

Laser-Scan Ltd.

MATRIX

Reference Manual

Volume I

Issue 3.7 - 5-June-1997

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Science Park, Milton Road, Cambridge, England CB4 4FY tel: (01223) 420414

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MATRIX Reference Documentation Change Record

Version 1.0 14 September 1988 D.R.Catlow

First issue of MATRIX reference documentation in a chapter based format.

Version 1.1 27 September 1988 J.H.Rees

DTICOMBINE Classification implemented.

Version 2.0 09 March 1989 D.R.Catlow, T.J.Hartnall, M.W.S.Reid

Extensive changes to incorporate DTI projection record and command standardisation.

Version 2.1 15 June 1990 J Barber

Extension of the DTICONVERT module to handle BIT datatype DTI files.

Version 2.2 23 July 1990 C Biggs

Addition of /TWO /THREE /FOUR and /PROJECTIVE qualifiers to DTITRANS to enable registration between a scanned raster image and a ground coordinate system.

Version 2.3 26 April 1991 S Gupta, J Barber

Extension to mathematical expressions in DTICOMBINE. Removal of ^ as symbol for exponentiation (use ** instead) and addition of OUTPUT command to set area of interest with overlapping DTI files.

New warning message NOTRANSFORM in DTITRANS to warn that /TRANSFORM has been supplied with another transformation qualifier, and will be ignored.

Version 2.4 19 July 1991 J Barber

New messages NONSTDROT and UNEXPRESULTS in DTILIB.

New message BITDATA in DTITRANS.

Version 2.5 8 August 1991 J Barber

New default output formats for LONGWORD and BIT DTI data types in DTI2TEXT.

Version 2.6 7 August 1992 J Barber

In DTILIB, the maximum size of DTI files has been increased to 65535 pixels in rows and columns, set in DIT_MAX_ROWS and DTI_MAX_COLUMNS in DTIPAR.PAR.

There is a seventh (optional) argument to DTI_OPEN so that a page fault cluster value may be passed to VIO\$OPEN_SEC. This may be used to improve the performance of programs reading large DTI files where the data access goes against the natural order of the data.

The action for null values in DTICOMBINE has changed for MAX and MIN expressions from the default action of outputting null if there is a single null in the input files, to outputting a result from any remaining values, if any.

Version 2.7 17 August 1992 J Barber

Messages added to the GO command in DTIBLEND when there is no overlap between two DTI files that abut along a common axis.

Version 2.8 4 March 1993 R.W. Russell

New projections added to DTITRANS.

Version 2.9 19 April 1993 J Barber

BIT data type DTI files are not allowed for DTIROTATE.

Version 3.0 27 April 1993 J Barber

The angle PHI has been limited to between -80 and 80 degrees in DTIVIEW.

Version 3.1 16 September 1993 J Barber

A new chapter for DTIFROMTEXT, text to DTI file conversion, has been added.

Version 3.2 28 October 1994 J Barber

The chapter for DTIFROMTEXT, text to DTI file conversion, has been changed to make the /INDEX file contents clearer.

Version 3.3 13 April 1995 J Barber

The Appendix for package MATRIX has been changed to make the use of DTILIB header reading routines clearer.

Version 3.4 13 July 1995 J Barber

The Modified-Stereographic projection has been added to DTITRANS, via a new GCTPLIB in package LSLMAINT, together with five options defined on the sphere. There is also a new DTILIB with associated changes to the MD2DAT projection options routine. These new options are further described in the MATRIX Release Notes.

Version 3.5 6 March 1996 J Barber

A new qualifier /ROUND_ORIGIN for DTITRANS has been implemented. This forces the origin offset to be a multiple of the sampling interval, required for some DTM formats.

Version 3.6 10 October 1996 J Cadogan

A new command ENABLE SMOOTH for DTIBLEND has been implemented. This enables a smooth (gradual) feathering of one matrix into another.

CHAPTER 1

INTRODUCTION

INTRODUCTION

The Laser-Scan DTM software packages provide tools for the production, validation, manipulation and viewing of matrix data, particularly of elevation (height) data. The MATRIX package consists of software modules for the processing and manipulation of raster data held in a Laser-Scan DTI (Digital Terrain Image) format. The package includes a library of routines that allow DTI format files to be read and written by an applications program.

This manual provides a module by module reference guide to the package.

CHAPTER 2

MODULE DTIVIEW

MODULE **DTIVIEW**

FUNCTION

DTIVIEW produces perspective or isometric profile plots of a DTM for validation or display purposes. The profile plots may be sent to a graphics screen or to an IFF file for subsequent plotting using a FPP (Laser-Scan Fast Plotting Program) based plotting program. Optionally vector information (point symbols, lines and areas) contained in an IFF file may be overlaid 2-dimensionally on the terrain base.

FORMAT

\$ DTIVIEW

PROMPTS

DTIVIEW is an interactive, command driven program. Command input is expected when the following prompt is issued:

DTIVIEW>

Commands may be issued at the terminal in response to the prompt, or in most cases by digitising a point inside a DTIVIEW menu box.

DESCRIPTION

GENERAL

DTIVIEW produces perspective or isometric profile plots of a DTM for validation or display purposes. The profile plots may be sent to a graphics screen or to an IFF file for subsequent plotting using a FPP based plotting program. Optionally vector information contained in an IFF file may be overlaid on the terrain view.

PROJECTION TRANSFORMATIONS

A projection transforms points in a 3 dimensional coordinate system into points in a 2 dimensional system. In the context of DTIVIEW the 3 dimensional coordinate system is that of the Digital Terrain Model, and the 2 dimensional system is the coordinate system of a graphics device.

The projection of a terrain surface recorded as a DTM, is defined by straight projection rays (projectors) emanating from the centre of projection, each passing through a single matrix node, and intersecting a projection plane to form the projection.

The two projections most frequently associated with terrain views, are the isometric which is a common form of the parallel projection, and the central perspective projection. Figure 1 shows a perspective and parallel projection of the endpoints of the same line. Since the projection of a line results in a line, only the line endpoints need be projected.

As may be seen from the figure, the difference between a perspective and parallel projection is related to the centre of the projection to the projection plane. In the perspective projection the distance from one to the other is finite; the projectors are not parallel to the projection plane and converge at a vanishing point. In a parallel projection the projectors are parallel, and the centre of projection is at infinity.

The perspective projection creates a visual effect similar to that of the human visual system. It takes into account the perspective phenomena of the real world, so that parallel lines appear to meet on the horizon, and an object appears smaller as the distance from the observer increases (perspective foreshortening). It is therefore used when some degree of realism is required, but has the disadvantage that it cannot be used for cartometric applications eg. distance measurements cannot be taken from the 3D view. Figure 2 illustrates the form of a perspective terrain view generated by DTIVIEW.

The parallel projection or isometric view is less realistic because perspective foreshortening is lacking, however distances between objects remain correct, and parallel lines remain parallel. Figure 3 illustrates an isometric view generated by DTIVIEW - the area of terrain is that shown in perspective in Figure 2.

Both terrain views are generated using a combination of primitive geometric transformations that allow rotation about one or more coordinate axes. The isometric view involves the use of 2 of these primitive rotation transformations to rotate about the x and y coordinate axes. The perspective view involves in addition to the rotation operations, division by the depth of each coordinate point. It is this division which causes the perspective projection of vectors defining a terrain profile to be smaller the greater the distance from the observer.

TERRAIN VIEW GENERATION

DTIVIEW uses a profile algorithm to generate terrain views. This involves taking a series of horizontal or vertical profiles through the DTM. The separate profiles combine to form the 3 dimensional isometric or perspective view.

The profiles are generated in order of increasing distance from the viewer. The order in which the DTM is sampled is controlled by the direction of view; the DTM is sampled column by column if the view direction is from the east or west, and row by row if the view direction is from the north or south.

As the height of each profile point is extracted from the DTM, the x,y,z coordinates of the point are passed to the projection functions to transform the coordinates into model space and subsequently into 2 dimensional view space. Before output to a graphics device, a vector on the profile is passed through a hidden line removal algorithm.

HIDDEN LINE REMOVAL

The perception of the third dimension and the understanding of the depth relationships in a perspective or isometric view, is enhanced by the use of hidden line removal. The aim of hidden line removal is to display only those parts of a profile that would be visible to the observer, given a solid (opaque) representation of the terrain surface.

DTIVIEW uses a scan-line algorithm for the removal of hidden lines. The algorithm is optimised for a terrain view generated by taking a series of profiles through the DTM which are orientated to the direction of view.

The solution is based on the generation and storage of a highest current profile or mask (see Figure 4), and relies on the component profiles of the view being generated in order of distance from the viewer, so that the mask may be advanced profile by profile towards the back of the model. The highest current profile is updated as each point on the current profile is transformed. The mask consists of all the visible parts of the present profile, plus any parts of the previous profiles that hide from view parts of the present profile.

SIMPLE PROFILE BETWEEN TWO DTM POINTS

In addition to producing an isometric or perspective terrain view, DTIVIEW may be used to generate a simple profile or cross section between 2 DTM points. The command PROFILE is provided.

PICTURE AND PLANES

Although DTIVIEW may be used on a graphics device configured with 4 planes, many options operate only on an 8 plane display device. In the section of the Reference Guide which provides details on all DTIVIEW commands, it is documented if a command is only valid on an 8 plane device.

When using an 8 plane device it is possible to divide the bit-planes into two contiguous sets of planes known as Pictures. The first set of planes forms Picture 1, and is used for the display of an isometric or perspective terrain view and any associated legend. The second set of planes forms Picture 2, and is used for the drawing of vector overlay information, and for any user annotation. The two Pictures may be selected and cleared independently.

You may select or deselect either of the Pictures using the DISABLE/ENABLE PICTURE commands. For example, **DISABLE PICTURE 1** will deselect Picture 1. This causes any image displayed in Picture 1 to be set 'invisible'. It may be set 'visible' again by giving the command **ENABLE PICTURE 1**. Picture 2 may be manipulated in a similar way. You should note that deselecting one Picture, will cause the other Picture to be selected. It is therefore not possible (and presumably not very useful), to deselect both Pictures.

Both Picture 1 and 2 may be cleared selectively by means of the CLEAR PICTURE command. For example, CLEAR PICTURE 2 will clear Picture 2 only. Clearing erases the contents of the Picture, so that the image in the Picture cannot be recovered. It is possible to clear both Pictures together using the command CLEAR with no qualifier.

By default DTIVIEW will allocate 5 planes to Picture 1 and the remaining 3 planes to Picture 2. You may vary the allocation of planes between Pictures by using the PLANES command. PLANES allows you to define the number of bit-planes that will be used for Picture 1. The remaining planes are always allocated to Picture 2.

The number of bit-planes allocated to each Picture determines the maximum number of colours available for the terrain view, and for any vector overlay.

	Picture 1	Picture 2
PLANES 5	32 colours	7 overlay colours
PLANES 6	64 colours	3 overlay colours
PLANES 7	128 colours	1 overlay colours
PLANES 8	256 colours	0 overlay colours

You are limited to a maximum of 7 overlay colours.

PLANES 4 has a special meaning, and is used to indicate to DTIVIEW that output is to a graphics device configured with 4 planes. If the PLANES 4 command is given, only Picture 1 will be used. Both the terrain view and any vector overlay and user annotation will be written to this picture. Commands relating to Picture 2 will not be recognised.

For a number of applications you may wish to use less than the maximum number of colours available with the current PLANES setting. The number of colours used for display of a terrain view may be set using the COLOURS command. For example, COLOURS 16 will select the use of just 16 Picture 1 colours. The value supplied with the COLOURS command may not exceed the number of possible colours available with the current PLANES setting. It should also be noted, that giving the PLANES command will always set the number of display colours to the maximum available for the number of Picture 1 planes.

COLOUR TABLES

6 colour tables are supplied with the program. Five of these tables are designed to be utilised with the five available PLANES setting, and the appropriate colour table is read in when the PLANES command is given. The colour tables associated with each PLANES setting are listed below:

	Colour Table Name	Description
PLANES 4	DTIVIEW4	16 display colours and no overlay colours
PLANES 5	DTIVIEW5	32 display colours and 7 overlay colours
PLANES 6	DTIVIEW6	64 display colours and 3 overlay colours
PLANES 7	DTIVIEW7	128 grey level values and 1 overlay colour
PLANES 8	DTIVIEW8	256 grey levels and no overlay colours

A special colour table UNDERSEA is also provided, and is read by the program when the bathymetry option is selected using the command ENABLE BATHYMETRY.

You may edit the colour representations in these tables using the system text editor. Alternatively, you may wish to define your own special colour tables, and select these from within DTIVIEW. Colour table selection is achieved using the LUT command.

In the supplied colour tables the first entry is defined as the colour black. DTIVIEW expects this to be case, and uses the first colour entry to selectively erase a quadrant or a Picture. The second entry in the table is defined as the colour white, and is used by DTIVIEW to draw legend text, and the parts of any profile that fall outside a height range defined using the ZLIMITS command. The third entry in the table is used to display parts of the profile that have a value of 0 or less (ie. areas of sea). In the supplied colour tables this entry is defined as the colour blue.

OVERLAY OF IFF DATA ON A TERRAIN VIEW

DTIVIEW offers the option of drawing IFF features on an isometric or perspective terrain view. These features will most usually consist of map features such as rivers and roads, or the contour and breakline data that may have been used in the generation of the DTM. The overlay may also consist of polygon information generated using Laser Scan DTM exploitation utilities, defining for example, areas of visibility or range of gradient. The overlay option is an important display and validation tool, and may be used for many Geographic Information System (GIS) applications.

The overlay option is enabled by giving the command `ENABLE OVERLAY`. This command should be given before any other commands that control the form of overlay, and **before an isometric or perspective view is generated**. The option is supplied as a licensed facility, and may not be available in all versions of the program.

Point, line and area features may be drawn on the terrain base. Point features are represented symbolically; the form of the symbol is defined in the SRI file. A symbol is drawn only if a point at the base of the symbol (ie. on the terrain surface) is visible to the observer. No hidden line removal involving the intersection of the symbol vectors with the terrain profiles is performed.

Line features are drawn on the terrain view in a solid line. Any line pattern or line thickness definitions contained in the FRT are ignored when the line is drawn. Only those parts of the line that are visible to the observer are shown.

Area features are shown as a hatched infilled region; the hatching is drawn at right angles to the terrain profiles. It is not possible to vary this representation. The FRT area fill parameters are not used by DTIVIEW. The boundary of the region is also drawn. Only those parts of the area that are visible to the observer are shown.

Note that in the case of all lines and areas, a 'cartographic' representation of the features produced. The features are treated as though they have no height above the terrain surface. Any coordinate height information associated with the IFF features is ignored when the

features are drawn by DTIVIEW.

The command IFF is used to select the IFF file which holds the overlay data. The command IFFWINDOW is used to define a rectangular geographical area in the IFF file. Registration of the overlay data with the terrain data is achieved using this command in combination with the WINDOW command; the corners of the IFF rectangular area are registered to the rectangular corners of the DTM current area of interest. The default IFF window is set up to achieve registration automatically provided header records, containing absolute file origin values, are present in both the DTI and IFF files. (See the DTILIB Module for more information on DTI header records and the IFF user guide for an explanation of the IFF Map Descriptor entry.) Resetting the DTI WINDOW causes automatic recalculation of the IFFWINDOW to maintain registration.

The SELECT and DESELECT commands should be used to define which IFF features are drawn on the terrain view; features may be included or excluded on the basis of FSN, feature code or layer. The graphical type and colour representation of the features is determined from a Feature Representation Table; the form of a point symbol is determined from a Symbol Representation file. The commands FRT and SRI should be used to define these two files before the features are drawn on the terrain view.

The command OVERLAY is used to draw the features on the terrain view. An isometric or perspective terrain view must have been previously generated, and the representation tables defined. A typical sequence of commands which results in IFF data being drawn on a terrain view is shown below.

```
DTIVIEW> ENABLE GRAPHICS <CR>
DTIVIEW> FILEIN TEST <CR>
DTIVIEW> WINDOW 1 1 100 100<CR>
DTIVIEW> ENABLE OVERLAY <CR>
DTIVIEW> IFF TEST_OVERLAY <CR>
DTIVIEW> IFFWINDOW 0 0 1000 1000 <CR>
DTIVIEW> FRT TEST <CR>
DTIVIEW> SRI TEST <CR>
DTIVIEW> SELECT FC 10, 20-25 <CR>
DTIVIEW> ISOMETRIC <CR>
DTIVIEW> OVERLAY <CR>
DTIVIEW> EXIT <CR>
```

DISPLAY ANNOTATION

When using a graphics device, it is possible to annotate a terrain view with a legend and with text labels. In both cases it is possible to control the size and position of the annotation, and in the case of labelling to select the colour in which the labels are drawn. The legend is used for analysis since it relates the colours used in drawing a terrain view to a height range, while labelling is used primarily for presentation purposes.

A legend may be output to the screen using the DRAW LEGEND command. A terrain view or cross section must have been previously generated. The legend consists of a display colour / height guide, which allows the colours in the terrain view to be related to the range of height values they represent. The colour/height guide is sub-sampled as necessary.

The commands LEGEND POSITION and LEGEND SIZE are used to control the position of the legend and the size of the legend boxes respectively. By default a legend will be drawn with the first box positioned close to the the bottom lefthand corner of the display. When using a quartered screen, the legend is drawn by default in the bottom lefthand corner of the selected quadrant. No check is made when drawing the legend to determine whether it will overwrite part of the terrain view.

The display may be annotated with text using the DRAW LABEL command. There is no restriction on the number of labels that may be drawn, however a single text string cannot consist of more than 80 characters. The LABEL POSITION command determines the position of the label on the screen; a label is drawn so that the first character is located at the current label position. The LABEL SIZE command may be used to select from 4 different character sizes.

In addition to position and size, it is also possible to select the colour in which the labels are drawn, when using a colour graphics display with 8 planes. The number of annotation colours is equal to the number of overlay colours and is controlled by the PLANES setting. The command LABEL COLOUR may be used to define the colour of a label.

The command CLEAR LABEL allows all the labels drawn on a screen to be cleared independently of any terrain view or legend.

The annotation commands are dependent on the configuration of the workstation display device. It is not possible to generate a legend on a TEKTRONIX 4014, or to clear labels independently of the terrain view. It is not possible to set the colour of labelling on a colour graphics device that has less than 8 planes.

The SHOW ANNOTATION command is provided to list current legend and label parameters.

PLOTTING AND MOVEMENT OF SYMBOLS ON A TERRAIN VIEW

DTIVIEW offers the option of interactively positioning and moving user defined symbols on an isometric or perspective terrain view. The form of the symbol is defined in the SRI file. A symbol is drawn only if a point at the base of the symbol (ie. on the terrain surface) is visible to the observer. No hidden line removal involving the intersection of the symbol vectors with the terrain profiles is performed. Up to fifteen symbols may be interactively positioned or moved.

The symbol option is enabled by giving the command ENABLE SYMBOLS. This command should be given before any other commands that control the form of the symbols, and **before an isometric or perspective view is generated.** The option is supplied as a licensed facility, and may not be available in all versions of the program.

A symbol is selected on the basis of feature code using the SYMBOL FC command. An entry for the feature code must be present in the currently selected FRT. The symbols are positioned on the terrain model using the SYMBOL POSITION command. This command requires a symbol number together with the x and y coordinates of the symbol specified in the current DTI units of measurement. The coordinates must lie within the currently specified window.

Alternatively, if a digitising table is available, and a map has been registered to the DTM, the position of a symbol may be defined using an appropriate button on the table puck. Button 1 positions symbol 1, button 2 positions symbol 2 and so on. All fifteen symbols may be positioned in this way. Button 0 may be used to redisplay all previously defined symbols. This is useful when a new view is generated with a different visibility grid, and causes all previously defined symbols to be displayed on the new terrain view.

The SYMBOL CLEAR command may be used to selectively clear a symbol or remove all symbols from the terrain model. The command will not remove symbols displayed using the OVERLAY command.

RESTRICTION OF VISIBILITY (FOG)

DTIVIEW offers the option of restricting visibility using the ENABLE FOG command. The limit of visibility is controlled by means of the FOG VISIBILITY command. For example, the command FOG VISIBILITY 2000 sets the visibility distance to 2000 metres. In calculating whether a point is visible the algorithm considers the spatial location (X_o, Y_o, Z_o) of the observer (o) and the spatial location (X_i, Y_i, Z_i) of a point (i) on the model surface. Points lying beyond the limit of visibility are considered to be in the fog, and are drawn in the currently defined fog colour. By default the fog colour is black so that parts of the terrain surface in the fog will not be visible on the graphics screen. An alternative fog colour index may be selected using the command FOG COLOUR.

The ENABLE FOG command should be given before any other commands that control the fog, and **before an isometric or perspective view is generated**. The option is supplied as a licensed facility, and may not be available in all versions of the program. The fog option is only valid for a perspective terrain view.

USE OF A DIGITISING TABLE AND PUCK BUTTONS

If your workstation incorporates a digitising table and button puck, then it is possible to register a source document such as a map to the DTM, and to issue many of the DTIVIEW commands from a table menu.

If the logical name LSL\$AUTO_ENABLE_TABLE is defined with a value of "1" the program will attempt to initialise the Laser Scan Table Monitor Utility on startup. If the logical name is absent or has any other value, initialisation is not performed on startup, however the table can be subsequently initialised using the command ENABLE TABLE.

The Table Monitor controls reading from the digitising table. It must be set up on your system if DTIVIEW is to take input from the digitising table. If table initialisation fails then the message:

```
*** WARNING *** Initialising table monitor
DTIVIEW will assume no table is available
```

will be output before the prompt **DTIVIEW>** is displayed on the terminal. In the event of failure, input from the digitising table or puck button is not possible, and the program will accept commands only from the terminal.

Table initialisation will generally fail because no Table Monitor is currently active, or because the Table Monitor is locked by another user. If neither of these reasons appear to apply, you should consult the TABLIB Reference Manual, or seek guidance from your system manager.

A map is registered to the DTM using the command **SETUP MAP**. Before giving this command you should have first selected the input DTM, and have securely attached the source document to the digitising table.

Registration is performed by digitising 4 rectangular registration points. The registration points represent 4 points on the map that correspond to the 4 corners of the DTM. The points are digitised in the order top left (NW), bottom left (SW), bottom right (SE) and top right (NE) using any button on the table puck. A point is digitised in response to an explanatory prompt on the terminal.

An error message is generated if any of the angles of the digitised rectangle are less than 88 degrees, or greater than 92 degrees (ie. if the corner points of the rectangle are more than 2 degrees off rectangular). In this situation you will be asked to redigitise the 4 registration points.

Once a map has been positioned on the table, it is possible to define an area of interest in the DTM by giving the WINDOW command and digitising two points on the map. It is also possible to digitise the start and end points of a simple profile through the DTM. The command PROFILE should be given, and subsequently two points should be digitised in the map area using any button on the table puck.

The map can also be used to position symbols on the model. See section **Plotting of user defined symbols on a terrain model**

If the table has been successfully initialised, then a command menu may be positioned on the table. The majority of the DTIVIEW commands may be issued from the menu.

A menu is positioned on the table using the command **SETUP MENU**. As with map setup, registration is performed by digitising 4 rectangular registration points. The registration points represent the 4 corners of the menu. The points are digitised in the order top left, bottom left, bottom right and top right using any button on the table puck. A point is digitised in response to an explanatory prompt on the terminal.

A menu command is issued by digitising a point in the relevant menu box. For commands that require a parameter argument, you should enter the parameter in response to a prompt on the terminal, using the keyboard. The ENABLE commands when given from the menu act as 'flip-flops'; if the enable option is currently disabled it will be enabled when the menu command is given, and vice versa.

DTIVIEW COMMANDS

@

Take command input from the specified file.

FORMAT: @ file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTIVIEW offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTIVIEW to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. the end of file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTIVIEW will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** ERROR *** Specifying command @
Command file specification is missing

*** ERROR *** Specifying command @
Unable to open indirect command file 'file-spec'

*** ERROR *** Specifying command @
Nested command files not supported

Examples:

```
DTIVIEW> @PRESETS<CR>
DTIVIEW> ENABLE GRAPHICS
DTIVIEW> FILEIN AREA1
```

```
DTI file LSL$DTI:AREA1.DTI;0 opened for read
Header : MIKE Data: WORD
```

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	40
Matrix Interval	E:	1		N:	1	
Value Range	:	378	to	526		

```
DTIVIEW> WINDOW 1 1 30 30
DTIVIEW> DIRECTION SOUTH
DTIVIEW> RETURN
DTIVIEW>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard MATRIX package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc.

Messages: None.

Examples:

DTIVIEW> **FILEIN TEST !open the file<CR>**
DTIVIEW> **!Define a window<CR>**
DTIVIEW> **WINDOW 1 1 10 10<CR>**
DTIVIEW>

CLEAR

Clears the display screen of a graphics device.

FORMAT: CLEAR

Command parameters: None

DESCRIPTION:

The CLEAR command is used to clear the display screen of a graphics device.

The command operates on both Picture 1 and Picture 2. If you wish to clear pictures independently, the command CLEAR PICTURE should be used.

If a divided screen is selected, then the command CLEAR QUADRANT may be used to clear a particular quadrant of the screen.

Messages:

The following error messages are specific to the CLEAR command:

*** ERROR *** Specifying command CLEAR
No graphics device is currently enabled

*** ERROR *** Specifying command CLEAR
Command qualifiers are PICTURE or QUADRANT

Examples:

DTIVIEW>CLEAR <CR>
DTIVIEW>

CLEAR QUADRANT

Clears a single quadrant of a graphics screen. The command is only valid if the option to use a divided screen has been selected.

FORMAT: **CLEAR QUADRANT quadrant_number**

Command parameters:

quadrant_number

specifies which quadrant of the screen is to be cleared. The quadrant_number should be in the range 1 to 4 where:

Quadrant_number 1 = top lefthand quadrant

Quadrant_number 2 = top righthand quadrant

Quadrant_number 3 = bottom righthand quadrant

Quadrant_number 4 = bottom lefthand quadrant

DESCRIPTION:

The CLEAR QUADRANT command is used to clear a single quadrant of a graphics screen. The quadrant_number parameter specifies which quadrant is to be cleared.

The command is only valid if a divided screen is currently selected. The command operates on both Picture 1 and Picture 2.

To clear the whole screen (ie. all quadrants) the command CLEAR without the qualifier QUADRANT should be given.

Note that it is not possible to clear a single quadrant on a TEKTRONIX 4014 display.

Messages:

The following error messages are specific to the CLEAR and CLEAR QUADRANT command:

*** ERROR *** Specifying command CLEAR
No graphics device is currently enabled

*** ERROR *** Specifying command CLEAR
Command qualifiers are PICTURE or QUADRANT

*** ERROR *** Specifying command CLEAR QUADRANT
A divided screen is not enabled

*** ERROR *** Specifying command CLEAR QUADRANT
Command requires a quadrant number in the range 1 to 4

Examples:

DTIVIEW>ENABLE DIVIDE <CR>
DTIVIEW>CLEAR QUADRANT 2<CR>
DTIVIEW>

CLEAR PICTURE

Clears the bit-planes of a graphics device that are currently allocated to the specified picture.

FORMAT: **CLEAR PICTURE picture_number**

Command parameters:

picture_number

The picture number. An integer value of either 1 or 2 is required.

DESCRIPTION:

The CLEAR PICTURE command is used to clear the bit-planes of a graphics device that are currently allocated to the specified picture.

The number of bit-planes allocated to picture 1 and picture 2 is determined using the PLANES command. By default 5 planes (bit-planes 1 to 5) are used for Picture 1, and the remaining 3 planes (bit-planes 6 to 8) are used for Picture 2. An isometric or perspective terrain view is drawn into Picture 1, while any vector overlay information or annotation drawn using the OVERLAY and DRAW LABEL commands, is displayed in Picture 2.

A terrain view may therefore be cleared independently of any overlay using the command CLEAR PICTURE 1, while any IFF overlay may be cleared independently from the terrain base using the command CLEAR PICTURE 2. To clear both pictures (ie. all bit-planes of a graphics display), the command CLEAR should be used.

Note that this command is not applicable if the output graphics device is a TEKTRONIX 4014, or if the device is configured with only 4 bit-planes.

Messages:

The following error messages are specific to the CLEAR and CLEAR PICTURE commands:

*** ERROR *** Specifying command CLEAR
No graphics device is currently enabled

*** ERROR *** Specifying command CLEAR
Command qualifiers are PICTURE or QUADRANT

*** ERROR *** Specifying command CLEAR PICTURE
Command requires 1 integer argument

*** ERROR *** Specifying command CLEAR PICTURE
Command requires a picture number of 1 or 2

Examples:

DTIVIEW>CLEAR PICTURE 1<CR>
DTIVIEW>

COLOURS

Defines the number of colours used to display an isometric or perspective view on a colour graphics device.

FORMAT: **COLOURS number**

Command parameters:

number

The number of colours to be used for display. An integer value is required. The valid range for the integer is dependent on the number of planes currently selected for PICTURE 1.

DESCRIPTION:

The COLOURS command defines the number of colours used to draw a terrain view on a colour graphics device.

By default, DTIVIEW allocates 5 bit-planes of a graphics device to the terrain view, and uses the colour table file LSL\$LOOKUP:DTIVIEW5.DAT. This file contains RGB definitions for 32 PICTURE 1 colours, and 7 overlay colours. The first 3 entries define the colours black, white and blue which are used specially by the program; the remaining 29 entries define a series of colours that are used when drawing the isometric or perspective view profile lines. Different colours are used to represent different height levels.

By default therefore the terrain view will be drawn using 29 colours.

Using the COLOURS command, it is possible to change this default, and specify how many colours are used when displaying a terrain view. For example, the command COLOURS 4 will select the use of the first 4 non-special colours in the currently selected colour table.

A common use for the command is to restrict the number of colours used in drawing the terrain base, so that any vector data overlaid on the view may be easily seen.

Note that redefining the number of colours, may change the height interval value previously set by the ZSTEP command, and that the PLANES command will automatically reset the number of colours to the maximum allowable for the bit-plane setting.

Messages:

The following error messages are specific to the COLOURS command:

*** ERROR *** Specifying command COLOURS
Command requires 1 integer argument

*** ERROR *** Specifying command COLOURS
Number of colours should be in the range 1 to <maximum_colours>

Examples:

```
DTIVIEW>COLOURS 13<CR>  
DTIVIEW>
```

DESELECT FC

Excludes an IFF feature from overlay on an isometric or perspective view on the basis of feature code.

FORMAT: **DESELECT FC feature_code [,...]**

Command parameters:

feature_code

An integer feature code in the range 0 to 32767. Multiple feature codes may be specified separated by commas or spaces, while a range of feature codes may be specified by means of a '-'. eg. Deselect FC 10-13 excludes feature codes 10,11,12 and 13.

Alternatively a valid FRT group name may be specified. eg. Deselect RIVERS

DESCRIPTION:

The Deselect FC command is used to exclude IFF features from overlay on an isometric or perspective view. Features are excluded on the basis of their feature code.

By default DTIVIEW will use all features within an IFF file.

Use of the SHOW SELECTIONS command is recommended to display feature selections before the OVERLAY command is given.

The Deselect FC command is only valid if the ENABLE OVERLAY command has been previously given, and the FRT command has been used to select a Feature Representation Table.

Messages:

The following error messages are specific to the Deselect and Deselect FC commands:

*** ERROR *** Specifying command Deselect
Overlay options are not currently enabled

*** ERROR *** Specifying command Deselect
Command qualifiers are FC, FSN, or LAYER

*** ERROR *** Specifying command Deselect
Illegal feature code

*** ERROR *** Specifying command Deselect FC
No FRT has been read

*** ERROR *** Specifying command Deselect FC

No groups have been defined in the FRT

Examples:

```
DTIVIEW>DESELECT FC 1<CR>
DTIVIEW>DESELECT FC RAILWAYS<CR>
DTIVIEW>DESELECT FC RIVERS 7-10,56-78
DTIVIEW>
```

DESELECT FSN

Excludes an IFF feature from overlay on an isometric or perspective view on the basis of feature serial number.

FORMAT: **DESELECT FSN fsn [,...]**

Command parameters:

fsn

An integer feature serial number in the range 0 to 65534. Multiple feature serial numbers may be specified separated by commas or spaces, while a range of numbers may be specified by means of a '-'. eg. DESELECT FSN 10-13 excludes feature serial numbers 10,11,12 and 13.

DESCRIPTION:

The DESELECT FSN command is used to exclude IFF features from overlay on an isometric or perspective view. Features are excluded on the basis of their feature serial number.

By default DTIVIEW will use all features within an IFF file.

Use of the SHOW SELECTIONS command is recommended to display feature selections before the OVERLAY command is given.

The DESELECT FSN command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the DESELECT and DESELECT FSN commands:

*** ERROR *** Specifying command DESELECT
Command is not valid unless the ENABLE OVERLAY command has been given

*** ERROR *** Specifying command DESELECT
Command qualifiers are FC, FSN, or LAYER

*** ERROR *** Specifying command DESELECT FSN
Illegal FSN number

Examples:

DTIVIEW>DESELECT FSN 4
DTIVIEW>DESELECT FSN 7-10,56-78
DTIVIEW>

DESELECT LAYER

Excludes an IFF feature from overlay on an isometric or perspective view on the basis of layer number.

FORMAT: **DESELECT LAYER layer [,...]**

Command parameters:

layer

An integer layer number in the range 1 to 32767. Multiple layer numbers may be specified separated by commas or spaces, while a range of layer numbers may be specified by means of a '-'. eg. Deselect LAYER 10-13 excludes all features in layers 10,11,12 and 13.

DESCRIPTION:

The Deselect LAYER command is used to exclude IFF features from overlay on an isometric or perspective view. Features are excluded on the basis of IFF layer.

By default DTIVIEW will use all features within an IFF file.

Use of the SHOW SELECTIONS command is recommended to display feature selections before the OVERLAY command is given.

The Deselect LAYER command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the Deselect and Deselect LAYER commands:

*** ERROR *** Specifying command Deselect
Command is not valid unless the ENABLE OVERLAY command has been given

*** ERROR *** Specifying command Deselect
Command qualifiers are FC, FSN, or LAYER

*** ERROR *** Specifying command Deselect
Illegal layer number

Examples:

DTIVIEW>DESELECT LAYER 7
DTIVIEW>DESELECT LAYER 1,7-10
DTIVIEW>

DIRECTION

Defines the direction of view.

FORMAT: **DIRECTION direction**

Command parameters:

direction

A keyword defining the direction of view. Valid keywords are NORTH, SOUTH, EAST or WEST.

DESCRIPTION:

The DIRECTION command defines the direction of view, and therefore controls the order in which the DTM elevation values are sampled. For a direction of NORTH or SOUTH, the DTM is sampled row by row; for a direction of EAST or WEST, the DTM is sampled column by column.

The default viewing direction is from the west.

Use of the SHOW VIEW command is recommended to check on current viewing parameters before an isometric or perspective view is generated.

If the DTIVIEW menu has been set up on a digitising table using the SETUP MENU command, the direction of view may be entered by means of the 4 boxes labelled **N E S W**.

Messages:

The following error message is specific to the DIRECTION command:

*** ERROR *** Specifying command DIRECTION
Command requires a keyword qualifier of NORTH, SOUTH, EAST or WEST.

Examples:

DTIVIEW>**DIRECTION EAST**
DTIVIEW>

DISABLE ABSOLUTE

Disables a previous ENABLE ABSOLUTE command.

FORMAT: DISABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

DISABLE ABSOLUTE cancels a previous ENABLE ABSOLUTE command. If DISABLE ABSOLUTE is given, then coordinate values required by the WINDOW, PROFILE and SYMBOL POSITION commands, supplied in metre or projection units, must be specified as an offset from the SW corner of the matrix. Coordinates supplied with the IFFWINDOW command should similarly be specified as an offset from the SW corner of the IFF file area.
By default window values should be specified as absolute coordinates.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW> DISABLE ABSOLUTE<CR>
DTIVIEW>

DISABLE AUTOSCALE

Deselects the option to automatically scale and position an isometric or perspective view on a graphics screen.

FORMAT: DISABLE AUTOSCALE

Command parameters: None

DESCRIPTION:

DISABLE AUTOSCALE deselects the automatic scaling and positioning of an isometric or perspective view on a graphics screen. The command therefore cancels any previous ENABLE AUTOSCALE command.

If the DISABLE AUTOSCALE is given, it is necessary to specifically set the position and scale of the view on the graphics screen using the SET SCALE and SET ORIGIN commands.

By default the scaling and positioning of the plot automatically by the program is enabled.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the DISABLE command:

```
*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

```
DTIVIEW>DISABLE AUTOSCALE<CR>
DTIVIEW>
```

DISABLE BATHYMETRY

Cancels any previous ENABLE BATHYMETRY command.

FORMAT: **DISABLE BATHYMETRY**

Command parameters: None

DESCRIPTION:

The DISABLE BATHYMETRY command cancels any previous ENABLE BATHYMETRY command. It is therefore used to reselect the normal modelling options that are appropriate to a DTM containing positive height values. The command also causes a default colour file that is appropriate to the current PLANES setting to be selected (eg. LSL\$LOOKUP:DTIVIEW5.DAT if 5 planes are selected).

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the DISABLE command:

```
*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

```
DTIVIEW>DISABLE BATHYMETRY<CR>
DTIVIEW>
```

DISABLE COLOUR_IFF

Cancels any previous ENABLE COLOUR_IFF command.

FORMAT: **DISABLE COLOUR_IFF**

Command parameters: None

DESCRIPTION:

The DISABLE COLOUR_IFF command cancels any previous ENABLE COLOUR_IFF command. It is therefore used to deselect the option of producing an output IFF feature in which a new feature is started whenever the colour of the vectors defining a profile changes.

If this option is deselected, then only parts of the profile that represent sea, land or heights outside the height range, will be distinguished in the IFF file.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE COLOUR_IFF**
DTIVIEW>

DISABLE DIVIDE

Cancels any previous ENABLE DIVIDE command, and therefore selects the use of a full graphics screen.

FORMAT: **DISABLE DIVIDE**

Command parameters: None

DESCRIPTION:

The DISABLE DIVIDE command cancels any previous ENABLE DIVIDE command. It is therefore used to reselect the use of an undivided (ie. full) display screen.

The SHOW ENABLE command may be used to check on the status of the option.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE DIVIDE**<CR>
DTIVIEW>

DISABLE FISHNET

Cancels a previous ENABLE FISHNET command, and therefore deselects the option of generating a fishnet representation of the terrain view.

FORMAT: **DISABLE FISHNET**

Command parameters: None

DESCRIPTION:

DISABLE FISHNET deselects the option to produce a fishnet representation of the terrain view.

By default the option is not selected.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE FISHNET** <CR>
DTIVIEW>

DISABLE FOG

Disables the option to restrict visibility.

FORMAT: **DISABLE FOG**

Command parameters: None.

DESCRIPTION:

The DISABLE FOG command is used to disable any current visibility restriction. The command is therefore used to cancel a previous ENABLE FOG command.

After using the DISABLE FOG command, other commands that are relevant to the fog option are invalid.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating a perspective view.

Messages:

The following error message is specific to the DISABLE command:

```
*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Example:

```
DTIVIEW>DISABLE FOG <CR>
DTIVIEW>
```

DISABLE GRAPHICS

Cancels a previous ENABLE GRAPHICS command, and therefore deselects output to all workstation graphics devices.

FORMAT: **DISABLE GRAPHICS**

Command parameters: None

DESCRIPTION:

DISABLE GRAPHICS deselects output to all workstation graphics devices when the ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY commands are given. It is therefore used to cancel any previous ENABLE GRAPHICS command.

The command is only useful when used with the ENABLE IFF_OUTPUT command.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE GRAPHICS** <CR>
DTIVIEW>

DISABLE IFF_OUTPUT

Cancels a previous ENABLE IFF_OUTPUT command

FORMAT: **DISABLE IFF_OUTPUT**

Command parameters: None

DESCRIPTION:

DISABLE IFF_OUTPUT deselects the option of directing output to an IFF file when the ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY commands are given. It is therefore used to cancel any previous ENABLE IFF_OUTPUT command.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE IFF_OUTPUT** <CR>
DTIVIEW>

DISABLE OVERLAY

Disables the option to overlay vector data on an isometric or perspective terrain view.

FORMAT: DISABLE OVERLAY

Command parameters: None.

DESCRIPTION:

The DISABLE OVERLAY command is used to disable the overlay of vector data on an isometric or perspective terrain view. The command is therefore used to cancel any previous ENABLE OVERLAY command.

After using the DISABLE OVERLAY command, other commands that are relevant to the overlay of vector data on a terrain view are invalid.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Example:

DTIVIEW>DISABLE OVERLAY <CR>
DTIVIEW>

DISABLE PICTURE

Deselects the specified picture.

FORMAT: **DISABLE PICTURE** picture_number

Command parameters:

picture_number

The picture number. An integer value in the range 1 to 2 is required.

DESCRIPTION:

The DISABLE PICTURE command is used to deselect (make invisible) the bit-planes of a graphics device that are currently allocated to the specified picture.

The number of bit-planes allocated to picture 1 and picture 2 is determined using the PLANES command.

An isometric or perspective terrain view is drawn into Picture 1, while any vector overlay information or annotation drawn using the OVERLAY and DRAW LABEL commands, is displayed in Picture 2. Giving the command DISABLE PICTURE 2 will therefore make invisible any vector overlay or annotation. PICTURE 2 may be reselected (made visible) using the command ENABLE PICTURE 2.

Note that this command is not applicable if the graphics device is a TEKTRONIX 4014, or if the device is configured with 4 bit-planes.

The SHOW ENABLE command may be used to check on the status of the 2 pictures.

Messages:

The following error message is specific to the DISABLE and DISABLE PICTURE commands:

```
*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

```
*** ERROR *** Specifying command DISABLE PICTURE
Command requires an integer argument
```

```
*** ERROR *** Specifying command DISABLE PICTURE
Command requires a picture number of 1 or 2
```

Examples:

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DISABLE PICTURE command

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DTIVIEW>**DISABLE PICTURE 2<CR>**
DTIVIEW>

DISABLE PRIMARY

Cancels a previous ENABLE PRIMARY command

FORMAT: **DISABLE PRIMARY**

Command parameters: None

DESCRIPTION:

DISABLE PRIMARY deselects the use of a workstation's primary graphics device. It is therefore used to cancel any previous ENABLE PRIMARY command.

The command is only useful on workstations that are configured with two display devices. On a workstation with a single graphics display use of the command DISABLE GRAPHICS is to be preferred.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE PRIMARY <CR>**
DTIVIEW>

DISABLE SECONDARY

Cancels a previous ENABLE SECONDARY command

FORMAT: **DISABLE SECONDARY**

Command parameters: None

DESCRIPTION:

DISABLE SECONDARY deselects the use of a workstation's secondary graphics device.

It is therefore used to cancel any previous ENABLE SECONDARY command.

The command is only useful on workstations that are configured with two display devices. On a workstation with a single graphics display the command will be ignored.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

DTIVIEW>**DISABLE SECONDARY** <CR>
DTIVIEW>

DISABLE SYMBOLS

Disables the option to plot symbols on an isometric or perspective terrain view.

FORMAT: DISABLE SYMBOLS

Command parameters: None.

DESCRIPTION:

The DISABLE SYMBOLS command is used to disable the plotting of symbols on an isometric or perspective terrain view. The command is therefore used to cancel any previous ENABLE SYMBOLS command.

After using the DISABLE SYMBOLS command, other commands that are relevant to the plotting of symbols on a terrain view, become invalid.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Example:

DTIVIEW>**DISABLE SYMBOLS** <CR>
DTIVIEW>

DISABLE TABLE

Turns off input from the digitising table.

FORMAT: **DISABLE TABLE**

Command parameters: None

DESCRIPTION:

The DISABLE TABLE command turns off input from the digitising table. If table input is disabled then DTIVIEW will accept commands only from the terminal.

Input from the table can be reselected using the ENABLE TABLE command.

The SHOW ENABLE command may be used to check on the status of table input.

Messages:

The following error messages are specific to the ENABLE and ENABLE TABLE commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Example:

DTIVIEW>**DISABLE TABLE** <CR>
DTIVIEW>

DISTANCE

Defines the distance of the viewpoint from the nearest point in the DTM area of interest. The distance parameter is used when generating a perspective view.

FORMAT: **DISTANCE distance**

Command parameters:

distance

Distance defines the distance of the viewpoint in metres from the nearest DTM node in the area of interest. A real (floating point) value is required.

DESCRIPTION:

The DISTANCE command defines the distance of the view point in metres from the nearest point in the DTM rectangular area of interest. The parameter is used when generating a perspective view.

The default distance is 300.0 metres.

Use of the SHOW VIEW command is recommended to check on the status of this parameter before a perspective view is generated.

Messages:

The following error message is specific to the DISTANCE command:

*** ERROR *** Specifying command DISTANCE
Command requires 1 real argument

Examples:

DTIVIEW>**DISTANCE 450.2**
DTIVIEW>

DRAW LABEL

Outputs a text string to the display screen of a graphics device.

FORMAT: **DRAW LABEL text**

Command parameters:

text

The text string which is to be output to the display. The string should not exceed 80 characters.

DESCRIPTION:

DRAW LABEL is used to output a text string to a graphics screen. Commonly it is used to annotate a terrain view with a title and place name details.

If the workstation colour graphics device is configured with 8 bit- planes, any annotation will be written to the bit-planes allocated to Picture 2. When using a 4 plane device, the annotation is written to Picture 1.

The specified text is written at the current label position, and in the current label colour and label size. These parameters may be varied using the appropriate LABEL commands.

On most devices, text output using the DRAW LABEL command may be cleared independently of the terrain view using the LABEL CLEAR or CLEAR PICTURE 2 commands. This is not possible for text output to a Tektronix 4014 display, or when using a display device configured with only 4 bit-planes.

Messages:

The following error messages are specific to the DRAW and DRAW LABEL commands:

*** ERROR *** Specifying command DRAW
No graphics device is currently enabled

*** ERROR *** Specifying command DRAW
Command qualifiers are LABEL or LEGEND

*** ERROR *** Specifying command DRAW LABEL
Command requires a text string of up to 80 characters

*** ERROR *** Specifying command DRAW LABEL
More than 80 characters in text string

Examples:

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DRAW LABEL command

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DTIVIEW>**DRAW LABEL An example terrain view<CR>**
DTIVIEW>

DRAW LEGEND

Generates a legend on the graphics screen. The legend relates the colours in the terrain view, to their DTM height values.

FORMAT: DRAW LEGEND

Command parameters: None

DESCRIPTION:

The DRAW LEGEND command is used to generate a legend on a graphics screen after an isometric or perspective view has been drawn.

The legend relates the colours used in the terrain view to their respective height ranges.

By default the legend is drawn in the bottom lefthand corner of the screen if a full screen is selected, or in the bottom lefthand corner of the currently selected quadrant.

The position of the legend on the screen may be changed by using the LEGEND POSITION command, while the size of the legend boxes may be controlled using the LEGEND SIZE command.

A legend cannot be generated on a TEKTRONIX 4014 monochrome display.

Messages:

The following error message are specific to the DRAW and DRAW LEGEND commands:

*** ERROR *** Specifying command DRAW
Command qualifiers are LABEL or LEGEND

*** ERROR *** Specifying command DRAW LEGEND
No graphics device is currently enabled

*** ERROR *** Specifying command DRAW LEGEND
No legend can be shown on a TEKTRONIX 4014

Examples:

DTIVIEW>DRAW LEGEND<CR>
DTIVIEW>

ENABLE ABSOLUTE

Selects the use of absolute coordinates values.

FORMAT: ENABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

If ENABLE ABSOLUTE is given, then coordinate values required by the WINDOW, PROFILE or SYMBOL POSITION commands, supplied in metre or projection units, must be specified as absolute (rather than relative) coordinate values. Coordinates for the IFFWINDOW command should also be supplied as absolute values.

For example if the projection indicates U.K. National Grid, then the WINDOW values may be specified as 6 figure National Grid coordinates.
By default window values should be specified as absolute coordinates.

This option can be disabled using the DISABLE ABSOLUTE command.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

```
DTIVIEW> ENABLE ABSOLUTE<CR>
DTIVIEW>
```

ENABLE AUTOSCALE

Selects the option to automatically scale and position an isometric or perspective view on the graphics screen.

FORMAT: ENABLE AUTOSCALE

Command parameters: None

DESCRIPTION:

ENABLE AUTOSCALE ensures that any isometric or perspective view drawn on a graphics screen, is correctly scaled and positioned on the screen.

Using ENABLE AUTOSCALE a view is drawn so that it is positioned in the centre of the screen, and extends almost to the edge of the screen in the longer of the plot axes.

If a quartered screen has been selected using the ENABLE DIVIDE command, the view is positioned in the centre of the currently selected quadrant, and scaled to fit the quadrant.

In order to determine the x and y plot coordinate ranges, two passes are made through the data in the currently defined DTM area of interest.

The first pass determines the coordinate ranges without output to the screen, and sets up the drawing scaling factor and origin. The drawing origin in normalised device coordinates (ie. in the range 0.0 to 1.0) and the drawing scaling factor are displayed on the terminal.

The second pass, draws the isometric or perspective view on the graphics screen.

By default the scaling and positioning of the terrain view automatically by the program is enabled. The option may be deselected by means of the DISABLE AUTOSCALE command; if this command is used, it is necessary to supply drawing origin and scaling values using the SET ORIGIN and SET SCALE commands.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

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DTIVIEW>**ENABLE AUTOSCALE**<CR>
DTIVIEW>

ENABLE BATHYMETRY

Selects the use of special display options for bathymetric data.

FORMAT: **ENABLE BATHYMETRY**

Command parameters: None

DESCRIPTION:

The ENABLE BATHYMETRY command selects the program's special options for generating and displaying a view using bathymetric data. The option should be enabled if the input DTM contains a large number of negative height values defining the depth and shape of the sea floor.

When using this option, only nodes in the DTM that have negative heights are modelled. DTM nodes with positive heights are not modelled, so that the land surface will always appear flat. Any vertical exaggeration value is applied only to nodes with negative heights.

Selection of the option also causes a special colour table UNDERSEA.DAT to be read from the search list LSL\$LOOKUP, so that when the view is drawn on a screen, different depths appear in different shades of blue, and all land appears in brown. The display colours may be changed by editing the RGB values in this file.

The normal modelling and colour table options may be reselected by means of the command DISABLE BATHYMETRY. By default the bathymetry option is not selected.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following messages are specific to the ENABLE and ENABLE BATHYMETRY commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** WARNING *** Current DTM does not contain any negative heights

Examples:

DTIVIEW>ENABLE BATHYMETRY<CR>
DTIVIEW>

ENABLE COLOUR_IFF

Selects the option of producing an IFF file in which a new feature is started whenever the colour of vectors defining a profile changes. The command is used in conjunction with the ENABLE IFF_OUTPUT command.

FORMAT: **ENABLE COLOUR_IFF**

Command parameters: None

DESCRIPTION:

The ENABLE COLOUR_IFF command selects the option of producing an IFF file in which a new feature is started whenever the colour of vectors defining a profile changes. The command is used in conjunction with the ENABLE IFF_OUTPUT command, and the ISOMETRIC, PERSPECTIVE and PROFILE commands.

If the option is selected, a new IFF feature is started whenever the colour of vectors defining a profile changes. The colour is recorded in the IFF file as the feature code (ie. in the first word of the FS entry). This enables the file to be subsequently plotted as a colour image, on a device such as a colour electrostatic plotter.

As with output to a colour graphics device, the form of the isometric or perspective image, is controlled using the COLOUR, ZSTEP, and ZLIMITS commands.

If the option is not selected, it will only be possible to distinguish in the IFF file (using feature code), profiles that are land profiles, profiles outside the height range defined with the ZLIMITS command, or profiles at or below sea-level.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

```
DTIVIEW>ENABLE COLOUR_IFF
DTIVIEW>
```

ENABLE DIVIDE

Selects the use of a quartered graphics screen.

FORMAT: **ENABLE DIVIDE**

Command parameters: None

DESCRIPTION:

ENABLE DIVIDE selects the use of quartered screen display mode.

If selected, the graphics screen is divided into 4 quadrants. Each quadrant is treated by the program as though it were a separate graphics screen. This allows 4 different isometric or perspective views to be displayed and compared.

The 4 quadrants are identified as follows:

- 1 = Top lefthand quadrant
- 2 = Top righthand quadrant
- 3 = Bottom righthand quadrant
- 4 = Bottom lefthand quadrant

On selection of a quartered screen, the default quadrant is the top lefthand quadrant. A different quadrant may be selected using the QUADRANT command.

Messages:

The following message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

```
DTIVIEW>ENABLE DIVIDE<CR>
DTIVIEW>
```

ENABLE FISHNET

Enables the option of producing a fishnet representation of a terrain view.

FORMAT: **ENABLE FISHNET**

Command parameters: None

DESCRIPTION:

ENABLE FISHNET enables the option of producing a fishnet representation of a terrain view when the ISOMETRIC or PERSPECTIVE command is given.

A fishnet representation involves drawing the 3-D terrain view as a grid, rather than as a series of profiles orientated along just one of the DTM axes. Profiles are generated both vertically (south to north) and horizontally (west to east) through the DTM.

A 'fishnet' representation enhances perception when dealing with a sparse data grid (ie. when a small DTM window has been defined), but is less successful when dealing with a dense grid. In the later case it can lead to a poorer perception of the depth relationships in the model, by making the incidental shading effects at the terrain horizons less apparent.

In the current implementation of this option in DTIVIEW, true hidden line removal is only applied to the first set of profiles that are generated. In the case of the second set of profiles drawn to produce the grid representation, only partial hidden line removal is performed to ensure that no vectors completely hidden by previous profiles are shown. The actual intersection of the two sets of profiles with each other is not carried out. The techniques developed to overlay vector data on a 3-D view are used.

By default the option to produce a fishnet representation is not enabled.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

Examples:

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ENABLE FISHNET command

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DTIVIEW>**ENABLE FISHNET <CR>**
DTIVIEW>

ENABLE FOG

Enables the option to restrict visibility.

FORMAT: **ENABLE FOG**

Command parameters: None

DESCRIPTION:

The ENABLE FOG command is used to enable the visibility restriction option.

The command is also used by the program to activate all DTIVIEW commands that are relevant to the fog option.

The ENABLE FOG command must be given before any of the FOG commands, and before generating a perspective view on which visibility restrictions are to be imposed. The visibility restriction option is only valid for a perspective view and cannot be used when drawing an isometric view.

Note: The visibility restriction option is supplied as a licensed facility; the option may not be available in your version of the program.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating perspective view.

Messages:

The following error messages are specific to the ENABLE and ENABLE FOG commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** ERROR *** Specifying command ENABLE FOG
Fog option cannot be activated

Example:

DTIVIEW>ENABLE FOG <CR>
DTIVIEW>

ENABLE GRAPHICS

Enables the use of all graphics devices on a workstation.

FORMAT: **ENABLE GRAPHICS**

Command parameters: None

DESCRIPTION:

ENABLE GRAPHICS causes output to be directed to a graphics device when the DRAW, ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY commands are given.

On a workstation that is configured with two graphics devices, both devices will be enabled when the ENABLE GRAPHICS command is given. This is equivalent to giving the commands ENABLE PRIMARY and ENABLE SECONDARY. Output to either device may be selectively disabled using the DISABLE PRIMARY and DISABLE SECONDARY commands.

By default output to a graphics device is not enabled when the program is started.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

Examples:

DTIVIEW>**ENABLE GRAPHICS** <CR>
DTIVIEW>

ENABLE IFF_OUTPUT

Enables the output of a terrain view to an IFF file.

FORMAT: **ENABLE IFF_OUTPUT file-spec**

Command parameters:

file-spec

The file specification for the output IFF file.
Any part of the file specification not supplied is taken from the default 'LSL\$IF:IFF.IFF', although if no file-spec is supplied, you will be asked to supply one in response to the prompt **Output IFF filename>**

DESCRIPTION:

ENABLE IFF_OUTPUT directs output to an IFF file when the ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY commands are given. This enables a terrain view to be subsequently plotted on a device such as a drum plotter, edited in LITES2, or manipulated using IFF utilities.

An IFF file holds a single terrain view, and optionally overlay information. Any overlay data is held in a separate layer to the terrain profiles. The commands SET LAYER, SET LAND_FC, SET NULL_FC and SET SEA_FC may be used to control into which IFF layers the data is written, and which feature codes are assigned to the land and sea profiles.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following messages are specific to the ENABLE and ENABLE IFF_OUTPUT commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** ERROR *** Specifying command ENABLE IFF_OUTPUT
Output IFF filename is missing

Examples:

DTIVIEW>ENABLE IFF_OUTPUT TEST<CR>
DTIVIEW>

ENABLE OVERLAY

Selects the option and activates the commands that allow vector data to be overlaid on an isometric or perspective view.

FORMAT: **ENABLE OVERLAY**

Command parameters: None

DESCRIPTION:

The ENABLE OVERLAY command selects the option to overlay vector data derived from an IFF file on an isometric or terrain view. The command is also used by the program to activate all DTIVIEW commands that are relevant to vector overlay, such as the commands IFF, FRT and OVERLAY.

The ENABLE OVERLAY command must be given before any of the vector overlay commands, and before generating the isometric or perspective view on which any data is to be overlaid.

Note. The vector overlay option is supplied as a licensed facility; the option may not be available in your version of the program.

Also note, that in the current implementation of this option in DTIVIEW, overlay of vector data on a 3-D view generated using DTM column and row sample values greater than 1, is not possible.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error messages are specific to the ENABLE and ENABLE OVERLAY commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** ERROR *** Specifying command ENABLE OVERLAY
Vector overlay option cannot be activated

*** ERROR *** Specifying command ENABLE OVERLAY
Overlay options are currently only available
with a column and row sampling interval of 1
Overlay options are not enabled

Example:

```
DTIVIEW>ENABLE OVERLAY <CR>  
DTIVIEW>
```

ENABLE PICTURE

Selects the specified picture.

FORMAT: **ENABLE PICTURE picture_number**

Command parameters:

picture_number

The picture number. An integer value in the range 1 to 2 is required.

DESCRIPTION:

The ENABLE PICTURE command is used to select (make visible) the bit-planes of a graphics device that are currently allocated to the specified picture.

The number of bit-planes allocated to picture 1 and picture 2 is determined using the PLANES command.

An isometric or perspective terrain view is drawn into Picture 1, while any vector overlay information or annotation drawn using the OVERLAY and DRAW LABEL commands, is displayed in Picture 2. Giving the command ENABLE PICTURE 2 will therefore make visible any vector overlay or annotation, that may have been made deselected (made invisible) using the DISABLE PICTURE 2 command.

Note that this command is not applicable if the output graphics device is a TEKTRONIX 4014, or if the device is configured with only 4 bit-planes.

The SHOW ENABLE command may be used to check on the status of the 2 pictures.

Messages:

The following error message is specific to the ENABLE and ENABLE PICTURE command:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

```
*** ERROR *** Specifying command ENABLE PICTURE
Command requires an integer argument
```

```
*** ERROR *** Specifying command ENABLE PICTURE
Command requires a picture number of 1 or 2
```

Examples:

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DTIVIEW>**ENABLE PICTURE 2**<CR>
DTIVIEW>

ENABLE PRIMARY

Enables the use of a workstation's primary graphics device.

FORMAT: **ENABLE PRIMARY**

Command parameters: None

DESCRIPTION:

ENABLE PRIMARY causes output to be directed to the primary workstation graphics device when a DRAW, ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY command is given.

The command is only useful when DTIVIEW is being run on a workstation that is configured with two graphics devices. Typically such a workstation will consist of a monochrome and colour display; the monochrome display is the primary device, and the colour display is the secondary device.

On a workstation configured with a single display, the display is the primary device. In this situation use of the commands ENABLE GRAPHICS and DISABLE GRAPHICS to select and deselect output to the device is to be preferred.

By default output to the primary device is selected when the ENABLE GRAPHICS command is given.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following message is specific to the ENABLE and ENABLE PRIMARY commands:

```
*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
                        FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
                        PRIMARY, SECONDARY, SYMBOLS or TABLE
```

```
*** ERROR *** Specifying command ENABLE PRIMARY
A PRIMARY graphics device is not supported
```

Examples:

