol), the interpolation process produces values (and new fields, if necessary) in the output file for the original point, delta X, delta Y, delta Z, azimuth, delta azimuth, inclination, delta inclination, radius of curvature, measured depth, dogleg angle, and dogleg severity. The well ID is taken from the input data file. A "1" in the original point field, ORIG_PT, signifies that the given output point is original. The line color field is taken from the input file and used for the output points. The delta X, Y, Z, azimuth, delta azimuth, inclination, and delta inclination fields are calculated fields, and reflect the change in location from the previous point. Original points will have a "0" for these calculated fields.

Interpolate Existing Well

Selecting *Interpolate Existing Well* causes data points to be interpolated along the active edit file's well path at intervals based on the value specified in the *Interval Distance* text box (with a default based on the X,Y,Z range of the data). The user is prompted via a pop-up menu for the well or line ID of the desired well. An output data file name is then required; the interpolation is performed; and the newly interpolated points are displayed in dark blue with the original points in yellow.

Note: The XY and Z units for the well data must be set to valid units (e.g., feet or meters) in order for interpolation to be performed. The units cannot be set to unknown.

Once additional points have been interpolated along a well path, if any edits are made to the control points, the well is automatically re-interpolated using the new control point locations. These edits are automatically saved to a temporary file and *cannot* be reversed using the *Undo* command. The original file is not affected, however. If a new data file is loaded or the 3D Viewer is exited, the 3D Viewer prompts to save the changes to a new file name.

Interpolated vs. Control Data

The *Interpolated* and *Control* radio buttons are used to switch between the new file containing the newly interpolated, smooth path of points, and the file containing the original well points. Alternating the views between the original and newly interpolated points allows for review of the calculated dogleg severity as well. Any further manipulation of the displayed file in the 3D Viewer (e.g., adding a point or saving a vue file) affects *only* the displayed file.

Interval Distance

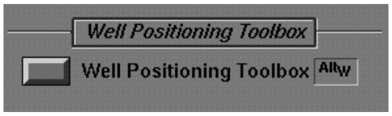
The default interval distance between interpolated points is based on the X,Y,Z range of the data; it is $1/25^{th}$ of the model radius. Selecting the *Interval Distance* text box and entering a new value changes the distance to be used for the next interpolation calculation.

Dogleg Severity

It can be useful to know where in a well path a specific dogleg severity (either degrees per 30 meters or degrees per 100 feet) is exceeded. The *Dogleg Highlighting* toggle button causes those parts of a well path that exceed a given dogleg severity (as specified in the *Dogleg Minimum Cutoff* text box) to be highlighted in red. A minimum severity value can be entered by selecting the *Dogleg Minimum Cutoff* text box and entering a value in degrees. Highlighting cannot be turned on without a cutoff value given. If *Dogleg Highlighting* is selected and no cutoff value has been given, the user is prompted to enter a value. Generally, reasonable values are between 3 and 5 degrees per 30 meters or 100 feet.

Note that the `dl_severity` field in the data file is read in order to highlight points where the given value is exceeded; it is not calculated interactively. Dogleg severity highlighting cannot be turned on for files that do not contain the `dl_severity` field; the `dl_severity` field is written into the output file of the interpolation calculation (discussed on the previous page).

Well Positioning Toolbox



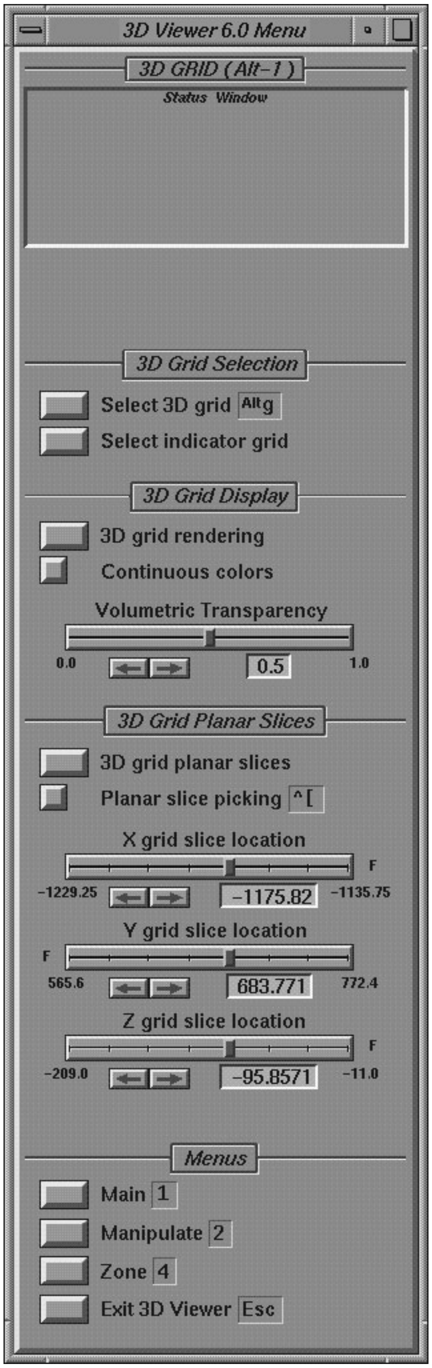
Various well positioning programs† are available by selecting the *Well Positioning Toolbox* button (or the "Alt-w" hot key), which produces the following window.

Numerous well positioning programs are available: Well Path Update, Edit Point Values, Extend Well to Vertical, Design Well, Well Path Structure Intersection, Slice Along Well Path, Property Along Well Path, Seismic Tube Along Well Path, Vertical Shift, New Fault or Horizon, Adjust Fault or Horizon, and WorkFlow Manager. A brief description of each of these follows. They are discussed fully in the Well Positioning Toolbox and Well Design documents.

- Well Path Update . . . . extends the end of a well path to a specified measured depth; the new portion of the path is created as a curved segment starting at the last point in the well path, given a specified measured depth, azimuth, and inclination.
- Edit Point Values . . . . is a text editor that is used to edit any of the information in a scattered data file (*.dat*), property data file (*.pdat*), or a well path file (*.path*). Any field in the file can be edited, even including the X, Y, Z, and/or P values, well ID, line ID, shotpt, color, and symbol.
- Extend Well Path to Vertical . . . . extends a well path vertically to the top of the model.
- Design Well . . . . uses the Well Path Designer program to create well paths and side tracks in 3D space. Wells can be interactively designed in relation to a geologic model (if provided) and offset well data using a variety of interpolation methods. In addition, ellipsoids of uncertainty can be generated, along with traveling cylinder diagrams that indicate where the well path nears or intersects other displayed wells. (`ev_wds` license required)
- Well Path/Structure Intersection . . . . calculates and displays the distance from each point on a well path to a selected horizon in a faces file.
- Slice Along Well Path . . . . . . slices an unsliced faces file along the trajectory of a well path.

- Property Along Well Path . . . calculates a property data file based on the points in a well path (*.path*) or scattered data (*.dat*) file and a model, by back-interpolating the points to the model.
- Seismic Tubes . . . . creates a well tube displaying the seismic information (as well as any intersections and property) along a well path.
- Vertical Shift . . . . adjusts horizons within fault blocks up or down by a fixed amount. A single horizon may be selected within a single fault block; all horizons in an entire fault block, or an entire horizon may be adjusted.
- New Fault or Horizon . . . . . . starts the WorkFlow Manager®, automatically loading the workflow project file for the model currently displayed in the 3D Viewer. A new fault and/or horizon can then be added to the model using the WorkFlow Manager. (`ev_ps` license required)
- Adjust Fault or Horizon . . . . works "behind the scenes" to update a model without the user having to run the WorkFlow Manager. The time stamps are checked for all the files used to build the model and if a newer time exists (indicating that a file has been changed or updated), then a new model is created. For example, if a user edits one of the scattered data files that are used to construct a horizon in the 3D Viewer and saves the file to the original file name, selecting Adjust Fault or Horizon re-runs the WorkFlow Manager and builds a new model with the same name. (`ev_ps` license required)
- WorkFlow Manager . . . . starts the WorkFlow Manager, automatically loading the workflow project file for the model currently displayed in the 3D Viewer. (`ev_ps` license required)

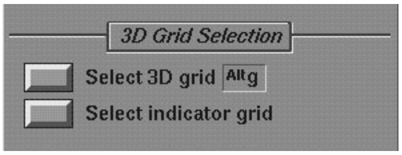
3D Grid Menu



The 3D Grid Menu (hot key "Alt-1") controls the display of a 3D grid when viewed on its own or with any other file type. One of the primary uses is to display a 3D seismic or property grid for model and interpretation verification. In addition, a 3D indicator grid, where each node represents the fault block and zone location within a model, can be selected allowing display of the 3D seismic or property grid on a zone- or fault-block-basis. The 3D Grid Menu controls the following capabilities:

- 3D grid and 3D indicator grid selection
- The 3D grid rendering style, colors, and transparency
- The display and location of the 3D grid planar slices

3D Grid Selection



Two types of 3D grids may be selected:

- a 3D grid (selected via the *Select 3D Grid* push button) for display as a secondary model when a scattered data, 2D grid, or faces file is already displayed, or
- a special 3D indicator grid (selected via the *Select Indicator Grid* push button) used for filtering the display of a 3D property or seismic grid based on zone and/or fault block location

A 3D grid as a primary model must be selected via the File Menu (refer to page 3DV 4-37). Typically, a secondary 3D grid is displayed to verify interpretation and/or modeling. When first displayed, if a seismic 3D grid is selected, three planar slices (X, Y, and Z) are displayed at the midpoints of the grid. If a property 3D grid is selected, cubes (blocks color-coded based on each grid node's value) are displayed. The display and location of the planar slices are controlled in the 3D Grid Planar Slices section; the rendering of the 3D grid, as isosurfaces, cubes, or volumetric clouds, is controlled in the 3D Grid Display section. The slicing of the 3D grid is controlled by the functions on the Manipulate Model Menu (by selecting the *3D Grid* toggle button; refer to page 3DV 4-12).

Once an indicator grid is selected, the display of the 3D grid can be based on the zone and/or fault block location of each node using the functions on the Zone menu (by toggling the *Active Volume* text box; refer to page 3DV 4-31). In this way, only those nodes within a certain zone of a seismic grid, for example, can be turned on, and the modeling of the faces file can be checked against the amplitudes displayed in the seismic grid.

3D indicator grids must be generated in either the Geologic Structure Builder (*Calculate –> Indicator Property Model* or *Calculate –> Indicator Grid*; refer to the Geologic Structure Builder document, page GSB-115) or the WorkFlow Manager (3D Property Models window; refer to online help).

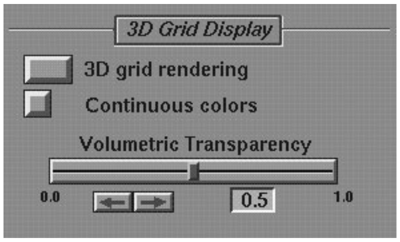
Sharing Property Groups

Multiple property models can be loaded in the 3D Viewer: Files with the same property "group" share the same property colors and levels. Property groups are determined by the property name and, in the case of 3D grids, whether the property type is property or seismic. Seismic grids even with the same property name are not considered part of the same group as faces file or data file. When a secondary property file (either a 3D grid or a property data file) is added in the 3D Viewer, if the property name is the same as a previously loaded file then they automatically "share" the same property colors and levels, becoming a property group. If the file has a property name not previously loaded into the 3D Viewer (e.g., if a data file has a P-field of "porosity" and a property 3D grid was created with a P-field of "por") or, in the case of a 3D grid, is of a different property type (seismic versus property), then the file automatically starts a new property group; its property levels and colors are determined separately from those in other property groups.

A faces file does not have a known property field, however. So when a secondary file is loaded, the 3D Viewer prompts whether the file's property should share the property colors and levels with the faces file (unless the file is a 3D seismic grid, which always has its own property group). If the answer is yes, then whatever P-levels and colors are used by the faces file are automatically used by the secondary file, and any subsequent files with the same property name. If the secondary file matches an already loaded property file, then the question is not asked (since it would automatically be part of the existing property group).

3D Grid Display

3D Grid Rendering



The *3D Grid Rendering* push button brings up a menu that controls how the 3D grid volume is rendered: either as cubes, isosurfaces, or volumetric clouds or not at all. A fourth type of display allowed is planar slices. Planar slices (discussed next) can be displayed at the same time as any one of the other three rendering types.

Property 3D grids are displayed using cube rendering by default. Seismic 3D grids are displayed as 3D grid planar slices with no volume rendering, by default.

When rendered as cubes, isosurfaces, or volumetric clouds, the 3D grid can be manipulated using any of the 3D Viewer functionality (e.g., slicing, isosurface setting, or zone display). If the 3D grid is displayed with another file (e.g., a faces or data file), then *Active Slice* text box on the Manipulate menu or the *Active Volume* text box on the Zone menu allow the grid versus the faces or data file to be manipulated; for more information refer to each of the menus respectively (pages 3DV 4-12 and 3DV 4-31).

Continuous Colors

A 3D grid can be displayed with colors interpreted in two different ways:

- Continuous colors. . . . . each color represents a specific P-value and a continuous interpolation of colors is displayed between each designated P-value (whether program calculated or user defined); up to 256 colors are displayed
- Discrete colors . . . . a given color represents a range of P-values (similar to the display of property colors for a faces file)

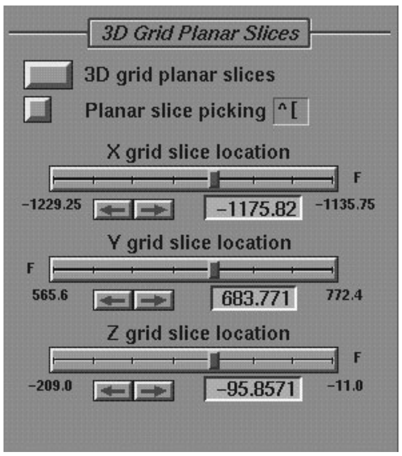
The *Continuous Colors* function toggles between the two types. *Continuous Colors* must be on for isosurface and volumetric rendering. Continuous or discrete colors can be used with cube rendering and 3D grid planes. By default, seismic grids are displayed with continuous colors on; all other grids are displayed with discrete colors on.

Although you can switch between discrete and continuous colors when the 3D grid is rendered as cubes, slight variations will appear in the color display because of the two different methods. (In the one case, a color represents a range of P values (discrete colors); in the other, a color represents a single P value (continuous colors).)

Volumetric Transparency

When rendered as volumetric clouds, the “cloud” surrounds each node, hence the volumetric cloud extends beyond the boundary of the wire frame. The transparency of the cloud can be set via the *Volumetric Transparency* slider. By default, transparency is set to 0.5. When set to 1, the cloud is fully transparent, hence it is off. When set to 0, the cloud is still somewhat transparent, but is at its “densest.”

3D Grid Planar Slices

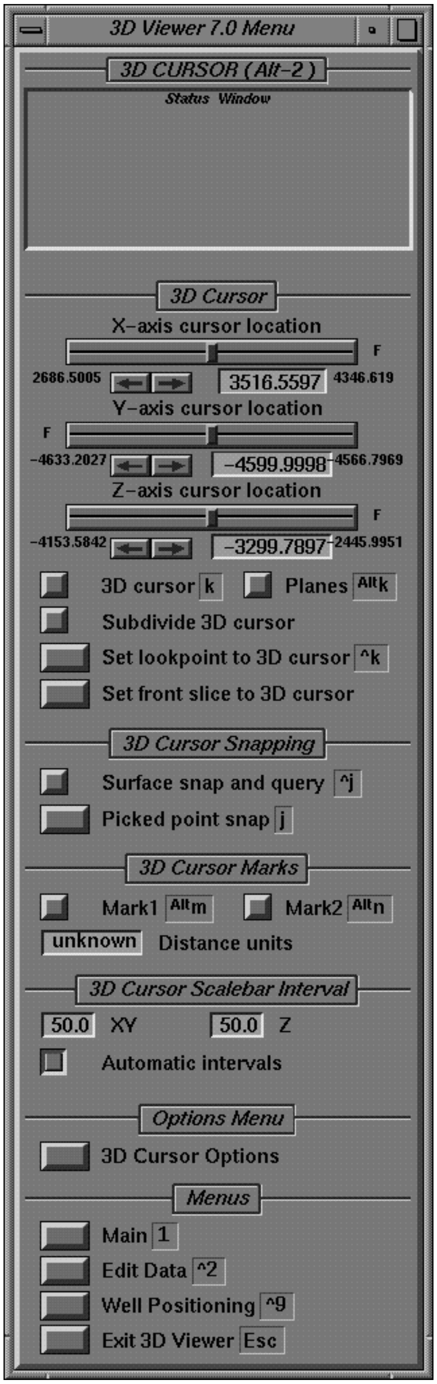


In addition to the three types of volume grid rendering, planar slices parallel to the three axes can be displayed, individually or together. Each planar slice can be turned on via the *3D Grid Planar Slices* push button. The location of the slices can be altered via the *X*, *Y*, and *Z Grid Slice Location* slider bars. In addition, turning *Planar Slice Picking* on, or using the “^[” hot key, allows users to click on the X, Y, or Z axes to set the X, Y, or Z planar slice location, respectively. When set on, slicing the primary or 3D grid model along the axes is disabled.

By default, seismic 3D grids are displayed as 3D grid planar slices with no volume rendering, although volume rendering can be turned on. Property 3D grids are displayed using cube rendering by default, without any planar slices on.

The X, Y, or Z planar slices of a 3D grid can be viewed sequentially by running the 3D Grid Slice Animation (discussed on page 3DV 4-116).

3D Cursor Menu



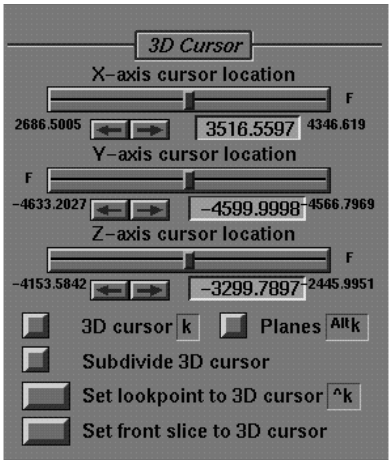
The 3D Cursor Menu (hot key “Alt-2”), along with the 3D Cursor Options Menu, contains all the controls for the 3D Cursor. The 3D Cursor, with a three-dimensional cross at its center and axes parallel to the X, Y, and Z axes, is shown in the figures on page 3DV Fig-4**.**

The 3D cursor is used in conjunction with several 3D Viewer features, including specifying the look point (refer to *Look Point Position*, page 3DV 4-24), editing and creating scattered data (refer to *Add/Edit Data*, 3DV 4-88), saving data point positions (refer to *3D Cursor Capture*, page 3DV 4-51), extending or editing a well path (refer to *Extend Well to 3D Cursor*, page 3DV 4-129), and measuring distances and dip and dip-azimuth values (discussed in this section).

The functionality of the 3D cursor is contained in the following sections:

- 3D Cursor Display and Location Controls
- 3D Cursor Slicing
- 3D Cursor Snapping
- 3D Cursor Marks
- 3D Cursor Scalebar Interval
- 3D Cursor Options

3D Cursor Display and Location Controls



Three slider bars are used to control the 3D cursor location, with the default position in the center of the model. The location can be changed using any of the slider bar manipulation techniques (refer to *Slider Bars,* page 3DV 3-15) or by clicking with the middle mouse button anywhere along the green axes of the 3D cursor (refer to *Additional Mouse Button Features*, page 3DV 4-149).

3D Cursor Toggle Button

The 3D cursor can be turned on or off by selecting the *3D Cursor* toggle button or “k” hot key. By default, the cursor is off.

Planes

Selecting the *Planes* toggle button turns off and on three transparent planes that intersect at the current 3D cursor location, and move as the 3D cursor moves. If the *Surface Snap and Query* toggle is enabled, a point on the plane can be selected and the 3D cursor moves to that position.

Subdivide 3D Cursor

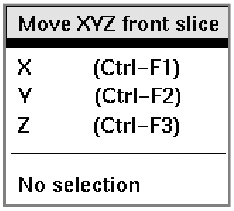
By default, the 3D cursor appears in a solid red color. The cursor, however, can be subdivided into 10 equal line segments in order to measure distance along the cross’s axes. When subdivided, the X axis of the 3D cross is shown in red and white, the Y-axis in green and white, and the Z-axis in blue and white (the same as the rest of the axes’ scalebars), but the subdivision is one-tenth of the interval set in the 3D Cursor Scalebar Interval section, thus a much finer unit of measure can be achieved.

When the 3D cursor is subdivided, turning off the 3D cursor shading (so that the cursor becomes a set of lines instead of looking like a three-dimensional object) can facilitate measuring distances. The 3D cursor shading is turned on or off via the 3D Cursor Options Menu, accessed by the *3D Cursor Options* push button (page 3DV 4-144).

Set Lookpoint to 3D Cursor

The look point (the X,Y,Z location that is used as the rotation point for the model) can be set to the current 3D cursor location via the *Set Look Point to 3D Cursor* push button or the equivalent “^k” hot key. This function is the same as appears on the View Menu under the Look Point Position section; refer to *Look Point Position* (page 3DV 4-24) for more information.

Set Front Slice to 3D Cursor

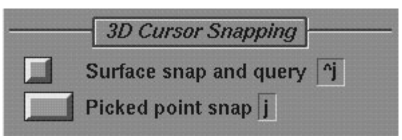


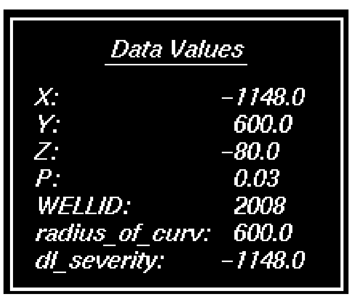
When the 3D cursor is on, the *Set Front Slice to 3D Cursor* command can be used to set the front X, Y, or Z slicing plane of the primary model (refer to *Model Selection*, page 3DV 4-13) to the X, Y, or Z coordinate of the current 3D cursor position. Selecting *Set Front Slice to 3D Cursor* brings up a pop-up menu, from which the X, Y, or Z front slice can be selected. Alternatively, the "^F1", "^F2", or "^F3" hot keys can be used to set the X, Y, or Z front slice (respectively) to the 3D cursor location.

When viewing a rotated model, it is important to remember that the front slice is set to XYZ location of the cursor and not where the cursor's axes hit the wireframe (since the cursor's location is in real world, not rotated coordinates).

3D Cursor Snapping

Surface Snap and Query





If a proposed well is displayed with a surface or set of surfaces, such as those produced by the Geologic Structure Builder, it is often useful to move—or "snap"—a proposed well location to the closest surface or location on an image plane (i.e., the X, Y, or Z plane on which an image is displayed). The *Surface Snap and Query* toggle button (hot key "^j") provides this functionality. With *Surface Snap and Query* turned on, a mode is set where clicking the middle mouse button moves the 3D cursor to the faces file or 3D grid surface, 3D cursor plane, or image plane closest to the selected location, and the Data Values information box (shown at left) is displayed. (The type of information displayed in the Data Values information box can be changed via the *Set Fields for Picking/Editing* function discussed on page 3DV 4-87.) The middle mouse button can be held down and the 3D cursor follows the mouse movement until the middle mouse button is released. Once the 3D cursor has been moved to the surface, a well path can be extended to that location by using the *Extend Well to 3D Cursor* function, discussed next.

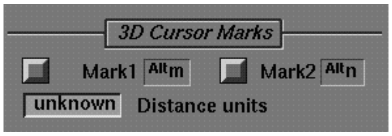
Note that this function sets a *mode* for the 3D cursor: in order to move the 3D cursor to a location *not* on a surface, 3D cursor plane, or image plane, *Surface Snap and Query* must be turned off.

Snap to Picked Point

The 3D cursor location can also be automatically set to the X,Y,Z location of the most recently picked data point by selecting the *Snap to Picked Point* button (or the "j" hot key). (A data point can be picked by selecting it with the right mouse button; discussed under *Additional Mouse Button Features*, page 3DV 4-149.)

