Laser-Scan Ltd.

CONVERT PACKAGE

IFFDLG Reference

Issue 1.1 - 5-May-1992

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

Document "IFFDLG REFERENCE", Category "REFERENCE"
Document Issue 1.1   J Cadogan (modified 05-May-1992)

CONTENTS

IFFDLG - Change Record

Version 1.0 S Townrow 17-June-1991

Module IFFDLG - Reorganised package documentation.

Version 1.2 J Cadogan 31-January-1992

Module IFFDLG
- New I2dlg qualifiers /DATUM, /DECIMAL_HEIGHTS and /HEIGHT_UNITS added which are reflected in the documentation.
- I2DLG New information message AUTONOD and new warning message HEINOTREQ.
- I2DLG Description of the translation of height values from AC type 3's added.

PREFACE

Intended audience

This manual is intended for users of a specific utility of the Laser-Scan CONVERT package running under the VAX/VMS operating system. Each manual contains the documentation for a particular CONVERT utility and a site will only receive new or updated documentation for those utilities which they have purchased.

Structure of this document

This document is composed of 2 major sections.

The Introduction is an overview of the CONVERT package and its purpose.

There then follow the User Guides for the individual modules which comprise CONVERT. Each individual module contains the same basic categories of information. These are:

MODULE - the name of the CONVERT module.

FORMAT DESCRIPTION - a description of the data format written or read by the utility programs in this conversion module.

DATA PREPARATION - guidance on how to digitise or prepare the IFF and other data required by the utility programs in this module.

For each utility program in the module, there will then be the following categories:

UTILITY - the name of the utility.

FUNCTION - a synopsis of what the utility does.

FORMAT - a summary of the utility command format and command qualifiers. Default qualifier settings are indicated.

PROMPT - how it prompts the user.

PARAMETERS - description of expected command parameters.

COMMAND QUALIFIERS - description of all command qualifiers. Qualifiers are ordered alphabetically and default argument values are indicated.

RESTRICTIONS - a summary of restrictions on the use of

qualifiers

DESCRIPTION - the definitive description of the utility action.

COMMANDS - for interactive utilities only, a description of all commands. Commands are ordered alphabetically and default argument values are indicated.

EXAMPLES - annotated examples of utility useage.

MESSAGES - all classes of message are listed and described and suggested user action given. The messages are divided into sections according to message severity within which the messages are ordered alphabetically by message mnemonic.

Conventions used in this document

Convention	Meaning
<CR>	The user should press the carriage control key on the terminal
<CTRL/x>	The phrase <CTRL/x> indicates that the user must press the key labelled CTRL while simultaneously pressing another key, for example, <CTRL/Z>.
$ **IFF2SIF<CR>**	Command examples show all user entered commands in **bold** type.
$ **IFF2SIF<CR>** . . .	Vertical series of periods, or ellipsis, mean either that not all the data that CONVERT would display in response to the particular command is shown or that not all the data that the user would enter is shown.
file-spec...	Horizontal elipsis indicates that additional parameters, values or information can be entered.
[logical-name]	Square brackets indicate that the enclosed item is optional. (Square brackets are not, however, optional in the syntax of a directory name in a file-specification, or in the syntax of a substring specification in a VMS assisnment statement).

Convention	Meaning
'integer'	An integer number is expected in the specified input or output field. (See "Command line data types" below).
'real'	A real number is expected in the specified input or output field. (See "Command line data types" below).
'file-spec'	A VMS file specification is expected in the specified input or output field.
'device-name'	A VMS device specification (for instance, MTA0:) is expected in the specified input or output field.

CHAPTER 1

DLG FORMAT DESCRIPTION

FORMAT DESCRIPTION

Introduction

The program I2DLG provides a translation from Laser-Scan's Internal Feature Format (IFF) to the U.S. Geological Survey Digital Line Graph (DLG) format. For a brief comparison of the way IFF and DLG regard data, see the section on 'Data Preparation' below.

The program produces the **Standard DLG Distribution format (Level 3)**, as described in the document **National Mapping Program, Technical Instructions, Data Users Guide 1, US GeoData, Digital Line Graphs from 1:24,000-Scale Maps.** of 1986, (Department of the Interior, U.S. Geological Survey, National Mapping Division.)

Magnetic tape output

The program write to magnetic tape in DLG-3 format in ASCII code, in a block size that is divisible by 144 and which lies in the range 144 to 5760 bytes (inclusive). Records have a fixed length of 144 characters and are padded with spaces if necessary. The output is normally at 1600 bpi, PE, on 9 track tape.

There are no header blocks, only a series of header records at the start of the tape. There are no tapemarks at either the start or end of the file on tape. A single run of I2DLG will read a single IFF file and create a single data file on tape.

Disk file output

Output may also be made to disk file. Again, the record length defaults to 144 bytes. Records are filled with spaces if necessary.

Each disk file contains the output from one IFF file.

These files may then be output to magnetic tape using either of the VAX programs BACKUP or EXCHANGE - the former is intended for transfer between VAXes, and the latter provides an ANSI standard tape format (it replaces the RSX utility FLX on VAXes with VMS version 4.0 and up). Consult the relevant Digital manuals for more details of these utilities.

CHAPTER 2

DLG DATA PREPARATION

DATA PREPARATION

Comparison of DLG and IFF

IFF is a feature oriented data format - data is separated into features, and each feature represents one 'thing' on the map. An integer feature code is used to say what type of thing it is that the feature represents. A feature might thus be a contour, or a house, or a river, depending on the type of map being digitised, and the way that the data is to be used. The IFF format also has the capacity to hold information on a link and node structure of the points and lines.