```
DTIVIEW>ENABLE PRIMARY<CR>
DTIVIEW>
```

ENABLE SECONDARY

Enables the use of a workstation's secondary graphics device.

FORMAT: **ENABLE SECONDARY**

Command parameters: None

DESCRIPTION:

ENABLE SECONDARY causes output to be directed to the secondary workstation graphics device when a DRAW, ISOMETRIC, PERSPECTIVE, PROFILE or OVERLAY command is given.

The command is only useful when DTIVIEW is being run on a workstation that is configured with two graphics devices. Typically such a workstation will consist of a monochrome and colour display; the monochrome display is the primary device, and the colour display is the secondary device.

On a workstation configured with a single display, no secondary graphics device will exist, and the command ENABLE SECONDARY will have no effect.

By default output to any secondary device is selected when the ENABLE GRAPHICS command is given.

Use of the SHOW ENABLE command is recommended to check on the status of the option before a terrain view is generated.

Messages:

The following messages are specific to the ENABLE and ENABLE SECONDARY commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** ERROR *** Specifying command ENABLE SECONDARY
A SECONDARY graphics device is not supported

Examples:

DTIVIEW>ENABLE SECONDARY<CR>
DTIVIEW>

ENABLE SYMBOLS

Selects the option and activates the commands that allow symbols to be interactively drawn on an isometric or perspective view.

FORMAT: **ENABLE SYMBOLS**

Command parameters: None

DESCRIPTION:

The ENABLE SYMBOLS command selects the option that allows symbols to be interactively drawn on an isometric or perspective terrain view. The command is also used by the program to activate all DTIVIEW commands that are relevant to symbol plotting, such as the commands FRT and SYMBOL FC.

The ENABLE SYMBOLS command must be given before any of the symbol commands, and before generating the isometric or perspective view on which any symbols are to be drawn.

Note. The symbol plotting option is supplied as a licensed facility; the option may not be available in your version of the program.

Use of the SHOW ENABLE command is recommended to check on the status of the option before generating an isometric or perspective view.

Messages:

The following error messages are specific to the ENABLE and ENABLE SYMBOLS commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** ERROR *** Specifying command ENABLE SYMBOLS
Symbol plotting option cannot be activated

Example:

DTIVIEW>ENABLE SYMBOLS <CR>
DTIVIEW>

ENABLE TABLE

Initialises the Table Monitor to allow input from a digitising table.

FORMAT: ENABLE TABLE

Command parameters: None

DESCRIPTION:

The ENABLE TABLE command initialises the table monitor to allow input from a digitising table. The command SETUP MAP may be used to register a map to the DTI file, while SETUP MENU allows commands to be input using the DTIVIEW menu. In the event of failure, input from the digitising table or puck button is not possible, and the program will accept commands only from the terminal.

Table initialisation will generally fail because no Table Monitor is currently active, or because the Table Monitor is locked by another user. If neither of these reasons appear to apply, you should consult the TABLIB Reference Manual, or seek guidance from your system manager.

If the logical name LSL\$AUTO_ENABLE_TABLE is defined with a value of "1", then the table is initialised on program startup.

The DISABLE TABLE command may be used to turn off input from the digitising table.

The SHOW ENABLE command may be used to check on the status of table input.

Messages:

The following error messages are specific to the ENABLE and ENABLE TABLE commands:

*** ERROR *** Specifying command ENABLE
Command qualifiers are ABSOLUTE, AUTOSCALE, BATHYMETRY, COLOUR_IFF, DIVIDE
FISHNET, FOG, GRAPHICS, IFF_OUTPUT, OVERLAY, PICTURE
PRIMARY, SECONDARY, SYMBOLS or TABLE

*** WARNING *** Initialising table monitor
DTIVIEW will assume no table is available

Example:

DTIVIEW>ENABLE TABLE <CR>
DTIVIEW>

EXIT

Terminates the program.

FORMAT: **EXIT**

Command parameters: None.

DESCRIPTION:

The EXIT command is used to exit from DTIVIEW.
<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to exit from the program.

Messages: None.

Examples:

DTIVIEW>**EXIT**<CR>

\$

FILEIN

Selects and opens the input DTM that contains the terrain elevation data.

FORMAT: **FILEIN file-spec**

Command parameters:

file-spec

The file specification for the input DTM.
Any part of the file specification not supplied is taken from the default 'LSL\$DTI:DTI.DTI', although if no file-spec is supplied, you will be asked to supply one in response to the prompt **Input DTI filename>**

DESCRIPTION:

This command opens and maps into memory a DTI file, containing the terrain elevation data that will be used when generating an isometric or perspective view.

Details derived from the header of the file are displayed on the terminal to confirm that the file has been successfully opened.

If the logical name LSL\$MATRIX_DEFAULT_WINDOW is defined with a value of "1", then a default area of interest defined in matrix units of bottom left hand corner 1,1 and top right hand corner 200,200 is set when the file is opened. If the logical name is absent or has any other value, or if the input DTI file has fewer than 200 columns or 200 rows, then a default window equivalent to the total matrix is set.

Messages:

The following error message is specific to the FILEIN command:

*** ERROR *** Specifying command FILEIN
Input DTI filename is missing

Example:

DTIVIEW>**FILEIN TEST<CR>**

LSL\$DTI:TEST.DTI

Header: MIKE Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Window	SW:	1	1	NE:	200	200
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	851		

DTIVIEW>

FOG COLOUR

Selects the colour used to draw parts of the terrain view that are beyond the limit of visibility.

FORMAT: FOG COLOUR index

Command parameters:

index

Index is the value of the colour index. An integer value is required. The valid range for the integer is dependent on the number of planes currently selected for PICTURE 1.

DESCRIPTION:

The FOG COLOUR command is used to set the fog colour, ie. the colour index used to draw all areas of the perspective view that lie beyond the current limit of visibility. By default the colour index is 0 (ie. black) so that areas in fog will not be visible on the screen.

Setting the fog colour to a value other than black will allow a false colour to be assigned to all DTM nodes beyond the visibility distance irrespective of height of the node. The fog colour has no effect on culture or symbol data which are always plotted in black beyond the visibility distance. Culture and symbol data are therefore always invisible to the observer if within the fog.

The FOG COLOUR command must be given prior to generating a perspective view.

The command is only valid if the ENABLE FOG command has been previously given.

Messages:

The following error messages are specific to the FOG and FOG COLOUR commands:

*** ERROR *** Specifying command FOG
Fog has not been enabled

*** ERROR *** Specifying command FOG
Command qualifiers are COLOUR or VISIBILITY

*** ERROR *** Specifying command FOG COLOUR
Command requires integer colour index in the range 0 to <max_colour>

Examples:

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DTIVIEW>FOG COLOUR 1<CR>
DTIVIEW>

FOG VISIBILITY

Defines the distance beyond which a point on the terrain is considered to lie in an area of fog.

FORMAT: **FOG VISIBILITY distance**

Command parameters:

distance

Distance is the distance between the observer and the start of the fog. A real (floating point) value is required.

DESCRIPTION:

The FOG VISIBILITY command is used to define the limit of visibility. By default the visibility distance is set to 1000.0 metres.

All terrain DTM nodes, culture and symbols that lie within the visibility distance are displayed without being affected by the fog. Terrain DTM nodes that lie beyond the limit of visibility are considered to lie within an area of fog, and are drawn in the current fog colour index. The fog colour is defined using the FOG COLOUR command, but by default is black. Culture and symbol data lying beyond the visibility distance will be considered to be in the fog and will not be plotted.

The command is only valid if the ENABLE FOG command has been previously given, and should be given prior to generating a perspective view.

The SHOW VIEW command may be used to examine the current fog visibility distance value.

Messages:

The following error messages are specific to the FOG and FOG VISIBILITY commands:

*** ERROR *** Specifying command FOG
Fog has not been enabled

*** ERROR *** Specifying command FOG
Command qualifiers are COLOUR or VISIBILITY

*** ERROR *** Specifying command FOG VISIBILITY
Command requires one real argument greater than 0.0

Examples:

DTIVIEW>**FOG VISIBILITY 1500**<CR>
DTIVIEW>

FRT

Reads a FRT (Feature Representation Table) file.

FORMAT: **FRT file-spec**

Command parameters:

file-spec

The file specification for the FRT file. Any part of the file specification not supplied will be taken from the default 'LSL\$FRT:FRT.FRT', although if no file-spec is supplied, you will be asked to supply one in response to the prompt **Input FRT filename>**

DESCRIPTION:

This command reads the specified Feature Representation Table. It is only appropriate to the overlay of vector data and the plotting of symbol data on a terrain view.

For overlays the entries in the FRT are used to determine the graphical representation of IFF features. DTIVIEW uses the table to determine the graphical type and colour representation of any IFF features that are overlaid on the terrain view. The table also defines feature code group names that may be supplied as parameters to the SELECT FC or DESELECT FC commands.

For symbols the entries in the FRT are use to determine which entry in the SRI file to use.

A FRT must be defined before the OVERLAY command or the SYMBOL command is given.

The command is only valid if the ENABLE OVERLAY or the ENABLE SYMBOLS has been previously given.

Messages:

The following error message is specific to the FRT command:

*** ERROR *** Specifying command FRT
Overlay options are not enabled

*** ERROR *** Specifying command FRT
Input FRT filename is missing

Examples:

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FRT command

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DTIVIEW>**FRT DTIVIEW.FRT<CR>**
DTIVIEW>

HEIGHT

Defines the height above sea level of the view point. The parameter is used when generating a perspective view.

FORMAT: **HEIGHT height_of_view**

Command parameters:

height_of_view

The height above sea level of the view point specified in metres. A real (floating point) value is required.

DESCRIPTION:

HEIGHT defines the height of the view point. The parameter is specified as a height above sea level in metres.

The parameter is used when generating a perspective view.

By default a height value of 300.0 is used.

Use of the SHOW VIEW command is recommended to check on the status of the parameter before a perspective view is generated.

Note: The height value is multiplied by the current vertical exaggeration (zscale) value.

Messages:

The following error messages are specific to the HEIGHT command:

*** ERROR *** Specifying command HEIGHT
Command requires 1 real argument

Examples:

DTIVIEW>**HEIGHT 100.5<CR>**
DTIVIEW>

HELP

Invokes help on DTIVIEW commands.

FORMAT: **HELP [command]**

Command parameters:

command

the command on which help is required

DESCRIPTION:

A brief description is given of the function and format of the specified command.

If no parameter is supplied then a list of all commands available is given.

Messages: None.

Examples:

DTIVIEW>**HELP DISTANCE**
DTIVIEW>

IFF

Opens an IFF (Internal Feature Format) file.

FORMAT: **IFF file-spec**

Command parameters:

file-spec

The file specification of the input IFF file. Any part of the file specification not supplied will be taken from the default 'LSL\$IF:IFF.IFF' although if no file specification is supplied, you will be asked to supply one in response to the prompt **Input IFF filename>**

DESCRIPTION:

The IFF command specifies the name of an Internal Feature Format file, containing vector data that is to overlaid on a terrain view.

A default area of interest within the IFF file is set when the file is opened. This may be subsequently altered using the IFFWINDOW command. If origin offset values are present in the headers of the DTI and IFF files, then the IFF window is set with respect to the current DTI window. This allows registration between the terrain view and the vector overlay to take place automatically. If no such header information is present, or if the DISABLE ABSOLUTE command has been given, then the default area of interest in the IFF file that corresponds to the IFF range entry (RA) values is set.

The IFF file range and IFF window may be examined using the command SHOW IFF.

The command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the IFF command:

*** ERROR *** Specifying command IFF
Overlay options are not enabled

*** ERROR *** Specifying command IFF
Input IFF filename is missing

Examples:

DTIVIEW>**IFF TEST<CR>**
DTIVIEW>

IFFWINDOW

Defines an area of interest in the IFF file.

FORMAT: IFFWINDOW swx swy nex ney

Command parameters:

swx swy nex ney

The IFF coordinates of the south-west (bottom lefthand) and north-west (top righthand) corners of the window. The coordinates are specified in IFF units, as real (floating point) values.

DESCRIPTION:

IFFWINDOW is used to define a rectangular area of interest within the IFF file. By default or if the ENABLE ABSOLUTE command has been given then window values should be supplied in absolute IFF units. Otherwise values should be specified as an offset from the SW corner of the IFF file area.

The IFFWINDOW command enables the IFF file to be registered to the current area of interest in the DTM.

When the command is given, a transformation matrix for IFF to DTM coordinate conversion is calculated, based on the coordinates of the IFF and DTM windows.

The command SHOW IFF may be used to examine the IFF range and window coordinate values.

The command is only valid if the ENABLE OVERLAY and IFF commands have been previously given

Messages:

The following error messages are specific to the IFFWINDOW command:

*** ERROR *** Specifying command IFFWINDOW
Overlay options are not enabled

*** ERROR *** Specifying command IFFWINDOW
No input IFF has been specified

*** ERROR *** Specifying command IFFWINDOW
Command requires 4 real arguments

*** ERROR *** Specifying command IFFWINDOW
NE corner should exceed SW corner

*** WARNING *** Specified window outside IFF file coordinate range

Examples:

```
DTIVIEW>IFFWINDOW 310000.0 220000.0 270000.0 180000.0 <CR>  
DTIVIEW>
```

ISOMETRIC

Generates an isometric view.

FORMAT: **ISOMETRIC**

Command parameters: None

DESCRIPTION:

The command ISOMETRIC is given to generate an isometric terrain view.

The view is generated using the current viewing direction and vertical exaggeration parameters, and using the current phi and theta rotation values.

Only DTM nodes lying within the current DTM area of interest are used when generating the isometric view.

The isometric view may either be output to a graphics device, or the plot coordinates may be sent to an IFF file for subsequent plotting or manipulation. Output is controlled by the ENABLE GRAPHICS and ENABLE IFF_OUTPUT commands.

Typing <CTRL/C> (Pressing the Ctrl and C keys together) will abort the generation of the isometric view, and return the user to the DTIVIEW> prompt.

Messages:

The following error messages are specific to the ISOMETRIC command:

*** ERROR *** Specifying command ISOMETRIC
The input DTM is undefined

*** ERROR *** Specifying command ISOMETRIC
No graphics device or output IFF file is enabled

Examples:

DTIVIEW>**ISOMETRIC**<CR>
DTIVIEW>

LABEL CLEAR

Clears user annotation.

FORMAT: **LABEL CLEAR**

Command parameters: None

DESCRIPTION:

The command causes all annotation that has been generated on a graphics screen using the DRAW LABEL command to be erased.

On a graphics device with more than 4 planes, the labels are written to the bit-planes allocated to PICTURE 2. Giving the command CLEAR PICTURE 2 therefore has the same effect as the command DRAW LABEL. Both commands will cause any vector overlay generated using the OVERLAY command, to be also cleared.

Annotation output to a Tektronix 4014 display or to a graphics device configured with 4 bit-planes, cannot be selectively erased using this command.

Messages:

The following error messages are specific to the LABEL and LABEL CLEAR commands:

*** ERROR *** Specifying command LABEL
Command qualifiers are CLEAR, COLOUR, POSITION, or SIZE

*** ERROR *** Specifying command LABEL CLEAR
No graphics device is currently enabled

*** ERROR *** Specifying command LABEL CLEAR
Command is not valid for a 4 planes graphics device

Example:

DTIVIEW>**LABEL CLEAR**<CR>
DTIVIEW>

LABEL COLOUR

Selects the colour of user labelling.

This command is only available on a graphics device with 8 planes

FORMAT: LABEL COLOUR index

Command parameters:

index

Index is the value of the colour index. An integer value is required. The actual range of the integer is dependent on the number of overlay colours available, and therefore on the current PLANES setting.

DESCRIPTION:

The command LABEL COLOUR determines which colour will be used to write a label when the DRAW LABEL command is given.

The number of colours available for labelling is the same as for overlay, and is dependent on the current planes setting defined using the PLANES command. By default DTIVIEW allocates 5 planes to the terrain view, and 3 planes to any annotation or overlay, and uses the colour table DTIVIEW5.DAT 7 different label colours have been defined in this table. The number of overlay colours available at any time, may be examined using the SHOW DEVICE command.

By default labels are drawn in colour 1.

Messages:

The following error message are specific to the LABEL and LABEL COLOUR command:

*** ERROR *** Specifying command LABEL
Command qualifiers are CLEAR, COLOUR, POSITION, or SIZE

*** ERROR *** Specifying command LABEL COLOUR
Command requires 1 integer argument

*** ERROR *** Specifying command LABEL COLOUR
Command requires an integer in the range 1 to <max_overlay_colours>

*** ERROR *** Specifying command LABEL COLOUR
Command is not valid for a 4 planes graphics device

Examples:

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LABEL COLOUR command

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DTIVIEW>**LABEL COLOUR 3<CR>**
DTIVIEW>

LABEL POSITION

Defines the position of a label on the graphics screen.

FORMAT: LABEL POSITION screen_x screen_y

Command parameters:

screen_x, screen_y

The x y position of the label on the screen specified in normalised device coordinates. Both the supplied values must be in the range 0.0 to 1.0

DESCRIPTION:

LABEL POSITION defines the position of a label on the screen.

The values are specified in normalised device coordinates. For example, coordinates of 0.5 0.5 will write a text string with the first character positioned in the centre of the screen.

Messages:

The following error messages are specific to the LABEL and LABEL POSITION command:

*** ERROR *** Specifying command LABEL
Command qualifiers are CLEAR, COLOUR, POSITION, or SIZE

*** ERROR *** Specifying command LABEL POSITION
Command requires 2 real arguments

*** ERROR *** Specifying command LABEL POSITION
Command requires 2 real arguments in the range 0 to 1

Examples:

DTIVIEW>LABEL POSITION 0.3 0.54<CR>
DTIVIEW>

LABEL SIZE

Specifies the character size of text output to the screen using the DRAW LABEL command.

FORMAT: LABEL SIZE character_size

Command parameters:

character_size

The parameter character_size defines the size of the text output to the screen. An integer value in the range 1 to 4 is required. Character_size 1 is the smallest and character_size 4 is the largest.

DESCRIPTION:

The command LABEL SIZE is used to define the size of any text output to a graphics screen using the DRAW LABEL command.

The character_size parameter controls the relative size of the text; size 1 is the smallest, and size 4 is the largest. The actual size of the text output to the screen will vary with the size of the graphics device screen, however the relative sizes of the text will remain constant.

By default, a label is output in size 1.

Messages:

The following error message are specific to the LABEL and LABEL SIZE commands:

*** ERROR *** Specifying command LABEL
Command qualifiers are CLEAR, COLOUR, POSITION, or SIZE

*** ERROR *** Specifying command LABEL SIZE
Command requires 1 integer argument

*** ERROR *** Specifying command LABEL SIZE
Command requires an integer argument in the range 1 to 4

Examples:

DTIVIEW>LABEL SIZE 3<CR>
DTIVIEW>

LEGEND POSITION

Defines the position on the legend on the screen.

FORMAT: **LEGEND POSITION screen_x screen_y**

Command parameters:

screen_x, screen_y

Screen x and y coordinates specified in normalised device units. 2 real (floating point) values are required in the range 0.0 to 1.0

DESCRIPTION:

The LEGEND POSITION command is used to control where the legend is drawn on a graphics screen when the DRAW LEGEND command is given. The supplied coordinates define the position of the bottom left hand corner of the first legend box.

By default the legend is positioned below and to the left of a terrain view at position (in NDC) x 0.005 and y 0.15.

It is often useful to vary the legend position so that it does not interfere with the terrain view.

Messages:

The following error message are specific to the LEGEND and LEGEND POSITION commands:

*** ERROR *** Specifying command LEGEND
Command qualifiers are POSITION or SIZE

*** ERROR *** Specifying command LEGEND POSITION
Command requires 2 real arguments

*** ERROR *** Specifying command LEGEND POSITION
Command requires real arguments in the range 0 to 1

Examples:

DTIVIEW>LEGEND POSITION 0.2 0.5<CR>
DTIVIEW>

LEGEND SIZE

Defines the size of the legend.

FORMAT: **LEGEND SIZE scale_factor**

Command parameters:

scale_factor

A scale factor in the range 0 to 1. A real (floating point) value is required.

DESCRIPTION:

The LEGEND SIZE command is used to control the size of the legend on the screen when the DRAW LEGEND command is given.

By default the legend is drawn with a scale factor of 0.25

Messages:

The following error message are specific to the LEGEND and LEGEND SIZE commands:

*** ERROR *** Specifying command LEGEND
Command qualifiers are POSITION or SIZE

*** ERROR *** Specifying command LEGEND SIZE
Command requires 1 real argument

*** ERROR *** Specifying command LEGEND SIZE
Command requires a real argument in the range 0 to 1

Examples:

DTIVIEW>**LEGEND SIZE 0.4**<CR>
DTIVIEW>

LUT

Selects a colour table.

FORMAT: LUT file-spec

Command parameters:

file-spec

The file specification for the colour table. Any part of the file specification not supplied will be taken from the default LSL\$LOOKUP:DTIVIEW5.DAT.

DESCRIPTION:

This command is used to select a colour table. The colour table is a file containing the RGB definitions for a series of colour values. These colour values are used when drawing an isometric or perspective view on a colour graphics device.

The default colour table which is read when a graphics device is first enabled is dependent on the current planes setting. By default DTIVIEW allocates 5 planes to PICTURE 1, and therefore the colour table DTIVIEW5.DAT is read. Using the LUT command, an alternative colour table may be subsequently used.

If a terrain view has already been output to a graphics device, the effect of reading a new colour table using the LUT command is immediately seen.

Messages:

The following error messages are specific to the LUT command command:

*** ERROR *** Specifying command LUT
No graphics device is currently enabled

*** ERROR *** Specifying command LUT
Command not valid for a TEKTRONIX 4014

*** ERROR *** Specifying command LUT
Unable to read specified colour table

Examples:

DTIVIEW>LUT MYTABLE<CR>
DTIVIEW>

OVERLAY

Overlays vector features from an IFF file on to an isometric or perspective terrain view.

FORMAT: OVERLAY

Command parameters: None

DESCRIPTION:

The command OVERLAY is used to overlay vector features from an IFF file on to an isometric or perspective terrain view.

With a planes setting of 5 6 or 7, the vector data is drawn into picture 2; with a planes setting of 4, the data is drawn into picture 1. No overlay is possible if 8 planes have been allocated to picture 1.

The SELECT and DESELECT commands control which IFF features are selected for overlay. A FRT is used to define the graphical type of the feature (symbol, line or area), and to determine the colour in which the feature will be drawn. A SRI file is used to determine the representation of symbols.

Automatic registration of the vector data to the DTM takes place if both DTI and IFF files contain origin offset values in the file headers. Registration may be controlled explicitly using the commands IFFWINDOW and WINDOW. Output is controlled by the ENABLE GRAPHICS and ENABLE IFF_OUTPUT commands.

The OVERLAY command is only valid if the ENABLE OVERLAY has been given prior to generating the isometric or perspective view on which data is to be overlaid. An IFF and FRT file, and optionally a SRI file, must have been previously defined.

Typing <CTRL/C> (Pressing the Ctrl and C keys together) causes the current OVERLAY operation to be aborted, and will return the user to the DTIVIEW> prompt.

Further details on the vector overlay facilities are to be found in the description section of the introduction.

Messages: The following messages are specific to the OVERLAY command.

*** ERROR *** Specifying command OVERLAY
Overlay options are not enabled

*** ERROR *** Specifying command OVERLAY
No IFF file has been specified

*** ERROR *** Specifying command OVERLAY
No FRT file has been specified

*** ERROR *** Specifying command OVERLAY
Before overlay it is necessary to generate a terrain view
Use the command ISOMETRIC or PERSPECTIVE

*** ERROR *** Specifying command OVERLAY
Overlay not possible with a planes selection of 8

Examples:

DTIVIEW>OVERLAY<CR>
DTIVIEW>

PERSPECTIVE

Generates a perspective view.

FORMAT: **PERSPECTIVE**

Command parameters: None

DESCRIPTION:

The command PERSPECTIVE is given to generate a perspective terrain view.

The view is generated using the current viewing direction, distance, height and vertical exaggeration parameters, and using the current phi rotation value. These values may be examined using the SHOW VIEW command.

Only DTM nodes lying within the current DTM area of interest are used when generating the perspective view.

The perspective view may either be output to a graphics device, or the plot coordinates may be sent to an IFF file for subsequent plotting or manipulation. Output is controlled by the ENABLE GRAPHICS and ENABLE IFF_OUTPUT commands.

Typing <CTRL/C> (Pressing the Ctrl and C keys together) will abort the generation of the perspective view, and return the user to the DTIVIEW> prompt.

Messages:

The following error messages are specific to the PERSPECTIVE command:

*** ERROR *** Specifying command PERSPECTIVE
The input DTM is undefined

*** ERROR *** Specifying command PERSPECTIVE
No graphics device or output IFF file is enabled

Examples:

DTIVIEW>**PERSPECTIVE**<CR>
DTIVIEW>

PHI

Defines the amount of rotation applied to the terrain view in the x axis.

FORMAT: **PHI rotation**

Command parameters:

rotation

The amount of rotation specified in degrees. A real (floating point) value in the range -80 to 80 degrees is required.

DESCRIPTION:

The command PHI defines the degree of rotation in the x axis that is applied to an isometric or perspective terrain view.

Applying a rotation in the x axis can be a valuable aid to interpreting a 3 dimensional view. Most frequently a rotation of 45 degrees is applied, so that a corner of the terrain view is pointing towards the viewer.

If an angle greater than 80 degrees is required for a particular direction, use a different direction and a small value for PHI.

By default a rotation of 45 degrees is applied to all terrain views.

Use of the SHOW VIEW command is recommended to check on the x rotation value before a terrain view is generated.

Messages:

The following error messages are specific to the PHI command:

*** ERROR *** Specifying command PHI
Command requires 1 real argument

*** ERROR *** Specifying command PHI
Command requires a rotation value in the range -80 to 80 degrees

Examples:

DTIVIEW>PHI 30.0<CR>
DTIVIEW>

PLANES

Defines how many bit-planes on a graphics device are allocated to PICTURE 1.

FORMAT: PLANES number_planes

Command parameters:

number_planes

The number of bit-planes that will be allocated to PICTURE 1. An integer value in the range 4 to 8 is required.

DESCRIPTION:

PLANES defines the number of bit-planes on a graphics device that will be allocated to PICTURE 1. It therefore determines the maximum number of colours that are available for display of a terrain view.

By default a set of 5 planes are allocated to PICTURE 1. This allows 32 colours to be defined, although in practice a maximum of 29 colours will be used when drawing the terrain surface, since the first 3 colours have a special use.

The remaining planes on an 8 bit-plane graphics device are allocated to picture 2, and used for the display of any vector overlay drawn using the OVERLAY command, and for any annotation generated using the DRAW LABEL command. With a planes setting of 5, 7 overlay and annotation colours are available. The LABEL COLOUR command may be used to select the annotation colour, while the colour entry in the FRT determines in what colour, different overlay features are shown.

It should be noted that after giving the PLANES command, a default colour table appropriate to the number of planes, is read. The effect of this will either be seen immediately if a terrain view is already displayed, or on the initialisation of the graphics device.

The command PLANES 4 should be given if you are using a graphics device configured with 4 bit-planes. This command will ensure that the terrain view, and any vector overlay and annotation, will use the same set of planes. It also ensures that commands not relevant to a 4 planes graphics device are not acted upon.

Further information on the default colour tables, and the use of the PLANES command may be found in the introductory description section.

Messages:

The following error messages are specific to the PLANES command:

*** ERROR *** Specifying command PLANES

Command requires 1 integer argument

*** ERROR *** Specifying command PLANES
Command requires an integer in the range 4 to 8

Examples:

DTIVIEW>**PLANES 6**<CR>
DTIVIEW>

PROFILE

Generates a simple profile or cross section through the DTM.

FORMAT: **PROFILE** **x_start y_start x_end y_end**

Command parameters:

x_start y_start

An x y coordinate pair defining the first point of the profile.

x_end y_end

An x y coordinate pair defining the last point of the profile.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - 4 integer values are required defining the position of the start and end points in terms of column and row numbers.

UNITS METRES - 4 real (floating point) values are required defining the start and end points as x and y metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - 4 real (floating point) values are required defining the absolute position of the start and end points in seconds of arc. The values are supplied in the order latitude followed by longitude. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - 4 values are required defining the absolute latitude and longitude position of the start and end points in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude.

UNITS PROJECTION Requires 4 real (floating point) values defining the start and end points in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

If the command is issued via the table menu, or if the command PROFILE without any arguments is given, you will be asked to supply a start and end value in response to appropriate prompts.

DESCRIPTION:

The command PROFILE is given to generate a simple cross section between two DTM node points.

The current vertical exaggeration value is applied to the cross section.

The profile may be output to a graphics device, or may be sent to an IFF file for subsequent plotting or manipulation.

Output is controlled by the ENABLE GRAPHICS and ENABLE IFF_OUTPUT commands.

Messages:

The following error messages are specific to the PROFILE command:

*** ERROR *** Specifying command PROFILE
The input DTM is undefined

*** ERROR *** Specifying command PROFILE
No graphics device or output IFF file is enabled

*** ERROR *** Specifying command PROFILE
Command requires 4 coordinate arguments

*** ERROR *** Specifying command PROFILE
Coordinate values must lie within DTM limits

Examples:

DTIVIEW>UNITS MATRIX<CR>
DTIVIEW>PROFILE 10 10 15 33<CR>
DTIVIEW>

QUADRANT

Selects which quadrant of a divided graphics screen will be used.

FORMAT: **QUADRANT** quadrant_number

Command parameters:

quadrant_number

A quadrant number specifying which quadrant of the screen is to be used.
An integer value in the range 1 to 4 is required, where:

Quadrant_number 1 = top lefthand quadrant

Quadrant_number 2 = top righthand quadrant

Quadrant_number 3 = bottom righthand quadrant

Quadrant_number 4 = bottom lefthand quadrant

DESCRIPTION:

The QUADRANT command controls which quadrant of a divided graphics screen will be used for the display of an isometric or perspective terrain view.

The command is only valid if use of a quartered screen has been selected using the ENABLE DIVIDE command.

Messages:

The following error messages are specific to the QUADRANT command:

*** ERROR *** Specifying command QUADRANT
Command requires 1 integer argument

*** ERROR *** Specifying command QUADRANT
Command requires an integer argument in the range 1 to 4

*** ERROR *** Specifying command QUADRANT
Divided screen is not enabled

Examples:

DTIVIEW>QUADRANT 4<CR>
DTIVIEW>

SAMPLE

Defines the interval at which nodes will be sampled along the columns and rows of the DTM.

FORMAT: **SAMPLE column_interval row_interval**

Command parameters:

column_interval

The sample interval along the columns of the DTM. A positive integer value is required.

row_interval

The sample interval along the rows of the DTM. A positive integer value is required.

DESCRIPTION:

SAMPLE is used to define the interval at which DTIVIEW samples the columns and rows of the DTM.

By default all nodes in the DTM area of interest are used to generate the 3-D terrain view (ie. a sample interval of 1 along both the columns and rows).

The SAMPLE command is useful when generating a terrain view covering a large area of interest. A quick look view may be generated first by sampling along the columns and rows, and subsequently a full view without sub-sampling. The command SAMPLE 1 1 should be used to specify that no sub-sampling is applied, if a previous SAMPLE command has redefined the sample intervals.

Note that irrespective of the sample intervals, the last column or row (depending on the viewing direction), in the DTM area of interest is always shown on the 3-D terrain view.

Note that in the current implementation of DTIVIEW, IFF features may only be overlaid on a terrain view generated with column and row sampling intervals of 1.

Message:

The following error messages are specific to the SAMPLE command:

*** ERROR *** Specifying command SAMPLE
Command requires 2 integer arguments

*** ERROR *** Specifying command SAMPLE
Command requires 2 positive integer arguments

Examples:

DTIVIEW>**SAMPLE 2 2 <CR>**
DTIVIEW>

SELECT ALL

Resets all feature selections

FORMAT: **SELECT ALL**

Command parameters: None

DESCRIPTION:

SELECT ALL resets all IFF feature selections made using any of the SELECT or DESELECT commands.

The SELECT ALL command is only valid if the ENABLE OVERLAY command has been previously given.

Message:

The following error messages are specific to the SELECT command:

*** ERROR *** Specifying command SELECT
Command qualifiers are ALL, FC, FSN or LAYER

*** ERROR *** Specifying command SELECT
Overlay options are not enabled

Examples:

DTIVIEW>SELECT ALL <CR>
DTIVIEW>SELECT FSN 7-10,56-78 <CR>
DTIVIEW>SHOW SELECTIONS <CR>
DTIVIEW>SELECT ALL <CR>
DTIVIEW>SHOW SELECTIONS <CR>
DTIVIEW>

SELECT FC

Includes an IFF feature for overlay on an isometric or perspective view on the basis of feature code.

FORMAT: **SELECT FC feature_code [,...]**

Command parameters:

feature_code

An integer feature code in the range 0 to 32767. Multiple feature codes may be specified separated by commas or spaces, while a range of feature codes may be specified by means of a '-'. eg. SELECT FC 10-13 includes feature codes 10,11,12 and 13.

Alternatively a valid FRT group name may be specified eg. SELECT FC RIVERS

DESCRIPTION:

The SELECT FC command is used to include an IFF feature for overlay on an isometric or perspective view. Features are included on the basis of their feature code.

By default DTIVIEW will use all features within an IFF file.

Use of the SHOW SELECTIONS command is recommended to check on feature selections before the OVERLAY command is given.

The SELECT FC command is only valid if the ENABLE OVERLAY command has been previously given, and the FRT command has been used to specify a Feature Representation Table.

Messages:

The following error messages are specific to the SELECT command:

*** ERROR *** Specifying command SELECT
Command qualifiers are ALL, FC, FSN, or LAYER

Examples:

```
DTIVIEW>SELECT FC 1<CR>
DTIVIEW>SELECT FC RAILWAYS<CR>
DTIVIEW>SELECT FC RIVERS 7-10,56-78
DTIVIEW>
```

SELECT FSN

Includes an IFF feature for overlay on an isometric or perspective view on the basis of feature serial number.

FORMAT: **SELECT FSN fsn [,...]**

Command parameters:

fsn

An integer feature serial number in the range 0 to 65534. Multiple feature serial numbers may be specified separated by commas or spaces, while a range of numbers may be specified by means of a '-'. eg. SELECT FSN 10-13 includes feature serial numbers 10,11,12 and 13.

DESCRIPTION:

The SELECT FSN command is used to include IFF features for overlay on an isometric or perspective view. Features are included on the basis of their feature serial number.

By default DTIVIEW will use all features within an IFF file.

Use of the SHOW SELECTIONS command is recommended to display feature selections before the OVERLAY command is given.

The SELECT FSN command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the SELECT command:

*** ERROR *** Specifying command SELECT
Command qualifiers are ALL, FC, FSN, or LAYER

Examples:

DTIVIEW>**SELECT FSN 4**
DTIVIEW>**SELECT FSN 7-10,56-78**
DTIVIEW>

SELECT LAYER

Includes an IFF feature for overlay on an isometric or perspective view on the basis of layer number.

FORMAT: **SELECT LAYER layer [,...]**

Command parameters:

layer

An integer layer number in the range 1 to 32767. Multiple layer numbers may be specified separated by commas or spaces, while a range of layer numbers may be specified by means of a '-'. eg. **SELECT LAYER 10-13** includes all features in layers 10,11,12 and 13.

DESCRIPTION:

The **SELECT LAYER** command is used to include IFF features for overlay on an isometric or perspective view. Features are included on the basis of IFF layer.

By default DTIVIEW will use all features within an IFF file.

Use of the **SHOW SELECTIONS** command is recommended to display feature selections before the **OVERLAY** command is given.

The SELECT LAYER command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the **SELECT** command:

*** ERROR *** Specifying command **SELECT**
Command qualifiers are **ALL**, **FC**, **FSN**, or **LAYER**

Examples:

DTIVIEW>**SELECT LAYER 7**
DTIVIEW>**SELECT LAYER 1,7-10**
DTIVIEW>

SET DEFAULT ANNOTATION

Sets all label and legend annotation parameters to their default values.

FORMAT: SET DEFAULT ANNOTATION

Command parameters: None

DESCRIPTION:

This command is used to set all LABEL (colour, size and position) and LEGEND (size and position) parameters to their default values.

The default annotation values may be examined using the command SHOW ANNOTATION after giving the SET DEFAULT ANNOTATION command.

Messages:

The following error messages are specific to the SET and SET DEFAULT commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
NULL_FC, ORIGIN, SCALE, SEA_FC or SYMBOL_SCALE

*** ERROR *** Specifying command SET
Command qualifiers are ANNOTATION or VIEW

Examples:

DTIVIEW>SET DEFAULT ANNOTATION<CR>
DTIVIEW>

SET DEFAULT VIEW

Sets all view parameters to their default values.

FORMAT: SET DEFAULT VIEW

Command parameters: None

DESCRIPTION:

This command is used to set all viewing parameters to their default values.

The default viewing values may be examined using the command SHOW VIEW after giving the SET DEFAULT VIEW command.

Messages:

The following error messages are specific to the SET and SET DEFAULT commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC or SYMBOL_SCALE

*** ERROR *** Specifying command SET
Command qualifiers are ANNOTATION or VIEW

Examples:

DTIVIEW>SET DEFAULT VIEW<CR>
DTIVIEW>

SET LAND_FC

Specifies the code given to feature code of features in an IFF output file that are profiles across the land (rather than the sea) surface.

FORMAT: **SET LAND_FC feature_code**

Command parameters:

feature_code

The feature code of the land profiles. An integer value in the range 1 to 32767 is required.

DESCRIPTION:

The SET LAND_FC command is used to specify the code given to features in the IFF output file that are profiles across the land surface.

By default such features are given a code of 1, and features that define a line across the sea surface are given a code of 2. This allows the IFF data to be plotted, so that the land and sea may be distinguished in different colours or line styles.

The command SET SEA_FC should be used to set the feature code of profiles across the sea surface.

The command is only relevant when using the ENABLE IFF_OUTPUT option, to write a terrain view to an IFF file.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET LAND_FC commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET LAND_FC
Command requires 1 integer argument

*** ERROR *** Specifying command SET LAND_FC
Command requires a feature code in the range 1 to 32767

Examples:

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SET LAND_FC command

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DTIVIEW>**SET LAND_FC 5 <CR>**
DTIVIEW>

SET LAYER

Specifies the layer into which features are placed in the output IFF file.

FORMAT: **SET LAYER layer**

Command parameters:

layer

The IFF layer number. An integer value in the range 1 to 32767 is required.

DESCRIPTION:

The SET LAYER command is used to specify the layer into which features are placed in the IFF output file.

Once a layer has been created in the output IFF file, the layer number is automatically incremented by 1. This ensures that any overlay data also output to the file, is held in a separate layer to the terrain profiles.

By default features are written to layer 1 in the IFF file.

The command is only relevant when using the ENABLE IFF_OUTPUT option, to write a terrain view to an IFF file.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET LAYER commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET LAYER
Command requires 1 integer argument

*** ERROR *** Specifying command SET LAYER
Command requires a feature code in the range 1 to 32767

Examples:

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SET LAYER command

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DTIVIEW>SET LAYER 4 <CR>
DTIVIEW>

SET LINE_STYLE

Selects the line style representation of lines drawn on a TEKTRONIX monochrome display.

FORMAT: **SET LINE_STYLE line_number**

Command parameters:

line_number

A TEKTRONIX line style number. An integer value in the range 1 to 5 is required where:

- 1 = continuous solid
- 2 = dotted
- 3 = short dash
- 4 = normal dash
- 5 = long dash

DESCRIPTION:

The SET LINE_STYLE command is used to select the line style in which lines will be drawn on a TEKTRONIX 4014 display, when ISOMETRIC, PERSPECTIVE and OVERLAY commands are given.

By default a solid line representation is used.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET LINE_STYLE commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET LINE_STYLE
Command requires 1 integer argument

*** ERROR *** Specifying command SET LINE_STYLE
Command requires an integer value in the range 1 to 5

Examples:

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SET LINE_STYLE command

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```
DTIVIEW>SET LINE_STYLE 2 <CR>  
DTIVIEW>
```

SET NULL_FC

Specifies the code given to features in an IFF output file that are profiles that fall outside the height range defined with the ZLIMITS command.

FORMAT: SET NULL_FC feature_code

Command parameters:

feature_code

The feature code of the profiles. An integer value in the range 1 to 32767 is required.

DESCRIPTION:

The SET NULL_FC command is used to specify the code given to features in the IFF output file that are profiles with heights outside the height range defined with the ZLIMITS command.

By default these features are given a code of 3. This allows the IFF data to be plotted, so that these profiles may be distinguished in a different colour or line style.

The command is only relevant when using the ENABLE IFF_OUTPUT option, to write a terrain view to an IFF file.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET NULL_FC commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET NULL_FC
Command requires 1 integer argument

*** ERROR *** Specifying command SET NULL_FC
Command requires a feature code in the range 1 to 32767

Examples:

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SET NULL_FC command

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```
DTIVIEW>SET NULL_FC 14 <CR>  
DTIVIEW>
```

SET ORIGIN

Defines the drawing origin that will be used when an isometric or perspective terrain view is output to a graphics device.

FORMAT: **SET ORIGIN x_origin y_origin**

Command parameters:

x_origin y_origin

The x y coordinate origin of the drawing. 2 real (floating point) values are required.

The origin is specified in normalised device coordinates (NDC). For example, an origin of 0.0 and 0.0 corresponds to the bottom lefthand corner of the screen. Negative values may be supplied.

DESCRIPTION:

The SET ORIGIN command is used to define a drawing origin. This determines where the bottom lefthand corner of the graphics drawing area is located. The origin values are specified in normalised device coordinates. For example, if an origin of 0.5 and 0.5 is specified, then only the upper righthand quadrant of the screen will be used.

The command is used in conjunction with the SET SCALE command to override the default scaling and positioning of the terrain view.

; Giving the command SET ORIGIN will automatically disable the AUTOSCALE option. This option can be reselected using the command ENABLE AUTOSCALE. If AUTOSCALE is selected, then drawing scale factor and origin values are automatically calculated, and applied in preference to any user supplied drawing scale and origin values.

Use of the SHOW SETTINGS or SHOW DEVICE command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET ORIGIN commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET ORIGIN
Command requires 2 real arguments

Examples:

```
DTIVIEW>SET ORIGIN 0.3 0.3 <CR>  
DTIVIEW>
```

SET SCALE

Defines the drawing scale factor that will be used when an isometric or perspective terrain view is output to a graphics device.

FORMAT: **SET SCALE scale_factor**

Command parameters:

scale_factor

The drawing scale factor. A positive real (floating point) is required.

DESCRIPTION:

The SET SCALE command is used to define a drawing scale factor. This determines the amount of enlargement that is applied to the terrain view and any vector overlay when output to a graphics device. The command is used in conjunction with the SET ORIGIN command to override the default scaling and positioning of the terrain view.

Giving the command SET SCALE will automatically disable the AUTOSCALE option. This option can be reselected using the command ENABLE AUTOSCALE. If AUTOSCALE is selected, then drawing scale factor and origin values are automatically calculated, and applied in preference to any user supplied drawing scale and origin values.

Use of the SHOW SETTINGS or SHOW DEVICE command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET SCALE commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET SCALE
Command requires 1 real argument

Examples:

DTIVIEW>SET SCALE 1.5 <CR>
DTIVIEW>

SET SEA_FC

Specifies the code which is given to features in an IFF output file that are profiles across the sea (rather than the land) surface.

FORMAT: SET SEA_FC feature_code

Command parameters:

feature_code

The feature code of the sea profiles. An integer value in the range 1 to 32767 is required.

DESCRIPTION:

The SET SEA_FC command is used to specify the code which is given to features in the IFF output file that are profiles across the sea surface.

By default such features are given a feature code of 2, and features that define a line across the land surface are given a feature code of 1. This allows the IFF data to be plotted, so that the land and sea may be distinguished in different colours or line styles.

The command SET LAND_FC should be used to set the feature code of profiles across the land surface.

The command is only relevant when using the ENABLE IFF_OUTPUT option, to write a terrain view to an IFF file.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET SEA_FC commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET SEA_FC
Command requires 1 integer argument

*** ERROR *** Specifying command SET SEA_FC
Command requires a feature code in the range 1 to 32767

Examples:

MATRIX REFERENCE (3.7): DTIVIEW - DTM 3-D Viewing Utility
SET SEA_FC command

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```
DTIVIEW>SET SEA_FC 4 <CR>  
DTIVIEW>
```

SET SYMBOL_SCALE

Specifies a scale factor that is applied to the normalised symbol coordinates in a SRI file before output to a graphics device. The command is therefore used to control the size of graphical symbols.

FORMAT: **SET SYMBOL_SCALE scale_factor**

Command parameters:

scale_factor

The symbol scale factor. A real (floating point) value is required.

DESCRIPTION:

The SET SYMBOL_SCALE command is used to specify a symbol enlargement factor, and therefore controls the representation of drawn symbols. It is a value by which the normalised SRI symbol coordinates are enlarged or reduced prior to output to a graphics device.

By default DTIVIEW will use the scale entry in the FRT and the dimensions of the graphics screen to determine the symbol size, however in some situations it is useful to override the default value.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

The command is only valid if the ENABLE OVERLAY command has been previously given.

Messages:

The following error messages are specific to the SET and SET SYMBOL_SCALE commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET SYMBOL__SCALE
Command requires 1 real argument

Examples:

DTIVIEW>SET SYMBOL_SCALE 4.5 <CR>
DTIVIEW>

SET TEXT_FC

Specifies the feature code which is given to the text feature that is generated if output of the perspective or isometric view is to an IFF file. This text feature labels the view with the time and date of generation, along with details of viewing direction.

FORMAT: **SET TEXT_FC feature_code**

Command parameters:

feature_code

The feature code of the text string. An integer value in the range 1 to 32767 is required.

DESCRIPTION:

The SET TEXT_FC command is used to specify the code which is given to the title text feature in the IFF output file.

By default this feature is given a feature code value of 64.

The command is only relevant when using the ENABLE IFF_OUTPUT option.

Use of the SHOW SETTINGS command is recommended to check on the current setting.

Messages:

The following error messages are specific to the SET and SET TEXT_FC commands:

*** ERROR *** Specifying command SET
Command qualifiers are DEFAULT, LAND_FC, LAYER, LINE_STYLE,
 NULL_FC, ORIGIN, SCALE, SEA_FC, SYMBOL_SCALE
 TEXT_FC

*** ERROR *** Specifying command SET TEXT_FC
Command requires 1 integer argument

*** ERROR *** Specifying command SET TEXT_FC
Command requires a feature code in the range 1 to 32767

Examples:

DTIVIEW>SET TEXT_FC 100 <CR>
DTIVIEW>

SETUP MAP

Registers a map or other source document placed on a digitising table, to the input DTM.

FORMAT: SETUP MAP

DESCRIPTION:

The SETUP MAP command allows a source document to be registered to the input DTM.

In order to register the map and a DTM, the DTM should have first been specified, and a source document should have been securely attached to the surface of a digitising table.

On giving the command you will be asked to digitise 4 rectangular registration points. The registration points represent 4 points on the map that correspond to the 4 corners of the DTM. The points are digitised in the order top left (NW), bottom left (SW), bottom right (SE) and top right (NE) using any button on the table puck. A point should be digitised in response to a prompt on the terminal.

An error message is generated if any of the angles of the digitised rectangle are less than 88 degrees, or greater than 92 degrees (ie. if the corner points of the rectangle are more than 2 degrees off rectangular). In this case you will be asked to redigitise the 4 registration points.

Setup of the map may be aborted using <CTRL/Z> (pressing the Ctrl and Z keys together).

Following the registration of a map to the DTM, coordinate values required by the WINDOW and PROFILE commands, may be input using the table puck. User defined symbols may also be positioned using the table puck.

Messages:

The following error messages are specific to the SETUP and SETUP MAP commands:

*** ERROR *** Specifying command SETUP
Command qualifiers are MAP or MENU

*** ERROR *** Specifying command SETUP MAP
Command is invalid if the table has not been initialised

*** ERROR *** Specifying command SETUP MAP
The input DTM must be specified before SETUP MAP

*** ERROR *** Setting up MAP
Badly digitised corner points; try again

Examples:

DTIVIEW>**SETUP MAP**<CR>

Digitise map NW corner>

Digitise map SW corner>

Digitise map SE corner>

Digitise map NE corner>

DTIVIEW>

SETUP MENU

Positions the DTIVIEW menu on the digitising table.

FORMAT: SETUP MENU

DESCRIPTION:

The SETUP MENU command allows the DTIVIEW menu to be positioned on the digitising table.

On giving the command you will be asked to digitise the 4 corners points of the menu. The corners are digitised in the order top left (NW), bottom left (SW), bottom right (SE) and top right (NE) using any button on the table puck. A point should be digitised in response to a prompt on the terminal.

An error message is generated if any of the angles of the digitised rectangle are less than 88 degrees, or greater than 92 degrees (ie. if the corner points of the rectangle are more than 2 degrees off rectangular). In this case you will be asked to redigitise the 4 menu corner points.

Setup of the menu may be aborted using <CTRL/Z> (pressing the Ctrl and Z keys together).

Once a menu has been positioned on the table, it is possible to enter many of the DTIVIEW commands by digitising a point in the appropriate menu box. If a command requires a parameter argument, you should enter the parameter in response to the prompt on the terminal, using the keyboard.

Messages:

The following error messages are specific to the SETUP and SETUP MENU commands:

*** ERROR *** Specifying command SETUP
Command qualifiers are MAP or MENU

*** ERROR *** Specifying command SETUP MENU
Command is invalid if the table has not been initialised

*** ERROR *** Setting up MENU
Badly digitised corner points; try again

Examples:

DTIVIEW>SETUP MENU<CR>

Digitise menu NW corner>

Digitise menu SW corner>

Digitise menu SE corner>

Digitise menu NE corner>

DTIVIEW>

SHOW ANNOTATION

Displays information on current label and legend parameters.

FORMAT: **SHOW ANNOTATION**

Command parameters: None.

DESCRIPTION:

The command SHOW ANNOTATION displays information on the current position, size and colour of a label, and the current position and size of a legend.

These parameters may be varied using the appropriate LABEL or LEGEND commands.

If the SHOW ANNOTATION command is given before any LABEL or LEGEND commands, the default annotation parameter settings may be examined.

Messages:

The following messages are specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>**SHOW ANNOTATION**<CR>

Label Position : 0.500 0.500
Label Size : 1
Label Colour : 1

Legend Position : 0.005 0.150
Legend Size : 0.25

DTIVIEW>

SHOW DEVICE

Displays information on parameters associated with the output graphics device. For example the current allocation of bit-planes to Picture 1 and Picture 2.

FORMAT: **SHOW DEVICE**

Command parameters: None.

DESCRIPTION:

The command SHOW DEVICE displays information on parameters that are associated with a graphics device. The status of the graphics device is shown, along with details on the current bit-plane and colour allocation. The drawing origin and scale values are also shown.

Messages:

The following messages are specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>SHOW DEVICE<CR>

PRIMARY On SECONDARY Off

5 Planes allocated to PICTURE 1
3 Planes allocated to PICTURE 2

Maximum number of colours for terrain view : 29
Number of colours selected for terrain view : 29
Maximum number of overlay colours : 7

Divided screen is enabled
Current quadrant number : 1

AUTOSCALE is enabled

DTIVIEW>

SHOW ENABLE

Shows the current status of those options that may be enabled by means of the ENABLE command, or disabled using the DISABLE command.

FORMAT: **SHOW ENABLE**

Command parameters: None.

DESCRIPTION:

Displays the current status of all the DTIVIEW options that may be enabled or disabled using the ENABLE and DISABLE commands.
The name of the option is shown, followed by either the word ON or OFF to indicate its current status.
If the command SHOW ENABLE is used before any ENABLE or DISABLE commands have been given, the default status of the options is displayed.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>**SHOW ENABLE<CR>**

Current status:

ABSOLUTE	On	AUTOSCALE	On	BATHYMETRY	Off
COLOUR_IFF	Off	DIVIDE	Off	FISHNET	Off
FOG	Off	GRAPHICS	Off	IFF_OUTPUT	On
OVERLAY	Off	PICTURE 1	Off	PICTURE 2	Off
PRIMARY	Off	SECONDARY	Off	SYMBOLS	Off
TABLE	Off				

DTIVIEW>

SHOW FILEIN

Displays information extracted from the header of the input DTM.

FORMAT: **SHOW FILEIN**

Command parameters: None.

DESCRIPTION:

Details extracted from the header of the DTM are displayed on the terminal, along with details of the current window or area of interest.

The header values are shown in the current units of measurement. This is dependent on the header type of the input file, or may be set explicitly using the UNITS command. By default or if the ENABLE ABSOLUTE command has been given then metre or projection values are expressed in absolute values. Otherwise they are displayed as offsets from the SW corner of the matrix.

Messages:

The following messages are specific to the commands SHOW and SHOW FILEIN:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

*** WARNING *** The input DTM is undefined

Examples:

DTIVIEW>**SHOW FILEIN**<CR>

LSL\$DTI:TEST.DTI

Header: MIKE Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Window	SW:	1	1	NE:	200	200
Matrix Interval	E:	1		N:	1	
Value Range	:		0	to	851	

DTIVIEW>

SHOW IFF

Displays information extracted from the header of the input IFF file.

FORMAT: **SHOW IFF**

Command parameters: None.

DESCRIPTION:

Displays information on the currently selected IFF file.

The name of the IFF file, and the IFF coordinate range and window settings are shown. By default or if the ENABLE ABSOLUTE command has been given, then the coordinates are expressed as absolute values. Otherwise they are displayed as offset values from the SW corner of the file area.

Messages:

The following messages are specific to the SHOW and SHOW IFF commands:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

*** WARNING *** The input IFF file is undefined

Examples:

DTIVIEW>**SHOW IFF**<CR>

IFF file: LSL\$IF:TEST.IFF
IFF file range:
SW: 270000.00 180000.00 NE: 310000.00 220000.00
IFF file window :
SW: 280000.00 190000.00 NE: 320000.00 190000.00

DTIVIEW>

SHOW SETTINGS

Shows the current value of those parameters that may be set using the SET command.

FORMAT: **SHOW SETTINGS**

Command parameters: None.

DESCRIPTION:

Displays the name of all DTIVIEW parameters that may be set using the SET command, and their current values.

If the SHOW SETTINGS command is given before using a SET command, the values shown are the default values that are allocated to the parameters by COVER.

Messages:

The following message is specific to the command SHOW:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>**SHOW SETTINGS**<CR>

Current Settings:

LAND_FC	1	LAYER	1	LINE_STYLE	1
ORIGIN	0.01 0.51	NULL_FC	3	SCALE	0.47
SEA_FC	2	SYMBOL_SCALE	602.59	TEXT_FC	64

DTIVIEW>

SHOW SYMBOLS

Displays information about currently defined symbols.

FORMAT: **SHOW SYMBOLS**

Command parameters: None.

DESCRIPTION:

The SHOW SYMBOLS command displays information about the currently defined symbols.

If the ENABLE SYMBOLS and the SYMBOL FC commands have been previously given the SHOW SYMBOLS command will display the number of symbols currently defined.

If the SYMBOL POSITION command has been given or the table puck has been used to position symbols, the SHOW SYMBOLS command will additionally display the x and y coordinate position of a symbol and its visibility status. The coordinates are shown in the current units of measurement. This is dependent on the header type of the input file, or may be set explicitly using the UNITS command. By default, or if the ENABLE ABSOLUTE command has been given, then metre or projection values are expressed in absolute values. Otherwise they are displayed as offsets from the SW corner of the matrix.

Messages:

The following message is specific to the command SHOW:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>SHOW SYMBOLS<CR>

Number of symbols currently defined : 9
Number of symbols currently used : 4

Symbol no	FC	X position	Y position	Visible
1	1	10	10	YES
2	2	20	20	YES
3	3	30	30	YES
4	4	40	40	YES

DTIVIEW>

SHOW VIEW

Displays the current values of all viewing parameters controlling the form of an isometric or perspective view.

FORMAT: **SHOW VIEW**

Command parameters: None.

DESCRIPTION:

The SHOW VIEW command displays on the terminal the current value of all view parameters.

These are the parameters that control how the DTM is sampled, and the transformations that are applied, when generating an isometric or perspective terrain view. Values defined using the ZSTEP and ZLIMITS commands are also displayed.

Messages:

The following message is specific to the command SHOW:

*** ERROR *** Specifying command SHOW
Command qualifiers are ANNOTATION, DEVICE, ENABLE, IFF, FILEIN
 SELECTIONS, SETTINGS, SYMBOLS or VIEW

Examples:

DTIVIEW>**SHOW VIEW**<CR>

Theta : -30.0
Phi : 45.0
Viewing direction : From the WEST
Vertical exaggeration: 1.0
Viewing distance : 300.0
Height of view : 1000.0

Fog colour index : 0
Visibility distance : 1000.0

Z Limits : 0 to 833
Z Step : 29

Sampling interval along columns : 1
Sampling interval along rows : 1

DTIVIEW>

SPAWN

The SPAWN command enables a subprocess to be created from within DTIVIEW.

FORMAT: SPAWN command-line

Command parameters:**command-line**

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTIVIEW. The command line cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within DTIVIEW. When the subprocess terminates, control is returned to DTIVIEW.

Messages:

The following error messages are specific to the SPAWN command:

*** ERROR *** Specifying command SPAWN
Command requires a valid DCL command line

*** ERROR *** Specifying command SPAWN
DCL command line cannot exceed 80 characters

*** ERROR *** Unable to spawn command, returning to DTIVIEW

Examples:

DTIVIEW> SPAWN DIRECTORY LSL\$DTI:*.DTI<CR>

Directory DUA3:[LSL.DTI]

TEST1.DTI;1	8/8	18-AUG-1987 07:56	[LSL,DAVEC]
TEST2.DTI;1	7/8	18-AUG-1987 17:17	[LSL,DAVEC]
TEST2.DTI;2	7/8	18-AUG-1987 17:34	[LSL,DAVEC]

Total of 3 files, 22/24 blocks.

DTIVIEW>

SRI

Reads a SRI (Symbol Representation IFF) file.

FORMAT: **SRI file-spec**

Command parameters:

file-spec

The file specification for the SRI file. Any part of the file specification not supplied will be taken from the default 'LSL\$FRT:SRI.SRI', although if no file-spec is supplied, you will be asked to supply one in response to the prompt **Input SRI filename>**

DESCRIPTION:

This command reads the specified Symbol Representation IFF file. It is only appropriate to the overlay of vector data or plotting of symbols on a terrain view.

The SRI determines how any IFF symbol or symbol-string features will appear graphically, when overlaid on a terrain view using the command OVERLAY.

The SRI file is optional, and need only be provided if the IFF file contains features that are to be symbolically represented.

The command is only valid if the ENABLE OVERLAY or the ENABLE SYMBOLS has been previously given.

Messages:

The following error messages are specific to the SRI command:

*** ERROR *** Specifying command SRI
Overlay or symbols options are not enabled

*** ERROR *** Specifying command SRI
Input SRI filename is missing

Examples:

DTIVIEW>**SRI DTIVIEW.SRI <CR>**
DTIVIEW>

SYMBOL CLEAR

Clears a symbol or symbols from a graphics screen.

FORMAT: **SYMBOL CLEAR ALL**

or

FORMAT: **SYMBOL CLEAR symbol_number**

Command parameters:

symbol_number

The symbol_number parameter is the number assigned to the symbol. An integer number is required. The valid range for the integer is between 1 and 15.

DESCRIPTION:

The SYMBOL CLEAR command is used to clear a symbol or all symbols from the graphics screen. The symbols are cleared independently of any perspective or isometric terrain view.

The command is only valid if the ENABLE SYMBOLS command has been previously given.

Messages:

The following error messages are specific to the SYMBOL and SYMBOL CLEAR commands:

*** ERROR *** Specifying command SYMBOL
Symbol options are not enabled
Use ENABLE SYMBOLS command

*** ERROR *** Specifying command SYMBOL CLEAR
Command requires symbol number

*** ERROR *** Specifying command SYMBOL CLEAR
Error reading integer number

Examples:

DTIVIEW>**SHOW SYMBOLS<CR>**

Number of symbols currently defined : 9

Number of symbols currently used : 4

Symbol no	FC	X position	Y position	Visible
1	1	270.00	270.00	YES
2	2	570.00	570.00	YES
3	3	870.00	870.00	YES
4	4	1170.00	1170.00	YES

DTIVIEW>**SYMBOL CLEAR 1<CR>**

DTIVIEW>**SHOW SYMBOLS<CR>**

Number of symbols currently defined : 9

Number of symbols currently used : 3

Symbol no	FC	X position	Y position	Visible
2	2	570.00	570.00	YES
3	3	870.00	870.00	YES
4	4	1170.00	1170.00	YES

DTIVIEW>

SYMBOL FC

Defines a symbol and its feature code.

FORMAT: **SYMBOL FC symbol_number feature_code**

Command parameters:

symbol_number

The symbol_number is the number assigned to the symbol. An integer number is required. The valid range for the integer is between 1 and 15.

feature_code

The feature code of the symbol being defined. An integer value in the range 1 to 32767 is required. This feature code must have an entry in the current FRT.

DESCRIPTION:

The SYMBOL FC command is used to define a symbol and its feature code. Up to fifteen symbols may be defined using the SYMBOL FC command.

The SYMBOL FC command checks that the feature code specified is a valid symbol in the FRT file. If the symbol is not valid an error message will be generated. The SYMBOL FC command must be given prior to issuing the SYMBOL POSITION command or before positioning the symbol using the table puck.

The command is only valid if the ENABLE SYMBOLS command has been previously given. A FRT file and a SRI file, must have been previously defined.

The SHOW SYMBOLS command should be used to display information about the symbols defined and in use.

Messages:

The following error messages are specific to the SYMBOL and SYMBOL FC commands:

*** ERROR *** Specifying command SYMBOL
Command qualifiers are CLEAR, FC or POSITION

*** ERROR *** Specifying command SYMBOL
Symbol options are not enabled
Use ENABLE SYMBOLS command

*** ERROR *** Specifying command SYMBOL
No FRT file has been specified
Use FRT command

*** ERROR *** Specifying command SYMBOL

No SRI file has been specified
Use SRI command

*** ERROR *** Specifying command SYMBOL FC
Command requires 2 integer arguments
eg SYMBOL FC <symbol number> <feature code>

*** ERROR *** Specifying command SYMBOL FC
Feature code <feature_code> is not a point symbol

Examples:

DTIVIEW>SYMBOL FC 1 57<CR>
DTIVIEW>SYMBOL POSITION 1 10 20<CR>

DTIVIEW>SHOW SYMBOLS<CR>

Number of symbols currently defined : 1
Number of symbols currently used : 1

Symbol no	FC	X position	Y position	Visible
1	57	10	20	YES

DTIVIEW>

SYMBOL POSITION

Defines the position of a symbol on the terrain model.

FORMAT: **SYMBOL POSITION** *symbol_number* *x_coord* *y_coord*

Command parameters:

symbol_number

The *symbol_number* is the number assigned to the symbol using the SYMBOL FC command. An integer number is required. The valid range for the integer is between 1 and 15.

x_coord *y_coord*

The coordinates of the symbol position..

The format of the coordinates is controlled by the UNITS command.

UNITS MATRIX - Requires 2 integer values defining the symbol position in terms of column and row numbers

UNITS METRES - Requires 2 real (floating point) values defining the symbol position as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 2 real (floating point) values defining the absolute position in seconds of arc. The values are supplied in the order latitude followed by longitude. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 2 values defining the absolute latitude and longitude position in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude.

UNITS PROJECTION Requires 2 real (floating point) values defining the position in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

DESCRIPTION:

The SYMBOL POSITION command is used to position a symbol on the terrain model. If the symbol is already shown on the terrain model, the command undraws the symbol at its current location and draws the symbol at the new location. Should the location specified be not be visible to the observer, then the symbol will not be drawn at the new location. Up to fifteen symbols can be positioned using the SYMBOL POSITION command.

Note: If the base of the symbol is not visible to the observer then no part of the symbol is drawn irrespective of the height of the symbol.

The size of the symbols is controlled by means of the size entry in the FRT and the SET SYMBOL_SCALE command.

If a digitising table is available, and a map has been registered to the DTM then the symbol may be positioned on the terrain model using the appropriate button on the table puck. Button 1 defines the position of symbol 1, button 2 defines the position of symbol 2 and so on. All fifteen symbols may be position in this way. Button 0 allows all previously defined and used symbols to be redisplayed. This is particularly useful when a new view is generated.

The command is only valid if the ENABLE SYMBOLS command has been previously given. A FRT file and a SRI file, must have been previously defined.

Messages:

The following error messages are specific to the SYMBOL and SYMBOL POSITION commands:

*** ERROR *** Specifying command SYMBOL
Symbol options are not enabled
Use ENABLE SYMBOLS command

*** ERROR *** Specifying command SYMBOL
Symbol plotting not possible with a plane setting of 8

*** ERROR *** Specifying command SYMBOL
No FRT file has been specified
Use FRT command

*** ERROR *** Specifying command SYMBOL
No SRI file has been specified
Use SRI command

*** ERROR *** Specifying command SYMBOL
Command qualifiers are CLEAR, FC or POSITION

*** ERROR *** Specifying command SYMBOL POSITION
Command requires symbol number and x,y coordinate pair

*** ERROR *** Specifying command SYMBOL POSITION
Symbol number less than 1 or greater than 15

*** ERROR *** Specifying symbol position
Unable to use supplied LATLONG values

Examples:

DTIVIEW>SHOW SYMBOLS<CR>

Number of symbols currently defined : 9
Number of symbols currently used : 5

Symbol no	FC	X position	Y position	Visible
1	95	51	26	YES
2	120	52	70	NO
3	54	60	60	YES
4	55	65	70	YES
5	56	75	52	YES

DTIVIEW>SYMBOL POSITION 2 53 30<CR>

DTIVIEW>SHOW SYMBOLS<CR>

Number of symbols currently defined : 10
Number of symbols currently used : 5

Symbol no	FC	X position	Y position	Visible
1	95	51	26	YES
2	120	53	30	NO
3	54	60	60	YES
4	55	65	70	YES
5	56	75	52	YES

DTIVIEW>

THETA

Defines the amount of rotation applied to an isometric view in the y axis (ie. the tilt of an isometric view).

FORMAT: THETA rotation

Command parameters:

rotation

The amount of rotation specified in degrees. A real (floating point) value in the range 0 to -90 degrees is required.

DESCRIPTION:

The command THETA defines the degree of rotation in the y axis that is applied to an isometric terrain view. It therefore defines the tilt that is applied to the isometric view.

The default value of THETA is -30.0 degrees.

Use of the SHOW VIEW command is recommended to check on the y rotation value before a terrain view is generated.

Messages:

The following error messages are specific to the THETA command:

*** ERROR *** Specifying command THETA
Command requires 1 real argument

*** ERROR *** Specifying command THETA
Command requires a rotation value in the range 0 to -90 degrees

Examples:

DTIVIEW>THETA -20.0<CR>
DTIVIEW>

UNITS

Specifies the units of measurement that will be used when defining an area of interest in the input DTM, or the start and end points of a profile.

FORMAT: UNITS units

Command parameters:

units

A keyword defining the measurement units, chosen from:

MATRIX	Matrix grid interval units, i.e rows and columns
METRES	Metre values
SECONDS	Latitude and Longitude in seconds of arc
LATLONG	Latitude and Longitude in degrees, minutes and seconds
PROJECTION	Projection Record Units (eg. mms on the source document)

DESCRIPTION:

The UNITS command defines the units of measurement that will be used when defining an area of interest in the input DTM by means of the WINDOW command, when defining the start and end of a profile using the PROFILE command or defining a symbol position with the SYMBOL POSITION command.

The command also controls in what format coordinate information is output when the SHOW FILEIN or SHOW SYMBOLS commands are given.

The command should be given after defining the input DTI file, since an appropriate default units of measurement is set up whenever an input DTI file is opened.

Messages:

The following error messages are specific to the UNITS command:

*** ERROR *** Specifying command UNITS
Command qualifiers are MATRIX, METRES, SECONDS, LATLONG or PROJECTION

*** ERROR *** Specifying command UNITS
Command qualifier is invalid for the input file

Examples:

DTIVIEW> UNITS MATRIX<CR>
DTIVIEW>

WAIT

The WAIT command causes processing to be suspended for a specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number of seconds for which processing is to be suspended. A real (floating point) value is required.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following error message is specific to the WAIT command:

*** ERROR *** Specifying command WAIT
Command requires a real argument

Examples:

DTIVIEW> WAIT 4.0<CR>
DTIVIEW>

WINDOW

Specifies an area of interest in the input DTM.

FORMAT: **WINDOW** **xmin ymin xmax ymax**

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the defining rectangle.

xmax ymax

The coordinates of top right hand corner of the defining rectangle.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 4 integer values defining the rectangle in terms of column and row numbers

UNITS METRES - Requires 4 real (floating point) values defining the rectangle as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 4 real (floating point) values defining the absolute position of the rectangle in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 4 values defining the absolute latitude and longitude position of the rectangle in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 4 real (floating point) values defining the rectangle in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

If the command is given from the table menu, or the command WINDOW is given without any arguments, you will be asked to supply the values in response to explanatory prompts.