3D Cursor Marks

Mark 1 and Mark 2



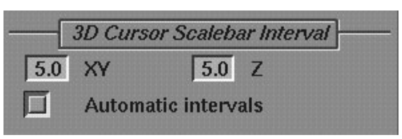
The 3D cursor location can be marked with a 3D cross so that the cursor can be moved to another location and a measurement taken between the marked cursor location and the present cursor location. When the *Mark1* toggle button (or “Alt-m” hot key) is selected, a yellow 3D cursor is drawn at the marked location (although not visible until the 3D cursor is moved) and the distance between the marked and current 3D cursor locations is displayed in the 3D Cursor Information box. Setting the *Mark2* toggle button (or “Alt-n” hot key) leaves a green 3D cursor at the marked location and displays the dip and dip-azimuth of the plane formed by the three points (two marked cursors and the current 3D cursor) in the 3D cursor information window; a transparent yellow plane becomes visible. Either cursor mark can be turned off individually by setting the *Mark1* or *Mark2* toggles off.

When snapping to a surface with the 3D cursor, the middle mouse button can be held down and the 3D cursor dragged to any location. With snap-to-surface on, the X, Y, Z location, the dip and dip azimuth of the surface polygon, the fault block, zone, and surface names, and the property value at the intersection point are displayed in the 3D Cursor Information box. Thus this information is updated as the 3D cursor is moved, providing a wide variety of updated information.

Distance Units

When the XY and the Z units do not match, the *Distance Units* value box allows the user to toggle which units are used for the distance calculation when marks are set. If the units match, then the box is greyed out, but the type of units is displayed in the box.

3D Cursor Scalebar Interval



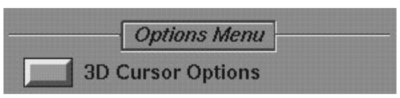
By default, the axes of the 3D cursor are shown as scaled lines, in alternating colored and white line segments: the X-axis is in red and white, the Y-axis in green and white, and the Z-axis in blue and white. These segments can be used to easily determine the distance to another point along the axes or to determine where to move the cursor interactively by clicking on the axis. A small square marker is drawn after every tenth line segment to help determine distances. The color of the scalebars and the markers can be changed via the 3D Cursor Options menu (page 3DV 4-146).

Default Line Lengths and Automatic Intervals

By default, the 3D Viewer selects a line segment length and that length varies (known as *Automatic Intervals*) as the view is zoomed in or out, so that no matter how far in or out the view is, the scalebars are divided into a reasonable number of sections—neither too large nor too small. By default, the length of the segments in the X, Y and Z directions are the same.

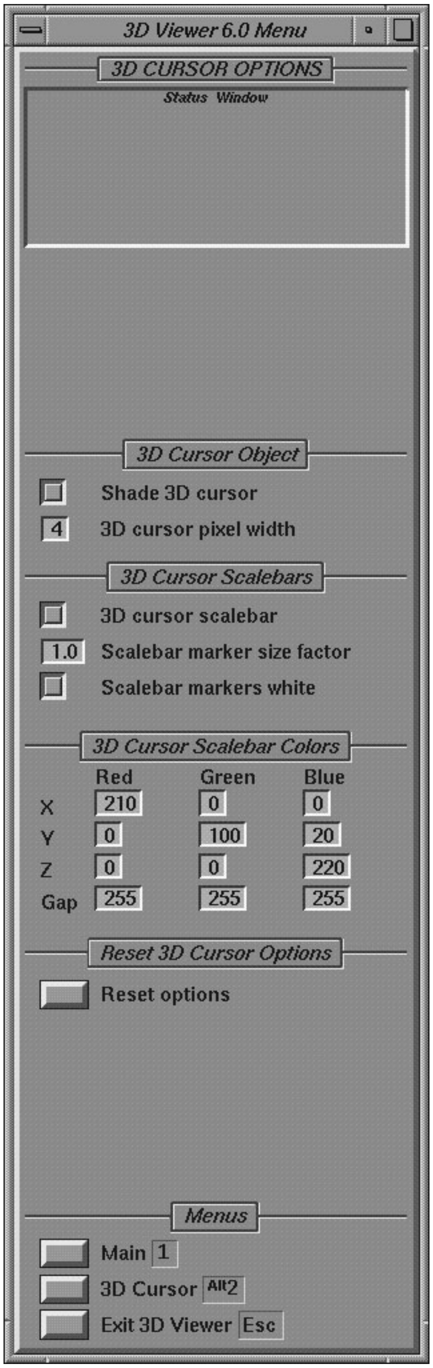
The default line segment length can be changed via the *XY* and *Z* value boxes. When a specific distance is entered, the *Automatic Intervals* toggle button is automatically turned off and the size of the 3D cursor object changes (since each X, Y, Z arm is the length of one X Y or Z segment). If *Automatic Intervals* is turned back on, the 3D Viewer automatically calculates an appropriate tick interval (line segment length) and changes the current settings of the 3D cursor, if necessary.

3D Cursor Options



Selecting the *3D Cursor Options* push button brings up the 3D Cursor Options Menu, discussed next.

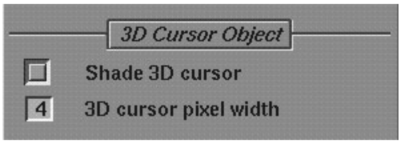
3D Cursor Options



The 3D Cursor Options Menu, available only via the *3D Cursor Options* push button on the 3D Cursor Menu, contains commands for the following functionality:

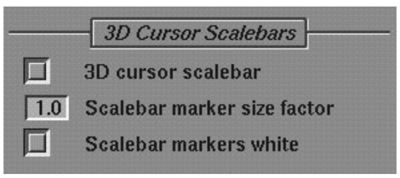
- Changing the size and shading of the 3D cursor cross
- Turning the 3D cursor axes on/off
- Changing the display, size, and color of the scalebar markers
- Changing the color of the 3D cursor axes
- Resetting the 3D cursor options

3D Cursor Object



The center of the 3D cursor is, by default, a three-dimensional cross. The *Shade 3D Cursor* toggle button turns the shading of the cursor on or off, switching between the shaded 3D cross and three intersecting lines. The pixel width of the three lines (but not the 3D cross) can be changed (to between 1 and 6 pixels) via the *3D Cursor Pixel Width* value box.

3D Cursor Scalebars

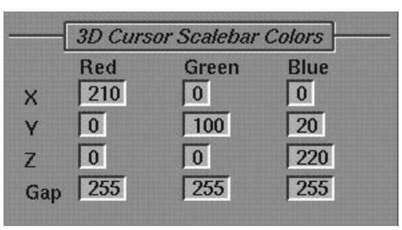


The *3D Cursor Scalebar* toggle button turns on and off the three axes parallel to the X, Y, and Z axes, leaving just the 3D cursor cross. The axes are drawn in alternating colors with a small square (the major tickmark) drawn after every tenth line segment to help determine distances.

The value in the *Scalebar Marker Size Factor* box controls the size in which the square is drawn; 1 is the default size factor; 0.5 would draw a square half as large in each direction (1/4th in area) and 2 would draw a square twice as large in each direction (4 times greater in area).

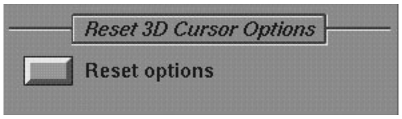
The *Scalebar Markers White* toggles between displaying the markers in the primary color of the axes and in white. Having the markers white helps distinguish the markers from data points. By default, the markers are white.

3D Cursor Scalebar Color



By default, the axes of the 3D Cursor are shown as scale bars, in alternating colored and white line segments: the X-axis is in red and white, the Y-axis in green and white, and the Z-axis in blue and white. The colors of the colored and white portions of each axis can be changed via the *Red*, *Green*, and *Blue* value boxes for the X, Y, and Z axes and the white gap. The red, green, and blue components can be set between 0 and 255, with 0, 0, 0 being black, and 255, 255, 255 being white. Refer to *The Color Systems Section* (page 3DV 5-9) for more information on the RGB color system.

Reset 3D Cursor Options

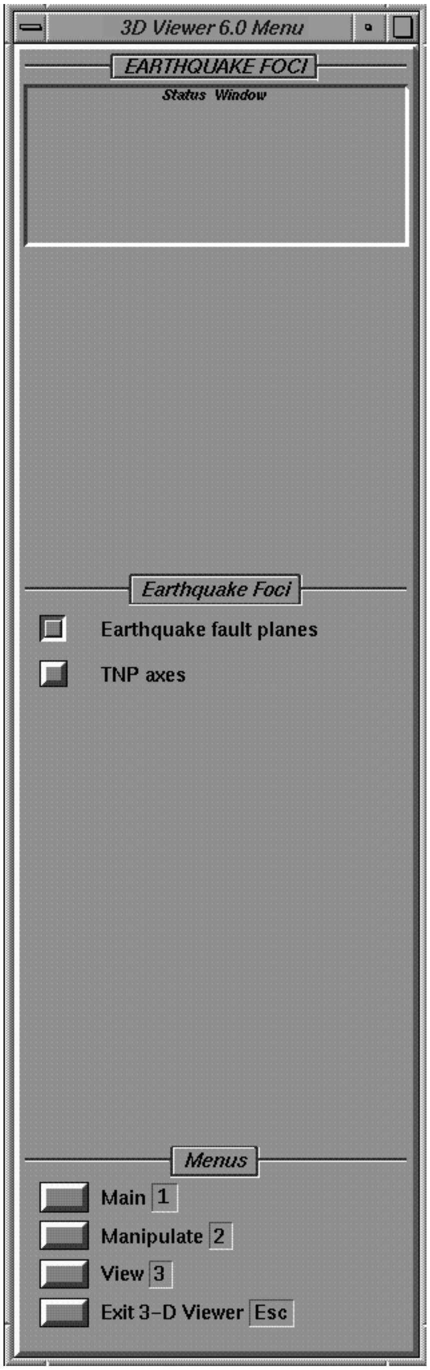


The *Reset 3D Cursor Options* brings up a pop-up menu to reset the following options:

- Cursor shading
- Cursor pixel width
- Cursor axes
- Scalebar marker size factor
- X scalebar color
- Y scalebar color
- Z scalebar color
- Scalebar axes gap color

Each can be reset individually, by clicking on it (an asterisk appears), or all together. Once the desired settings have been chosen, the *No More Resets* function changes the cursor options as set per this menu.

Earthquake Foci Menu



The Earthquake Foci Menu, shown at left, contains commands controlling the posting of earthquake foci symbols, also known as fault plane solutions. The earthquake foci symbol is a bi-colored sphere that resembles a beach ball, with default colors of blue for the tensional quadrant and yellow for the compressional quadrant. Two selections are available on the menu:

- Earthquake Fault Planes
- TNP Axes

The Earthquake Foci Menu is available only when a data set is displayed that contains earthquake foci symbol information.The scattered data file being displayed must specify symbol 7 (the earthquake foci symbol) in the SYMBOL field and contain the fields TPLUNGE, TAZIM, PPLUNGE, PAZIM, NPLUNGE, and NAZIM in order for earthquake foci symbols to be posted. The tensional and compressional quadrant colors can be changed via the EQTSYMCOLOR and EQPSYMCOLOR fields. Refer to *ASCII Scattered Data, Property Data, and Well Path Files* (page 3DV 2-1) for information on the scattered data fields.

The *Earthquake Fault Planes* button toggles the display of fault planes in the earthquake foci symbols. Fault planes can either bisect the tensional and compressional axes or be normal to the bisector (controlled by the EQFLTPLANE1 and EQFLTPLANE2 fields).

The *TNP Axes* button toggles the display of the tensional (T), neutral (N), and compressional (P) axes, which are drawn as rods or tubes. The neutral axis is the intersection of the tensional and compressional planes.

Additional Mouse Button Features

All features not controlled by menu buttons (or their associated hot keys) are mouse button features. Some of these are used in conjunction with menu items. These are discussed earlier in Chapter 3, *Using the 3D Viewer Interface,* and the appropriate sections of this chapter. In brief, they are as follows:

- The left mouse button is used to click on all menu buttons and pop-up menus.
- The left mouse button can be used to directly enter a setting for a slider bar or dial by clicking on the value box below the slider bar or dial, or to enter a value in a value box. For example, the contour interval for color-filled contours can be changed by clicking on the “Z Contour Interval” value box below the *Z Color-Filled Contours* toggle bar.
- The middle mouse button is used to click on a menu item to display on-line help.[†]
- The right mouse button toggles between data scale units and increment units for the incremental slider bars by clicking on the value box.
- The right mouse button is used to change the increment of slider bars and dials. For example, by default, the azimuth hot keys and arrow buttons change the display by 10° at a time; however, clicking the right mouse button on the arrow buttons, displays a prompt requesting the arrow increment value.
- The right mouse button is used to select data points for feature point picking and editing.

Other mouse button features function independently of the menus. These additional mouse button capabilities are as follows:

- Displaying P-values next to scattered data points using the right mouse button.
- Slicing along any axis using the left mouse button (front face and chair slices only).
- Changing 3D cursor location using the middle mouse button.[†]
- Moving screen objects, e.g., titles, color keys, etc., on the screen using the middle mouse button.[†]
- Rotating the model by dragging the cursor with the left mouse button and either the Control, Shift, or Alt keys depressed.
- Zooming in or out by moving the cursor with the middle mouse button and either the Control, Shift, or Alt keys depressed.[††]
- Changing the look point by moving the cursor with the right mouse button and either the Control or Shift keys depressed.

†. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be used to assign the functionality of the middle mouse button to the right mouse button (refer to Appendix B, page 3DV B-37)

††. When using the `twobuttonmouse` parameter, this functionality is assigned to using the left and right mouse buttons simultaneously.

Display File Name, P, Z, and Other Field Values

Displaying values associated with scattered data points is accomplished by clicking with the right mouse button on the small cube representing the scattered data point (if scattered data are posted). The selected point is highlighted in grey and a box appears in the lower portion of the screen; the information in certain fields in the file is displayed (for a full description of each field, please refer to *Scattered Data, Property Data, and Well Path Files*, starting on 3DV 2-1): Which fields are displayed can be controlled by the *Set Fields for Picking / Editing* function on the Edit Data menu (page 3DV 4-87). (This box can be moved using the middle mouse button, discussed later.)

If the display of the model is changed in any way (e.g., the azimuth is changed), the displayed values disappear. When the next point is selected, it is highlighted, the information updated, and the previous point set back to its original color. An example of P-values being displayed is shown in the middle-right figure on 3DV Fig-2.

If the 3D Viewer matches more than one point to the cursor location selected, the point closest to the cursor is highlighted. If this is not the desired point, clicking the cursor again in the same location will cycle to the next closest point. Clicking again goes to the next point, and so on, until the last of the nearby points is highlighted. Continuing to click cycles through the nearest points again.

Slice the Model

The left mouse button is used to pick the X, Y, or Z slicing plane for the **front face only**. At any given model position, the X, Y, and Z axis that is closest to the user's eyepoint is active for slicing. The active axis is designated by a blue "L" marker along the axis (see *Slices Markers Display* under *Screen Menu*). With the tip of the cursor at the desired X, Y, or Z slicing position along the active axis, clicking the left mouse button slices the model to the nearest cutting plane for that axis or, for an unsliced faces file, slices the model at that exact point.

When chair mode is on, the left mouse button can be used to change the chair slices. Yellow L-shaped brackets appear on each of the active axes to indicate where the chair slices are and which axis is active for slicing. By default, clicking on an active axis changes the front X, Y, or Z slice changes, *not* the chair slice. Selecting the *Chair Markers Active* (hot key "]") enables the chair axis slicing. This makes chair axis slicing possible and disengages model axis slicing. The slicing is performed the same way for front-face slicing, as described in the previous paragraph. Illustrations that show the blue and yellow L-shaped brackets are scattered throughout the 3D Viewer figures, such as the ones shown on 3DV Fig-3.

Change 3D Cursor Location

Once the 3D cursor is turned on (refer to the *3D Cursor Menu* section), its location can be changed using the middle mouse button, in addition to using the slider bars, "j" and "^j" hot keys (or associated push buttons), or value boxes (all on the 3D Cursor Menu). The position is changed by clicking with the middle mouse button† along one of the three green axes of the 3D cursor at the location desired. Clicking along the yellow cursor cue or along the wire frame does not change the 3D cursor location. The 3D cursor is shown on 3DV Fig-4.

Move Screen Objects

"Screen objects" include the main title, subtitle, color key, 3D cursor location coordinate box, volumetrics calculation box, scattered data value boxes, the Dynamic Graphics' logo, and screen annotation (screen annotation files, discussed in Chapter 2, *3D Viewer File Types*, can contain text, rectangles, circles, and lines that are displayed on the 3D Viewer background). Each of these objects can be moved anywhere on the 3D Viewer graphic display (i.e., excluding the menu area). To move an object place the cursor within the rectangular region that makes up the largest X,Y extent of the object, and drag it using the middle mouse button††. Once the middle mouse button is pressed, a red outline indicates the object can be moved. The place where the cursor started out relative to the object is the same as where it finishes.

†. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be used to assign the functionality of the middle mouse button to the right mouse button (refer to Appendix B, page 3DV B-37).
††. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be used to assign the functionality of the middle mouse button to the right mouse button (refer to Appendix B, page 3DV B-37).

Rotate the Model

The model can be rotated to any position by dragging the cursor within the 3D Viewer window with the left mouse button and either the Control, Shift, or Alt key pressed. The cursor can be anywhere on the 3D Viewer display screen. Moving the cursor straight up or down has the same effect as the up arrow and down arrow, respectively (i.e., moving the cursor up decreases the inclination; moving it down increases the inclination). Moving the cursor to the left or right has the same effect as the left arrow and right arrow, respectively (i.e., moving the cursor to the left increases the azimuth; moving it to the right decreases the azimuth). In addition, the cursor can be moved in any diagonal motion, causing the model's inclination and azimuth to change accordingly.

The three different modifiers on the mouse button (Control, Shift, and Alt) produce three different results:

Key with Left Mouse Button	Rotates
Control Key	Wire frame with the model turned off; the model is redrawn once the control key is released.
Shift Key	Wire frame with model and/or data are drawn through the entire redraw; zooming in or out with the model on can slow down the tracking of the cursor.
Alt Key	Wire frame and any scattered data are drawn during the rotation; the model is turned off.

Keeping any of the three keys (Control, Shift, or Alt) pressed and changing which mouse button is pressed shifts from rotation to zooming to panning (changing the look point) and back to any of the others without having a redraw occur with each change. In addition, since the display is not redrawn until the Control, Shift, or Alt key is released, if the cursor gets too close to the edge of the screen to make rotation comfortable, the mouse button can be released (without releasing the other key), the cursor repositioned on the mouse pad, the mouse button re-pressed, and the rotation continued. These controls also make it very easy to zoom in on an exact location.

A toggle is available that allows model rotation without holding down the Control, Shift, or Alt keys. Refer to *Rotate, Zoom, Change Lookpoint without a Modifier Key* (page 3DV 4-155) for more information.

Zoom In on a Model

Any region of the model can be zoomed in using the middle mouse button[†] and pressing either the Control, Shift, or Alt key. The cursor can be anywhere in the 3D Viewer display screen. Moving the cursor towards the bottom of the screen (towards the user) zooms in on the model (as if the model is being pulled towards the user); moving the cursor away from the user (towards the top of the screen) zooms out from the model (as if the model is being pushed away from the user).

The three different modifiers on the mouse button (Control, Shift, and Alt) produce three different results:

Key with Middle Mouse Button	Zooms
Control Key	Wire frame with the model turned off; the model is redrawn once the control key is released.
Shift Key	Wire frame with model and/or data are drawn through the entire redraw; zooming in or out with the model on can slow down the tracking of the cursor.
Alt Key	Wire frame and any scattered data are drawn during the rotation; the model is turned off.

Keeping any of the three keys (Control, Shift, or Alt) pressed and changing which mouse button is pressed shifts from zooming to rotation to panning (changing the look point) and back to any of the others without having a redraw occur with each change. In addition, since the display is not redrawn until the Control, Shift, or Alt key is released, if the cursor gets too close to the edge of the screen to make zooming comfortable, the mouse button can be released (without releasing the other key), the cursor repositioned on the mouse pad, the mouse button re-pressed, and the zooming continued. These controls also make it very easy to zoom in on an exact location.

A toggle is available that allows model rotation without holding down the Control, Shift, or Alt keys. Refer to *Rotate, Zoom, Change Lookpoint without a Modifier Key* (page 3DV 4-155) for more information.

†. When using the `twobuttonmouse` vue file parameter (discussed on page 3DV B-37), this functionality is assigned to using the left and right mouse buttons simultaneously. In this case, the Alt key combination does not work because the Alt-right mouse button combination brings up a system window.

Change the Look Point (Panning)

The look point can be changed such that any portion of the model is in the middle of the screen using the right mouse button and either the Control or Shift key pressed. (*Note:* The Alt key cannot be used with the right mouse button, since when used in combination, they bring up an operating system pop-up window.) The cursor can be anywhere in the 3D Viewer display screen. Moving the cursor moves the model in the XY plane of the screen in the same direction as the cursor (e.g., moving the cursor towards the right and up, moves the model to the right and up). Changing the look point has the effect of panning along the model.

The two different modifiers on the mouse button (Control and Shift) produce two different results:

Key with Right Mouse Button	Moves
Control Key	Wire frame with the model turned off; the model is redrawn once the Control key is released.
Shift Key	Wire frame with model and/or data are drawn through the entire redraw; zooming in or out with the model on can slow down the tracking of the cursor.

Keeping either key (Control or Shift) pressed and changing which mouse button is pressed shifts from changing the look point to zooming to rotation and back to any of the others without having a redraw occur with each change. In addition, since the display is not redrawn until the Control or Shift key is released, if the cursor gets too close to the edge of the screen to make panning comfortable, the mouse button can be released (without releasing the other key), the cursor repositioned on the mouse pad, the mouse button re-pressed, and the panning continued. These controls also make it very easy to view an exact location.

A toggle is available that allows model panning without holding down the Control or Shift keys. Refer to *Rotate, Zoom, Change Lookpoint without a Modifier Key* (page 3DV 4-155) for more information.

Rotate, Zoom, Change Lookpoint without a Modifier Key

The model can be rotated, zoomed in or out, and the lookpoint changed, with or without using the Control, Shift, or Alt keys. Using the grave (‘) key with the modifier key (Control, Shift, Alt) toggles whether or not the modifier key is necessary. The three different modifiers (Control, Shift, Alt) with the grave key produce three different results:

Key with Tilde (~)	Toggles
Control Key	A mode where the wire frame is moved by pressing and moving only the left, middle, or right mouse buttons.
Shift Key	A mode where the wire frame with model and/or data are moved by pressing and moving only the left, middle, or right mouse button.
Alt Key	A mode where the wire frame and scattered data are moved by pressing and moving only the left, middle, or right mouse buttons.

Additional Hot Key Features

In addition to the menu button commands and the mouse button features, a few additional hot key commands are available that are either not associated with a menu button or not visible next to the menu item. These hot keys may be associated with a menu button in future versions of the 3D Viewer, or may exist in a modified form. Almost all of these hot keys have keywords that can be used in vue files (vue files are discussed in Appendix B). Most of these additional hot key commands are control characters, i.e., in order to type the hot key, the user must hold down the control (CTRL) key and type the letter or key indicated. The symbol that indicates the control key is the caret (^). The commands are as follows:

Hot Key	Vue File Keyword	Function
Alt s	<none>	Toggles stereoscopic display, which can be run only on certain SGI machines. Refer to *Stereo3D Display* (page 3DV 4-65) for more information.
^spacebar	<none>	Interrupts any sequence of events, regardless of how they were started in the 3D Viewer (e.g., by selecting menu items or hot keys).
^d	logo	Turns on and off the Dynamic Graphics logo.
^Home†	<none>	Resets all program attributes to their system defaults (without using the *Home* pop-up menu); refer to *Reset Attributes* (page 3DV 4-27) for more information.
↑ → ↓ ←	azimuth inclination	Changes the azimuth or inclination of the model; refer to the *View Angle—Rotating the Model* (page 3DV 4-23).
^↑ ^→ † ^↓ ^←	xlookpoint ylookpoint zlookpoint	Changes the lookpoint location (pans the model); arrow direction indicates movement of the model; refer to *Look Point Position* (page 3DV 4-24).
F1, F2† F3, F4 F5, F6	xmincutgrid xmincutdata ymincutgrid ymincutdata zmincutgrid zmincutdata	Moves the X, Y, or Z front slice in (even F keys) or out (odd F keys); refer to *Adjust Slices—Cutting Away the Property Model* (page 3DV 4-13)
F9, F10† F11, F12	isosurfminlev isosurfmindata isosurfmaxlev isosurfmaxdata	Moves the minimum or maximum isosurface in (even F keys) or out (odd F keys); refer to *Adjust Isosurfaces* (page 3DV 4-17).
pad 0†	<none>	Resumes an interupted script file; refer to *Run Script* (page 3DV 4-112).
space bar	<none>	Suspends a script file or animation; refer to *Run Script* (page 3DV 4-112) or *Pause Animation* (page 3DV 4-116).
^q†	<none>	Exits the 3D Viewer; this is equivalent to using the Esc key.