DESCRIPTION:

The WINDOW command is used to define a rectangular geographical area of interest in the DTM. Only nodes that lie within this area are used when generating an isometric or perspective terrain view.

The specified area of interest should lie within the geographical bounds of the DTM.

If the logical name LSL\$MATRIX_DEFAULT_WINDOW is defined with a value of "1", then a default area of interest defined in matrix units of bottom left hand corner 1,1 and top right hand corner 200,200 is set when the file is opened. If the logical name is absent or has any other value, or if the input DTI file has fewer than 200 columns or 200 rows, then a default window equivalent to the total matrix is set.

If a digitising table is available, and a map has been registered to the DTM, the coordinates of the window may be defined using any button on the table puck.

Messages:

The following messages are specific to the WINDOW command:

*** ERROR *** Specifying command WINDOW
The input DTM must be specified before WINDOW

*** ERROR *** Specifying command WINDOW using puck button
No map set up has been performed

*** ERROR *** Specifying command WINDOW
Command requires 4 arguments

*** ERROR *** Specifying command WINDOW
NE corner values must exceed SW corner values

*** ERROR *** Specifying command WINDOW
Supplied values exceed matrix extents

*** ERROR *** Specifying command WINDOW
Latitude and longitude values supplied in wrong format

Examples:

```
DTIVIEW>WINDOW 1 1 200 200<CR>
DTIVIEW>UNITS LATLONG<CR>
DTIVIEW>WINDOW 42 00 00N 3 00 00E 42 30 00N 2 58 40E
DTIVIEW>
```

ZLIMITS

Allocates the display colours only to height values that lie within the specified height range.

FORMAT: **ZLIMITS lower_height upper_height**

Command parameters:

lower_height

The lower height limit. An integer value is required.

upper_height

The upper height limit. An integer value is required.

DESCRIPTION:

The ZLIMITS command restricts the allocation of colours to profile vectors that have height values that lie within the specified height range. Profile vectors that lie outside the height range are shown in white when the terrain view is displayed on a colour graphics device, or are given a null feature code value when written to an output IFF file.

The supplied height values must lie within the minimum and maximum height values of the input DTM range.

Messages:

The following error messages are specific to the ZLIMITS command:

*** ERROR *** Specifying command ZLIMITS
Command requires 2 integer arguments

*** ERROR *** Specifying command ZLIMITS
Upper height value must exceed the lower height value

Examples:

DTIVIEW>**HEIGHT RANGE 50 250**CR>
DTIVIEW>

ZSCALE

Defines the vertical exaggeration that is applied to all DTM heights when generating a profile or, an isometric or perspective view.

FORMAT: **ZSCALE scale_factor**

Command parameters:

scale_factor

Scale_factor defines a z scaling factor that is applied to all DTM height values. A real (floating point) value is required.

DESCRIPTION:

The ZSCALE command defines a vertical exaggeration (z scale) factor. This is a value by which all DTM height values are multiplied before a profile, or an isometric or perspective view is generated.

By default no vertical exaggeration is applied ie. a z scale factor of 1 is used.

Use of the SHOW VIEW command is recommended to check on the status of the parameter before an isometric or perspective view is generated.

Messages:

The following error messages are specific to the ZSCALE command:

*** ERROR *** Specifying command EXAGGERATION
Command requires 1 real argument

Examples:

DTIVIEW>**ZSCALE 2.5**
DTIVIEW>

ZSTEP

Defines the height interval used when displaying an isometric or perspective view on a colour graphics device.

FORMAT: **ZSTEP height_interval**

Command parameters:

height_interval

The height interval. An integer value is required.

DESCRIPTION:

The ZSTEP command defines the height interval value that is used when displaying an isometric or perspective view on a colour graphics device.

A unique colour is allocated to each height band when the terrain view is drawn. For example if a ZSTEP interval of 100 is used, profile vectors generated from DTM nodes that fall within the range 1 to 100 will be shown in one colour, while profile vectors associated with DTM nodes with values in the range 101 to 200 will be shown in a different colour. Using this command it is possible to produce a height banded or layered terrain view for validation or analysis purposes.

The command may be used in conjunction with the ZLIMITS command.

When the DTM is first specified a default ZSTEP value is calculated by dividing the height range in the file by the default number of display colours appropriate to the current planes setting. Changing the number of display colours using the COLOURS command will alter the default ZSTEP value.

Messages:

The following error message is specific to the ZSTEP command:

*** ERROR *** Specifying command ZSTEP
Command requires 1 integer argument

Examples:

DTIVIEW>**ZSTEP 50**<CR>
DTIVIEW>

MESSAGES (OTHER)

In addition to messages which are generated by the program itself, other messages may be produced by Laser-Scan libraries. In particular, messages may be generated by the DTI library, and by the Laser-Scan I/O library, LSLLIB.

DTI library messages are introduced by '%DTI', and are documented in the DTILIB Reference Manual. In all cases the messages indicate a fatal error, that will cause processing to halt.

LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. Such messages rarely indicate a fatal error, and are generated most frequently by entering a command in an invalid format in response to the DTIVIEW prompt.

CHAPTER 3

MODULE DTIEDIT

MODULE **DTIEDIT**

REPLACES MATRIX module DTI

FUNCTION

DTIEDIT enables the interactive display and editing of a Laser-Scan Digital Terrain Image (DTI) file, using a VT100 compatible display. A number of non-interactive editing commands are also provided, and an option to output the matrix display to a line printer.

FORMAT

\$ DTIEDIT

PROMPTS

DTIEDIT is an interactive, command driven program. Command input is expected when the following prompt is issued:

DTIEDIT>

DESCRIPTION

GENERAL

DTIEDIT enables the interactive display and editing of a Laser-Scan Digital Terrain Image (DTI) file, using a VT100 compatible display. Interaction with the displayed data is via the keyboard keypad keys. A number of non-interactive editing commands are provided, and an option to output the matrix display to a line printer or disk file.

The program will handle all types of digital terrain image headers, and currently supported data formats (ie. bit,byte,word,longword and real).

The matrix is displayed as an image of up to 26 classes, with each class (ie. band of values) being represented by an alphabetic character (lowest A, highest Z). The class interval may be varied using the STEP command, while the range of values displayed may be defined using the LIMITS command.

The area of the matrix displayed, and available for editing, is determined using the ORIGIN command. It is possible to set the number of columns shown on the screen to either 80 or 132, and to scroll the display in the y direction using the keypad.

Two different modes of operation may be distinguished. Command line mode is used to issue program commands such as FILEIN and ORIGIN, while keypad mode is used to interact with the displayed data. The two modes of operation are described below.

COMMAND LINE MODE

Command line mode is signified by the prompt **DTIEDIT>** Commands may only be issued when this prompt is displayed on the screen. On invoking the program you are immediately placed in command line mode.

The commands that may be issued are documented in detail in the section on DTIEDIT commands. Commands are available to:

- o set terminal characteristics (SET SCREEN, ENABLE BELL)
- o define the Digital Terrain Image file (FILEIN)
- o define an area of interest in the DTI file (ORIGIN)
- o set matrix display parameters (LIMITS, STEP, RESET LIMITS, RESET STEP)
- o edit the matrix (ENABLE EDIT, EDIT AREA, EDIT LINE, EDIT POINT, SUBSTITUTE)

- o produce a hardcopy representation of the matrix (PRINT)
- o display the matrix and select keypad mode of operation (CHANGE)
- o provide information on commands and display parameters (HELP, SHOW DISPLAY)

KEYPAD MODE

The command CHANGE is used to transfer control from command line mode to keypad mode.

On giving the command, the DTI data is displayed on the screen as a series of characters. A different character is used for each separate value step. Character **A** is used to represent a value at the bottom of the range; character **Z** to represent a value at the top of the range. The characters **+** and **-** are used to indicate a data value that is either above or below the data display limits. Matrix points with a value of 0 are displayed using a space (ie. as an absent character).

Information on the current position of the screen cursor, and the data value at the matrix position, is shown on the bottom line of the screen. This information will change as the cursor is interactively moved around the matrix display.

Following the display of the matrix on the screen, the keypad keys (on the right of the keyboard) may be used to move the screen cursor around the display, and to edit the matrix data.

The keypad keys have the following meanings:

PF1	PF2	PF3	PF4
undefined	undefined	undefined	undefined
7 up & left	8 up	9 up & right	- edit
4 left	5 undefined	6 right	, return to command line mode
1 down & left	2 down	3 down & right	Enter
0 undefined		. define edit rectangle	undefined

The keypad keys **1 2 3 4 6 7 8 9** are used to move the screen cursor around the display. The arrow keys to the left of the keypad may also be used for this purpose.

Keypad key **','** is used to return to command line mode. **<CTRL/Z>** (pressing the Ctrl and Z keys together) may also be used to return to the command line prompt.

Keypad key **.'** may be used to select a rectangle in the matrix for editing. The key selects the bottom left hand corner of the area to be edited. Moving the cursor up or to the right of this point causes a rectangle to be pulled out in reverse video. If the edit key is now pressed (see below), all matrix points displayed in reverse video may be changed to a new value.

Keypad key **'-'** is used to edit a single matrix data value, or all data values in a rectangular area (if an area has been defined using the **.'** key). On pressing the key you will be prompted for a new data value on the bottom of the screen.

Editing of the matrix values is only possible if the ENABLE EDIT command has been previously given in command line mode. An indication of whether it is possible to edit the matrix values, is shown on the bottom line of the screen. If an attempt to edit a matrix point using the '-' key is made when editing is not enabled, an error message is generated.

If the '-' key is pressed, you will be prompted for a matrix value. The value is specified either using the numeric **keyboard** keys '+-1234567890.' or by means of the alpha keys **A - Z**. In the latter case, the character will be translated into a number defining the top of the band. The value is written to the matrix by means of the **<RETURN>** key.

In most situations, it is advisable to define a new value using the numeric keys.

The number supplied must be valid for the type of data held in the DTI file, and is validated against the following ranges:

- o BIT The number may have a value of 0 or 1.
- o BYTE The byte value is treated as unsigned. The number may have a value in the range 0 through 255.
- o WORD The number may have a value in the range -32,768 through 32,767.
- o LONG The number may have a value in the range -2,147,483,648 through 2,147,483,647.
- o REAL The number may have a value in the range .29 times 10 raised to the power of -38 through 1.7 times 10 raised to the power of 38.

The **** key causes the last digit of a value to be deleted, or if the value has been generated using an alpha key, the value to be cancelled. **<CTRL/U>** or **<CTRL/X>** have the same effect of cancelling a value.

To leave a matrix value unchanged, and return control to the keypad, simply press **<RETURN>** without entering a value.

DTIEDIT COMMANDS

@

Take command input from the specified file.

FORMAT: @ file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTIEDIT offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTIEDIT to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. the end of file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTIEDIT will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** ERROR *** Specifying command @
Command file specification is missing

*** ERROR *** Specifying command @
Unable to open indirect command file 'file-spec'

*** ERROR *** Specifying command @
Nested command files not supported

Examples:

```
DTIEDIT> @DTIEDIT_EDITS<CR>
DTIEDIT> DISABLE BELL
DTIEDIT> ENABLE EDIT
DTIEDIT> RETURN
DTIEDIT>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from command interpretation.

DESCRIPTION:

An exclamation mark is the standard MATRIX package comment delimiter. All text (and numbers) which lie to the right of a '!' character are excluded from command interpretation. Comments are useful for annotating command procedures used in batch processing etc.

Messages: None.

Examples:

DTIEDIT> **FILEIN TEST !open the file<CR>**
DTIEDIT> **!Define the screen width<CR>**
DTIEDIT> **SET SCREEN 132<CR>**
DTIEDIT>

CHANGE

The CHANGE command is used to transfer control from command line mode to keypad mode.

FORMAT: CHANGE

Command parameters: None

DESCRIPTION:

The CHANGE command transfers control from command line mode to keypad mode. On giving the command, the DTI data is displayed on the screen as a series of characters. Each character represents a separate value step. The step interval is defined when the DTI file is first opened, or may be specifically set using the STEP command. The LIMITS command controls the range of data values that will be shown.

The ORIGIN command determines which area of the matrix will be displayed. The column and row specified with the ORIGIN command will appear in the bottom lefthand corner of the screen.

Once the matrix has been displayed, it is possible to move the cursor around the screen using the appropriate keypad commands. If the command ENABLE EDIT has been previously specified, it is also possible to interactively edit the DTI data values. The introductory section provides full details on available keypad commands.

Control may be transferred back to command line mode using the keypad key ',' or by using <CTRL/Z> (pressing the Ctrl and Z keys together).

Note that the CHANGE command cannot be given from an indirect command file.

Messages:

The following messages are specific to the CHANGE command:

*** ERROR *** Specifying command CHANGE
No DTI file has been defined

*** ERROR *** Specifying command CHANGE
Command not valid when reading from a command file

*** ERROR *** Specifying command CHANGE
Terminal is not a VT100 compatible display

Examples:

DTIEDIT>**CHANGE**<CR>

DISABLE BELL

 Cancels a previous ENABLE BELL command

FORMAT: **DISABLE BELL**

DESCRIPTION:

DISABLE BELL turns off the audible warning that is normally given when an attempt is made to move the screen cursor beyond the lefthand or righthand edge of the screen, or outside the bounds of the DTI data area.

The current status of the option may be examined using the SHOW DISPLAY command.

Messages:

The following messages are specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are BELL or EDIT

Examples:

DTIEDIT>**DISABLE BELL**<CR>
DTIEDIT>

DISABLE EDIT

Disables the editing of DTI data values.

FORMAT: **DISABLE EDIT**

Command parameters: None

DESCRIPTION:

DISABLE EDIT is used to disable the editing of DTI data values. If EDIT is disabled, any attempt to change a data value using a command line EDIT command, or using the keypad key '-' in keypad mode, will be disallowed, and will cause the error message **Edit option is not enabled** to be displayed.

By default editing of the matrix is disabled, and if required must be enabled using the ENABLE EDIT command.

The current status of the option may be examined using the SHOW DISPLAY command.

Messages:

The following messages are specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Command qualifiers are BELL or EDIT

Examples:

DTIEDIT>**DISABLE EDIT**<CR>
DTIEDIT>

EDIT AREA

Changes the value of all matrix points in a rectangular area to a specified value.

FORMAT: **EDIT AREA xmin ymin xmax ymax data_value**

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the rectangle. An integer column and row value is required.

xmax ymax

The coordinates of top right hand corner of the rectangle. An integer column and row value is required.

data_value

The value to which the matrix points are to be changed. Depending on the type of data held in the DTI file, an integer or real data value is required. The data type also determines the valid range of the data value.

DESCRIPTION:

The EDIT AREA command is used to change the value of all matrix points in a rectangular area to a specified value.

The coordinates of the defining rectangle must lie within the bounds of the DTI file data area.

Note, that as with all DTI edit commands, the edit is performed immediately and 'in situ' on the current DTI file.

Messages:

The following messages are specific to the EDIT and EDIT AREA commands:

*** ERROR *** Specifying command EDIT
Command qualifiers are AREA, LINE, or POINT

*** ERROR *** Specifying command EDIT AREA
No DTI file has been defined

*** ERROR *** Specifying command EDIT AREA
The coordinates of the rectangle are out of range

*** ERROR *** Specifying command EDIT AREA
The top righthand point must exceed the bottom lefthand point

*** ERROR *** Specifying command EDIT AREA

The data value is missing

*** ERROR *** Specifying command EDIT AREA
The data value is invalid for the DTI data type

Examples:

DTIEDIT>EDIT AREA 1 1 34 45 345<CR>
DTIEDIT>

EDIT LINE

Changes the value of all matrix points along the defined line to a specified value.

FORMAT: **EDIT LINE xstart ystart xend yend data_value**

Command parameters:

xstart ystart

The coordinates of the line start point. An integer column and row value is required.

xend yend

The coordinates of the line end point. An integer column and row value is required.

data_value

The value to which the matrix points are to be changed. Depending on the type of data held in the DTI file, an integer or real data value is required. The data type also determines the valid range of the data value.

DESCRIPTION:

The EDIT LINE command is used to change the value of all matrix points along the defined line to a specified value.

The start and end points of the line must lie within the bounds of the DTI file data area.

Note, that as with all DTI edit commands, the edit is performed immediately and 'in situ' on the current DTI file.

Messages:

The following messages are specific to the EDIT and EDIT LINE commands:

*** ERROR *** Specifying command EDIT
Command qualifiers are AREA, LINE, or POINT

*** ERROR *** Specifying command EDIT LINE
No DTI file has been defined

*** ERROR *** Specifying command EDIT LINE
The coordinates of the line are out of range

*** ERROR *** Specifying command EDIT LINE
The data value is missing

*** ERROR *** Specifying command EDIT LINE

The data value is invalid for the DTI data type

Examples:

DTIEDIT>**EDIT LINE 12 24 34 45 345<CR>**
DTIEDIT>

EDIT POINT

Changes a single matrix point to a specified value.

FORMAT: **EDIT POINT x_coord y_coord data_value**

Command parameters:

x_coord y_coord

The coordinates of the matrix point. An integer column and row value is required.

data_value

The value to which the matrix point is to be changed. Depending on the type of data held in the DTI file, an integer or real data value is required. The data type also determines the valid range of the data value.

DESCRIPTION:

The EDIT POINT command is used to change the value of a single matrix point to a specified value.

The point must lie within the bounds of the DTI file data area.

Note, that as with all DTI edit commands, the edit is performed immediately and 'in situ' on the current DTI file.

Messages:

The following messages are specific to the EDIT and EDIT POINT commands:

*** ERROR *** Specifying command EDIT
Command qualifiers are AREA, LINE, or POINT

*** ERROR *** Specifying command EDIT POINT
No DTI file has been defined

*** ERROR *** Specifying command EDIT POINT
The coordinates of the point are out of range

*** ERROR *** Specifying command EDIT POINT
The data value is missing

*** ERROR *** Specifying command EDIT POINT
The data value is invalid for the DTI data type

Examples:

DTIEDIT>**EDIT POINT 34 45 345**<CR>
DTIEDIT>

ENABLE BELL

Enables the output of an audible warning when an attempt is made to move the cursor outside the display area.

FORMAT: **ENABLE BELL**

Command parameters: None

DESCRIPTION:

ENABLE BELL selects the output of an audible warning when an attempt is made to move the screen cursor beyond the lefthand or righthand edge of the screen, or outside the bounds of the DTI data area.

An explanatory warning message is displayed on the bottom line of the screen.

By default the option is selected, and may be disabled using the DISABLE BELL command.

Messages:

The following messages are specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE
Command qualifiers are BELL or EDIT

Examples:

DTIEDIT>**ENABLE BELL**<CR>
DTIEDIT>

ENABLE EDIT

Enables the option to edit matrix values using the EDIT commands, or interactively when in change mode.

FORMAT: **ENABLE EDIT**

Command parameters: None

DESCRIPTION:

ENABLE EDIT selects the option of editing matrix values. By default editing of the matrix is disabled. The ENABLE EDIT command must therefore be given in order to use the various command line EDIT commands, or in order to edit values when in keypad mode.

If an attempt to edit the matrix is made before the ENABLE EDIT command is given, an error message is generated.

The current status of the option may be examined using the SHOW DISPLAY command.

Messages:

The following messages are specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE
Command qualifiers are BELL or EDIT

Examples:

DTIEDIT>**ENABLE EDIT**<CR>
DTIEDIT>

EXIT

Terminates the program.

FORMAT: **EXIT**

Command parameters: None.

DESCRIPTION:

The EXIT command is used to exit from DTIEDIT.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to exit from the program.

If the values in the DTI file have been edited such that the minimum and maximum value range has been changed, the range values in the header of the DTI file will be updated before the file is closed.

Messages:

The following message is specific to the EXIT command:

Updating minimum and maximum range values - Please wait.

Examples:

DTIEDIT>**EXIT**<CR>

\$

FILEIN

Selects and opens the input DTI file.

FORMAT: **FILEIN file-spec**

Command parameters:

file-spec

The specification for the input DTI file.
Any part of the file specification not supplied is taken from the
default 'LSL\$DTI:DTI.DTI'.

DESCRIPTION:

The FILEIN command opens and maps into memory a DTI file.
Details derived from the header of the file are displayed on the terminal to
confirm that the file has been successfully opened.

On reading a file, the values associated with the ORIGIN command are set to
column 1, row 1, and the data value range in the file is used to calculate a
default display step interval. The values associated with the LIMITS command
are set to the minimum and maximum data values contained in the header.

Messages:

The following error message is specific to the FILEIN command:

*** ERROR *** Specifying command FILEIN
Input DTI filename is missing

Example:

DTIEDIT>**FILEIN TEST<CR>**

LSL\$DTI:TEST.DTI

Header: LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	851		

DTIEDIT>

HELP

Give help on a subject

FORMAT: HELP command

Command parameters:

command

The command on which help is required.

Description:

A brief description is given of the function and format of the specified command.

The information is extracted from the DTIEDIT section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

If no parameter is specified, a list of all the commands available in DTIEDIT is displayed.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTIEDIT>HELP FILEIN<CR>

DTIEDIT

FILEIN

The FILEIN command opens and maps into memory a DTI file.
Details derived from the header of the file are displayed on the terminal to confirm that the file has been successfully opened.

DTIEDIT>

LIMITS

Defines lower and upper data display limits.

FORMAT: LIMITS lower_value upper_value

Command parameters:

lower_value upper_value

The lower and upper data value limits. Two integer values are required.
Both values must lie within the file minimum and maximum data values.

DESCRIPTION:

The LIMITS command is used to define lower and upper data display limits.

When the CHANGE command is given, any data value that lies below the lower limit is shown using the character '-', while a data value above the upper limit is shown as the character '+'.
By default the LIMITS values are set to the minimum and maximum data values in the DTI file, when the file is opened. The LIMITS command is used to change these defaults, while the RESET LIMITS command may be used to reset to the default values.

Note that if the data display range specified with the LIMITS command, when taken in conjunction with the current STEP value, results in the generation of more than 26 step intervals, the STEP value is adjusted appropriately.

After giving the LIMITS command, details of the current limits and step values, are shown on the terminal.

Messages:

The following messages are specific to the LIMITS command:

*** ERROR *** Specifying command LIMITS
Command requires 2 integer arguments

*** ERROR *** Specifying command LIMITS
Upper value must exceed lower value

Examples:

DTIEDIT>LIMITS 120 550<CR>

```
Display Origin      :      1      1
Data Display Limits :    120    550
Data Display Step   :     50
```

Screen Width : 80
Warning Bell : Off

Edit of Data Values : Off

DTIEDIT>

ORIGIN

Defines the display origin.

FORMAT: ORIGIN x_coord y_coord

Command parameters:

x_coord y_coord

The coordinates of the matrix point that will be displayed at the bottom lefthand corner of the screen. An integer column and row value is required.

DESCRIPTION:

The ORIGIN command is used to define the origin of the display. The coordinate values supplied with the command determine which area of the matrix will be displayed on the screen. The specified matrix point will appear at the bottom lefthand corner of the screen when the matrix is displayed using the CHANGE command.

The screen cursor will automatically be positioned on this point.

The coordinates supplied with the command must lie within the bounds of the DTI file.

The number of columns of data displayed is dependent on the size of the matrix and the current screen width defined using the SET SCREEN command.

Messages:

The following messages are specific to the ORIGIN command:

*** ERROR *** Specifying command ORIGIN
Command requires 2 integer arguments

*** ERROR *** Specifying command ORIGIN
No DTI file has been defined

*** ERROR *** Specifying command ORIGIN
The coordinates of the origin are out of range

Examples:

DTIEDIT>ORIGIN 120 50<CR>
DTIEDIT>

PRINT

Outputs an area of the matrix in a classified form, to a printer or to a specified file.

FORMAT: **PRINT number_columns number_rows [file-spec]**

Command parameters:

number_columns

The number of columns to output. An integer value is required.

number_rows

The number of rows to output. An integer value is required.

file_spec

An optional parameter specifying the output list file. If no file specification is supplied, a temporary file DTIEDIT.DAT will be created, which will be spooled to SYS\$PRINT, and deleted once listed. Any file specification supplied will be parsed against the default DTIEDIT.DAT.

DESCRIPTION:

The PRINT command is used to output the whole or part of the DTI file, either to a disk file, or to a printer on SYS\$PRINT. The data values are output in the same classified form as they would appear on the screen if the CHANGE command is given.

The area output is determined by the current ORIGIN values, and by the parameter arguments.

The number of columns output may not exceed 132. The number of columns will be truncated if necessary. There is no restriction on the number of rows that may be output.

Current LIMITS and STEP values are used to determine the representation of the matrix values.

Messages:

The following messages are specific to the PRINT command:

*** ERROR *** Specifying command PRINT
No DTI file has been defined

*** ERROR *** Specifying command PRINT
Number of columns exceeds 132
Number of columns will be truncated

Examples:

MATRIX REFERENCE (3.7): DTIEDIT - DTI File Screen Editor
PRINT command

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DTIEDIT>**PRINT 100 100<CR>**
DTIEDIT>

RESET LIMITS

Sets the lower and upper data display limits to the minimum and maximum data values in the DTI file.

FORMAT: RESET LIMITS

Command parameters: None.

DESCRIPTION:

The command RESET LIMITS is used to set the lower and upper matrix display limits to the minimum and maximum data values in the DTI file. The command is generally used to return to the default values, when the lower and upper display values have been previously set using the LIMITS command, or to set the limits to be equal to new DTI minimum and maximum values.

Note that if the data display range when taken in conjunction with the current STEP value, results in the generation of more than 26 step intervals, the STEP value is adjusted appropriately.

After giving the RESET LIMITS command, details of the current limits and step values, are shown on the terminal.

Messages:

The following messages are specific to the RESET and RESET LIMITS commands:

*** ERROR *** Specifying command RESET
Command qualifiers are LIMITS, MINMAX or STEP

*** ERROR *** Specifying command RESET LIMITS
No DTI file has been defined

Examples:

DTIEDIT>**RESET LIMITS**<CR>

Display Origin : 1 1

Data Display Limits : 120 550

Data Display Step : 50

Screen Width : 80

Warning Bell : Off

Edit of Data Values : Off

DTIEDIT>

RESET MINMAX

Determines the minimum and maximum data values in the DTI file.

FORMAT: RESET MINMAX

Command parameters: None.

DESCRIPTION:

The command RESET MINMAX is used to determine the minimum and maximum data values in the DTI file. The command is generally used to recalculate the minimum and maximum range following a series of edit commands, and often preceding a RESET LIMITS command. The newly determined values are written to the header of the DTI file.

Note, that if any edits are performed on the DTI file, and no RESET MINMAX command is given before the EXIT command is used, the minimum and maximum data values will be calculated before closing the DTI file.

The message **Determining minimum and maximum values - please wait** indicates that the data values are being calculated.

After giving the RESET MINMAX command, details from the DTI header are output to the terminal.

Messages:

The following messages are specific to the RESET and RESET MINMAX commands:

*** ERROR *** Specifying command RESET
Command qualifiers are LIMITS, MINMAX or STEP

*** ERROR *** Specifying command RESET MINMAX
No DTI file has been defined

Examples:

DTIEDIT>RESET MINMAX<CR>

LSL\$DTI:TEST.DTI

Header: LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Window	SW:	1	1	NE:	200	200
Matrix Interval	E:	1		N:	1	
Value Range	:		0	to	851	

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RESET MINMAX command

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DTIEDIT>

RESET STEP

Calculates a default display step interval from the current lower and upper limit values.

FORMAT: **RESET STEP**

Command parameters: None.

DESCRIPTION:

The command RESET STEP is used to calculate a default display step interval. The step interval is calculated using the the current lower and upper limit values. The procedure involves divided the current limit range by 26.

After giving the RESET STEP command, details of the current limits and step values, are shown on the terminal.

Messages:

The following messages are specific to the RESET and RESET STEP commands:

*** ERROR *** Specifying command RESET
Command qualifiers are LIMITS, MINMAX or STEP

*** ERROR *** Specifying command RESET STEP
No DTI file has been defined

Examples:

DTIEDIT>**RESET STEP**<CR>

```
Display Origin      :      1      1
Data Display Limits :    120    550
Data Display Step   :     50
Screen Width        :     80
Warning Bell        :    Off
Edit of Data Values :    Off
```

DTIEDIT>

RETURN

Restores command input from an indirect command file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect command file to SYS\$COMMAND.

A typical application is to use an indirect command file to set up a number of run time defaults for a flowline, and then return to input from the terminal for the run specific commands. To do this RETURN must be the last command in the indirect command file.

A RETURN command is only valid if present in a command file.

Messages:

The following messages are specific to the RETURN command:

*** ERROR *** Specifying command RETURN
The RETURN command is only valid in a command file

Returning to terminal input

Examples:

```
DTIEDIT> @SETUP<CR>
DTIEDIT> ENABLE EDIT
DTIEDIT> DISABLE BELL
DTIEDIT> RETURN
Returning to terminal input
DTIEDIT>
```

SET SCREEN

The SET SCREEN command sets the width of the terminal screen. A width of 80 or 132 characters may be selected.

FORMAT: SET SCREEN width

Command parameters:

width

The screen width. An integer value of 80 or 132 is required.

DESCRIPTION:

The SET SCREEN command is to change the the width of the terminal screen. A width of 80 or 132 characters may be selected. The width value is used when the matrix values are displayed on the screen using the CHANGE command.

The current screen width may be examined using the SHOW DISPLAY command.

Messages:

The following error messages are specific to the SET and SET SCREEN commands:

*** ERROR *** Specifying command SET
Command qualifier is SCREEN

*** ERROR *** Specifying command SET SCREEN
Command requires an integer argument

*** ERROR *** Specifying command SET SCREEN
Valid screen widths are 80 or 132

Examples:

DTIEDIT> SET SCREEN 132<CR>
DTIEDIT>

SHOW DISPLAY

Shows information on the parameters that control how the DTI data values will be displayed on the screen when the CHANGE command is given.

FORMAT: SHOW DISPLAY

Command parameters: None.

DESCRIPTION:

The command SHOW DISPLAY may be used to examine the current status of the parameters that control how the DTI data values will be displayed on the screen.

Information on the ORIGIN, LIMITS, and STEP, along with details of the screen width is given. The status of the BELL and EDIT options are shown.

Messages:

The following message is specific to the command SHOW:

*** ERROR *** Specifying command SHOW
Command qualifiers are DISPLAY or FILEIN

Examples:

DTIEDIT>SHOW DISPLAY<CR>

Display Origin	:	1	1
Data Display Limits	:	120	550
Data Display Step	:	50	
Screen Width	:	80	
Warning Bell	:	Off	
Edit of Data Values	:	Off	

DTIEDIT>

SHOW FILEIN

Displays information extracted from the header of the input DTI file.

FORMAT: **SHOW FILEIN**

Command parameters: None.

DESCRIPTION:

Details extracted from the header of the DTI file are displayed on the terminal.
The header values are shown in the current units of measurement.

Messages:

The following messages are specific to the commands SHOW and SHOW FILEIN:

*** ERROR *** Specifying command SHOW
Command qualifiers are DISPLAY, FILEIN

*** WARNING *** The input DTI file is undefined

Examples:

DTIEDIT>**SHOW FILEIN**<CR>

LSL\$DTI:TEST.DTI

Header: LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Window	SW:	1	1	NE:	200	200
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	851		

DTIEDIT>

SPAWN

The SPAWN command enables a subprocess to be created from within DTIEDIT.

FORMAT: SPAWN command-line

Command parameters:

command-line

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTIEDIT. The command line cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within DTIEDIT. When the subprocess terminates, control is returned to DTIEDIT.

Messages:

The following error messages are specific to the SPAWN command:

*** ERROR *** Specifying command SPAWN
Command requires a valid DCL command line

*** ERROR *** Specifying command SPAWN
DCL command line cannot exceed 80 characters

*** ERROR *** Unable to spawn command, returning to DTIEDIT

Examples:

DTIEDIT> SPAWN DIRECTORY LSL\$DTI:*.DTI<CR>

Directory DUA3:[LSL.DTI]

TEST1.DTI;1	8/8	18-AUG-1987 07:56	[LSL,DAVEC]
TEST2.DTI;1	7/8	18-AUG-1987 17:17	[LSL,DAVEC]
TEST2.DTI;2	7/8	18-AUG-1987 17:34	[LSL,DAVEC]

Total of 3 files, 22/24 blocks.

DTIEDIT>

STEP

Defines the display step interval.

FORMAT: **STEP step_interval**

Command parameters:

step_interval

The display step interval. A positive integer value is required.

DESCRIPTION:

The command STEP is used to set a display step interval, and therefore to classify the data into a series of value ranges. When the CHANGE command is given a different letter will be used by used to display each step range.

A default step interval is calculated when the DTI file is first opened, or when the RESET STEP command is given, using the lower and upper limit values. This default may be changed using the STEP command.

Note that if the step interval value, taken in conjunction with the current lower and upper display limit values, results in the generation of more than 26 step intervals, the upper limits value is adjusted appropriately.

After giving the STEP command, details of the current limits and step values, are shown on the terminal.

Messages:

The following messages are specific to the STEP command:

*** ERROR *** Specifying command STEP
Command requires an integer argument

*** ERROR *** Specifying command STEP
Command requires a positive integer argument

Examples:

DTIEDIT>**STEP 100**<CR>

Display Origin : 1 1

Data Display Limits : 120 550

Data Display Step : 100

Screen Width : 80

Warning Bell : Off

Edit of Data Values : Off

DTIEDIT>

SUBSTITUTE

Substitutes with a new value all matrix points having a specified value.

FORMAT: **SUBSTITUTE [AREA xmin ymin xmax ymax] old_value new_value**

Command parameters:

AREA

An optional qualifier that enables the value substitution to be restricted to a rectangular area defined by the parameters xmin, ymin, xmax and ymax. If the qualifier is not given, substitution is performed on an area corresponding to the total matrix.

xmin ymin

The coordinates of the bottom left hand corner of the rectangle. An integer column and row value is required.

xmax ymax

The coordinates of top right hand corner of the rectangle. An integer column and row value is required.

old_value

The existing matrix value which is to be changed. Depending on the type of data held in the DTI file, an integer or real data value is required. The data type also determines the valid range of the data value.

new_value

The matrix value which is to be substituted. Depending on the type of data held in the DTI file, an integer or real data value is required. The data type also determines the valid range of the data value.

DESCRIPTION:

The SUBSTITUTE command is used to replace all occurrences of a matrix data value with a new data value eg. using the command SUBSTITUTE 4 24, all matrix points with a value of 4 are replaced by a value of 24.

Using the AREA qualifier, substitution may be restricted to a rectangular area. The coordinates of the defining rectangle are supplied as command parameters, and must lie within the bounds of the DTI file data area. If the AREA qualifier is not present, substitution is performed on the total DTI file.

Note, that as with all DTI edit commands, the edit is performed immediately and 'in situ' on the current DTI file.

Messages:

The following messages are specific to the SUBSTITUTE and SUBSTITUTE AREA commands:

*** ERROR *** Specifying command SUBSTITUTE
No DTI file has been defined

*** ERROR *** Specifying command SUBSTITUTE AREA
The coordinates of the rectangle are out of range

*** ERROR *** Specifying command SUBSTITUTE AREA
The top righthand point must exceed the bottom lefthand point

*** ERROR *** Specifying command SUBSTITUTE
The data value is invalid for the DTI data type

Examples:

DTIEDIT>**ENABLE EDIT** <CR>
DTIEDIT>**SUBSTITUTE AREA 1 1 34 45 345 23**<CR>
DTIEDIT>

UNITS

Specifies the units of measurement that will be used to display header details from the DTI file.

FORMAT: UNITS units

Command parameters:

units

A keyword defining the measurement units, chosen from:

MATRIX	Matrix grid interval units, i.e rows and columns
METRES	Metre offsets from the south west corner of the DTM
SECONDS	Latitude and Longitude in seconds of arc
LATLONG	Latitude and Longitude in degrees, minutes and seconds
PROJECTION	Projection Record Units (eg. mms. on the source document)

DESCRIPTION:

The UNITS command controls in what format details from the header of the DTI are displayed, when the SHOW FILEIN command is given.

The command should be given after defining the input DTI file, since DTI matrix units are always used by default when a file is opened.

Messages:

The following error messages are specific to the UNITS command:

*** ERROR *** Specifying command UNITS
Command qualifiers are MATRIX, METRES, SECONDS, LATLONG or PROJECTION

*** ERROR *** Specifying command UNITS
Command qualifier is invalid for the input file

Examples:

DTIEDIT> UNITS MATRIX<CR>
DTIEDIT>

DTIEDIT examples

EXAMPLES

\$ DTIEDIT

DTIEDIT>**FILEIN TEST <CR>**

LSL\$DTI:TEST.DTI

Header: LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	301	251
Matrix Window	SW:	1	1	NE:	200	200
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	851		

DTIEDIT>**ENABLE EDIT<CR>**

DTIEDIT>**EDIT AREA 1 1 50 50 50 <CR>**

DTIEDIT>**EDIT AREA 30 30 40 40 200 <CR>**

DTIEDIT>**EDIT LINE 1 1 10 10 100 <CR>**

DTIEDIT>**PRINT 50 50 <CR>**

DTIEDIT>**EXIT <CR>**

Determining minimum and maximum values - please wait

\$

In the example above command line mode is used to define the input DTI file; to enable the editing of the file; to perform three edits on the matrix data, and to print the results of the edit on the lineprinter.

The representation of 50 columns and 50 rows of the matrix, as it would appear on the lineprinter is shown below.

DTI file: LSL\$DTI:TEST.DTI DTI window: SW 1 1 NE 50 50
Character Values: <space>=0 ,A = 1 to 50, Z=1251 to 1300, step=50

DTIEDIT messages

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by by Laser-Scan libraries. In particular, messages may be generated by the DTI library or by the Laser-Scan I/O library, LSLLIB. DTI library messages are introduced by %DTI and are documented in the MATRIX Reference manual. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are often used to explain the details of program generated errors.

If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis.

CHAPTER 4

MODULE DTIBLEND

MODULE DTIBLEND

REPLACES None. DTIBLEND is a new MATRIX utility.

FUNCTION

DTIBLEND is the MATRIX DTI file edge blend utility. It takes as input two DTI files, usually containing terrain elevation models, and edge matches them to avoid value discontinuities at the matrix adjoining edge. Options are provided to hold one matrix unchanged while smoothing the other to match it, or to smooth both matrices to a common mean along the edge. An option is provided to read in IFF vector data for use as control to the smoothing process.

FORMAT

\$ DTIBLEND

COMMAND QUALIFIERS

None, DTIBLEND is command driven.

DTIBLEND COMMAND DEFAULTS

On program startup, the following command defaults apply:

BORDER	- 3.
DIAGNOSTICS	- disabled.
DIVIDEBY	- 1.0, i.e. disabled.
IN_SITU	- disabled.
MULTIPLYBY	- 1.0, i.e. disabled.
NULL	- -DTILIB default for data-type.
PME	- disabled.
SMOOTH	- disabled.
THRESHOLD	- disabled.
TOFEET	- disabled.
TOMETRES	- disabled.

DESCRIPTION

General

DTIBLEND is the MATRIX DTI file edge blend utility. It takes as input two DTI files, usually containing terrain elevation models, and edge matches them to avoid value discontinuities at the matrix adjoining edge.

Processing options are:

- o hold one matrix unchanged while smoothing the other to match it, or
- o smooth both matrices to a common mean along the edge.
- o read in IFF vector data for use as control to the smoothing process.
- o process in_situ, i.e. open both input files for read and write access. This option is useful when edge blending large DTI files when the user's virtual address quota is inadequate for opening additional DTI files for output.
- o override of default blend border width (3 posts).
- o report changes that exceed a user specified threshold value and:
 1. output editing directives to ROVER guidance files,
 2. generate a listing file.

DTIBLEND and null post handling

Provision for null post handling is made within DTIBLEND. Any null post values found within the blend zone (of width defined by the BORDER command) will be omitted from the edge blend process. If the null value occurs at either or both ends of the blend profile no posts within that profile will be changed. Messages will be sent to the terminal or to the optional listing file and ROVER guidance files, which will draw attention to any processing omissions caused by null post detection.

DTIBLEND typical command sequence

Detailed descriptions of the individual commands available are given below.

A typical command sequence is:

```
HOLD TESTDATA1          - open LSL$DTI:TESTDATA1.DTI;0 for readonly
                          input. The edge of this file will be held
                          as control for the corresponding edge of the file
                          opened with the BLEND command.

BLEND TESTDATA2 TESTDATA2__BLENDED
                          - open LSL$DTI:TESTDATA2.DTI;0 for readonly input.
                          This file will be copied to
                          LSL$DTI:TESTDATA2__BLENDED.DTI;0. The edge of this
                          copied file will then be brought into
                          vertical alignment with the corresponding
                          edge of the HOLD file LSL$DTI:TESTDATA1.DTI;0.

IFF TEST__CONTROL.IFF    - open LSL$IF:TEST__CONTROL.IFF:0 for readonly
                          input. The vector data in this file will be used
                          to control the amount of change allowed in the edge
                          blend process.

BORDER 5                 - blend 5 posts in from the blend edge.

GO                        - start processing
```

This series of commands specifies that DTIBLEND is to edge blend two DTI files: LSL\$DTI:TESTDATA1.DTI;0 as the control (unchanged) file and LSL\$DTI:TESTDATA2.DTI;0 as the file which is to be blended to fit it.

Output is to be to a new DTI file; LSL\$DTI:TESTDATA2_BLEND.DTI;0.

When adjusting the BLEND file edge post values relative to the HOLD file, the edge blend process is to be further controlled by reference to vector data held in an IFF file LSL\$IF:TEST_CONTROL.IFF:0.

DTIBLEND commands

@

Take command input from the specified file.

FORMAT: @ file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied for the @ command will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTIBLEND offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTIBLEND to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. end-of-file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTIBLEND will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** WARNING *** "@" must precede a file-spec

*** WARNING *** Indirect file error - returning to terminal input

*** ERROR *** Can't open indirect command file 'file-spec'

Examples:

```
$ DTIBLEND<CR>
MATRIX module DTIBLEND of 18:30:39 18-FEB-88
DTIBLEND> @PRESETS<CR>
DTIBLEND> ENABLE DIAGNOSTICS
DTIBLEND> BORDER 5
DTIBLEND> RETURN
DTIBLEND>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard MATRIX package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc_.

Messages: None.

Examples:

DTIBLEND> ! a comment for the sake of it<CR>
DTIBLEND> BORDER 2 ! just blend the very edge posts only<CR>

BLEND

Specifies a DTI file that is to be opened and blended and optionally the name of the output file which is to receive the results of the blend processing.

FORMAT: BLEND dti-file-spec [output-dti-file-spec]

COMMAND PARAMETERS:

dti-file-spec

The specification of the DTI file to be opened for blend input.

If the optional IN_SITU option is enabled, this file will be opened for both read and write and will be modified by the edge blend process.

Any parts of the file-spec not supplied will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

output-dti-file-spec

The specification of the DTI file to be opened for blend output.

Any parts of the file-spec not supplied will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

If the optional IN_SITU option is enabled, this file-spec is not required.

DESCRIPTION:

Specifies a DTI file that is to be opened and blended. If the IN_SITU option is enabled, the DTI file will be opened for read and write (modify) access. If the IN_SITU option is disabled (default) the BLEND command must be given two file-specification arguments. In this situation the file defined by the first file-spec is opened readonly as the input file and the second is opened with write access as the output file.

If the user wishes to blend two DTI files to a common mean edge value two BLEND commands should be used instead of one BLEND and one HOLD command.

It is recommended that the IN_SITU processing option is not normally used, as it will irrevocably modify the source input file (of which the user may not have another copy). The IN_SITU option is, however, useful when edge blending large DTI files when the user's virtual address quota or disk space is inadequate for opening additional DTI files for output.

At least one BLEND command must be issued before the GO command will be accepted.

Messages:

The following messages are specific to the BLEND command:

```
*** ERROR *** Unable to interpret input file-spec

*** ERROR *** Two BLEND commands have already been accepted!
                DTIBLEND requires either a HOLD command and a BLEND command
                or two BLEND commands

*** ERROR *** You must specify a file-spec argument to the BLEND command

*** ERROR *** You must specify two file-spec arguments to
                the BLEND command.
                For example BLEND SW301.DTI SW301OUT.DTI

*** ERROR *** You must specify two file-spec arguments to
                the BLEND command if the IN__SITU option is disabled.

*** ERROR *** Reading BLEND output file-spec

*** ERROR *** Unable to interpret BLEND file-spec
```

Examples:

DTIBLEND> BLEND SOIL SOIL2<CR>

File : LSL\$DTI:SOIL.DTI;0
Header : MIKE Data: REAL

Units are DTI Matrix Values.

Matrix Coverage	SW:	1	1	NE:	449	449
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	-5.00	to	326421.00		

File : LSL\$DTI:SOIL2.DTI;0
Header : MIKE Data: REAL

Units are DTI Matrix Values.

Matrix Coverage	SW:	1	1	NE:	449	449
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	-5.00	to	326421.00		

DTIBLEND>

BORDER

Specifies the width (expressed matrix units) of the blend zone within each DTI file opened for blend.

FORMAT: **BORDER width**

Command parameters:

width

The width (expressed matrix units) of the blend zone within each DTI file opened for blend. This must lie in the range 2 to 5.

If the DTI files adjoin top to bottom width indicates the number of rows to be blended parallel to the adjoining edge. If the DTI files adjoin side by side width indicates the number of columns to be blended parallel to the adjoining edge.

Description:

The value supplied for the BORDER command (expressed matrix units) determines the width of the blend zone within each DTI file opened for blend. If the DTI files adjoin top to bottom, BORDER width indicates the number of rows to be blended parallel to the adjoining edge. If the DTI files adjoin side by side, BORDER width indicates the number of columns to be blended parallel to the adjoining edge.

The row or column that lies along the mutual join between the 2 DTI files is treated as part of the blend zone and is included in the BORDER width. In other words, the blend zone width within each BLEND DTI file will be BORDER-1 times the matrix grid interval for that axis. Thus using two blend commands and the default BORDER width of 3, and the DTI files adjoin top to bottom, the edge row and the two adjacent rows in each DTI file will be modified.

By default DTIBLEND applies a BORDER value of 3.

Messages:

The following warning messages are specific to the BORDER command:

*** WARNING *** You must specify an integer argument to the BORDER command
 For example BORDER 3

*** ERROR *** Invalid border width.
 BORDER arguments must lie in the range 2 to 5

Examples:

DTIBLEND> **BORDER 8<CR>**

ERROR Invalid border width.
BORDER arguments must lie in the range 2 to 5
DTIBLEND> **BORDER 5**<CR>
DTIBLEND>

DESELECT FC

Deselects specified IFF feature codes. Any IFF features having the specified feature codes will be excluded as control for the blend process.

FORMAT: **DESELECT FC feature-code[,...]**

Command parameters:

feature-code

An IFF feature code which must lie in the range 0 to 32767. Multiple feature codes may be specified separated by commas or spaces. Ranges of feature codes may be specified by separating the range start and stop values by a colon, e.g. DESELECT FC 2:6 will result in the deselection of feature codes 2,3,4,5 and 6.

If an FRT file has been read into DTIBLEND any valid feature code group names may be used as arguments to the DESELECT FC command.

DESCRIPTION:

The DESELECT FC command complements the SELECT FC command. DESELECT FC enables the user to prevent DTIBLEND from reading in any IFF features which have the specified feature codes.

On program startup all FCs are selected for input.

Specific FC selections may then be made with the SELECT FC command. Only the specified FCs will be used for input. All FCs not explicitly specified in a SELECT FC command will be then excluded from input.

ALL FC and layer selections are cancelled by the SELECT ALL command; i.e. all layers and FCs are reselected for input.

Messages:

The following warning messages are specific to the DESELECT FC command:

```
*** WARNING *** You must have read an FRT file to be able to use group names
*** WARNING *** No groups have been defined in the FRT
*** WARNING *** Illegal feature code 'integer'
*** WARNING *** Bad group name 'group-name'
```

Examples:

```
DTIBLEND> DESELECT FC 6:9,WATER,126<CR>
DTIBLEND>
```

DESELECT LAYER

Deselects specified IFF layers. Any IFF features lying within the specified layers will be excluded as control for the blend process.

FORMAT: **DESELECT LAYER layer[,...]**

Command parameters:

layer

An IFF layer number must lie in the range 0 to 32767. Multiple layers may be specified separated by commas or spaces. Ranges of layers may be specified by separating the range start and stop values by a colon, e.g. Deselect LAYER 2:6 will result in the deselection of layers 2,3,4,5 and 6.

DESCRIPTION:

The Deselect LAYER command complements the SELECT LAYER command. Deselect LAYER enables the user to prevent DTIBLEND from reading in any IFF features which lie within the specified layers.

The Deselect LAYER command complements the SELECT LAYER command. Deselect LAYER enables the user to prevent DTIBLEND from reading in any IFF features which lie within the specified layers.

On program startup all layers are selected for input.

Specific layer selections may then be made with the SELECT FC command. Only the specified layers will be used for input. All layers not explicitly specified in SELECT LAYER commands will be then excluded from input.

ALL FC and layer selections are cancelled by the SELECT ALL command; i.e. all layers and FCs are reselected for input.

Messages:

The following warning messages are specific to the Deselect LAYER command:

```
*** WARNING *** Too many layer arguments in one command
*** WARNING *** Illegal layer number 'integer'
```

Examples:

```
DTIBLEND> Deselect LAYER 21:29,126<CR>
DTIBLEND>
```

DISABLE DIAGNOSTICS

Disables a previous ENABLE DIAGNOSTICS command.

FORMAT: DISABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

DISABLE DIAGNOSTICS allows the user to disable a previous ENABLE DIAGNOSTICS command.

Messages: None.

Examples:

```
DTIBLEND> ENABLE DIAGNOSTICS<CR>
DTIBLEND> SHOW ENABLE<CR>
DIAGNOSTICS ..... On
DIVIDEBY ..... Off
INTEGER_HEIGHT ..... Off
(Incoming IFF heights expected in type 3 AC entries)
IN_SITU ..... Off
MULTIPLY ..... Off
PME ..... Off
SMOOTH ..... Off
TOFEET ..... Off
TOMETRES ..... Off
DTIBLEND>
```

DISABLE DIVIDEBY

Disables a previous ENABLE DIVIDEBY command.

FORMAT: **DISABLE DIVIDEBY**

Command parameters: None.

DESCRIPTION:

DISABLE DIVIDEBY allows the user to disable a previous ENABLE DIVIDEBY command.

Messages: None.

Examples:

DTIBLEND> **DISABLE DIVIDEBY**<CR>
DTIBLEND>

DISABLE IN SITU cancels the effect of a previous ENABLE IN SITU command.

Command parameters: None.

By default DTIBLEND requires an output file specification to be supplied for the BLEND command. It then creates and opens this file to receive the results of the blend process. Like a HOLD input DTI file, the input DTI file opened with a BLEND command is not altered in any way.

ENABLE IN SITU enables in-situ processing of the DTI file opened for BLEND.

DISABLE IN_SITU cancels the effect of a previous ENABLE IN_SITU command. However, any DTI input files that have already been specified using BLEND commands when INSITU mode was enabled will remain subject to in-situ modification. DTIBLEND issues the following message when a DISABLE IN_SITU command is accepted:

```
*****
*
*                                     W A R N I N G
*
*
*   Any DTI input files that have already been specified using BLEND
*   commands when IN_SITU mode was enabled will remain subject to in-situ
*   modification
*
*****
```

Message:

See above for the warning message issued by the `DISABLE IN SITU` command.

Examples:

DTIBLEND> **DISABLE** IN_SITU<CR>

```

*****
*
*                               W A R N I N G
*
*
*   Any DTI input files that have already been specified using BLEND
*   commands when IN_SITU mode was enabled will remain subject to in-situ
*   modification
*
*****

```

DISABLE INTEGER_HEIGHT

DISABLE INTEGER_HEIGHT disables the effect of a previous ENABLE INTEGER_HEIGHT command.

FORMAT: **DISABLE INTEGER_HEIGHT**

Command parameters: None.

DESCRIPTION:

In IFF files height values are transmitted via AC (Ancillary Code) or ZS (3D string) entries. By default contour and spot height Z values are read from type 3 ACs as floating point values. By use of the ENABLE INTEGER_HEIGHT command, integer heights may be read from type 2 ACs.

The DISABLE INTEGER_HEIGHT command disables the effect of a previous ENABLE INTEGER_HEIGHT command and heights will be read from type 3 (floating point) ACs.

Messages: None.

Examples:

DTIBLEND> **DISABLE INTEGER_HEIGHT**<CR>
DTIBLEND>

DISABLE MULTIPLYBY

Disables a previous ENABLE MULTIPLYBY command.

FORMAT: **DISABLE MULTIPLYBY**

Command parameters: None.

DESCRIPTION:

DISABLE MULTIPLYBY allows the user to disable a previous ENABLE MULTIPLYBY command.

Messages: None.

Examples:

DTIBLEND> **DISABLE MULTIPLYBY**<CR>
DTIBLEND>

DISABLE PME

Disables a previous ENABLE PME command.

FORMAT: **DISABLE PME**

Command parameters: None.

DESCRIPTION:

DISABLE PME allows the user to disable a previous ENABLE PME command.

Messages:

*** WARNING *** You are not using PME !

Examples:

DTIBLEND> **ENABLE PME<CR>**
DTIBLEND> **DISABLE PME<CR>**
DTIBLEND>

DISABLE SMOOTH

 Cancels the effect of a previous ENABLE SMOOTH command.

FORMAT: **DISABLE SMOOTH**

Command parameters: None.

DESCRIPTION:

By default standard linear interpolation from one matrix to another is performed, but an alternative action is to perform a smooth (gradual) feathering of one matrix to another.

The ENABLE SMOOTH command enables the smooth feathering interpolation action to be applied.

Messages: None.

Examples:

DTIBLEND> **DISABLE SMOOTH**<CR>
DTIBLEND>

DISABLE TOFEET

Cancels the effect of a previous ENABLE TOFEET command.

FORMAT: **DISABLE TOFEET**

Command parameters: None.

DESCRIPTION:

It is possible that different IFF input files may have heights recorded in different measurement systems. The DTI file heights are relative to one measurement system only. Two preset height conversion options are available: ENABLE TOMETRES and ENABLE TOFEET.

The ENABLE TOFEET command enables the conversion of heights held in the IFF file in metres to feet. It has the same effect as an explicit ENABLE MULTIPLYBY 3.2808455 command. For example, if the DTI file heights are in feet, it is possible to read in one IFF control file with heights in feet with one IFF command and then use the ENABLE TOFEET command and read in another file with heights in metres, converting to feet during read-in.

N.B. DISABLE TOFEET will not cancel an explicit ENABLE MULTIPLYBY 3.2808455 command.

Messages: None.

Examples:

DTIBLEND> **DISABLE TOFEET**<CR>
DTIBLEND>

DISABLE TOMETRES

 Cancels the effect of a previous ENABLE TOMETRES command.

FORMAT: **DISABLE TOMETRES**

Command parameters: None.

DESCRIPTION:

It is possible that different IFF input files may have heights recorded in different measurement systems. The DTI file heights are relative to one system only. Two height conversion options are available: ENABLE TOFEET and ENABLE TOMETRES.

The ENABLE TOMETRES command enables the conversion of heights held in the IFF file in feet to metres. It has the same effect as an explicit ENABLE DIVIDEBY 3.2808455 command. For example, if the DTI file heights are in metres, it is possible to read in one IFF control file with heights in metres with one IFF command and then use the ENABLE TOMETRES command and read in another file with heights in feet, converting to metres during read-in.

N.B. DISABLE TOMETRES will not cancel an explicit ENABLE DIVIDEBY 3.2808455 command.

Messages: None.

Examples:

DTIBLEND> **DISABLE TOMETRES**<CR>
DTIBLEND>

ENABLE DIAGNOSTICS

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

FORMAT: ENABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

On a heavily loaded computer it may be reassuring to ENABLE DIAGNOSTICS to indicate the progress of processing.

Messages: None.

Examples:

```
DTIBLEND> ENABLE DIAGNOSTICS<CR>
DTIBLEND> SHOW ENABLE<CR>
DIAGNOSTICS ..... On
DIVIDEBY ..... Off
INTEGER_HEIGHT ..... Off
(Incoming IFF heights expected in type 3 AC entries)
IN_SITU ..... Off
MULTIPLY ..... Off
PME ..... Off
SMOOTH ..... Off
TOFEET ..... Off
TOMETRES ..... Off
DTIBLEND> DISABLE DIAGNOSTICS<CR>
DTIBLEND> SHOW ENABLE<CR>
DIAGNOSTICS ..... Off
DIVIDEBY ..... Off
INTEGER_HEIGHT ..... Off
(Incoming IFF heights expected in type 3 AC entries)
IN_SITU ..... Off
MULTIPLY ..... Off
PME ..... Off
SMOOTH ..... Off
TOFEET ..... Off
TOMETRES ..... Off

DTIBLEND>
```

ENABLE DIVIDEBY

ENABLE DIVIDEBY allows the user to enable division of IFF input file heights by a specified floating point constant.

FORMAT: **ENABLE DIVIDEBY denominator**

Command parameters:

denominator

The value by which all IFF input file heights are to be divided.

DESCRIPTION:

The ENABLE DIVIDEBY enables the user to divide all incoming heights by a specified (floating point) constant. For example, the command ENABLE DIVIDEBY 2.0 will cause all incoming heights to be divided by 2.0. An ENABLE DIVIDEBY 3.2808455 command has the same effect as an ENABLE TOMETRES command.

Messages:

The following messages are specific to the ENABLE DIVIDEBY command:

*** WARNING *** You are already planning to multiply by 'constant'
 ENABLE DIVIDEBY command now overrides ENABLE MULTIPLYBY command
*** WARNING *** You must specify a value for DIVIDEBY

Examples:

DTIBLEND> **ENABLE DIVIDEBY 39.2<CR>**
DTIBLEND>

ENABLE IN_SITU

ENABLE IN_SITU enables in-situ processing of the DTI file opened for BLEND.

FORMAT: ENABLE IN_SITU

Command parameters: None.

DESCRIPTION:

By default, DTIBLEND requires an output file specification to be supplied for the BLEND command. It then creates and opens this file to receive the results of the blend process. Like a HOLD input DTI file, the input DTI file opened with a BLEND command is not altered in any way.

ENABLE IN_SITU enables in-situ processing of the DTI file opened for BLEND. ENABLE IN_SITU completely changes the way DTIBLEND treats the BLEND command. When the IN_SITU command is specified, DTIBLEND expects only one DTI file-spec argument to the BLEND command. This DTI file is then opened for both read and write and the results of the blend process are written back into the same file.

Because of the danger of modifying a unique input file in an irrevocable fashion using the ENABLE IN_SITU command, DTIBLEND issues a stern warning after accepting the IN_SITU command:

```
*****
*                                                                 *
*                               W A R N I N G                      *
*                                                                 *
*   Use of the BLEND command with only one file-spec argument will result *
*   in the input file being overwritten. If you want the results of the *
*   edge blend process to be written to a new output file the BLEND *
*   command must be specified with two file-spec arguments.        *
*                                                                 *
*****
```

Message:

The following warning message is specific to the ENABLE IN_SITU command:

*** WARNING *** You are already using IN_SITU!

Examples:

```
$ DTIBLEND<CR>
MATRIX module DTIBLEND of 12:23:19 18-MAR-88
DTIBLEND> ENABLE IN_SITU<CR>
```

```
*****
*
*                               W A R N I N G                               *
*
* Use of the BLEND command with only one file-spec argument will result   *
* in the input file being overwritten. If you want the results of the     *
* edge blend process to be written to a new output file the BLEND        *
* command must be specified with two file-spec arguments.                 *
*
*****
```

```
DTIBLEND>
```

ENABLE INTEGER_HEIGHT

Take feature heights from type 2 (integer) AC (Ancillary Code) entries in an IFF input file.

FORMAT: **ENABLE INTEGER_HEIGHT**

Command parameters: None.

DESCRIPTION:

In IFF files, height values are transmitted via AC (Ancillary Code) or ZS (3D string) entries. By default contour and spot height Z values are read from type 3 ACs as floating point values. By use of the **ENABLE INTEGER_HEIGHT** command, integer heights may be read from type 2 ACs.

ENABLE INTEGER_HEIGHT causes **DTIBLEND** to take heights from type 2 (integer) AC (Ancillary Code) entries in an IFF input file.

Messages: None.

Examples:

DTIBLEND> **ENABLE INTEGER_HEIGHT**<CR>
DTIBLEND>

ENABLE SMOOTH

FORMAT: **ENABLE SMOOTH**

Command parameters: None.

DESCRIPTION:

By default standard linear interpolation from one matrix to another is performed, but an alternative action is to perform a smooth (gradual) feathering of one matrix to another.

The ENABLE SMOOTH command enables the smooth feathering interpolation action to be applied.

Messages: None.

Examples:

DTIBLEND> **ENABLE SMOOTH**<CR>
DTIBLEND>

ENABLE TOFEET

FORMAT: **ENABLE TOFEET**

Command parameters: None.

DESCRIPTION:

It is possible that different IFF input files may have heights recorded in different measurement systems. The DTI file heights are relative to one measurement system only. Two preset height conversion options are available: ENABLE TOMETRES and ENABLE TOFEET.

The ENABLE TOFEET command enables the conversion of heights held in the IFF file in metres to feet. It has the same effect as an explicit ENABLE MULTIPLYBY 3.2808455 command. For example, if the DTI file heights are in feet, it is possible to read in one IFF control file with heights in feet with one IFF command and then use the ENABLE TOFEET command and read in another file with heights in metres, converting to feet during read-in.

N.B. DISABLE TOFEET will not cancel an explicit ENABLE MULTIPLYBY 3.2808455 command.

Messages: None.

Examples:

DTIBLEND> **ENABLE TOFEET**<CR>
DTIBLEND>

ENABLE TOMETRES

FORMAT: **ENABLE TOMETRES**

Command parameters: None.

DESCRIPTION:

It is possible that different IFF input files may have heights recorded in different measurement systems. The DTI file heights are relative to one system only. Two height conversion options are available: **ENABLE TOFEET** and **ENABLE TOMETRES**.

The **ENABLE TOMETRES** command enables the conversion of heights held in the IFF file in feet to metres. It has the same effect as an explicit **ENABLE DIVIDEBY 3.2808455** command. For example, if the DTI file heights are in metres, it is possible to read in one IFF control file with heights in metres with one IFF command and then use the **ENABLE TOMETRES** command and read in another file with heights in feet, converting to metres during read-in.

N.B. **DISABLE TOMETRES** will not cancel an explicit **ENABLE DIVIDEBY 3.2808455** command.

Messages: None.

Examples:

DTIBLEND> **ENABLE TOMETRES**<CR>
DTIBLEND>

ENABLE PME

ENABLE PME enables the PME performance monitor.

FORMAT: ENABLE PME

Command parameters: None.

DESCRIPTION:

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

Message:

The following warning message is specific to the ENABLE PME command:

*** WARNING *** You are already using PME!

Examples:

\$ DTIBLEND<CR>

MATRIX module DTIBLEND of 12:23:19 18-MAR-88

DTIBLEND> ENABLE PME<CR>

FRT

Specifies an FRT file which contains feature code group definitions.

FORMAT: **FRT file-spec**

Command parameters:

file-spec

The specification of an FRT (Feature Representation Table) file required to define feature code groups.

Missing parts from the FRT file-spec argument are taken from the default specification LSL\$FRT:FRT.FRT;0.

DESCRIPTION:

The FRT command allows the user to specify an FRT file which contains feature code group definitions. The availability of feature code groups simplifies the specification of complex feature code selections for blend process control.

Messages:

The following messages are specific to the FRT command:

*** ERROR *** reading FRT file-spec
*** ERROR *** unable to open specified FRT

Examples:

DTIBLEND> **SELECT FC 7,COAST<CR>**
*** WARNING *** You must have read an FRT file to be able to use group names
DTIBLEND> **FRT HOVER<CR>**
FRT file LSL\$FRT:HOVER.FRT;8 opened for read

DTIBLEND> **SELECT FC 7,COAST<CR>**

DTIBLEND> **SELECT FC 7,COAST<CR>**
DTIBLEND>

GO

Starts DTIBLEND processing.

FORMAT: GO

Command parameters: None.

DESCRIPTION:

The GO command signifies the end of command interaction with the user and DTI file processing begins.

Before DTI file processing is begun, DTIBLEND checks that two DTI input files have been specified using either BLEND or HOLD commands.

Messages:

The following messages are specific to the GO command:

*** WARNING *** You must specify 2 DTI files for input. Either use a BLEND and a HOLD command or 2 BLEND commands

Two DTI files must be supplied before submitting a GO command.

*** ERROR *** Although abutting along a common horizontal axis, the input DTI files do not join across a common edge.

*** ERROR *** Although abutting along a common vertical axis, the input DTI files do not join across a common edge.

The DTI files have a common edge coordinate, but do not overlap along it.

Examples:

\$ DTIBLEND<CR>
DTIBLEND> GO<CR>

*** WARNING *** You must specify 2 DTI files for input. Either use a BLEND and a HOLD command or 2 BLEND commands
DTIBLEND> HOLD SW12I88<CR>

File : LSL\$DTI:SW12I88.DTI;0
Header : MIKE Data: REAL

Units are DTI Matrix Values.

Matrix Coverage	SW:	1	1	NE:	449	449
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	0.00 to 326.00				

DTIBLEND> **GO<CR>**

HELP

Give help on a subject

FORMAT: **HELP subject**

Command parameters:

subject

The subject on which help is required.

Description:

The HELP command looks the rest of the line up in the MATRIX HELP library. This library contains a brief summary of the operation of each command.

The information is looked up in the DTIBLEND section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTIBLEND> **HELP ENABLE PME<CR>**

DTIBLEND

ENABLE

PME

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.
DTIBLEND>

HOLD

Specifies a DTI file that is to be opened readonly to which the DTI file opened with the BLEND command will be blended.

FORMAT: **HOLD dti-file-spec**

COMMAND PARAMETERS:

dti-file-spec

The specification of the DTI file to be opened for HOLD input.

Any parts of the file-spec not supplied will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

Specifies a DTI file that is to be opened readonly. It is the edge of this file which is held fixed, to which the DTI file opened with the BLEND command will be blended.

If the user wishes to blend two DTI files to a common mean edge value, two BLEND commands should be used instead of one BLEND and one HOLD command.

Messages:

The following messages are specific to the HOLD command:

- *** ERROR *** Unable to interpret input file-spec
- *** ERROR *** A HOLD command has already been accepted. If the HOLD command is used, the other DTI file must be opened using the BLEND command.
- *** ERROR *** Two BLEND commands have already been accepted. If the HOLD command is used, only one BLEND command can be specified.
- *** ERROR *** You must specify a file-spec argument to the HOLD command
For example HOLD SW301.DTI
- *** ERROR *** reading DTI offset

You must specify both the X and the Y origin offset
DTI file 'file-spec' is now closed. Please respecify the HOLD command

Examples:

DTIBLEND> **HOLD SW12I88<CR>**

File : LSL\$DTI:SW12I88.DTI;0
Header : MIKE Data: REAL

Units are DTI Matrix Values.

Matrix Coverage	SW:	1	1	NE:	449	449
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	0.00	to 326.00			

DTIBLEND>

IFF

Specifies an IFF file that is to be opened and used as control to the DTI file blend process.

FORMAT: **IFF file-spec**

COMMAND PARAMETERS:

file-spec

The specification of the file to be opened for data input.

Any parts of the file-spec not supplied for the FILEIN command will be taken from the default specification 'LSL\$IF:IFF.IFF;0'.

DESCRIPTION:

The IFF command causes the specified IFF file to be opened and used as an input file to DTIBLEND.

DTIBLEND is designed to be compatible with the "new" type IFF files introduced in conjunction with the IMP (IFF Map Processing) package. The origin offset entry in a type 2 MD (Map Descriptor) is used to offset coordinate values within an input IFF file. Although downwards compatible with "old" type IFF files a warning message is issued if an IFF file is found not to contain a set type 2 MD (Map Descriptor) entry.

Heights

In IFF files height values are transmitted via AC (Ancillary Code) or ZS (3D string) entries. By default contour and spot height Z values are read from type 3 ACs as floating point values. By use of the ENABLE INTEGER_HEIGHT command, integer heights may be read from type 2 ACs.

Cliff lines are associated with two constant floating point height values; one for the terrain to the left of the cliffline (relative to the direction of digitising) and one for the height of the terrain to the right. Clifflines are not currently supported by DTIBLEND.

More than one input file may be specified using a new IFF command for each file. Defaults may be changed between reading files. This means that IFF files with different allocations of IFF entries for height information may be combined. Imperial heights may be converted to metric on input with the ENABLE TOMETRES command. The reverse is possible with the ENABLE TOFEET command. Incoming heights may be multiplied or divided by a user specified constant with the ENABLE MULTIPLYBY and ENABLE DIVIDEBY commands respectively.

Messages:

The following messages are specific to the IFF command:

*** WARNING *** You must specify a file-spec argument to the IFF command
*** ERROR *** Unable to interpret input file-spec

Examples:

DTIBLEND> **IFF DUA3:[DEMONSTRATION]IDAHO<CR>**
DTIBLEND>

LIST

The LIST command specifies the name of a file which will contain a log of the DTIBLEND run.

FORMAT: **LIST file_spec**

Command parameters:

file_spec

The specification of the log file. Any parts of the file-spec not supplied will be taken from the default specification 'SYS\$DISK:[]DTIBLEND.LIS;0'.

DESCRIPTION:

The LIST command specifies the name of a file which will contain a log of the DTIBLEND run.

The SHOW FILES command will display the name of the currently specified LIST file.

The following is a typical example of a file created by DTIBLEND :

===== D T I B L E N D =====

DTIBLEND log file created by TIM at 3-JUN-1988 15:04:24.96 using DTIBLEND

Two files specified for blend:

LSL\$DTI:TOP1.DTI;0

LSL\$DTI:BOTTOM.DTI;0

With a BORDER value of 3, all DTI z values are subject to change that lie within the rectangle defined by:

SW corner:	0.000	196.000
NE corner:	200.000	204.000

In LSL\$DTI:TOP1.DTI;0 this affects:

Column 1 to column 101 and row 1 to row 3

In LSL\$DTI:BOTTOM.DTI;0 this affects:

Column 1 to column 101 and row 101 to row 99

IFF control is supplied by:

LSL\$DATA_ROOT:[USER.DATA]CONTROL.IFF;4

Heights expected in type 3 ACs

IFF selections:

Layers:
0-32767

Feature codes:
0-32767

=====

IFF file #1 is LSL\$DATA_ROOT:[USER.DATA]CONTROL.IFF;4
File has no IFF HI entry.

Two BLEND files specified - calculating mean values for the common edge

Blending posts in DTI file LSL\$DTI:TOP1.DTI;0

Blending posts in DTI file LSL\$DTI:BOTTOM.DTI;0

Messages:

The following error messages are specific to the LIST command:

*** WARNING *** You must specify a file-spec argument to the LIST command

*** ERROR *** You must specify a file-spec argument to the LIST command

*** ERROR *** Unable to interpret input file-spec

Example:

DTIBLEND>LIST JEMIMA.LIS<CR>
DTIBLEND>

NULL

Specifies the null value used in the input DTI file for which no calculated value is available. This null value overrides the DTILIB default null value for the DTI data-type.

FORMAT: NULL null_value

Command parameters:

null_value

The null value to be detected. This must lie within a range appropriate to the input DTI file data type:

Minimum	Maximum	DTI data type
0	255	UNSIGNED BYTE
-32768	32767	WORD INTEGER
-2E31	2E31-1	LONG INTEGER
-1.0E38	1.0E38	REAL*4

By default the DTILIB the DTILIB default null value for the DTI data-type is used.

DESCRIPTION:

Specifies the null value used in the input DTI file for which no calculated value is available. This null value overrides the DTILIB default null value for the DTI data-type.

The null value can only be set after a DTI file has been input using the FILEIN command, as the range of valid null values depends on the data type of the file.

Messages:

The following messages are specific to the NULL command:

*** WARNING *** null value out of range for a byte type DTI file
*** WARNING *** null value out of range for a word type DTI file
*** WARNING *** null value out of range for a longword type DTI file
*** WARNING *** null value out of range for a real type DTI file

Examples:

DTIBLEND> NULL 0<CR>
DTIBLEND>

PAUSE

Pauses DTIBLEND execution.

FORMAT: PAUSE

Command parameters: None.

DESCRIPTION:

Pauses DTIBLEND execution and issues a prompt for a carriage return to continue execution. This command is designed for use in software demonstration situations.

Messages: None.

Examples:

DTIBLEND> PAUSE<CR>

Press <RETURN> to continue<CR>
DTIBLEND>

QUIT

Quit from DTIBLEND.

FORMAT: QUIT

Command parameters: None.

Description:

The QUIT command causes DTIBLEND to exit immediately, closing the input file and closing and deleting any files already created for output.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to quit from the program.

Messages: None.

Examples:

DTIBLEND> **QUIT<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
_ \$

RETURN

Restores command input from an indirect file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect file to SYS\$COMMAND.

A typical application is to allow the user to use an indirect command file to set up those run time defaults which are constant within a flowline and then return to input from the terminal (or batch stream) for the run specific commands. To do this RETURN must be the last command in the indirect command file.

Messages:

The following messages are specific to the RETURN command:

RETURN command detected - returning to terminal input

RETURN command ignored - command input is already from terminal

Examples:

DTIBLEND> @FLOW2<CR>

DTIBLEND> ENABLE DIAGNOSTICS

DTIBLEND> RETURN

DTIBLEND>

ROVER

Specifies that a ROVER command file is to be created for each of the DTI files created (or modified in-situ) by the edge blend process.

FORMAT: ROVER

COMMAND PARAMETERS: None.

DESCRIPTION:

Specifies that a ROVER command file is to be created for each of the DTI files created (or modified in-situ) by the edge blend process. These ROVER guidance files receive ROVER commands indicating the positions of DTI posts which have been altered by the blend process by more than the threshold value. ROVER commands are also generated to indicate the position of blend profiles which could not be processed because they contained a null value at one or at both ends of the profile.

The ROVER command does not take a file-spec argument. This is because when two BLEND commands are used, (in the case of blending the DTI files on both sides of the adjoining edge), two ROVER files are needed, one for each output DTI file.

The ROVER files are instead given file specifications of the form:
LSL\$ROVERCMD:'blend-file-name'.RCM;0'.

In addition to receiving the name of the DTI file to which it relates the ROVER file is also given a standard header containing information about the DTIBLEND run which created it. This header is of the form:

```
MESSAGE
MESSAGE -----
MESSAGE
MESSAGE           R O V E R   C O M M A N D   F I L E
MESSAGE
MESSAGE RCM file created by TIM at  3-JUN-1988 10:16:47.37 using DTIBLEND
MESSAGE
MESSAGE Two files specified for blend:
MESSAGE     LSL$DTI:LEFT1.DTI;0
MESSAGE     LSL$DTI:RIGHT1.DTI;0
MESSAGE
MESSAGE
MESSAGE The ROVER commands in this guidance file relate to changes made
MESSAGE to LSL$DTI:LEFT1.DTI;0
MESSAGE
MESSAGE These changes affect column 99 to column 101 and row
MESSAGE 1 to row 201
MESSAGE
MESSAGE -----
MESSAGE
```

The ROVER command must be issued before the GO command.

Messages:

The following messages are specific to the ROVER command:

*** ERROR *** Logical name LSL\$ROVERCMD not set up

*** WARNING *** You cannot specify a file-spec argument to the ROVER command
File-spec argument ignored. DTIBLEND will construct
ROVER command file-specs based on the input DTI
filenames. For further details see the MATRIX
Reference Manual

Examples:

DTIBLEND> ROVER <CR>
DTIBLEND>

SELECT ALL

Resets all IFF feature selections made with the SELECT and DESELECT commands.

FORMAT: **SELECT ALL**

Command parameters: _None

DESCRIPTION:

This command resets all IFF feature input selections. If features are subsequently selected using the other SELECT commands then all features are first implicitly deselected.

Messages:

The following message is specific to the SELECT command.

*** ERROR *** Specifying command SELECT
Command qualifiers are ALL, FC or LAYER

Examples:

DTIBLEND>**SELECT ALL <CR>**

At this point all features are selected.

DTIBLEND> **SELECT FC 7:10,56:78<CR>**

Here only features with the specified feature codes are selected

DTIBLEND> **SELECT FC 11:20<CR>**

At this point the specified feature codes are added to the currently selected features code, i.e. features with FC 7-20 and 56-78 are now selected.

DTIBLEND>

SELECT FC

Selects IFF features with the specified feature codes for use as control for the blend process.

FORMAT: **SELECT FC feature-code[,...]**

Command parameters:

feature-code

An IFF feature code which must lie in the range 0 to 32767. Multiple feature codes may be specified separated by commas or spaces. Ranges of feature codes may be specified by separating the range start and stop values by a colon, e.g. SELECT FC 2:6 will result in the selection of feature codes 2,3,4,5 and 6.

If an FRT file has been read into DTIBLEND any valid feature code group names may be used as arguments to the SELECT FC command.

DESCRIPTION:

The SELECT FC command complements the DESELECT FC command. SELECT FC enables the user to select any IFF features which have the specified feature codes.

On program startup all FCs are selected for input. IFF features which are not required for input must be specifically excluded using the appropriate DESELECT FC and DESELECT LAYER commands. For example, the command DESELECT FC 0:7 11:300 302:32767 will leave only features with FCs 8,9,10, and 301 selected for input.

The first SELECT FC command has the effect of deselecting all FCs from input except those explicitly specified as the arguments to the SELECT FC command. Subsequent SELECT FC commands have the effect of adding the specified FCs to the list of FCs selected for input.

All layers and FCs may be reselected for input by specifying the SELECT ALL command.

Messages:

The following warning messages are specific to the SELECT FC command:

```
*** WARNING *** You must have read an FRT file to be able to use group names
*** WARNING *** No groups have been defined in the FRT
*** WARNING *** Illegal feature code 'integer'
*** WARNING *** Bad group name 'group-name'
```

Examples:

DTIBLEND> **SELECT FC 6:9,WATER,126<CR>**
DTIBLEND>

SELECT LAYER

Selects IFF features which lie within the specified layers for use as control for the blend process.

FORMAT: **SELECT LAYER layer[,...]**

Command parameters:

layer

An IFF layer number must lie in the range 0 to 32767. Multiple layers may be specified separated by commas or spaces. Ranges of layers may be specified by separating the range start and stop values by a colon, e.g. SELECT LAYER 2:6 will result in the selection of layers 2,3,4,5 and 6.

DESCRIPTION:

The SELECT LAYER command complements the DESELECT LAYER command. SELECT LAYER enables the user to select any IFF features which are contained within the specified layers.

By default DTIBLEND will input all features within an IFF file, regardless of the layer in which they lie.

On program startup all layers are selected for input. IFF features which are not required for input must be specifically excluded using the appropriate DESELECT FC and DESELECT LAYER commands. For example, the command DESELECT LAYER 0:7 11:300 302:32767 will leave only features which lie within layers 8,9,10, and 301 selected for input.

The first SELECT LAYER command has the effect of deselecting all layers from input except those explicitly specified as the arguments to the SELECT LAYER command. Subsequent SELECT LAYER commands have the effect of adding the specified layers to the list of FCs selected for input.

All layers and FCs may be reselected for input by specifying the SELECT ALL command.

Messages:

The following warning messages are specific to the SELECT LAYER command:

*** WARNING *** Too many layer arguments in one command
*** WARNING *** Illegal layer number 'integer'

Examples:

DTIBLEND> **SELECT LAYER 21:29,126<CR>**
DTIBLEND>

SHOW

Shows current status of DTIBLEND defaults.

FORMAT: SHOW subject

Command parameters:

subject

The subject that is to be displayed, chosen from:

BORDER ENABLE FILES NULL SELECTIONS THRESHOLD

DESCRIPTION:

SHOW enables the user to examine the current status of the DTIBLEND options and parameters.

Messages:

The following warning messages are specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

BORDER ENABLE FILES NULL SELECTIONS THRESHOLD

Examples:

\$ DTIBLEND<CR>
MATRIX module DTIBLEND of 18:08:43 26-FEB-88
DTIBLEND> SHOW BORDER<CR>

Blend border width 3
DTIBLEND> QUIT<CR>
ELAPSED: 0 00:01:25.42 CPU: 0:00:01.30 BUFIO: 12 DIRIO: 10 FAULTS: 187
\$

SHOW BORDER

Shows current status of the BORDER parameter.

FORMAT: **SHOW BORDER**

Command parameters: None.

DESCRIPTION:

SHOW BORDER enables the user to examine the current status of the DTIBLEND BORDER parameter.

Messages: None.

Examples:

\$ DTIBLEND<CR>
MATRIX module DTIBLEND of 18:08:43 26-JAN-89
DTIBLEND> **SHOW BORDER**<CR>

Blend border width 3
DTIBLEND> **QUIT**<CR>
ELAPSED: 0 00:01:25.42 CPU: 0:00:01.30 BUFIO: 12 DIRIO: 10 FAULTS: 187
\$

SHOW ENABLE

Shows current status of DTIBLEND option settings.

FORMAT: SHOW ENABLE

Command parameters: None.

DESCRIPTION:

SHOW ENABLE enables the user to examine the current status of DTIBLEND processing options that are set or unset using the ENABLE and DISABLE commands.

Messages: None.

Examples:

```
$ DTIBLEND<CR>
MATRIX module DTIBLEND of 18:08:43 26-JAN-89
DTIBLEND> SHOW ENABLE<CR>
DIAGNOSTICS ..... Off
DIVIDEBY ..... Off
INTEGER_HEIGHT ..... Off
(Incoming IFF heights expected in type 3 AC entries)
IN_SITU ..... Off
MULTIPLY ..... Off
PME ..... Off
SMOOTH ..... Off
TOFEET ..... Off
TOMETRES ..... Off
DTIBLEND>
```

SHOW FILES

Shows current DTIBLEND input, output and listing files.

FORMAT: **SHOW FILES**

Command parameters: None.

DESCRIPTION:

SHOW FILES enables the user to examine the current status of DTIBLEND input, output and listing files.

Messages: None.

Examples:

\$ DTIBLEND<CR>
MATRIX module DTIBLEND of 19:41:50 8-FEB-89
DTIBLEND> **SHOW FILES<CR>**

BLEND file:
 Not yet specified

HOLD file:
 None specified

Output DTI file:
 Not yet specified

IFF files:
 Not yet specified

DTIBLEND> **QUIT<CR>**
ELAPSED: 0 00:01:25.42 CPU: 0:00:01.30 BUFIO: 12 DIRIO: 10 FAULTS: 187
\$

SHOW NULL

Shows current DTIBLEND null value selection.

FORMAT: **SHOW NULL**

Command parameters: None.

DESCRIPTION:

SHOW NULL enables the user to examine the current DTIBLEND null value selection.

Messages: None.

Examples:

\$ DTIBLEND<CR>
MATRIX module DTIBLEND of 19:41:50 8-FEB-89
DTIBLEND> **SHOW NULL<CR>**

Null valueDTILIB default
DTIBLEND> **QUIT<CR>**
ELAPSED: 0 00:01:25.42 CPU: 0:00:01.30 BUFIO: 12 DIRIO: 10 FAULTS: 187
\$

SHOW SELECTIONS

Shows current status of DTIBLEND layer and feature code input selections.

FORMAT: **SHOW SELECTIONS**

Command parameters: None.

DESCRIPTION:

Shows current status of DTIBLEND layer and feature code input selections.

Messages: None.

Examples:

\$ **DTIBLEND**<CR>
MATRIX module DTIBLEND of 13:53:27 3-FEB-89
DTIBLEND> **SHOW SELECTIONS**<CR>
Feature codes selected for input:
0-32767
Layers selected for input:
0-32767
DTIBLEND>

SHOW THRESHOLD

Shows current status of the THRESHOLD parameter.

FORMAT: SHOW THRESHOLD

Command parameters: None.

DESCRIPTION:

SHOW THRESHOLD enables the user to examine the current status of the DTIBLEND THRESHOLD parameter.

Messages: None.

Examples:

\$ DTIBLEND<CR>
MATRIX module DTIBLEND of 18:08:43 26-JAN-89
DTIBLEND> **SHOW THRESHOLD**<CR>

Threshold change value for messagesUnset

DTIBLEND> **QUIT**<CR>

ELAPSED: 0 00:01:25.42 CPU: 0:00:01.30 BUFIO: 12 DIRIO: 10 FAULTS: 187
\$

SPAWN

The SPAWN command enables you to create a subprocess while within DTIBLEND.

FORMAT: SPAWN command-line

Command parameters:**command-line**

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTIBLEND. The command string cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within DTIBLEND. When the subprocess terminates control is returned to DTIBLEND.

Messages:

The following warning messages are specific to the SPAWN command:

*** WARNING *** SPAWN requires a valid DCL command line

*** ERROR *** Unable to spawn command, returning to DTIBLEND

Examples:

DTIBLEND> SPAWN DIRECTORY *_.DTI;*<CR>

Directory DUA3:[EXPERIMENT3.DTI]

HUMUS.DTI;1	7/8	18-Oct-1987 17:07	[LSL,TIM]
INFILTRATION.DTI;1	8/8	18-Oct-1987 07:56	[LSL,TIM]
SOILS.DTI;2	7/8	18-Oct-1987 17:17	[LSL,TIM]

Total of 3 files, 22/24 blocks.

DTIBLEND>

THRESHOLD

Specifies the maximum change in DTI post height allowed in the blend process before DTIBLEND outputs a message.

FORMAT: **THRESHOLD difference**

Command parameters:

difference

The maximum change in DTI post height allowed in the blend process before DTIBLEND outputs a message.

Description:

The value supplied for the THRESHOLD command (expressed in DTI file height units) determines the maximum change in DTI post height allowed in the blend process before DTIBLEND outputs a messages to SYS\$OUTPUT (if DIAGNOSTICS are enabled), to the optional listing file (see the LIST command) and to the optional ROVER guidance file (see the ROVER command).

Unless the THRESHOLD command is used to set a threshold tolerance, DTIBLEND will not apply any threshold change tests.

Messages:

The following warning messages are specific to the THRESHOLD command:

*** WARNING *** You must specify a floating point argument to the THRESHOLD command

For example THRESHOLD 4.2

*** ERROR *** Invalid THRESHOLD value.
The THRESHOLD argument must be positive

Examples:

DTIBLEND> **THRESHOLD -8.3<CR>**

*** ERROR *** Invalid THRESHOLD value.

The THRESHOLD argument must be positive

DTIBLEND> **BORDER 5<CR>**

DTIBLEND>

WAIT

Suspend processing for the specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number of seconds for which DTIBLEND processing is to be suspended.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following warning message is specific to the WAIT command:

*** WARNING *** You must specify the number of seconds to wait

Examples:

DTIBLEND> WAIT 4<CR>
DTIBLEND>

DTIBLEND examples

EXAMPLES

\$ DTIBLEND<CR>

DTMCREATE module DTIBLEND of 13:43:42 3-JUN-88

DTIBLEND> **ENABLE DIAGNOSTICS**<CR>

DTIBLEND> **BLEND LEFT LEFT1**<CR>

Please enter the coordinates of the bottom left-hand corner
of LSL\$DTI:LEFT.DTI;0

0.0 0.0 <CR>

File : LSL\$DTI:LEFT.DTI;0

Header : MIKE Data: WORD

Units are Metres

Matrix Coverage	SW:	0.00	0.00	NE:	200.00	400.00
Matrix Interval	E:	2.00		N:	2.00	
Value Range	:	110	to	418		

File : LSL\$DTI:LEFT1.DTI;0

Header : MIKE Data: WORD

Units are Metres

Matrix Coverage	SW:	0.00	0.00	NE:	200.00	400.00
Matrix Interval	E:	2.00		N:	2.00	
Value Range	:	110	to	418		

DTIBLEND> **HOLD RIGHT**<CR>

Please enter the coordinates of the bottom left-hand corner
of LSL\$DTI:RIGHT.DTI;0

200.0 0.0<CR>

File : LSL\$DTI:RIGHT.DTI;0

Header : MIKE Data: WORD

Units are Metres

Matrix Coverage	SW:	200.00	0.00	NE:	400.00	400.00
Matrix Interval	E:	2.00		N:	2.00	
Value Range	:	97	to	468		

DTIBLEND> **IFF CONTROL.IFF**<CR>

IFF file LSL\$DATA_ROOT:[USER.DATA]CONTROL.IFF;4 selected for read

DTIBLEND> **ROVER**<CR>

DTIBLEND> **THRESHOLD 2**<CR>

DTIBLEND> **GO**<CR>

----- B L E N D O P T I O N S S U M M A R Y -----

LSL\$DTI:RIGHT.DTI;0 is a HOLD file.

The blend zone therefore lies entirely within the BLEND
file LSL\$DTI:LEFT1.DTI;0

Using a BORDER value of 3, the blend zone lies between 196.000
and 200.000 in X and 0.000 and 400.000 in Y, i.e. column 99 to
column 101 and row 1 to row 201

%DTIBLEND-I-RCMOPEN, ROVER guidance file LSL\$ROVERCMD:LEFT1.RCM;0 opened for
write

%LSLLIB-I-IFFOPENED, LSL\$DATA_ROOT:[USER.DATA]CONTROL.IFF;4 opened for read

%DTIBLEND-I-NOIFFHI, file has no IFF HI entry

Reading IFF control file LSL\$DATA_ROOT:[USER.DATA]CONTROL.IFF;4

Blending posts in DTI file LSL\$DTI:LEFT1.DTI;0

Null value detected at end of blend profile

No blend will be performed on row 2

ELAPSED: 0 00:04:22.66 CPU: 0:00:50.63 BUFIO: 24 DIRIO: 3151 FAULTS: 358

This example illustrates the use of DTIBLEND for blending the edge of
one DTI file to the edge of another which is held fixed.

For the purposes of the example, the user has enabled diagnostic
message output by using the ENABLE DIAGNOSTICS command.

The BLEND command is then used to specify the DTI file that is to be
blended along the blend edge and a DTI file to receive the results of
the blend process. Notice that the user has specified filenames only
as arguments to the BLEND command. Missing parts of the file
specifications are taken from the default 'LSL\$DTI:DTI.DTI;0'. This
results in the file LSL\$DTI:LEFT.DTI;0 being opened readonly as the
file which is to be blended, and LSL\$DTI:LEFT1.DTI;0 as the file to
receive the results of blending LSL\$DTI:LEFT.DTI;0. As the readonly
input file has a MIKE type header, DTIBLEND must prompt for the
coordinate offset of the south west corner of the DTI file. The user
has typed in the coordinates (0.0,0.0). DTIBLEND copies both the
header and the data from the readonly input DTI file to the output DTI
file LSL\$DTI:LEFT1.DTI;0 in preparation for edge blend processing.
The input DTI file is then closed as no further reference is made to
it. The blend process will, from now onwards, refer to
LSL\$DTI:LEFT1.DTI;0 only.

The user has then specified a HOLD command. The file defined by the
file-spec argument to the BLEND command is opened for readonly input
and will act as the fixed Z value edge for the blend process. As the
hold file also has a MIKE type header, DTIBLEND prompts for the
coordinate offset of the south west corner of the file. The user has
responded with the coordinates (200.0, 0.0). This means that looking
at the HOLD and BLEND DTI file header reports which DTIBLEND issues on

opening a DTI file, the two DTI files LSL\$DTI:LEFT1.DTI;0 and LSL\$DTI:RIGHT.DTI;0 lie side by side. The two files share a common column of data which is column 101 in LSL\$DTI:LEFT1.DTI and column 1 in LSL\$DTI:RIGHT.DTI;0.

The user has next specified that control for the blend process is to be taken from the features in the IFF file LSL\$IF:CONTROL.IFF;0. As the user has specified no input feature selection with the SELECT and DESELECT commands all features in the IFF file that lie within the blend zone will be read and used as control for the blend process. IFF feature heights, where not available from ZS or CB (Coordinate Block) Z coordinates, will by default be taken from a type 3 AC (Ancillary Code) within the IFF feature.

The user has next specified that DTIBLEND is to generate a ROVER guidance file which will contain ROVER editing commands to guide the user to any posts within the output DTI file (LSL\$DTI:LEFT1.DTI;0) which have been changed by more than the specified threshold value, or which could not be changed because of the presence of a null value.

The user has next specified the threshold value. Any changes that are greater than this value will be reported and commands sent to the ROVER guidance file.

The user has then issued a GO command and the edge blend begins.

After providing a blend option summary and opening the ROVER guidance file, the IFF control file is opened and read.

Apart from detecting a null post at one end of row 2, DTIBLEND successfully performs the blend. The IFF and DTI files are closed and DTIBLEND exits. DCL symbol \$STATUS is set to SS\$_NORMAL, normal successful completion.

DTIBLEND messages

MESSAGES (INFORMATIONAL)

These messages give information only, and require no immediate action by the user. They are used to provide information on the current state of the program, or to supply explanatory information in support of a warning or error message.

CONFLMDPAR, conflicting projection parameters in 'file-spec'

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND takes pains to check that the type 2 IFF Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. This message indicates that the input files contain data relating to different projection parameters.

User action: Use ITRANS to transform all the input files into a common projection, measurement system etc.

CONFLPROJ, conflicting map projection in 'file-spec'

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND takes pains to check that the type 2 IFF Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. This message indicates that the input files contain data on different projections.

User action: Use ITRANS to transform all the input files into a common projection, measurement system etc.

CONFLSPHERE, conflicting spheroid in 'file-spec'

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND takes pains to check that the type 2 IFF Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. This message indicates that the input files contain data on different spheroids.

User action: Use ITRANS to transform all the input files into a common projection, measurement system etc.

CONFLUNIT, conflicting map units in 'file-spec'

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND takes pains to check that the type 2 IFF Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. This message indicates that the input files contain data in different measurement systems.

User action: Use ITRANS to transform all the input files into a common projection, measurement system etc.

CONFLUSPHERE, conflicting user spheroid in 'file-spec'

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND takes pains to check that the type 2 IFF Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. This message indicates that the input files contain data on different user defined spheroids.

User action: Use ITRANS to transform all the input files into a common projection, measurement system etc.

DTIIFFP RJ, the DTI input files and IFF control have different projections

Explanation: DTIBLEND checks that the type 2 IFF Map Descriptors in the IFF control files define the same projection, units, spheroid etc as the DTI input file projection records. The IFF and DTI data appear to be on different projections.

User action: Use ITRANS and DTITRANS to transform all the input files into a common projection, measurement system etc.

DTIIFFP RJ P, the DTI input files and IFF control have different projection parameters

Explanation: DTIBLEND checks that the type 2 IFF Map Descriptors in the IFF control files define the same projection, units, spheroid etc as the DTI input file projection records. The IFF and DTI data appear to have different projection parameters.

User action: Use ITRANS and DTITRANS to transform all the input files into a common projection, measurement system etc.

DTIIFFS PH, the DTI input files and IFF control have different spheroids

Explanation: DTIBLEND checks that the type 2 IFF Map Descriptors in the IFF control files define the same projection, units, spheroid etc as the DTI input file projection records. The IFF and DTI data appear to be on different spheroids.

User action: Use ITRANS and DTITRANS to transform all the input files into a common projection, measurement system etc.

DTIIFFUNI, the DTI input files and IFF control have different units

Explanation: DTIBLEND checks that the type 2 IFF Map Descriptors in the IFF control files define the same projection, units, spheroid etc as the DTI input file projection records. The IFF and DTI data appear to be using different units.

User action: Use ITRANS and DTITRANS to transform all the input files into a common projection, measurement system etc.

DTIIFUSPH, the DTI input files and IFF control have different user defined spheroids

Explanation: DTIBLEND checks that the type 2 IFF Map Descriptors in the IFF control files define the same projection, units, spheroid etc as the DTI input file projection records. The IFF and DTI data appear to be on different user defined spheroids.

User action: Use ITRANS and DTITRANS to transform all the input files into a common projection, measurement system etc.

FTIGN, feature ignored

Explanation: The IFF feature specified in a previous message will be omitted from DTIBLEND input.

User action: Check that omission of the specified feature will not be detrimental to the blend process.

LSTOPEN, listing file 'file-spec' opened for write

Explanation: In response to the LIST command the specified listing file has been created and opened for write.

User action: None.

NOIFFHI, file has no IFF HI entry

Explanation: The input IFF file that is currently open is of the old pre-IMP pattern and probably also lacks a type 2 map descriptor (for which a separate warning will be issued).

User action: None.

RCMOPEN, ROVER guidance file 'file-spec' opened for write

Explanation: In response to the ROVER command the specified ROVER guidance file has been created and opened for write.

User action: None.

MESSAGES (WARNING)

These messages are output when an error has occurred that can be corrected immediately by the user or that the program will attempt to overcome.

CONFLMD, conflicting Map Descriptor information

Explanation: If more than one IFF file is specified for use as blend control, DTIBLEND checks that the type 2 Map Descriptors are all set to common values for projection, measurement units, spheroid etc. The first input file is considered to have the definitive Map Descriptor information. The accompanying messages will indicate what aspect of the Map Descriptor is at fault and in which file.

User action: Use ITRANS to transform all the input files into a common projection, measurement system, etc. Re-run DTIBLEND.

EQNFAIL, Equation solution failure

Explanation: DTIBLEND was unable to determine the equation of a line defined by adjacent points in an IFF string.

User action: DTIBLEND will continue to process the remaining relevant features within the IFF file. If this message appears very frequently examine the IFF underlay data within the blend zone. Look for supimposed points and consider any possible effect of the IFF coordinate system being used.

FTNOTAC, feature 'integer' ('integer') has no type %W'integer' AC

Explanation: The specified feature has no height AC of the specified type.

User action: Check that omission of the specified feature will not be detrimental to the blend process.

IFFCLIFF, Feature 'integer' ('integer') is a cliffline

Explanation: The specified IFF feature has type 80 and 81 AC (Ancillary Code) entries which identify it as a cliffline. DTIBLEND does not currently support clifflines as control to the edge blend process.

User action: Check that omission of the specified feature will not be detrimental to the blend process.

NOMD, no map descriptor found in 'file-spec'

Explanation: The specified IFF file does not have a map descriptor entry. This is most irregular, and is probably the result of output from a badly written user routine or the mis-use of IPATCH in /WRITE mode. DTIBLEND will attempt to continue.

User action: Determine the cause of the input file corruption and rectify. Check the DTIBLEND output files.

NOV2MD, IFF map descriptor in 'file-spec' is not version 2

Explanation: DTIBLEND expects IFF input files to have type 2 map descriptors as it offers IFF file offsetting functionality based on the contents of the map descriptor. DTIBLEND is downwards compatible with old pattern IFF files which have type 1 map descriptors, but no origin offset facility is supported for the earlier pattern files.

User action: If origin offsetting is required use ITRANS/DESCRIPTOR to create a copy of the IFF file having a type 2 map descriptor.

UNEXPACT, unexpected type 'integer' AC found in feature 'integer' ('integer')

Explanation: An AC (Ancillary Code) of the specified type has been found in the specified feature. It will be ignored as DTIBLEND expects only type 2 (integer height), type 3 (real height) or type 80 and 81 (cliffline) ACs.

User action: None.

UNSETMD, map descriptor in 'file-spec' is unset

Explanation: The Map Descriptor in the specified input file is unset.

User action: If origin offsetting is required or other input files have characteristics which require the map descriptor to be set, use ITRANS/DESCRIPTOR to set up the map descriptor. Re-run DTIBLEND.

MESSAGES (ERROR)

These messages indicate an error in processing which will cause the program to terminate. The most likely causes are a corrupt or otherwise invalid input file, or an error related to command line processing and file manipulation.

CLDTI, error closing DTI file 'file-spec'

Explanation: DTIBLEND is unable to close the specified DTI file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

CLIFF, error closing IFF file 'file-spec'

Explanation: DTIBLEND is unable to close the specified IFF file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

CLIND, error closing indirect command file 'file-spec'

Explanation: DTIBLEND is unable to close the indirect command file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

CLLIT, error closing LITES2 file 'file-spec'

Explanation: DTIBLEND is unable to close the specified LITES2 guidance file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem, e.g. insufficient disk space for file allocation. Notify your system manager.

CLROV, error closing ROVER file 'file-spec'

Explanation: DTIBLEND is unable to close the specified ROVER guidance file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem, e.g. insufficient disk space for file allocation. Notify your system manager.

IFOUTBZ, IFF file 'file-spec' lies wholly outside the blend zone

Explanation: All the data within the specified IFF file lies outside of the blend zone and is therefore of no use as control for the edge blend process.

User action: Check that the correct IFF file was specified to DTIBLEND. Also check that the origin offset in the IFF file MD (Map Descriptor) is correctly set.

INVDTYP, invalid DTI data type for DTIBLEND

Explanation: DTIBLEND has discovered that an input DTI file has data type BIT or BYTE

User action: Check that you are using the correct input DTI files. If so use the DTICONVERT utility to change the data type of the input DTI files to WORD, LONGWORD or REAL.

MISMDTYP, mismatched input DTI file data types detected

Explanation: DTIBLEND has discovered that the input DTI files have different DTI data types.

User action: Check that you are using the correct input DTI files. If so use the DTICONVERT utility to change the data type of one of the input DTI files.

MISMHTYP, mismatched input DTI file header types detected

Explanation: DTIBLEND has discovered that the input DTI files have different DTI header types.

User action: Check that you are using the correct input DTI files. If so use the DTICONVERT utility to change the header type of one of the input DTI files.

MISMLAT, mismatched input DTI latitude steps

Explanation: DTIBLEND has discovered that the DTED input DTI files have different latitude steps between the rows.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the latitude step of one of the input DTI files.

MISMLON, mismatched input DTI longitude steps

Explanation: DTIBLEND has discovered that the DTED input DTI files have different longitude steps between the columns.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the longitude step of one of the input DTI files.

MISMPJPAR, mismatched DTI projection parameters

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different projection parameters.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the projection parameters of one of the input DTI files.

MISMPRJ, mismatched DTI projections

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different projections

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the projection of one of the input DTI files.

MISMPRJR, mismatched input DTI file projection records

Explanation: DTIBLEND has read a projection record from one of the input DTI files but is unable to do so from the other.

User action: Use DTITRANS to insert the missing projection record.

MISMSAMX, mismatched DTI projection record X sample interval

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different x sample intervals.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the X sample interval of one of the input DTI files.

MISMSAMY, mismatched DTI projection record Y sample interval

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different Y sample intervals

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the Y sample interval of one of the input DTI files.

MISMSPH, mismatched DTI projection spheroid

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different spheroids.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the spheroid of one of the input DTI files.

MISMUNI, mismatched DTI projection units

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different projection units.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the projection units of one of the input DTI files.

MISMUSPH, mismatched DTI projection user defined spheroid

Explanation: DTIBLEND has discovered that the ALVY input DTI file projection records define different user defined spheroids.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS utility to change the user definrd spheroid of one of the input DTI files.

MISMNST, mismatched input DTI x-steps

Explanation: DTIBLEND has discovered that the input DTI files have different x-steps between the columns.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS or DTIPATCH utility to change the x-step of one of the input DTI files.

MISMNST, mismatched input DTI y-steps

Explanation: DTIBLEND has discovered that the input DTI files have different y-steps between the rows.

User action: Check that you are using the correct input DTI files. If so use the DTITRANS or DTIPATCH utility to change the y-step of one of the input DTI files.

OPNLST, error opening LIST file 'file-spec' for write'

Explanation: DTIBLEND has failed to open the specified LIST file.

User action: The supplementary message given after this error should help you to decide what has gone wrong (e.g. disk full, file protection error, etc.). Correct this problem and then re-run DTIBLEND.

OPNRCM, error opening ROVER file %S for write'

Explanation: DTIBLEND has failed to open the specified LIST file.

User action: The supplementary message given after this error should help you to decide what has gone wrong (e.g. disk full, file protection error, etc.). Correct this problem and then re-run DTIBLEND.

RDDTIPROJ, error reading projection record in 'file-spec'

Explanation: DTIBLEND has detected an error while reading the projection record from the specified ALVY type DTI file.

User action: The supplementary messages which accompany this message should help you determine the cause of the error.

TOMNYIFTR, Too many IFF features lies within blend zone

Explanation: Too many IFF features lie within the blend zone for use as control to the blend process.

User action: Reduce the number of features that lie within the blend zone by using DTIBLEND two or more times, each time specifying IFF control for different sections of the blend zone.

UNEXPEOF, unexpected end of IFF file 'file-spec'

Explanation: The specified input IFF file terminated before an IFF EJ entry was encountered.

User action: Use the IMP utility IMEND to correctly terminate the file. Re-run DTIBLEND on the repaired IFF file. If the problem persists try reading the file into LITES2 and then exit. Re-run DTIBLEND.

MESSAGES (FATAL)

These messages indicate a severe error in processing, or some form of system failure, which has caused the program to terminate.

RETPOST, failed to return to blend file post

Explanation: DTIBLEND was unable to locate the current post in the blend DTI file

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists please save all the data files used and submit an SPR to Laser-Scan.

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTILIB library and by the Laser-Scan I/O library, LSLLIB. DTILIB library messages are introduced by '%DTILIB' and are documented in the MATRIX package reference manual. In most cases DTI errors will be due to a corrupt input file, and this should be the first area of investigation. If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are used to explain the details of program generated errors.

CHAPTER 5

MODULE DTITLE

MODULE DTITILE

REPLACES PANACEA modules PANTILE and PANULL.

FUNCTION

DTITILE is a utility to merge together DTI files or to create void areas in a DTI file. Up to eight DTI input files can be merged together in one DTITILE run.

FORMAT

\$ DTITILE

PROMPTS

DTITILE is command driven. Command input is expected when the following prompt is issued:

DTITILE>

DTITILE command defaults

On program startup, the following command defaults apply:

ABSOLUTE - enabled.

DIAGNOSTICS - disabled.

NULL - once the first input DTI file is specified the null will have one of the following:-

0 if BYTE type.

-32767 if WORD type.

80000000 Hex if LONG type.

-1.0E-38 if REAL type.

NULL_CHECKING - disabled.

PME - disabled.

UNITS - once a DTI file is specified appropriate default UNITS are setup.

WINDOW - None specified.

DESCRIPTION

General

DTITILE is a command driven utility to merge up to eight DTI files into a larger DTI output file, or to extract an area of interest from an input DTI file and write this to a separate DTI output file. The utility also includes a facility to make areas void in the output DTI file.

The DTI files always may be explicitly positioned with respect to one another using the ORIGIN command. However, if the DTI files to be tiled have absolute origin offset information set up in the file headers, then DTITILE calculates default origins to enable automatic positioning to take place.

The output file derives its header information primarily from the first input file specified with the FILEIN command. Origin offset information is obtained from the most southerly and westerly input files, or from any WINDOW specifications which have been applied to them.

DTITILE will only accept input DTI files which share the same data type. It is not possible, for example, to merge together a byte type DTI file with a real*4 type DTI file. IF the second or subsequent DTI files are found to be a different data type than the first, appropriate messages are issued. The DTI file will be closed with control being returned to the command input prompt.

DTITILE will give warning messages if input file header types or units types do not match, or if the X or Y grid intervals are different. Tiling may still however, be carried out.

Typical command sequence

A typical command sequence is:

FILEOUT LSL\$DTI:FINAL	(output file is LSL\$DTI:FINAL.DTI)
FILEIN AREA1	(input file 1 is LSL\$DTI:AREA1.DTI)
ORIGIN 1 1	(the SW corner of file 1 will correspond to position 1 1 in the output matrix)
FILEIN AREA4	(input file 2 is LSL\$DTI:AREA4.DTI)
ORIGIN 200 200	(the SW corner of file 2 will correspond to position 200 200 in the output matrix)
FILEIN AREA6	(input file 3 is LSL\$DTI:AREA6.DTI)
WINDOW 100 100 200 200	(area of interest in file 3 is defined by SW 100x 100y and NE 200x 200y)
ORIGIN 200 1	(the SW corner of the file 3 window will correspond to position 200 1 in the output matrix)
GO	(start to process)

This series of commands will create an output file LSL\$DTI:FINAL.DTI consisting of data from the 3 input files. Positioning is carried out explicitly with the ORIGIN command. Note that in the case of file 3 only the data within the specified area of interest will be transferred to the output matrix.

Areas in the output DTI file for which no data are available will be given a null height value.

DTITLE commands

@

Take command input from the specified file.

FORMAT: @file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied for the @ command will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTITLE offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTITLE to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. end-of-file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTITLE will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** WARNING *** "@" must precede a file-spec

*** WARNING *** Indirect file error - returning to terminal input

*** ERROR *** Can't open indirect command file 'file-spec'

Examples:

```
DTITILE> @PRESETS<CR>
DTITILE> ENABLE DIAGNOSTICS
DTITILE> FILEIN AREA1
DTI file LSL$DTI:AREA1.DTI;0 opened for read
Header   : LSLA   Data: REAL
```

Units are DTI Matrix Values

```
Matrix Coverage   SW:      1      1  NE:      45      40
Matrix Interval   E:       1          N:       1
Value Range       :      -5.00 to 326421.00
```

```
DTITILE> WINDOW 1 1 30 30
DTITILE> FILEOUT AREA15
DTITILE> SIZE 50 50
DTITILE> RETURN
DTITILE>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard MATRIX package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc.

Messages: None.

Examples:

DTITLE> ! a comment for the sake of it<CR>
DTITLE> WINDOW 0.0 0.0 900.0 900.0<CR>
DTITLE>

CANCEL VOID

Cancels a previously specified void window.

FORMAT: CANCEL VOID void_number

Command parameters:

void_number

The void number is an identifier assigned to the void window by the VOID command. The void number is integer and must be in the range 1 to 10.

DESCRIPTION:

The CANCEL VOID command cancels a previously specified void window. A list of currently defined void windows can be obtained using the SHOW VOIDS command.

Messages:

*** ERROR *** Specifying the command CANCEL

Available CANCEL command qualifiers are:

VOID

The following messages are specific to the CANCEL VOID command:

*** ERROR *** Specifying the command CANCEL VOID
Command requires void_number

*** ERROR *** Specifying the command CANCEL VOID
Void 'void_number' out of range
Use command SHOW VOIDS to list defined voids

*** ERROR *** Specifying the command CANCEL VOID
Void 'void_number' not defined
Use command SHOW VOIDS to list defined voids

Examples:

```
DTITLE> SHOW VOIDS<CR>
Void number 1 in DTI matrix units 10 10 20 20
Void number 2 in DTI matrix units 35 10 45 20
Void number 3 in DTI matrix units 60 10 75 20
DTITLE> CANCEL VOID 2<CR>
DTITLE> SHOW VOIDS<CR>
Void number 1 in DTI matrix units 10 10 20 20
Void number 2 not currently set
```

MATRIX REFERENCE (3.7): DTITILE - DTI File Merge Utility
CANCEL VOID command

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Void number 3 in DTI matrix units 60 10 75 20
DTITILE>

DISABLE ABSOLUTE

Disables a previous ENABLE ABSOLUTE command.

FORMAT: DISABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

DISABLE ABSOLUTE cancels a previous ENABLE ABSOLUTE command. If DISABLE ABSOLUTE is given, then coordinate values required by the ORIGIN, WINDOW or VOID commands, supplied in metre or projection units, must be specified as an offset from the SW corner of the matrix.
By default values should be specified as absolute coordinates.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

Examples:

DTITLE> **DISABLE ABSOLUTE**<CR>
DTITLE>

DISABLE DIAGNOSTICS

Disables a previous ENABLE DIAGNOSTICS command.

FORMAT: DISABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

DISABLE DIAGNOSTICS allows the user to disable a previous ENABLE DIAGNOSTICS command.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

Examples:

DTITLE> **ENABLE DIAGNOSTICS**<CR>
DTITLE> **DISABLE DIAGNOSTICS**<CR>
DTITLE>

DISABLE NULL_CHECKING

Disables a previous ENABLE NULL_CHECKING command.

FORMAT: DISABLE NULL_CHECKING

Command parameters: None.

DESCRIPTION:

DISABLE NULL_CHECKING allows the user to disable a previous ENABLE NULL_CHECKING command.

If null checking is disabled, then during tiling, no checking for null values overwriting actual data posts, will take place. Processing may consequently be quicker.

Messages:

The following error message is specific to the DISABLE command:

```
*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE      DIAGNOSTICS      NULL_CHECKING      PME
```

Examples:

```
DTITLE> DISABLE NULL_CHECKING<CR>
DTITLE>
```

DISABLE PME

Disables a previous ENABLE PME command.

FORMAT: DISABLE PME

Command parameters: None.

DESCRIPTION:

DISABLE PME allows the user to disable a previous ENABLE PME command.

Messages:

The following error messages are specific to the DISABLE and DISABLE PME commands:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

*** WARNING *** You are not using PME !

Examples:

DTITLE> **ENABLE PME**<CR>
DTITLE> **DISABLE PME**<CR>
DTITLE>

ENABLE ABSOLUTE

Selects the use of absolute coordinates values.

FORMAT: ENABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

If ENABLE ABSOLUTE is given, then coordinate values required by the WINDOW, ORIGIN or VOID commands, supplied in metre or projection units, must be specified as absolute (rather than relative) coordinate values.

For example if the projection indicates U.K. National Grid, then the WINDOW values may be specified as 6 figure National Grid coordinates.
By default window values should be specified as absolute coordinates.

ENABLE ABSOLUTE also controls whether DTITLE attempts to calculate default origins for files based on the origin offset information held in the headers of the files. This option can be disabled using the DISABLE ABSOLUTE command.

Messages:

The following error message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

Examples:

DTITLE> **ENABLE ABSOLUTE**<CR>
DTITLE>

ENABLE DIAGNOSTICS

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

FORMAT: ENABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

Because DTITLE is usually used in a batch processing environment, by default the utility produces minimal diagnostic printout. If however, the user wishes to receive an indication of processing progress then diagnostic printout may be selected with the ENABLE DIAGNOSTICS command.

On a heavily loaded computer it may be reassuring to ENABLE DIAGNOSTICS for the processing stage to indicate progress through the input data. Messages are issued indicating which input file is currently being processed. The command also enables output of information on the window being applied if the WINDOW command had been invoked for the current input DTI file.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE      DIAGNOSTICS      NULL_CHECKING      PME
```

Examples:

```
DTITLE> ENABLE DIAGNOSTICS<CR>
DTITLE>
```

ENABLE NULL_CHECKING

ENABLE NULL_CHECKING selects the option to check for null values.

FORMAT: ENABLE NULL_CHECKING

Command parameters: None.

DESCRIPTION:

Sometimes it may be necessary to tile files together in which null values in one file overlap valid data values in the other. In this case it is not desirable that the null values should overwrite the actual data values in the output file produced. If the command ENABLE NULL_CHECKING is given, then DTITLE checks for null values to ensure this does not happen.

Because extra checking is involved, processing time may be greater in this mode of operation.

Messages:

The following error message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

Examples:

DTITLE> **ENABLE NULL_CHECKING**<CR>
DTITLE>

ENABLE PME

ENABLE PME enables the PME performance monitor.

FORMAT: ENABLE PME

Command parameters: None.

DESCRIPTION:

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

Message:

The following error messages are specific to the ENABLE and ENABLE PME commands:

*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS NULL_CHECKING PME

*** WARNING *** You are already using PME!

Examples:

DTITLE> **ENABLE PME**<CR>
DTITLE>

FILEIN

Specifies a DTI file that is to be opened and used for data input.

FORMAT: FILEIN file-spec

COMMAND PARAMETERS:

file-spec

The specification of the DTI file to be opened for data input.

Any parts of the file-spec not supplied for the FILEIN command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEIN command causes the specified file to be opened and used as an input file to DTITLE. A FILEIN command must be issued before the WINDOW or GO commands will be accepted.

An ORIGIN and a WINDOW command may be specified for each input DTI file, before the next file is defined using the FILEIN command.

If origin offset information is present in the header of the file, and the ENABLE ABSOLUTE command has been given, then a default origin is calculated, to allow automatic positioning to take place. Otherwise, the default origin will be the bottom left hand corner of the output DTI file.

By default the window is the total extent of the input file.

Messages:

The following messages are specific to the FILEIN command:

*** ERROR *** Specifying command FILEIN
You must specify a file-spec argument to the FILEIN command

*** ERROR *** Specifying command FILEIN
You have already got eight DTI files open for input

*** ERROR *** Specifying command FILEIN
Unable to interpret input file-spec

*** ERROR *** Specifying command FILEIN
Failed while opening DTI file 'file spec' for input

*** ERROR *** Specifying command FILEIN
File 'file spec' data type 'type' invalid
Only data types 1 2 3 or 4 allowed

*** ERROR *** Specifying command FILEIN
File 'file-spec' data type not compatible with first DTI file

*** WARNING *** Header mismatch
File 'file-spec' does not have the same header type as the first DTI file

*** WARNING *** Units mismatch
File 'file-spec' does not have the same units as the first DTI file

*** WARNING *** Grid interval mismatch
File 'file-spec' X and/or Y grid not compatible with first DTI file

Examples:

DTITILE> **FILEIN AREAl<CR>**
DTI file LSL\$DTI:AREAl.DTI;0 opened for read
Header : LSLA Data: REAL

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	40
Matrix Interval	E:	1		N:	1	
Value Range	:	-5.00 to 326421.00				

DTITILE>

FILEOUT

Specifies the file-spec of the DTI file which is to receive the merged DTI data.

FORMAT: FILEOUT file-spec

COMMAND PARAMETERS:

file-spec

The file-spec of the text file which is to receive the DTI data.

Any parts of the file-spec not supplied for the FILEOUT command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEOUT command enables specification of the DTI file which is to receive the merged DTI data.

The FILEOUT command must be issued before the GO command.

Messages:

The following messages are specific to the FILEOUT command:

*** ERROR *** You must specify a file-spec argument to the FILEOUT command

*** ERROR *** Unable to interpret output file-spec

Examples:

DTITILE> **FILEOUT DUA3:[DEMONSTRATION]IDAHO<CR>**
DTITILE>

GO

Merge the input files together and put the results into the file specified with the FILEOUT command.

FORMAT: GO

Command parameters: None

DESCRIPTION:

Before the merge processing takes places, checks will be carried out to ensure that certain preconditions hold. The following checks are performed by the command:-

1. Test that at least one input DTI file has been opened and that a DTI output filename has been specified. An error message will be generated and the command will be terminated if the test fails.
2. If the SIZE command has been executed check that the origins of the input DTI files lie within the output DTI limits. If the test fails then a warning message is output indicating that the offending input DTI file will not be processed.
3. If the SIZE command has been executed check that these limits are at least as large as the calculated limits from the input DTI files. If the test fails the size is reset and a warning message is displayed. The command will continue processing.

The command will create the DTI file specified by the FILEOUT command. The format of the new DTI file will be the same as the first input DTI file specified with the FILEIN command. The data area will be initialised with the currently defined null value for the data type.

Merging of the opened input files will proceed in the order in which they were specified.

Upon successful completion of the GO command DTITLE is terminated.

Messages:

The following messages are specific to the GO command:

*** WARNING *** Origin values supplied exceed output file limits
Input file 'file spec' will not be processed

*** WARNING *** The supplied columns and/or rows via SIZE command is too small
The output DTI files will be created with the calculated column and row values.

*** ERROR *** FILEIN command must be used to open the DTI file first

*** ERROR *** FILEOUT command must be used to specify the output DTI file

Examples:

DTITILE> **FILEIN SOUTH<CR>**

DTI file LSL\$DTI:SOUTH.DTI;0 opened for read

File : LSL\$DTI:SOUTH.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	100	100
Matrix Interval	E:	1		N:	1	
Value Range	:		189 to	326		

DTITILE> **FILEIN NORTH<CR>**

DTI file LSL\$DTI:NORTH.DTI;0 opened for read

File : LSL\$DTI:NORTH.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	100	100
Matrix Interval	E:	1		N:	1	
Value Range	:		234 to	452		

DTITILE> **ORIGIN 1 200<CR>**

DTITILE> **FILEOUT FINAL<CR>**

DTITILE> **GO<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263

\$

HELP

Give help on a subject

FORMAT: HELP subject

Command parameters:

subject

The subject on which help is required.

Description:

The HELP command looks the rest of the line up in the MATRIX HELP library. This library contains a brief summary of the operation of each command.

The information is looked up in the DTITLE section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTITLE> **HELP ENABLE PME**<CR>

DTITLE

ENABLE

PME

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

DTITLE>

NULL

Specifies the null value to be applied to posts in the output DTI file for which no input DTI value is available.

FORMAT: NULL null_value

Command parameters:

null_value

The null value to be applied. This must lie within a range appropriate to the first input DTI file data type and hence the output DTI file data type:

Minimum	Maximum	DTI data type
0	255	BYTE
-32767	32767	WORD INTEGER
-2E31	2E31-1	LONG INTEGER
-1.0E38	1.0E38	REAL_*4

By default a value of 0 is used for BYTE type DTI files, -32767 for WORD type DTI files and 80000000 Hex for LONGWORD and -1.0E-38 for REAL type DTI files.

DESCRIPTION:

The NULL command specifies the null value to be applied to posts in the output DTI file for which no input DTI value is available.

The current null value may be examined using the command SHOW NULL.

Messages:

The following warning messages are specific to the NULL command:

*** WARNING *** Null value out of range for a byte type DTI file
Null value must be between 0 and 255
Default value restored

*** WARNING *** Null value out of range for a word type DTI file
Null value must be between -32767 and 32767
Default value restored

*** WARNING *** Null value out of range for a longword type DTI file
Null value must be between -2E31 and 2E31 - 1
Default value restored

*** WARNING *** Null value out of range for a real type DTI file
Null value must be between -1.0E38 and 1.0E38
Default value restored

*** ERROR *** FILEIN command must be used to open the DTI file first

Examples:

DTITILE> NULL 0<CR>
DTITILE> SHOW NULL<CR>

NULL:
Current null byte value is 0

DTITILE>

ORIGIN

Specifies the location within the output DTI file of the input DTI file.

FORMAT: ORIGIN xloc yloc

Command parameters:

xloc yloc

The coordinate position within the output DTI file at which the bottom left hand (or south west) corner of the input DTI file will be located.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 2 integer values defining the origin in terms of column and row numbers

UNITS METRES - Requires 2 real (floating point) values defining the origin as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 2 real (floating point) values defining the origin in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 2 values defining the absolute latitude and longitude position of the origin in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 2 real (floating point) values defining the origin in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

DESCRIPTION:

The command is used to define the location of the bottom left hand (or south west) corner of the input DTI file within the output DTI file. If ORIGIN is to be used it must be specified before another FILEIN command is executed. ORIGIN command operates on the last opened input DTI file.

If the command SIZE has been executed then the ORIGIN command parameters must lie within the limits specified by the SIZE command.

If origin offset information is present in the header of the file, and the ENABLE absolute command has been given, then a default origin is calculated to enable automatic positioning to take place. Otherwise the default will be the bottom left hand corner of the output DTI file.

Messages:

The following warning messages are specific to the ORIGIN command:

*** ERROR *** FILEIN command must be used to open the DTI file first

*** ERROR **** Specifying the DTI origin
Unable to use supplied LATLONG values

*** ERROR **** Specifying the DTI origin
Command requires x,y coordinate for position in output

*** ERROR **** Specifying the DTI origin
Both integer values must be greater then 0

*** ERROR **** Specifying the DTI origin
Origin must not exceed supplied output matrix size
Output matrix size 'ncol' columns and 'nrow' rows

Examples:

DTITLE> **FILEIN SWAREA<CR>**
DTI file LSL\$DTI:SWAREA.DTI;0 opened for read

File : LSL\$DTI:SWAREA.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	50	50
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITLE> **FILEIN NWAREA<CR>**
DTI file LSL\$DTI:NWAREA.DTI;0 opened for read

File : LSL\$DTI:NWAREA.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	50	40
Matrix Window	SW:	1	1	NE:	50	40
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITILE> **ORIGIN 1 51<CR>**

DTITILE> **FILEIN NEAREA<CR>**

DTI file LSL\$DTI:NEAREA.DTI;0 opened for read

File : LSL\$DTI:NEAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	40
Matrix Window	SW:	1	1	NE:	45	40
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITILE> **ORIGIN 51 51<CR>**

DTITILE> **FILEIN SEAREA<CR>**

DTI file LSL\$DTI:SEAREA.DTI;0 opened for read

File : LSL\$DTI:SEAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	50
Matrix Window	SW:	1	1	NE:	45	50
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITILE> **ORIGIN 51 1<CR>**

DTITILE> **FILEOUT NEWAREA<CR>**

DTITILE> **FILEOUT NSEWAREA<CR>**

DTITILE> **GO<CR>**

ELAPSED: 00:00:25.08 CPU: 0:00:06.43 BUFIO: 453 DIRIO: 75 FAULTS: 303

\$

PAUSE

Pauses DTITLE execution.

FORMAT: PAUSE

Command parameters: None.

DESCRIPTION:

Pauses DTITLE execution and issues a prompt for a carriage return to continue execution. This command is designed for use in software demonstration situations.

Messages: None.

Examples:

DTITLE> **PAUSE<CR>**

Press <RETURN> to continue<CR>
DTITLE>

QUIT

Quit from DTITILE.

FORMAT: QUIT

Command parameters: None.

Description:

The QUIT command causes DTITILE to exit immediately, closing any opened DTI files.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to quit from the program.

Messages: None.

Examples:

DTITILE> **QUIT<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
\$

RETURN

Restores command input from an indirect file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect file to SYS\$COMMAND.

A typical application is to allow the user to use an indirect command file to set up those run time defaults which are constant within a flowline and then return to input from the terminal (or batch stream) for the run specific commands. To do this RETURN must be the last command in the indirect command file.

Messages:

The following messages are specific to the RETURN command:

RETURN command detected - returning to terminal input

RETURN command ignored - command input is already from terminal

Examples:

```
DTITLE> @FLOW2<CR>
DTITLE> ENABLE DIAGNOSTICS
DTITLE> RETURN
DTITLE>
```

SHOW ENABLE

Shows the current status of those options that may be enabled by means of the ENABLE command, or disabled using the DISABLE command.

FORMAT: **SHOW ENABLE**

Command parameters: None.

DESCRIPTION:

Displays the current status of all the DTITILE options that may be enabled or disabled using the ENABLE and DISABLE commands.
The name of the option is shown, followed by either the word ON or OFF to indicate its current status.
If the command SHOW ENABLE is used before any ENABLE or DISABLE commands have been given, the default status of the options is displayed.

Messages:

The following message is specific to the SHOW command:

```
*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE  FILES  NULL  SIZE  UNITS  VOIDS
```

Examples:

DTITILE>**SHOW ENABLE<CR>**

Current status:

ABSOLUTE	On	DIAGNOSTICS	Off	NULL_CHECKING	Off
PME	Off				

DTITILE>

SHOW FILES

Extracts information from the headers of the input files and outputs it to the screen.

FORMAT: SHOW FILES

Command parameters: None.

DESCRIPTION:

Details extracted from the header of all input files are displayed on the terminal.

The header values are shown in the current units of measurement. This is dependent on the header type of the input file, or may be set explicitly using the UNITS command. By default or if the ENABLE ABSOLUTE command has been given then metre or projection values are expressed in absolute values. Otherwise they are displayed as offsets from the SW corner of the matrix. Currently selected windows are also displayed.

The file specification of the currently selected output file is also shown.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE FILES NULL SIZE UNITS VOIDS

Examples:

DTITLE>**SHOW FILES<CR>**

File : LSL\$DTI:TST.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	71	71
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	139	to	192		

File : LSL\$DTI:TST11.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	71	71
Matrix Window	SW:	50	50	NE:	71	71
Matrix Interval	E:	1		N:	1	
Value Range	:	134	to	297		

DTITLE>

SHOW NULL

Displays the currently specified null value.

FORMAT: **SHOW NULL**

Command parameters: None.

DESCRIPTION:

The null value specified with the NULL command is displayed on the terminal.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE FILES NULL SIZE UNITS VOIDS

Examples:

DTITLE>**SHOW NULL<CR>**
Current null word value is -32767
DTITLE>

SHOW SIZE

Displays the currently specified SIZE values.

FORMAT: **SHOW SIZE**

Command parameters: None.

DESCRIPTION:

The current output file size value, specified with the SIZE command, are output to the terminal.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE FILES NULL SIZE UNITS VOIDS

Examples:

DTITLE>**SHOW SIZE**<CR>
No user defined size for output DTI file
size will be calculated from input DTI files
DTITLE>

SHOW UNITS

Displays on the terminal the current units of measurement.

FORMAT: **SHOW UNITS**

Command parameters: None.

DESCRIPTION:

Displays the current units of measurement which will be used when specifying coordinates with the ORIGIN, WINDOW or VOID commands.

The UNITS command may be used to change the current units of measurement.

Messages:

The following message is specific to the SHOW command:

```
*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE  FILES  NULL  SIZE  UNITS  VOIDS
```

Examples:

```
DTITLE>SHOW UNITS<CR>
Current units are Projection Units.
DTITLE>
```

SHOW VOIDS

Displays on the terminal the current void windows.

FORMAT: **SHOW VOIDS**

Command parameters: None.