† These hot key features have associated menu buttons but are not readily visible as hot keys.

Chapter 5: Using the Color Editor

The 3D Viewer Color Editors allow the user to alter the default colors used when displaying models, grids, and scattered data files. The 3D Viewer uses six color tables and, therefore, has six separate Color Editors: one each for properties, zones, Z-levels, features, time, and uniform data colors. Each of the color tables has default colors, although the user can modify or create custom color files using the appropriate Color Editor. This chapter first discusses the differences between the Color Editors, and then each of the available functions. Please refer to *Color Files* (page 3DV 2-13) and *The Color Key* (page 3DV 3-10), *Property/Zone Colors* (page 3DV 4-33), *Z Color-Filled Contours* (page 3DV 4-34), and *Color Key Control* (page 3DV 4-56) for discussions on how color files and color tables are used in the 3D Viewer.

The Color Editors help make the 3D Viewer a more powerful communication tool by allowing color files to be created that better present the modeled data. The default colors for each color table differs:

- properties, Z-levels, and time values . . . . represent a full spectrum of colors starting with purples through blues, greens, yellows, oranges, and, finally, reds; while these colors may be suitable for some data sets, the subtle gradation may be undesirable or inappropriate for other data sets.
- zones. . . . . a mixture of colors, with the intent that adjacent colors are dissimilar; if, for example, a particular zone is very thin, a user might want to change the color to make it stand out.
- feature IDs . . . . a spectrum of colors (e.g., red, green, blue, orange, purple, yellow) repeated, with each repetition increasing in lightness; this mixture of colors allows different features with sequential feature color numbers to be easily distinguished.
- seismic grids. . . . . colors span from shades of red through white to shades of blue; this color table is a special default property color table just for seismic grids.
- uniform data colors. . . . . eight colors, repeated to form a set of 64 colors; yellow, green, red, blue, orange, magenta, brown, cyan.

Examples of how color can immediately communicate ideas are:

- Using cool, blue colors for colder temperatures and hotter, red colors for warmer temperatures
- Putting target P-values in a color or colors that contrast greatly with the surrounding colors (e.g., putting a dark red color for the target P-values; see the figure on 3DV 5-7)

- Making all elevations (Z-levels) black above or below the height where useful interpretations can be made; then, when color-filled contours are displayed, the surfaces outside the valid area show up in black
- Using blues for water, browns and greens for land, dark colors for pollutants
- Using colors based on industry standards
- Using the same colors for adjacent levels, thereby appearing to decrease the number of isovalue levels displayed (as shown in the bottom right color key on page 3DV 5-7)
- Showing zones that are not of interest in darker, duller colors, while displaying target zones in brighter, richer colors
- Altering colors for hard copies, photographs, and videos, since some colors look better on the terminal screen than they do in other media; for example, reds tend to bleed in videos

Additional color files can be created and saved as defaults for all 3D Viewer displays, as the default file for particular faces files, or as additional color files to be used whenever deemed necessary. Alternatively, the color schemes created in the Color Editors can be used temporarily within a single 3D Viewer session without being saved.

Since property, zone, feature, time, uniform data, and Z values can each be shown in a different set of colors, a separate Color Editor is available for each. The different Color Editors work almost exactly the same, with only a few exceptions. A discussion of each of the Color Editors follows.

Color Editor Differences

For ease, separate color editors are available for property, Z, zone, feature, time, and uniform data, colors. With the exception of Z color files, the color files created in each editor have exactly the same format (shown under *Color File Formats*, page 3DV 5-22); however, the suffix for each is different:

Color Editor	*Suffix*
Property	*.pclr*
Z	*.zclr*
Zone	*.znclr*
Feature/Uniform Data	*.fclr*
Time	*.tclr*

Other differences include:

- The currently loaded color table or the default color table for each type is displayed when each color editor is entered.
- The labels at the right of the color table display isovalues for property tables, Z-values for Z tables, user-entered zone names for zone tables (if available), feature IDs for feature tables, time values for time tables, and the file names for uniform data color tables (examples are shown on page 3DV 5-7). (The zone names must be listed in a vue file; please refer to *Vue Files* (page 3DV 2-14) and Appendix B for more information.)

- Z color files are ordered from 9 at the bottom to 72 at the top; zone color files are ordered from 1 to 256; other color files are ordered from 1 to 64 (bottom to top).

Z color files can also be created in the EarthVision Color Table Editor (`evcte`).

Entering the Color Editors

After selecting the *Color Editors* menu button on the Color Menu, or typing the “z” hot key, the pop-up menu shown at left appears. Once one of the available Color Editors is selected, the model display is replaced with the graphic display of the Color Editor, shown in the top figure on the page 3DV 5-6. The rest of this chapter describes the components of the Color Editors and how to use them.

Color Editor Display

Upon entering the Color Editors, the model display is replaced with the Color Editor graphic display. An example of the Color Editor display is shown in the top figure on 3DV 5-6.

The Color Editor display consists of six components:

- Three Color Bars at the top of the screen
- The Current Color box in the middle of the screen
- The Color Table along the left side of the screen (either property, zone, feature, time, or Z)
- The Main Menu on the right side of the screen
- The Options Menu displayed in the same area as the Main Menu, and only accessed from the Main Menu
- The Mouse icon and help section at the bottom of the screen

Each of the components are discussed after the sections on getting help and using hot keys in the Color Editor.

Online Help

As with the rest of the 3D Viewer, help for any menu button is displayed in the Status Window on the Main Menu by clicking with the middle mouse button† on the desired menu button.

Two other types of help are available:

- Brief help on mouse button functions within the Color Editor is displayed to the right of the mouse icon.
- Detailed help about the functions of each mouse button is available by clicking on any of the three mouse icon buttons (examples are shown in the figures on 3DV 5-6).

Hot Keys

Next to each menu button is a command followed by a single letter, short word (e.g., Esc), number, or a letter and number combination enclosed in parentheses. These letters and numbers are the hot keys; typing the letter, number, or specified key (such as the Esc key or the F1 key) invokes the command the same way as would clicking the menu button. The command takes effect when the key is pressed, and does not require that the "return" or "enter" key be pressed. The layout of the keyboard and all associated hot keys for the 3D Viewer and the Color Editors are shown in Appendix D of this document.

Color Table

When any Color Editor is first entered, the color table displays the 64 available colors for the property, zone, Z, time, feature, or uniform data, color file that is currently being used in the 3D Viewer (the first 64 colors for zone color tables). The color levels that are being used for the current model are indicated by the arrow-headed bracket on the left and the property, zone, time, Z, or color values or file names on the right (see figure on 3DV 5-7); feature IDs are not displayed since any number of feature IDs can be associated with the feature color values. These brackets and values help the user reference the colors of the model to the color table. The color table serves as the palette for creating new color files. Methods for changing the color table are discussed in *Color Modification* (page 3DV 5-18). If a step factor is being used in the main portion of the 3D Viewer, only those colors that are shown based on the model parameters are bracketed; refer to *Z Color-Filled Contours* (page 3DV 4-34) and *Color Menu* (page 3DV 4-72).

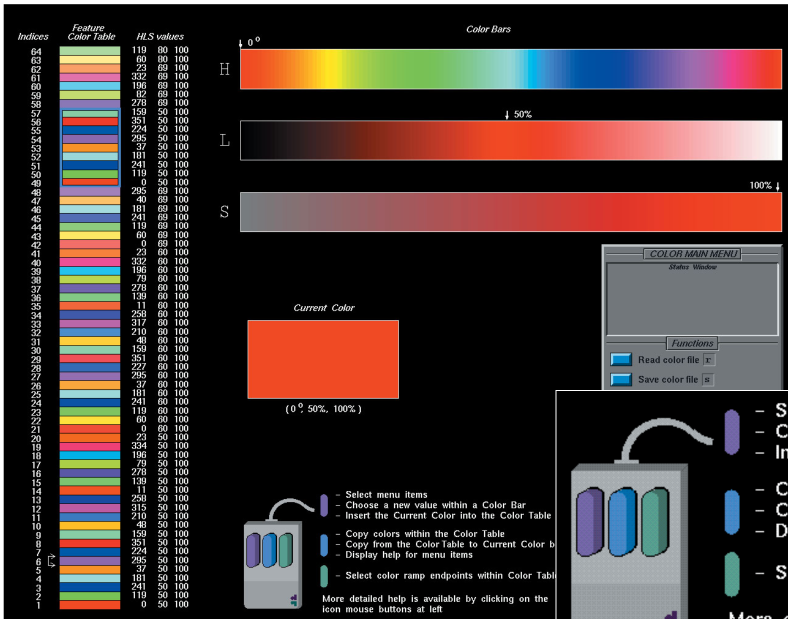
†. On systems without a middle mouse button, the vue file parameter `twobuttonmouse` can be set, so that the right mouse button has middle mouse button functionality; refer to Appendix B (page 3DV B-37) for more information.

Color Bars

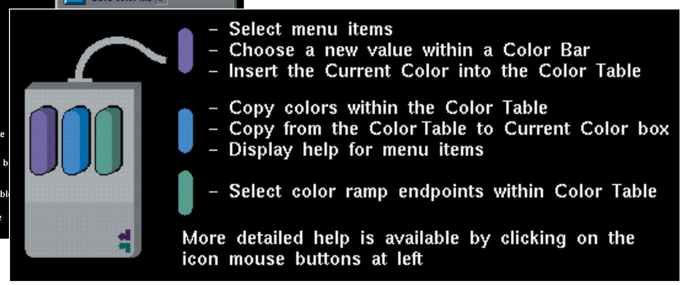
Each color bar represents one of the three components of a color system. (Four color-systems are available within the 3D Viewer; these are discussed later under *The Color Systems Section*, page 3DV 5-9.) Colors are created using the color bars. The arrows and numbers above the bars indicate the current setting of each bar. For example, in the top figure on 3DV 5-12, the color system is RGB (red, green, blue) and the amount of red is 252 out of 255, green is 0 out of 255, and blue is 0 out of 255. These three components make up the red color shown in the Current Color box. When each of these components is set to 0, the resulting color (displayed in the Current Color box) is black. When each component is 255, the resulting color is white. The different colors along any given bar show what the current color would become if the setting for the bar were at that position. The current setting is changed by placing the cursor at the desired color position along the color bar and clicking with the left mouse button. The position of the arrow, the value displayed next to it, and the Current Color all change to reflect the new color. The spectrum of colors displayed on the bars also changes to reflect all the new color possibilities now that one of the bars has been changed. With a little practice, it becomes easy to quickly select any color desired.

Current Color Box

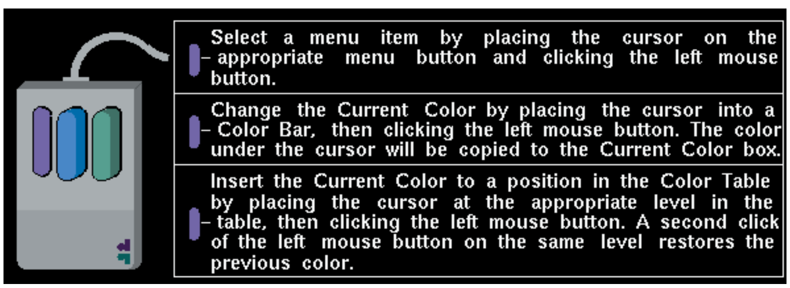
The color resulting from the components specified using the color bars is displayed in the Current Color box (refer to the figure on 3DV 5-12). Once the desired color is achieved, it can be easily inserted into the color table at any position (refer to *Color Modification*, page 3DV 5-18, for further discussion).



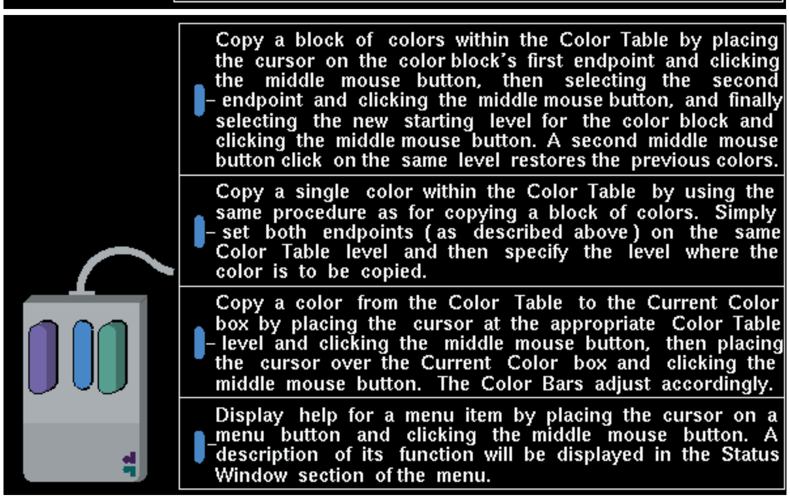
Feature Color Editor



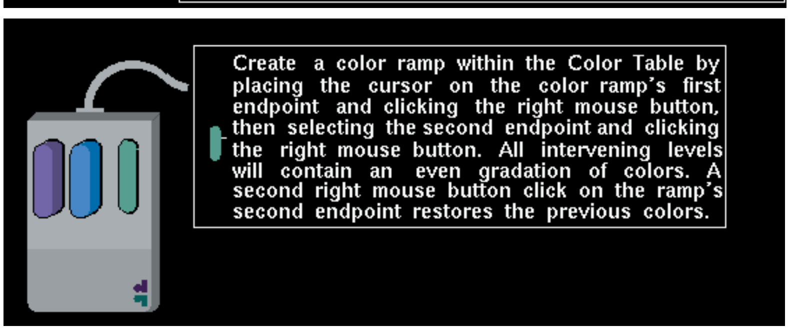
Main Help



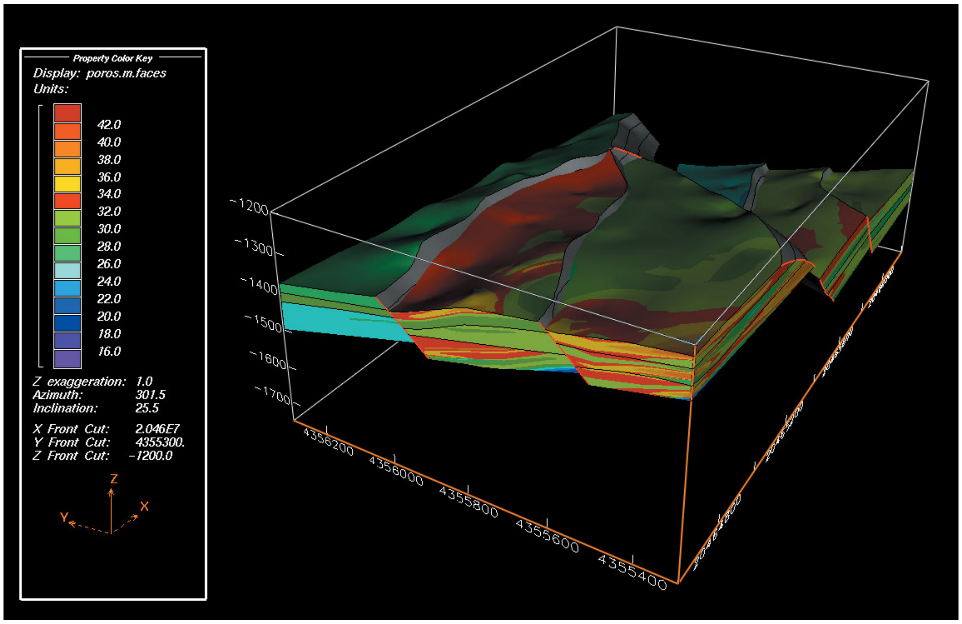
Left Mouse Button



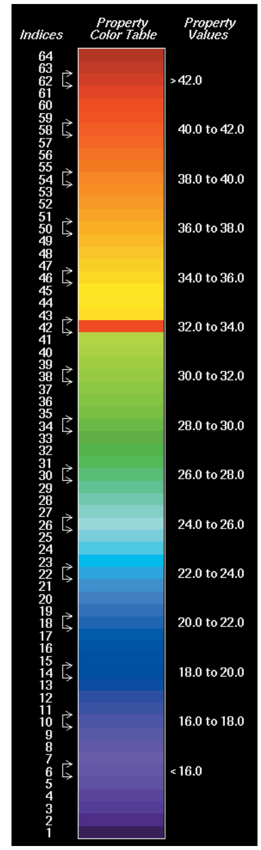
Middle Mouse Button



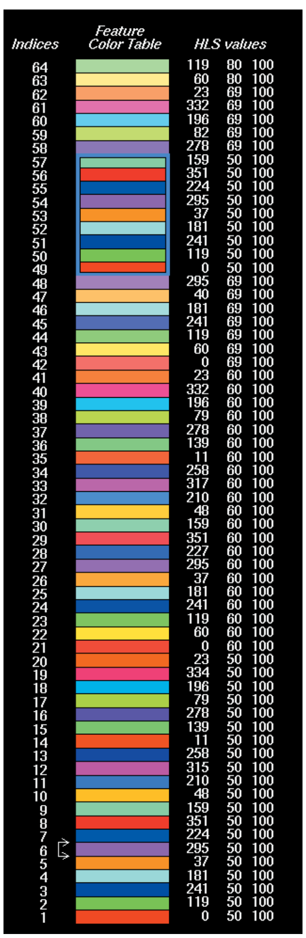
Right Mouse Button



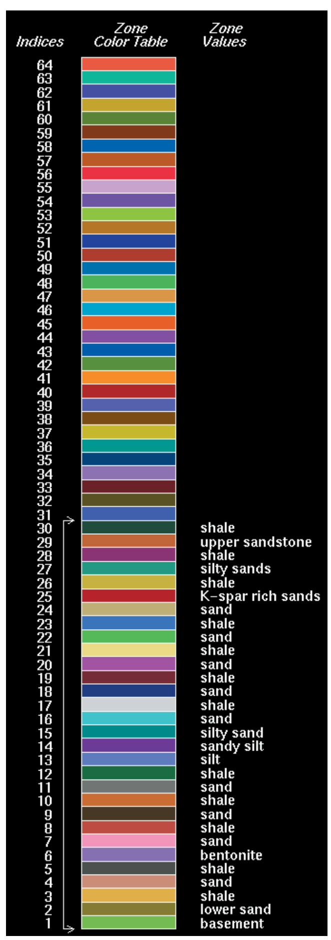
Property Color Key
Display: poros.m.faces
Units:
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
Z exaggeration: 1.0
Azimuth: 301.5
Inclination: 25.5
X Front Cut: 2.046E7
Y Front Cut: 4355300.
Z Front Cut: -1200.0
Z
Y
X
-1200
-1300
-1400
-1500
-1600
-1700
4356200
4356000
4355800
4355600
4355400



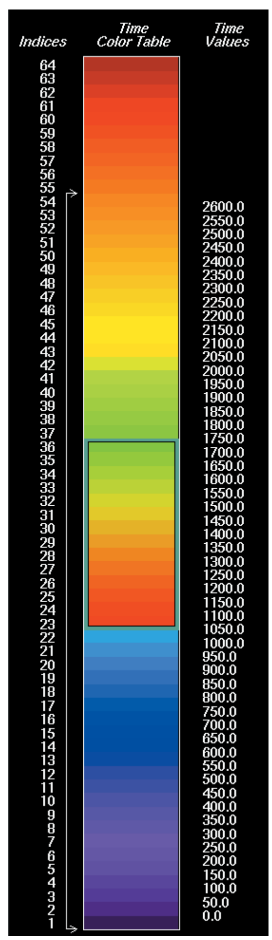
Indices
Property Color Table
Property Values
>42.0
40.0 to 42.0
38.0 to 40.0
36.0 to 38.0
34.0 to 36.0
32.0 to 34.0
30.0 to 32.0
28.0 to 30.0
26.0 to 28.0
24.0 to 26.0
22.0 to 24.0
20.0 to 22.0
18.0 to 20.0
16.0 to 18.0
<16.0



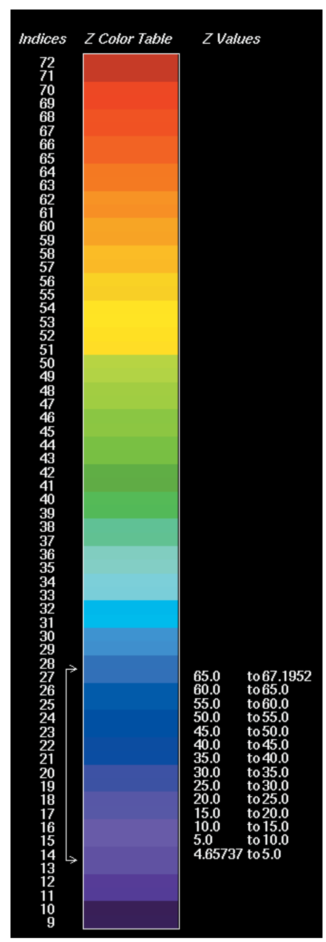
Indices
Feature Color Table
HLS values



Indices
Zone Color Table
Zone Values
shale
upper sandstone
shale
silty sands
shale
K-spar rich sands
sand
shale
sand
shale
sand
shale
sand
shale
sand
silty sand
sandy silt
silt
shale
sand
shale
sand
shale
sand
bentonite
shale
sand
shale
lower sand
basement



Indices
Time Color Table
Time Values
2600.0
2550.0
2500.0
2450.0
2400.0
2350.0
2300.0
2250.0
2200.0
2150.0
2100.0
2050.0
2000.0
1950.0
1900.0
1850.0
1800.0
1750.0
1700.0
1650.0
1600.0
1550.0
1500.0
1450.0
1400.0
1350.0
1300.0
1250.0
1200.0
1150.0
1100.0
1050.0
1000.0
950.0
900.0
850.0
800.0
750.0
700.0
650.0
600.0
550.0
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0



Indices
Z Color Table
Z Values
65.0 to 67.1952
60.0 to 65.0
55.0 to 60.0
50.0 to 55.0
45.0 to 50.0
40.0 to 45.0
35.0 to 40.0
30.0 to 35.0
25.0 to 30.0
20.0 to 25.0
15.0 to 20.0
10.0 to 15.0
5.0 to 10.0
4.65737 to 5.0

The Main Menu

The Main Menu is the gray-filled box located on the right side of the Color Editor display (see the top figures on pages 3DV 5-6 and 3DV 5-13). The Main Menu includes a Status Window (similar to the one displayed in the 3D Viewer) and menu buttons and hot keys for selecting functions. The Main Menu is used to retrieve, save, and delete color files, enter the Options Menu (discussed later), and change the color system.

The Functions Section of the Main Menu

The following menu button functions are available from the Main Menu:

- Read Color File
- Save Color File
- Delete Color File
- Color Table Display
- Options Menu
- Exit Color Editor

Read Color File

The 3D Viewer Color Editors can select any color file for display in the color table (although only zone and property color files and time and feature color files can be interchanged between the Color Editors). After selecting the *Read Color File* menu button (or typing the hot key “r”), a pop-up menu appears listing all the available appropriate color files (e.g., for the Property Color Editor, all files ending in *.pclr*). A color file in the current working directory can then be chosen by clicking on the desired color file name. For more information on how to use the File Selection menu, refer to the File Selection section (page 3DV 3-7).