DESCRIPTION:

Displays the current void areas which are set null in the output file.

The VOID command may be used to set up void areas. By default or if the ENABLE ABSOLUTE command has been given then metre or projection values are expressed in absolute values. Otherwise they are displayed as offsets from the SW corner of the matrix.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE FILES NULL SIZE UNITS VOIDS

Examples:

DTITLE>**SHOW VOIDS**<CR>
Void number 1 in DTI matrix units 10 100 120 150
Void number 2 in Meters on the ground 500.00 450.00 650.00 500.00
DTITLE>

SIZE

Enables the user to specify the number of columns and rows to be generated in the output DTI file.

FORMAT: SIZE ncol nrow

Command parameters:

ncol

nrow

The SIZE command expects 2 arguments; the first is the number of columns 'x' , the second the number of rows 'y'. If one argument is omitted then the number of columns and rows are assumed equal.

DESCRIPTION:

DTITILE normally calculates the size of the output DTI file using input DTI file header information and any specified WINDOW and ORIGIN values. For some applications it may be desirable to specifically define the size of the output matrix. If the specified size exceeds the area covered by the merged DTI files, the current null value will be written to the unused parts of the output DTI file. If the specified size is smaller than the area covered by the merged DTI files an error message is generated, and the file will be created at the correct size.

Messages:

The following error messages are specific to the SIZE command:

*** ERROR *** Specifying columns and rows
Command requires number of columns and number of rows

*** ERROR *** SIZE arguments must be positive integers

Examples:

DTITILE> **FILEIN TST11<CR>**
DTI file LSL\$DTI:TST11.DTI;0 opened for read

File : LSL\$DTI:TST11.DTI;0
Header : LSLA Data: BYTE

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	100	100
Matrix Window	SW:	1	1	NE:	100	100

Matrix Interval E: 1 N: 1
Value Range : 0 to 255

DTITLE> **UNITS MATRIX<CR>**

DTITLE> **WINDOW 41 41 100 100<CR>**

DTITLE> **SIZE 101 101<CR>**

DTITLE> **FILEOUT TST12<CR>**

DTITLE> **GO<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
\$

SPAWN

The SPAWN command enables a subprocess to be created from within the DTITLE utility.

FORMAT: SPAWN command-line

Command parameters:

command-line

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTITLE. The command line cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within the DTITLE utility. When the subprocess terminates, control is returned to DTITLE.

Messages:

The following error messages are specific to the SPAWN command:

*** ERROR *** Specifying command SPAWN
Command requires a valid DCL command line

*** ERROR *** Unable to spawn command, returning to DTITLE

Examples:

DTITLE> SPAWN DIRECTORY LSL\$DTI:*.DTI<CR>

Directory DUA3:[LSL.DTI]

TEST1.DTI;1	8/8	18-AUG-1987 07:56	[LSL,DAVEC]
TEST2.DTI;1	7/8	18-AUG-1987 17:17	[LSL,DAVEC]
TEST2.DTI;2	7/8	18-AUG-1987 17:34	[LSL,DAVEC]

Total of 3 files, 22/24 blocks.

DTITLE>

UNITS

Specifies the units of measurement that will be used when defining an area of interest in the input DTI file using the WINDOW command or defining a void area using the VOID command. The command also controls the units of measurement which will be used when displaying file header details.

FORMAT: UNITS units

Command parameters:

units

A keyword defining the measurement units, chosen from:

MATRIX	Matrix grid interval units, i.e rows and columns
METRES	Metres on the ground
LATLONG	Latitude and Longitude (in degrees, minutes and seconds)
SECONDS	Seconds of arc
PROJECTION	Projection Record Units (eg. mms on the source

document)

DESCRIPTION:

The UNITS command enables the user to specify in what units of measurement he wishes to define an area of interest in an input DTM using the WINDOW VOID or ORIGIN commands. The command also controls in what format data from the header of the DTM are displayed.

The UNITS command should be given after defining the DTI file containing the input DTM, since an appropriate default units of measurement is set up whenever an input DTI file is opened.

Messages:

The following error messages are specific to the UNITS command:

*** ERROR *** FILEIN command must be used to open the DTI file first

*** ERROR *** Specifying command UNITS
Command qualifiers are MATRIX,METRES,SECONDS,LATLONG or PROJECTION

*** ERROR *** Specifying command UNITS
Command qualifier is invalid for the input file

Examples:

DTITILE> FILEIN TST11<CR>

DTI file LSL\$DTI:TST11.DTI;0 opened for read

File : LSL\$DTI:TST11.DTI;0
Header : LSLA Data: BYTE

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	100	100
Matrix Window	SW:	1	1	NE:	100	100
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITILE> **UNITS MATRIX<CR>**

DTITILE> **WINDOW 41 41 100 100<CR>**

DTITILE>

VOID

Specifies an area in the output DTI which is to be made void.

FORMAT: VOID xmin ymin xmax ymax

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the defining rectangle.

xmax ymax

The coordinates of the top right hand corner of the defining rectangle.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 4 integer values defining the rectangle in terms of column and row numbers

UNITS METRES - Requires 4 real (floating point) values defining the rectangle as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 4 real (floating point) values defining the absolute position of the rectangle in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 4 values defining the absolute latitude and longitude position of the rectangle in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 4 real (floating point) values defining the rectangle in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

DESCRIPTION:

The VOID command is used to define the rectangular limits of areas in the output DTI which will be made void. The area defined by the VOID command will be given a null height value. The limits must be specified in the order bottom left hand (or south west) corner then top right hand (or north east) corner.

The specified void window values should lie within the output DTI file x and y ranges. A maximum of 10 void windows may be specified during one execution of the module. Void windows may be redefined by first using the CANCEL VOID command and then re-specifying the VOID command.

The VOID command can be used to restrict access to data in the output DTI file.

Messages:

The following warning messages are specific to the VOID command:

```
*** ERROR *** Specifying the VOID command
You must use the FILEIN command to open an input DTI first

*** ERROR *** Specifying DTI void arguments
Command requires 2 x,y coordinate pairs (SW and NE)

*** ERROR *** Specifying DTI void window
Unable to use supplied LATLONG values

*** ERROR *** Specifying the VOID command
Command arguments invalid
NE coordinates must exceed SW coordinates

*** ERROR *** Specifying the VOID command
Maximum number of voids exceeded
Use SHOW VOID command followed by CANCEL VOID 'void_number' first
```

Examples:

```
DTITLE> FILEIN TST20<CR>
DTI file LSL$DTI:TST20.DTI;0 opened for read
```

```
File      : LSL$DTI:TST20.DTI;0
Header    : LSLA Data: BYTE
```

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	500	500
Matrix Window	SW:	1	1	NE:	500	500
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITILE> VOID 10 100 120 150<CR>

Void number 1 has been specified in DTI matrix units

DTITILE> UNIT METRES<CR>

DTITILE> VOID 500.0 450.0 650.0 500.0<CR>

Void number 2 has been specified in Meters on the ground

DTITILE> SHOW VOID<CR>

Void number 1 in DTI matrix units 10 100 120 150

Void number 2 in Meters on the ground 500.00 450.00 650.00 500.00

DTITILE>

WAIT

Suspend processing for the specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number of seconds for which DTITLE processing is to be suspended.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following warning message is specific to the WAIT command:

*** WARNING *** You must specify the number of seconds to wait

Examples:

DTITLE> WAIT 4<CR>
DTITLE>

WINDOW

Specifies the limits of the data area to be extracted from an input file.

FORMAT: WINDOW xmin ymin xmax ymax

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the defining rectangle.

xmax ymax

The coordinates of top the right hand corner of the defining rectangle.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 4 integer values defining the rectangle in terms of column and row numbers

UNITS METRES - Requires 4 real (floating point) values defining the rectangle as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 4 real (floating point) values defining the absolute position of the rectangle in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 4 values defining the absolute latitude and longitude position of the rectangle in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 4 real (floating point) values defining the rectangle in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

DESCRIPTION:

The command is used to define the rectangular limits of the area of data which is to be extracted from the current input DTI file. The limits must be specified in the order bottom left hand (or south west) corner then top right hand (or north east) corner.

The specified window values should lie within the input DTI file x and y ranges. If necessary the window values will be truncated to fit the input DTI file x and y ranges.

The WINDOW command can be used to clip data from the input DTI file. If input is to be from an entire DTI file then the WINDOW command may be omitted as the WINDOW extents will then, by default, be taken from the DTI file header.

Messages:

The following warning messages are specific to the WINDOW command:

*** WARNING **** Specified window exceeds matrix limits
Window will be truncated to fit

*** ERROR **** You must use the FILEIN command to open the DTI file first

*** ERROR **** Specifying DTI window arguments
Command requires 2 x,y coordinate pairs (SW and NE)

*** ERROR **** Specifying DTI window
NE coordinates must exceed SW coordinates

Examples:

DTITLE> **FILEIN TST<CR>**
DTI file LSL\$DTI:TST.DTI;0 opened for read

File : LSL\$DTI:TST.DTI;0
Header : LSLA Data: BYTE

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	500	500
Matrix Window	SW:	1	1	NE:	500	500
Matrix Interval	E:	1		N:	1	
Value Range	:	139	to	345		

DTITLE> **WINDOW 100 1 300 400<CR>**
DTITLE> **SHOW FILES<CR>**

File : LSL\$DTI:TST.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	500	500
Matrix Window	SW:	100	1	NE:	300	400
Matrix Interval	E:	1		N:	1	
Value Range	:	139	to		345	

DTITILE>

DTITLE examples

EXAMPLES

\$ DTITLE

MATRIX module DTITLE of 17:24:53 23-MAR-88

DTITLE> **FILEIN SWAREA<CR>**

DTI file LSL\$DTI:SWAREA.DTI;0 opened for read

File : LSL\$DTI:SWAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	50	50
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITLE> **FILEIN NWAREA<CR>**

DTI file LSL\$DTI:NWAREA.DTI;0 opened for read

File : LSL\$DTI:NWAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	50	40
Matrix Window	SW:	1	1	NE:	50	40
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITLE> **ORIGIN 1 51<CR>**

DTITLE> **FILEIN NEAREA<CR>**

DTI file LSL\$DTI:NEAREA.DTI;0 opened for read

File : LSL\$DTI:NEAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	40
Matrix Window	SW:	1	1	NE:	45	40
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

DTITLE> **ORIGIN 51 51<CR>**

DTITLE> **WINDOW 1 1 40 45<CR>**

WARNING Specified window exceeds matrix limits
Window will be truncated to fit

DTITLE> **FILEIN SEAREA<CR>**

DTI file LSL\$DTI:SEAREA.DTI;0 opened for read

File : LSL\$DTI:SEAREA.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	45	50
Matrix Window	SW:	1	1	NE:	45	50
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

```
DTITILE> ORIGIN 51 1<CR>
DTITILE> WINDOW 1 1 40 45<CR>
DTITILE> FILEOUT NEWAREA<CR>
```

```
DTITILE> GO<CR>
```

File : LSL\$DTI:NEWAREA.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	90	90
Matrix Window	SW:	1	1	NE:	90	90
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	255		

ELAPSED: 0 00:04:25.81 CPU: 0:00:01.75 BUFIO: 30 DIRIO: 15 FAULTS: 139

\$

The above is an example of using the DTITILE utility to merge together four input DTI files to make one larger output DTI file. The first and second input DTI files opened, with the FILEIN command, are used in their entirety. The third and fourth input DTI files are windowed using the WINDOW command. Note the use of the ORIGIN command to position the input DTI files on the output DTI file. On completion, header information on the output file is displayed and the DTITILE utility terminates.

\$ DTITILE

MATRIX module DTITILE of 14:45:02 7-DEC-88

```
DTITILE> ENABLE DIAGNOSTICS<CR>
DTITILE> FILEIN OS48E<CR>
```

File : LSL\$DTI:os48e.DTI;0
Header : LSLA Data: WORD

Units are metres

Matrix Coverage	SW:	450000.00	80000.00	NE:	460000.00	100000.00
Matrix Window	SW:	450000.00	80000.00	NE:	460000.00	100000.00
Matrix Interval	E:	50.00		N:	50.00	
Value Range	:	0	to	235		

Default origin calculated from header offset
DTITILE> FILEIN OS48W<CR>

File : LSL\$DTI:os48w.DTI;0
Header : LSLA Data: WORD

Units are metres

Matrix Coverage	SW:	440000.00	80000.00	NE:	449950.00	100000.00
Matrix Window	SW:	440000.00	80000.00	NE:	449950.00	100000.00
Matrix Interval	E:	50.00		N:	50.00	
Value Range	:	0	to	214		

Default origin calculated from header offset

DTITILE> VOID 445000 85000 455000 90000<CR>

Void number 1 has been specified in Metres on the ground

DTITILE> SHOW VOID<CR>

Void number 1 in Metres on the ground : 445000.0 85000.0 455000.0 90000.0

DTITILE> FILEOUT OS48WHOLE<CR>

DTITILE> GO<CR>

Number of columns in output file 401
Number of rows in output file 401
LSL\$DTI:os48e.DTI;0 input DTI file currently being processed
LSL\$DTI:os48w.DTI;0 input DTI file currently being processed

File : LSL\$DTI:os48whole.DTI;0
Header : LSLA Data: WORD

Units are metres

Matrix Coverage	SW:	440000.00	80000.00	NE:	460000.00	100000.00
Matrix Window	SW:	440000.00	80000.00	NE:	460000.00	100000.00
Matrix Interval	E:	50.00		N:	50.00	
Value Range	:	0	to	235		

ELAPSED: 0 00:01:48.68 CPU: 0:00:02.10 BUFIO: 53 DIRIO: 217 FAULTS: 1147
\$

The above example demonstrates a run of DTITILE with automatic positioning of the files taking place. Because the two input files contain origin offset information in their headers, DTITILE calculates origins to ensure that the two data areas are correctly positioned with respect to one another in the output file. A void area has also been specified in absolute coordinates. This area will be set to null values in the output file.

DTITLE messages**MESSAGES (OTHER)**

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTI library or by the Laser-Scan I/O library, LSLLIB. DTI library messages are introduced by %DTI and are documented in the MATRIX Reference manual. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are often used to explain the details of program generated errors.

If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis.

CHAPTER 6

MODULE DTICOMBINE

MODULE DTICOMBINE

REPLACES None. DTICOMBINE is a new MATRIX utility.

FUNCTION

DTICOMBINE allows data values in multiple DTI files (maximum 8) to be combined according to a user specified arithmetic expression. DTICOMBINE creates an output DTI file containing the resulting data values.

Optionally, only data values that lie within a user specified rectangular window within each input file will be processed.

DTICOMBINE may be used to perform overlay operations and to determine differences between DTI files.

FORMAT

\$ DTICOMBINE

COMMAND QUALIFIERS

None, DTICOMBINE is command driven.

DTICOMBINE command defaults

On program startup, the following command defaults apply:

ABSOLUTE - enabled.

CLASSIFICATION- disabled.

DIAGNOSTICS - disabled.

PME - disabled.

OUTPUT - INTERSECTION

DESCRIPTION

General

DTICOMBINE allows data values in multiple DTI files (maximum 8) to be combined according to a user specified arithmetic expression. DTICOMBINE creates an output DTI file containing the resulting data values.

Optionally only data values that lie within a user specified rectangular window may be processed.

DTICOMBINE may be used to perform overlay operations and to determine differences between DTI files.

Classification of data can also be performed by DTICOMBINE.

If diagnostic printout is enabled, the resulting messages are sent to SYS\$OUTPUT:.

DTICOMBINE and null post handling

If a null post value is encountered in any of the input files, then a corresponding null value is generated in the output file for any arithmetic expression (and a warning message generated at the first null occurrence). However, for MAX or MIN expressions, null values are simply ignored and a result obtained from the remaining values, if any (and a similar warning message generated at the first null occurrence). Null values are recognised as the following for various file data types: -

-32767 if WORD type.

80000000 Hex if LONG type.

-1.0E-38 if REAL type.

0 is output as the null value for BYTE files.

DTICOMBINE typical command sequence

Detailed descriptions of the individual commands available are given below.

A typical command sequence is:

FILEA TESTDATA1	- input file A is LSL\$DTI:TESTDATA1.DTI
WINDOW 100 100 200 200	- area of interest in input file A is defined by SW 100x 100y and NE 200x 200y matrix units
FILEB TESTDATA2	- input file B is LSL\$DTI:TESTDATA2.DTI. In the absence of a WINDOW command following the FILEB command, the whole DTI file will be used
WORD=A*B	- the expression defining the combination of DTI file A and DTI file B. The result is to be placed in a word type DTI file. (Not yet specified).
FILEOUT RESULT.DTI	- Specifies that LSL\$DTI:RESULT.DTI is to be used as the output file.
GO	- Create and open LSL\$DTI:RESULT.DTI as output file. Start to process. The size of the file is determined by the size of the input files or by a window command (if specified). The type of file (DTED, LSLA etc.) is set to that of the input file with the lowest alphabetic identifier.

This series of commands specifies that DTICOMBINE is to combine two DTI files: LSL\$DTI:TESTDATA1.DTI;0 as file A and LSL\$DTI:TESTDATA2.DTI;0 as file B.

Output is to be to a new DTI file; LSL\$DTI:RESULT.DTI;0.

The WORD=A*B command specifies the expression defining how the 2 input files are to be combined and that the results are to be stored in a DTI file as word (16 bit) integers.

DTICOMBINE commands

@

Take command input from the specified file.

FORMAT: @ file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied for the @ command will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTICOMBINE offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTICOMBINE to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. end-of-file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTICOMBINE will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** WARNING *** "@" must precede a file-spec

*** WARNING *** Indirect file error - returning to terminal input

*** ERROR *** Can't open indirect command file 'file-spec'

Examples:

```
$ DTICOMBINE<CR>
MATRIX module DTICOMBINE of 18:30:39 18-FEB-88
DTICOMBINE> @PRESETS<CR>
DTICOMBINE> ENABLE DIAGNOSTICS
DTICOMBINE> FILEA ISOTROPHIC1000.DTI
DTICOMBINE> WINDOW 1 1 101 51
DTICOMBINE> REAL=ABS((A*B)/(C**2))
DTICOMBINE> RETURN
DTICOMBINE>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard DTM package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc.

Messages: None.

Examples:

DTICOMBINE> ! a comment for the sake of it<CR>
DTICOMBINE> WINDOW 1 1 200 250<CR>

BYTE

The BYTE command enables specification of the combination expression and instructs DTICOMBINE to place the results into a BYTE valued DTI file.

FORMAT: BYTE = expression

Command parameters:

expression

Specifies the arithmetic expression with which the input DTI files are to be combined.

- See section 9 for the description of the format of the expressions

DESCRIPTION:

The BYTE command enables specification of the combination expression and instructs DTICOMBINE to place the results into a BYTE valued DTI file.

Messages:

The following messages are specific to the BYTE command:

*** ERROR *** Byte underflow detected at post X = 'integer', Y = 'integer'

*** ERROR *** Byte overflow detected at post X = 'integer', Y = 'integer'

Examples:

DTICOMBINE> **BYTE=A*(B-C)<CR>**
DTICOMBINE>

CLASS

Allows creation of new, or access to an old, class.

FORMAT: CLASS class-id

Command parameters:

class-id

The value to which output DTI data - which matches the members of this class - are set.

The class-id can be a fixed or floating-point value.

DESCRIPTION:

The CLASS command enables the user to create or re-open a class - depending on whether the class already exists, or not.

Once the class is open, all INCLUDE and EXCLUDE commands are then directed to that class until a further CLASS or DISABLE CLASSIFICATION command is issued.

Classification must be enabled before a CLASS command can be issued.

Messages:

The following warning messages are specific to the CLASS command:

*** WARNING *** CLASSIFICATION not ENABLEd

*** WARNING *** Missing or illegal class number

*** WARNING *** Maximum number of classifications exceeded

Examples:

```
$ DTICOMBINE<CR>
MATRIX module DTICOMBINE of 10:41:45 29-FEB-88
DTICOMBINE> CLASS 2.8
*** WARNING *** CLASSIFICATION not ENABLEd
DTICOMBINE> ENABLE CLASSIFICATION
DTICOMBINE> CLASS 2
DTICOMBINE> INCLUDE 120,200:300
DTICOMBINE> CLASS 10
DTICOMBINE> INCLUDE ALL
DTICOMBINE> SHOW CLASS

CLASS 2.0    120.0 >=200.0 <=300.0
CLASS 10.0   All values
```

DTICOMBINE>

CLOSE

Facilitates closure of a DTI file previously opened with a FILEx command.

FORMAT: **CLOSE file-id**

Command parameters:

file-id

The symbolic identification of the DTI file to be closed. For example, if the file to be closed was opened as file A in the combination expression by use of the FILEA command, its file-id is A.

DESCRIPTION:

The CLOSE command enables the user to close a DTI file previously opened with a FILEx command.

An example application of the CLOSE command arises when an input file has been incorrectly windowed and a subsequent FILEx command issued. The incorrectly windowed file may be closed with the CLOSE command and then reopened with a FILEx command and the WINDOW respecified.

Messages:

Examples:

```
$ DTICOMBINE<CR>
MATRIX module DTICOMBINE of 10:41:45 29-FEB-88
DTICOMBINE> FILEA SOILS<CR>
DTI file LSL$DTI:SOILS.DTI;0 opened for read
```

```
File      : LSL$DTI:SOILS.DTI;0
Header    : LSLA Data: WORD
```

Units are DTI Matrix Values

```
Matrix Coverage  SW:      1      1  NE:    201    201
Matrix Interval   E:      1      1  N:      1
Value Range      :    97    to    468
```

By default WINDOW commands for this file must be specified in DTI matrix units

Use the UNITS command to change the default units

DTICOMBINE> **FILEB WOODLAND<CR>**

DTI file LSL\$DTI:WOODLAND.DTI;0 opened for read

File : LSL\$DTI:WOODLAND.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	201	201
Matrix Interval	E:	1		N:	1	
Value Range	:	9	to	1798		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> **FILEA INFILTRATION<CR>**

WARNING You have already got LSL\$DTI:SOILS.DTI;0 open as file A

DTICOMBINE> **CLOSE A<CR>**

DTICOMBINE> **FILEA INFILTRATION<CR>**

DTI file LSL\$DTI:INFILTRATION.DTI;0 opened for read

File : LSL\$DTI:INFILTRATION.DTI;0

Header : LSLA Data: REAL

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	201	201
Matrix Window	SW:	1	1	NE:	51	51
Matrix Interval	E:	1		N:	1	
Value Range	:	0.06	to	0.89		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> **REAL=A/(B*1.39)<CR>**

DTICOMBINE>

DELETE

Deletes CLASSes.

FORMAT: **DELETE class-id**

Command parameters:

class-id

The number of the CLASS to delete; if ALL specified then all the classes will be deleted.

DESCRIPTION:

Deletes either all or specific CLASSes.

Messages:

*** WARNING *** No CLASS deleted

*** ERROR *** Missing or illegal CLASS specified

CLASS <n> deleted

All CLASSes deleted

Examples:

DTICOMBINE> **DELETE 2<CR>**
CLASS 2 deleted
DTICOMBINE>

DISABLE ABSOLUTE

Disables a previous ENABLE ABSOLUTE command.

FORMAT: DISABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

DISABLE ABSOLUTE cancels a previous ENABLE ABSOLUTE command. If DISABLE ABSOLUTE is given, then coordinate values required by the WINDOW command, supplied in metre or projection units, must be specified as an offset from the SW corner of the matrix.

By default window values should be specified as absolute coordinates.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS CLASSIFICATION PME

Examples:

DTICOMBINE> **DISABLE ABSOLUTE**<CR>
DTICOMBINE>

DISABLE CLASSIFICATION

Disables a previous ENABLE CLASSIFICATION command.

FORMAT: DISABLE CLASSIFICATION

Command parameters:None

DESCRIPTION:

DISABLE CLASSIFICATION allows the user to disable a previous ENABLE CLASSIFICATION command.

Messages: None.

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS CLASSIFICATION PME

Examples:

DTICOMBINE> **ENABLE CLASSIFICATION<CR>**
DTICOMBINE> **SHOW CLASS<CR>**

*** WARNING *** No classes found
DTICOMBINE> **DISABLE CLASSIFICATION<CR>**
DTICOMBINE> **SHOW CLASS<CR>**

Classification not enabled
DTICOMBINE>

DISABLE DIAGNOSTICS

Disables a previous ENABLE DIAGNOSTICS command.

FORMAT: DISABLE DIAGNOSTICS

Command parameters:None

DESCRIPTION:

DISABLE DIAGNOSTICS allows the user to disable a previous ENABLE DIAGNOSTICS command.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS CLASSIFICATION PME

Examples:

DTICOMBINE> DISABLE DIAGNOSTICS<CR>
DTICOMBINE>

DISABLE PME

Disables a previous ENABLE PME command.

FORMAT: **DISABLE PME**

Command parameters: None.

DESCRIPTION:

DISABLE PME allows the user to disable a previous ENABLE PME command.

Messages:

The following messages are specific to the DISABLE and DISABLE PME commands:

*** ERROR *** Specifying command DISABLE
Available DISABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS CLASSIFICATION PME

*** WARNING *** You are not using PME !

Examples:

DTICOMBINE> **ENABLE PME**<CR>
DTICOMBINE> **DISABLE PME**<CR>
DTICOMBINE>

ENABLE ABSOLUTE

Selects the use of absolute coordinates values.

FORMAT: **ENABLE ABSOLUTE**

Command parameters: None.

DESCRIPTION:

If ENABLE ABSOLUTE is given, then coordinate values required by the WINDOW command, supplied in metre or projection units, must be specified as absolute (rather than relative) coordinate values.

For example if the projection indicates U.K. National Grid, then the WINDOW values may be specified as 6 figure National Grid coordinates.
By default window values should be specified as absolute coordinates.

This option can be disabled using the DISABLE ABSOLUTE command.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE      DIAGNOSTICS      CLASSIFICATION      PME
```

Examples:

```
DTICOMBINE> ENABLE CLASSIFICATION<CR>
DTICOMBINE> SHOW CLASS<CR>
*** WARNING *** No classes found
DTICOMBINE> DISABLE CLASSIFICATION<CR>
DTICOMBINE> SHOW CLASS<CR>
Classification not enabled
DTICOMBINE>
```

ENABLE CLASSIFICATION

ENABLE CLASSIFICATION allows the user to enable classification of output data.

FORMAT: **ENABLE CLASSIFICATION**

Command parameters: None.

DESCRIPTION:

ENABLE CLASSIFICATION allows the user to enable classification of output data. Please see the CLASS command.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE      DIAGNOSTICS      CLASSIFICATION      PME
```

Examples:

```
DTICOMBINE> ENABLE CLASSIFICATION<CR>
DTICOMBINE> SHOW CLASS<CR>
*** WARNING *** No classes found
DTICOMBINE> DISABLE CLASSIFICATION<CR>
DTICOMBINE> SHOW CLASS<CR>
Classification not enabled
DTICOMBINE>
```

ENABLE DIAGNOSTICS

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

FORMAT: **ENABLE DIAGNOSTICS**

Command parameters: None.

DESCRIPTION:

The ENABLE DIAGNOSTICS command is reserved for Laser-Scan use. DIAGNOSTICS is a debugging tool and should be invoked by LSL software personnel only.

DIAGNOSTICS allows a detailed listing of what the software is doing and helps to identify possible software performance inconsistencies. This causes the execution of the software to be slower.

Messages:

The following error message is specific to the ENABLE command:

```
*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE      DIAGNOSTICS      CLASSIFICATION      PME
```

Examples:

```
DTICOMBINE> ENABLE DIAGNOSTICS<CR>
DTICOMBINE>
```

ENABLE PME

ENABLE PME enables the PME performance monitor.

FORMAT: **ENABLE PME**

Command parameters:None.

DESCRIPTION:

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

Message:

The following messages are specific to the ENABLE and ENABLE PME commands:

*** ERROR *** Specifying command ENABLE
Available ENABLE command qualifiers are:
ABSOLUTE DIAGNOSTICS CLASSIFICATION PME

*** WARNING *** You are already using PME!

Examples:

\$ DTICOMBINE<CR>
MATRIX module DTICOMBINE of 12:23:19 18-MAR-88
DTICOMBINE> **ENABLE PME**<CR>

EXCLUDE

The EXCLUDE command prevents the association of user-supplied values to classes.

FORMAT: EXCLUDE arguments

Command parameters:

arguments

Specifies the value, or range of values, that are not to be matched-up with the output DTI data.

EXCLUDE <argument 1>,<argument 2>,...<argument n>

Argument is an integer or floating point constant - with or without qualifiers; or a range of constants - with or without qualifiers.

Available qualifiers:

: range specifier
> greater than
< less than
>= greater than or equal to
<= less than or equal to

DESCRIPTION:

The EXCLUDE command excludes a value, or range of values, from being included as a member of a currently open CLASS.

For further explanation - please see the INCLUDE command (NB the only way in which EXCLUDE differs from INCLUDE is in that EXCLUDE does not take the "ALL" qualifier).

Messages:

The following messages are specific to the EXCLUDE command:

*** WARNING *** CLASSIFICATION not ENABLEd

```
*** WARNING *** No class currently open - use command CLASS n first
*** ERROR *** <string> ..multiple decimal-point
*** ERROR *** <string> ..illegal use of decimal-point/sign
*** ERROR *** <string> ..extra characters after valid expression
*** ERROR *** <string> ..error reading number
*** ERROR *** <string> ..number followed by another number
*** ERROR *** <string> ..illegal range
*** ERROR *** <string> ..illegal use of operator
*** ERROR *** <string> ..incomplete "ALL" specified
*** ERROR *** <string> ..illegal operators with "ALL" specifier
*** ERROR *** <string> ..unrecognised qualifiers
*** ERROR *** <string> ..illegal to specify "ALL" with EXCLUDE command
```

Examples:

```
DTICOMBINE> CLASS 1
DTICOMBINE> INCLUDE <20,150,>=400
DTICOMBINE> SHOW CLASS
CLASS 1.0 <20.0 150.0 >=400.0
DTICOMBINE> EXCLUDE 150
DTICOMBINE> SHOW CLASS
CLASS 1.0 <20.0 >=400.0
DTICOMBINE>
```

FILEx

Specifies a DTI file that is to be opened and used for data input as file 'x' in the combination expression.

FORMAT: FILEx dti-file-spec e.g. FILEA EXAMPLE.DTI;9

COMMAND PARAMETERS:

dti-file-spec

The specification of the DTI file to be opened for data input.

Any parts of the file-spec not supplied for the FILEx command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEx command causes the specified file to be opened and used as input file 'x' in the combination expression.

FILEx commands must be selected from the range FILEA to FILEH inclusive; i.e. FILEA, FILEB, FILEC, FILED, FILEE, FILEF, FILEG, FILEH. A file may be specified for all 8 possible FILEx commands in this range within a single DTICOMBINE run.

DTICOMBINE checks that a file has been opened for each of the operands A through H in the user defined expression before a GO command will be executed. Similarly, DTICOMBINE checks that all files specified with FILEx commands are actually referenced within the user defined expression.

A file that has been opened by mistake using a FILEx command may be closed again using the CLOSE command.

At least one FILEx command must be issued before the WINDOW or GO commands will be accepted.

The output DTI file header type is taken from the input DTI file opened with the lowest alphabetic FILEx command. Thus if the FILEx commands FILEC TEST.DTI;0 and FILEF TEST2.DTI;8 are issued, the output file header type will be taken from the DTI file opened for input with the FILEC command.

A FILEx command also sets the context for the WINDOW command. The WINDOW command will only be accepted after a FILEx command has been accepted. The WINDOW command will relate to the file most recently opened with a FILEx command until the next FILEx command is issued, where-upon context is switched to the latest input file.

Appropriate default units of measurement are set up for the WINDOW command whenever an input DTI file is opened using a FILEx command.

The UNITS command should be given after opening the DTI file, but before the WINDOW command, should the user wish to specify WINDOW command arguments in a different measurement system to the file-type default.

If input file has been incorrectly windowed and a subsequent FILEx command issued, all is not lost. The incorrectly windowed file may be closed with the CLOSE command and then reopened with a FILEx command and the WINDOW respecified.

Messages:

The following messages are specific to the FILEx commands:

*** WARNING *** You must specify a file-spec argument to the FILEx command
*** ERROR *** Unable to interpret input file-spec

Examples:

DTICOMBINE> **FILEA SOIL<CR>**

File : LSL\$DTI:SOIL.DTI;0
Header : LSLA Data: REAL

Units are DTI Matrix Values.

Matrix Coverage	SW:	1	1	NE:	449	449
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	-5.00	to	326421.00		

DTICOMBINE> **WINDOW 1 1 250 250<CR>**
DTICOMBINE>

FILEOUT

Specifies a DTI file that is to be opened and used for data output

FORMAT: FILEOUT dti-file-spec

COMMAND PARAMETERS:

dti-file-spec

The specification of the DTI file to be opened for data output.

Any parts of the file-spec not supplied for the FILEOUT command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEOUT command causes the specified file to be opened and used as the output file in the combination expression.

The output DTI file data type is taken from the keyword on the left hand side of the combination expression. Possible data types are

- o BYTE
- o WORD
- o REAL
- o LONGWORD

The output DTI file header type is taken from the input DTI file opened with the lowest alphabetic FILEx command. Thus if the FILEx commands FILEC TEST.DTI;0 and FILEF TEST2.DTI;8 are issued, the output file header type will be taken from the DTI file opened for input with the FILEC command.

Messages:

The following messages are specific to the FILEOUT command:

*** WARNING *** You must specify a file-spec argument to the FILEOUT command

*** ERROR *** Unable to interpret input file-spec

Examples:

DTICOMBINE> FILEOUT TEST5
DTICOMBINE> GO

Output file now open:

File : LSL\$DTI:TEST5.DTI
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to		0	

25 columns of output DTI file complete

50 columns of output DTI file complete

75 columns of output DTI file complete

100 columns of output DTI file complete

101 columns of output DTI file complete

ELAPSED: 0 00:00:14.18 CPU: 0:00:10.11 BUFIO: 14 DIRIO: 11 FAULTS: 165

\$

GO

GO starts DTICOMBINE processing.

FORMAT: GO

Command parameters: None.

DESCRIPTION:

The GO command creates and opens the output file specified with the FILEOUT command and then sets DTICOMBINE processing in motion.

Before the output file is opened, DTICOMBINE checks that the following condition are met:

- o At least one input DTI file has been specified
- o An output DTI file has been specified
- o The combination expression has been specified
- o All operands specified in the combination expression have a corresponding input DTI file
- o All input DTI files have a corresponding operand in the combination expression

The output DTI file header type is taken from the input DTI file opened with the lowest alphabetic FILEx command. Thus if the FILEx commands FILEC TEST.DTI;0 and FILEF TEST2.DTI;8 are issued, the output file header type will be taken from the DTI file opened for input with the FILEC command.

Message:

The following messages are specific to the GO command:

*** WARNING *** You must specify at least one input DTI file before processing can begin

*** WARNING *** You must specify the expression defining the file combination before processing can begin

*** WARNING *** You must use the FILEOUT command to specify the output DTI file before processing can begin

*** ERROR *** File 'file-spec' open but not used in expression
Use CLOSE 'x' command or respecify expression'

*** ERROR *** No file open for operand 'operand' in expression
Use FILE'x' command to open appropriate file

Examples:

\$ DTICOMBINE<CR>

DTICOMBINE> FILEA POLYOVERSOILS<CR>

DTI file LSL\$DTI:POLYOVERSOILS.DTI;0 opened for read

File : LSL\$DTI:POLYOVERSOILS.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	29	to	1020		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> FILEB POLYOVERSLOPES

DTI file LSL\$DTI:POLYOVERSLOPES.DTI;0 opened for read

File : LSL\$DTI:POLYOVERSLOPES.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	2000		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> WORD=A-B

DTICOMBINE> FILEOUT TEST5

DTICOMBINE> GO

Output file now open:

File : LSL\$DTI:TEST5.DTI

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	0		

25 columns of output DTI file complete
50 columns of output DTI file complete
75 columns of output DTI file complete
100 columns of output DTI file complete

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GO command

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101 columns of output DTI file complete

ELAPSED: 0 00:00:14.18 CPU: 0:00:10.11 BUFIO: 14 DIRIO: 11 FAULTS: 165
\$

HELP

Give help on a subject

FORMAT: HELP subject

Command parameters:

subject

The subject on which help is required.

Description:

The HELP command looks the rest of the line up in the MATRIX HELP library. This library contains a brief summary of the operation of each command.

The information is looked up in the DTICOMBINE section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTICOMBINE> HELP ENABLE PME<CR>

DTICOMBINE

ENABLE

PME

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

DTICOMBINE>

INCLUDE

The INCLUDE command allows association of user-supplied values to classes.

FORMAT: INCLUDE arguments

Command parameters:

arguments

Specifies the value, or range of values, that are to be matched-up with the output DTI data.

INCLUDE <argument 1>,<argument 2>,...<argument n>

Argument is an integer or floating point constant - with or without qualifiers; or a range of constants - with or without qualifiers; or the keyword **ALL**

Available qualifiers:

: range specifier
> greater than
< less than
>= greater than or equal to
<= less than or equal to

DESCRIPTION:

The INCLUDE command enables a value, or range of values, to be included as a member of a currently open CLASS.

On output of the DTI data, the data is compared against all the members of all the classes set-up, if there is a match then the DTI value is changed to that of the class-id, if there is no match to any of the class-members then the DTI value is set to zero.

Specifying ALL with INCLUDE causes all the DTI values that failed to match any members of any of the other classes to be set to the class-id of this class. If more than one class has an INCLUDE ALL specification, then the class-id of the first - chronologically speaking - class, is used.

If no INCLUDE or EXCLUDE command is issued in association with a CLASS command then the effect is the same as if the INCLUDE ALL command was issued.

Messages:

The following messages are specific to the INCLUDE command:

```
*** WARNING *** CLASSIFICATION not ENABLEd
*** WARNING *** No class currently open - use command CLASS n first
*** ERROR *** <string> ..multiple decimal-point
*** ERROR *** <string> ..illegal use of decimal-point/sign
*** ERROR *** <string> ..extra characters after valid expression
*** ERROR *** <string> ..error reading number
*** ERROR *** <string> ..number followed by another number
*** ERROR *** <string> ..illegal range
*** ERROR *** <string> ..illegal use of operator
*** ERROR *** <string> ..incomplete "ALL" specified
*** ERROR *** <string> ..illegal operators with "ALL" specifier
*** ERROR *** <string> ..unrecognised qualifiers
```

Examples:

```
DTICOMBINE> CLASS 1
DTICOMBINE> INCLUDE <20,150,>=400
DTICOMBINE> SHOW CLASS
```

```
CLASS 1.0 <20.0 150.0 >=400.0
DTICOMBINE>
```

LONGWORD

The LONGWORD command enables specification of the combination expression and instructs DTICOMBINE to place the results into a LONGWORD valued DTI file.

FORMAT: LONGWORD = expression

Command parameters:

expression

Specifies the arithmetic expression with which the input DTI files are to be combined.

- See section 9 for the description of the format of the expressions

DESCRIPTION:

The LONGWORD command enables specification of the combination expression and instructs DTICOMBINE to place the results into a LONGWORD valued DTI file.

Messages:

The following messages are specific to the LONGWORD command:

*** ERROR *** Longword underflow detected at post X = 'integer', Y = 'integer'

*** ERROR *** Longword overflow detected at post X = 'integer', Y = 'integer'

Examples:

DTICOMBINE> LONGWORD=A*(B-C)<CR>
DTICOMBINE>

OUTPUT INTERSECTION

Sets area from which data will be used to generate output file.

FORMAT: OUTPUT INTERSECTION

Command parameters: None.

DESCRIPTION:

Sets the area from which the data will be taken to create the output file to be the common area of overlap between the open DTI files.

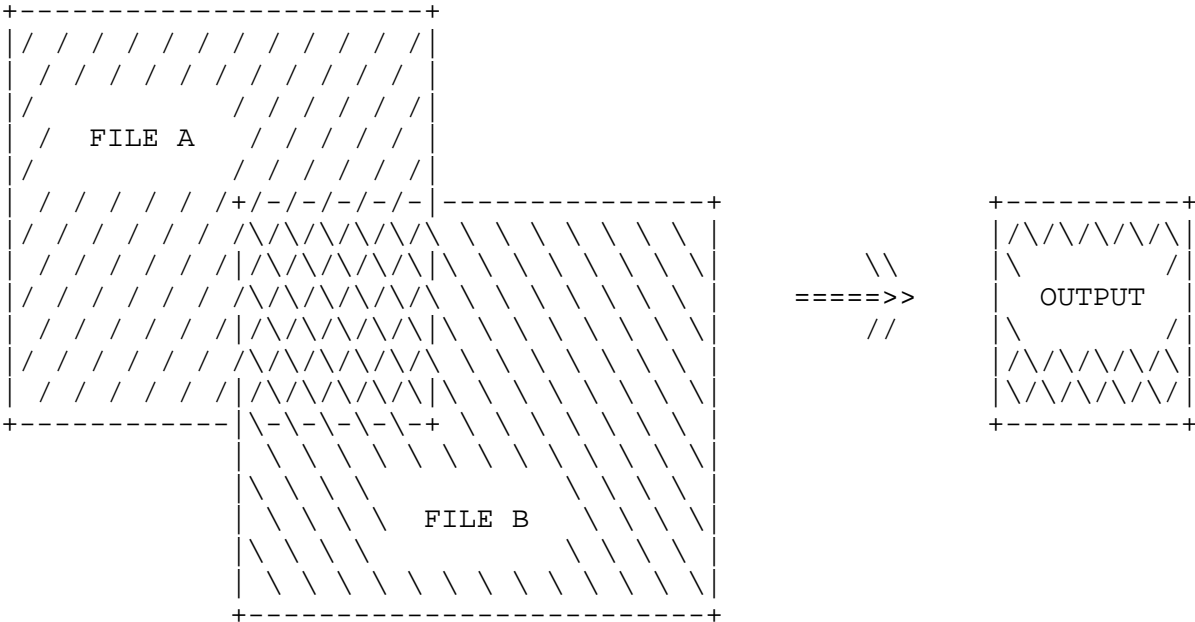
Messages:

When the GO command is issued, the areas covered by the files are checked. If all the files do not overlap, then the OUTPUT is set to UNION (see command OUTPUT UNION) and a warning message is issued.

Examples:

DTICOMBINE> OUTPUT INTERSECTION<CR>

DTICOMBINE>



OUTPUT UNION

Sets area from which data will be used to generate output file.

FORMAT: OUTPUT UNION

Command parameters: None.

DESCRIPTION:

Sets the area from which the data will be taken to create the output file to be the rectangle which contains all of the input DTI files.

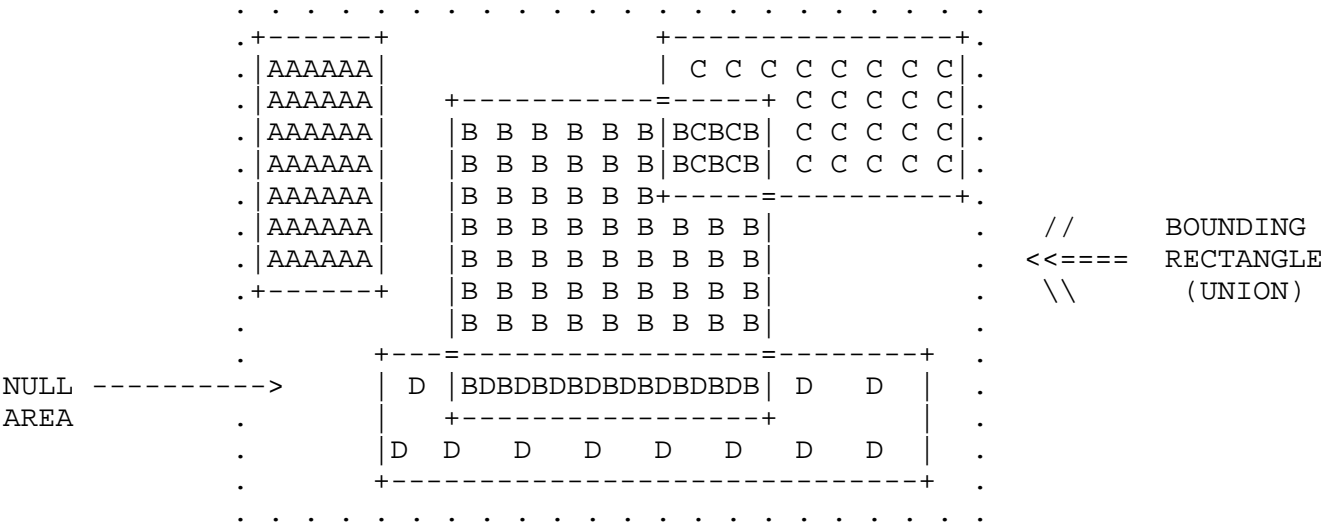
The rectangle is bounded by the extreme north-east and south-west corners (in real world coordinates), of the active windows in the open DTI files.

When the GO command is issued, areas of the input files which fall within the UNION area but fall outside the active window areas are treated as NULL.

Messages:none

Examples:

DTICOMBINE> OUTPUT UNION<CR>
DTICOMBINE>



PAUSE

Pauses DTICOMBINE execution.

FORMAT: PAUSE

Command parameters: None.

DESCRIPTION:

Pauses DTICOMBINE execution and issues a prompt for a carriage return to continue execution. This command is designed for use in software demonstration situations.

Messages: None.

Examples:

DTICOMBINE> PAUSE<CR>

Press <RETURN> to continue<CR>
DTICOMBINE>

QUIT

Quit from DTICOMBINE.

FORMAT: QUIT

Command parameters: None.

Description:

The QUIT command causes DTICOMBINE to exit immediately, closing the input file and closing and deleting the output file.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to quit from the program.

Messages: None.

Examples:

DTICOMBINE> **QUIT<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
\$

REAL

The REAL command enables specification of the combination expression and instructs DTICOMBINE to place the results into a REAL valued DTI file.

FORMAT: REAL=expression

Command parameters:

expression

Specifies the arithmetic expression with which the input DTI files are to be combined.

- See section 9 for the description of the format of the expressions

DESCRIPTION:

The REAL command enables specification of the combination expression and instructs DTICOMBINE to place the results into a REAL valued DTI file.

Examples:

DTICOMBINE> REAL=A*(B-C)<CR>
DTICOMBINE>

RETURN

Restores command input from an indirect file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect file to SYS\$COMMAND.

A typical application is to allow the user to use an indirect command file to set up those run time defaults which are constant within a flowline and then return to input from the terminal (or batch stream) for the run specific commands. To do this RETURN must be the last command in the indirect command file.

Messages:

The following messages are specific to the RETURN command:

RETURN command detected - returning to terminal input

RETURN command ignored - command input is already from terminal

Examples:

DTICOMBINE> @FLOW2<CR>

DTICOMBINE> RETURN

DTICOMBINE>

SHOW CLASSES

Shows the current ...

FORMAT: **SHOW CLASSES**

Command parameters: None.

DESCRIPTION: ..

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
CLASSES, ENABLE, EXPRESSION, FILEA, FILEB, FILEC, FILED
FILEE, FILEF, FILEG, FILEH, FILES, UNITS, OUTPUT

Examples:

DTICOMBINE>**SHOW CLASSES**<CR>

CLASS 2.0 120.0 >=200.0 <=300.0
CLASS 10.0 All values
DTICOMBINE>

SHOW ENABLE

Shows the current status of those options that may be enabled by means of the ENABLE command, or disabled using the DISABLE command.

FORMAT: **SHOW ENABLE**

Command parameters: None.

DESCRIPTION:

Displays the current status of all the DTICOMBINE options that may be enabled or disabled using the ENABLE and DISABLE commands.
The name of the option is shown, followed by either the word ON or OFF to indicate its current status.
If the command SHOW ENABLE is used before any ENABLE or DISABLE commands have been given, the default status of the options is displayed.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
CLASSES, ENABLE, EXPRESSION, FILEA, FILEB, FILEC, FILED
FILEE, FILEF, FILEG, FILEH, FILES, UNITS, OUTPUT

Examples:

DTICOMBINE>**SHOW ENABLE**<CR>

Current status:

ABSOLUTE	On	CLASSIFICATION	Off	DIAGNOSTICS	Off
PME	Off				

DTICOMBINE>

SHOW EXPRESSION

Shows the current combination expression.

FORMAT: **SHOW EXPRESSION**

Command parameters: None.

DESCRIPTION:

This command displays the current combination expression defined with the BYTE, WORD, LONGWORD or REAL commands.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
CLASSES, ENABLE, EXPRESSION, FILEA, FILEB, FILEC, FILED
FILEE, FILEF, FILEG, FILEH, FILES, UNITS, OUTPUT

Examples:

DTICOMBINE>**SHOW EXPRESSION**<CR>
WORD = A*5

DTICOMBINE>

SHOW FILEx

Displays information extracted from the header of input DTI FILE 'x'.

FORMAT: **SHOW FILEx**
 SHOW FILES

Command parameters: None.

DESCRIPTION:

Details extracted from the header of FILE 'x' are displayed on the terminal.

The header values are shown in the current units of measurement. This is dependent on the header type of the input file, or may be set explicitly using the UNITS command. By default or if the ENABLE ABSOLUTE command has been given then metre or projection values are expressed in absolute values. Otherwise they are displayed as offsets from the SW corner of the matrix.

The SHOW FILES command displays the information for all the input files.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
CLASSES, ENABLE, EXPRESSION, FILEA, FILEB, FILEC, FILED
FILEE, FILEF, FILEG, FILEH, FILES, UNITS, OUTPUT

Examples:

DTICOMBINE>**SHOW FILES<CR>**

FILEA:

DTI file LSL\$DTI:UHL1DATA.DTI;0 opened for read

File : LSL\$DTI:UHL1DATA.DTI;0

Header : UHL1 Data: WORD

Units are Degrees, Minutes, Seconds

Matrix Origin	:	52 00 00S	58 00 00W		
Matrix Coverage	SW:	52 00 00S	58 00 00W	NE:	51 50 00S 57 39 20W
Matrix Interval	E:	2		N:	1
Value Range	:	0	to 321		

By default WINDOW commands for this file must be specified in Latlong (degrees,

minutes and seconds)
Use the UNITS command to change the default units

FILEB:
File B is undefined

FILEC:
File C is undefined

FILED:
File D is undefined

FILEE:
File E is undefined

FILEF:
File F is undefined

FILEG:
File G is undefined

FILEH:
File H is undefined

DTICOMBINE>

SHOW OUTPUT

Displays on the terminal where the data for the output file will come from .

FORMAT: **SHOW OUTPUT**

Command parameters: None.

DESCRIPTION:

Displays whether the data for the creation of the output file will come from the union or the intersection of the active window areas in the currently opened input files.

The OUTPUT command may be used to change the output settings

Examples:

DTICOMBINE>**SHOW OUTPUT**<CR>

Output set to UNION of input files
DTICOMBINE>

SHOW UNITS

Displays on the terminal the current units of measurement.

FORMAT: **SHOW UNITS**

Command parameters: None.

DESCRIPTION:

Displays the current units of measurement which will be used when defining an area of interest in the input DTI file with the WINDOW command.

The UNITS command may be used to change the current units of measurement.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
CLASSES, ENABLE, EXPRESSION, FILEA, FILEB, FILEC, FILED
FILEE, FILEF, FILEG, FILEH, FILES, UNITS, OUTPUT

Examples:

DTICOMBINE>**SHOW UNITS**<CR>

Current WINDOW units are Projection Units.
DTICOMBINE>

SPAWN

The SPAWN command enables you to create a subprocess while within DTICOMBINE.

FORMAT: SPAWN command-line

Command parameters:

command-line

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTICOMBINE. The command string cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within DTICOMBINE. When the subprocess terminates control is returned to DTICOMBINE.

Messages:

The following warning messages are specific to the SPAWN command:

*** WARNING *** SPAWN requires a valid DCL command line

*** ERROR *** Unable to spawn command, returning to DTICOMBINE

Examples:

DTICOMBINE> SPAWN DIRECTORY *.DTI;*<CR>

Directory DUA3:[EXPERIMENT3.DTI]

HUMUS.DTI;1	7/8	18-Oct-1987 17:07	[LSL,TIM]
INFILTRATION.DTI;1	8/8	18-Oct-1987 07:56	[LSL,TIM]
SOILS.DTI;2	7/8	18-Oct-1987 17:17	[LSL,TIM]

Total of 3 files, 22/24 blocks.

DTICOMBINE>

UNITS

Specifies the units of measurement that will be used when defining an area of interest in the input DTI FILE using the WINDOW command. The command also controls the units of measurement which will be used when displaying file header details for the current DTI file.

FORMAT: UNITS units

Command parameters:

units

A keyword defining the measurement units, chosen from:

MATRIX	Matrix grid interval units, i.e rows and columns
METRES	Metres on the ground
LATLONG	Latitude and Longitude (in degrees, minutes and seconds)
SECONDS	Seconds of arc
PROJECTION	Projection Record Units (eg. mms on the source

document)

DESCRIPTION:

The UNITS command specifies the units of measurement used to define an area of interest in the input DTI file using the WINDOW command. The command also controls in what format details from the header of the file are displayed.

Appropriate default units of measurement are set up for the WINDOW command whenever an input DTI file is opened using a FILEx command.

The UNITS command should be given after opening the DTI file, but before the WINDOW command, should the user wish to specify WINDOW command arguments in a different measurement system to the file-type default.

Messages:

The following error messages are specific to the UNITS command:

*** ERROR *** Specifying command UNITS
Command qualifiers are MATRIX, METRES, SECONDS, LATLONG or PROJECTION

*** ERROR *** Specifying command UNITS
Command qualifier is invalid for the input file

WAIT

Suspend processing for the specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number of seconds for which DTICOMBINE processing is to be suspended.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following warning message is specific to the WAIT command:

*** WARNING *** You must specify the number of seconds to wait

Examples:

DTICOMBINE> WAIT 4<CR>
DTICOMBINE>

WINDOW

Specifies the limits of the data area to be used from an input file.

FORMAT: WINDOW xmin ymin xmax ymax

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the defining rectangle.

xmax ymax

The coordinates of top right hand corner of the defining rectangle.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 4 integer values defining the rectangle in terms of column and row numbers

UNITS METRES - Requires 4 real (floating point) values defining the rectangle as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 4 real (floating point) values defining the absolute position of the rectangle in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 4 values defining the absolute latitude and longitude position of the rectangle in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 4 real (floating point) values defining the rectangle in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

DESCRIPTION:

The command is used to define rectangular limits to the area of data to be checked within the input DTI file. The limits must be specified in the order bottom left hand (or south west) corner then top right hand (or north east) corner.

The specified window values must lie within the input DTI file x and y ranges.

Appropriate default units of measurement are set up for the WINDOW command whenever an input DTI file is opened. The UNITS command should be given after opening the DTI file, but before the WINDOW command, should the user wish to specify WINDOW command arguments in a different measurement system to the file-type default.

The WINDOW command can be used to clip data from the input DTI file. If input is to be from an entire DTI file then the WINDOW command may be omitted as the WINDOW extents will then, by default, be taken from the DTI file header.

Messages:

The following warning messages are specific to the WINDOW command:

*** ERROR **** FILEx command must be used to open the DTI file first

*** ERROR **** Specifying DTI window arguments Command requires 2 x,y coordinate pairs (SW and NE)

*** ERROR **** Specifying DTI window NE coordinates should exceed SW coordinates

*** WARNING *** Specified window exceeds matrix limits Window will be truncated to fit

Examples:

DTICOMBINE> WINDOW 10 10 120 120<CR>
DTICOMBINE>

WORD

The WORD command enables specification of the combination expression and instructs DTICOMBINE to place the results into a WORD valued DTI file.

FORMAT: WORD=expression

Command parameters:

expression

Specifies the arithmetic expression with which the input DTI files are to be combined.

T.p 0;- See section 9 for the description of the format of the expressions

DESCRIPTION:

The WORD command enables specification of the combination expression and instructs DTICOMBINE to place the results into a WORD valued DTI file.

Messages:

The following messages are specific to the WORD command:

*** ERROR *** Word underflow detected at post X = 'integer', Y = 'integer'

*** ERROR *** Word overflow detected at post X = 'integer', Y = 'integer'

Examples:

DTICOMBINE> WORD=A*(B-C)<CR>
DTICOMBINE>

DTICOMBINE examples

EXAMPLES

\$ **DTICOMBINE**<CR>

MATRIX module DTICOMBINE of 15:27:43 9-MAR-88

DTICOMBINE> @XXX<CR>

Command input now being read from SYS\$DISK:[]XXX.COM;0

DTICOMBINE> FILEA POLYOVERSOILS<CR>

DTI file LSL\$DTI:POLYOVERSOILS.DTI;0 opened for read

File : LSL\$DTI:POLYOVERSOILS.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	29	to	1020		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> FILEB POLYOVERSLOPES

DTI file LSL\$DTI:POLYOVERSLOPES.DTI;0 opened for read

File : LSL\$DTI:POLYOVERSLOPES.DTI;0

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	2000		

By default WINDOW commands for this file must be specified in DTI matrix units
Use the UNITS command to change the default units

DTICOMBINE> WORD=A-B

DTICOMBINE> FILEOUT TEST5

DTICOMBINE> GO

Output file now open:

File : LSL\$DTI:TEST5.DTI

Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	0	to	0		

25 columns of output DTI file complete

50 columns of output DTI file complete

75 columns of output DTI file complete

```
100 columns of output DTI file complete
101 columns of output DTI file complete
ELAPSED:    0 00:00:14.18  CPU: 0:00:10.11  BUFIO: 14  DIRIO: 11  FAULTS: 165
$
```

This example shows the use of an indirect command file for command input. In response to the DTICOMBINE> prompt the user has specified the '@' command followed by a filename. The missing parts of the file-spec are taken from the default 'SYS\$DISK:[].COM', i.e. the user's current default device and directory.

The already prepared command file XXX.COM is opened for read.

The FILEA command specifies that the file specified by the FILEA file-spec argument is to be opened for read and used wherever variable A is encountered in the combination expression.

DTICOMBINE successfully opens the file specified as file A and displays a summary of the file contents.

A file for variable B in the expression is similarly successfully opened using the FILEB command.

The user wishes to use all the data in both matrix files and makes no attempt to specify sub-windows of the data using the UNITS and WINDOW commands.

The expression is specified with the WORD command, indicating that the result of expression evaluation is to be placed in a WORD type DTI.

The expression is a simple one! Matrix B is to subtracted from matrix A. The characteristics of the output file are taken from the input file specified with the lowest alphabetic FILEx command. In this case the output file is going to take the characteristics of the file opened with the FILEA command: LSL\$DTI:POLYOVERSOILS.DTI;0. In this example the output file will have a 'LSLA' type header.

The output file LSL\$DTI:TEST5.DTI;0 is specified using the FILEOUT command. It will not be opened until the GO command is detected, as the user may CLOSE and reopen another input file with the lowest alphabetic identifier, thereby altering the output file characteristics!

The ENABLE DIAGNOSTICS command will cause DTICOMBINE to output diagnostic messages indicating processing progress through the output DTI file.

The GO command starts DTICOMBINE processing.

The run completed successfully. DCL symbol \$STATUS is set to SS\$NORMAL.

MESSAGES

MESSAGES

DTICOMBINE produces no messages of the %DTICOMBINE-severity-mnemonic variety of it's own. All the DTICOMBINE messages are of the more conversational *** WARNING *** and *** ERROR *** variety, as all are directly or indirectly attributable to the effects of commands the user has specified.

In addition to the above messages which are generated by DTICOMBINE itself, other messages may be produced by the command line interpreter and by Laser-Scan libraries. In particular, messages may be generated by the DTI library and by the Laser-Scan I/O library, LSLLIB. DTI library messages are introduced by '%DTI' and are documented in the DTI library users' guide. In most cases DTI errors will be due to a corrupt input file, and this should be the first area of investigation. If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are used to explain the details of program generated errors.

EXPRESSIONS

SYNTAX

An expression is a mathematically correct combination of:
Operands, Operators and Functions

Operands:

An operand is an integer or floating point constant, or a variable chosen from the set A through H. The letter chosen to symbolise the variable should match that selected when opening the corresponding DTI input file.

Operands may take the form of sub-expressions. These are expressions which are surrounded by parentheses and are contained in an expression.

E.g.

1. $a+(\cos(b)*\sin(3*d))$ is an expression and
2. $(\cos(b)*\sin(3*d))$ is a sub-expression of the expression.

Sub-expressions are evaluated by DTICOMBINE and their return values are treated as operands within the expression.

Operators are chosen from the set:

Arithmetic operators:

unary minus	-	e.g.	- A
addition	+	e.g.	A + B
subtraction	-	e.g.	A - 3
division	/	e.g.	A / 2
multiplication	*	e.g.	A * 3
exponentiation	**	e.g.	A **1.2

Bitwise operators:

bitwise AND	&	e.g.	A & 127
bitwise OR		e.g.	A B
bitwise NOT	~	e.g.	~ A
bitwise XOR	^	e.g.	A ^ B

Logical operators:

logical AND	&&	e.g.	(A > 1) && B
logical OR		e.g.	(A<3) (B>20)
logical NOT	~~	e.g.	~~(A = 4)
logical XOR	^^	e.g.	(A = 3) ^^ (B < 3)

Relational operators:

less than	<	e.g.	A < 3
greater than	>	e.g.	D > 4
equal to	=	e.g.	A = B
not equal to	<>	e.g.	A <> 6.7
less than or equal to	<=	e.g.	C <= A

greater or equal to >= e.g. B >= (10*A)

Functions available are:

absolute	ABS	e.g.	ABS(A)
nearest integer	NINT	e.g.	NINT(3.1415927)
arc cosine	ACOS	e.g.	ACOS(.32)
arc sine	ASIN	e.g.	ASIN(A)
arc tangent	ATAN	e.g.	ATAN(B/A)
cosine	COS	e.g.	COS(90)
sine	SIN	e.g.	SIN(D)
tangent	TAN	e.g.	TAN(A/B)
maximum	MAX	e.g.	MAX(A,B,C,D,E,F)
minimum	MIN	e.g.	MIN(2,D,B)
conditional	IF	e.g.	IF(A>3,A,B)

Notes on expressions

1. The exponentiation operator '**' may be used to obtain square roots
e.g. 4 ** 0.5 = 2
2. Numbers are interpreted in decimal radix.
3. Expressions are evaluated using precedence (see section 9.2).
4. All calculations are performed using REAL*4 arithmetic.

If the result of the expression is to be written to a BYTE, WORD integer or LONGWORD integer DTI file, real to integer conversion is performed at the end of expression evaluation. Integer truncation is applied

e.g. BYTE = 3.0 / 2.0 is 1 .

Data overflow and underflow checking of the result is performed before writing to the DTI file.

5. The IF function takes 3 arguments:
 1. A logical expression.
 2. An expression which is evaluated if the logical expression is evaluated to TRUE.
 3. An expression which is evaluated if the logical expression is evaluated to FALSE.
6. The MAX and MIN functions take lists as their arguments, where a list consists of a variable number of arguments, separated by commas and enclosed in parentheses.

PRECEDENCE

The list below shows the order of precedence in descending order as used by DTICOMBINE while evaluating expressions:

- unary minus , functions
- exponentiation
- multiplication, division
- addition, subtraction
- relational operators
- binary and logical NOT
- binary and logical AND
- binary and logical OR
- binary and logical XOR
- operand separator (comma)
- parentheses

Operators of equal precedence are evaluated from left to right. Parentheses '(' and ')' may be used to force the order of evaluation.

Truth Values In Expressions

When an expression contains logical operators, the operands of the operation are interpreted by DTICOMBINE as having logical values - either TRUE or FALSE.

If a numeric operand is used in a logical operation, then any non-zero values are interpreted as having the logical value TRUE, while zero is interpreted as having the logical value of false.

The result of the expression is

1. -1 if the result of the operation was TRUE
2. 0 if the result of the operation was FALSE

Examples

For the purpose of these examples, The values of the variables A through to H are set to be 1,2,3,4,5,6,7,8 respectively.

	Expression	result
-	-A	-1
+	A+B	3
-	D-3	1
/	7/G	1
*	2*3	6
**	3**C	27
&	12 & C	0
	13 G	15
~	~ C	65533
^	57 ^ 19	42
&&	2 && A	0
	34 G	-1
~~	~~ A	0
^^	A ^^ 6	-1
<	A < 0.5	0
>	D > C	-1
=	A = 1	-1
<>	B <> 2	0
<=	A <= G	-1
>=	G >= 243	0
ABS	ABS(-3.45)	3.45
ACOS	ACOS(.23)	76.7029
ASIN	ASIN(.90)	64.1580
ATAN	ATAN(-.456)	-24.5129
COS	COS(H)	.9922
SIN	SIN(B)	.0349
TAN	TAN(34)	.67450
MAX	MAX(A,B,3,78,H)	78
MIN	MIN(3,2,B)	2
IF	IF(A<B, D-E,H**5)	-1
NINT	NINT(5.342)	5

Examples of parentheses used to force evaluation order

without parentheses	2*6+3	15
with parentheses	2*(6+3)	18

some examples of expressions involving sub-expressions:

```
MAX( ACOS(.23) , IF(A<B,B-A,A-B),2*G)
IF( A&&B , IF(A<B,C, IF(B=A,B,34) ), 9)
```

USER NOTES

CHAPTER 7

MODULE DTIROTATE

MODULE **DTIROTATE**

REPLACES PANACEA module FLIPPANT.

FUNCTION

DTIROTATE is a utility to mirror and/or rotate a DTI file.

FORMAT

\$ DTIROTATE

PROMPTS

DTIROTATE is command driven. Command input is expected when the following prompt is issued:

DTIROTATE>

DTIROTATE command defaults

On program startup, the following command defaults apply:

DIAGNOSTICS - disabled.

MIRROR - disabled.

PME - disabled.

ROTATE - enabled.

DTIROTATE is currently not allowed for BIT data type DTI files. To process a BIT file, use the MATRIX utility DTICONVERT to convert to another format, and convert back to BIT if required.

DESCRIPTION

General

DTIROTATE is a command driven utility to mirror and/or rotate a DTI file. The utility provides for eight possible combinations of mirroring and/or rotation achieved with the four mirror states and the two rotation states.

Mirror states	Rotation states
DISABLE MIRROR	DISABLE ROTATE
ENABLE MIRROR BOTH	ENABLE ROTATE
ENABLE MIRROR X	
ENABLE MIRROR Y	

Operation states

The eight combinations of mirror and rotate operations are described below. The first combination is invalid. All other combinations are valid. To help understand the action of each valid combination a diagram has been included. Where a mirror action and a rotate action are both enabled an intermediate state is drawn. It should be noted that the mirror action is always performed before the rotate action.

1. Combination of **DISABLE MIRROR** and **DISABLE ROTATE**.

The combination of **DISABLE MIRROR** and **DISABLE ROTATE** would result in an identical output DTI file and therefore serves no purpose. The DTIROTATE utility will allow this combination to be specified without error. However, if the GO command (processing command) is issued with this combination an error message will be displayed with control being returned to the user via the command prompt.

2. Combination of **DISABLE MIRROR** and **ENABLE ROTATE**.

DTI file will be rotated clockwise through 90 degrees.

ROTATE enabled

INPUT DTI	>>	OUTPUT DTI
-----		-----
3 6 9 12		1 2 3
-----		-----
2 5 8 11		4 5 6
-----		-----
1 4 7 10		7 8 9
-----		-----
		10 11 12

3. Combination of **ENABLE MIRROR X** and **DISABLE ROTATE**.

DTI file will be mirrored about the x axis.

MIRROR X enabled

INPUT DTI	>>	OUTPUT DTI
-----		-----
3 6 9 12		1 4 7 10
-----		-----
2 5 8 11		2 5 8 11
-----		-----
1 4 7 10		3 6 9 12
-----		-----

4. Combination of **ENABLE MIRROR X** and **ENABLE ROTATE**.

The DTI file will be mirrored about the x axis, then rotated clockwise through 90 degrees.

MIRROR X enabled

ROTATE enabled

INPUT DTI	>>	intermediate state	>>	OUTPUT DTI
-----		-----		-----
3 6 9 12		1 4 7 10		3 2 1
-----		-----		-----
2 5 8 11		2 5 8 11		6 5 4
-----		-----		-----
1 4 7 10		3 6 9 12		9 8 7
-----		-----		-----
				12 11 10

5. Combination of **ENABLE MIRROR Y** and **DISABLE ROTATE**.

DTI file will be mirrored about the y axis.

MIRROR Y enabled

INPUT DTI	>>	OUTPUT DTI
3 6 9 12		12 9 6 3
2 5 8 11		11 8 5 2
1 4 7 10		10 7 4 1

6. Combination of **ENABLE MIRROR Y** and **ENABLE ROTATE**.

The DTI file will be mirrored about the y axis, then rotated clockwise through 90 degrees.

MIRROR Y enabled

ROTATE enabled

INPUT DTI	>> intermediate state	>> OUTPUT DTI
3 6 9 12	12 9 6 3	10 11 12
2 5 8 11	11 8 5 2	7 8 9
1 4 7 10	10 7 4 1	4 5 6
		1 2 3

7. Combination of **ENABLE MIRROR BOTH** and **DISABLE ROTATE**.

DTI file will be mirrored about both axes.

MIRROR BOTH enabled

INPUT DTI	>>	OUTPUT DTI
3 6 9 12		10 7 4 1
2 5 8 11		11 8 5 2
1 4 7 10		12 9 6 3

8. Combination of **ENABLE MIRROR BOTH** and **ENABLE ROTATE**.

The DTI file will be mirrored about both axes, then rotated clockwise through 90 degrees.

MIRROR BOTH enabled				ROTATE enabled																						
INPUT DTI				>>	intermediate state				>>	OUTPUT DTI																
-----					-----					-----																
	3		6		9		12				10		7		4		1				12		11		10	
-----					-----					-----																
	2		5		8		11				11		8		5		2				9		8		7	
-----					-----					-----																
	1		4		7		10				12		9		6		3				6		5		4	
-----					-----					-----																

Typical Command Sequence

A typical command sequence is:

FILEIN AREA1	(input file 1 is LSL\$DTI:AREA1.DTI)
FILEOUT AREA1_R180	(output file is LSL\$DTI:AREA1_R180.DTI)
DISABLE ROTATE	(disable 90 degree clockwise rotation)
ENABLE MIRROR BOTH	(enables mirroring about both x and y axes)
GO	(start to process)

This series of commands will mirror the input DTI about the x and y axes. This would have the same effect as rotating the DTI file through 180 degrees.

DTIROTATE commands

@

Take command input from the specified file.

FORMAT: @file-spec

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied for the @ command will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTIROTATE offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTIROTATE to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. end-of-file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTIROTATE will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** WARNING *** "@" must precede a file-spec

*** WARNING *** Indirect file error - returning to terminal input

*** ERROR *** Can't open indirect command file 'file-spec'

Examples:

```
DTIROTATE> @PRESETS<CR>
DTIROTATE> ENABLE DIAGNOSTICS
DTIROTATE> ENABLE MIRROR X
DTIROTATE> DISABLE ROTATE
DTIROTATE> FILEIN AREA1
```

DTI file LSL\$DTI:AREA1.DTI;0 opened for read

```
File      : LSL$DTI:AREA1.DTI;0
Header    : LSLA  Data:  WORD
```

Units are DTI Matrix Values

```
Matrix Coverage  SW:      1      1  NE:    201    201
Matrix Interval   E:      1      1  N:      1
Value Range      :    97    to    468
DTIROTATE> FILEOUT AREA1_X
DTIROTATE> RETURN
DTIROTATE>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard MATRIX package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc.

Messages: None.

Examples:

DTIROTATE> ! a comment for the sake of it<CR>
DTIROTATE> ENABLE MIRROR BOTH<CR>
DTIROTATE>

DISABLE DIAGNOSTICS

Disables a previous ENABLE DIAGNOSTICS command.

FORMAT: DISABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

DISABLE DIAGNOSTICS allows the user to disable a previous ENABLE DIAGNOSTICS command.

Messages:

The following message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

Examples:

DTIROTATE> **ENABLE DIAGNOSTICS**<CR>
DTIROTATE> **DISABLE DIAGNOSTICS**<CR>
DTIROTATE>

DISABLE MIRROR

Disables a previous ENABLE MIRROR command.

FORMAT: DISABLE MIRROR

Command parameters: None.

DESCRIPTION:

DISABLE MIRROR allows the user to disable a previous ENABLE MIRROR command.

Messages:

The following message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

Examples:

DTIROTATE> **ENABLE MIRROR Y<CR>**
DTIROTATE> **DISABLE MIRROR<CR>**
DTIROTATE>

DISABLE PME

Disables a previous ENABLE PME command.

FORMAT: DISABLE PME

Command parameters: None.

DESCRIPTION:

DISABLE PME allows the user to disable a previous ENABLE PME command.

Messages:

The following messages are specific to the DISABLE and DISABLE PME commands:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

*** WARNING *** You are not using PME !

Examples:

DTIROTATE> **ENABLE PME**<CR>
DTIROTATE> **DISABLE PME**<CR>
DTIROTATE>

DISABLE ROTATE

Disables a previous ENABLE ROTATE command.

FORMAT: DISABLE ROTATE

Command parameters: None.

DESCRIPTION:

DISABLE ROTATE allows the user to disable a previous ENABLE ROTATE command.

Messages:

The following message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

Examples:

DTIROTATE> **ENABLE ROTATE<CR>**
DTIROTATE> **DISABLE ROTATE<CR>**
DTIROTATE>

ENABLE DIAGNOSTICS

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

FORMAT: ENABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

Because it is usually used in a batch processing environment, by default DTIROTATE produces minimal diagnostic printout. If however, the user wishes to receive an indication of processing progress, diagnostic printout may be selected with the ENABLE DIAGNOSTICS command.

On a heavily loaded computer it may be reassuring to ENABLE DIAGNOSTICS for the processing stage to indicate progress through the input data.

Messages:

The following message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

Examples:

DTIROTATE> ENABLE DIAGNOSTICS<CR>
DTIROTATE>

ENABLE MIRROR BOTH

Enables mirroring about both axes.

FORMAT: ENABLE MIRROR BOTH

Command parameters: None.

DESCRIPTION:

ENABLE MIRROR BOTH will mirror the output DTI about both the x and the y axes. This has the effect of 180 degree rotation. This command if used with the ENABLE ROTATE command would produce an output DTI with 270 degree rotation (-90).

Messages:

The following messages are is specific to the ENABLE and ENABLE MIRROR commands:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

*** ERROR *** Specifying the command ENABLE MIRROR

Available ENABLE MIRROR sub-command qualifiers are:

BOTH X Y

Examples:

```
DTIROTATE> DISABLE ROTATE<CR>
DTIROTATE> ENABLE MIRROR BOTH<CR>
DTIROTATE> SHOW PARAMETERS<CR>
PARAMETERS:
MIRROR BOTH enabled  ROTATE disabled
File will be mirrored about both axes
```

INPUT DTI				>>		OUTPUT DTI			
3	6	9	12			10	7	4	1
2	5	8	11			11	8	5	2
1	4	7	10			12	9	6	3

DTIROTATE>

ENABLE MIRROR X

Enables mirroring about the x axis.

FORMAT: ENABLE MIRROR X

Command parameters: None.

DESCRIPTION:

ENABLE MIRROR X will mirror the output DTI about the x axis. This command can be used with the ENABLE ROTATE command. The rotate action is performed after the mirror action.

Messages:

The following messages are is specific to the ENABLE and ENABLE MIRROR commands:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS MIRROR PME ROTATE

*** ERROR *** Specifying the command ENABLE MIRROR

Available ENABLE MIRROR sub-command qualifiers are:

BOTH X Y

Examples:

DTIROTATE> **DISABLE ROTATE**<CR>

DTIROTATE> **ENABLE MIRROR X**<CR>

DTIROTATE> **SHOW PARAMETERS**<CR>

PARAMETERS:

MIRROR X enabled ROTATE disabled

File will be mirrored about the x axis

INPUT DTI	>>	OUTPUT DTI
-----		-----
3 6 9 12		1 4 7 10
-----		-----
2 5 8 11		2 5 8 11
-----		-----
1 4 7 10		3 6 9 12
-----		-----

DTIROTATE>

ENABLE MIRROR Y

Enables mirroring about the y axis.

FORMAT: ENABLE MIRROR Y

Command parameters: None.

DESCRIPTION:

ENABLE MIRROR Y will mirror the output DTI about the y axis. This command can be used with the ENABLE ROTATE command. The rotate action is performed after the mirror action.

Messages:

The following messages are is specific to the ENABLE and ENABLE MIRROR commands:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS MIRROR PME ROTATE

*** ERROR *** Specifying the command ENABLE MIRROR

Available ENABLE MIRROR sub-command qualifiers are:

BOTH X Y

Examples:

DTIROTATE> **DISABLE ROTATE**<CR>

DTIROTATE> **ENABLE MIRROR Y**<CR>

DTIROTATE> **SHOW PARAMETERS**<CR>

PARAMETERS:

MIRROR Y enabled ROTATE disabled

File will be mirrored about the y axis

INPUT DTI				>> OUTPUT DTI			
3	6	9	12	12	9	6	3
2	5	8	11	11	8	5	2
1	4	7	10	10	7	4	1

DTIROTATE>

ENABLE PME

ENABLE PME enables the PME performance monitor.

FORMAT: ENABLE PME

Command parameters: None.

DESCRIPTION:

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

Message: The following messages are specific to the ENABLE and ENABLE PME commands:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS MIRROR PME ROTATE

*** WARNING *** You are already using PME!

Examples:

DTIROTATE> **ENABLE PME<CR>**

DTIROTATE>

ENABLE ROTATE

Rotate the DTI data clockwise through 90 degrees.

FORMAT: ENABLE ROTATE

Command parameters: None.

DESCRIPTION:

ENABLE ROTATE will rotate the DTI data clockwise through 90 degrees. The ENABLE ROTATE command can be used with any of the ENABLE MIRROR commands.

In all cases the rotate action is performed after the mirror action.

Messages: The following message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :
DIAGNOSTICS MIRROR PME ROTATE

Examples:

DTIROTATE> **ENABLE ROTATE <CR>**

DTIROTATE> **SHOW PARAMETERS<CR>**

PARAMETERS: MIRROR disabled ROTATE enabled file will be rotated clockwise through 90 degrees

INPUT DTI				>>		OUTPUT DTI			
	3		6		9		12		
	2		5		8		11		
	1		4		7		10		
	10		11		12				

DTIROTATE>

FILEIN

Specifies a DTI file that is to be opened and used for data input.

FORMAT: FILEIN file-spec

COMMAND PARAMETERS:

file-spec

The specification of the DTI file to be opened for data input.

Any parts of the file-spec not supplied for the FILEIN command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEIN command causes the specified DTI file to be opened for read only and used as an input file to DTIROTATE. A FILEIN command must be issued before the GO command will be accepted.

Messages:

The following messages are specific to the FILEIN command:

*** WARNING *** Specifying command FILEIN
You must specify a file-spec argument to the FILEIN command

*** ERROR *** Specifying command FILEIN
You must specify a file-spec argument to the FILEIN command

*** ERROR *** Specifying command FILEIN
Unable to interpret input file-spec

*** ERROR *** Specifying command FILEIN
Failed while opening DTI file 'file spec' for input

*** ERROR *** Specifying command FILEIN
File 'file spec' data type 'type' invalid
Only data types 1 2 3 or 4 allowed

*** ERROR *** Specifying command FILEIN
File 'file spec' data type not compatible with first DTI file

*** ERROR *** Specifying command FILEIN
BIT data is not suitable for DTIROTATE

Examples:

DTIROTATE> **FILEIN AREA1<CR>**

DTI file LSL\$DTI:AREA1.DTI;0 opened for read

File : LSL\$DTI:AREA1.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	201	201
Matrix Interval	E:	1		N:	1	
Value Range	:	97	to	468		

DTIROTATE>

FILEOUT

Specifies the file-spec of the DTI file which is to receive the rotated DTI data.

FORMAT: FILEOUT file-spec

COMMAND PARAMETERS:

file-spec

The file-spec of the text file which is to receive the DTI data.

Any parts of the file-spec not supplied for the FILEOUT command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEOUT command enables specification of the DTI file which is to receive the rotated DTI data.

The FILEOUT command must be issued before the GO command.

Messages:

The following messages are specific to the FILEOUT command:

*** WARNING *** You must specify a file-spec argument to the FILEOUT command

*** ERROR *** You must specify a file-spec argument to the FILEOUT command

*** ERROR *** Unable to interpret output file-spec

Examples:

DTIROTATE> **FILEOUT DUA3:[DEMONSTRATION]IDAHO_ROTATE90<CR>**
DTIROTATE>

GO

Process the input DTI file and carry out the required mirror and/or rotate operations.

FORMAT: GO

Command parameters: None

DESCRIPTION:

Before the mirror and/or rotate processing takes places, checks will be carried out to ensure that certain preconditions hold. The following checks are performed by this command:-

1. Test that the input DTI file has been opened and that a DTI output filename has been specified. An error message will be generated and the command will be terminated if the test fails.
2. Test whether the invalid combination DISABLE MIRROR and DISABLE ROTATE has been specified. This condition will result in an error message being generated and the command being terminated.

The command will create a new DTI file as specified by the FILEOUT command. The format of the new DTI file will be the same as the first input DTI file specified with the FILEIN command.

Mirroring and/or rotation will be performed according to rotate and mirror states.

Upon successful completion of the GO command DTIROTATE is terminated.

Messages:

The following messages are specific to the GO command:

*** ERROR *** Specifying the command GO
No input DTI file specified >> Execute the FILEIN command

*** ERROR *** Specifying the command GO
No output DTI file specified >> Execute the FILEOUT command

*** ERROR *** Specifying the command GO
Both MIRROR and ROTATE are disabled
This combination would result in an identical output file
Processing has been aborted

Examples:

DTIROTATE> **FILEIN NORMAL<CR>**

DTI file LSL\$DTI:NORMAL.DTI;0 opened for read

DTIROTATE> **FILEOUT ROTATED<CR>**

DTIROTATE> **GO<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263

\$

HELP

Give help on a subject

FORMAT: HELP subject

Command parameters:

subject

The subject on which help is required.

Description:

The HELP command looks the rest of the line up in the MATRIX HELP library. This library contains a brief summary of the operation of each command.

The information is looked up in the DTIROTATE section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTIROTATE> **HELP ENABLE PME<CR>**

DTIROTATE

ENABLE

PME

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

DTIROTATE>

PAUSE

Pauses DTIROTATE execution.

FORMAT: PAUSE

Command parameters: None.

DESCRIPTION:

Pauses DTIROTATE execution and issues a prompt for a carriage return to continue execution. This command is designed for use in software demonstration situations.

Messages: None.

Examples:

DTIROTATE> **PAUSE<CR>**

Press <RETURN> to continue<CR>
DTIROTATE>

QUIT

Quit from DTIROTATE.

FORMAT: QUIT

Command parameters: None.

Description:

The QUIT command causes DTIROTATE to exit immediately, closing any opened DTI files.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to quit from the program.

Messages: None.

Examples:

DTIROTATE> **QUIT<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
\$

RETURN

Restores command input from an indirect file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect file to SYS\$COMMAND.

A typical application is to allow the user to use an indirect command file to set up those run time defaults which are constant within a flowline and then return to input from the terminal (or batch stream) for the run specific commands. To do this RETURN must be the last command in the indirect command file.

Messages:

The following messages are specific to the RETURN command:

RETURN command detected - returning to terminal input

RETURN command ignored - command input is already from terminal

Examples:

```
DTIROTATE> @FLOW2<CR>
DTIROTATE> ENABLE DIAGNOSTICS
DTIROTATE> RETURN
DTIROTATE>
```

SHOW ENABLE

Shows the current status of those options that may be enabled by means of the ENABLE command, or disabled using the DISABLE command.

FORMAT: **SHOW ENABLE**

Command parameters: None.

DESCRIPTION:

Displays the current status of all the DTIROTATE options that may be enabled or disabled using the ENABLE and DISABLE commands.
The name of the option is shown, followed by either the word ON or OFF to indicate its current status.
If the command SHOW ENABLE is used before any ENABLE or DISABLE commands have been given, the default status of the options is displayed.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE, FILES, PARAMETERS, PME

Examples:

DTIROTATE>**SHOW ENABLE**<CR>

Current status:

DIAGNOSTICS	On	MIRROR BOTH	Off	MIRROR X	Off
MIRROR Y	Off	PME	Off	ROTATE	On

DTIROTATE>

SHOW FILES

Displays information about the input and output files.

FORMAT: SHOW FILES

Command parameters: None.

DESCRIPTION:

Details extracted from the header of the input file are displayed on the terminal.

The name of the output file is also displayed if it has been specified.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE, FILES, PARAMETERS

Examples:

DTIROTATE>**SHOW FILES<CR>**

DTI file LSL\$DTI:UHL1DATA.DTI;0 opened for read

File : LSL\$DTI:UHL1DATA.DTI;0
Header : UHL1 Data: WORD

File : LSL\$DTI:TEST5.DTI
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	101	101
Matrix Interval	E:	1		N:	1	
Value Range	:	1	to		400	

DTI file LSL\$DTI:AREA1_R180.DTI;0 selected for output

DTIROTATE>

SHOW PARAMETERS

Displays the current DTIROTATE parameters.

FORMAT: **SHOW PARAMETERS**

Command parameters: None.

DESCRIPTION:

The current DTIROTATE parameters are displayed. A schematic diagram is shown which indicates the matrix which will result after the GO command is specified with the current parameters.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW
Available SHOW command qualifiers are:
ENABLE, FILES, PARAMETERS

Examples:

DTIROTATE>**SHOW PARAMETERS**<CR>
PARAMETERS:
MIRROR disabled ROTATE enabled
File will be rotated clockwise through 90 deg

INPUT DTI				>>	OUTPUT DTI			
	3		6		9		12	
	2		5		8		11	
	1		4		7		10	
	10		11		12			

DTIROTATE>

SPAWN

The SPAWN command enables a subprocess to be created from within the DTIROTATE utility.

FORMAT: SPAWN command-line

Command parameters:

command-line

Specifies a DCL command string to be executed as if typed in response to a '\$' prompt. When the command completes, the subprocess terminates and control is returned to DTIROTATE. The command line cannot exceed 80 characters.

DESCRIPTION:

The SPAWN command enables you to create a subprocess while within the DTIROTATE utility. When the subprocess terminates, control is returned to DTIROTATE.

Messages:

The following error messages are specific to the SPAWN command:

*** ERROR *** Specifying command SPAWN
Command requires a valid DCL command line

*** ERROR *** Unable to spawn command, returning to DTIROTATE

Examples:

DTIROTATE> SPAWN DIRECTORY LSL\$DTI:*.DTI<CR>

Directory DUA3:[LSL.DTI]

TEST1.DTI;1	8/8	18-AUG-1987 07:56	[LSL,DAVEC]
TEST2.DTI;1	7/8	18-AUG-1987 17:17	[LSL,DAVEC]
TEST2.DTI;2	7/8	18-AUG-1987 17:34	[LSL,DAVEC]

Total of 3 files, 22/24 blocks.

DTIROTATE>

WAIT

Suspend processing for the specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number of seconds for which DTIROTATE processing is to be suspended.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following warning message is specific to the WAIT command:

*** WARNING *** You must specify the number of seconds to wait

Examples:

DTIROTATE> WAIT 4<CR>
DTIROTATE>

DTIROTATE examples

EXAMPLES

```
$ DTIROTATE
MATRIX module DTIROTATE of 15:43:39 25-MAR-88
DTIROTATE> FILEIN WEEPY2<CR>
DTI file LSL$DTI:WEEPY2.DTI;0 opened for read
```

```
File      : LSL$DTI:WEEPY2.DTI;0
Header    : LSLA  Data:  WORD
```

Units are DTI Matrix Values

```
Matrix Coverage  SW:      1      1  NE:   201   201
Matrix Interval   E:      1      1  N:     1
Value Range      :    97   to   468
```

```
DTIROTATE> FILEOUT WEEPY2_X_Y<CR>
DTIROTATE> SHOW PARAMETERS<CR>
PARAMETERS:
MIRROR disabled  ROTATE enabled
File will be rotated clockwise through 90 deg
```

INPUT DTI				>>	OUTPUT DTI			
3	6	9	12		1	2	3	
2	5	8	11		4	5	6	
1	4	7	10		7	8	9	
					10	11	12	

```
DTIROTATE> DISABLE ROTATE<CR>
DTIROTATE> ENABLE MIRROR BOTH<CR>
DTIROTATE> SHOW PARAMETERS<CR>
PARAMETERS:
MIRROR BOTH enabled  ROTATE disabled
File will be mirrored about both axes
```

INPUT DTI				>>	OUTPUT DTI			
3	6	9	12		10	7	4	
2	5	8	11		11	8	5	
1	4	7	10		12	9	6	

```
DTIROTATE> GO<CR>
ELAPSED:    0 00:01:36.42  CPU: 0:00:05.04  BUFIO: 16  DIRIO: 142  FAULTS: 463
$
```

The above is an example of using the DTIROTATE utility to rotate a DTI file through 180 degrees. The input DTI file is opened using the FILEIN command and output DTI file specified using the FILEOUT command. The SHOW PARAMETERS command is then used to determine the state of the DTIROTATE operator parameters. The picture reveals that the required operation would not be performed. The DISABLE ROTATE and ENABLE MIRROR BOTH commands are given. The SHOW PARAMETERS command is once again given to confirm that the desired operation would now be performed. The GO command is then issued to do the processing. On completion the DTIROTATE utility terminates.

DTIROTATE messages

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTI library or by the Laser-Scan I/O library, LSLLIB. DTI library messages are introduced by %DTI and are documented in the MATRIX Reference manual. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are often used to explain the details of program generated errors.

If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis.

CHAPTER 8

MODULE DTI2TEXT

MODULE DTI2TEXT

REPLACES None. DTI2TEXT is a completely new MATRIX utility.

FUNCTION

DTI2TEXT is a utility to convert DTI input files into text output files.

FORMAT

\$ DTI2TEXT

COMMAND QUALIFIERS

None, DTI2TEXT is command driven.

DTI2TEXT command defaults

On program startup, the following command defaults apply:

ABSOLUTE - enabled.

DIAGNOSTICS - disabled.

NINT - disabled.

PME - disabled.

UNITS - once a DTI file is specified, if it is TED4 or UHL1, DTI type is LATLONG, other DTI types have default units MATRIX.

FORMAT - 8I10 for integer and BYTE, 6I12 for longword integer, 8F10.3 for reals and 40I2 for BIT output.

NULL - once a first input DTI file is specified the null will have one of the following:-
0 if BYTE or BIT type.
-32767 if WORD type.
80000000 Hex if LONG type.
-1.0E-38 if REAL type.

WINDOW - None specified

DESCRIPTION

General

DTI2TEXT is a command driven utility which converts the data in a specified DTI file to a text format and outputs that data in records to a text file.

DTI2TEXT converts the DTI file, or window within the specified file, to text output format a column at a time. Each column of values from the input file is split into a series of records of default or user defined format in order of increasing row position. Each record is written as a single line to the output file. A column may thus extend over several lines of the output file. The final record for each column may only be partially filled if the number of values in it is not exactly divisible by the number of fields in each text output record. Each record or line must be of less than 255 characters in length (see description of FORMAT command).

Note that DTI2TEXT is not intended to provide a spatially accurate representation of a DTI file - ie. each DTI **column** is output as a series of **rows** in the text file. The MATRIX module DTIEDIT may be used to produce a textual 'picture' of a DTI file.

A single session in DTI2TEXT may involve the conversion of more than one DTI file to a corresponding text file. When each conversion is completed, all the conditions set up to govern it, apart from the files involved and any window specified in the input file, will persist to any subsequent conversions unless explicitly altered using the relevant commands.

Detailed descriptions of the individual commands available are given below.

DTI2TEXT commands

@

Take command input from the specified file.

FORMAT: @file-spec<CR>

Command parameters:

file-spec

The file to be opened and used for command input.

Any parts of the file-spec not supplied for the @ command will be taken from the default specification 'SYS\$DISK:[].COM;0'.

DESCRIPTION:

DTI2TEXT offers the facility of command input from an indirect command file. The '@' character preceding a file-spec will cause DTI2TEXT to open and read commands from the specified file until:

1. a RETURN command is detected and command input is returned to SYS\$COMMAND.
2. end-of-file is detected. This provokes an error message and command input is returned to SYS\$COMMAND.

Nested command files are not supported (i.e. a command file containing an '@' command), although sequential '@' commands are supported when read from SYS\$COMMAND.

As an aid to batch log interpretation DTI2TEXT will echo all commands read from an indirect command file.

Messages:

The following messages are specific to the @ command:

*** WARNING *** "@" must precede a file-spec

*** WARNING *** Indirect file error - returning to terminal input

*** ERROR *** Can't open indirect command file 'file-spec'

Examples:

```
$ DTI2TEXT<CR>
MATRIX module DTI2TEXT of 13:30:39 18-OCT-87
DTI2TEXT> @PRESETS<CR>
DTI2TEXT> ENABLE DIAGNOSTICS
DTI2TEXT> ENABLE NINT
DTI2TEXT> FILEIN READATA
DTI2TEXT> FILEOUT REALDATA.TXT
DTI2TEXT> UNITS METRES
DTI2TEXT> WINDOW 1 1 100 50
DTI2TEXT> RETURN
DTI2TEXT>
```

!

Treat all text to the right of the '!' as a comment.

FORMAT: ! [comment text]

Command parameters:

comment text

text that is to be treated as a comment and which will be excluded from
command interpretation.

DESCRIPTION:

An exclamation mark is the standard DTM package comment delimiter. All text
(and numbers) which lie to the right of a '!' character are excluded from
command interpretation. Comments are useful for annotating command procedures
used in batch processing etc.

Messages: None.

Examples:

DTI2TEXT> ! a comment for the sake of it<CR>
DTI2TEXT> WINDOW 0.0 0.0 900.0 900.0<CR>

DISABLE ABSOLUTE

Disables a previous ENABLE ABSOLUTE command.

FORMAT: DISABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

DISABLE ABSOLUTE cancels a previous ENABLE ABSOLUTE command. If DISABLE ABSOLUTE is given, then coordinate values required by the WINDOW command supplied in metre or projection units, must be specified as an offset from the SW corner of the matrix.

By default window values should be specified as absolute coordinates.

Messages: None.

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **DISABLE ABSOLUTE**<CR>

DTI2TEXT>

DISABLE DIAGNOSTICS

Disables a previous ENABLE DIAGNOSTICS command.

FORMAT: DISABLE DIAGNOSTICS

Command parameters: None.

DESCRIPTION:

DISABLE DIAGNOSTICS allows the user to disable a previous ENABLE DIAGNOSTICS command.

Messages: None.

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **DISABLE DIAGNOSTICS**<CR>
DTI2TEXT>

DISABLE NINT

Disables a previous ENABLE NINT command.

FORMAT: DISABLE NINT

Command parameters: None.

DESCRIPTION:

DISABLE NINT allows the user to disable a previous ENABLE NINT command.

Messages:

The following error message is specific to the DISABLE command:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **ENABLE NINT**<CR>

DTI2TEXT> **DISABLE NINT**<CR>

DTI2TEXT>

DISABLE PME

Disables a previous ENABLE PME command.

FORMAT: DISABLE PME

Command parameters: None.

DESCRIPTION:

DISABLE PME allows the user to disable a previous ENABLE PME command.

Messages:

The following messages are specific to the DISABLE and DISABLE PME commands:

*** ERROR *** Specifying command DISABLE

Available DISABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

*** WARNING *** You are not using PME !

Examples:

DTI2TEXT> **ENABLE PME<CR>**

DTI2TEXT> **DISABLE PME<CR>**

DTI2TEXT>

ENABLE ABSOLUTE

Selects the use of absolute coordinates values.

FORMAT: ENABLE ABSOLUTE

Command parameters: None.

DESCRIPTION:

If ENABLE ABSOLUTE is given, then coordinate values required by the WINDOW command, supplied in metre or projection units, must be specified as absolute (rather than relative) coordinate values.

For example if the projection indicates U.K. National Grid, then the WINDOW values may be specified as 6 figure National Grid coordinates.
By default window values should be specified as absolute coordinates.

This option can be disabled using the DISABLE ABSOLUTE command.

Messages:

The following error message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **ENABLE ABSOLUTE**<CR>
DTI2TEXT>

ENABLE DIAGNOSTICS

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

FORMAT: ENABLE DIAGNOSTICS

Command parameters:None.

DESCRIPTION:

ENABLE DIAGNOSTICS allows the user to enable diagnostic printout.

Because it is usually used in a batch processing environment, by default DTI2TEXT produces minimal diagnostic printout. If however, the user wishes to receive indications of processing progress and of the effect of windowing on data input, diagnostic printout may be selected with the ENABLE DIAGNOSTICS command.

On a heavily loaded computer it may be reassuring to ENABLE DIAGNOSTICS for the conversion stage of DTI2TEXT processing to indicate progress through the data set. A message indicating the current column being converted is issued at approximately each one tenth of the way through the DTI file.

Messages:

The following error message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **ENABLE DIAGNOSTICS**<CR>
DTI2TEXT>

ENABLE NINT

ENABLE NINT allows the user to enable the rounding of real data in the DTI file to the nearest integer prior to output to the text file.

FORMAT: ENABLE NINT

Command parameters: None.

DESCRIPTION:

ENABLE NINT allows the user to enable the conversion of any real data in the DTI file to integer data by rounding to the nearest integer. The rounded numbers will then be output in the same way as integer data from an integer DTI file.

Messages:

The following error message is specific to the ENABLE command:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

Examples:

DTI2TEXT> **ENABLE NINT**<CR>
DTI2TEXT> **FILEIN REALDATA**<CR>
DTI2TEXT> **FILEOUT ROUNDED**<CR>
DTI2TEXT> **GO**<CR>
DTI2TEXT> **DISABLE NINT**<CR>
DTI2TEXT>

ENABLE PME

ENABLE PME enables the PME performance monitor.

FORMAT: ENABLE PME

Command parameters: None.

DESCRIPTION:

The ENABLE PME and DISABLE PME commands are reserved for Laser-Scan use. PME is a code optimisation tool and should be invoked by LSL software personnel only.

ENABLE PME causes the PME_INIT routine to be invoked.

Message:

The following messages are specific to the ENABLE and ENABLE PME commands:

*** ERROR *** Specifying command ENABLE

Available ENABLE qualifiers are :

DIAGNOSTICS NINT PME ABSOLUTE

*** WARNING *** You are already using PME!

Examples:

\$ DTI2TEXT<CR>

MATRIX module DTI2TEXT of 13:30:39 18-OCT-87

DTI2TEXT> ENABLE PME<CR>

FILEIN

Specifies a DTI file that is to be opened and used for data input.

FORMAT: **FILEIN file-spec**

COMMAND PARAMETERS:

file-spec

The specification of the DTI file to be opened for data input.

Any parts of the file-spec not supplied for the FILEIN command will be taken from the default file specification 'LSL\$DTI:DTI.DTI;0'.

DESCRIPTION:

The FILEIN command causes the specified file to be opened and used as an input file to DTI2TEXT. A FILEIN command must be issued before the WINDOW or GO commands will be accepted.

Messages:

The following messages are specific to the FILEIN command:

*** WARNING *** You must specify a file-spec argument to the FILEIN command
*** ERROR *** Unable to interpret input file-spec

Examples:

DTI2TEXT> **FILEIN REAL<CR>**
DTI file LSL\$DTI:REAL.DTI;0 opened for read

File : LSL\$DTI:REAL.DTI;0
Header : LSLA Data: REAL

Units are Metres

Matrix Coverage	SW:	0.00	0.00	NE:	49.00	49.00
Matrix Interval	E:	1.00		N:	1.00	
Value Range	:	-5.00 to 326421.00				

DTI2TEXT>

FILEOUT

Specifies the file-spec of the text file which is to receive the DTI data.

FORMAT: FILEOUT file-spec

COMMAND PARAMETERS:

file-spec

The file-spec of the text file which is to receive the DTI data.

Any parts of the file-spec not supplied for the FILEOUT command will be taken from the default '.DAT;0'.

DESCRIPTION:

The FILEOUT command enables specification of the text file which is to receive the data.

The FILEOUT command must be issued before the GO command.

Messages:

The following messages are specific to the FILEOUT command:

```
*** WARNING *** You must specify a file-spec argument to the FILEOUT command
*** ERROR *** Unable to interpret output file-spec
*** ERROR *** in opening output file
*** ERROR *** in selecting output file
*** ERROR *** Not possible to open file
```

Examples:

```
DTI2TEXT> FILEOUT DUA3:[DEMONSTRATION]IDAHO<CR>
Text output file 'file-spec' opened
DTI2TEXT>
```

FORMAT

Allows the user to specify a format for the text output file records.

FORMAT: **FORMAT format**

Command parameters:

format

The format in which output is required.

Description:

The FORMAT command allows the user to specify a format for the text output file records (one record per line of the file) in terms of a FORTRAN like format definition.

The syntax of the format definition is :

<number of fields> ["F"|"I"] <field width> [". " number of decimal places]

The format definition will be parsed at the time it is input. It will be checked to make sure that it is compatible with the data in the DTI file, in terms of whether it is real or integer and whether it is wide enough to accommodate the longest number in the file, when the GO command is issued. The maximum record length allowed is 256 characters.

Messages:

Current format is 'format'
Enter new format, or press <return> to invoke default (10F8.3 or 10I8).
New format, eg 12F6.2 or 8I10 ?

*** ERROR *** Error reading format

*** ERROR *** Illegal user defined format 'format', default
format reinstated

With indirect file input:

*** ERROR *** Must specify format with format command

Examples:

DTI2TEXT> **FORMAT 20I4<CR>**
DTI2TEXT> **SHOW FORMAT<CR>**
Current user defined format (20I4)
DTI2TEXT>

GO

Carry out the conversion from the specified DTI input file to the specified text output file according to the conditions set up with any other commands issued prior to the GO command.

FORMAT: GO

Command parameters: None

DESCRIPTION:

This will carry out the conversion from a previously specified DTI input file to a previously specified text output file under the conditions set up using any other commands, for example to specify a diagnostic printout or rounding of real input data to the nearest integer.

Before the conversion takes places, checks will be carried out to ensure that certain preconditions hold. For example that the input and output files have been opened, and that any user defined or default format is compatible with the data range and type in the DTI file.

A single session with DTI2TEXT may involve a number of successive conversions of different DTI files. In such cases, all the conditions set up to govern one conversion will persist when it is complete, with the exceptions of the files specified and any window defined within the input file.

Messages:

Messages connected with checking the format :

*** ERROR *** Require real format for real data
*** ERROR *** Require integer format for rounded real data
*** ERROR *** Require integer format for integer data
*** ERROR *** Text field format too narrow, please redefine

Other messages

```
*** ERROR *** Please check that text output file is open
*** ERROR *** Please check that DTI input file is open
*** ERROR *** Error in selecting output file 'file-spec'
*** ERROR *** Error reading column 'integer' of DTI file 'file-spec'
*** ERROR *** Error closing text output file 'file-spec'
*** ERROR *** Error closing DTI input file 'file-spec'
*** ERROR *** Unrecognised datatype in DTI file
*** ERROR *** Cannot write line to output file 'file-spec'
```

In addition to these there are the diagnostic printout messages which will be given if diagnostics are enabled. These consist of the file specifications of the input and output files, the header details of the DTI file, and messages indicating which group of columns, of those being processed, has been reached by the conversion command.

Examples:

```
DTI2TEXT> FILEIN TST
DTI2TEXT> FILEOUT TST
DTI2TEXT> GO<CR>
```

Converting from DTI file LSL\$DTI:TST.DTI;0 to text file TST.DAT.

Details of input DTI file :

File : LSL\$DTI:TST.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	71	71
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	139	to	192		

Converting columns	1 to	4
Converting columns	5 to	8
Converting columns	9 to	12
Converting columns	13 to	16
Converting columns	17 to	20
Converting columns	21 to	24

Converting columns	25 to	28
Converting columns	29 to	32
Converting columns	33 to	36
Converting columns	37 to	40
Converting columns	41 to	44
Converting columns	45 to	48
Converting columns	49 to	50

DTI2TEXT>

HELP

Give help on a subject

FORMAT: HELP subject

Command parameters:

subject

The subject on which help is required.

Description:

The HELP command looks the rest of the line up in the MATRIX HELP library. This library contains a brief summary of the operation of each command.

The information is looked up in the DTI2TEXT section of the MATRIX help library, LSL\$HELP:MATRIX.HLB.

Messages:

Where required, warning messages are output via the VMS LBR\$OUTPUT_HELP utility.

Examples:

DTI2TEXT> **HELP ENABLE NINT<CR>**

DTI2TEXT

ENABLE

NINT

When a DTI file containing real data is to be converted to a text file, it may be required that the data is rounded to the nearest integer and then output. The ENABLE NINT command causes this to be done is issued prior to the GO command.

DTI2TEXT>

NULL

Allows specification of null post value to be substituted in the output text file in place of standard null values found in the input DTI file.

FORMAT: NULL value

Command parameters:

value

The new null value which will be output to the text file. This must lie within a range appropriate to the input DTI file data type:

Minimum	Maximum	DTI data type
0	255	BYTE
-32767	32767	WORD INTEGER
-2E31	2E31-1	LONG INTEGER
-1.0E38	1.0E38	REAL_*4

By default a value of 0 is used for BYTE type DTI files, -32767 for WORD type DTI files and 80000000 Hex for LONGWORD and -1.0E-38 for REAL type DTI files.

DESCRIPTION:

Causes all occurrences of the standard null value in DTI files to be replaced by the user specified null value in the output file. Just entering the command with no value parameter causes the standard null value to be restored.

Messages:

Default value restored

Examples:

DTI2TEXT> NULL -1<CR>
Null value set to -1
DTI2TEXT> NULL<CR>
Default value restored
DTI2TEXT>

PAUSE

Pauses DTI2TEXT execution.

FORMAT: PAUSE

Command parameters: None.

DESCRIPTION:

Pauses DTI2TEXT execution and issues a prompt for a carriage return to continue execution. This command is designed for use in software demonstration situations.

Messages: None.

Examples:

DTI2TEXT> PAUSE<CR>

Press <RETURN> to continue<CR>
DTI2TEXT>

QUIT

Quit from DTI2TEXT.

FORMAT: QUIT

Command parameters: None.

Description:

The QUIT command causes DTI2TEXT to exit immediately, closing the input file and closing and deleting the output file.

<CTRL/Z> (pressing the Ctrl and Z keys together) may also be used to quit from the program.

Messages: None.

Examples:

DTI2TEXT> **QUIT<CR>**

ELAPSED: 00:00:20.04 CPU: 0:00:04.71 BUFIO: 281 DIRIO: 46 FAULTS: 263
\$

RETURN

Restores command input from an indirect file to SYS\$COMMAND.

FORMAT: RETURN

Command parameters: None.

DESCRIPTION:

Restores command input from an indirect file to SYS\$COMMAND.

A typical application is to allow the user to use an indirect command file to set up those run time defaults which are constant within a flowline and then return to input from the terminal (or batch stream) for the run specific commands. To do this RETURN must be the last command in the indirect command file.

Messages:

The following messages are specific to the RETURN command:

RETURN command detected - returning to terminal input

RETURN command ignored - command input is already from terminal

Examples:

```
DTI2TEXT> @FLOW2<CR>
DTI2TEXT> ENABLE DIAGNOSTICS
DTI2TEXT> RETURN
DTI2TEXT>
```

SHOW ENABLE

Shows the current status of those options that may be enabled by means of the ENABLE command, or disabled using the DISABLE command.

FORMAT: **SHOW ENABLE**

Command parameters: None.

DESCRIPTION:

Displays the current status of all the DTI2TEXT options that may be enabled or disabled using the ENABLE and DISABLE commands.
The name of the option is shown, followed by either the word ON or OFF to indicate its current status.
If the command SHOW ENABLE is used before any ENABLE or DISABLE commands have been given, the default status of the options is displayed.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

ENABLE FILES FORMAT NULL UNITS

Examples:

DTI2TEXT>**SHOW ENABLE**<CR>

Current status:

ABSOLUTE	On	DIAGNOSTICS	On	NINT	Off
PME	Off				

DTI2TEXT>

SHOW FILES

Displays information about the input and output files.

FORMAT: **SHOW FILES**

Command parameters: None.

DESCRIPTION:

Details extracted from the header of the input file are displayed on the terminal.

The name of the output file is also displayed if it has been specified.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

ENABLE FILES FORMAT NULL UNITS

Examples:

DTI2TEXT>**SHOW FILES<CR>**

File : LSL\$DTI:TST.DTI;0
Header : LSLA Data: WORD

Units are DTI Matrix Values

Matrix Coverage	SW:	1	1	NE:	71	71
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	139	to		192	

DTI2TEXT>

SHOW FORMAT

Displays the current output format string.

FORMAT: **SHOW FORMAT**

Command parameters: None.

DESCRIPTION:

This command is used to display the currently selected format string as specified with the FORMAT command.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

ENABLE FILES FORMAT NULL UNITS

Examples:

DTI2TEXT>**SHOW FORMAT<CR>**

Current user defined format (20I4)

DTI2TEXT>

SHOW NULL

Displays the current null value.

FORMAT: **SHOW NULL**

Command parameters: None.

DESCRIPTION:

The null value specified with the NULL command is displayed on the terminal.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

ENABLE FILES FORMAT NULL UNITS

Examples:

DTI2TEXT>**SHOW NULL<CR>**

Current null word value is -32767

DTI2TEXT>

SHOW UNITS

Displays on the terminal the current units of measurement.

FORMAT: **SHOW UNITS**

Command parameters: None.

DESCRIPTION:

Displays the current units of measurement which will be used when defining an area of interest in the input DTI file with the WINDOW command.

The UNITS command may be used to change the current units of measurement.

Messages:

The following message is specific to the SHOW command:

*** ERROR *** Specifying command SHOW

Available SHOW command qualifiers are:

ENABLE FILES FORMAT NULL UNITS

Examples:

DTI2TEXT>**SHOW UNITS<CR>**
Current WINDOW units are Projection Units.
DTI2TEXT>

UNITS

Specifies the units of measurement that will be used when defining an area of interest in the input DTM using the WINDOW command. The command also controls the units of measurement which will be used when displaying file header details.

FORMAT: UNITS units

Command parameters:

units

A keyword defining the measurement units, chosen from:

MATRIX	Matrix grid interval units, i.e rows and columns
METRES	Metres on the ground
LATLONG	Latitude and Longitude (in degrees, minutes and seconds)
SECONDS	Seconds of arc
PROJECTION	Projection Record Units (eg. mms on the source

document)

DESCRIPTION:

The UNITS command enables the user to specify in what units of measurement he wishes to define an area of interest in the input DTM using the WINDOW command. The command also controls in what format details from the header of the DTM are given.

The command should be given after defining the DTI file containing the input DTM, since an appropriate default units of measurement is set up whenever an input DTI file is opened.

The UNITS command should be given after opening the DTI file, but before the WINDOW command, should the user wish to specify WINDOW command arguments in a different measurement system to the file-type default.

Messages:

The following error messages are specific to the UNITS command:

*** ERROR *** Specifying command UNITS

Command qualifiers are MATRIX, METRES, SECONDS, LATLONG or PROJECTION

*** ERROR *** Specifying command UNITS

Command qualifier is invalid for the input file

Examples:

DTI2TEXT> UNITS MATRIX<CR>
DTI2TEXT>

WAIT

Suspend processing for the specified number of seconds.

FORMAT: WAIT seconds

Command parameters:

seconds

The number (integer) of seconds for which DTI2TEXT processing is to be suspended.

DESCRIPTION:

The WAIT command causes processing to be suspended for a specified number of seconds. It is designed for use in software demonstration situations and is of no value in a production flowline.

Messages:

The following warning message is specific to the WAIT command:

*** WARNING *** You must specify the number of seconds to wait

Examples:

DTI2TEXT> WAIT 4<CR>
DTI2TEXT>

WINDOW

Specifies the limits of the data area to be converted to text format.

FORMAT: WINDOW xmin ymin xmax ymax

Command parameters:

xmin ymin

The coordinates of the bottom left hand corner of the defining rectangle.

xmax ymax

The coordinates of top right hand corner of the defining rectangle.

The format of the command parameters is controlled by the UNITS command.

UNITS MATRIX - Requires 4 integer values defining the rectangle in terms of column and row numbers

UNITS METRES - Requires 4 real (floating point) values defining the rectangle as metre offsets from the SW corner of the DTM. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates (eg. U.K. National Grid coordinates); if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

UNITS SECONDS - Requires 4 real (floating point) values defining the absolute position of the rectangle in seconds of arc. The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner. A negative latitude value indicates a position in the Southern Hemisphere, and a negative longitude value a point to the west of Greenwich.

UNITS LATLONG - Requires 4 values defining the absolute latitude and longitude position of the rectangle in the format DDD MM SS H where DDD is the number of degrees, MM is the number of minutes, SS is the number of seconds, and H is the hemisphere (N,S,E,W). The values are supplied in the order latitude followed by longitude for the SW corner, and latitude followed by longitude for the NE corner.

UNITS PROJECTION Requires 4 real (floating point) values defining the rectangle in projection record units. By default, or if the ENABLE ABSOLUTE command has been given, the values are absolute coordinates; if the DISABLE ABSOLUTE command has been given, then the coordinates are offsets from the SW corner of the matrix.

Note that in all cases, the input values are adjusted to the nearest column and row values.

If the command is given from the table menu, or the command WINDOW is given without any arguments, you will be asked to supply the values in response to explanatory prompts.

DESCRIPTION:

The command is used to define rectangular limits to the area of data to be converted to text. The limits must be specified in the order bottom left hand (or south west) corner then top right hand (or north east) corner.

The WINDOW command can be used to clip data from the input DTI file. If input is to be from an entire DTI file then the WINDOW command may be omitted as the WINDOW extents will then, by default, be taken from the DTI file header.

Messages:

The following warning messages are specific to the WINDOW command:

*** ERROR **** Specifying DTI window Command requires 2 x,y coordinate pairs (SW and NE)

*** ERROR **** Specifying DTI window NE coordinates should exceed SW coordinates

*** WARNING *** Specified window exceeds matrix limits Window will be truncated to fit

Examples:

DTI2TEXT> WINDOW 0.0 0.0 120.0 120.0<CR>
DTI2TEXT>

DTI2TEXT examples

EXAMPLES

```
$ DTI2TEXT
DTI2TEXT> ENABLE DIAGNOSTICS<CR>
DTI2TEXT> FILEIN TST<CR>
DTI file LSL$DTI:TST.DTI;0 opened for read
```

```
File      : LSL$DTI:TST.DTI;0
Header    : LSLA  Data:  WORD
```

Units are Metres

```
Matrix Coverage  SW:      0.00      0.00    NE:      70.00      70.00
Matrix Interval   E:      1.00                      N:      1.00
Value Range      :    139    to    192
```

```
DTI2TEXT> FILEOUT TST<CR>
Text output file TST.DAT opened
DTI2TEXT> UNITS MATRIX<CR>
DTI2TEXT> WINDOW 1 1 50 50<CR>
DTI2TEXT> SHOW FILES<CR>
```

```
File      : LSL$DTI:TST.DTI;0
Header    : LSLA  Data:  WORD
```

Units are DTI Matrix Values

```
Matrix Coverage  SW:      1      1  NE:      71      71
Matrix Window    SW:      1      1  NE:      50      50
Matrix Interval   E:      1          N:      1
Value Range      :    139    to    192
```

Text File TST.DAT selected for output.

```
DTI2TEXT> FORMAT 20I4<CR>
DTI2TEXT> SHOW FORMAT<CR>
Current user defined format (20I4)
DTI2TEXT> GO<CR>
```

Converting from DTI file LSL\$DTI:TST.DTI;0 to text file TST.DAT.

Details of input DTI file :

```
File      : LSL$DTI:TST.DTI;0
Header    : LSLA  Data:  WORD
```

Units are DTI Matrix Values

```
Matrix Coverage  SW:      1      1  NE:      71      71
Matrix Window    SW:      1      1  NE:      50      50
Matrix Interval   E:      1          N:      1
Value Range      :    139    to    192
```

```
Converting columns 1 to 4
Converting columns 5 to 8
Converting columns 9 to 12
Converting columns 13 to 16
Converting columns 17 to 20
Converting columns 21 to 24
Converting columns 25 to 28
Converting columns 29 to 32
Converting columns 33 to 36
Converting columns 37 to 40
Converting columns 41 to 44
Converting columns 45 to 48
Converting columns 49 to 50
```

DTI2TEXT>

This example shows a typical COMMAND sequence for DTI2TEXT

Diagnostic printout is enabled with the ENABLE DIAGNOSTICS command.

The input DTI file (TST.DTI) and the output text file (DTI.DAT) are specified using the FILEIN and FILEOUT commands respectively.

The units are then set to those of the matrix of the DTI file, and a window in the input DTI file to be converted is specified with the window command. SHOW FILES illustrates that the specified window has been set.

Next, a user defined format is entered using the FORMAT command, and its effect checked using SHOW FORMAT.

Finally, the actual conversion is started by the GO command. The diagnostic printout gives details of the files involved and of the progress of the conversion through the columns which are to be processed.

The DTI2TEXT prompt returns after the conversion is complete, so that further commands to process other files may be issued.

\$ **DTI2TEXT**<CR>

DTI2TEXT> **ENABLE** **DIAGNOSTICS**<CR>

DTI2TEXT> **FILEIN UHL1**<CR>1

DTI file LSL\$DTI:UHL1.DTI;0 opened for read

File : LSL\$DTI:UHL1.DTI;0

Header : UHL1 Data: WORD

Units are degrees, minutes, seconds

Matrix Origin	:	52 00 00S	58 00 00W				
Matrix Coverage	SW:	52 00 00S	58 00 00W	NE:	51 50 00S	57 39 20W	
Matrix Window	SW:	52 00 00S	58 00 00W	NE:	51 50 00S	57 39 20W	
Matrix Interval	E:	2		N:	1		
Value Range	:	0	to 321				

DTI2TEXT> **FILEOUT UHL1**<CR>

Text output file UHL1.DAT opened

DTI2TEXT> **GO**<CR>

Converting from DTI file LSL\$DTI:UHL1.DTI;0 to text file UHL1.DAT.

Details of input DTI file :

File : LSL\$DTI:UHL1.DTI;0

Header : UHL1 Data: WORD

Units are degrees, minutes, seconds

Matrix Origin	:	52 00 00S	58 00 00W				
Matrix Coverage	SW:	52 00 00S	58 00 00W	NE:	51 50 00S	57 39 20W	
Matrix Window	SW:	52 00 00S	58 00 00W	NE:	51 50 00S	57 39 20W	
Matrix Interval	E:	2		N:	1		
Value Range	:	0	to 321				

Converting columns 1 to 62

Converting columns 63 to 124

Converting columns 125 to 186

Converting columns 187 to 248

Converting columns 249 to 310

Converting columns 311 to 372

Converting columns 373 to 434

Converting columns 435 to 496

Converting columns 497 to 558

Converting columns 559 to 620

Converting columns 621 to 621

DTI2TEXT> **SHOW FILES**<CR>

DTI input file not yet specified

Text output file not yet specified

DTI2TEXT> **SHOW ENABLE**<CR>

Current status:

ABSOLUTE	On	DIAGNOSTICS	On	NINT	Off
PME	Off				

DTI2TEXT>

The example above illustrates the conversion of a DTI file of integer word data to a text file with the diagnostic printout enabled. The SHOW FILES and SHOW ENABLE commands after the conversion has completed demonstrates that the input and output files have been closed, but that the other conditions, such as whether diagnostics are enabled, or whether rounding to integers is enabled, still hold for any subsequent conversions carried out in this session of DTI2TEXT. Any window specified is reset when the DTI file is closed, and so must be reentered after each FILEIN command.

.
. .
. .
. .

DTI2TEXT> **FILEIN REAL<CR>**

DTI file LSL\$DTI:REAL.DTI;0 opened for read

File : LSL\$DTI:REAL.DTI;0

Header : LSLA Data: REAL

Units are DTI matrix values

Matrix Coverage	SW:	1	1	NE:	50	50
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	-5.00 to 326421.00				

DTI2TEXT> **FILEOUT REAL<CR>**

Text output file REAL.DAT opened

DTI2TEXT> **ENABLE DIAGNOSTICS<CR>**

DTI2TEXT> **ENABLE NINT<CR>**

DTI2TEXT> **FORMAT 20I4<CR>**

DTI2TEXT> **GO<CR>**

*** ERROR *** Text field format too narrow, please redefine

DTI2TEXT> **FORMAT<CR>**

Current format is (20I4)

Enter new format, or press <return> to invoke default (10F8.3 or 10I8).

New format, eg 12F6.2 or 8I10 ? **<CR>**

DTI2TEXT> **GO<CR>**

Converting from DTI file LSL\$DTI:REAL.DTI;0 to text file REAL.DAT.

Details of input DTI file :

File : LSL\$DTI:REAL.DTI;0

Header : LSLA Data: REAL

Units are DTI matrix values

Matrix Coverage	SW:	1	1	NE:	50	50
Matrix Window	SW:	1	1	NE:	50	50
Matrix Interval	E:	1		N:	1	
Value Range	:	-5.00 to 326421.00				

Converting columns 1 to 4

Converting columns 5 to 8

Converting columns 9 to 12

Converting columns 13 to 16

Converting columns 17 to 20

Converting columns 21 to 24

Converting columns 25 to 28

Converting columns 29 to 32

Converting columns 33 to 36

Converting columns 37 to 40
Converting columns 41 to 44
Converting columns 45 to 48
Converting columns 49 to 50

DTI2TEXT> **QUIT<CR>**

ELAPSED: 0 00:15:20.28 CPU: 0:01:08.46 BUFIO: 348 DIRIO: 1481 FAULTS:
232
\$

In this example, a DTI file of real data is converted to a text output file. The `ENABLE NINT` command means that the data in the text file will be rounded to the nearest integer. `FORMAT` is used first to set up a format which is subsequently rejected when `GO` is issued. It is then used to reinstate the default output formats.

DTI2TEXT messages

MESSAGES (ERROR)

These messages indicate an error in processing which will cause the program to terminate. The most likely causes are a corrupt or otherwise invalid input file, or an error related to command line processing and file manipulation.

CLDTI, error closing DTI file

Explanation: DTI2TEXT is unable to close the input DTI file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

CLIND, error closing indirect command file

Explanation: DTI2TEXT is unable to close the indirect command file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

CLTXT, error closing output text file

Explanation: DTI2TEXT is unable to close the output text file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem, e.g. insufficient disk space for file allocation. If the problem persists, notify your system manager.

UNRECDT, the data type of the DTI file is not recognised

Explanation: DTI2TEXT does not recognise the data in the DTI file as being of one of the expected types (real, longword, word, byte or bit).

User action: The DTI file header may be corrupted, so examine the file with the DTIPATCH utility.

WRREC, error writing record to output text file

Explanation: DTI2TEXT is unable to write the current record string to the output text file.

User action: The supplementary messages supplied with this message will enable the user to determine the cause of the problem. If the problem persists notify your system manager.

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTILIB library and by the Laser-Scan I/O library, LSLLIB. DTILIB library messages are introduced by '%DTILIB' and are documented in the MATRIX package reference manual. In most cases DTI errors will be due to a corrupt input file, and this should be the first area of investigation. If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are used to explain the details of program generated errors.

CHAPTER 9

MODULE DTICONVERT

MODULE DTICONVERT

REPLACES DTICONVERT is a new utility

FUNCTION

DTICONVERT is a module to convert between different style DTI header and data formats. Header and data conversions may be carried out separately, or as a combined operation.

FORMAT

\$ DTICONVERT

PROMPTS

DTICONVERT requires no command line qualifiers, but requests information from the user about the input and output DTI files in response to a series of prompts.

DESCRIPTION

GENERAL

DTICONVERT is a module to convert between different style DTI header and data formats. Header and data conversions may be carried out separately, or as a combined operation.

The module preserves the original (input) DTI file by always creating a new output file with the requested header and data structure.

The module recognises LSLA, UHL1, TED4, and the historical MIKE and ALVY header structures in the case of the input DTI file, and allows the creation of an output file with a LSLA, UHL1 or TED4 header format. Data conversion is performed on BIT, BYTE, WORD, LONGWORD and REAL formats. Full details of the format of the different DTI headers, and the structure of the data area, are to be found in the DTILIB Reference Manual.

DTICONVERT OPERATION

DTICONVERT requires no command line qualifiers, but requests information from the user about the input and output DTI files in response to a series of prompts. The following sequence of prompts are output by the module:

Input Filename >

Output Filename >

Output Header Type >

Header Size (Default = n) > Only for output DTI files
a LSLA style header.

with

Output Data Type >

INPUT FILENAME PROMPT

In response to the prompt 'Input Filename >' you should supply the name of the DTI file you wish to convert.

The input filename is parsed against the default 'LSL\$DTI:DTI.DTI;0'.

If the file is found and successfully opened, confirmation is output to the terminal by printing details from the file header. Included are details of the style of header, and data type.

If the file is not found or cannot be opened, an explanatory system error will be generated, and you will be requested to enter another input filename.

OUTPUT FILENAME PROMPT

In response to the prompt 'Output Filename >' you should supply the name of the DTI file you wish to create. This file is created with a header structure specified in response to the 'Output Header Type >' prompt, and with data from the input file held in the format specified via the 'Output Data Type >' prompt.

The output filename is parsed against the default 'LSL\$DTI:DTI.DTI;0'.

OUTPUT HEADER TYPE PROMPT

In response to the prompt 'Output Header Type >' you should type the name of a valid DTI header identifier.

The three options are:

1. LSLA - Creates a DTI file with a LSLA style header. The LSLA header record is of variable length, so if this option is selected, you will be additionally prompted for a header length value.
2. UHL1 - Creates a DMA Change 2 style DTI file with a DTED UHL1 header record.
3. TED4 - Creates a DMA Change 3 or 4 style DTI file with DTED DSI and ACC header records.

When output is to a file with the same style of header as the input, the header record of the original file is copied to the output. In other cases, a blank header will be created in the output DTI file. For example, if the input file has a LSLA style header and output is to a file with a TED4 header, blank DSI and ACC records are created in the output, and any header information recorded in the input file is lost.

In all cases, the header variables that are common to all DTI headers (ie. x,y data extent, x,y grid intervals and minimum and maximum data values) are copied from the original file to the output file.

HEADER SIZE PROMPT

If conversion is to a file with an LSLA style of header, the prompt 'Header Size (Default = n) >' is output. In response you should type a value that defines the length of the header in bytes.

A default value 'n' is always supplied, and may be accepted by pressing Return in response to the prompt. If the input DTI file has an LSLA or the now historical ALVY style header, the default value is the same as the input file header length; in other cases the default value is set to the minimum LSLA header length of 32.

The supplied value should be in the range 1 to 32734.

OUTPUT DATA TYPE PROMPT

In response to the prompt 'Output Data Type >' you should type the name of a valid DTI data format.

The four options are:

1. BIT - The data is stored as a bit with a value of 0 or 1.
2. BYTE - The data is stored as an 8 bit byte. It is conventional to treat the byte value as unsigned, so that it may have a value in the range 0 through 255.
3. WORD - The data is stored as a 16 bit integer (INTEGER2). A data value can have a value in the range -32,768 through 32,767
4. LONG - The data is stored as a 32 bit integer (INTEGER4). A data value can have a value in the range -2,147,483,648 through 2,147,483,647
5. REAL - The data is stored as a single-precision 32 bit real (REAL4). A data value can have a value in the range .29 times 10 raised to the power of -38 through 1.7 times 10 raised to the power of 38.

If a data value in the input DTI file is too large or too small to be stored in the output DTI file, the input value is truncated by the program to the lower or upper value limits. For example, if a value of 340 stored as a WORD is converted to a BYTE data value, it will be represented by a value of 255 in the output file. Similarly an input WORD data value of -10 will be converted to a BYTE data value of 0 in the output file.

When converting from REAL to a BIT, BYTE, WORD or LONGWORD format, the real value is first converted to the nearest integer, and then truncated as necessary.

When converting to REAL format all data values are floated.

NOTE

BIT DTI files are only supported by a limited set of programs (DTICONVERT, DTITRANS/DESCRIPTOR, DTIPATCH and LITES2), and only for storage and display. For any sort of processing of BIT datatype files, such as transformation, combination etc., the data should be converted to BYTE datatype using DTICONVERT. This restriction arises from the fact that a byte is the smallest data unit capable of independent manipulation by the VAX computer architecture.

INITIATING CONVERSION

The conversion of the input DTI file starts as soon as a valid response is received as answer to the prompt 'Output Data Type >'.

The success of the conversion operation is indicated by printing header details of the output DTI file, and by the termination of the module.

CHAPTER 10

MODULE DTIPATCH

MODULE **DTIPATCH**

REPLACES MATRIX module DPATCH

FUNCTION

DTIPATCH enables values in the header of a DTI file to be examined and edited. Currently only the first part of the DTI header, which is common to all types of DTI files, and the data order values present in a LSLA type header, may be edited. Using the module it is possible to edit the fields that define the size of the matrix (number of columns and rows), the matrix x and y grid intervals and the matrix data range (minimum and maximum data values), and for LSLA type files the data order corner and direction values.