Save Color File

Once the user creates a color table and wishes to save it, it can be stored using the *Save Color File* function. After selecting the *Save Color File* menu button (or typing the hot key “s”), the user is prompted (from the Status Window) to enter a color file name via the keyboard; the appropriate suffix is supplied (e.g., *.znclr* for zone color files). If the file already exists, the 3D Viewer prompts for confirmation before overwriting the file.

The 3D Viewer default colors cannot be overwritten. If, however, alternate default colors are desired, default color files named *cf0.pclr*, *cf0.znclr, cf0.zclr*, *cf0.fclr,* or *cf0.tclr* can be created to override the programs default. The next time the 3D Viewer is entered, any color files in the current disk directory with these names are loaded as the default colors rather than the 3D Viewer default colors. The 3D Viewer default colors are used if these files do not exist.

Delete Color File

The user can delete color files by selecting the *Delete Color File* menu button (or by typing the hot key “d”). A pop-up menu appears listing all file names in the directory that have the appropriate suffix; color files can also be selected from other directories using the Directories section of the File Selection menu.

Color Table Display

The Color Table Display section appears when a zone color file is displayed. These files contain up to 256 colors; the radio buttons in the Color Table Display section toggle which set of 64 colors is displayed in the color table.

Options Menu

The *Options Menu* button (or the "o" key) displays a secondary menu with less frequently used functions. See *Options Menu Functions* (page 3DV 5-15) for more information.

Exit Color Editor

The *Exit Color Editor* button (or the "Esc" key) returns the user to the 3D Viewer display at the same point as when the Color Editor was entered. If the user wants to save the edits for future 3D Viewer sessions, the color table must be saved into a color file before exiting the Color Editor, and prior to loading another color file or altering the color table in any way. When returning to the 3D Viewer model display, the most recently edited color table is used, whether or not the current color table has been saved. In this manner, the user can view the current color table while displaying a model. Then, if desired, the user can reenter the Color Editor and save the color table to a file **as long as a new color file has not been loaded**. It is recommended that a new or modified color table be saved prior to exiting the Color Editor, if the current color table may be needed in the future.

Back-up Color Files

If the current color table has not been saved and the user exits the Color Editor or exits the 3D Viewer, the most recent color table for each Color Editor entered is stored in a temporary file. These temporary files are named

- *cfbak.pclr* (for property color files)
- *cfbak.znclr* (for zone color files)
- *cfbak.zclr* (for Z color files)
- *cfbak.fclr* (for feature color files)
- *cfbak.tclr* (for time color files).
- *cfbak_uni.fclr* (for uniform data color files)

These files can then be renamed outside of the 3D Viewer to a permanent file. **The backup color files are overwritten each time the Color Editor is exited**; therefore, these names should not be used for storing color tables.

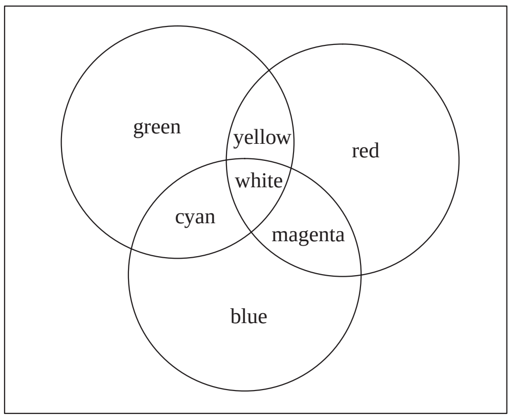
The Color Systems Section

Four color-systems are available in each of the 3D Viewer Color Editors. Each system uses three values (controlled by the three color-bars) to create a color.

- Red, Green, Blue (RGB) Color System
- Cyan, Magenta, Yellow (CMY) Color System
- Hue, Saturation, Value (HSV) Color System
- Hue, Lightness, Saturation (HLS) Color System

RGB

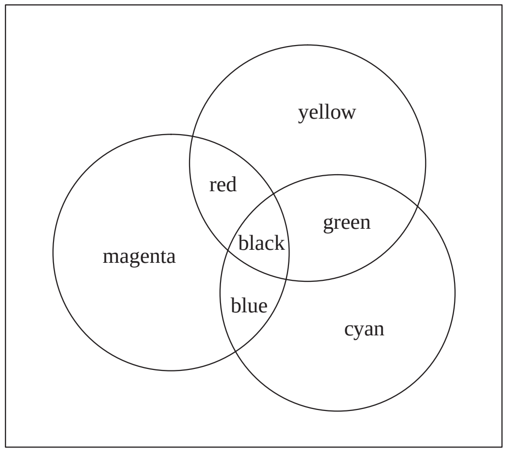
The Red, Green, and Blue Color System (RGB) is an additive color system, i.e., it represents the behavior of mixtures of colored light, with primary hues of red, green, and blue. The RGB color system is used for most video displays, using illuminated red, green, and blue phosphor dots that comprise pixels. If all three primaries are equally mixed and illuminated at full intensity, the result is white (as illustrated below); if red and blue are equally mixed, with no green component present, then the result is a shade of magenta, etc. Each of the three values that comprise a color in the RGB system can be thought of as levels of illumination of the component color and may range from 0 to 255. When all three are set to 255, the resulting color is white; when all three are 0, the result is black. Anytime all three components have the same value, the resulting color is a shade of gray ranging between the black and white endpoints. The RGB color system is selected by selecting the *RGB* menu button under the Color Systems section with the left mouse button (or selecting the “F1” hot key). The RGB system is shown in the top figure on 3DV 5-12.



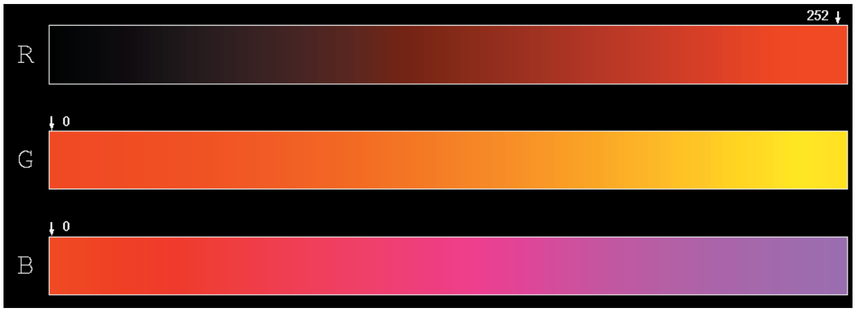
A schematic representation of the additive RGB color system. This figure represents the behavior of mixed colored light at 100% intensity.

CMY

The Cyan, Magenta, and Yellow Color System (CMY) is a subtractive color system, i.e., it represents the behavior of mixtures of translucent color, with primary hues of cyan, magenta, and yellow. This color system is used for printing ink, film, and other non-light emitting media. If all three primaries are equally mixed at full intensity, the result is black (as illustrated below); if cyan and yellow are equally mixed, the result is green, etc. The three values that represent the color components in the CMY system could be thought of as the intensity of the pigments being mixed and may range from 0 to 255. Opposite of the RGB system, when all three CMY components are set to 255, the resulting color is black; when all three are set to 0, the resulting color is white. The CMY Color System is selected using the CMY menu button under the Color Systems section (or by selecting the “F2” hot key). An example of the CMY system is shown in the second figure on 3DV 5-12.

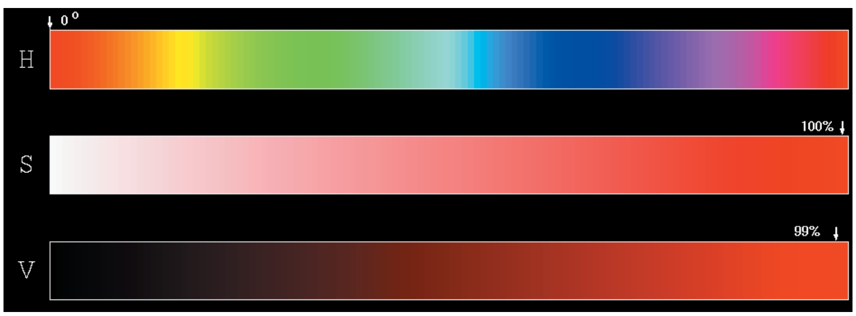


A schematic representation of the subtractive CMY color system. This figure represents the behavior of colored media which are not self-luminous.

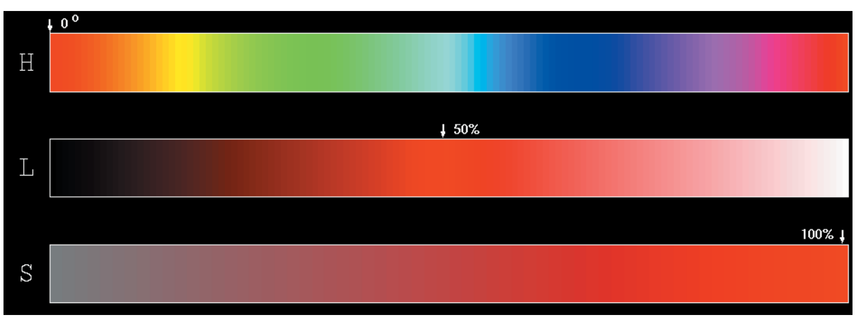


RGB (Red, Green, Blue)

CMY (Cyan, Magenta, Yellow)

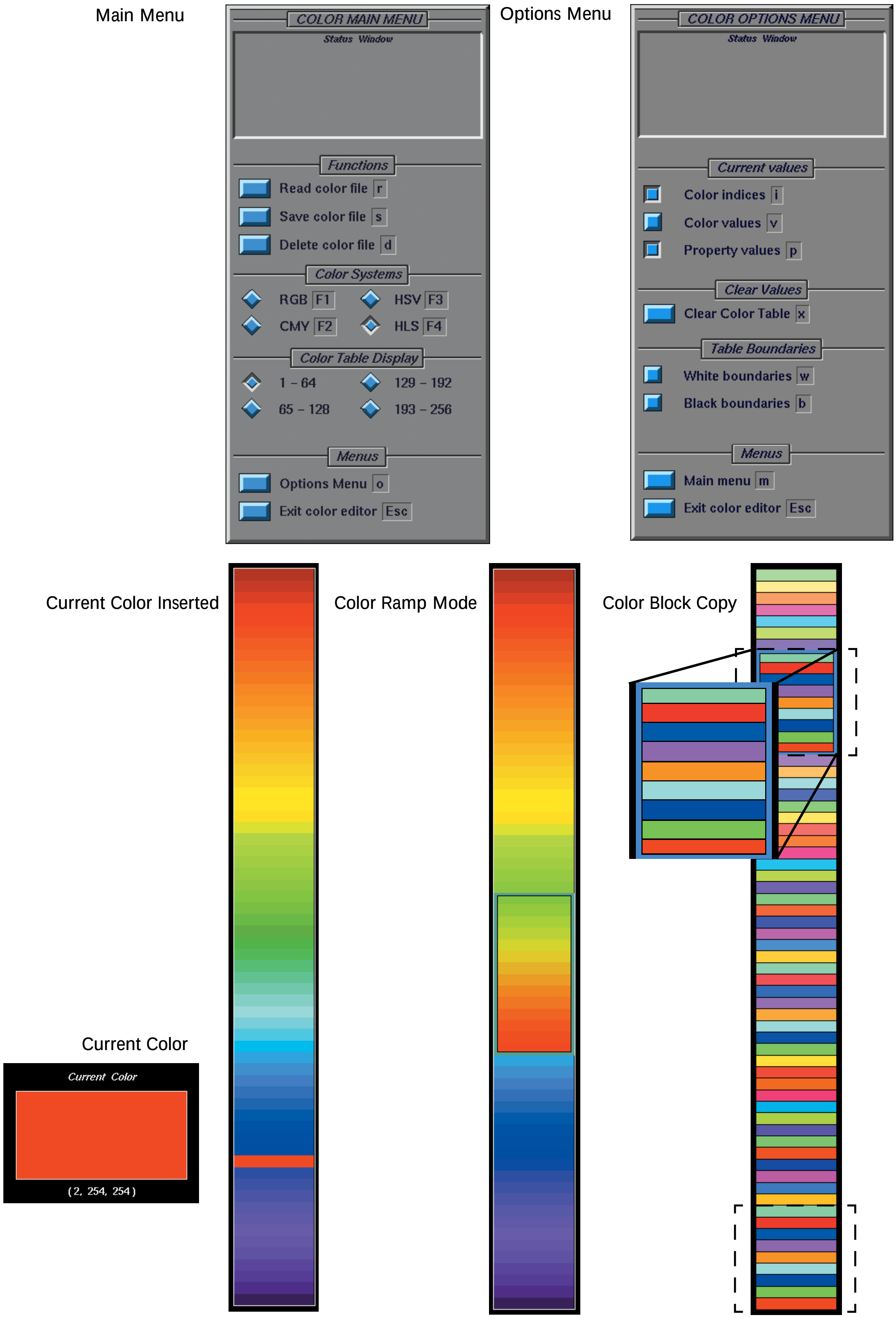


HSV (Hue, Saturation, Value)



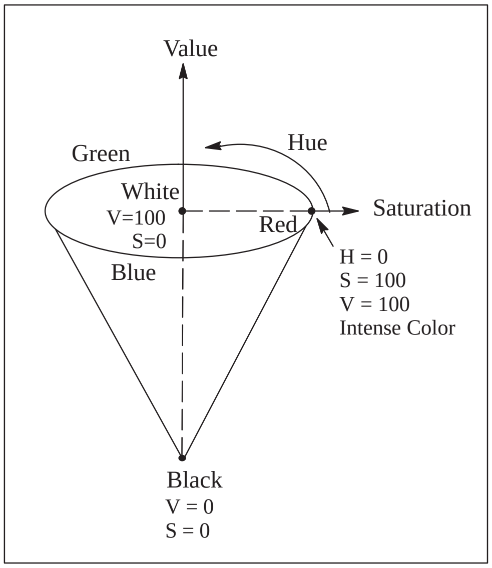
HLS (Hue, Lightness, Saturation)

Current Color


Main Menu
COLOR MAIN MENU
Status Window
Functions
Read color file r
Save color file s
Delete color file d
Color Systems
RGB F1
HSV F3
CMY F2
HLS F4
Color Table Display
1 – 64
129 – 192
65 – 128
193 – 256
Menus
Options Menu o
Exit color editor Esc
Options Menu
COLOR OPTIONS MENU
Status Window
Current values
Color indices i
Color values v
Property values p
Clear Values
Clear Color Table x
Table Boundaries
White boundaries w
Black boundaries b
Menus
Main menu m
Exit color editor Esc
Current Color Inserted
Color Ramp Mode
Color Block Copy
Current Color
Current Color
(2, 254, 254)

HSV

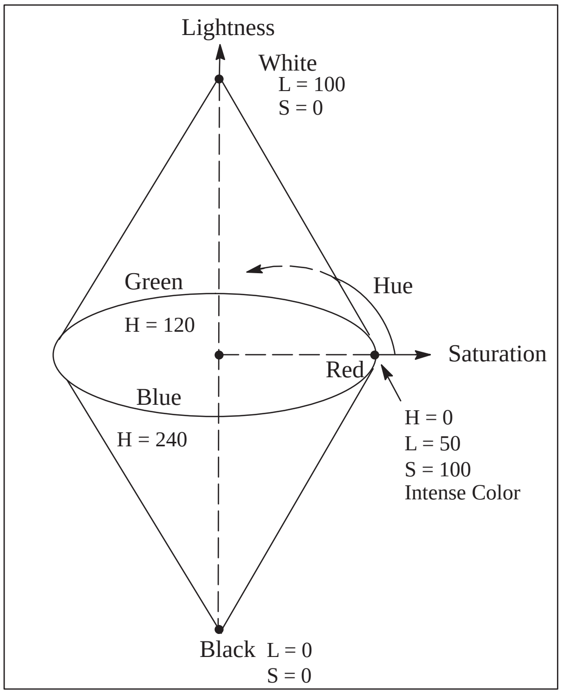
HSV stands for the Hue, Saturation, Value Color System. When using this system (selected by the menu button or the “F3” hot key), the top color bar represents the Hue component of the color, the middle bar is the Saturation component, and the bottom bar, the Value component. Hue represents the “color” part of the color—the wavelength of light reflected from a surface; it may range from 0° to 360°. Saturation ranges from 0% to 100% and represents the purity or intensity of the chosen hue. Value also ranges from 0% to 100% and controls the shade of gray in the color; the higher the value, the less gray there is in a color. For any given Hue, if Value is 0%, regardless of the Saturation setting, the resulting color is black; if Value is 100% and Saturation is 0% (in this case, the setting for the Saturation is important), the resulting color is white. If Saturation is at a value other than 0%, then some color, dependent on the hue, will result. At 100% Saturation, the color is its most intense. Also, for a given Saturation and Hue, decreasing the Value darkens the color (see the diagram below). The HSV color system is shown in the third figure on 3DV 5-12.



A schematic representation of the HSV Color System. Hue is selected from a closed, 360 color wheel. Saturation increases outward, and value increases upward.

HLS

HLS stands for the Hue, Lightness, Saturation Color System, and is similar to the HSV color system. HLS is the default color system for each of the Color Editors (i.e., it is the color system on the screen when first entering the editors). When using this system (selected using the menu button or the “F4” hot key), the top color bar represents the Hue component of the color, the middle bar is the Lightness component, and the bottom bar, the Saturation component. (The HLS color bars are shown in the bottom figure on 3DV 5-12.) Hue represents the “color” of the color-the wavelength of light reflected from a surface. It can range from 0° to 360°. Lightness ranges from 0% to 100% and is a measure of the amount of reflected light in the color (with black, the absence of light, at one end, and white, full light, at the other). Saturation also ranges from 0% to 100%, and represents the purity of the chosen hue. A color with a saturation value of 100% is at its most intense for that hue. For any given Hue or Saturation, if Lightness is 0%, the resulting color is black; if Lightness is 100%, the resulting color is white. When Lightness is 50% and Saturation is 100%, the resulting color is its most intense. When Saturation is 0%, the Lightness bar shows shades of gray, with black and white at either end. Another way to look at this color system is: for any given Hue or Saturation and starting at 50% Lightness, adding Lightness (towards 100%) adds white to the color; subtracting Lightness (towards 0%) adds black to the color, as shown on the following page.



A schematic representation of the HLS Color System. Hue is selected from a closed, 360 color wheel, shown here between two cones. Saturation increases outward, and lightness increases upward.

Options Menu Functions

The options available from the Options Menu in each of the Color Editors are generally functions that the user would want to change infrequently. They are divided into three sections; each section and associated commands are discussed below. The Options Menu is displayed in the top right figure on 3DV 5-13.

Current Values Section

Color Indices

The *Color Indices* toggle button (or the "i" hot key) turns on or off the display of the index number associated with each color level in the color table. When enabled, as is the default, the values are located to the left of the color table. The indices are used in determining which colors are displayed in the 3D Viewer. The 3D Viewer usually starts the color display with the color associated with index 1, although other 3D Viewer settings can affect this.

Color Values

The *Color Values* toggle button (or the "v" hot key) turns on or off the display of the RGB, CMY, HSV, or HLS settings (depending on the current color system being used) of each color to the right of the color table. By default, the color values are not shown. The lower left figure on 3DV 5-7 shows the HLS values displayed next to the color table. The color values cannot be displayed if the property, zone, time, or Z values are on; selecting the *Color Values* toggle button turns off any of these other values, if displayed.

Note: The colors are always stored as the RGB equivalents in the color file, regardless of which color system was used to create the colors.

Property/Zone/Time/Z Values and Data File Names

This command varies between each of the Color Editors. The commands, *Property Values*, *Zone Values*, *Time Values*, *Z Values* and *Data File Names* (respectively for each Color Editor), and the associated "p" hot key toggle on and off information about each color in the color table being edited. For example, if a user is editing the property color table, the P-values in the faces file header are shown next to each color; for zones, the zone labels in the vue file (discussed in Chapter 2 and in Appendix B) are shown; for Z-colors, the Z-values are shown next to each color; and for time colors, the time values. By default, these values are displayed (as in the two bottom right figures on 3DV 5-7); they cannot be displayed, however, at the same time the color values are shown.

Note: If a color step is being used, the Z values displayed next to the color levels may have an ellipsis next to them to indicate that addition values are associated with the color due to wrapping around the color table. These additional values are not displayed due to a lack of space. (Refer to Z Color Step, *page 3DV 4-35, for more information on color stepping.)*

Clear Values

Clear Color Table

Clear Color Table (or the "x" hot key) resets all the colors in the color table to black. This action does not affect any of the color files, only the display. If the current color table has not been saved, clearing it will lose any edits that have been performed on the current color table. Once a color table is cleared, turning on boundaries (discussed next) can aid in differentiating the color-level locations.

Table Boundaries

Boundaries may be drawn around each color table level to aid in differentiating colors. The boundaries are not saved in the color file.

Toggle White Boundaries

Toggle White Boundaries (or the “w” hot key) turns on or off the display of white lines around each color level in the color table. The default display does not have any boundaries between colors. The second figure from the bottom left on 3DV 5-6 shows the color table with white boundary lines.

Toggle Black Boundaries

Toggle Black Boundaries (or the “b” hot key) turns on or off the display of black lines around each color level in the color table. The default display does not have any boundaries between colors. The lower left figure on 3DV 5-7 shows the color table with black boundary lines.

Options Exit

Exit Color Editor

Exit Color Editor (or the “Esc” hot key) returns the user directly from the Options Menu in the Color Editor to the 3D Viewer model display. Any color table edits the user wishes to keep must be saved before exiting the editor. If the user forgets to save a color file before exiting, the backup color files (e.g., *cfbak.pclr*) can be read and renamed within the Color Editor in order to recover the color file, or renamed at the operating system level. Refer to the *Exit Color Editor* discussion (3DV 5-9) for more information.

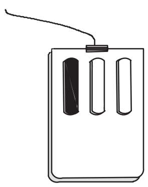
Return to Main Menu

Return to Main Menu (or the “m” hot key) removes the Options Menu and returns the user to the Color Editor Main Menu.

Color Modification

The following sections discuss the methods for modifying colors. Brief descriptions are highlighted in bold with a ☞ next to them. More detailed descriptions then follow.

Modify Current Color Box



☞ **To change the color displayed in the Current Color box, click the left mouse button on the desired position within any color bar.**

Each color system displays three color-bars; each of which represents a component of color. Colors are created and displayed in the Current Color box by changing the setting on any or all of the bars. To change the setting on a given bar, click the left mouse button on the desired new position. This action automatically changes the composition of the color and displays the new color in the Current Color box. The colors displayed on the color bars are also updated with each setting change. The color bars not only display the settings of that component in the current color (as indicated by the arrow and number along the top of the bar), but also display, at every position along the bar, what the current color would become if the cursor were moved to that location. This display makes it easy to arrive at the desired color.

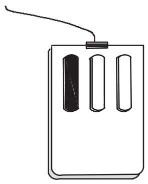
Modify Color Table

Colors are created, altered, copied, ramped, and variously manipulated using the three mouse buttons. Brief help, describing the functions associated within each mouse button, is displayed within each Color Editor next to the Mouse Icon. A detailed description of the functions available for the selected button is displayed to the right of the Mouse Icon by clicking (with any mouse button) on any of the three Mouse Icon buttons.

The color table is made up of 64 color levels, any of which can be altered. The color table may be modified in five different ways:

- Inserting colors into the color table
- Copying groups of colors
- Copying single colors
- Creating color ramps
- Fine tuning individual colors

Insert Colors into the Color Table

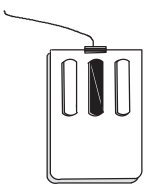


☞ **Click the left mouse button on the level in the color table that is to be overwritten by the current color.**

First, the color bars must be adjusted (by clicking on them with the left mouse button) to create the desired color, which is automatically displayed in the Current Color box. This color can then be inserted into a particular color table level by clicking with the left mouse button on the level to be overwritten. The user does not need to click on the Current Color box. An example is shown in the bottom left figure on page 3DV 5-12; the color in the Current Color box was inserted into color level 13.