FORMAT

\$ DTIPATCH

PROMPTS

DTIPATCH is a prompt driven program. Command input is expected in response to the different DTIPATCH screen prompts.

DESCRIPTION

GENERAL

DTIPATCH enables values in the header of a Digital Terrain Image (DTI) file to be examined and edited.

The first part of the DTI header, which is common to all types of DTI file headers may be edited. The fields in this part of the header define the size of the matrix (number of columns and rows), the matrix x and y grid intervals and the matrix data range (minimum and maximum data values). In addition for a DTI files with a LSLA type header, the values defining the arrangement of the data within the file (ie data order corner and direction values) may be edited.

All modules in the Laser Scan packages DTMCREATE, MATRIX and TVES that utilise DTI files, will normally correctly set the header values on file creation or closure. It is envisaged therefore, that DTIPATCH will only be used in the event of the corruption of the DTI header. If the frequent use of DTIPATCH is found to be required, it is indication of a serious problem in either a Laser Scan package module, or a utility developed by a customer. In the former case Laser Scan should be informed of the problem.

When using DTIPATCH, the user should be aware of the consequences of changing the header values. In particular, if the matrix x and y size values are incorrectly set, then it may not be possible for Laser Scan modules to open the file, since data extent consistency checks are performed by the DTI input / output library DTILIB. No consistency checks, other than whether the data minimum and maximum values are valid for the type of data held in the file, and that data order values are within range, are carried out by the module itself.

DTIPATCH PROMPTS

DTIPATCH requires no command line qualifiers, but requests input from the user in response to a series of prompts. The following sequence of prompts are output by the module:

```
Enter DTI Filename      >
Corner of Data Origin   >          LSLA type header only
Data Direction          >          LSLA type header only
Number of Columns      >
Number of Rows          >
X Grid Interval         >
Y Grid Interval         >
```

Minimum Data Value >

Maximum Data Value >

<CTRL/Z> (pressing the Ctrl and Z keys together) may be supplied in response to any of the prompts in order to quit from DTIPATCH. If <CTRL/Z> is used, any input DTI file is closed, and the original header values are preserved.

ENTER DTI FILENAME PROMPT

In response to the prompt 'Enter DTI Filename >' you should supply the file specification of the DTI file you wish to edit.

Any part of the file specification not supplied is taken from the default 'LSL\$DTI:DTI.DTI', although if no file specification is supplied you will be reprompted for a file name.

If the file is found and successfully opened, the current header values are displayed on the screen. The header values shown are the ones that may be edited using DTIPATCH.

CORNER OF DATA ORIGIN PROMPT

In response to the prompt 'Corner of Data Origin >' you should enter an integer value defining the corner where the data origin is located.

Valid responses are 0 for SW, 1 for NW, 2 for NE and 3 for SE.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

DATA DIRECTION PROMPT

In response to the prompt 'Data Direction >' you should enter an integer value defining the direction in which the data is ordered in the file.

Valid responses are 0 for clockwise, and 1 for anticlockwise.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

NUMBER OF COLUMNS PROMPT

In response to the prompt 'Number of Columns >' you should enter an integer value defining the x extent of the matrix.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

NUMBER OF ROWS PROMPT

In response to the prompt 'Number of Rows >' you should enter an integer value defining the y extent of the matrix.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

X GRID INTERVAL PROMPT

In response to the prompt 'X Grid Interval >' you should enter a real (floating point) value defining the matrix x grid interval. This is the width of the matrix columns.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

Y GRID INTERVAL PROMPT

In response to the prompt 'Y Grid Interval >' you should enter a real (floating point) value defining the matrix y grid interval. This is the width of the matrix rows.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

MINIMUM DATA VALUE PROMPT

In response to the prompt 'Minimum Data Value >' you should enter a number defining the minimum data value in the file. Depending on the type of data held in the file, a real or integer value is required.

DTIPATCH will validate the number entered to ensure that in the case of bit, byte or word data, the number is in a valid range. If the file contains bit data, a value of either 0 or 1 is required; for byte data a value in the range 0 through 255 is required, while for word data a value in the range -32768 to 32767 is required.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

MAXIMUM DATA VALUE PROMPT

In response to the prompt 'Maximum Data Value >' you should enter a number defining the maximum data value in the file. Depending on the type of data held in the file, a real or integer value is required.

DTIPATCH will validate the number entered to ensure that in the case of bit, byte or word data, the number is in a valid range. If the file contains bit data, a value of either 0 or 1 is required; for byte data a value in the range 0 through 255 is required, while for word data a

value in the range -32768 to 32767 is required.

If you wish to leave the value unchanged, then press <RETURN> without entering a value.

Following the input of a response to this final prompt, DTIPATCH displays the new and old header values, and proceeds to write the new values to the file.

DTIPATCH examples

EXAMPLES

\$ DTIPATCH

DTIPATCH

This module allows the first part of the DTI header to be edited.
You will be prompted for a filename, followed by a series of header
values.

To leave a header value unchanged, press RETURN

```
*****
* WARNING - NO CONSISTENCY CHECKS ARE MADE *
*****
```

Enter DTI filename > TEST<CR>

Existing Header Values

```
Corner of Data Origin :      0 (SW)
Data Direction       :      0 (clockwise)
Number of Columns    :     301
Number of Rows       :     251
X Grid Interval      :    100.00
Y Grid Interval      :    100.00
Minimum Data Value   :        0
Maximum Data Value   :     851
```

```
Corner of Data Origin > <CR>
Data Direction       > <CR>
Number of Columns    > <CR>
Number of Rows       > <CR>
X Grid Interval      > 200<CR>
Y Grid Interval      > 200<CR>
Minimum Data Value   > <CR>
Maximum Data Value   > <CR>
```

	New Values	Old Values
Corner of Data Origin :	0	0
Data Direction :	0	0
Number of Columns :	301	301
Number of Rows :	251	251
X Grid Interval :	200.00	100.00
Y Grid Interval :	200.00	100.00
Minimum Data Value :	0	0
Maximum Data Value :	851	851

Writing new values to header now

ELAPSED: 0 00:00:09.28 CPU: 0:00:00.69 BUFIO: 46 DIRIO: 4 FAULTS: 70

DTIPATCH messages**-----
MESSAGES (OTHER)**

In addition to the above messages which are generated by the program itself, other messages may be produced by Laser-Scan libraries. In particular, messages may be generated by the DTI library or by the Laser-Scan I/O library, LSLLIB. DTI library messages are introduced by %DTI and are documented in the MATRIX Reference manual. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are often used to explain the details of program generated errors.

If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis.

CHAPTER 11

MODULE DTITRANS

MODULE DTITRANS

FUNCTION

DTITRANS performs the following operations on raster data held in a DTI format:

1. transforms data held in one map projection system into another projection system
2. transforms data held in a map projection system into Geographicals (latitude and longitude), or from Geographicals (latitude and longitude) to a map projection system
3. transforms data using affine transformation parameters, determined by the IMAGEPROCESS (SATMAP) image orientation module, to create an image map
4. transforms data fom one coordinate system to another, allowing rotation, scaling, translation and shearing
5. resamples data to new x and y sample intervals without projection change
6. allows a DTI projection record to be created and modified

The module is applicable to all types of raster data, but is primarily used to transform satellite or digital terrain data.

FORMAT	
\$ DTITRANS DTI-input-file-spec DTI-output-file-spec	
Command Qualifiers	Defaults
/DESCRIPTOR	None
/FILE_TYPE	/FILE_TYPE=LSLA (see text)
/FOUR=control-file-spec	/FOUR='HERE:RECTIFY.DAT'
/IFF=IFF-file-spec	/IFF='LSL\$IF:DTITRANS.IFF'
/IMAGEMAP=Image-orientation-file	/IMAGEMAP='LSL\$RCP:TRANSP.DAT'
/[NO]LOG	/NOLOG
/PROJECTIVE=control-file-spec	/PROJECTIVE='RECTIFY.DAT'
/[NO]PROMPT	/NOPROMPT
/RESAMPLE	/RESAMPLE=LINEAR (see text)

/[NO]ROUND_ORIGIN	/NOROUND_ORIGIN
/[NO]SHIFT	/NOSHIFT
/THREE=control-file-spec	/THREE='RECTIFY.DAT'
/[NO]TRANSFORM	/TRANSFORM
/TWO=control-file-spec	/TWO='RECTIFY.DAT'
/[NO]WINDOW	/NOWINDOW

PROMPTS

_Input DTI File: DTI-input-file-spec
_Output DTI File: DTI-output-file-spec

COMMAND PARAMETERS

DTI-input-file-spec

Specifies the input DTI file.

Any part of the file specification that is not supplied will be completed from the default of "LSL\$DTI:DTI.DTI;0"

DTI-output-file-spec

Specifies the name of the DTI file to be created.

Any part of the file-spec that is not specified will be completed from the parsed input file-spec.

RESTRICTIONS

- o DTITRANS cannot be used to convert data from one spheroid onto another
- o /DESCRIPTOR cannot be present with any other qualifier except /LOG or /ROUND_ORIGIN
- o /IMAGEMAP and /TRANSFORM is not allowed
- o /IMAGEMAP and /SHIFT is not allowed
- o /IMAGEMAP and /PROMPT is not allowed
- o /IFF is only allowed with the qualifier /IMAGEMAP

- o any of /TWO or /THREE or /FOUR or /PROJECTIVE is not allowed with any of /IMAGEMAP or /SHIFT or /TRANSFORM or /PROMPT or /FILE_TYPE
- o DTITRANS will not transform data in the BIT format, and if required, DTICONVERT must be used to transform to another format.

COMMAND QUALIFIERS

/DESCRIPTOR

- Selects the option to create and set the fields of a DTI Projection record, or to modify an existing DTI Projection record. This option is only valid if the input DTI file has a 'LSLA' header.

If the input file does not contain a DTI Projection record, DTITRANS will insert a record by extending the size of the file header. If the input file already contains a Projection record, the contents of the record will be displayed, and may be edited. In both cases the operations are performed 'in situ'.

/FOUR=control-file-spec

- Specifies that a four point transformation will be carried out to rectify an image from one coordinate system to another, using control points read from the specified ASCII file.

The default specification for the control file is 'RECTIFY.DAT'.

/FILE_TYPE

- Determines what style of DTI file header is created by the module. The following options are available:

/FILE_TYPE=LSLA (default) A DTI file with a 'LSLA' header, and with a DTI Projection record is created. The format of the DTI Projection record is described below and in the DTILIB Reference Manual.

/FILE_TYPE=TED4 A DTI file with a 'TED4' header and no DTI Projection record is created. If the transformation is to Geographicals, the relevant fields in the DSI record are set by the module. A blank ACC record is created.

/FILE_TYPE=UHL1 A DTI file with a 'UHL1' header and no DTI Projection record is created. If the transformation is to Geographicals, the relevant fields in the UHL record are set by the module.

For full details of the different DTI header structures, the user is referred to the DTILIB Reference Manual.

/IFF=IFF-file-spec

- Creates an IFF file containing registration marks in the form of border and grid ticks that may be overlaid on the transformed image map. The registration ticks are written to layer 0 of the IFF file, and are given a feature code of 0. The grid ticks define a 1km grid.

The default specification for the output IFF file is 'LSL\$IF:DTITRANS.IFF'

This qualifier is only allowed if /IMAGEMAP has also been specified.

/IMAGEMAP=image-orientation-file-spec

- This option allows an image map to be generated using transformation parameters determined by the IMAGEPROCESS (SATMAP) image orientation module and read from the specified image orientation file.

The default specification for the orientation file is 'LSL\$RCP:TRANSP.DAT'.

/LOG

/NOLOG (default)

- Generates a display on SYS\$OUTPUT indicating the progress of the transformation and resampling operations.

The default is /NOLOG.

/PROJECTIVE=control-file-spec

- Specifies that a projective transformation will be carried out to rectify an image from one coordinate system to another, using control points read from the specified ASCII file.

The default specification for the control file is 'RECTIFY.DAT'.

/PROMPT

/NOPROMPT (default)

- Forces the module to prompt for details of all input DTI projection parameters, irrespective of whether all or some of these parameters are available from the DTI header records.

This qualifier is generally only used in situations where the projection information contained in the input DTI file is unset or is known to be unreliable.

/RESAMPLE

- Selects the algorithm to be used when resampling the input data values.

/RESAMPLE=NINT. A Nearest Neighbour algorithm is used. The value of the node in the transformed DTI file is taken as the data value of the nearest node in the input DTI file.

This algorithm is useful in situations where it is important to maintain the original input matrix values, but has the disadvantage that in the process of rounding, a node may be offset by up to half the sample interval. This may be visually apparent when the output image is displayed.

/RESAMPLE=LINEAR. The value of the node in the transformed DTI file is derived from the nearest four nodes in the input file using bi-linear interpolation.

The advantage of this method is that it results in a smooth image without the problem of image discontinuity exhibited by the nearest neighbour approach. The default is /RESAMPLE=LINEAR

/ROUND_ORIGIN

/NOROUND_ORIGIN (default)

- Forces the origin offset of the DTI file to be a multiple of the sampling interval.

The default is /NOROUND_ORIGIN.

/SHIFT

/NOSHIFT (default)

- Specifies that the module is to apply a constant x and y shift to all coordinates before any transformation and/or resampling operation. The extent of the coordinate shift is defined by the user when the module prompts for projection data for the output DTI file. The shift is achieved by modifying the local origin values of the output DTI file.

This option is not valid when /IMAGEMAP has been selected.

The default is /NOSHIFT

/THREE=control-file-spec

- Specifies that a three point transformation will be carried out to rectify an image from one coordinate system to another, using control points read from the specified ASCII file.

The default specification for the control file is 'RECTIFY.DAT'.

/TRANSFORM (default)
/NOTTRANSFORM

- Specifies that the module is to perform a projection change operation on the input DTI file. The module will prompt for any input projection data that cannot be derived from the header records of the input DTI file, and for output projection data. The number and nature of the output projection parameters varies with the selected projection.

/NOTTRANSFORM specifies that the module is to perform a resampling operation on the input DTI file, without any projection change. The input DTI file may be resampled to either a coarser or finer resolution grid. If /NOTTRANSFORM is specified the user is prompted only for output sample values.

This option is invalid when /IMAGEMAP has been selected.

/TWO=control-file-spec

- Specifies that a two point transformation will be carried out to rectify an image from one coordinate system to another, using control points read from the specified ASCII file.

The default specification for the control file is 'RECTIFY.DAT'.

/WINDOW
/NOWINDOW (default)

- Causes the module to prompt the user for SW and NE coordinates that define a rectangular area of interest in the input DTI file, and a rectangular area of interest in the output file. Only those nodes that fall within the defined area of interest are considered for transformation or resampling.

The default is /NOWINDOW ie. all the data values in the input DTI file are used.

DESCRIPTION

o **The DTI Projection Record.**

DTI files output from DTITRANS are created by default with an 'LSLA' (LSL Type A) header and with a DTI Projection record. The Projection record contains a projection and spheroid code and associated parameters, and the coordinates of address (1,1) in the matrix. The record is analogous to an IFF version 2 Map Descriptor (MD) entry. The coding conventions adopted by the IMP module ITRANS are followed.

The DTI Projection record holds the following information:

1. The units in which the data is recorded.

When the data in the DTI file is held in Geographicals the units may be in radians, seconds of arc, degrees of arc or tenths of seconds of arc. Tenths of seconds of arc is the default.

When the data is recorded on a projection the units may be metres (default) or feet.

The units codes recorded in the DTI Projection record are:

- 0 Unset
- 1 Feet
- 2 Metres
- 3 Seconds of arc (only valid if projection is 100)
- 4 Degrees of arc (only valid if projection is 100)
- 5 Radians (only valid if projection is 100)
- 102 mm on the source document
- 104 thousands of an inch on source document
- 110 1/10 seconds of arc (only valid if projection is 100)

2. The x,y coordinate values of address (1,1) in the matrix.

The coordinate values are held in the units specified in the Projection record. The coordinates of other nodes in the matrix may be determined using these values, and the matrix sample interval values.

3. The sample interval in x and y.

The grid values are held in the units specified in the Projection record. The x and y grid values may be different, and are constant for the entire matrix.

4. The spheroid that the data relates to.

All geographical data is ultimately related to a particular spheroid.

The spheroid is the geometrical model of the earth that was used when the original survey was carried out. It is not possible, using DTITRANS, to convert data from one spheroid to another.

The spheroids supported by DTITRANS, and the code recorded in the DTI Projection record are:

- 0 Clarke 1866
- 1 Clarke 1880
- 2 Bessel
- 3 New International 1967
- 4 International 1924 (Hayford 1909)
- 5 World Geodetic System 72 (WGS 72)
- 6 Everest
- 7 World Geodetic System 66 (WGS 66)
- 8 Geodetic Reference System 1980 (GRS 1980)
- 9 Airy
- 10 Modified Everest
- 11 Modified Airy
- 12 Walbeck
- 13 Southeast Asia
- 14 Australian National
- 15 Krassovsky
- 16 Hough
- 17 Mercury 1960
- 18 Modified Mercury 1968
- 19 Sphere of radius 6370997 M
- 20 Sphere of radius 6371229.3M
- 21 Clarke 1880 (IGN)
- 22 World Geodetic System 84 (WGS 84)
- 101 User specified spheroid

Appendix A of the IMP Reference Manual gives full details of these spheroids.

When a user specified spheroid is defined, then information about the length of the semi-major axis, and the length of the semi-minor axis or eccentricity squared, is also recorded in the Projection record.

5. The projection that the data are on.

The projections that DTITRANS supports are:

- 0 Unset
- 1 Universal Transverse Mercator
- 2 State Plane Coordinates
- 3 Albers Conical Equal Area
- 4 Lambert Conformal Conic
- 5 Mercator
- 6 Polar Stereographic
- 7 Polyconic
- 8 Equidistant Conic
- 9 Transverse Mercator
- 10* Stereographic
- 11* Lambert Azimuthal Equal Area

12* Azimuthal Equidistant
13* Gnomonic
14* Orthographic
15* General Vertical Near-Side Perspective
16* Sinusoidal
17* Equirectangular
18* Miller Cylindrical
19* Van der Grinten
20 Oblique Mercator (Hotine)
21* Oblique Mercator (Spherical)
22 Stereographic (UKSL formulae)
23 Cassini
24 Krovak
25 Bonne
26* Mollweide
27* Hammer-Aitoff
28* Winkel III
29* Modified-Stereographic
100 Geographic (ie. Latitude and Longitude)
101 UK national grid (a special case of 9)

1) Those projections marked with a '*' are only defined for a sphere, not a spheroid

2) Data can be held in geographicals (ie. Latitude and Longitude) by specifying projection code 100

Currently the DTI Projection record is created and modified only by the module DTITRANS. It is designed to reduce the amount of information a user must enter when carrying out a series of projection changes on a set of data, and to enable the automatic registration of raster and vector geographic data.

The Projection record is always appended on to the end of any DTI header information that may exist in an input 'LSLA' type DTI file.

o **Carrying out projection transformations.**

DTITRANS will carry out a projection change unless the /NOTTRANSFORM, /DESCRIPTOR, /IMAGEMAP, /TWO, /THREE, /FOUR or /PROJECTIVE options are selected. Projection change on raster data involves both a coordinate transformation using parameters derived from the input and output projection values, and the calculation of the data value at the transformed coordinate position by resampling the input data values.

In order to calculate the size of the output DTI file, the transformation parameters are first applied directly to the 4 corners of the input matrix. The minima and maxima of these transformed coordinates in conjunction with the output sample values determine the size of the output matrix.

Subsequently an inverse transformation is applied. The transformation is applied to each point in the output matrix in order to determine its corresponding position in the input matrix. The

value of the transformed point is determined from the input matrix values using one of the resampling techniques described below. If the transformed point lies outside the input matrix, a null value is assigned to the point. For DTI files holding byte data this is 0, while for all other data types a value of -32767 is used.

The resampling options available in the program are nearest neighbour, in which the value of the matrix point in the transformed image is taken as the value of the nearest matrix point in the original image, and bilinear interpolation (default) in which the value of the transformed matrix point is taken as the weighted average of the nearest 4 points in the input image. The advantage of the nearest neighbour method is that it is simple to compute, and the value from the original image is used without modification. The disadvantage is that in the process of rounding the transformed value to the nearest matrix point, discontinuities that may be visually apparent in the output image may be introduced. In contrast bilinear interpolation produces a smooth image without apparent discontinuity, but has the disadvantage that the input matrix values are altered, and computation times are increased.

o **Carrying out plane transformations.**

When carrying out plane transformations on data in a DTI file, DTITRANS uses an ASCII file of control points to define the two coordinate spaces. Each control file has four or more lines of input/output points in the format XINPUT YINPUT XOUTPUT YOUTPUT. The control file may contain blank lines and comment lines, the comment lines are identified by a '!' or ';' as the first character and must appear on separate lines from the control points. An example control file might be:

```
!This is an example control file
```

```
!and here is the first row of control points
```

```
11567.009    45389.873    490000    280000
```

```
;and the second
```

```
12896.7      88742.607    490000    281000
```

```
!and the third and fourth, preceeded by a blank line.
```

```
55468.886    46672.245    491000    280000
```

```
56487.076    88921.502    491000    281000
```

```
;and that's the file
```

```
[EOB]
```

The plane transformation is similar to the projection transformation, the difference being, that instead of carrying out a projection calculation to determine the forward and backward matrices, one of the following plane transformations is applied.

1. If the /FOUR qualifier is given then DTITRANS uses the four sets of coordinates to compute the transformation

$$\begin{aligned} X &= a1 + a2*x + a3*y + a4*x*y \\ Y &= b1 + b2*x + b3*y + b4*x*y \end{aligned}$$

This transformation will force the 4 input points to fit the four output points exactly, but it is not obvious how other points in the file will be distorted. It is thought to be useful for correcting paper distortion, as when data is digitised from a paper map based on known exact control points such as graticule intersections.

This transformation is called the "Extended four point" transformation in other Laser-Scan programs.

NOTE

This transformation breaks down if a rotation of exactly 45 degrees, a scale change and a shift are the only differences between the input points and the output points. In this case /TWO or /THREE will give the required results.

2. The /PROJECTIVE qualifier uses the four sets of coordinates to compute the transformation

$$\begin{aligned} X &= (a1*x + a2*y + a3) / (a7*x + a8*y + 1) \\ Y &= (a4*x + a5*y + a6) / (a7*x + a8*y + 1) \end{aligned}$$

This transformation uses a projective algorithm and will force the 4 input points to fit the four output points exactly.

3. The /THREE qualifier uses the four sets of coordinates to compute the transformation

$$\begin{aligned} X &= a1 + a2*x + a3*y \\ Y &= b1 + b2*x + b3*y \end{aligned}$$

This transformation is sufficient to correct for rotation, scaling, translation and shearing. This means that shapes may be altered, but in a predictable way (e.g. a square may be transformed into a parallelogram).

This transformation is also known as the "Affine" transformation.

4. The /TWO qualifier uses the four sets of coordinates to compute the transformation

$$\begin{aligned} X &= a1 + a2*x - a3*y \\ Y &= a4 + a3*x + a2*y \end{aligned}$$

This transformation is sufficient to correct for rotation, scaling and translation only. This means that the shapes of features will not be altered.

This transformation is called the "Orthogonal" transformation in other Laser-Scan programs.

By default, a plane transformation will try to preserve the input file resolution, and calculate an output grid pixel to account for any change in the relative sizes of the input and output DTI files. If the output DTI is required at a coarser or finer resolution, the user must give the desired sampling when prompted with the new calculated grid sizes.

Using the /THREE and /TWO qualifiers with four sets of coordinates, or giving more than four control points, over determines the transformation, so a least squares solution is applied. This means that the final coordinates of the control points may be slightly different from the target values. Where the maximum of these discrepancies is greater than 1/1000th of the range of the target control point values then the operator is asked if the transformation is to be accepted.

EXAMPLES

\$DTITRANS<CR>

Input-DTI-file: **OS44000800<CR>**

Output-DTI-file: **TEST<CR>**

Existing Projection Data for source DTI file:

Spheroid : 9 (Airy)

Projection : 101 (UK national grid)

Units : 2 (metres)

Local origin : 440000.000 (Eastings) 80000.000 (Northings)

Sample values : 50.000 (Eastings) 50.000 (Northings)

Enter projection data for destination DTI file

Enter projection code (101): ?<CR>

Allowable projections and their codes are:-

0 Unset	1 Universal Transverse Mercator
2 State Plane Coordinates	3 Albers Conical Equal Area
4 Lambert Conformal Conic	5 Mercator
6 Polar Stereographic	7 Polyconic
8 Equidistant Conic	9 Transverse Mercator
10* Stereographic	11* Lambert Azimuthal Equal Area
12* Azimuthal Equidistant	13* Gnomonic
14* Orthographic	15* General Vert Near-Side Persp
16* Sinusoidal	17* Equirectangular
18* Miller Cylindrical	19* Van der Grinten
20 Oblique Mercator (Hotine)	21* Oblique Mercator (Spherical)
22 Stereographic (UKSL formulae)	100 Geographic (ie Lat and Long)
101 UK national grid	

Note: projections marked "*" are defined for the sphere, not the spheroid.
If a spheroid is defined, then the sphere with the same surface area
as the spheroid is used

Enter projection code (101): **100<CR>**

(Geographic (ie Lat and Long))

Enter unit code (110): **<CR>**

(1/10 seconds of arc)

Define sample intervals as Latitude Longitude (0.0, 0.0): **10 20<CR>**

Final Projection Data for output DTI file

```
Spheroid      :    9 (Airy)
Projection    : 100 (Geographic  (ie Lat and Long))

Units        : 110 (1/10 seconds of arc)
Local origin  :      1822177.245 (Latitude)      -51643.070 (Longitude)
Sample values :      10.000 (Latitude)          20.000 (Longitude)

ELAPSED:      0 00:02:49.94  CPU: 0:01:08.36  BUFIO: 67  DIRIO: 18  FAULTS: 516
$
```

In this example DTITRANS was used to transform data held in U.K. National Grid into Geographicals (Latitude and Longitude). The input DTI file had a complete and valid Projection Record, so that there was no need to prompt for any projection information for the input DTI file.

Since the input and output DTI files were not specified on the input command line, DTITRANS prompts for the file specifications of the two files.

The user is asked to enter projection information for the output DTI file. Note that in response to the prompt "Enter projection code", the user has typed "?" in order to obtain a list of all available projection codes. The user is prompted in addition for a unit code, and has accepted the default of 110 (1/10 seconds of arc) by pressing <CR>, and for the output sample intervals in the selected units. Where possible sensible default values are supplied - since in this case, the units of the output DTI file were different to the input no defaults were supplied for the sample intervals. Note the user is not required to enter the spheroid code for the output file since a change in spheroid is not allowed. The user is also not prompted for a local origin for the output file since this is worked out by the program as part of the transformation operation.

On entering all the output projection data, confirmation is printed on the terminal, and DTITRANS proceeds to transform and resample the input matrix.

\$DTITRANS/LOG OS44000800 MERCATOR<CR>

Existing Projection Data for source DTI file:

Spheroid : 9 (Airy)
 Projection : 101 (UK national grid)

 Units : 2 (metres)
 Local origin : 440000.000 (Eastings) 80000.000 (Northings)
 Sample values : 50.000 (Eastings) 50.000 (Northings)

Enter projection data for destination DTI file

Enter projection code (101): **5<CR>**
 (Mercator)

The Mercator projection requires the following additional information:-

Latitude that has true scale
 in DDD MM SS.SS format (0 00 00.000N): **49N<CR>**
 Longitude of the central meridian
 in DDD MM SS.SS format (0 00 00.000E): **2W<CR>**
 Eastings of the origin of the projection (0.0): **<CR>**
 Northings of the origin of the projection (0.0): **<CR>**

Enter unit code (2): **<CR>**
 (metres)

Define sample intervals as Eastings Northings (50.0, 50.0): **100 100<CR>**

Final Projection Data for output DTI file

Sspheroid : 9 (Airy)
Projection : 5 (Mercator)

 Latitude of true scale : 49 00 00.000N
 Longitude of the central meridian : 2 00 00.000W
 Eastings of origin : 0.000
 Northings of origin : 0.000

 Units : 2 (metres)
 Local origin : 41372.472 (Eastings) 4285745.865 (Northings)
 Sample values : 100.000 (Eastings) 100.000 (Northings)

```

+-----+
|                                     |
|           Transforming and Resampling Matrix Points           |
|                                     |
+-----+
  
```

ELAPSED: 0 00:34:48.87 CPU: 0:00:29.39 BUFIO: 124 DIRIO: 4 FAULTS: 330

In this example DTITRANS is used to transform data from one projection (UK National Grid) to another (Mercator).

The input DTI file contained a complete and valid projection record so the user was not prompted for any input projection data. The user was however asked to enter data for the output projection system. Output to a Mercator projection was selected. This projection requires four additional pieces of information. Since the input projection is different from the target projection, defaults of 0.0 are supplied.

The /LOG qualifier was present on the command line, so that details of the processing operation are displayed on the terminal. If the program is being run on a CRT an indication of the percentage complete will also be shown.

\$DTITRANS/WINDOW OS44000800 MERCATOR<CR>

Existing Projection Data for source DTI file:

Spheroid : 9 (Airy)
Projection : 101 (UK national grid)

Units : 2 (metres)
Local origin : 440000.000 (Eastings) 80000.000 (Northings)
Sample values : 50.000 (Eastings) 50.000 (Northings)

Define input window as Eastings Northings (440000.0, 80000.0, 460000.0, 100000.0):**440000.0 80000.0 450000.0 90000.0<CR>**

Enter projection data for destination DTI file

Enter projection code (101): 5<CR>
 (Mercator)

The Mercator projection requires the following additional information:-

Latitude that has true scale
in DDD MM SS.SS format (0 00 00.000N): **49N<CR>**
Longitude of the central meridian
in DDD MM SS.SS format (0 00 00.000E): **2W<CR>**
Eastings of the origin of the projection (0.0): **<CR>**
Northings of the origin of the projection (0.0): **<CR>**

Enter unit code (2): **<CR>**
 (metres)

Define sample intervals as Eastings Northings (50.0, 50.0): **<CR>**

Define output window as Eastings Northings (41372.472, 4285854.342, 51813.705, 4296295.559): <CR>

Final Projection Data for output DTI file

Spheroid : 9 (Airy)
 Projection : 5 (Mercator)

Latitude of true scale : 49 00 00.000N
 Longitude of the central meridian : 2 00 00.000W
 Eastings of origin : 0.000
 Northings of origin : 0.000

Units : 2 (metres)
 Local origin : 41372.472 (Eastings) 4285854.342 (Northings)
 Sample values : 50.000 (Eastings) 50.000 (Northings)

ELAPSED: 0 00:02:33.93 CPU: 0:00:40.55 BUFIO: 58 DIRIO: 7 FAULTS: 423

This example is similar to the previous example, with DTITRANS being used to transform data from UK National Grid to Mercator, however the user has additionally selected the option to restrict processing to a rectangular area of interest by means of the /WINDOW qualifier. Since this qualifier was present the user is prompted for an input window in UK National Grid coordinates, and an output window in metres in the Mercator Projection System. In this instance, the user has chosen to define an input window that covers a quarter of the input matrix, and has not defined an output area of interest by accepting the supplied default output window values. The output window values were calculated by transforming the input window coordinates.

\$DTITRANS/NOTRANSFORM/LOG OS44000800 TEST<CR>

Existing Projection Data for source DTI file:

Spheroid : 9 (Airy)
 Projection : 101 (UK national grid)

Units : 2 (metres)
 Local origin : 440000.000 (Eastings) 80000.000 (Northings)
 Sample values : 50.000 (Eastings) 50.000 (Northings)

Enter projection data for destination DTI file

Define sample intervals as Eastings Northings (50.0, 50.0): **30.5 60.5<CR>**

```
+-----+
|                                     |
|                               Resampling Matrix Points                               |
|                                     |
+-----+
```

ELAPSED: 0 00:01:27.50 CPU: 0:00:12.20 BUFIO: 105 DIRIO: 14 FAULTS: 341

In this example DTITRANS has been used to resample the input matrix to a matrix with different sample interval values. No transformation of the matrix coordinates will be performed. The user is only prompted for sample interval values for the output matrix. Since the resampling method was not specified using the /RESAMPLE qualifier, the default linear resampling method will be used.

\$DTITRANS/DESCRIPTOR TEST1

Enter projection data for source DTI file

Enter spheroid code (0): **9<CR>**
 (Airy)

Enter projection code (0): **101<CR>**
 (UK national grid)

Enter unit code (2): **<CR>**
 (metres)

Define local origin as Eastings Northings (0.0, 0.0): **440000.0 80000.0<CR>**

Define sample intervals as Eastings Northings (50.0, 50.0): **<CR>**

ELAPSED: 0 00:00:45.14 CPU: 0:00:00.47 BUFIO: 24 DIRIO: 4 FAULTS: 264

In this example DTITRANS was used to set up a Projection Record in a DTI file that did not already contain one. This file has a LSLA type header. The user is prompted for all projection record values. Note that only an input DTI file is required since the operation is performed 'in situ'.

\$ DTITRANS/LOG/IMAGEMAP=PARAMS.DAT/IFF=TEST SPOT SPOT_RECTIFIED<CR>

Enter projection data for destination DTI file

Enter spheroid code (0): <CR>
 (Clarke 1866)

Enter projection code (0): <CR>
 (Unset)

Enter unit code (2): <CR>
 (metres)

Define sample intervals as Eastings Northings (1.0, 1.0): 10 10<CR>

Final Projection Data for output DTI file

Spheroid : 0 (Clarke 1866)
Projection : 0 (Unset)

Units : 2 (metres)
Local origin : 874031.932 (Eastings) 3170437.401 (Northings)
Sample values : 10.000 (Eastings) 10.000 (Northings)

%LSLLIB-I-IFFOPENED, LSL\$DATAROOT:[LSL.IFF]TEST.IFF;2 opened for write

```
+-----+
|               Transforming and Resampling Matrix Points               |
+-----+
```

ELAPSED: 0 00:00:18.08 CPU: 0:00:01.34 BUFIO: 48 DIRIO: 54 FAULTS: 588

In this example the IMAGEMAP option has been selected. The original image is "SPOT.DTI" and the transformed and resampled image is "SPOT_RECTIFIED.DTI". The data is processed using transformation parameters defined in the file "PARAMS.DAT". The option to produce an IFF registration file has been selected, along with the LOG option.

In this example the /FOUR qualifier has been chosen, this will take a scanned raster DTI image and transform it to a ground coordinate system, performing any necessary rotations, scaling and translations. The input DTI file is SP9800.DTI and the output DTI file is SP_OUT.DTI. The control file, which contains the control points is called SP9800_REC.DAT an example of which can be seen on page 11-10 in Carrying out a plane transformation. The /TWO, /THREE and /PROJECTIVE qualifiers all operate similarly. /WINDOW is used to clip the output DTI file. The /LOG and /RESAMPLE qualifiers were also selected.

DTITRANS messages

MESSAGES (SUCCESS)

These messages are used to indicate that the program has succeeded in performing some action, and do not require any user action.

NORMAL, DTITRANS normal successful completion

Explanation: DTITRANS has terminated successfully, without encountering any errors.

User action: None

These messages give information only, and require no immediate action by the user. They are used to provide information on the current state of the program, or to supply explanatory information in support of a warning or error message.

Explanation: The creation of an output DTI file is not required.

NOPROCREQ, no transformation or resampling operation required

User action: None

MESSAGES (WARNING)

These messages are output when an error has occurred that can be corrected immediately by the user or that the program will attempt to overcome.

BADMODSTOPT, 'integer' is an invalid option for modified-stereographic

Explanation: The modified-stereographic projection option code entered does not correspond to a valid projection code.

User action: Enter '?' to obtain a list of valid codes, and enter one of them.

BADPRJSPH, 'string' projection must be on 'string' spheroid

Explanation: Certain projections are only defined for specific spheroids. For example, UK National Grid is always on an Airy Spheroid. The projection code that has been specified is not valid with the specified spheroid.

User action: Select another projection code, or if the spheroid is wrong either rerun DTITRANS with the /PROMPT qualifier which will give you the opportunity of redefining the input spheroid, or more permanently use DTITRANS with the /DESCRIPTOR qualifier to reset the projection values of the input DTI file.

BADPROJCODE, 'integer' is an invalid projection code

Explanation: The projection code entered does not correspond to a valid projection code.

User action: Enter '?' to obtain a list of valid codes, and enter one of them.

BADSAMPLE, invalid x or y sample value of 0 or less

Explanation: It is not possible to have a negative sample interval, or sample interval of 0.

User action: Reenter the sample values ensuring values greater than 0 are entered.

BADSPHCODE, 'integer' is an invalid spheroid code

Explanation: The spheroid code entered does not correspond to a valid spheroid code.

User action: Enter '?' to obtain a list of valid codes, and enter one of them.

BADSPSZONE, 'integer' is an invalid SPS zone

Explanation: The zone number entered is not a valid state plane projection system zone.

User action: Enter '?' to obtain list of valid zone numbers, and reenter the zone.

BADUNITCODE, 'integer' is an invalid unit code

Explanation: The unit code entered does not correspond to a valid unit code.

User action: Enter '?' to obtain a list of valid codes, and enter one of them.

BADUTMZONE, 'integer' is an invalid UTM zone

Explanation: The zone number entered is not a valid UTM zone.

User action: Enter '?' to obtain list of valid zone numbers, and reenter the zone.

EOF, program terminated prematurely by 'Z'

Explanation: The user has entered <CTRL/Z> when defining a projection or associated transformation parameters. This causes DTITRANS to be terminated.

User action: None.

```
ERRCPTS, residuals in 'string' transformation of 'real' 'real' in x and y
('string' units)
```

Explanation: Residuals from the chosen transformation are larger than recommended.

User action: Decide whether or not to continue with these residuals.

EXTRACPTS, extra input line found, ignoring all further lines

Explanation: Extra lines of control points have been found in the control file. These will be ignored.

User action: None

ILLEGANGVAL, impossible value for component of angle

Explanation: An angle has been input with a value of one of its components that is impossible (e.g. minutes greater than 60) **USERACTION**

User action:

ILLEGDECPT, only last component in angle may have decimal point

Explanation: An angle has been input where more then one of its components has a decimal point.

User action: Reenter the angle with correct value.

```
ILLEGLAT, 'string' is an illegal latitude value
```

Explanation: A latitude value has been entered with an absolute value greater than 90 degrees.

User action: Reenter the angle with correct value.

ILLEGLONG, 'string' is an illegal longitude value

Explanation: A longitude value has been entered with an absolute value greater than 180 degrees.

User action: Reenter the angle with correct value.

INVLATS, cannot have projection along a line of latitude

Explanation: The input latitude of the first point on the central line equals that of the second, this is invalid.

User action: Reenter the two values, making sure that they are different.

INVALID, 'real' is an invalid value in this context

Explanation: Element of spheroid less than or equal to zero if x value, or less than zero if y value. These are not valid.

User action: Reenter the values.

INVALUNIT, 'integer' is an invalid unit code for projection

Explanation: Angular units can only be used when dealing with geographical coordinates, and scalar units can only be used when dealing with a projection.

User action: Enter '?' to obtain a list of valid codes, and enter one of them.

NOTTRANSFORM, transform qualifier ignored

Explanation: The /TRANSFORM qualifier (either given explicitly, or defaulted by the command line decoder) has been given with another disallowed qualifier, and has been ignored. Note that TRANSFORM is always defaulted by DTITRANS unless the /NOTTRANSFORM qualifier is given.

User action: Resupply the command line, with /NOTTRANSFORM or without the disallowed qualifier.

REENTER, reenter input values

Explanation: The values entered in response to a program prompt are invalid. An accompanying error message will generally indicate the problem.

User action: Reenter the values in response to the prompt.

SIGNANDHEMI, sign and hemisphere present in angle

Explanation: Both a sign and hemisphere character were supplied. This is not valid.

User action: Reenter the angle using either a sign, or a hemisphere character, but not both.

```
UNEXPCH, unexpected character 'char' found
```

Explanation: An unexpected character was found at the end of the input line.

User action: Reenter the input line checking the number of parameters and the spacing.

UNEXPEOL, unexpected end of line

Explanation: An insufficient number of values were supplied in response to the prompt.

User action: Reenter the values, ensuring data for all required values are supplied.

WRNGHEM, wrong hemisphere

Explanation: A latitude value has been input when a longitude was expected or vise versa.

User action: Reenter the angle with correct hemisphere letter.

MESSAGES (ERROR)

These messages indicate an error in processing which will cause the program to terminate. The most likely causes are a corrupt or otherwise invalid input file, or an error related to command line processing and file manipulation.

BADCPTS, badly conditioned control points

Explanation: The control points are badly conditioned.

User action: Check the continuity of the control points.

BADQUAL, error while decoding DTITRANS command line

Explanation: An error has occurred when decoding the DTITRANS command line. The DCL error message will indicate the precise nature of the problem.

User action: Check the format of the command line qualifiers, and reenter command line.

BADCOMFILE, error reading command file

Explanation: An error has been encountered trying to read the control file.

User action: Check the control file for any spurious characters.

BITDATA, DTI file contains BIT data

Explanation: The DTI file contains BIT data, unsuitable for transformation with DTITRANS.

User action: Convert the data to another format with DTICONVERT, and rerun DTITRANS.

BKWDMATRIXERR, error forming backward transformation matrix

Explanation: The backward transformation matrix can not be formed due to badly conditioned control points.

User action: Check the continuity of the control points.

CTRLFILEERR, error opening control file

Explanation: An error has been encountered while trying to open the control file.

User action: Check the location and name of the control file.

CTRLUNEXPEOL, unexpected end of line found while reading the control file

Explanation: A line in the control file has too few control points on it.

User action: Check the number of points and the spacing in the control file.

FWDMATRIXERR, error forming forward transformation matrix

Explanation: The forward transformation matrix cannot be formed due to badly conditioned control points.

User action: Check the continuity of the control points.

INVPROJTRANS, invalid projection code for transformation

Explanation: The projection code set in the projection record of the input DTI file, cannot be used to perform a projection transformation. A code indicating an unset projection cannot be used.

User action: Use the DESCRIPTOR or PROMPT qualifiers to change the projection code in the DTI Projection record.

INVPROJVAL, invalid identifier found in the Projection Record

Explanation: The Spheroid, Projection or Units Identifier that is present in the DTI Projection Record was found to be invalid.

User action: Rerun the program, but specify the qualifier PROMPT on the command line so that you will be prompted for new Projection Record values.

INVUNTRANS, invalid unit code for transformation

Explanation: The units code set in the projection record of the input DTI file, cannot be used to perform a projection transformation. Only a units code that refers to ground units can be used in projection transformation.

User action: Use the DESCRIPTOR or PROMPT qualifiers to change the units code in the DTI Projection record.

MISSINGCPTS, missing line of control points

Explanation: The control file does not contain enough lines of control points. USERACTION

User action:

NOTLSLAHEAD, not a LSLA type header

Explanation: Set up of the input DTI file projection record was requested by means of the DESCRIPTOR qualifier, however the file does not have a LSLA type header. Only a LSLA type file may contain a Projection Record.

User action: Convert the header of the DTI file to a LSLA type using the MATRIX module DTICONVERT, and then rerun DTITRANS to set up the header.

WGCTPERR, Projection tranformation error

Explanation: An error has been generated by the GCTPLIB library during the projection transformation of a coordinate pair.

User action: Submit a SPR to Laser-Scan along with details of the input parameters and the source DTI file, to allow investigation of the problem.

MESSAGES (FATAL)

These messages indicate a severe error in processing, or some form of system failure, which has caused the program to terminate.

PROCESS, fatal error when processing DTI file

Explanation: A fatal error has occurred while either transforming or resampling the matrix values.

User action: Submit an SPR to Laser-Scan along with details of the input parameters and the source DTI file, to allow investigation of the problem.

READSATMAPFIL, fatal error trying to read SATMAP file

Explanation: An error has occurred while reading transformation parameters from the SATMAP parameter file.

User action: Ensure that the specified file is a valid SATMAP parameter file, or submit an SPR to Laser-Scan along with details of the input parameters and the source DTI file, to allow investigation of the problem.

RESAMPLE, fatal error when calculating sample value

Explanation: A fatal error has occurred while resampling the matrix values.

User action: Submit an SPR to Laser-Scan along with details of the input parameters and the source DTI file, to allow investigation of the problem.

SATMAPFILEERR, error trying to open SATMAP file

Explanation: DTITRANS was unable to open the SATMAP parameter file.

User action: The accompanying error message will indicate the nature of the problem.

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTILIB library and by the Laser-Scan I/O library, LSLLIB. DTILIB library messages are introduced by '%DTILIB' and are documented in the MATRIX package reference manual. In most cases DTI errors will be due to a corrupt input file, and this should be the first area of investigation. If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are used to explain the details of program generated errors.

CHAPTER 12

MODULE DTILIB

INTRODUCTION

The Digital Terrain Image (DTI) file is the means by which Laser Scan holds grid based data such as Digital Elevation Models (DEMs), intervisibility matrices and Remotely Sensed Imagery. The structure of this file is described in Appendix A at the end of this chapter.

DTILIB provides a library of functions which enables an applications program to access DTI files, and perform basic I/O operations on both the header and data areas. The following groups of routines are provided within the library:

1. File Manipulation - eg. DTI file creation
2. DTI Utility - eg. print header details
3. Header Read - eg. read word from header
4. Header Write - eg. write word to header
5. Data Read - eg. read word from data area
6. Data Write - eg. write word to data area
7. Header Copy - eg. copy array of byte values to header
8. Data Copy - eg. copy array of word values to the data area
9. Data Initialise - eg. set all data values to 0

The library allows up to 9 DTI files to be handled simultaneously.

The library may be found in LSL\$LIBRARY:DTILIB.OLB, and its associated common blocks and parameter files in LSL\$CMNDTI.

It should be noted that the DTILIB functions utilise the memory mapping routines (eg. VIO\$OPEN_SEC) within Laser-Scan's library LSLLIB, along with other LSLLIB I/O functions. An applications program that utilises DTILIB must therefore be linked with LSLLIB. It should also be noted that DTI_LUNs specified in the range 1 to 9, are supplied to the LSLLIB memory mapping routines as luns 0 to 8.

DTILIB is also available in sharable image form. To link with the shareable images on VAX systems, specify LSL\$LIBRARY:DTISHR/OPT on the link command lines. Specify LSL\$LIBRARY:DTISHR_TV/OPT on the link command lines on AXP systems. Linking with DTISHR also requires that the code be linked with LSLSHR, the sharable image version of LSLLIB. This may be done by adding LSL\$LIBRARY:LSLSHR/OPT or LSL\$LIBRARY:LSLSHR_TV/OPT to the link command lines on VAX and AXP systems respectively.

A major advantage of DTISHR over DTILIB is that it can be linked with native AXP code, eliminating the need to use VEST (aka DECmigrate). In order for the AXP linker to produce a correctly working executable, it is necessary to link against the supplied dummy versions of any AXP sharable images used. The dummy versions are needed to correctly set up the linkages to shared data (common blocks). This is done by temporarily changing the relevant logical names to point to the dummy images rather than the real ones. The following DCL file shows an example of this being done:

```
$! Compile all source using /TIE
$!
$  FORTRAN/TIE DTISHR_TEST
$!
$! Redefine logical names to point to dummy sharable images. Done in /USER mode
$! so that definitions revert to normal after the LINK instruction
$!
$  DEFINE/USER LSL$DTISHR_TV LSL$LIBRARY:DTISHR_DUMMY_AXP
$  DEFINE/USER LSL$LSLSHR_TV LSL$LIBRARY:LSLSHR_DUMMY_AXP
$!
$! Link against sharable images using /NONATIVE_ONLY
$!
$  LINK  DTISHR_TEST, -
        LSL$LIBRARY:DTISHR_TV/OPT, -
        LSL$LIBRARY:LSLSHR_TV/OPT/NONATIVE_ONLY
```

FUNCTION RETURN CODES

All DTILIB routines are declared as INTEGER*4 Functions, and return an error code, which may be looked up in the parameter file LSL\$CMNDTI:DTILIBMSG.PAR. DTILIB error parameters have the prefix DTI__.

All routines return DTI__NORMAL if successful. An applications program may specifically test for this code, or simply whether the return is .true. indicating success, or .false. indicating failure. In the event of failure the return code will indicate the reason for failure. The error code DTI__SYSERR indicates a system error. In such cases the system error code will be returned as a function argument.

In order to access the function return message list, and therefore output a message associated with a return code using the LSLLIB facility LSL_PUTMSG, the routine DTI_INIT must be called by an applications program prior to any DTILIB routines. It is conventional to call DTI_INIT at the point in the program where LSL_INIT is called.

Examples showing the two ways in which the return code can be tested are provided below

```
C      Open as read only a DTI file EXAMPLE on DTI_LUN 1
      RETVAL = DTI_OPEN (1,'LSL$DTI:EXAMPLE.DTI;1',19,.FALSE.,ERROR)
C
C      Test for success, using DTI__NORMAL
      IF (RETVAL.NE.DTI__NORMAL) THEN
C
C      Output error message
        CALL LSL_PUTMSG(RETVAL)
C
C      Test for system error, and output
        IF(RETVAL.EQ.DTI__SYSERR)CALL LSL_PUTMSG(ERROR)
      ENDIF
C
C-----
C      Alternatively.....
C      Open as read only a DTI file EXAMPLE on DTI_LUN 1
      RETVAL = DTI_OPEN (1,'LSL$DTI:EXAMPLE.DTI;1',19,.FALSE.,ERROR)
C
C      Test for success
      IF (.NOT.RETVAL) THEN
C
C      Output error message
        CALL LSL_PUTMSG(RETVAL)
C
C      Test for system error, and output
        IF(RETVAL.EQ.DTI__SYSERR)CALL LSL_PUTMSG(ERROR)
      ENDIF
C
```


DTIHDR COMMON BLOCK

DTILIB routines communicate with an applications program either via the function arguments and/or via the common block DTIHDR to be found in LSL\$CMNDTI. This common block contains information about each mapped file. In many cases the variables in the common block may be modified by a program, although the user should be aware of possible consequences. An asterisk is placed against those variables that should generally NOT be modified by an applications program once set by the DTILIB functions DTI_OPEN, DTI_CREATE and DTI_EXTEND.

```

C      DTILIB COMMON DTIHDR
C-----
C      Maximum number of DTI files
C      INTEGER*4      MAX_DTI
C      PARAMETER      (MAX_DTI=9)
C-----
C      Status of DTI LUNs
C
C      * LOGICAL      DTILUN_INUSE(MAX_DTI)    !.true. if in use
C                                           !.false. if free
C      * LOGICAL      READ_ONLY(MAX_DTI) !.true. if read only access
C                                           !.false. if write access
C-----
C      Mapped section details
C
C      * INTEGER*4      SEC_ADDR(MAX_DTI) !addr. of start of mapped file
C      * INTEGER*4      SEC_SIZE(MAX_DTI) !size of mapped file(in bytes)
C-----
C      DTI file specification details
C
C      CHARACTER*128    DTI_NAME(MAX_DTI)      !filename
C      INTEGER*4        DTI_NAME_LENGTH(MAX_DTI)!length of filename
C-----
C      DTI file header type identifier
C
C      * INTEGER*4      HEADER_TYPE(MAX_DTI)    !1 for MIKE, 2 for UHL1,
C                                           !3 for TED4, 4 for ALVY
C                                           !5 for LSLA
C-----
C      Byte offset of data area from start of mapped file.
C      ie. length of DTI header
C
C      * INTEGER*4      DATA_OFFSET(MAX_DTI)    !data offset (in bytes)
C-----
C      Data type identifier
C
C      * INTEGER*4      DATA_TYPE(MAX_DTI)      !1 for BYTE, 2 for WORD,
C                                           !3 for LONGWORD,
C                                           !4 for REAL, 5 for BIT
C-----
C      Number of columns and rows
C
C      * INTEGER*4      X_EXTENT(MAX_DTI) !matrix x size (no. of cols)
C      * INTEGER*4      Y_EXTENT(MAX_DTI) !matrix y size (no. of rows)

```

```

C-----
C      Matrix x and y grid interval
C
C      REAL          X_GRID(MAX_DTI)      !x grid interval (metres)
C      REAL          Y_GRID (MAX_DTI)     !y grid interval (metres)
C-----
C      Minimum and maximum data value ranges
C
C      REAL          MIN_RVALUE(MAX_DTI)   !min real data value
C      REAL          MAX_RVALUE(MAX_DTI)   !max real data value
C      INTEGER*4     MIN_LVALUE(MAX_DTI)   !min longword data val
C      INTEGER*4     MAX_LVALUE(MAX_DTI)   !max longword data val
C      INTEGER*2     MIN_WVALUE(MAX_DTI)   !min byte/word data val
C      INTEGER*2     MAX_WVALUE(MAX_DTI)   !max byte/word data val
C-----
C      Projection record status.  Indicates whether a projection record
C      was found on opening the DTI file.
C      Projection record details are held in COMMON DTIPROJ
C
C      LOGICAL        HAD_PROJ_RECORD(MAX_DTI)
C
C                          !.true. if proj rec was present
C                          !.false. if no proj record
C-----
C      Geographical (latitude longitude) information for DTED files.
C      Values are recorded in .1 seconds of arc
C
C      INTEGER*4     LATREC(4,MAX_DTI)     !latitude and longitude
C      INTEGER*4     LONREC(4,MAX_DTI)     !values of the 4 corners
C
C                          !SW,NW,NE,SE
C      INTEGER*4     LATORI(MAX_DTI)       !latitude origin
C      INTEGER*4     LONORI(MAX_DTI)       !longitude origin
C      INTEGER*4     LATINT(MAX_DTI)       !latitude grid interval
C      INTEGER*4     LONINT(MAX_DTI)       !longitude grid interval
C-----
C      Absolute SW corner values for non DTED files
C
C      REAL          X_OFFSET(MAX_DTI)     !absolute position of
C      REAL          Y_OFFSET(MAX_DTI)     !column 1, row 1 (metres)
C-----
C      Current rectangular area of interest in the DTI file
C      Specified in matrix units, and set up by applications program.
C
C      INTEGER*4     DTI_WINDOW_SWX(MAX_DTI)!current area of interest
C      INTEGER*4     DTI_WINDOW_SWY(MAX_DTI)!in the DTI file,
C      INTEGER*4     DTI_WINDOW_NEX(MAX_DTI)!specified
C      INTEGER*4     DTI_WINDOW_NEY(MAX_DTI)!in matrix units
C-----
C      Data order (ie. arrangement of data in the DTI file)
C
C      INTEGER*4     DTI_ORDER_CORNER(MAX_DTI)
C
C                          !corner of data origin
C                          !0 = SW, 1 = NW
C                          !2 = NE, 3 = SE
C      INTEGER*4     DTI_ORDER_DIRECTION(MAX_DTI)
C
C                          !0 = clockwise
C                          !1 = anticlockwise

```

C-----
COMMON/DTIHDR/ X_GRID,Y_GRID,MIN_RVALUE,MAX_RVALUE,
& MIN_LVALUE,MAX_LVALUE,X_EXTENT,Y_EXTENT,
& LATREC,LONREC,LATORI,LONORI,LATINT,LONINT,
& SEC_ADDR,SEC_SIZE,DATA_OFFSET,
& MIN_WVALUE,MAX_WVALUE,
& HEADER_TYPE,DATA_TYPE,DTI_NAME,DTI_NAME_LENGTH,
& DTILUN_INUSE,X_OFFSET,Y_OFFSET,
& DTI_WINDOW_SWX,DTI_WINDOW_SWY,
& DTI_WINDOW_NEX,DTI_WINDOW_NEY,
& READ_ONLY,HAD_PROJ_RECORD,
& DTI_ORDER_CORNER,DTI_ORDER_DIRECTION

DTIPROJ COMMON BLOCK

A DTI file with a LSLA type header may optionally contain a DTI Projection Record. The Projection Record holds information about the spheroid and projection system on which the data is recorded, along with data on the location of the SW corner of the matrix and the x and y grid intervals. A Projection Record in a LSLA header record is recognised by means of the identifier 'DTIPROJ'.

The DTILIB routines DTI_READ_PROJ_REC and DTI_WRITE_PROJ_REC are provided to read and write the Projection Record, and transfer details between the file header and the DTILIB common block DTIPROJ. The common block variables may be accessed and modified by an applications program.

```
C      DTILIB COMMON block DTIPROJ
C
C      Holds details of the DTI Projection Record that may be
C      optionally present as part of a LSLA (or the historical
C      ALVY) style DTI header record.
C      The common variables are filled out when a call to the
C      DTILIB routine DTI_READ_PROJ_REC is made.
C      They may be modified by an applications program, and
C      written to a LSLA DTI file using DTI_WRITE_PROJ_REC.
C      Note: the DTI Projection Record may be located anywhere
C      in the header record, and is identified to the
C      library routines by the keyword '*DTIPROJ'.
C
C-----
C      DTIPROJ Parameters:
C
C      INTEGER*4      DTIPROJ_IDENT1
C      PARAMETER      (DTIPROJ_IDENT1='*DTI')
C      INTEGER*4      DTIPROJ_IDENT2
C      PARAMETER      (DTIPROJ_IDENT2='PROJ')
C      DTI Projection Record Identifier in two parts
C
C      INTEGER*4      NUM_DTI
C      PARAMETER      (NUM_DTI=9)
C      Maximum number of DTI files
C
C      INTEGER*4      DTIPROJ_RECORD_LENGTH
C      PARAMETER      (DTIPROJ_RECORD_LENGTH=1600)
C      Length of DTI Projection Record in bytes
C
C-----
C
C      INTEGER*4      DTIPROJ_RECORD_OFFSET(NUM_DTI)
C      Byte offset of projection record
C
C      REAL*8         DTIPROJ_ORIGIN(2,NUM_DTI)
C      x,y coordinates of matrix point (1,1)
C
C      REAL*4         DTIPROJ_SAMPLE(2,NUM_DTI)
C      x,y grid sample values
C
```

```

C      INTEGER*4          DTIPROJ_UNITS(NUM_DTI)
C      DTI units code:
C      =    0 Unset
C      =    1 Feet (assuming projection units are metres)
C      =    2 Metres
C      =    3 Seconds of arc (only valid if projection is 100)
C      =    4 Degrees of arc (only valid if projection is 100)
C      =    5 Radians (only valid if projection is 100)
C      = 102 mm on the source document
C      = 104 thousands of an inch on source document
C      = 110 1/10 seconds of arc (only valid if projection is 100)
C
C      INTEGER*4          DTIPROJ_SPHEROID(NUM_DTI)
C      DTI spheroid code:
C      =    0 Clarke 1866
C      =    1 Clarke 1880
C      =    2 Bessel
C      =    3 New International 1967
C      =    4 International 1924 (Hayford 1909)
C      =    5 World Geodetic System 72 (WGS 72)
C      =    6 Everest
C      =    7 World Geodetic System 66 (WGS 66)
C      =    8 Geodetic Reference System 1980 (GRS 1980)
C      =    9 Airy
C      =   10 Modified Everest
C      =   11 Modified Airy
C      =   12 Walbeck
C      =   13 Southeast Asia
C      =   14 Australian National
C      =   15 Krassovsky
C      =   16 Hough
C      =   17 Mercury 1960
C      =   18 Modified Mercury 1968
C      =   19 Sphere of radius 6370997 M
C      =   20 Sphere of radius 6371229.3M
C      =   21 Clarke 1880 IGN
C      =   22 World Geodetic System 84 (WGS 84)
C      =101 User specified spheroid
C
C      INTEGER*4          DTIPROJ_PROJECTION(NUM_DTI)
C      DTI projection code:
C      =    0 Unset
C      =    1 Universal Transverse Mercator
C      =    2 State Plane Coordinates
C      =    3 Albers Conical Equal Area
C      =    4 Lambert Conformal Conic
C      =    5 Mercator
C      =    6 Polar Stereographic
C      =    7 Polyconic
C      =    8 Equidistant Conic
C      =    9 Transverse Mercator
C      =   10* Stereographic
C      =   11* Lambert Azimuthal Equal Area
C      =   12* Azimuthal Equidistant
C      =   13* Gnomonic
C      =   14* Orthographic
```

```
C      = 15* General Vertical Near-Side Perspective
C      = 16* Sinusoidal
C      = 17* Equirectangular
C      = 18* Miller Cylindrical
C      = 19* Van der Grinten
C      = 20  Oblique Mercator (Hotine)
C      = 21* Oblique Mercator (Spherical)
C      = 100 Geographic (ie Latitude and Longitude )
C      = 101 UK national grid (a special case of 9)
C
C      REAL*8          DTIPROJ_USER_SPHEROID(2,NUM_DTI)
C      Details of user specified spheroid.
C      The first real contains the semi-major axis
C      of the ellipse;
C      The second real contains one of:
C      1) 0.0 to specify a sphere rather than a spheroid
C      2) the semi-minor axis
C      3) the eccentricity squared
C      Note: This system works because e**2 is less than
C      1.0, while the semi-minor axis is greater than 1.
C
C      REAL*8          DTIPROJ_PROJ_PARAMS(15,NUM_DTI)
C      Map projection definition parameters
C      The values are dependent on the projection.
C      See GCTPLIB documentation for the values required
C      for each projection listed above.
C      No values need be given for projections 100 and 101.
C
C      COMMON/DTIPROJ/
C      &          DTIPROJ_RECORD_OFFSET,
C      &          DTIPROJ_ORIGIN,DTIPROJ_SAMPLE,
C      &          DTIPROJ_UNITS,DTIPROJ_SPHEROID,
C      &          DTIPROJ_PROJECTION,
C      &          DTIPROJ_USER_SPHEROID,
C      &          DTIPROJ_PROJ_PARAMS
```

DTILIB PARAMETER FILES

The following parameter files used by DTILIB are to be found in LSL\$CMNDTI, and may be utilised within an applications program.