Note: *To cancel the insertion of the current color, simply click the left mouse button a second time at the level containing the newly inserted color. This cancellation must be made before any other other function is selected or any other mouse or key click is made.*

Copy Groups of Colors within the Color Table



☞ **Click the middle mouse button on both color endpoints of the block of colors to be copied. Then click the middle mouse button on the location to be overwritten by the copied block[†].**

Place the cursor over one of the color endpoints of the block to be copied and click the middle mouse button. Place the cursor over the second color endpoint of the group to be copied and click the middle mouse button. When both endpoints are correctly selected, they and the group of colors between them are highlighted. If a mistake is made in selecting either endpoint, another click with the middle mouse button *outside* of the color table undoes the selection. After the color block has been highlighted, the user must select the level of the location for the copy by clicking the middle mouse button on the location for the *first* endpoint. The block of colors is copied into the required number of levels, and the original colors are overwritten. To cancel the group copy, click the middle mouse button on the same level where the group was inserted. The bottom right figure on page 3DV 5-13 shows a color block copy.

Note: *The following rules apply when copying groups of colors:*

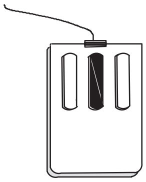
- If the endpoints of the block of colors to be copied are selected from top to bottom, the copy command fills levels *down* from the new location that is selected.
- If the block endpoints are selected from bottom to top, the copy command fills levels *up* from the new location that is selected.
- If a block of colors is copied onto a section of the color table that has fewer levels than the original block, only the number of colors that fit in the new section are added.

Note: *When editing a zone color table with more than 64 colors, a block of colors cannot be copied from one set of 64 colors to another set.*

---

†. On systems without a middle mouse button, the vue file parameter, `twobuttonmouse`, can be set, so that, in these cases, the left and right mouse buttons can be used simultaneously to mimic middle mouse button functionality; refer to Appendix B (page 3DV B-37) for more information.

Copy Single Colors within the Color Table

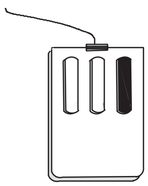


☞ **Click the middle mouse button twice over the color to be moved. Then click the middle mouse button on the location to be overwritten by the copied color.†**

Copying a single color is essentially the same as copying a block of colors, except that the single color is selected by clicking twice (because it is both the beginning and ending endpoints). After the single color is selected and highlighted, move the cursor to the new level to be overwritten and click the middle mouse button again. To cancel this copy, click the middle mouse button again over the new location; the previous color is restored.

Note: When editing a zone color table with more than 64 colors, a single color cannot be copied from one set of 64 colors to another set.

Create a Color Ramp



☞ **Click the right mouse button over the endpoints of the color ramp to be created, and the ramp is displayed immediately.**

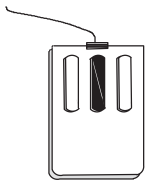
A color ramp is a series of steps that display a constant gradation in color between two user-selected color endpoints. For example, if the user selects red and yellow as the endpoints for a color ramp, a constant color gradation from red through shades of orange to yellow would be created. The ramp created depends on the color system displayed. For example, if red and purple endpoints are selected and the HLS color system (the default) is displayed, then the resulting colors start at red, go through orange, yellow, green, and blue, ending with purple. If, however, the RGB color system is displayed, the ramp would have colors ranging from reds through pinks, magentas, and purples.

To create a color ramp, place the cursor over one of the color endpoints and click the right mouse button. Then move the cursor to the other color endpoint and click the right mouse button. A box is displayed on the color table surrounding all the levels that are a part of the color ramp, and the color ramp is generated immediately. The colors that were previously displayed between the endpoints are overwritten.

If a mistake is made in selecting the first endpoint of the ramp, the selection is cancelled by clicking the right mouse button anywhere outside of the color table section. If a mistake is made on the second endpoint, an additional click of the right mouse button *on that same endpoint* cancels the ramp and restores the previous colors. An example of a ramp is shown in the bottom middle figure on 3DV 5-13.

†. On systems without a middle mouse button, the vue file parameter, `twobuttonmouse`, can be set, so that, in these cases, the left and right mouse buttons can be used simultaneously to mimic middle mouse button functionality; refer to Appendix B (page 3DV B-37) for more information

Fine Tune Individual Colors



☞ **Copy a color from the color table to the Current Color box for "fine tuning" by clicking the middle mouse button on the desired color and then clicking the middle mouse button again within the Current Color box†.**

Sometimes it is desirable to "fine tune" a color that already exists in the color table. For example, a user may want a slightly brighter, paler, or darker shade of a particular color-by changing to the HLS or HSV color system, the appropriate amount of white, black, or color could be added. Fine tuning is accomplished by copying the color from the color table into the Current Color box, so that adjustments can be made using the color bars. After the required adjustments have been made in the Current Color box, the color can be reinserted into the color table.

The color to be copied (in the color table) is selected by clicking on the appropriate level with the middle mouse button (used for all color copying). The color is then copied to the Current Color box by clicking with the middle mouse button anywhere within the Current Color box. The color is copied immediately and it is not possible to cancel this copy. An example of this type of copy is shown in the bottom left figure on 3DV 5-13. The color can then be adjusted using the color bars and any of the color systems. After the color has been altered, it can be reinserted into the color table at the desired position using the left mouse button (as described previously).

†. On systems without a middle mouse button, the vue file parameter, `twobuttonmouse`, can be set, so that, in these cases, the left and right mouse buttons can be used simultaneously to mimic middle mouse button functionality; refer to Appendix B (page 3DV B-37) for more information.

Color File Formats

The following are examples of the property color file format and the Z color file format. The zone, feature, and time color file formats are identical to the property color file format.

Property Color File Format

```
 53   3  77
 81   3 117
107   3 157
127   3 185
151   5 221
163   7 238
173   7 253
162   9 253
151   9 253
136   9 253
117  11 253
 97  13 253
 62  11 255
 27   8 255
 25  29 255
 23  50 255
 20  70 255
 18  91 255
 16 111 255
 14 132 255
 11 152 254
  9 173 254
  7 193 254
  5 214 254
  2 234 254
  0 254 254
  1 241 218
  1 229 182
  1 216 146
  1 203 109
  1 191  73
  1 178  37
 38 171   1
 57 182   1
 74 193   1
 92 203   1
110 214   1
128 224   1
145 235   1
163 245   1
180 255   1
218 255   1
255 255   1
252 245   1
249 235   1
245 225   1
242 215   1
243 204   1
244 193   1
244 181   1
245 170   1
246 159   1
246 147   1
246 136   1
247 120   1
248 104   1
249  88   1
249  72   1
249  47   1
253   1   1
233   1   1
213   1   1
193   1   1
173   1   1
```

Z Color File Format

```
 9  53   3  77  -1
10  22   6  92  -1
11  10  38 108  -1
12  14  98 122  -1
13  18 136 106  -1
14  24 148  56  -1
15  60 160  32  -1
16 132 172  38  -1
17 182 156  46  -1
18 192 100  56  -1
19 164 208  42  -1
20  30 226  68  -1
21  18 210 240  -1
22  27   8 255  -1
23  24 152 236  -1
24  42 218 168  -1
25  58 198  64  -1
26 142 178  76  -1
27 160 138  94  -1
28 140 112 112  -1
29 158 126  94  -1
30 178 178  74  -1
31 126 196  56  -1
32  38 214  38  -1
33  18 234 126  -1
34   0 254 254  -1
35   1 241 218  -1
36  10 232 162  -1
37  18 226 112  -1
38  26 218  70  -1
39  34 210  36  -1
40  76 202  42  -1
41 114 194  50  -1
42 144 186  60  -1
43 166 180  68  -1
44 172 162  76  -1
45 164 138  86  -1
46 156 122  94  -1
47 148 112 102  -1
48 140 112 112  -1
49 148 104 102  -1
50 158 100  92  -1
51 166  96  84  -1
52 176  96  74  -1
53 184  96  64  -1
54 192 100  56  -1
55 202 104  46  -1
56 210 112  38  -1
57 214 192  34  -1
58 160 220  30  -1
59  74 226  26  -1
60  22 232  66  -1
61  20 236 162  -1
62  18 218 240  -1
63  16 118 244  -1
64  14  14 248  -1
65 117  11 253  -1
66   2  50 248  -1
67   2 196 236  -1
68   2 222 120  -1
69  22 210   2  -1
70 146 198   2  -1
71 184 118   2  -1
72 173   1   1  -1
```

Appendix A: 3D Viewer Limits

The following limits apply in the 3D Viewer:

File Display

- 1 2D grid file displayed at a time
- 1 faces file displayed at a time
- 1 3D grid file displayed at a time; can be displayed with a 2D grid, faces file, or any number of scattered data files
- Any number of scattered data files can be displayed together, or with a faces file, 2D grid, or 3D grid
- 1 surface annotation file displayed at a time; can be displayed with 1 screen annotation data file
- 1 screen annotation file displayed at a time; can be displayed with 1 surface annotation data file
- 1 image file displayed at a time; can be draped or planar

3D Viewer Program Execution

- No limit to the number of files or vues in a script file or listed on the command line
- No limit to the number of files selected interactively for display
- Up to 64 color-filled contours displayed on a surface

Faces Files

- Up to 2048 X slice columns
- Up to 2048 Y slice rows
- Up to 1024 Z slice levels
- Up to 63 isovalues
- Up to 256 different zones can be merged in one file; any number of faces files can compose the merged file
- Up to 500 fault blocks can be displayed

Scattered Data Files

- No limit to ASCII scattered data points

Annotation Files

- Up to 20,000 coordinate pairs per surface annotation command
- No limit to the number of commands in a screen annotation file

3D Grids

- Up to 10,000,000 nodes supported

Appendix B: Vue Files

Vue files may contain settings for displayed isosurfaces, chair cuts, auxiliary displayed files, etc. Vue files can be used alone to display one view, or with other vue files as part of a script (see Chapters 2 and 3 for a description of and uses for script files).

This appendix gives a quick overview of vue files and then focuses on the keywords and parameters found in a vue file. The vue file type is discussed in *Vue Files* (page 3DV 2-14), and the use and creation of vue files is discussed in *Vue File Settings* (page 3DV 4-28). Entering `evview -hv` at the command line displays the vue file keywords and parameters on the monitor.

The following table describes the available types of vue files:

- .vue . . . . A vue file with this suffix can be used when displaying a faces file.
- .dvue . . . . A vue file with this suffix can be used when displaying an ASCII scattered data file.
- .2gvue . . . . A vue file with this suffix can be used when displaying a 2D grid.
- .3gvue . . . . A vue file with this suffix can be used when displaying a 3D grid.
- defaults.vue . . . . An automatically loaded vue file for all 3D Viewer sessions run in the directory where this file is present or in the EarthVision `etc` directory (refer to *Vue Files*, page 3DV 2-14).
- <*facesfilename*>.vue . . . . . . An automatically loaded vue file for the faces file named <*facesfilename*>*.faces* (refer to *Vue Files*, page 3DV 2-14).
- <*dataname*>.dvue . . . . An automatically loaded vue file for the ASCII scattered data file named <*dataname*>*.dat* or <*dataname*>*.pdat* (refer to *Vue Files*, page 3DV 2-14).
- <*2Dgridname*>.2gvue . . . . . An automatically loaded vue file for the 2D grid named <*2dgridname*>*.2grd* (refer to *Vue Files*, page 3DV 2-14).
- <*3Dgridname*>.3gvue . . . . . An automatically loaded vue file for the 3D grid named <*3dgridname*>*.3grd* (refer to *Vue Files*, page 3DV 2-14).

Vue files consist of a series of keywords, each followed by parameters. Each keyword and its associated parameters are on a separate line followed by a carriage return. A keyword plus its associated parameters form a vue file command.

Vue files are either created manually in a text editor or interactively using the *Save Vue* function on the View Menu (refer to 3DV 2-14). When creating or editing ASCII vue files, the following items should be kept in mind.

- Comments can be added by placing a pound sign (#) in the first column of the line containing the comment. Everything in this line is ignored by the 3D Viewer.
- The 3D Viewer is case sensitive; use lower case letters for all keywords and parameters.
- Screen location parameters are specified in pixel coordinates with (0,0) at the lower left corner of the 3D Viewer display window.
- Parameters of two or more separated values must be separated by blank spaces or tabs (no commas).
- Some parameters call for consecutive values that must be entered with no spaces, tabs, or commas between values.

The following pages contain descriptions and specifications for all the available vue file keywords and parameters. Following these specifications is a sample .vue file.

Note: *Default settings are indicated under the Description column. These program default settings are only used for keywords that are missing in all of the automatically loaded vue files (if they exist): the* <displayfilename>*.vue,* <dataname>*.dvue,* <2Dgridname>*.2gvue,* <3Dgridname>*.3gvue, and defaults.vue files (in the executable directory and/or the current directory). Please refer to Vue Files, (page 3DV 2-14) for further information on automatically loaded vue files. (If keywords are missing from other vue files, the settings for those keywords remain the same as the current display.)*

Allan Fault Menu Commands

The Allan Fault Menu is discussed on pages 3DV 4-124 to 3DV 4-127.

Keyword	*Permitted Parameters*	*Description*
allanfaults	0 1	Allan fault planes are not displayed. [default] Allan fault planes are displayed.
allanlabels	"txt"	The fault grid names given specify which Allan fault plane displays are on. [default: none]
alnzoneclrs	consecutive 1s or 0s	With one number for each zone, a 0 indicates that property colors are displayed if Allan fault planes are turned on for that zone; a 1 indicates that zone colors are displayed if Allan fault planes are turned on for that zone. [default: 1]
alnzoneremoval	consecutive 1s or 0s	With one number for each zone, a 0 indicates that the zone is displayed if Allan fault planes are turned on for that zone; a 1 indicates that the zone is removed if Allan fault planes are turned on for that zone. [default: 0]
alnpropminlev	0 to 64 integer or *min*	The minimum Allan fault property level is set to the interval number supplied. The word *min* can be placed here to specify the minimum level of the file. This value cannot be greater than the value set for *alnpropmaxlev*. [default: *min*]
alnpropmaxlev	0 to 64 integer or *max*	The maximum Allan fault property level is set to the interval number supplied. The word *max* can be placed here to specify the maximum level of the file. This value cannot be less than the value set for *alnpropminlev*. [default: *max*]
alnpropmindata	integer/float or *min*	The minimum Allan fault property data level is set to the P-value supplied. The word *min* can be placed here to specify the minimum P-value of the faces file. This P-value cannot be greater than the P-value for the *alnpropmaxdata*. [default: *min*]
alnpropmaxdata	integer/float or *max*	The maximum Allan fault property data level is set to the P-value supplied. The word *max* can be placed here to specify the maximum P-value of the faces file. This P-value cannot be less than the P-value for the *alnpropmindata*. [default: *max*]
alnpropinout	*inside* or *outside*	The display of Allan fault property levels can be set so that either the colors corresponding to P-values *inside* the P-range supplied are displayed, or the colors corresponding to P-values *outside* the range supplied are displayed. [default: *inside*]

Animation Menu Commands

The Animation Menu is discussed on pages 3DV 4-111 to 3DV 4-115.

Keyword	*Permitted Parameters*	*Description*
autosequence	0	The data animation is run with auto-sequencing off (manual sequencing is on).
	1	The data animation is run with auto-sequencing on (manual sequencing is off). [default]
timeinfowin	0	The time information box is not displayed. [default when a time field is not present in a scattered data file and when a scattered data file is not displayed]
	1	The time information box is displayed. [default when a time field is present in a displayed scattered data file]
timewinpos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the time information box relative to the 3D Viewer graphic display window. These two values must be separated by spaces. [default: 620, 10; dependent on window size]
growanimate	0	The data animation is run as front points.
	1	The data animation is run as growing lines. [default]
timeincr	integer/float	The value supplied indicates the time increment (in seconds) for data animation. [default: data dependent]
frametime	integer/float	The value supplied indicates the minimum frame time (in fractional seconds) for data animation. [default: 0.0]
grd3animslice	0	Run through the X planar slices for 3D grid animation. [default]
	1	Run through the Y planar slices for 3D grid animation.
	2	Run through the Z planar slices for 3D grid animation.
grd3animcycle	0	Loop through 3D grid animation. [default]
	1	Swing during 3D grid animation.
grdanimfront	0	Run 3D grid animation from back to front.
	1	Run 3D grid animation from front to back. [default]
grdanimframetime	float	Defines, in seconds, the minimum time for each frame during a 3D grid animation. [default: 0 seconds; each frame drawn as quickly as possible]

Axes Menu Commands

The Axes Menu is discussed on pages 3DV 4-117 to 3DV 4-121.

Keyword	*Permitted Parameters*	*Description*
axes	0 1	The lines defining the scalebar axes are not displayed. The lines defining the scalebar axes are displayed. [default]
axesrot	0 1	The lines defining the rotated axes are not displayed. The lines defining the rotated axes are displayed. [default]
axespixwid	1 2 3 4	The lines drawing the scalebar axes are 1 pixel wide. [default] The lines drawing the scalebar axes are 2 pixels wide (twice the default width). The lines drawing the scalebar axes are 3 pixels wide (three times the default width). The lines drawing the scalebar axes are 4 pixels wide (four times the default width).
axeslabels	0 1	Scalebar numbers and tick marks are not displayed. Scalebar numbers and tick marks are displayed. [default]
axeslabpixwid	1 2 3 4	Scalebar numbers are 1 pixel wide. [default] Scalebar numbers are 2 pixels wide (twice the default width). Scalebar numbers are 3 pixels wide (three times the default width). Scalebar numbers are 4 pixels wide (four times the default width).
axeslabsize	integer 1 to 6	The value supplied specifies the size of the axes labels. Six (6) specifies the largest label size. [default: 2]
lattice	0 1	The tick mark lattice is not displayed. [default] The tick mark lattice is displayed.
latticepixwid	1 2 3 4	Tickmark lattice is drawn 1 pixel wide. [default] Tickmark lattice is drawn 2 pixels wide (twice the default width). Tickmark lattice is drawn 3 pixels wide (three times the default width). Tickmark lattice is drawn 4 pixels wide (four times the default width).
local	0 1	The X, Y, and Z coordinates are shown as in the faces file. [default] The X and Y coordinates are shifted to Local Rectangular, with the (Xmin, Ymin) point moved to (0,0). The Z coordinates are not affected.
xtickinterval	integer/float	The value supplied specifies the X-axis tick interval in data scale units. [default: data dependent]
ytickinterval	integer/float	The value supplied specifies the Y-axis tick interval in data scale units. [default: data dependent]

Keyword	*Permitted Parameters*	*Description*
ztickinterval	integer/float	The value supplied specifies the Z-axis tick interval in data scale units. [default: data dependent]
xtickrefval	integer/float	The value supplied specifies the reference tick mark level from which the X-axis tick mark values are counted. [default: 0.0]
ytickrefval	integer/float	The value supplied specifies the reference tick mark level from which the Y-axis tick mark values are counted. [default: 0.0]
ztickrefval	integer/float	The value supplied specifies the reference tick mark level from which the Z-axis tick mark values are counted. [default: 0.0]
xcaptiondpy	0 1	The X axes caption string is not displayed. [default] The X axes caption string is displayed.
ycaptiondpy	0 1	The Y axes caption string is not displayed. [default] The Y axes caption string is displayed.
zcaptiondpy	0 1	The Z axes caption string is not displayed. [default] The Z axes caption string is displayed.
xaxescaption	“txt”	The caption for the X-axis. A 0 to 60 character string is permitted and must be enclosed in double quotes. [default: no text]
yaxescaption	“txt”	The caption for the Y-axis. A 0 to 60 character string is permitted and must be enclosed in double quotes. [default: no text]
zaxescaption	“txt”	The caption for the Z-axis. A 0 to 60 character string is permitted and must be enclosed in double quotes. [default: no text]
axescappixwid	1 2 3 4	Axes captions are 1 pixel wide. [default] Axes captions are 2 pixels wide (twice the default pixel width). Axes captions are 3 pixels wide (three times the default pixel width). Axes captions are 4 pixels wide (four times the default pixel width).
axescapsize	integer 1 to 6	The value supplied specifies the size of the axes captions. Six (6) specifies the largest label size. [default: 2]

Capture Data Menu Commands

The Capture Data Menu is discussed on pages 3DV 4-49 to 3DV 4-54.

Keyword	*Permitted Parameters*	*Description*
volumetrics	0 1	Instant volumetrics are off. [default] Instant volumetrics are on.
volumefactor	integer/float	The value specified is used as the factor (multiplier) for the volume calculations. [default: 1]
volumeunits	xy or z	For mixed-unit models, whether the XY or Z units are used for volumetric calculation and 3D cursor mark distance. [default: the Z units]
volumewinpos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the 3D volumetrics window relative to the 3D Viewer graphic display window. These two values must be separated by spaces. [default: dependent upon window size]

Color Menu Commands

The Color Menu is discussed on pages 3DV 4-72 to 3DV 4-78.

Keyword	*Permitted Parameters*	*Description*
revpropcolors	 0 1	This parameter must follow a pfieldgroup header. Colors used for display are determined by the property color step and start; colors are displayed in the order in the property color file. [default] After colors are determined by the property color step and start, the order of the colors is reversed.
revzonecolors	0 1	Colors are shown in the order in which they are in the zone color file. [default] Order of original colors shown is reversed.
revzcolors	0 1	Colors used for display are determined by the Z color step and start; colors are displayed in the order in the Z color file. [default] After colors are determined by the Z color step and start, the order of the colors is reversed.
revgrd3colors	0 1	Colors used for display are determined by the 3D grid color step and start; colors are displayed in the order in the 3D grid color file. [default] After colors are determined by the 3D grid color step and start, the order of the colors is reversed.

Keyword	*Permitted Parameters*	*Description*
propctstart	1 to 21	The value supplied defines the starting color for the property color table; the color is tied to the minimum property-value in the faces file or ASCII scattered data file. This parameter must follow a pfieldgroup header. [default: data dependent, but near 1]
propctstep	integer	The value supplied defines the color step for the property color table (e.g., a propctstep of 2 means that every other color in the property color table will be used in displaying the property values and isosurfaces; the colors will wrap around the color table). This parameter must follow a pfieldgroup header. [default: data dependent]
propcolorfile	filename	Name of the color file used for property colors. The word *defaults* may be specified to load the program default colors. [default: defaults]
zonecolorfile	filename	Name of a color file used for zone colors. The word defaults may be specified to load the program default colors. [default: defaults]
zcolorfile	filename	Name of a color file used for Z colors. The word defaults may be specified to load the program default colors. [default: defaults]
ftrcolorfile	filename	Name of a color file used for feature colors. The word defaults may be specified to load the program default colors. [default: defaults]
timecolorfile	filename	Name of a color file used for time colors. The word defaults may be specified to load the program default colors. [default: defaults]
unicolorfile	filename	Name of a color file used for uniform data colors. The word defaults may be specified to load the program default colors. [default: defaults]
scatdatcolors	defaults property zone z time	The value supplied specifies the color file used in property displaying points from binary and ASCII scattered zone data files. *Defaults* indicates use of default colors for Z all points. *Property* indicates each point is colored based on the loaded property color file and the property value of that point. *Zone* indicates each point is colored based on the loaded zone color file and the zone number in which the point lies. *Z* indicates each point is colored based on the loaded Z color file and the Z-value of the point. *Time* indicates each point is colored based on the loaded Time color file and the time-value of the point. [default: data dependent; see 3DV 4-76]
faultcolor	propzone fault	The value supplied specifies the colors to be displayed along a fault face. *propzone* displays the colors of the properties or zones that intersect the fault face. *fault* displays a solid grey color. [default: *fault*]

Keyword	*Permitted Parameters*	*Description*
applyzonecols	0	Apply zone colors on a zone-by-zone basis (individual zones are visible). [default]
	1	Apply zone colors on a fault-block-by-fault-block basis (individual fault blocks are visible).
bwswap	0	Does not swap black and white. [default]
	1	Swaps black elements in display to white and white elements to black. These elements include axes, background, areas surrounding color keys, titles, and information boxes as well as all text. *Note: Black is defined by an RGB value of 0 0 0, while white is defined by an RGB value of 255 255 255. Any RGB values other than these will not be swapped.*

Edit Data Menu Commands

The Edit Data Menu is discussed on pages 3DV 4-83 to 3DV 4-102.

Keyword	*Permitted Parameters*	*Description*
dataactivefile	filename	Name of the currently active data file. This file is the only scattered data file (either *.dat, .pdat,* or *.path*) that can be edited; only one file name can be specified as the active data file.
pfieldgroup	Two parameters: 1] P field name (in parenthesis) 2] "property” or “seismic" label	This "header" defines a property group. It must preceed all other property vue-file parameters that apply to every property model matching the given P field name and the "property” or “seismic" label. An example would be: *(porosity) property*. The following parameters must follow a *pfieldgroup* header: • *plist* • *propctstart* • *propctstep* • *revpropcolors*
pfilegroup	pdat 3grd faces	This "header" defines a subdivision of a property group. Certain parameters apply to only the *.pdat*, the *.3grd*, or the *.faces* files within a property group (as defined by the pfieldgroup), e.g., the display of P-levels is file-type dependent. It must preceed all other property vue-file parameters that apply to a specific property file group. The following parameters must follow a pfilegroup subheader: • *isosurfmindata* • *isosurfmaxdata* • *isosurfminlev* • *isosurfmaxlev* • *isosurfinout*
dataeditfile	filename	Name of the ASCII scattered data file to be displayed..

Keyword	*Permitted Parameters*	*Description*
showdata	0 1	The most recently specified data file (via the *dataeditfile* keyword) is "hidden" (i.e., it is not shown) in the3D Viewer model display, although it remains in memory. The same data file is "shown" or displayed.
ascdatapts	0 1	The ASCII scattered data points are not displayed. [default] The ASCII scattered data points are displayed, unless indicated otherwise by the *ascdatalineids* keyword.
ascdatalineids	"txt" "txt" ...	The text strings listed represent line IDs or well IDs and specify which lines of data are displayed. The IDs must be between double quotes. This keyword is only written out if only some of the lines of data are displayed. [default: all data displayed]
ascdatalines	0 1	Lines connecting ASCII scattered data points are not displayed. [default] Lines connecting ASCII scattered data points are displayed.
ascdatafeature	 0 1	Sets all data points on or off; to turn on data points with only certain feature IDs, *ascdatafeatureids* must be used. All data points regardless of feature ID are off. All data points regardless of feature ID are on. [default]
ascdatafeatureids	string	When some data points are on or off based on their feature IDs, the strings (feature IDs) specified determine which scattered data points are on.
ascdatablocks	0 1	All data points with *faultblock* field values are off. All data points with *faultblock* field values are on, unless indicated otherwise by the *ascdatablocklbls* keyword. [default]
ascdatablocklbls	"txt" "txt" ...	The text strings specified indicate, by name or ID, the fault block(s) for which the scattered data points are displayed. If all data points within all fault blocks are either on or off, then only the *ascdatablocks* keyword need be specified. [default: all data displayed] *Note: This function is only available through the vue file commands.*
datafieldpick	"fld1" "fld2" ...	Field names in a given data file whose values will be displayed in the data information box when the point is picked; specified on a file by file basis.
ascdatwinpos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the Data Values information box displayed when querying scattered data points (location is specified relative to the 3D Viewer graphic display window). [default: dependent upon window size]
dataeditfullline	0 1	Data edit applies to point selected. [default] Data edit applies to entire line for the point selected.
datalinetubes	"txt" float\\ "txt" float	The text string listed represents the line ID for which the tube is displayed; the value supplied defines the radius (in X,Y units) of the tube. If more than one tube is desired, a backslash is added at the end of the line, and the additional values are specified on the next line. These values must be separated by spaces. [default: ask via pop-up menu]

Keyword	*Permitted Parameters*	*Description*
tubecap	0 1	Caps are not displayed at the ends of the tubes. [default] Caps are displayed at the ends of the tubes.

Image Menu Commands

The Image Menu is discussed on pages 3DV 4-122 to 3DV 4-123.

Keyword	*Permitted Parameters*	*Description*
imregfile	filename	The name of the image registration file, containing the image file name and the registration coordinates.
imagedrapezone	consecutive 1s or 0s	A one (1) indicates that the draped image is displayed in that zone. A zero (0) indicates that it is not.
imagetrans	0 1	The draped image is displayed as a solid image (transparency is off). [default] The draped image is displayed semi-transparently.
imageplanar	0 1	The image is draped on each zone. [default] The image is draped on a flat plane.
imageplanartrans	0 1	The planar image is displayed as a solid image (transparency is off). [default] The planar image is displayed semi-transparently.
imagezpos	float	The value supplied is the Z-value (in data scale units) of the placement of a planar image.

Lighting Menu Commands

The Lighting Menu is discussed on pages 3DV 4-103 to 3DV 4-107.

Keyword	*Permitted Parameters*	*Description*
lightazm	float –90.0 to 90.0	The value supplied specifies the azimuth of the light source relative to the viewer. [default: 0]
lightinclin	float –90.0 to 90.0	The value supplied specifies the inclination of the light source relative to the viewer. [default: 0]

Keyword	*Permitted Parameters*	*Description*
light2	0 1	The second directional light source is off. [default] The second directional light source is on.
light2azim	integer/float –90.0 to 90.0	The value supplied specifies the azimuth of the second light source. [default: 0]
light2inclin	integer/float -90.0 to 90.0	The value supplied specifies the inclination of the second light source. [default: 0]
light1intens	integer/float 0.0 to 1.0	The value supplied specifies the lighting intensity of the first light source. [default: 1]
light2intens	integer/float 0.0 to 1.0	The value supplied specifies the lighting intensity of the second light source. [default: 1]
ambience	0.0 to 1.0 integer/float	The value supplied defines the degree of ambience. [default: 0]
specularity	0.0 to 1.0 integer/float	The value supplied defines the degree of specularity. [default: 1.0]
gouraudshading	0 1	Gouraud shading is off. Gouraud shading is on. [default]

Main Menu Commands

The Main Menu is discussed on pages 3DV 4-9 to 3DV 4-12.

Keyword	*Permitted Parameters*	*Description*
modelload	filename	Name of faces file, scattered data file, 2D or 3D grid file loaded when vue file was saved. The modelload keyword is saved preceded by # (i.e., commented out); if the # sign is removed, the model is reloaded whenever the vue file is read.
initmenu		The specified menu appears when the vue file is read. The possibilities are:
	main	Main Menu [default]
	manipulate	Manipulate Menu
	view	View Menu
	zone	Zone Menu
	file	File Menu
	data	Post Data Menu
	capture	Capture Data Menu
	screen	Screen Menu
	color	Color Menu
	output	Output Menu
	dataedit	Edit Data Menu
	lighting	Lighting Menu
	transparency	Transparency Menu
	animation	Animation Menu
	axes	Axes Menu
	image	Image Menu
	allan	Allan Fault Menu
	wellpos	Well Positioning Menu
	grid3d	3D Grid Menu
	cursor3d	3D Cursor Menu
	cursor3doption	3D Cursor Options Menu
	earthquake	Earthquake Foci Menu

Manipulate Menu Commands

The Manipulate Menu is discussed on pages 3DV 4-12 to 3DV 4-16.

Keyword	*Permitted Parameters*	*Description*
manipmenuprimary	0	Secondary 3D grid is affected by the Manipulate and Zone menu settings.
	1	Primary model is affected by the Manipulate menu and Zone settings. [default]
xgridnum	integer	The integer value specified indicates the number of X columns for ASCII data files viewed without a faces file. [default: 100]
ygridnum	integer	The integer value specified indicates the number of Y rows for ASCII data files viewed without a faces file. [default: 100]
zgridnum	integer	The integer value specified indicates the number of Z levels for ASCII data files viewed without a faces file. [default: 100]
xmincutgrid	integer	The integer value supplied defines the grid column of the minimum X cutting plane. [default: 1, the X grid column minimum]
xmaxcutgrid	integer	The integer value supplied defines the grid column of the maximum X cutting plane. [default: the X grid column maximum]
ymincutgrid	integer	The integer value supplied defines the grid row of the minimum Y cutting plane. [default: 1, the Y grid row minimum]
ymaxcutgrid	integer	The integer value supplied defines the grid row of the maximum Y cutting plane. [default: the Y grid row maximum]
zmincutgrid	integer	The integer value supplied defines the grid level of the minimum Z cutting plane. [default: 1, the Z grid level minimum]
zmaxcutgrid	integer	The integer value supplied defines the grid level of the maximum Z cutting plane. [default: the Z grid level maximum]
xmincutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the minimum X cutting plane; since the cutting planes must lie along a grid X-column, the 3D Viewer rounds to the nearest column location. [default: Xmin, the X-range minimum]
xmaxcutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the maximum X cutting plane; since the cutting planes must lie along a grid X-column, the 3D Viewer rounds to the nearest column location. [default: Xmax, the X-range maximum]

Keyword	*Permitted Parameters*	*Description*
ymincutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the minimum Y cutting plane; since the cutting planes must lie along a grid Y-row, the 3D Viewer rounds to the nearest row location. [default: Ymin, the Y-range minimum]
ymaxcutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the maximum Y cutting plane; since the cutting planes must lie along a grid Y-row, the 3D Viewer rounds to the nearest row location. [default: Ymax, the Y-range maximum]
zmincutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the minimum Z cutting plane; since the cutting planes must lie along a grid Z-level, the 3D Viewer rounds to the nearest level location. [default: Zmin, the Z-range minimum]
zmaxcutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the maximum Z cutting plane; since the cutting planes must lie along a grid Z-level, the 3D Viewer rounds to the nearest level location. [default: Zmax, the Z-range maximum]
chairmode	0 1	Chair mode is off. [default] Chair mode is on (the portion of the model removed is dependent on the azimuth and inclination).
chairshells	0 1	Chair shells are off. [default] Chair shells are on (chair mode must be turned on first; isosurfaces can be set before or after the chair shells are set).
chairfreeze	0 1	Chair freeze is off. [default] Chair freeze is on (chair mode must be turned on first; the portion of the model that is removed is dependent on the azimuth and inclination and whether they are set before or after chair freeze is turned on).
chaircorner	3 consecutive 1s or 0s	These three values define on which corner of the faces file the chair cut is made. These values are used only if chair mode *and* chair freeze are turned on. Any of the eight corners on the model can be specified by supplying a maximum (1) or minimum (0) for the X, Y, and Z axes. For example, 000 indicates that the chair cut is taken from the corner of the model at Xmin, Ymin, Zmin; 010 indicates a chair at Xmin, Ymax, Zmin; etc.
xchaircutgrid	integer	The integer value supplied defines the grid column of the chair X cutting plane. (Chair mode must be turned on first.) [default: halfway between Xmin cut and Xmax cut]
ychaircutgrid	integer	The integer value supplied defines the grid row of the chair Y cutting plane. (Chair mode must be turned on first.) [default: halfway between the Ymin cut and Ymax cut]
zchaircutgrid	integer	The integer value supplied defines the grid level of the chair Z cutting plane. (Chair mode must be turned on first.) [default: halfway between the Zmin cut and Zmax cut]

Keyword	*Permitted Parameters*	*Description*
xchaircutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the chair X cutting plane; since the cutting planes must lie along a grid X-column, the 3D Viewer rounds to the nearest column. (Chair mode must be turned on first.) [default: halfway between the Xmin cut and Xmax cut]
ychaircutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the chair Y cutting plane; since the cutting planes must lie along a grid Y-row, the 3D Viewer rounds to the nearest row. (Chair mode must be turned on first.) [default: halfway between the Ymin cut and Ymax cut]
zchaircutdata	integer/float	The integer or floating point value supplied defines the data location (in data scale units) of the chair Z cutting plane; since the cutting planes must lie along a grid Z-level, the 3D Viewer rounds to the nearest level. (Chair mode must be turned on first.) [default: halfway between the current Zmin cut and Zmax cut]
pfieldactive	Two parameters: 1] P field name (in parenthesis) 2]"property" or "seismic" label	Defines which P-field group is active for property-level manipulation. Every property model matching the given P field name and the "property" or "seismic" label will be affected by the P-levels set. An example would be: *(porosity) property*.
pfileactive	pdat 3grd faces	Determines for which file type within a property group the Property level settings apply, since different P-levels can be displayed on a file-type basis, even within the same property group.
plist	list of integer/float	The list of values specify the isosurfaces that are to be used for an ASCII property data file (*.pdat*) when viewed without a faces file. This parameter must follow a pfieldgroup header. [default: data dependent; the maximum number of shells using a reasonable value]
isosurfminlev	0 to 64 integer or *min*	The minimum isosurface level is set to the interval number supplied. The word *min* can be placed here to specify the minimum level of the file. This value cannot be greater than the value set for isosurfmaxlev. This parameter must follow a pfilegroup sub-header. [default: *min*]
isosurfmaxlev	0 to 64 integer or *max*	The maximum isosurface level is set to the intervalnumber supplied. The word *max* can be placed here to specify the maximum isosurface level of the file, i.e., the level greater than the highest P-value supplied when the faces file was created or the system generated value for an ASCII file. This value cannot be less than the value set for isosurfminlev. In addition, the maximum number may be less than 64, if the faces file has fewer than 63 isovalue levels set. This parameter must follow a pfilegroup sub-header. [default: *max*]

Keyword	*Permitted Parameters*	*Description*
isosurfmindata	integer/ float, or *min*	The minimum isosurface level is set to the data P-value supplied. The word *min* can be placed here to specify the minimum isosurface level of the faces file. This P-value cannot be greater than the P-value set for isosurfmaxdata. This parameter must follow a pfilegroup sub-header. [default: *min*]
isosurfmaxdata	integer/ float, or *max*	The maximum isovalue contour level is set to the data P-value supplied. The word *max* can be placed here to specify the maximum isosurface level of the faces file. This P-value cannot be less than the P-value set for isosurfmindata. This parameter must follow a pfilegroup sub-header. [default: *max*]
isosurfinout	*inside* or *outside*	The display of isosurface levels can be set so that either the isosurface levels *inside* the range supplied are displayed, or the isosurface levels *outside* the range supplied are shown. This parameter must follow a pfilegroup sub-header. [default: *inside*]

Output Menu Commands

The Output Menu is discussed on pages 3DV 4-79 to 3DV 4-82.

Keyword	*Permitted Parameters*	*Description*
outputimgsize	0 1 2	Actual image size for output image. [default] Maximum allowed image size for output image. User-defined image size for output image.
outputimgxsize	integer	X dimension (in pixels) of user-specified output image size.
outputimgysize	integer	Y dimension (in pixels) of user-specified output image size.
outputformat	0 1 2 3	Output image format is an SGI rgb file. [default] Output image format is a tiff file. Output image format is a gif file. Output image format is a jpeg file.
outputquality	1–100	Specifies the quality of a JPEG image; the higher the quality, the larger the file. [default: 75]

Post Data Menu Commands

The Post Data Menu is discussed on pages 3DV 4-41 to 3DV 4-48.

Keyword	*Permitted Parameters*	*Description*
datapointrender	0 1	Scattered data points and symbols are drawn as lighted, 3D cubes or objects (respectively). [default] Scattered data points are drawn in “point render” mode as unlit, flat dots.
ellipdipsym	0 1	Do not display elliptical disks with strike/dip symbols. [default] Display scattered data points that have dip/dip azimuth information as elliptical disks with strike/dip symbols.
datacubefactor	integer/float	The value supplied defines the scale factor used in displaying the cubes that represent binary or ASCII scattered data points. [default: 1.0]
pfield	fieldname	Specifies the P-field for an ASCII scattered data file that will be displayed (this command, which can also be included in a script file, avoids having to specify the P-field during scripting).

Keyword	*Permitted Parameters*	*Description*
zfield	fieldname(s)	Specifies the Z-field(s) for an ASCII scattered data file that will be displayed (this command, which can also be included in a script file, avoids having to specify the Z-field(s) during scripting).
xyclipdist	integer/float	The value supplied defines the distance from the X-slice and Y-slice within which data are displayed. Data beyond this range are clipped. [default: set to the X or Y range, whichever is greater]
zclipdist	integer/float	The value supplied defines the distance from the Z-slice in which data are displayed. Data beyond this range are clipped. [default: set to Z total range]
lineclipdashed	0 1	When viewing a scattered data file by itself, when data lines are clipped, the data lines are removed. When data lines are clipped, the lines are drawn dashed. [default]
datapointclip	0 1	Data points are not clipped. [default] Data points are clipped.
datapointcap	0 1	Clipped data points are not capped. [default] Clipped data points are capped.
vfltfile	filename	Name of the vertical fault file.
vfaults	0 1	The vertical faults are not displayed. [default] The vertical faults are displayed.
vfltcurtain	0 1	The vertical fault curtain is not displayed. [default] The vertical fault curtain is displayed. Vertical fault curtains can be displayed only if the vertical fault data is also turned on.
vfltfilergb[†]	3 integers 0–255	The three values specify the red, green, and blue components, respectively, of the color of the vertical fault file displayed. [default: red; 255 0 0]
plydatafile	filename	Name of the polygon, non-vertical fault, or volumetrics polygon file.
plydata	0 1	The polygons are not displayed. [default] The polygons are displayed.
plyfilergb[†]	3 integers 0–255	The three values specify the red, green, and blue components, respectively, of the color of the polygon file displayed. [default: red; 255 0 0]
plycurtain	0 1	The polygon curtains are not displayed. [default] The polygon curtains are displayed. Polygon curtains can be displayed only if the polygon data is also turned on.
annotation	0 1	The surface annotation is not displayed. [default] The surface annotation is displayed.

Keyword	*Permitted Parameters*	*Description*
annotationfile	filename	Name of surface annotation file to be displayed.
annpos	*top*, *bottom*, or *topbottom*	The keyword supplied specifies the position of the displayed surface annotation. [default: *top*]
annfollowz	0 1	Surface annotation will not follow the Z-slices. [default] Surface annotation will follow the Z-slices.
anndrapezone	consecutive 1s or 0s	Specifies on a zone-by-zone basis whether draped annotation is off (0) or on (1). [default: 0]
bwdfile	filename	The name of the binary well display (.*bwd*) file; this file is created using *Calculate Well Display* on the Post Data menu.
bwdon	0 1	Binary well display (.*bwd*) file is off. [default] Binary well display (.*bwd*) file is on.
queryproglist	“program name” “pathname/ filename"	The two text strings list the program label that shows up in the pop-up menu and the UNIX path and program name, respectively; multiple pairs are allowed.
queryprog	“txt”	The text given makes this program active; the text corresponds to (one of) the file name(s) specified with the *queryproglist* keyword.

† These vue file parameters are read-only. They are not written out to a vue file from the 3D Viewer interface.

Screen Menu Commands

The Screen Menu is discussed on pages 3DV 4-55 to 3DV 4-64.

Keyword	*Permitted Parameters*	*Description*
colorkeytype	*off* *property* *zone* *z* *feature* *time*	The color key is not displayed. The property color key is displayed. [default] The zone color key is displayed. The Z color key is displayed. The feature color key is displayed. The time color key is displayed.
colorkeyinfo	15 consecutive 1s or 0s	Each color table has 15 attributes which can be displayed (1) or not (0). Following this command should be a value of 1 or 0 for each of the following attributes (without any commas or spaces): (1) Color table label (2) Display name (3) Units label (4) Color table (5) Z exaggeration (6) Azimuth (7) Inclination (8) X front cut (9) Y front cut (10) Z front cut (11) X chair cut (12) Y chair cut (13) Z chair cut (14) Coordinate axes (15) Color key borders and background (Color key must be turned on first.) [default: all 1s]
colorkeyxpos	integer	The value supplied defines the X screen position of the lower left corner of the displayed color key relative to the 3D Viewer graphic display window. (Color key must be displayed first.) [default: 0]
colorkeyypos	integer	The value supplied defines the Y screen position of the lower left corner of the displayed color key relative to the 3D Viewer graphic display window. (Color key must be displayed first.) [default: 0]
slicemarkers	0 1	The slice markers are not displayed. The slice markers are displayed. [default]
chairaxmarkers	0 1	The slice axis markers are the active slicing markers. [default] The chair axes markers are the active slicing markers.
maintitle	“txt”	Text supplied is used for the model’s main title; it must be enclosed in double quotes. [default: title in faces file header]

Keyword	*Permitted Parameters*	*Description*
maintitlepos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the main title relative to the 3D Viewer graphic display window. These two values must be separated by spaces. [default: dependent upon window size]
subtitle	“txt”	Text supplied is used for the model's subtitle; it must be enclosed in double quotes. [default: subtitle in faces file header]
keypropsunit	“txt”	Text supplied is used for the model's property units, displayed in the color key; it must be enclosed in double quotes. [default: units in faces file header]
subtitlepos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the subtitle relative to the 3D Viewer graphic display window. These two values must be separated by spaces. [default: dependent upon window size]
screenannfile	filename	Name of screen annotation file to be displayed.
screenann	0 1	Designated screen annotation file is not displayed. [default] Designated screen annotation file is displayed.
fullscreen	0 1	Specifies display is in partial screen mode (i.e., a menu is visible). [default] Specifies display is in full screen mode (i.e., no menu is visible).
doublebuffer	0 1	Double buffering is off. Double buffering is on. [default]
lineantialias	0 1	Line anti-aliasing is off. Line anti-aliasing is on. [default]
stereoeyeoffsetfac	real	Multiplicative factor for stereo separation [default = 1.0]
stereoeyefocusfac	real	Multiplicative factor for stereo focus distance [default = 1.0]

Transparency Menu Commands

The Transparency Menu is discussed on pages 3DV 4-108 to 3DV 2-110.

Keyword	*Permitted Parameters*	*Description*
transzone	consecutive 1s and 0s	For each zone, a one (1) or zero (0) indicates whether the transparent-zone-display is activated for that zone (1) or not (0). *Note:* Some portion of the isosurfaces must be removed and property colors must be displayed within a zone, if it is to appear transparent. [default: all 0s]
transcolor	consecutive 1s and 0s	For each zone, a one (1) or zero (0) indicates the color in which the transparent portion of that zone should be displayed. One (1) specifies lithology colors, zero (0) specifies property colors. [default: all 1s]
translevel	1	Transparent items (e.g., zones, blocks) have a low transparency (i.e., more opaque).
	2	Transparent items have a medium transparency. [default]
	3	Transparent items have a high transparency (i.e., less opaque). Refer to *Transparency Level*, page 3DV 4-110, for more information.

View Menu Commands

The View Menu is discussed on pages 3DV 4-22 to 3DV 4-29.

Keyword	*Permitted Parameters*	*Description*
xlookpoint	integer/float	The value supplied defines the X-coordinate of the lookpoint location. [default: halfway between Xmin and Xmax]
ylookpoint	integer/float	The value supplied defines the Y-coordinate of the lookpoint location. [default: halfway between Ymin and Ymax]
zlookpoint	integer/float	The value supplied defines the Z-coordinate of the lookpoint location. [default: halfway between Zmin and Zmax]
azimuth	0 to 360 integer/ float	The value supplied defines the azimuth of view towards the model. the smallest increment that the 3D Viewer can display is 0.1 degree. [default: 65°]

Keyword	*Permitted Parameters*	*Description*
inclination	–90 to 90 integer/float	The value supplied defines the inclination of view towards the model. The smallest increment that the 3D Viewer can display is 0.1 degree. [default: 35°]
zexag	0 to 100 integer/float	The value supplied defines the z-exaggeration. [default: data dependent]
zoom	0.00001 to 100 integer/float	Multiplying by a number less than 1 zooms in on the model. Multiplying by a number greater than 1 zooms out from the model. Any number less than 0.00001 is set to 0.00001, and any number greater than 100 is set to 100. Each time the Zoom In command is selected in the 3D Viewer, it moves the user .8 times closer to the model, e.g., when .8 is given here, it is equivalent to one Zoom In; .64 is two Zoom In's; .512 is three Zoom In's. Each Zoom Out command moves out by 1.25 times, e.g., 1.25 is one Zoom Out; 1.5625 is two Zoom Out's; 1.95325 is three Zoom Out's. [default: 1]
perspective	0 1	The perspective projection is off (an orthographic projection is used). The perspective projection is on. [default]

Well Positioning Menu Commands

The Well Positioning Menu is discussed on pages 3DV 4-128 to 3DV 4-134.