DTIPAR.PAR

C File contains parameters used by DTILIB functions.

```
C
C-----
C      Type Field parameters
C
      INTEGER*4      MIKE_MAKE      !historical
      INTEGER*4      UHL1_MAKE      !historical
      INTEGER*4      TED4_MAKE
      INTEGER*4      ALVY_MAKE      !historical
      INTEGER*4      LSLA_MAKE

C
      PARAMETER (MIKE_MAKE='MIKE')
      PARAMETER (UHL1_MAKE='UHL1')
      PARAMETER (TED4_MAKE='TED4')
      PARAMETER (ALVY_MAKE='ALVY')
      PARAMETER (LSLA_MAKE='LSLA')

C
C-----
C      HEADER_TYPE parameters
C
      INTEGER*4      DTI_MIKE      !historical
      INTEGER*4      DTI_UHL1      !historical
      INTEGER*4      DTI_TED4
      INTEGER*4      DTI_ALVY      !historical
      INTEGER*4      DTI_LSLA

C
      PARAMETER (DTI_MIKE = 1)      ! HEADER_TYPE for MIKE DTI
      PARAMETER (DTI_UHL1 = 2)      ! HEADER_TYPE for UHL1 DTI
      PARAMETER (DTI_TED4 = 3)      ! HEADER_TYPE for TED4 DTI
      PARAMETER (DTI_ALVY = 4)      ! HEADER_TYPE for ALVY DTI
      PARAMETER (DTI_LSLA = 5)      ! HEADER_TYPE for LSLA DTI

C
C-----
C      DATA_TYPE parameters
C
      INTEGER      DATA_BYTE
      INTEGER      DATA_WORD
      INTEGER      DATA_LONG
      INTEGER      DATA_REAL
      INTEGER      DATA_BIT

C
      PARAMETER (DATA_BYTE = 1)
      PARAMETER (DATA_WORD = 2)
      PARAMETER (DATA_LONG = 3)
      PARAMETER (DATA_REAL = 4)
      PARAMETER (DATA_BIT = 5)

C
C-----
C      DTI null data values
      BYTE      DTI_NULL_BYTE
```

```

      INTEGER*2      DTI_NULL_WORD
      INTEGER*4      DTI_NULL_LONG
      REAL*4         DTI_NULL_REAL

C
      PARAMETER (DTI_NULL_BYTE = 0)
      PARAMETER (DTI_NULL_WORD = -32767)
      PARAMETER (DTI_NULL_LONG = '80000000'X)
      PARAMETER (DTI_NULL_REAL = -1.0E-38)

C
C-----
C      UNITS parameters
C
      INTEGER*4      UNITS_DTI
      INTEGER*4      UNITS_MET
      INTEGER*4      UNITS_SEC
      INTEGER*4      UNITS_DEG
      INTEGER*4      UNITS_PROJ

C
      PARAMETER (UNITS_DTI = 1)
      PARAMETER (UNITS_MET = 2)
      PARAMETER (UNITS_SEC = 3)
      PARAMETER (UNITS_DEG = 4)
      PARAMETER (UNITS_PROJ = 5)

C
C-----
C      LSLA default header size
      INTEGER        DEFAULT_LSLA_HEADER

C
      PARAMETER (DEFAULT_LSLA_HEADER = 32)

C
C      Maximum header size
      INTEGER        MAX_HEADER

C
      PARAMETER (MAX_HEADER=65535)

C-----
C
C      Maximum DTI column and row sizes
      INTEGER        DTI_MAX_COLUMNS
      INTEGER        DTI_MAX_ROWS

C
      PARAMETER (DTI_MAX_COLUMNS = 65535)
      PARAMETER (DTI_MAX_ROWS   = 65535)

C-----
C
C      Corner of data origin parameters (DTI_ORDER_CORNER)
      INTEGER*4      DTI_ORDER_SW
      INTEGER*4      DTI_ORDER_NW
      INTEGER*4      DTI_ORDER_NE
      INTEGER*4      DTI_ORDER_SE

C
      PARAMETER (DTI_ORDER_SW = 0)
      PARAMETER (DTI_ORDER_NW = 1)
      PARAMETER (DTI_ORDER_NE = 2)
      PARAMETER (DTI_ORDER_SE = 3)

C
C      Data direction parameters (DTI_ORDER_DIRECTION)

```


C

INTEGER*4	DTI_ORDER_CLOCKWISE
INTEGER*4	DTI_ORDER_ANTICLOCKWISE

PARAMETER (DTI_ORDER_CLOCKWISE = 0)
PARAMETER (DTI_ORDER_ANTICLOCKWISE = 1)

DTIDEF.PAR

```
C Parameter File Created 070C86 for use by DTILIB.
C File contains parameters defining the layout of DTI section files
C All values are offsets in bytes from the start of the file
C
C*****
C DMA-type DTIs (for change 2 DTED).  These have a fixed length
C header of 256 bytes.
C
    PARAMETER DTI_DMA_TYPE = 0      ! type field (UHL1)
    PARAMETER DTI_DMA_UHLSZ = 80    ! UHL field size
C
C things outside the UHL
    PARAMETER DTI_DMA_EEXT = 80     ! x data extent
    PARAMETER DTI_DMA_NEXT = 82     ! y data extent
    PARAMETER DTI_DMA_EINT = 84     ! x grid interval
    PARAMETER DTI_DMA_NINT = 88     ! y grid interval
    PARAMETER DTI_DMA_WMIN = 92     ! min byte or word data value
    PARAMETER DTI_DMA_WMAX = 94     ! max byte or word data value
C
    PARAMETER DTI_DMA_LMIN = 96     ! min long or real data value
    PARAMETER DTI_DMA_LMAX = 100    ! max long or real data value
    PARAMETER DTI_DMA_DTYP = 104    ! data type
C
    PARAMETER DTI_DMA_DATA = 256    ! data area
C
C*****
C PAN-type DTIs (sometimes known as MIKE type)
C The header is of a fixed length of 256 bytes.
C Now historical.
C
    PARAMETER DTI_PAN_TYPE = 0      ! type field
    PARAMETER DTI_PAN_EEXT = 4      ! x data extent
    PARAMETER DTI_PAN_NEXT = 6      ! y data extent
    PARAMETER DTI_PAN_EINT = 8      ! x grid interval
    PARAMETER DTI_PAN_NINT = 12     ! y grid interval
    PARAMETER DTI_PAN_WMIN = 16     ! min byte or word data value
    PARAMETER DTI_PAN_WMAX = 18     ! max byte or word data value
C
    PARAMETER DTI_PAN_LMIN = 20     ! min long or real data value
    PARAMETER DTI_PAN_LMAX = 24     ! max long or real data value
    PARAMETER DTI_PAN_DTYP = 28     ! data type
C
    PARAMETER DTI_PAN_DATA = 256    ! start of data area
C
C*****
C DMA DTED change 3/4 type DTI. These start off like the MIKE type
C but then have a DSI and an ACC block.  The header is of a fixed length
C of 3584 bytes.
C
    PARAMETER DTI_TED_TYPE = 0      ! type field (TED4)
    PARAMETER DTI_TED_EEXT = 4      ! x data extent
    PARAMETER DTI_TED_NEXT = 6      ! y data extent
    PARAMETER DTI_TED_EINT = 8      ! x grid interval
```

[illegible]

C ! header in bytes)

DOCUMENTATION NOTATION

The following conventions have been followed:

- * all arguments are fully declared for each routine
- * the following input/output declarations are made:
 - out - this variable will be written to by the routine
 - in - this variable is read by the routine - it is not written to
 - i/o - this variable may be both read by the routine, and written to
- * the following argument types are used:

byte	-	this is a Fortran BYTE (8 bit variable)
integer*2	-	this is a Fortran INTEGER*2 (16 bit variable)
integer*4	-	this is a Fortran INTEGER*4 (32 bit variable)
real	-	this is a Fortran REAL*4 variable
real*8	-	this is a Fortran REAL*8 variable
logical	-	this is a Fortran LOGICAL variable
char	-	this is a Fortran CHARACTER variable
*	-	this may be a byte, integer*2, integer*4 or real value depending on the type of data held in the DTI file
- * arguments are compulsory unless enclosed in square brackets
In cases where a number of arguments are optional, then if
one optional argument is supplied, the remaining optional
arguments should also be present.

LIBRARY INITIALISATION

Before using any of the routines in DTILIB, the library should be initialised by a call to DTI_INIT. This routine ensures that DTILIB error messages will be available to applications programs via a call to LSL_PUTMSG, and also establishes an exit handler to ensure DTI files are correctly unmapped on abnormal program exit. The routine takes no arguments.

CALL DTI_INIT

FILE MANIPULATION

Routines to open, create, extend and close DTI files are provided. These routines interface with the routines in LSLIB for mapping files into virtual memory.

DTI_OPEN

Opens an existing DTI file on the specified DTI_LUN; extracts header details and places these in common block DTIHDR.

In addition for files with a LSLA header structure, projection record details are placed in common DTIPROJ. Note that the DTIHDR variable HAD_PROJ_RECORD is used to indicate whether a projection record is present in the file. The DTI file is mapped into virtual memory using the LSLIB function VIO\$OPEN_SEC.

```
RETVAL = DTI_OPEN ( dti_lun, filename, filename_length,
                    write, error, [report], [pge_flt_cluster] )
```

dti_lun	integer*4	in	LUN on which the file is to be opened.
filename	char*128	in	DTI filename
filename_length	integer*4	in	length of filename
write	logical	in	.t. - allow write access to file .f. - open for read only
error	integer*4	out	system error code
report	logical	in	.t. - output warning message if data origin and direction values are not default (ie. DTI_ORDER_CORNER = 0, and DTI_ORDER_DIRECTION = 0) .f. - no message is generated
pge_flt_cluster	integer*4	in	page fault cluster value to be passed to VIO\$OPEN_SEC to try to improve the performance of programs reading large DTI files where the data access goes against the natural order of the data.

Function return codes:

1. DTI__NORMAL DTI file successfully opened

2. DTI__BADLUN DTILUN out of range (1:9)
3. DTI__NONSTDROR Non standard (SW, clockwise) corner or orientation
4. DTI__UNEXPRESULTS Unexpected results very likely
5. DTI__LUNINUSE A file is already opened on DTILUN
6. DTI__INVHEAD Invalid header type found
7. DTI__INVORDER Invalid data order values
8. DTI__INVFILESIZE The number of blocks occupied by the file, does not correspond to the file size as determined by the header and data extent values
9. DTI__INVYEXTENT Y extent of data area is invalid for bit data type. Y extent should be a multiple of 8.
10. DTI__SYSERR System error while mapping the file, or reading the file header

DTI_CREATE

Routine to create a DTI file with the specified name on DTI_LUN.

HEADER_TYPE determines with which type of header the file is created. In the latest implementation of DTILIB, files with a MIKE or ALVY header structure cannot be created using the library. This change is upwards compatible - if an attempt is made to create a file with a MIKE header structure (HEADER_TYPE = 1), the library will create a file with a LSLA header of length 32 bytes, while an attempt to create a file with an ALVY header structure (HEADER_TYPE = 4) will result in a file with a LSLA header.

For a LSLA header the optional argument HEADER_SIZE defines the size of the header. If no value is supplied, a file with a default header length of 32 bytes will be created. For all other types of headers (ie. UHL1 and TED4) the size of the header is fixed.

DATA_TYPE determines the sort of data that will be stored in the data area. and XSIZE and YSIZE determines the size of the data area. Note that if the file is created to hold bit data values, the y size value must be a multiple of 8.

On opening the file, filename specification details are written to the relevant common DTIHDR variables, along with details on the address and size of the memory mapped file. Details on x and y data extent, data type, data offset and header type are written to the mapped file, and to common DTIHDR variables. Note that the x and y grid interval values must be set up in common by an applications program before calling DTI_CREATE if they are to be written to the header of the mapped file.

The file is opened for write access.

```
RETVAL = DTI_CREATE ( dti_lun, filename, filename_length,
                      header_type, [header_size],
                      data_type, xsize, ysize, error )
```

dti_lun	integer*4	in	LUN on which the file is to be opened.
filename	char*128	in	DTI filename
filename_length	integer*4	in	length of filename
header_type	integer*4	in	1 - (see note above) 2 - create file with UHL1 header structure 3 - create file with TED4 header structure 4 - (see note above) 5 - create file with LSLA header structure
header_size	integer*4	in	optional argument defining the size of a LSLA type header.

data_type	integer*4	in	defines the type of data to be held in the file 1 - byte 2 - word 3 - longword 4 - real 5 - bit
xsize	integer*4	in	x extent of matrix (number of columns)
ysize	integer*4	in	y extent of matrix (number of rows)
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL DTI file successfully created
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNINUSE A file is already opened on DTI_LUN
4. DTI__INVHEAD Invalid HEADER_TYPE value
5. DTI__INVDATA Invalid DATA_TYPE value
6. DTI__BADEXTENT X or Y data extent values is invalid
7. DTI__INVYEXTENT Y extent of data area is invalid for bit data type.
Y extent should be a multiple of 8.
8. DTI__SYSERR System error while creating the mapped file

DTI_EXTEND_DATA

Routine to extend a currently mapped DTI file by increasing the number of columns and rows in the matrix. Note that if the file to be extended contains bit data values, the value associated with the argument *y_number* must be a multiple of 8. The additional columns and rows created in the matrix by this routine will be given an initial value of 0.

The routine interfaces with the LSLIB function VIO\$EXTEND_SEC

The file must have been opened or created with write access.

```
RETVAL = DTI_EXTEND_DATA ( dti_lun, x_number, y_number, error )
```

<i>dti_lun</i>	integer*4	in	LUN on which the file is opened.
<i>x_number</i>	integer*4	in	number of columns by which to extend
<i>y_number</i>	integer*4	in	number of rows by which to extend
<i>error</i>	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL DTI file successfully extended
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file is opened on DTI_LUN
4. DTI__READONLY Only read access to the file is permitted
5. DTI__BADEXTENT Cannot use values supplied for X_NUMBER or Y_NUMBER
6. DTI__SYSERR System error while extending the mapped file

DTI_EXTEND_HEADER

Routine to extend a currently mapped DTI file by increasing the length of the header record. This operation is only permitted on a file with a LSLA header structure. Note that the library routine ensures the position of the data values in the mapped file are correctly adjusted to accommodate the larger header.

The routine interfaces with the LSLLIB function VIO\$EXTEND_SEC

The file must have been opened or created with write access.

```
RETVAL = DTI_EXTEND_HEADER ( dti_lun, number_bytes, error )
```

dti_lun	integer*4	in	LUN on which the file is opened.
number_bytes	integer*4	in	number of bytes by which to extend the header
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL DTI file successfully extended
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file is opened on DTI_LUN
4. DTI__READONLY Only read access to the file is permitted
5. DTI__BADHEADER The file opened on DTI_LUN is not a LSLA type file
6. DTI__BADHEADSIZE Byte length of header is invalid
7. DTI__SYSERR System error while extending the mapped file

DTI_CLOSE

Routine to close a currently opened DTI file, and free the DTI LUN for further use. It interfaces with the LSLIB routine VIO\$CLOSE_SEC.

If update is requested, header details in common DTIHDR are written to the mapped file before closing. If HAD_PROJ_RECORD is set to true for this file, the projection record of the mapped file is also updated before close, using the values in common DTIPROJ.

```
RETVAL = DTI_CLOSE ( dti_lun, update, clear_common, error )
```

dti_lun	integer*4	in	LUN on which the file is opened.
update	logical	in	If .true. update the header details of the mapped file before closing.
clear_common	logical	in	If .true. clear the variables in common DTIHDR and DTIPROJ relating to this file.
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL DTI file successfully closed
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__READONLY Update of the mapped file header was requested, but only read access to the file is permitted
5. DTI__SYSERR System error while unmapping the file, or writing the DTI header record

DTILIB UTILITIES

A number of utility programs are provided within DTILIB.

- o DTI_NEXT_LUN is used to obtain the next free channel
- o DTI_PRINT_HEADER is used to print file header details derived from common DTIHDR
- o DTI_PRINT_PROJECTION is used to print projection details derived from common DTIPROJ
- o DTI_MINMAX_DATA is used to determine the minimum and maximum data values in the DTI file
- o DTI_WINDOW_MINMAX is used to determine the minimum and maximum data value in a DTI window
- o DTI_UNITS is used to set an appropriate default units type, and to test whether a units type is valid for a file
- o DTI_MATRIX_TO_UNITS is used to convert coordinates from DTI matrix units to specified units of measurement.
- o DTI_UNITS_TO_MATRIX is used to convert coordinates in the specified units of measurement to DTI matrix units.
- o DTI_WIN_MATRIX_TO_UNITS is used to convert window coordinates from DTI matrix units to specified units of measurement.
- o DTI_WIN_UNITS_TO_MATRIX is used to convert window coordinates in the specified units of measurement to DTI matrix units.

DTI_NEXT_LUN

Routine to return the number of the next free DTI_LUN.

```
RETVAL = DTI_NEXT_LUN ( dti_lun )
```

dti_lun	integer*4	out	number of next free LUN
---------	-----------	-----	-------------------------

Function return codes:

1. DTI__NORMAL Success
2. DTI__NOFREELUN No free LUN

DTI_PRINT_HEADER

Routine to output header details of the DTI file opened on the specified DTI_LUN. The details may be output in matrix units, metres or in the case of a DTI file with a TED4 or UHL1 header in degrees, minutes and seconds, or seconds.

If the DTIHDR variables DTI_WINDOW_SWX, DTI_WINDOW_SWY, DTI_WINDOW_NEX and DTI_WINDOW_NEY have been set up by an applications program, then details of the current DTI area of interest are included (see example below).

The optional rotation argument is necessary to calculate the correct geographical coordinates (in metres, latlong, seconds or projection units) if the DTI file is rotated with respect to the geographical origin. Note that the rotation argument has no effect on DTI matrix coordinates.

```
RETVAL = DTI_PRINT_HEADER ( dti_lun, units, [offset], [rotation] )
```

dti_lun	integer*4	in	LUN on which the DTI file is opened
units	integer*4	in	1 = matrix units 2 = metres 3 = seconds 4 = deg, min, sec 5 = projection units
offset	logical*4	in	if .t. or the argument is not supplied, absolute coordinate values are output by adding X_OFFSET and Y_OFFSET if .f. coordinate values relative to a matrix origin of 0,0 are output
rotation	integer*4	in	0 - SW 1 - NW 2 - NE 3 - SE If the argument is not supplied, 0 is assumed.

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADUNITS UNITS out of range (1-4)
5. DTI__INVUNITS UNITS value not valid for type of DTI

6. DTI__BADROTATION Unrecognised rotation type

An example of how the header details are output is given below:

```
LSL$DTI:TEST.DTI
Header: TED4      Data: WORD

Units are degrees, minutes, seconds

Matrix Origin      SW:  56 36 00N    5 15 00W
Matrix Coverage    SW:  56 36 00N    5 15 00W    NE:  56 58 12N    5 00 00W
Matrix Window      SW:  56 36 00N    5 15 00W    NE:  56 40 00N    4 32 16W
Matrix Interval     E:      2              N:      1

Value Range        :      0  to 1340
```


DTI_PRINT_PROJECTION

Routine to print projection details derived from a Projection Record of the DTI file opened on DTILUN. Note: The projection details are printed from the DTIPROJ common block, and not from the header of the mapped DTI file.

RETVAL = DTI_PRINT_PROJECTION (dti_lun)

dti_lun	integer*4	in	LUN on which the DTI file is opened
---------	-----------	----	----------------------------------------

Function return codes:

- | | | |
|----|----------------|----------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |

An example of how the projection record details are output is given below:

Spheroid	:	9 (Airy)	
Projection	:	101 (UK national grid)	
Units	:	2 (Metres)	
Local Origin	:	440000.000 (Eastings)	80000.000 (Northings)
Sample values	:	50.000 (Eastings)	50.000 (Northings)

DTI_UNITS

Routine to test whether UNITS is valid for the file opened on DTILUN, or in the case where the UNITS argument is passed with a value of 0, to return a suitable default UNITS value. If the passed UNITS value is not valid for the DTI file, the function returns the error code DTI__INVUNITS.

The following rules are applied when testing the validity of UNITS:

- o MATRIX - valid for all DTI files
- o METRES - valid for UHL1 and TED4 files; LSLA files without a projection record, and LSLA files with a projection record whose units entry does not indicate unset, feet, sheet mms. or thousands of an inch.
- o SECONDS - valid for UHL1 and TED4 files, and LSLA files with a projection record whose units indicate seconds, degrees, radians or .1 seconds of arc.
- o LATLONG - valid for UHL1 and TED4 files, and LSLA files with a projection record whose units indicate seconds, degrees, radians or .1 seconds of arc.
- o PROJECTION - valid for LSLA files with a projection record.

The following rules are applied when returning a default UNITS value:

- o MATRIX - LSLA files without a projection record; LSLA files with a projection record with a units entry that indicates the units are unset, or historical MIKE or ALVY files.
- o METRES - LSLA files with a projection record whose units entry indicates metres
- o LATLONG - UHL1 and TED4 files, LSLA files with a projection record indicating the data is held as geographicals
- o PROJECTION - LSLA files with a projection record whose units entry indicates the data is held as feet, sheet mms. or thousands of an inch.

RETVAL = DTI_UNITS (dti_lun, units)

dti_lun	integer*4	in	LUN on which the DTI file is open
units	integer*4	i/o	0 = derive a default unit type value (returned in units) 1 = matrix 2 = metres 3 = seconds of arc 4 = latlong (degrees, minutes and seconds) 5 = projection

Function return codes:

- | | | |
|----|----------------|----------------------------------------------|
| 1. | DTI__NORMAL | Success (units are valid) |
| 2. | DTI__INVUNITS | Units not valid for the DTI file |
| 3. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 4. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 5. | DTI__BADUNITS | Units value is invalid (not in range 0 to 5) |

DTI_MATRIX_TO_UNITS

Routine to convert DTI matrix column and row values to the specified units of measurement.

The optional rotation argument is necessary to calculate the correct geographical coordinates (in metres, latlong, seconds or projection units) if the DTI file is rotated with respect to the geographical origin.

Note that if latlong units are specified then coordinates are returned as seconds of arc.

```
RETVAL = DTI_MATRIX_TO_UNITS ( dti_lun, x_matrix, y_matrix,
                                units, [rotation], [offset],
                                x_coord, y_coord )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
x_matrix	real*4	in	x matrix coordinate (column)
y_matrix	real*4	in	y matrix coordinate (row)
units	integer*4	in	conversion units (ie. units of measurement of output coordinates) 1 = matrix 2 = metres 3 = seconds of arc 4 = latlong (degrees, minutes and seconds) 5 = projection
rotation	integer*4	in	0 - SW 1 - NW 2 - NE 3 - SE If the argument is not supplied, 0 is assumed.
offset	logical*4	in	if .t. or the argument is not supplied, absolute coordinate values are output by adding X_OFFSET and Y_OFFSET if .f. coordinate values relative to a matrix origin of 0,0 are output
x_coord	real*8	out	x coordinate in specified units
y_coord	real*8	out	y coordinate in specified units

Function return codes:

1. DTI__NORMAL Success (units are valid)
2. DTI__INVUNITS Units not valid for the DTI file
3. DTI__BADLUN DTI_LUN out of range (1:9)
4. DTI__LUNUNUSED No file opened on DTI_LUN
5. DTI__BADUNITS Units value is invalid (not in range 0 to 5)
6. DTI__BADROTATION Unrecognised rotation type

DTI_UNITS_TO_MATRIX

Routine to convert x and y coordinates in the specified units of measurement to DTI matrix row and column values.

The optional rotation argument is necessary to calculate the correct matrix coordinates if the DTI file is rotated with respect to the geographical origin.

Note that if latlong units are specified then coordinates are assumed to be in seconds of arc.

```
RETVAL = DTI_UNITS_TO_MATRIX ( dti_lun, x_coord, y_coord,
                                units, [rotation], [offset],
                                x_matrix, y_matrix)
```

dti_lun	integer*4	in	LUN on which the DTI file is open
x_coord	real*8	in	x coordinate in specified units
y_coord	real*8	in	y coordinate in specified units
units	integer*4	in	1 = matrix 2 = metres 3 = seconds of arc 4 = latlong (degrees, minutes and seconds) 5 = projection
rotation	integer*4	in	0 - SW 1 - NW 2 - NE 3 - SE If the argument is not supplied, 0 is assumed.
offset	logical*4	in	if .t. or the argument is not supplied, absolute coordinate values are output by adding X_OFFSET and Y_OFFSET if .f. coordinate values relative to a matrix origin of 0,0 are output
x_matrix	real*4	out	x matrix coordinate (column)
y_matrix	real*4	out	y matrix coordinate (row)

Function return codes:

1. DTI__NORMAL Success (units are valid)
2. DTI__INVUNITS Units not valid for the DTI file

3. DTI__BADLUN DTI_LUN out of range (1:9)
4. DTI__LUNUNUSED No file opened on DTI_LUN
5. DTI__BADUNITS Units value is invalid (not in range 0 to 5)
6. DTI__BADROTATION Unrecognised rotation type

DTI_WIN_MATRIX_TO_UNITS

Routine to convert two DTI matrix coordinates defining the south-west and north-east coordinates of an area of interest, into the specified units of measurement defining the same area.

The optional rotation argument is necessary to calculate the correct geographical coordinates (in metres, latlong, seconds or projection units) if the DTI file is rotated with respect to the geographical origin.

Note that if latlong units are specified then coordinates are returned as seconds of arc.

```
RETVAL = DTI_WIN_MATRIX_TO_UNITS ( dti_lun, x_matrix_sw, y_matrix_sw,
                                   x_matrix_ne, y_matrix_ne
                                   units, [rotation], [offset],
                                   x_coord_sw, y_coord_sw
                                   x_coord_ne, y_coord_ne )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
x_matrix_sw	integer*4	in	sw x matrix coordinate (column)
y_matrix_sw	integer*4	in	sw y matrix coordinate (row)
x_matrix_ne	integer*4	in	ne x matrix coordinate (column)
y_matrix_ne	integer*4	in	ne y matrix coordinate (row)
units	integer*4	in	1 = matrix 2 = metres 3 = seconds of arc 4 = latlong (degrees, minutes and seconds) 5 = projection
rotation	integer*4	in	0 - SW 1 - NW 2 - NE 3 - SE If the argument is not supplied, 0 is assumed.
offset	logical*4	in	if .t. or the argument is not supplied, absolute coordinate values are output by adding X_OFFSET and Y_OFFSET if .f. coordinate values relative to a matrix origin of 0,0 are output
x_coord_sw	real*8	out	sw x coordinate in specified units

y_coord_sw	real*8	out	sw y coordinate in specified units
x_coord_ne	real*8	out	ne x coordinate in specified units
y_coord_ne	real*8	out	ne y coordinate in specified units

Function return codes:

1. DTI__NORMAL Success (units are valid)
2. DTI__INVUNITS Units not valid for the DTI file
3. DTI__BADLUN DTI_LUN out of range (1:9)
4. DTI__LUNUNUSED No file opened on DTI_LUN
5. DTI__BADUNITS Units value is invalid (not in range 0 to 5)
6. DTI__BADROTATION Unrecognised rotation type
7. DTI__BADWINDOW Invalid window column and row values

DTI_WIN_UNITS_TO_MATRIX

Routine to convert two coordinates in the specified units, defining the south-west and north-east coordinates of an area of interest into DTI matrix coordinates defining the same area.

The optional rotation argument is necessary to calculate the correct matrix coordinates if the DTI file is rotated with respect to the geographical origin.

Note that if latlong units are specified then coordinates are assumed to be in seconds of arc.

```
RETVAL = DTI_WIN_UNITS_TO_MATRIX ( dti_lun, x_coord_sw, y_coord_sw,
                                   x_coord_ne, y_coord_ne
                                   units, [rotation], [offset],
                                   x_matrix_sw, y_matrix_sw
                                   x_matrix_ne, y_matrix_ne )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
x_coord_sw	real*8	in	sw x coordinate in specified units
y_coord_sw	real*8	in	sw y coordinate in specified units
x_coord_ne	real*8	in	ne x coordinate in specified units
y_coord_ne	real*8	in	ne y coordinate in specified units
units	integer*4	in	1 = matrix 2 = metres 3 = seconds of arc 4 = latlong (degrees, minutes and seconds) 5 = projection
rotation	integer*4	in	0 - SW 1 - NW 2 - NE 3 - SE If the argument is not supplied, 0 is assumed.
offset	logical*4	in	if .t. or the argument is not supplied, absolute coordinate values are output by adding X_OFFSET and Y_OFFSET if .f. coordinate values relative to a matrix origin of 0,0 are output
x_matrix_sw	integer*4	out	sw x matrix coordinate (column)

y_matrix_sw	integer*4	out	sw y matrix coordinate (row)
x_matrix_ne	integer*4	out	ne x matrix coordinate (column)
y_matrix_ne	integer*4	out	ne y matrix coordinate (row)

Function return codes:

1. DTI__NORMAL Success (units are valid)
2. DTI__INVUNITS Units not valid for the DTI file
3. DTI__BADLUN DTI_LUN out of range (1:9)
4. DTI__LUNUNUSED No file opened on DTI_LUN
5. DTI__BADUNITS Units value is invalid (not in range 0 to 5)
6. DTI__BADROTATION Unrecognised rotation type
7. DTI__BADWINDOW Invalid window column and row values

DTI_MINMAX_DATA

Routine to scan the all nodes in the data area and determine the minimum and maximum data values. The routine updates the relevant entries in DTIHDR, and if UPDATE is true, also writes the new values to the mapped DTI file.

RETVAL = DTI_MINMAX_DATA (dti_lun, update, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
update	logical	in	If .true. update the minimum and maximum data values in the header of mapped file.
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__READONLY Update of the mapped file header was requested, but only read access to the file is permitted
5. DTI__SYSERR System error while updating the file header

DTI_WINDOW_MINMAX

Routine to scan all nodes in a DTI window (rectangular area of interest) and determine the minimum and maximum data values. The window bottom lefthand and top righthand column and row values are extracted from the DTIHDR common block variables DTI_WINDOW_SWX, DTI_WINDOW_SWY, DTI_WINDOW_NEX and DTI_WINDOW_NEY. The minimum and maximum values are returned as function arguments.

```
RETVAL = DTI_WINDOW_MINMAX ( dti_lun, min_value, max_value )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
min_value	*	out	minimum data value
max_value	*	out	maximum data value

Function return codes:

- | | | |
|----|----------------|-------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADWINDOW | Window values in DTIHDR are invalid |

READ HEADER ROUTINES

A series of functions to read values from the header of the DTI file are provided. The routines use a byte offset to point to the relevant location in the header.

DTI_READ_HEADER

Routine to read the header (x,y extent, grid intervals, minimum and maximum data values, header size, data type and if appropriate latitude and longitude values) of a DTI file. The values are placed in DTIHDR. The routine is called by DTI_OPEN, but may also be called by an applications program.

RETVAL = DTI_READ_HEADER (dti_lun, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
---------	-----------	----	--------------------------------------

error	integer*4	out	system error code
-------	-----------	-----	-------------------

Function return codes:

- | | | |
|----|----------------|------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__SYSERR | System error while reading from the DTI header |

DTI_READ_PROJ_REC

Routine to read a DTI Projection Record. This record may only be present in an LSLA type DTI header. The start of the record is identified by means of the identifier 'DTIPROJ'. The routine transfers the Projection Record details, include the record's byte offset to the DTILIB common block DTIPROJ.

RETVAL = DTI_READ_PROJ_REC (dti_lun, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
error	integer*4	out	system error code

Function return codes:

- | | | |
|----|----------------|-----------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADHEADER | The file opened on DTI_LUN is not an LSLA type file |
| 5. | DTI__NOPROJREC | No projection record was found in the header |
| 6. | DTI__SYSERR | System error while reading from the DTI header |

DTI_READ_DSI

Routine to read the DSI record of a TED4 type DTI header, and extract the latlong origin and corner values, and grid intervals. The values are placed in DTIHDR. The routine is called by DTI_OPEN, but may also be called by an applications program.

RETVAL = DTI_READ_DSI (dti_lun)

dti_lun	integer*4	in	LUN on which the DTI file is open
---------	-----------	----	--------------------------------------

Function return codes:

- | | | |
|----|----------------|----------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADHEADER | The file opened on DTI_LUN is not a TED4 type file |
| 5. | DTI__BADDSI | DSI record did not conform to the usual format |

DTI_READ_UHL

Routine to read the UHL record of a UHL1 type DTI header, and extract the latlong corner values, and grid intervals. The values are placed in DTIHDR. The routine is called by DTI_OPEN, but may also be called by an applications program.

Note that the routine sets the latlong origin values in DTIHDR to be equal to the latlong S.W. corner.

RETVAL = DTI_READ_UHL (dti_lun)

dti_lun	integer*4	in	LUN on which the DTI file is open
---------	-----------	----	--------------------------------------

Function return codes:

- | | | |
|----|----------------|----------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADHEADER | The file opened on DTI_LUN is not a UHL1 type file |
| 5. | DTI__BADUHL | The UHL record did not conform to the usual format |

DTI_READ_BYTE_HEADER

Routine to read a byte value from the header area.

```
RETVAL  = DTI_READ_BYTE_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	out	value of byte
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-1)
5. DTI__SYSERR System error while reading from the DTI header record

DTI_READ_WORD_HEADER

Routine to read a word (INTEGER2) from the header area

```
RETVAL  = DTI_READ_WORD_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*2	out	value of word
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-2)
5. DTI__SYSERR System error while reading from the DTI header record

DTI_READ_LONG_HEADER

Routine to read a longword (INTEGER4) from the header area

RETVAL = DTI_READ_LONG_HEADER (dti_lun, value, byte_offset, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*4	out	value of longword
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-4)
5. DTI__SYSERR System error while reading from the DTI header record

DTI_READ_REAL_HEADER

Routine to read a real value from the header area

```
RETVAL  = DTI_READ_REAL_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real	out	value of real
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-4)
5. DTI__SYSERR System error while reading from the DTI header record

DTI_READ_REAL8_HEADER

Routine to read a real value from the header area

RETVAL = DTI_READ_REAL8_HEADER (dti_lun, value, byte_offset, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real*8	out	value of real*8
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-8)
5. DTI__SYSERR System error while reading from the DTI header record

READ DATA ROUTINES

A series of functions to read values from the DTI data area are provided. The routines are passed a x and y position defining the location of the value to be read.

DTI_READ_DATA

Generic routine to read a value from the data area. The routine determines the type of data stored in the file, and calls the appropriate DTILIB reading routine (see below).

RETVAL = DTI_READ_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	*	out	data value
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

- | | | |
|----|-----------------|-----------------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADDATAPOS | The x and y position does not lie within the data
area |

DTI_READ_BIT_DATA

Routine to read a bit value from the data area.

RETVAL = DTI_READ_BIT_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	out	value of bit (0 or 1)
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain bit data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area

DTI_READ_BYTE_DATA

Routine to read a byte value from the data area.

RETVAL = DTI_READ_BYTE_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	out	value of byte
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain byte data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area

DTI_READ_WORD_DATA

Routine to read a word (INTEGER2) from the data area.

RETVAL = DTI_READ_WORD_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*2	out	value of word
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain word data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area

DTI_READ_LONG_DATA

Routine to read a longword (INTEGER4) from the data area.

RETVAL = DTI_READ_LONG_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*4	out	value of longword
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain longword data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area

DTI_READ_REAL_DATA

Routine to read a real value from the data area.

RETVAL = DTI_READ_REAL_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real	out	real value
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain real data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area

WRITE HEADER ROUTINES

A number of routines to write information to the header area of the DTI file are provided.

DTI_WRITE_HEADER

Routine to write the DTI header, consisting of header type, x,y extent, grid intervals, minimum and maximum data values, header size, data type, and if appropriate latitude and longitude values, to a mapped DTI file. The values to be written are passed via DTIHDR. The routine is called by DTI_CLOSE if the option to update is selected, and may be called by an applications program.

```
RETVAL = DTI_WRITE_HEADER ( dti_lun, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
error	integer*4	out	system error code

Function return codes:

- | | |
|-------------------|----------------------------------------------------|
| 1. DTI__NORMAL | Success |
| 2. DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. DTI__READONLY | Only read access to the file is permitted |
| 5. DTI__SYSERR | System error writing the header values to the file |

DTI_WRITE_PROJ_REC

Routine to write a DTI Projection Record. This record may only be written to an LSLA type DTI header. The start of the record is identified by means of the identifier 'DTIPROJ'. The routine extracts Projection Record details from the DTILIB common block DTIPROJ.

Note that if the optional argument BYTE_OFFSET is not supplied, the Projection Record is written to the byte offset specified in the variable DTIPROJ_RECORD_OFFSET.

```
RETVAL = DTI_WRITE_PROJ_REC ( dti_lun, [byte_offset], error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADER The file opened on DTI_LUN is not a LSLA type file
5. DTI__BADHEADOFF Byte offset out of range (0:Header Size-1)
6. DTI__HEADTOOSMALL The file header is too small to hold a Projection Record (ie. Less than DEFAULT_LSLA_HEADER + DTIPROJ_RECORD_LENGTH)
7. DTI__READONLY Only read access to the file is permitted

DTI_WRITE_DSI

Routine to write the latlong origin and corner values, grid interval in seconds and data extent values, to the DSI record of a TED4 type DTI file. The routine is called by DTI_WRITE_HEADER, but may also be called by an applications program.

```
RETVAL = DTI_WRITE_DSI ( dti_lun, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
error	integer*4	out	system error code

Function return codes:

- | | | |
|----|----------------|----------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__BADHEADER | The file opened on DTI_LUN is not a TED4 type file |
| 5. | DTI__READONLY | Only read access to the file is permitted |
| 6. | DTI__SYSERR | System error writing the header values to the file |

DTI_WRITE_UHL

Routine to write the latlong S.W. corner values, and grid intervals to the UHL record of a UHL1 type DTI file.

The routine is called by DTI_WRITE_HEADER, but may also be called by an applications program.

RETVAL = DTI_WRITE_UHL (dti_lun, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
error	integer*4	out	system error code

Function return codes:

- | | |
|-------------------|----------------------------------------------------|
| 1. DTI__NORMAL | Success |
| 2. DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. DTI__BADHEADER | The file opened on DTI_LUN is not a UHL1 type file |
| 5. DTI__READONLY | Only read access to the file is permitted |
| 6. DTI__SYSERR | System error writing the header values to the file |

DTI_WRITE_BYTE_HEADER

Routine to write a byte value into the header area

```
RETVAL  = DTI_WRITE_BYTE_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	in	value of byte
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-1)
5. DTI__READONLY Only read access to the file is permitted
6. DTI__SYSERR System error writing the header values to the file

DTI_WRITE_WORD_HEADER

Routine to write a word (INTEGER2) into the header area

```
RETVAL = DTI_WRITE_WORD_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*2	in	value of word
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-2)
5. DTI__READONLY Only read access to the file is permitted
6. DTI__SYSERR System error writing the header values to the file

DTI_WRITE_LONG_HEADER

Routine to write a longword (INTEGER4) into the header area

```
RETVAL = DTI_WRITE_LONG_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*4	in	value of longword
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-4)
5. DTI__READONLY Only read access to the file is permitted
6. DTI__SYSERR System error writing the header values to the file

DTI_WRITE_REAL_HEADER

Routine to write a real value into the header area

```
RETVAL  = DTI_WRITE_REAL_HEADER ( dti_lun, value, byte_offset, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real	in	value of real
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	error number

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-4)
5. DTI__READONLY Only read access to the file is permitted
6. DTI__SYSERR System error writing the header values to the file

DTI_WRITE_REAL8_HEADER

Routine to write a real value into the header area

RETVAL = DTI_WRITE_REAL8_HEADER (dti_lun, value, byte_offset, error)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real*8	in	value of real*8
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	error number

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-8)
5. DTI__READONLY Only read access to the file is permitted
6. DTI__SYSERR System error writing the header values to the file

WRITE DATA ROUTINES

Routines to write to the DTI data area are provided. The routines are passed a x and y data position defining the location at which to write.

DTI_WRITE_DATA

Generic routine to write a value to the data area. The routine determines the type of data stored in the file, and calls the appropriate DTILIB writing routine (see below).

RETVAL = DTI_WRITE_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	*	in	data value
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADDATAPOS The x and y position does not lie within the data area
5. DTI__BADDATAVALUE Data value is invalid for bit data. A value of 0 or 1 is required.
6. DTI__READONLY Only read access to the file is permitted

DTI_WRITE_BIT_DATA

Routine to write a bit value to the data area.

RETVAL = DTI_WRITE_BIT_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	in	bit value as byte (0 or 1)
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain bit data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area
6. DTI__BADDATAVALUE Data value is invalid for bit data. Value of 0 or 1
required.
7. DTI__READONLY Only read access to the file is permitted

DTI_WRITE_BYTE_DATA

Routine to write a byte value to the data area.

RETVAL = DTI_WRITE_BYTE_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	in	byte value
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

- | | | |
|----|-------------------|-----------------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__DATAMISMATCH | The DTI file is not set up to contain byte data |
| 5. | DTI__BADDATAPOS | The x and y position does not lie within the data
area |
| 6. | DTI__READONLY | Only read access to the file is permitted |

DTI_WRITE_WORD_DATA

Routine to write a word (INTEGER2) to the data area.

RETVAL = DTI_WRITE_WORD_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*2	in	value of word
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain word data
5. DTI__BADDATAPOS The x and y position does not lie within the data
area
6. DTI__READONLY Only read access to the file is permitted

DTI_WRITE_LONG_DATA

Routine to write a longword (INTEGER4) to the data area.

RETVAL = DTI_WRITE_LONG_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*4	in	value of longword
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

- | | | |
|----|-------------------|-----------------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__DATAMISMATCH | The DTI file is not set up to contain longword data |
| 5. | DTI__BADDATAPOS | The x and y position does not lie within the data
area |
| 6. | DTI__READONLY | Only read access to the file is permitted |

DTI_WRITE_REAL_DATA

Routine to write a real value to the data area.

RETVAL = WRITE_REAL_DATA (dti_lun, value, x_position, y_position)

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real	in	value of real
x_position	integer*4	in	column
y_position	integer*4	in	row

Function return codes:

- | | | |
|----|-------------------|-----------------------------------------------------------|
| 1. | DTI__NORMAL | Success |
| 2. | DTI__BADLUN | DTI_LUN out of range (1:9) |
| 3. | DTI__LUNUNUSED | No file opened on DTI_LUN |
| 4. | DTI__DATAMISMATCH | The DTI file is not set up to contain real data |
| 5. | DTI__BADDATAPOS | The x and y position does not lie within the data
area |
| 6. | DTI__READONLY | Only read access to the file is permitted |

COPY HEADER FUNCTIONS

Routines to copy the header details from one mapped file to another mapped file, and to copy from a user byte array to the header area or from the header area to a user byte array are provided.

DTI_COPY_BYTE_HEADER

Function to transfer byte data from the DTI header area to a user byte array, or from a byte array to the DTI header area.

RETVAL = DTI_COPY_BYTE_HEADER (dti_lun, user_array, to,			
number_bytes, byte_offset, error)			
dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	byte	i/o	user byte array
to	logical	in	.t. copy from user array to header area .f. copy from header area to user array
number_bytes	integer*4	in	number of bytes to transfer
byte_offset	integer*4	in	offset in header specified in bytes
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADHEADOFF Byte offset out of range (0:Header Size-number_bytes)
5. DTI__SYSERR System error writing to or reading from the DTI header
6. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted

DTI_COPY_HEADER

Function to copy part of the header of one mapped DTI file to another mapped DTI file. The two files must have the same type of header structure.

How much and which part of the header is copied is determined by the header types. If both files have a UHL1 header then the UHL field is transferred; if both files have a DTED header then the DSI and ACC fields are transferred, and if both files have a LSLA header then the free format part of the header is copied. In addition for LSLA files, details from any projection record are copied from the input to the output file (and transferred to the relevant DTIPROJ variables), along with the data order values.

NB. The extent, grid and minimum and maximum data values contained in the first part of the header are not copied by the function. To transfer grid and minmax values from the source DTI file, to the destination DTI file, an applications program should transfer the values via common DTIHDR and select the update option in DTI_CLOSE.

```
RETVAL = DTI_COPY_HEADER ( from_dti_lun, to_dti_lun, error,
                           [projection] )
```

from_dti_lun	integer*4	in	LUN on which DTI file with header to copy is opened
to_dti_lun	integer*4	in	LUN on which DTI file to receive header is opened
error	integer*4	out	system error code
projection	logical*4	in	if .t. or absent, copy the projection record information if .f. don't transfer projection record data

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on one of the specified LUNs
4. DTI__HEADMISMATCH The two files have different header structures
5. DTI__BADHEADSIZE The size of the header opened on to_dti_lun is smaller than the header of the file opened on from_dti_lun
6. DTI__SYSERR System error occurred during read or write
7. DTI__READONLY Only read access to the output file is permitted

COPY DATA FUNCTIONS

A series of routines to allow an array of data to be written to the data area, or data to be transferred from the data area to a user array are provided.

DTI_COPY_DATA

Generic function to copy data values from the data area to a user array, or from a user array to the data area. The function determines the type of data stored in the file, and calls the appropriate data copying routines (see below).

```
RETVAL = DTI_COPY_DATA ( dti_lun, user_array, to,
                        x_start, y_start,
                        x_number, y_number, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	*	i/o	user array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADDATAPOS x_start or y_start outside data area
5. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
6. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
7. DTI__SYSERR System error occurred during read or write

DTI_COPY_BIT_DATA

Function to copy bit data from the DTI data area to a user byte array, or from a byte array to the DTI data area. Note that for efficiency the routine will copy the bit data as a series of bytes, consisting of 8 bits. For this reason the function must be supplied with a y_start value that is a bit offset from the start of the data area that coincides with the start of a byte (eg. 1,9,17), and a y_number value that is a multiple of 8. The same restrictions do not apply to the values associated with the arguments x_start and x_number.

```
RETVAL  = DTI_COPY_BIT_DATA ( dti_lun, user_array, to,
                               x_start, y_start,
                               x_number, y_number, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	byte	i/o	user byte array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain bit data
5. DTI__BADDATAPOS x_start or y_start outside data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the
data area
7. DTI__INVYSTART Y start is invalid for bit data. The value must
represent a bit offset that coincides with a byte boundary.

8. DTI__INVYEXTENT Y extent is invalid for bit data. The value supplied with y_number should be a multiple of 8.
9. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
10. DTI__SYSERR System error occurred during read or write

DTI_COPY_BYTE_DATA

Function to copy byte data from the DTI data area to a user byte array, or from a byte array to the DTI data area.

```

RETVAL  = DTI_COPY_BYTE_DATA ( dti_lun, user_array, to,
                                x_start, y_start,
                                x_number, y_number, error )

```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	byte	i/o	user byte array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain byte data
5. DTI__BADDATAPOS x_start or y_start outside data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
8. DTI__SYSERR System error occurred during read or write

DTI_COPY_WORD_DATA

Function to copy word data (INTEGER2) from the DTI data area to a user word array, or from a word array to the DTI data area.

```
RETVAL = DTI_COPY_WORD_DATA ( dti_lun, user_array, to,
                               x_start, y_start,
                               x_number, y_number, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	integer*2	i/o	user word array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain word data
5. DTI__BADDATAPOS x_start or y_start outside data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
8. DTI__SYSERR System error occurred during read or write

DTI_COPY_LONG_DATA

Function to copy longword data (INTEGER4) from the DTI data area to a user longword array, or from a longword array to the DTI data area.

```
RETVAL = DTI_COPY_LONG_DATA ( dti_lun, user_array, to,
                               x_start, y_start,
                               x_number, y_number, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	integer*4	i/o	user longword array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain longword data
5. DTI__BADDATAPOS x_start or y_start outside data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
8. DTI__SYSERR System error occurred during read or write

DTI_COPY_REAL_DATA

Function to copy real data from the DTI data area to a user real array, or from a real array to the DTI data area.

```
RETVAL  = DTI_COPY_REAL_DATA ( dti_lun, user_array, to,
                                x_start, y_start,
                                x_number, y_number, error )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
user_array	real	i/o	user real array
to	logical	in	.t. copy from user array to data area .f. copy from data area to user array
x_start	integer*4	in	start column
y_start	integer*4	in	start row
x_number	integer*4	in	number of columns of data to transfer
y_number	integer*4	in	number of rows of data to transfer
error	integer*4	out	system error code

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain real data
5. DTI__BADDATAPOS x_start or y_start outside data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Transfer to the DTI file was requested, but only read access to the file is permitted
8. DTI__SYSERR System error occurred during read or write

INITIALISE DATA AREA

A number of routines which enable the whole or part of the data area to be set to a particular value are provided.

DTI_INIT_DATA

Generic function to set a rectangular area in the DTI data area to a specified value. The routine determines the type of data stored in the file, and calls the appropriate data initialisation routine (see below).

```
RETVAL = DTI_INIT_DATA ( dti_lun, value,  
                        [x_position], [,y_position],  
                        [x_number], [y_number] )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	*	in	data value
x_position	integer*4	in	start column
y_position	integer*4	in	start row
x_number	integer*4	in	number of columns
y_number	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__BADATAPOS Start column and row values do not lie within the data area
5. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
6. DTI__BADDATAVALUE Data value is invalid for bit data. A value of 0 or 1 is required.
7. DTI__READONLY Only read access to the file is permitted
8. DTI__MISSARGS Some but not all of the optional arguments are present

DTI_INIT_BIT_DATA

Routine to set a rectangular area in the DTI data area to a specified bit value. If the optional arguments *x_position*, *y_position*, *x_number* and *y_number* are missing, the whole of the data area is set to the supplied value.

```
RETVAL = DTI_INIT_BIT_DATA ( dti_lun, value,
                             [x_position], [y_position],
                             [x_number], [y_number] )
```

<i>dti_lun</i>	integer*4	in	LUN on which the DTI file is open
<i>value</i>	byte	in	bit value as byte (0 or 1)
<i>x_position</i>	integer*4	in	start column
<i>y_position</i>	integer*4	in	start row
<i>x_number</i>	integer*4	in	number of columns
<i>y_number</i>	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain bit data
5. DTI__BADATAPOS Start column and row values do not lie within the data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__BADDATAVALUE Data value is invalid for bit data. A value of 0 or 1 is required.
8. DTI__READONLY Only read access to the file is permitted
9. DTI__MISSARGS Some but not all of the optional arguments are present

DTI_INIT_BYTE_DATA

Routine to set a rectangular area in the DTI data area to a specified byte value. If the optional arguments x_position, y_position, x_number and y_number are missing, the whole of the data area is set to the supplied value.

```
RETVAL = DTI_INIT_BYTE_DATA ( dti_lun, value,  
                               [x_position], [y_position],  
                               [x_number], [y_number] )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	byte	in	byte value
x_position	integer*4	in	start column
y_position	integer*4	in	start row
x_number	integer*4	in	number of columns
y_number	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain byte data
5. DTI__BADATAPOS Start column and row values do not lie within the
data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the
data area
7. DTI__READONLY Only read access to the file is permitted
8. DTI__MISSARGS Some but not all of the optional arguments are
present

DTI_INIT_WORD_DATA

Routine to set a rectangular area in the DTI data area to a specified word (INTEGER2) value. If the optional arguments x_position, y_position, x_number and y_number are missing, the whole of the data area is set to the supplied value.

```
RETVAL = DTI_INIT_WORD_DATA ( dti_lun, value,
                               [x_position], [y_position],
                               [x_number], [y_number] )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*2	in	word value
x_position	integer*4	in	start column
y_position	integer*4	in	start row
x_number	integer*4	in	number of columns
y_number	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain word data
5. DTI__BADATAPOS Start column and row values do not lie within the data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Only read access to the file is permitted
8. DTI__MISSARGS Some but not all of the optional arguments are present

DTI_INIT_LONG_DATA

Routine to set a rectangular area in the DTI data area to a specified longword (INTEGER4) value. If the optional arguments x_position, y_position, x_number and y_number are missing, the whole of the data area is set to the supplied value.

```
RETVAL = DTI_INIT_LONG_DATA ( dti_lun, value,
                              [x_position], [y_position],
                              [x_number], [y_number] )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	integer*4	in	longword value
x_position	integer*4	in	start column
y_position	integer*4	in	start row
x_number	integer*4	in	number of columns
y_number	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain longword data
5. DTI__BADATAPOS Start column and row values do not lie within the data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Only read access to the file is permitted
8. DTI__MISSARGS Some but not all of the optional arguments are present

DTI_INIT_REAL_DATA

Routine to set a rectangular area in the DTI data area to a specified real value. If the optional arguments x_position, y_position, x_number and y_number are missing, the whole of the data area is set to the supplied value.

```
RETVAL = DTI_INIT_REAL_DATA ( dti_lun, value,
                               [x_position], [y_position],
                               [x_number], [y_number] )
```

dti_lun	integer*4	in	LUN on which the DTI file is open
value	real	in	real value
x_position	integer*4	in	start column
y_position	integer*4	in	start row
x_number	integer*4	in	number of columns
y_number	integer*4	in	number of rows

Function return codes:

1. DTI__NORMAL Success
2. DTI__BADLUN DTI_LUN out of range (1:9)
3. DTI__LUNUNUSED No file opened on DTI_LUN
4. DTI__DATAMISMATCH The DTI file is not set up to contain real data
5. DTI__BADATAPOS Start column and row values do not lie within the data area
6. DTI__BADDATAEXT Rectangular area of interest does not lie within the data area
7. DTI__READONLY Only read access to the file is permitted
8. DTI__MISSARGS Some but not all of the optional arguments are present

CHAPTER 13

MODULE DTIFROMTEXT

MODULE DTIFROMTEXT

FUNCTION

DTIFROMTEXT converts a text data file, in various formats, into a DTI file.

FORMAT

\$ DTIFROMTEXT input-file-spec output-DTI-file-spec

Command Qualifiers	Defaults
/ANTICLOCKWISE	/NOANTICLOCKWISE
/BYTE	/NOBYTE
/CLOCKWISE	/CLOCKWISE
/CUSTOMER	/NOCUSTOMER
/INDEX	/INDEX = 'TEXT.INDEX'
/LONG	/NOLONG
/NE	/NONE
/NW	/NONW
/REAL	/NOREAL
/SE	/NOSE
/SW	/SW
/WORD	/WORD
/XYZ	/NOXYZ
/Z	/Z

PROMPTS

Input File: input-file-spec
Output DTI File: output-DTI-file-spec

COMMAND PARAMETERS

input-file-spec

Specifies the input text file.

Any part of the file specification that is not supplied will be completed from the default of "TEXT.TXT;0"

output-DTI-file-spec

Specifies the name of the DTI file to be created.

Any part of the file specification that is not supplied will be completed from the default of "LSL\$DTI:DTI.DTI"

COMMAND QUALIFIERS

/ANTICLOCKWISE

- Specifies that the output DTI file represents data in an anticlockwise direction.

/BYTE

- Specifies that the output DTI file should be created with byte data.

/CLOCKWISE

- Specifies that the output DTI file represents data in a clockwise direction, and is the default output style.

/CUSTOMER = Customer-format

- This is an optional qualifier specifying a pre-defined translation from a particular input text file format giving output to a specific DTI file style, without further qualifiers being necessary apart from /INDEX to provide the origin offset. At present /CUSTOMER = AUSLIG or /CUSTOMER = MOBILE are the only supported options.

/INDEX = index-file-spec

- Specifies the index file holding a single line containing the DTI x,y origin offset (for the projection record), the x,y DTI extents (in number of pixels) and the x,y DTI pixel sizes.

The default specification for the index file is 'TEXT.INDEX'

The index may contain comment lines prefixed with a '!' character.

This qualifier is necessary if the input text file is not one of the pre-defined customer formats (ie. AUSLIG or MOBILE). If a customer format is specified the /INDEX qualifier may be used to specify the DTI file origin offset.

/LONG

- Specifies that the output DTI file should be created with long-word data.

/NE

- Specifies that the output DTI file represents data with a north-east corner.

/NW

- Specifies that the output DTI file represents data with a north-west corner.

/REAL

- Specifies that the output DTI file should be created with real data.

/SE

- Specifies that the output DTI file represents data with a south-east corner.

/SW

- Specifies that the output DTI file represents data with a south-west corner, and is the default output style.

/XYZ

- Specifies that the text data contains x, y and z data.

/WORD

- Specifies that the output DTI file should be created with word data, and is the default output data type.

/Z

- Specifies that the text data contains z data only, and is the default input style.

RESTRICTIONS

- o /CLOCKWISE and /ANTICLOCKWISE are not allowed
- o /Z and /XYZ are not allowed
- o Only one of /SW, /SE, /NW or /NE is permitted
- o Only one of /BYTE, /LONG, /WORD or /REAL is permitted
- o Only one customer format may be specified

DESCRIPTION

The Text to DTI Translation.

The translation of text file to DTI is defined primarily by specifying an index file via the /INDEX = index-file-spec qualifier. The index file is a single line ASCII file providing, in order, the DTI x,y origin, the x,y DTI extents (number of pixels) and the x,y DTI pixel sizes.

The input text data is read and the contents written to the DTI file in the standard DTI order, ie. starting at the SW corner and proceeding in a clockwise direction (in the increasing y direction, repeated for successive columns). The qualifiers /BYTE, /LONG, /REAL or /WORD may be used to set up a different output data format, the default being to output word data.

The qualifiers /CLOCKWISE, /ANTICLOCKWISE, /SW, /SE, /NW or /NE may be used to set the DTI header to the correct values if this default setup is not a suitable representation for the subsequent use of the DTI file.

The text data may be simple free format z values, or x,y,z value records on separate lines, this latter option being selected with the /XYZ qualifier. The default is to read just z height values. (The text data may represent height (z), or any other numeric attribute such as vegetation type, slope, clutter category, colour etc. For simplicity in this document it is referred to as z.)

The DTI Projection Record.

DTI files output from DTIFROMTEXT are created with an 'LSLA' (LSL type A) header with a DTI Projection record. The Projection record contains unset projection and spheroid codes and associated parameters.

The coordinates of address (1,1) of the matrix are taken from the /INDEX file (or the first x,y,z record) and written to the DTI header and projection origin offset fields.

The MATRIX utilities DTIPATCH or DTITRANS/DESCRIPTOR may be used to change the

output DTI file header entries as an alternative to using the relevant qualifiers when running DTIFROMTEXT.

The Pre-defined Customer Formats.

At present there are two supported pre-defined formats that may be read by DTIFROMTEXT specified by the /CUSTOMER = customer-name qualifier. These customer-names are AUSLIG (to translate AUSMAP data from the Australian Surveying and Land Information Group) and MOBILE (to translate data from Mobile Systems UK Ltd.).

The first format (AUSLIG) expects an ASCII file of x,y,z values with one coordinate triple per line starting at the SW corner and increasing in longitude for a particular latitude value, followed by the next latitude values moving up the file. These x,y coordinate values represent the positions in degrees in the order lat, long with positive latitude values down from the equator, resulting in a DTI corner and direction of SW and anticlockwise. The index qualifier is not required as the origin offset is contained in the first data record, and the DTI extents and pixel sizes are known to the program (ie. 101 x 101 values of 0.005 degree size pixels on a geographic projection).

The second format (MOBILE) uses a binary file containing just the height values representing a DTI file with order and direction of NW and clockwise. Again the index file is not required except to give the origin offset as the DTI extents and pixel sizes are known to the program (ie. 320 x 320 values of 1.0 degree x 40 minute size pixels on a geographic projection).

MESSAGES (SUCCESS)

These messages are used to indicate that the program has succeeded in performing some action, and do not require any user action.

NORMAL, successful function return

Explanation: This message is used internally by the program for debugging purposes and will not normally appear to users.

User action: None.

MESSAGES (ERROR)

These messages indicate an error in processing which will cause the program to terminate. The most likely causes are a corrupt or otherwise invalid input file, or an error related to command line processing and file manipulation.

BADDATAVALUE, Bad data value in data file

Explanation: There was an incorrect value in the input text data.

User action: Check the input data file.

INDEXFILERR, Error reading index file

Explanation: There was an error reading the index file. Further messages give more information.

User action: Check that the index file exists and contains sensible data.

INDEXOPNERR, Error opening index file

Explanation: There was an error opening the index file. Further messages give more information.

User action: Check that the index file exists.

NOINDEXFILE, No index file

Explanation: There was no index file given.

User action: Give one.

TEXTEOFERR, Unexpected end of data file

Explanation: There was insufficient input text data.

User action: Check the input data file.

TEXTFILERR, Error reading text file

Explanation: There was an error reading the text file. Further messages give more information.

User action: Check that the text file exists and contains sensible data.

TEXTOPNERR, Error opening text file

Explanation: There was an error opening the text file. Further messages give more information.

User action: Check that the text file exists.

MESSAGES (OTHER)

In addition to the above messages which are generated by the program itself, other messages may be produced by the command line interpreter (CLI) and by Laser-Scan libraries. In particular, messages may be generated by the DTILIB library and by the Laser-Scan I/O library, LSLLIB. DTILIB library messages are introduced by '%DTILIB' and are documented in the MATRIX package reference manual. In most cases DTI errors will be due to a corrupt input file, and this should be the first area of investigation. If the cause of the error cannot be traced by the user, and Laser-Scan are consulted, then the output file should be preserved to facilitate diagnosis. LSLLIB messages are introduced by '%LSLLIB' and are generally self-explanatory. They are used to explain the details of program generated errors.

APPENDIX A

DTI FORMAT FILES

A DTI (Digital Terrain Image) file is the means by which Laser-Scan hold grid based geographic data, and in particular elevation data in the form of a DEM.

DTI files derive their name from 'Digital Terrain Image Section.' In essence they are images suitable for mapping into a program's virtual memory space. Once mapped into memory the data may be treated as an array, and accessed rapidly by application programs. DTILIB provides routines to perform this memory mapping and basic i/o operations.

A DTI file consists of a header and data area. For most types of DTI file the header is of a fixed length (but see LSLA type file below), and the data area is of a variable length.

DTI HEADER

DTI HEADER

The information contained in the header allows an application program to determine the dimensionality of the matrix, the ground unit values, and the location of the matrix on the earth's surface. In the context of a DEM, the structure of the header will vary with the source of the elevation data.

DTILIB provides two routines specifically to read the DTI header values. The first, DTI_READ_HEADER, reads the header record for all DTI files and puts the values into DTIHDR.CMN. The second, DTI_READ_PROJ_REC, reads the LSLA projection record if present, and puts any values into DTIPROJ.CMN. The presence of the projection record is indicated by HAD_PROJ_RECORD(DTILUN) in DTIHDR.CMN, with its details held in DTIPROJ.CMN.

5 different header structures may be distinguished, and identified by means of the header type identifier held in the first 4 bytes of the DTI file:

1. UHL1 DTED Change 2
2. TED4 DTED Change 3/4
3. MIKE (historical) Output from the PANACEA modelling package
4. ALVY (historical) ALVEY project file
5. LSLA Laser-Scan Type A header format

In the latest implementation of DTILIB, the MIKE and ALVY header formats are now treated as historical. The LSLA header replaces both these formats. If projection information is required to be stored in the header of the DTI file a LSLA header format should be used.

The following tables describe the length, offset and content of fields in the different DTI headers. The length and offset values are specified in bytes.

DTI HEADER

UHL1 TYPE DTI FILES

UHL1 DTI files are derived from DMA-format files (DTED Change 2). The header of these images is a direct copy of the character data from the UHL1 block at the start of the original tape file.

Field length	Field offset	Description
4	0	Header Type Identifier = UHL1
76	4	UHL Record
2	80	X Data Extent
2	82	Y Data Extent
4	84	X Grid Interval
4	88	Y Grid Interval
2	92	Minimum Byte or Word Data Value
2	94	Maximum Byte or Word Data Value
4	96	Minimum Long or Real Data Value
4	100	Maximum Long or Real Data Value
2	104	Data Type Identifier
150	106	Unused
	256++	Data Area

TED4 TYPE DTI FILES

TED4 DTI files are derived from DMA-format files (DTED Change 3/4). This format does not retain the UHL1 record since all the information in it is duplicated in the DSI and ACC records. These latter records are stored as on the original tape.

Field length	Field offset	Description
4	0	Header Type Identifier = TED4
2	4	X Data Extent
2	6	Y Data Extent
4	8	X Grid Interval
4	12	Y Grid Interval
2	16	Minimum Byte or Word Data Value
2	18	Maximum Byte or Word Data Value
4	20	Minimum Long or Real Data Value
4	24	Maximum Long or Real Data Value
2	28	Data Type Identifier
206	30	Unused
648	236	DSI Record
2700	884	ACC record
	3584++	Data Area

DTI HEADER

MIKE TYPE DTI FILES

MIKE DTI files are derived from the PANACEA terrain model generation package. These type of files are now historical. The current implementation of DTILIB will read MIKE files, but will prevent DTI files with a MIKE header from being created.

Field length	Field offset	Description
4	0	Header Type Identifier = MIKE
2	4	X Data Extent
2	6	Y Data Extent
4	8	X Grid Interval
4	12	Y Grid Interval
2	16	Minimum Byte or Word Data Value
2	18	Maximum Byte or Word Data Value
4	20	Minimum Long or Real Data Value
4	24	Maximum Long or Real Data Value
2	28	Data Type Identifier
226	30	Unused
	256++	Data Area

ALVY TYPE DTI FILES

ALVY DTI files vary from other DTI files in having a variable length header record. The length of the record is defined by a header length field (at byte offset 30) in the header. These type of files are now historical. The current implementation of DTILIB will read ALVY files, but will prevent DTI files with a ALVY header from being created.

Field length	Field offset	Description
4	0	Header Type Identifier = ALVY
2	4	X Data Extent
2	6	Y Data Extent
4	8	X Grid Interval
4	12	Y Grid Interval
2	16	Minimum Byte or Word Data Value
2	18	Maximum Byte or Word Data Value
4	20	Minimum Long or Real Data Value
4	24	Maximum Long or Real Data Value
2	28	Data Type Identifier
2	30	Unsigned Word Defining Start of Data Area (ie. Length of Header)

DTI HEADER

LSLA TYPE DTI FILES

LSLA DTI files vary from other DTI files in having a variable length header record. The length of the record is defined by a header length field (at byte offset 30) in the header. These types of files are now generated in most situations by Laser-Scan utilities.

Field length	Field offset	Description
4	0	Header Type Identifier = LSLA
2	4	X Data Extent
2	6	Y Data Extent
4	8	X Grid Interval
4	12	Y Grid Interval
2	16	Minimum Byte or Word Data Value
2	18	Maximum Byte or Word Data Value
4	20	Minimum Long or Real Data Value
4	24	Maximum Long or Real Data Value
1	28	Data Type Identifier
1	29	Data Order Values (Corner of Origin and Direction)
2	30	Unsigned Word Defining Start of Data Area (ie. Length of Header)

DTI DATA AREA

DTI DATA AREA

The structure of the data area is common to all types of DTI files. The size of the data area is defined by means of the east and north extent values in the DTI header. The data values are currently held as bit (binary), byte, word (INTEGER*2), longword (INTEGER*4) or real. This may be determined from the header data type identifier.

The first data value encountered in the data array is the south-west DTM value. The final data value is the north-east DTM value. Intervening data values are organised on a column basis, with the southernmost value of the column always being encountered first.

$s(1,1), s(1,2), \dots, s(1,n), s(2,1), \dots, s(e,1), \dots, s(e,n)$

where: 's' is the sample $s(1,1)$ = SW corner of the grid
'n' is the north extent
'e' is the east extent

3	6	9
2	5	8
1	4	7

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