Keyword	*Permitted Parameters*	*Description*
wellextendcursor	0 1	The extend well to cursor function is off. [default] The extend well to cursor function is on.
wellextendvector	0 1	The extend well along vector function is off. [default] The extend well along vector function is on.
wellextendid	"string"	The string indicates the well or line ID used for extending a well.
vecextenddist	real	The value is the extension distance along the vector defined by the last two points in a well at which a new point will be added. [default: none]

Keyword	*Permitted Parameters*	*Description*
wellextwinpos	2 integers	The X,Y screen location, in pixels, of the lower-left corner of the Well Extension window. [default: 689,10]
interpdist	real	The value, in data scale units, of the well interpolation interval distance. [default: approximately .04*<the model radius>]
dlhighlight	1 0	Dogleg-severity highlighting is on. Dogleg-severity highlighting is off. [default]
dlmincutoff	real	The value specifies a minimum dogleg-severity cutoff value; portions of the well path that are greater than this value are highlighted. [default: “null” when off; otherwise data dependent]

The following vue file keywords are read-only; they control highlighting of well paths when running the Well Planning software accessed from the Well Positioning Toolbox

Keyword	*Permitted Parameters*	*Description*
datahilitfile	filename	Name of the well path data file containing the line/well to be highlighted.
datahilitlineid	"string"	Name of the lineid/wellid for line-segment highlighting.
datahilitlineseg	-1	Indicates the entire line should be highlighted. Integer (0-N) Specifies which line segment (0-N) on a given line will be highlighted in the specified color (datahilitrgb). The data points on either side of the line segment are also colored. If an "orig_pt" field exists, then points with "orig_pt" values of zero (i.e., interpolated data points) are not included when determining the line segment number.
datahiliton	0 1	Data line highlighting is off Data line highlighting is on.
datahilitrgb	3 integers	The three values specify the red, green, and blue components, respectively of the color of to be use for line highlighting. 0-255

Zone Menu Commands

The Zone Menu is discussed on pages 3DV 4-31 to 3DV 4-36.

Keyword	*Permitted Parameters*	*Description*
manipmenuprimary	0 1	Secondary 3D grid is affected by the Manipulate and Zone menu settings. Primary model is affected by the Manipulate and Zone menu settings. [default]
zonepropclrs	consecutive 1s or 0s	For each zone, a one (1) or zero (0) indicates whether zone (1) or property (0) colors are displayed in that zone. 1s and 0s are listed consecutively, a value of each zone, without commas or spaces. [default: all 0s]
zoneremoval	consecutive 1s or 0s	For each zone, a one (1) or zero (0) indicates whether that zone is removed (1) or not (0). 1s and 0s are listed consecutively, a value for each zone, without commas or spaces. [default: all 0s]
zonecfc	consecutive 1s or 0s	For each zone, a one (1) or zero (0) indicates whether Z color-filled contours are displayed (1) or not (0). 1s and 0s are listed consecutively, a value for each zone, without commas or spaces. [default: all 0s]
zcfcmin	integer/float	The value supplied defines the minimum Z setting for color-filled contours. [default: Zmin]
zcfcmax	integer/float	The value supplied defines the maximum Z setting for color-filled contours. [default: Zmax]
cfcinterval	integer/float	The color-filled contour interval is set to the value given. [default: calculated for each model]
zctstart	9 to 72	The value supplied defines the starting color for the Z color table; the color is tied to the minimum Z-value as defined by zcfcmin. [default: data dependent, but near 9]
zctstep	integer	The value supplied defines the color step for the Z color table (e.g., a zctstep of 2 means that every other color in the Z color table will be used in posting the color-filled contours; the colors will wrap around the color table). [default: data dependent]

Keyword	*Permitted Parameters*	*Description*
maxcfcintvl	1 or 0	A value of 1 calculates the smallest Z contour interval such that 64 color contours result; however it is based on a step of 1. A larger step (zctstep) will result the colors wrapping through the Z color table. A value of 0 uses the *cfcinterval* command to specify the contour interval. This command is not automatically written out to a vue file. [default: 0]
zonechairmode	consecutive 1s or 0s	For each zone, a one (1) or zero (0) indicates whether chair mode is displayed in that zone (0) or not (1). 1s and 0s are listed consecutively, a value for each zone, without commas or spaces. (Chair mode must be turned on first.) [default: all 0s]
blocks1_10	consecutive 1s or 0s	For blocks 1 through 10, a one (1) indicates the block is on; a zero (0) indicates the block is off. [default: all 1s]
blocks11_20	consecutive 1s or 0s	For blocks 11 through 20, a one (1) indicates the block is on; a zero (0) indicates the block is off. [default: all 1s]
blocks21_30	consecutive 1s or 0s	For blocks 21 through 30, a one (1) indicates the block is on; a zero (0) indicates the block is off. [default: all 1s]
blocks31_40	consecutive 1s or 0s	For blocks 31 through 40, a one (1) indicates the block is on; a zero (0) indicates the block is off. [default: all 1s]
blocks41_50	consecutive 1s or 0s	For blocks 41 through 50, a one (1) indicates the block is on; a zero (0) indicates the block is off. [default: all 1s]
fltoutlines	0 1	Faults are not outlined. Faults are outlined. [default]
zoneoutlines	0 1	Zones are not outlined. Zones are outlined. [default]
propoutlines	0 1	Property values are displayed without outlines. [default] Property values are separated by outlines.
fltoutlnpixwid	0 1 2 3 4 5	The outlines of faults is off. The outlines of faults is 1 pixel wide. The outlines of faults is 2 pixels wide. The outlines of faults is 3 pixels wide. [default] The outlines of faults is 4 pixels wide. The outlines of faults is 5 pixels wide.

Keyword	*Permitted Parameters*	*Description*
zoneoutlnpixwid	0 1 to 5	Zones are not outlined. Zone outlines are drawn with the given pixel width (values are drawn with the given pixwl width (values from 1 to 5). [default: 1]
propoutlnpixwid	0 1 to 5	Properties are not outlined. Property outlines are drawn with the given pixel width (values from 1 to 5). [default: 1]
fltoutlnrgb	3 integers 0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the outline color of the zones. [default: 0 0 0 (black)]
zoneoutlnrgb	3 integers 0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the outline color of the faults. [default: 255 0 0 (red)]
propoutlnrgb	3 integers 0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the outline color of the properties. [default: 255 255 255 (white)]

3D Cursor Menu Commands

The 3D Cursor Menu is discussed on pages 3DV 4-140 to 3DV 4-144; the 3D Cursor Options Menu is discussed on pages 3DV 4-145 to 3DV 4-147.

Keyword	*Permitted Parameters*	*Description*
cursor3d	0 1	The 3D cursor is not displayed. [default] The 3D cursor is displayed.
cursorcue3d	0 1	The 3D cursor cue is not displayed. [default] The 3D cursor cue is displayed (3D cursor must be turned on first).
xcursor3d	integer/float	The value supplied defines the X-coordinate of the 3D cursor in data scale units (3D cursor must be turned on first). [default: halfway between Xmin and Xmax]
ycursor3d	integer/float	The value supplied defines the Y-coordinate of the 3D cursor in data scale units (3D cursor must be turned on first). [default: halfway between Ymin and Ymax]
zcursor3d	integer/float	The value supplied defines the Z-coordinate of the 3D cursor in data scale units (3D cursor must be turned on first). [default: halfway between Zmin and Zmax]
curswinpos	2 integers	The values supplied specify the X,Y screen location of the lower left corner of the 3D cursor location window. These two values must be separated by spaces. [default: dependent upon window size]
curs3dsubdivide	0 1	Show 3D cursor object as solid bars without subdivisions. [default] Subdivide 3D cursor object into intervals of 1/10th of the tick mark interval.
snaptosurf	0 1	3D cursor *Surface snap and query* function is off. [default] 3D cursor *Surface snap and query* function is on.
curs3dmark1	0 1	3D cursor mark 1 off. [default] 3D cursor mark 1 on.
curs3dmark1pos	3 reals	The three values specify the X, Y, and Z coordinates of the first 3D cursor mark.
curs3dmark2	0 1	3D cursor mark 2 off. [default] 3D cursor mark 2 on.
curs3dmark2pos	3 reals	The three values specify the X, Y, and Z coordinates of the second 3D cursor mark.
curs3dxytickint	real	The real value specifies the interval, in data scale units, for the XY tick marks for the 3D cursor axes. [default: data and zoom-factor dependent]

Keyword	*Permitted Parameters*	*Description*
curs3dztickint	real	The real value specifies the interval, in data scale units, for the Z tick marks for the 3D cursor axes. [default: data and zoom-factor dependent]
curs3dautoints	0 1	The tick mark interval for the 3D cursor remains static, regardless of the zoom factor. Automatic intervals are set on; the tick mark interval for the 3D cursor changes based on the zoom factor. [default]
curs3dshade	0 1	The 3D cursor is displayed as three non-shaded, intersecting lines. The 3D cursor is displayed as shaded, three-dimensional cross. [default]
curs3dpixwid	integer	The integer value specifies the pixel width [1-6] of the 3D cursor. [default: 4]
curs3daxes	0 1	The 3D cursor axes are off. The 3D cursor axes are on. [default]
curs3daxtickscale	real	A marker appears between every tenth interval along each of the 3D cursor's axes; this value specifies a sizing factor to determine how large the marker will be. [default: 1]
curs3daxtickwhite	0 1	Color scalebar disks based on RGB settings (*curs3dxaxesrgb*, *curs3dyaxesrgb*, *curs3dzaxesrgb*). Color scalebar disks white. [default]
curs3dxaxesrgb	3 integers 0 to 255	The three values specify the red, green and blue components, respectively, of the colored segments of 3D cursor's X axis. [default: red; 210 0 0]
curs3dyaxesrgb	3 integers 0 to 255	The three values specify the red, green and blue components, respectively, of the colored segments of 3D cursor's Y axis. [default: green; 0 100 20]
curs3dzaxesrgb	3 integers 0 to 255	The three values specify the red, green and blue components, respectively, of the colored segments of 3D cursor's Z axis. [default: blue; 0 0 220]
curs3dgaprgb	3 integers 0 to 255	The three values specify the red, green and blue components, respectively, of the gap (non-colored) segments of 3D cursor's axes. [default: white; 255 255 255]

3D Grid Menu Commands

The 3D Grid Menu is discussed on pages 3DV 4-136 to 3DV 4-139.

Keyword	*Permitted Parameters*	*Description*
manipmenuprimary	0 1	Secondary 3D grid is active on the Manipulate and Zone menus. Primary model is active on the Manipulate and Zone menus. [default]
grd3file	filename	When a faces file, 2D grid, or scattered data file is loaded, this text string specifies the name of a secondary 3D grid.
grd3drender	0 1 2 3	3D grid volume is not diaplayed. 3D grid volume is rendered as cubes. [default] 3D grid volume is rendered as volumetric clouds. 3D grid volume is rendered as isosurfaces.
pcontinuous	0 1	3D grid is displayed in discrete colors (continuous colors is off). [default when displaying a non-seismic grid in cube-rendering mode] 3D grid is displayed in continuous colors. [default when displaying a seismic grid or grid planar slices]
pcontinuousinit	0 1	3D grid was initially displayed in discrete colors (continuous colors is off), when the P intervals were defined. 3D grid was initially displayed in continuous colors when the P intervals were defined.
grd3trans	0 1	3D grid transparency is off. [default] 3D grid transparency is on.
grd3xmincut	integer	The integer value supplied defines the grid column of the minimum X cutting plane. [default: 1; the X grid column minimum]
grd3xmaxcut	integer	The integer value supplied defines the grid column of the maximum X cutting plane. [default: the X grid column maximum]
grd3ymincut	integer	The integer value supplied defines the grid row of the minimum Y cutting plane. [default: 1; the Y grid row minimum]
grd3ymaxcut	integer	The integer value supplied defines the grid row of the maximum Y cutting plane. [default: the Y grid row maximum]
grd3zmincut	integer	The integer value supplied defines the grid level of the minimum Z cutting plane. [default: 1; the Z grid level minimum]

Keyword	*Permitted Parameters*	*Description*
grd3zmaxcut	integer	The integer value supplied defines the grid level of the maximum Z cutting plane. [default: the Z grid level maximum]
grd3chairmode	0 1	3D grid chair is mode off. [default] 3D grid chair is mode on.
grd3chairshells	0 1	3D grid chair shells are off. [default] 3D grid chair shells are on (chair mode must be turned on first; P-levels can be set before or after the chair shells are set).
grd3chairfreeze	0 1	3D grid chair freeze is off. [default] 3D grid chair freeze is on (chair mode must be turned on first; the portion of the model that is removed is dependent on the azimuth and inclination and whether they are set before or after chair freeze is turned on).
grd3chaircorner	3 consecutive 1s or 0s	These three values define in which corner of the grid the chair cut is made. These values are used only if chair mode *and* chair freeze are turned on. Any of the eight corners of the 3D grid can be specified by supplying a maximum (1) or a minimum (0) for the X, Y, and Z axes. For example, 000 indicates that the chair cut is taken from the corner of the model at Xmin, Ymin, Zmin; 010 indicates a chair at Xmin, Ymax, Zmin.
grd3xchaircut	integer	The integer value supplied defines the grid column of the chair X cutting plane. (Chair mode must be turned on first.) [default: halfway between Xmin cut and Xmax cut]
grd3ychaircut	integer	The integer value supplied defines the grid column of the chair Y cutting plane. (Chair mode must be turned on first.) [default: halfway between Ymin cut and Ymax cut]
grd3zchaircut	integer	The integer value supplied defines the grid column of the chair Z cutting plane. (Chair mode must be turned on first.) [default: halfway between Zmin cut and Zmax cut]
grd3indicatorfile	filename	When a 3D grid file is loaded, this text string specifies the name of a 3D indicator grid to be used.
grd3zone1_50, 51_100, etc.	consecutive 1s or 0s	3D grid zone display 1–50, 51–100, etc. on/off
grd3block1_50 grd3block51_100 grd3block101_150, etc.	consecutive 1s or 0s	Specifies whether the 3D grid's fault blocks are displayed (1) or not (0); an indicator grid must be specified in order for the fault blocks to be turned on or off. [default: 1]

Keyword	*Permitted Parameters*	*Description*
grd3xplane	0 1	The 3D grid's X planar slice is off. [default] The 3D grid's X planar slice is on.
grd3yplane	0 1	The 3D grid's Y planar slice is off. [default] The 3D grid's Y planar slice is on.
grd3zplane	0 1	The 3D grid's Z planar slice is off. [default] The 3D grid's Z planar slice is on.
grd3planepick	0 1	Clicking on the axes slices the primary model or rendered 3D grid. [default] Clicking on the axes slices the 3D grid planar slices.
grd3xplanepos	(integer)	X planar slice position (1-N)
grd3yplanepos	(integer)	Y planar slice position (1-N)
grd3zplanepos	(integer)	Z planar slice position (1-N)

Miscellaneous Commands

Color Commands

Keyword	*Permitted Parameters*	*Description*
bckgrndrgb	3 integers 0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the display background. These three values must be separated by spaces. [default: 0 0 0 (black)]
forgrndrgb	3 integers0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the display foreground. These three values must be separated by spaces. [default: 255 255 255 (white)]
axesrgb	3 integers0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the wire frame axes. These three values must be separated by spaces. [default: 255 255 255 (white)]
axesoriginrgb	3 integers 0 to 255	The three values supplied specify the red, green, and blue components, respectively, of the principal axes of the wire frame (the three axes meeting at Xmin, Ymin, Zmin). [default: 255 128 0 (orange)]
nonproprgb	3 integers 0 to 255	The three values specify the red, green and blue components, respectively, of zones that do not contain property information, when a property information is being displayed for a faces file. [default: tan; 205 120 85]

Color Key Description Commands

Keyword	*Permitted Parameters*	*Description*
keyprop1 to keyprop64	“txt”	Text is posted next to property levels 1 through 64, respectively, on the property color key. Text must be enclosed in double quotes and can be up to 16 characters long. These commands are not automatically saved to a vue file unless they existed in a previously loaded vue file.
keypropstrs	0	The strings associated with the keyprop command labels are not displayed in the property color key. Numeric labels are displayed. [default]
	1	The strings associated with the keyprop commands appear in the property color key.

Keyword	*Permitted Parameters*	*Description*
keyzone1 to keyzone64	"txt"	Text is posted next to zone levels 1 through 64, respectively, on the zone color key. The words must be enclosed in double quotes; text can be up to 16 characters long. These commands are not automatically saved to a vue file unless they existed in the previously loaded vue file or were entered as zone names in the faces file creation process. [default: no text]
keyfeature1 to keyfeature64	"txt"	Text is posted next to feature levels 1 to 64, respectively, on the feature color key. The words must be enclosed in double quotes; text can be up to 16 characters long. These commands are not automatically saved to a vue file unless they existed in the previously loaded vue file. *keyfeature1* text is associated with color key box containing featurecol of 1, and so on. [default: no text]

Display Commands

Keyword	*Permitted Parameters*	*Description*
geospace	Xp, Yp, Zp, Xr, Yr, Zr, α (all real)	The seven values defined create a rotated wire frame where the X axis is red, the Y axis is green, and the Z axis is blue. The seven parameters are the X, Y, and Z pivot location, the X, Y, and Z lengths (or range), and the rotation angle.
kilomark	" "	This command determines what single character (e.g., a comma (,), a period (.), or space ( )) is used as a thousands separator in the instant volumetrics window. The character must be specified within double quotes (e.g., ","). This command is not automatically written out to a vue file. [default: comma (,)]
decimalpt	" "	This command determines what single character (e.g., a comma (,), a period (.), or space ( )) is used as a fractional separator in the instant volumetrics window. The character must be specified within double quotes (e.g., ","). This command is not automatically written out to a vue file. [default: period (.)]
logo	0 1 2	Dynamic Graphics logo is not displayed. [default] Dynamic Graphics offices logo is displayed. Dynamic Graphics software label is displayed.
dgilogoxpos	integer	The value supplied defines the X screen position of the lower left Dynamic Graphics logo corner. (Logo must be turned on first.) [default: dependent upon window size]
dgilogoypos	integer	The value supplied defines the Y screen position of the lower left Dynamic Graphics logo corner. (Logo must be turned on first.) [default: dependent upon window size]
lineclipdashed	0 1	Clipped data lines are not drawn when a data file is viewed without a faces file. [default] Clipped data lines appear as dashed lines.

Keyword	*Permitted Parameters*	*Description*
pfield	"txt"	The text specified is the name of the P-field to use when displaying a *.pdat* file. The text must be enclosed in double quotes. This command is not automatically written out to a vue file. [default: ask via a pop-up menu]
zfield	"txt" "txt"	The text specified is the name of the Z-field(s) to use when displaying a *.dat* file. The text must be enclosed in double quotes. This command is not automatically written out to a vue file. If multiple Z-fields are desired, each field name must be separated by a space. [default: ask via a pop-up menu]
plist	real real	The value(s) specified define the property intervals for a 3D grid. Recognized in *.3gvue* files only.
winxmin	integer	The value supplied defines the X screen position of the lower left corner of the 3D model window.
winymin	integer	The value supplied defines the Y screen position of the lower left corner of the 3D model window.
winxsize	integer	X screen size of 3D model window.
winysize	integer	Y screen size of 3D model window.
xminbound	integer/float	The integer or floating point value supplied defines the minimum X location (in data scale units) for which an ASCII scattered point is displayed. If the data point's X value is greater than or equal to the value supplied, the point is displayed; if the X value is less than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Xmin, the X-range minimum]
xmaxbound	integer/float	The integer or floating point value supplied defines the maximum X location (in data scale units) for which an ASCII scattered point is displayed. If the data point's X value is less than or equal to the value supplied, the point is displayed; if the X value is greater than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Xmax, the X-range maximum]
yminbound	integer/float	The integer or floating point value supplied defines the minimum Y location (in data scale units) for which an ASCII scattered point is displayed. If the data point's Y value is greater than or equal to the value supplied, the point is displayed; if the Y value is less than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Ymin, the Y-range minimum]
ymaxbound	integer/float	The integer or floating point value supplied defines the maximum Y location (in data scale units) for which an ASCII scattered point is displayed. If the data point's Y value is less than or equal to the value supplied, the point is displayed; if the Y value is greater than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Ymax, the Y-range maximum]

Keyword	*Permitted Parameters*	*Description*
zminbound	integer/float	The integer or floating point value supplied defines the minimum Z location (in data scale units) for which an ASCII scattered point is displayed. If the data point's Z value is greater than or equal to the value supplied, the point is displayed; if the Z value is less than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Zmin, the Z-range minimum]
zmaxbound	integer/float	The integer or floating point value supplied defines the maximum Z location (in data scale units) for which an ASCII scattered point is displayed. If the data point's Z value is less than or equal to the value supplied, the point is displayed; if the Z value is greater than it, the point is not displayed. This keyword is only used for ASCII data files displayed alone (e.g., not with a faces file). [default: Zmax, the Z-range maximum]

Mouse Commands

Keyword	*Permitted Parameters*	*Description*
twobuttonmouse	0	Three-button mouse installed; use default functionality.
	1	Two-button mouse installed; assign middle mouse button functionality to the right mouse button. In certain cases (e.g., for model zooming and Color Table Editor functions), middle mouse button functionality is assigned to the combination of the left and right mouse buttons.

Read-only Commands

These commands are never written out by the 3D Viewer, even if they have been previously read in. They are primarily used by programs in the Well Positioning Toolbox.

Keyword	Permitted Parameters	Description
dataexpandrange		Command must preceed the dataeditfile keyword. .
	0	Do not expand the wireframe's XYZ range to include this new data set.
	1	Expand the wireframe's XYZ range to include this new data set.
fileremove	"filename"	Specifies a non-primary file that is to be removed from the 3D Viewer's display and memory (differs from showdata which removes a file from display but not from memory).
datahilitlineseg	integer	Specifies which line segment (0-N) on a given line (datahilitlineid) will be highlighted in the specified color (datahilitrgb).
datahilitfile	filename	Specifies the file (containing lines) to which line-segment highlighting will be applied.
datahilitlineid	"string"	Specifies which line ID or well ID will be used for line segment highlighting.

Keyword	Permitted Parameters	Description
datahiliton	0 1	Line-segment highlighting is off. Line-segment highlighting is on.
datahilitrgb	3 integers 0–255	The three values specify the red, green, and blue components, respectively, of the color to be used for line-segment highlighting.

Sample Vue File

The following example shows a typical .vue file:

```
#modelload           case.faces
initmenu             color
xmincutgrid          1
xmaxcutgrid          22
ymincutgrid          1
ymaxcutgrid          31
zmincutgrid          1
zmaxcutgrid          15
xmincutdata          29000.000000
xmaxcutdata          50000.000000
ymincutdata          60000.000000
ymaxcutdata          90000.000000
zmincutdata          -8400.000000
zmaxcutdata          -7500.000000
chairmode            0
isosurfminlev        min
isosurfmaxlev        max
isosurfmindata       min
isosurfmaxdata       max
isosurfinout         inside
xlookpoint           43939.605469
ylookpoint           87956.843750
zlookpoint           -7620.581055
azimuth              65.0
inclination          35.0
zexag                10.000000
zoom                 0.356295
perspective          1
zonepropclrs         1111111111
zoneremoval          0000000001
zonecfc              0000000000
zcfcmin              -8400.000000
zcfcmax              -7500.000000
cfcinterval          50.000000
zctstart             9
zctstep              1
zonechairmode        0000000000
blocks1_10           1
fltoutlnrgb          255 0 0
fltoutlnpixwid       3
revpropcolors        0
revzonecolors        0
revzcolors           0
propctstart          1
propctstep           1
propcolorfile        defaults
zonecolorfile        defaults
zcolorfile           defaults
ftrcolorfile         defaults
timecolorfile        defaults
scatdatcolors        defaults
faultcolor           fault
keyprop1             ”Lower Lamont Bas”
keyprop2             ”Lower Lamont San”
keyprop3             ”channel erosion”
keyprop4             ”Channel Shale”
keyprop5             ”Lower Lamont Unc”
keyprop6             ”Upper Lamont San”
keyprop7             ”Siltstone”
keyprop8             ”Aurora Creek San”
keyprop9             ”Shale ”
keyprop10            ”Unconformity”
keypropstrs          1
axes                 1
axespixwid           1
axeslabels           1
axeslabpixwid        1
axeslabsize          2
lattice              0
latticepixwid        2
keyzone1             ”Lower Lamont Bas”
keyzone2             ”Lower Lamont San”
keyzone3             ”channel erosion”
keyzone4             ”Channel Shale”
keyzone5             ”Lower Lamont Unc”
keyzone6             ”Upper Lamont San”
keyzone7             ”Siltstone”
keyzone8             ”Aurora Creek San”
keyzone9             ”Shale”
keyzone10            ”Uncomformity”
blocklbl1            ”ALL”8
datacubefactor       1.000000
datapointrender      0
xyclipdist           30000.000000
zclipdist            900.000000
linedata3d           0
vfaults              0
vfaults              0
vfltcurtain          0
plydata              0
plycurtain           0
annotation           0
colorkeytype         zone
colorkeyinfo         111111111111111
colorkeyxpos         10
colorkeyypos         8
slicemarkers         1
chairaxmarkers       0
maintitle            ”Geologic
  Structure Builder Example”
maintitlepos         default
subtitle             ””
subtitlepos          default
screenann            0
fullscreen           0
doublebuffer         1
lineantialias        0
logo                 0
cursor3d             0
dataeditfile         null
volumetrics          0
volumefactor         1.000000
lightazim            0.0
lightinclin          0.0
light2               0
light1intens         1.00
ambience             0.30
specularity          1.00
transzone            0000000000
transcolor           1111111111
translevel           1111111111
autosequence         12
timeinfowin          0
timewinpos           620 10
growanimate
timeincr             0.000000
frametime            0.000000
```

```
local                0
xtickinterval        4000.000000
ytickinterval        4000.000000
ztickinterval        100.000000
xtickrefval          0.000000
ytickrefval          0.000000
ztickrefval          0.000000
xcaptiondpy          0
ycaptiondpy          0
zcaptiondpy          0
xaxescaption         ""
yaxescaption         ""
zaxescaption         ""
axescappixwid        1
axescapsize          3
imagetrans           0
allanfaults          0
alnzoneclrs          1111111111
alnzoneremoval       0000000000
alnpropminlev        min
alnpropmaxlev        max
alnpropmindata       min
alnpropmaxdata       max
alnpropinout         inside
bckgrndrgb           40 0 0
forgrndrgb           255 255 255
axesrgb              255 255 255
axesoriginrgb        255 128 0
bwswap               0
```

Appendix C: Screen Annotation Fonts

Screen annotation files are used to display text, lines, rectangles, and circles on a 3D Viewer screen. These annotation objects are positioned relative to the X,Y locations of the graphic display window, unlike surface annotation, which are displayed relative to the X,Y locations of the ASCII data, 2D or 3D grid, or faces file. Screen annotation files are discussed fully in *Screen Annotation Files* (page 3DV 2-10) and *Screen Annotation* (page 3DV 4-60), including how to create a screen annotation file, a list of available commands, a sample file, and how to use and manipulate these files in the 3D Viewer.

This appendix shows samples of the available fonts: Courier, Helvetica, Helvetica Narrow, New Century Schoolbook, and Times. Sample point sizes are also included (supported point sizes are from 2 to 24). Not all point sizes are available for all font styles. When a specified size is not available, the 3D Viewer substitutes the nearest available size (smaller or larger).

Note: *The commands,* txtfont *and* txtpntsize, *which control the font and point size, are not currently supported under Windows NT.*

Sample Fonts

Courier

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 — Courier

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 — **Courier-Bold**

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 — *Courier-Oblique*

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789 — ***Courier-BoldOblique***

Helvetica

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	Helvetica
ABCDEFGHIJKLMNOPQRSTUVWXYZ **abcdefghijklmnopqrstuvwxyz** **0123456789**	**Helvetica-Bold**
ABCDEFGHIJKLMNOPQRSTUVWXYZ *abcdefghijklmnopqrstuvwxyz* *0123456789*	*Helvetica-Oblique*

Helvetica Narrow

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	Helvetica-Narrow
ABCDEFGHIJKLMNOPQRSTUVWXYZ **abcdefghijklmnopqrstuvwxyz** **0123456789**	**Helvetica-Narrow-Bold**
ABCDEFGHIJKLMNOPQRSTUVWXYZ *abcdefghijklmnopqrstuvwxyz* *0123456789*	*Helvetica-Narrow-Oblique*
ABCDEFGHIJKLMNOPQRSTUVWXYZ ***abcdefghijklmnopqrstuvwxyz*** ***0123456789***	***Helvetica-Narrow-BoldOblique***

Note: Helvetica Narrow is only available on SGI workstations.

New Century Schoolbook

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	NewCenturySchlbk-Roman
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	**NewCenturySchlbk-Bold**
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	*NewCenturySchlbk-Italic*
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	***NewCenturySchlbk-BoldItalic***

Times

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	Times-Roman
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	**Times–Bold**
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	*Times-Italic*
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789	***Times-BoldItalic***

Sample Point Sizes†

Letter Size	Point Size
ABCD	8 point
ABCD	10 point
ABCD	12 point
ABCD	14 point
ABCD	18 point
ABCD	24 point

†. The *txtfont* and *txtpntsize* commands are not currently supported under Windows NT.

Appendix D: Hot Keys

"Hot keys" are one-key or two-key strokes available in order to quickly perform a command. They allow users to perform commands without moving to the appropriate menu, to move from menu to menu without selecting the Main Menu, and to work in full-screen mode without the menus showing. Hot keys are displayed on the 3D Viewer menus in a recessed box to the right of each menu item that has a hot key. A few of the available hot keys are not tied to menu commands; these are listed in this appendix and mentioned specifically in *Additional Hot Key Features* (page 3DV 4-156).

Each hot key is represented by a single letter, number, a letter and number combination, or a control character. Typing the letter, number, specified key (such as the HOME key or the F1 key), or control sequence (e.g., the control key and the number 1, indicated as ^1) invokes the command the same way as would clicking on the menu button. The command takes effect when the key is pressed, and does not require the "return" or "enter" key to be pressed. All two-stroke hot keys are typed using the control or alternate key simultaneously with another key. The control key is shown in the program and in the documentation using the caret sign (^), and the alternate key is designated by "Alt."

This appendix includes:

- Keyboard hot keys
- Color Editor hot keys

The hot keys are grouped and listed in approximately menu order. The functions associated with each hot key are discussed in Chapter 4, *3D Viewer Menus.*

Menus

Main Menu	1
Manipulate Menu	2
View Menu	3
Zone Menu	4
File Menu	5
Post Data Menu	6
Capture Data Menu	7
Screen Menu	8
Color Menu	9
Output Menu	^1
Edit Data Menu	^2
Lighting Menu	^3
Transparency Menu	^4
Animation Menu	^5
Axes Menu	^6
Image Menu	^7
Allan Fault Menu	^8
Well Positioning Menu	^9
3D Grid Menu	Alt-1
3D Cursor Menu	Alt-2
Exit the 3D Viewer	Esc, ^q

X, Y, Z Slicing

Visible X slice plane in	F1
Visible X slice plane out	F2
Visible Y slice plane in	F3
Visible Y slice plane out	F4
Visible Z slice plane in	F5
Visible Z slice plane out	F6
Set visible X slice to 3D cursor	^F1
Set visible Y slice to 3D cursor	^F2
Set visible Z slice to 3D cursor	^F3
Toggle 3D grid planar slice picking on/off	^[

P/Isosurface Levels

Active P (property) group	Alt-y
Decrement minimum isosurface level	F9
Increment minimum isosurface level	F10
Decrement maximum isosurface level	F11
Increment maximum isosurface level	F12
Reset levels	0 (zero)
Display inside isosurface levels	=
Display inside Allan Fault Property levels	^=
Display outside isosurface levels	-
Display outside Allan Fault Property levels	^-

Chair Mode

Chair mode on/off	Insert
Chair shells on/off	Delete
Chair freeze on/off	(pad /)

Inclination and Azimuth (Rotation)

Increase azimuth 10 degrees	←
Decrease azimuth 10 degrees	→
Increase inclination 10 degrees	↓
Decrease inclination 10 degrees	↑
Rotate interactivity	ctrl/shift/alt-left mouse button

Z Exaggeration

Flatten (decrease Z exaggeration)	d
Stretch (increase Z exaggeration)	s

Deferred Mode

Toggle deferred mode	(pad *)
Redraw display	(pad -)

Zoom/Pan (Look Point)

Zoom in	i
Zoom out	o (letter o)
Zoom In/Out	ctrl/shift/alt middle mouse button†
Pan	ctrl/shift right mouse button
Move model up (look point down)	^↑
Move model down (look point up)	^↓
Move model right (look point left)	^→
Move model left (look point right)	^←

Reset

Reset attributes	Home
Reset slices	End
Full program reset	^Home

Vue Files, Scripting, Animation

Read vue	e
Save vue	w
Run script	t
Interrupt script/Pause animation	space bar
Step through paused script	→
Resume previous script	Alt-t
Run data animation	^t
Run 3D grid animation	Alt-q

3D Cursor Control/Markers

Turn 3D cursor display	k
Toggle 3D cursor planes display	Alt-k
Set look point to 3D cursor	^k
Move cursor to last picked data point	j
Snap to surface and query	^j
Mark 3D Cursor Location 1	Alt-m
Mark 3D Cursor Location 2	Alt-n

Stereo3D Viewing

Toggle Stereo3D mode on/off	Alt-s
Decrease stereo separation 5%	(pad 4)
Increase stereo separation 5%	(pad 6)
Decrease stereo focus distance 20%	(pad 2)
Increase stereo focus distance 20%	(pad 8)
Reset stereo parameters	(pad 7) Home
Toggle stereo parameter information window	(pad 1) End

File Selection

Edit file selection	b
Get a selected file, reset	g
Get a selected file, no reset	h
Get next file, reset	y
Get next file, no reset	u
Get previous file, reset	^y
Get previous file, no reset	^u
3D grid file selection (as a secondary model)	Alt-g

†. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be set to assign this capability to the combination of the left and right mouse buttons together.

Data, Annotation, and Well Posting

Toggle ASCII data display	^m
Toggle ASCII data lines on/off	^n
Select ASCII scattered data file	^b
Select polygon file	^h
Select vertical fault file	^e
Save data point position (Edit menu)	^f
Select annotation file	a
Planar annotation display	q
Draped annotation display	Alt-a
Toggle annotation following Z-slices on/off	r
Open Well Postioning Toolbox	Alt-w
Toggle well log display	^x
Select well display file	^z
Select data query program	^r

Edit Data

Active edit file pop-up menu/toggle	Alt-v
Save data file as	^s
Save data file	^w
Undo edit	Alt-u
Redo edit	Alt-r
Delete data point	Alt-d
Insert data point	Alt-i
Move data point	Alt-o
End data editing	Alt-e

Volumetrics

Toggle volumetrics calculation on/off	l (letter l)

Screen Control

Toggle full screen mode on/off	f
Push 3D Viewer window	Page Down
Pop 3D Viewer window	Page Up
Get previous screen	Num Lock
Toggle single/double buffer mode	^Alt
Toggle axes	^a

Display Titles/Screen Annotation

Edit display titles (main and subtitle)	F7
Select screen annotation	F8
Turn screen annotation on/off	^F7
Save screen annotation	^F8

Slice Marker Display

Toggle slice markers on/off	[
Toggle slice/chair markers active	]

Color Key

Select Color Key display	c
Edit Color Key information	;

Color Control

Reverse color table	v
Select a property color file	x
Select a zone color file	^c
Select a Z color file	^v
Enter Color Editors	z
Select scattered data colors	p

Model Selection

Toggle primary/3D grid model selection	^o

Screen Output

Send output	Print Scrn
Sweep area	Scroll Lock
Clear box	Pause
Specify image size	^Pause

Lighting

Toggle smooth (gouraud) shading on/off	^g

Zone/Block Display

Fault block display	Alt-b
Zone display	Alt-z
Property/zone color display	Alt-p
Z color-filled contours display	Alt-l (letter l)
Zone chair mode	Alt-c

Additional Hot Keys

Draped image display	^i
Toggle local rectangular coordinates	^l (letter l)
Dynamic Graphics logo	^d
Toggle perspective	^p
Interrupt event	^space bar
Online help	middle mouse button†
Pick point	right mouse button
Rotate axes only	^left mouse button
Zoom axes only	^middle mouse button††
Pan axes only	^right mouse button
Allow direct-mouse-button axes only rotate/zoom/pan	^‘ (grave key; backwards single quote)
Rotate axes and data only	Alt-left mouse button
Zoom axes and data only	Alt-middle mouse button†††
Pan axes and data only	Alt-right mouse button††††
Allow direct-mouse-button axes and data rotate/zoom/pan	Alt-‘ (grave key; backwards single quote)
Rotate full model only	shift-left mouse button
Zoom full model only	shift-middle mouse button††
Pan full model only	Shift-right mouse button
Allow direct-mouse-button full model rotate/zoom/pan	Shift-‘ (grave key; backwards single quote)

†. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be set to assign this capability to the right mouse button.

††. On systems with a two-button mouse, the vue file parameter, `twobuttonmouse`, can be set to assign this capability to the combination of the left and right mouse buttons together.

†††. This capability is not available on NT systems with a two-button mouse, since middle mouse button functionality would have to be assigned to the right mouse button, but the alt key cannot be used in combination with the right mouse button.

††††. On NT systems, the alt key cannot be used with the right mouse button.

Color Editor Hot Keys

Main Menu Functions	
Read a color file	r
Save a color file	s
Delete a color file	d
Options Menu	o
Exit color editor	Esc

Color Systems	
RGB	F1
CMY	F2
HSV	F3
HLS	F4

Display/Clear Current Values	
Toggle color indices	i
Toggle color values	v
Toggle property/zone/Z/feature/time values	p
Clear color table	x

Options Menu	
Return to Main Menu	m
Toggle white boundaries	w
Toggle black boundaries	b

3D Viewer Glossary

This glossary covers terms referred to in *The 3D Viewer* document. For a complete EarthVision glossary, refer to the EarthVision *Glossary,* Appendix G.

2D Surface Grid

A 2D Surface Grid is any two-dimensional grid, represented as a matrix or array of values at regularly spaced X,Y locations. These grids can be output from 2D Grid Calculations, for example. A polygonal version of a two-dimensional surface grid, created in Faces File Generation or selected via the File Selection Menu (the polygonal version is calculated on the fly) can be displayed in the 3D Viewer.

3D Grid Model

A 3D Grid Model is a three-dimensional matrix or array of P-values, which is used as a property model. Refer to the *3D Grid Calculations* document for more information.

ASCII File

An ASCII file is stored using a standard internal computer coding system which is readily displayed as characters on a terminal or sent to a printer on the computer system. ASCII files can be called plain text files.

Scattered Data File

A Scattered Data File contains, at a minimum, X, Y, and Z information. It can also include multiple P-fields and special fields such as a line identifier, line color, dip, dip azimuth, feature number, time, or symbols fields. The special field names are described in Chapter 2, *3D Viewer File Types*. Scattered data files can be displayed in the 3D Viewer without any kind of processing.

Binary File

Binary Files are stored in an internal coding system, which uses much less space than ASCII files, and can be read or written more quickly. Faces files, 2D grids, and 3D grids are all written in binary, for example.

Capture File

A Capture File is created in the 3D Viewer by saving model information to an ASCII file. The types of information that could be included in a capture file are data point locations and polygon vertices.

Clipped Data

Clipped data includes any scattered data points or 2D slice grid nodes that are specified in the grid calculation, but are not actually used for calculating the grid because they are “clipped” by one or more of the gridding parameters. Clipping can be due to the X, Y, Z, or P grid-ranges, the top or bottom 2D structure grids, the polygon file, transformation during conformal gridding, or any null or invalid values in the data set or 2D slice grid. These data are not generally displayed in the 3D Viewer; however, they can be, if desired (refer to Chapter 4, *3D Viewer Menus*).

Color Key

The Color Key is the legend box displayed in the 3D Viewer. It contains information regarding the current display, such as the isosurface intervals and their respective colors (known as the Color Table), the orientation of the axes, the Z-exaggeration, viewing angles, and the location of the X, Y, and Z slices.

Color Table

The Color Table is used to refer to the series of colors that distinguish the different isovalue shells, zones, or Z-levels. The colors can be changed using any of three color editors in the 3D Viewer.

Control Information

Control Information is any type of data that can be used to modify an output 3-D property model or its associated input scattered data file. The data may, for example, come from additional boreholes for a seismic data set, previous or new studies, or additional geologic or atmospheric information. The additional data can be used to edit the scattered data file in the 3D Viewer. This new edited information can then be used for recalculation of the 3D grid model. (Additional editing capabilities are available in EarthVision.)

Faces

A Faces File is the graphic file calculated from a 2D or 3D grid model, showing a single surface in space or modeled property values at user-specified isovalues. The faces file is input to the 3D Viewer for manipulation (e.g., slicing into the model and removing isovalue shells) and rotation. Refer to Chapter 2, *3D Viewer File Types*.

Facets

Facets are the polygons that create the displayed isovalue surfaces within a faces file.

Grid Cell

A Grid Cell is a rectangular prism (not necessarily a cube) with a grid node at each corner. A grid cell cannot contain any grid nodes, but rather the grid nodes are the corners of the grid cell. A slicing plane must fall along one side of a grid cell.

Grid Node

A Grid Node is a position within a grid at which a P-value is stored. Grid nodes lie on each corner of a grid cell.

Grid Size

The Grid Size is the number of X-columns and Y-rows in a 2D grid; it is the number of X-columns, Y-rows, and Z-levels in a 3D grid. Grid size is usually expressed as: 25 x 39 (2D grid) or 18 x 43 x 56 (3D grid).

Hot Keys

Hot Keys perform certain display functions immediately upon being typed. They eliminate the need to use the mouse for selecting menu items. Hot keys are discussed throughout Chapter 4, *3D Viewer Menus*, and in Appendix D.

Isovalue

Isovalue is defined as having the same numerical value. For example, an isovalue line is made up of points that all have the same numerical value assigned to them.

Isovalue Interval

The Isovalue Interval is the difference in P-value units between one isovalue shell and the next higher or lower shell. The interval is chosen by the user and may or may not be uniform within the 3D model. Isosurface Interval is used synonymously with Isovalue Interval.

Isovalue Level

The Isovalue Level defines the P-value of the isovalue shell (see below). The isovalue level may be defined explicitly by the user or determined by a user-specified isovalue interval.

Isovalue Shell

An Isovalue Shell is a surface boundary joining points within a 3D grid that have the same value of P. It is the three-dimensional equivalent to a contour line. Synonyms are Isovalue Surface, Isovalue Layers, and Isosurface.

Isosurface (See Isovalue Shell)

Isosurface Interval (See Isovalue Interval)

Isosurface (Isovalue Level)

P

"P" is the variable name used to stand for the property being modeled in a 3D grid. Associated with each P is an X,Y,Z location. Every scattered data file used for gridding 3D models must contain an X, Y, Z, and P field, although the names may vary.

P-value

P-value is the value of the property at a particular X,Y,Z location. P-values are the input used for gridding and also represent the grid node value.

Parallel-Piped Matrix

A Parallel-Piped Matrix is a series of rectangular prisms joined together to form the basis of a 3D grid model (see 3D Grid Model).

Piercing

Piercing occurs when values of a bottom 2D grid become higher than that of the top 2D grid.

Polygon Conversion Tolerance

Polygon Conversion Tolerance is used in converting a 2D grid (either on its own or one that truncates a 3D grid model) into the top or bottom surface of the faces file so that it can be displayed in the 3D Viewer. The tolerance is the maximum vertical distance that a Z-value of the 2D grid can vary from the polygons used to define the grid surface in the display. The tolerance is specified by the user. The polygon conversion tolerance is discussed in the *Faces File Generation and Merging* document.

Property Model (See 3D Grid Model)

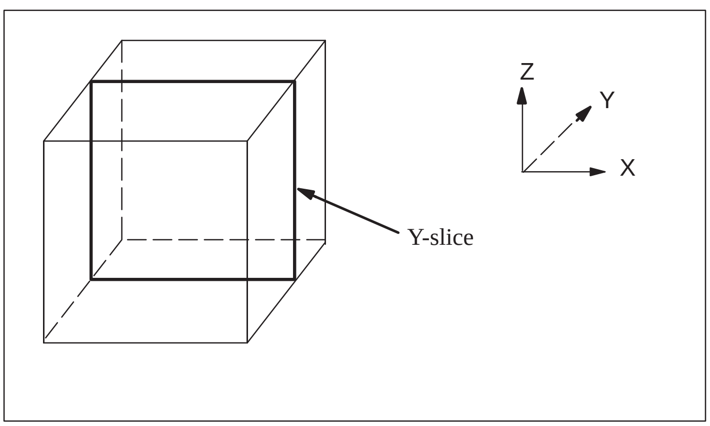
Shell (See Isovalue Shell)

Slice

A Slice refers to either a method of manipulating the display of a 3D model (verb; 3D Viewer) or to a type of a 2D grid extracted from a 3D grid (adjective; 3D Grid Calculations).

Slice (verb): To take a “slice” in the 3D Viewer means to remove a portion (or volume) of the model that is often one grid cell in thickness in one direction (say the Y direction) and the full range of the model in the other two directions of the axes (the X and Z directions; this would be a “Y-slice”). A new Y-plane, which was previously interior to the model, is now an exterior face in the display.

Slice (adjective): To extract a “slice” grid in 3D grid operations means to create a 2D grid at a constant coordinate value (e.g., at Y=constant) that is the full range of the model in the other two axis directions (the X and Z). The 2D grid node values are the same as the 3D grid nodes at that location. The illustration below shows a Y-slice.



Screen Annotation File

A Screen Annotation File contains keywords and parameters for displaying annotation such as text, lines, rectangles (filled or not), and circles (filled or not) on the 3D Viewer graphic display. These files differ from binary annotation in that they are referenced to screen locations rather than the X,Y locations of the display file, and also in the type of annotation they display. For more information, refer to Chapter 2, *3D Viewer File Types*.

Stereo3D Viewing

The EarthVision 3D Viewer has the capability of being viewed in “stereo3D,” which creates the impression of realistically viewing a three-dimensional scene. By presenting each eye of the user with a slightly different perspective of the scene, the user perceives depth in the same way in which we see the world around us in 3D.

Stereo3D is currently only offered on the SGI™ IRIX® platform, and requires a pair of StereoGraphics® CrystalEyes® liquid crystal goggles and an associated infrared emitter box. The infrared emitter box plugs into the back of the SGI workstation and is typically placed on top of the SGI monitor.

Stereo3D viewing is discussed in Chapter 4 (page 3DV 4-65).

Vue Files

Vue Files are ASCII files that contain 3D Viewer specifications for the proper display of faces files, ASCII scattered data files, or 2D or 3D grid files. Four types of vue files exist: those files with names ending in *.vue* control the display of faces files; those ending in *.dvue* control the display of ASCII scattered data files; and those ending in *.2gvue* and *.3gvue* control the display of 2D and 3D grids, respectively. (Refer to Appendix B.)

X-column

An X-column is a plane of grid nodes perpendicular to the X-axis. In other words, every grid node within that plane has the same X-value, but different Y and Z values. Every X slice is along an X-column.

Y-row

A Y-row is a plane of grid nodes perpendicular to the Y-axis. In other words, every grid node within that plane has the same Y-value, but different X and Z values. Every Y slice is along a Y-row.

Z-level

A Z-level is a plane of grid nodes perpendicular to the Z-axis. In other words, every grid node within that plane has the same Z-value, but different X and Y values. Every Z slice is along a Z-level.

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