An DLG file contains information about nodes, areas and lines held in data records, which are similar in concept to single point and linear IFF features. Each data record holds information about a single feature including, for lines, its structural links to node and area features.

Format of IFF Files for Transfer To DLG

A DLG file contains header information, held in the initial logical records, each one holding a specific item of information about the data set such as the scale and the map corner coordinates. The Data Users Guide contains a detailed description of these records.

In an IFF file, as read by I2DLG, most of the header information must be held in a predetermined set of attributes (AC entries) attached to a feature in layer 0. The remainder of the header information is extracted by the program from the Map Descriptor entry of the IFF file which must be a complete and version 2 entry. Details of the AC entries used are given below.

A DLG-3 (standard format) file holds data only as nodes, areas and lines where the node and area data records hold primarily the coordinates of the entity and any attributes are held in subsequent records. The coordinate strings of line features are held in a series of records following the principle line record.

The IFF file to be converted to DLG format will hold the nodes,areas and lines as separately feature coded features where the nodes and areas are unorientated point features, and the lines are linear features. In addition DLG nodes will be generated from junction entries in the IFF file where the node is not represented by a appropriately feature coded node feature. There is a fourth category of feature allowed in the IFF file and that is unorientated point features that are not at node locations nor represent areas. These will be converted into DLG format as a 'degenerate line' comprising a node record and a line record of zero length.

Heights for line features in an IFF file are held as AC's of type 3. These heights are converted into DLG as the appropriate elevation attribute code for the particular category that a feature is in. The units which the heights represent can be specified with the

/HEIGHT_UNITS qualifier and can be either feet or metres. If the heights are an offset below a datum then the /DATUM qualifier will specify this. Height values are by default rounded to the nearest integer when converted, but if the /DECIMAL_HEIGHTS qualifier is used then the integer part of the height value will be output along with an additional attribute code giving its decimal part rounded to 1 decimal place. The categories which use heights are Hydrography, Hypsography, and Survey Control. AC type 3's in features which belong to other categories will be ignored and a warning message issued.

The AC Entries Used to Hold DLG Information in IFF

In the IFF file AC entries are used to hold DLG header data, indicate special area features, hold 'left' and 'right' labels of lines and to hold the major and minor DLG codes of features.

The contents of DLG header record fields, with a few exceptions, are held in Ancillary Code (AC) entries in layer 0 of the IFF file. The AC entries may be held in any kind of feature in layer 0 .

The program I2DLG always refers to the ACs by the same names, so allowing the user to determine which code is used in the AC entries in the IFF file, by supplying a suitable Feature Representation Table (FRT) file. The names of the header ACs are encoded in the program and must not be altered by the user. An example FRT ACD table is given below.

There are some elements of the DLG header which are not held in ACs. These are the corner points which are read from the IFF Corner Point (CP) entry, the map projection parameters and the scale which are read from the IFF Map Descriptor (MD) entry. The remaining fields, not given by the ACs in Table 1 of the FRT, have fixed values encoded in the program.

The DLG format requires the first area entry to be defined as an outside area. This area feature may be identified by an appropriate AC with the name 'OUTSIDE AREA' if the user wishes to locate it at a particular position. If no area feature with this AC is supplied in the IFF file then a default DLG area record will be created at the position 0,0 with major and minor codes of 0.
The IFF file must contain at least 1 area feature as the background area identified by an AC of name 'BACKGROUND AREA'. The coordinates of all background areas will be made 0,0 in the DLG file.

The DLG format for line records includes a cross_reference to the areas to the left and right of it. I2DLG reads this information from ACs of code 4 and 5 in the IFF line features. These ACs will always hold respectively the left and right area references which in this case are the FSNs of the area point features.

The IFF format holds the major and minor codes of the DLG features as AC entries within node, area, line and point features. The DLG major code is the AC code number and the DLG minor code is held as the value of the AC. These ACs are converted directly into the DLG attribute code records following the feature records.

I2DLG will construct the DLG header record specifying the category of the data from the name in the ACD table of the first valid AC read from the IFF file. All valid attributes (major codes) for the 1:24,000 series of quads are given in the example FRT ACD Table 2 below. Both the code and the names in this table may be altered and extended to cover the categories of other scales by the user.

The FRT file will be read by the program, which then uses it to determine the AC codes corresponding to each AC name. Full details of the preparation and use of FRT files can be found in the Laser-Scan 'FRT User Guide'.

The default number of AC codes allowed in an FRT file is 50. To execute I2DLG with more codes (eg the full range of attributes defined below and in the example FRT file) the allowable number must be increased. If this has not been implemented systemwide by the system manager, increase the allowable number of codes by entering the following command to the DCL prompt:

```
$DEFINE LSL$FRT_ACDMAX 200
```

Where a text field is held in an AC of type "C" (text) the text is generally held as "Additional Text".

A Typical FRT File for use with DLG Data Held in IFF

The following is a listing of a typical FRT file which might be used with I2DLG and other utilities to prepare and process an IFF file for a DLG format magnetic tape file. This FRT file is normally supplied with the program.
LSL$PUBLIC_ROOT:[CONVERT.ACCEPT]DLG_ACD_TABLE.FRT

```
! USGS 24/50 verification plot Feature Representation Table (FRT)
! version 2 PGH 28/1/86

! first the FRT itself
!       FC      GT      Colour  Width   Size    SC      Description
FRT     0       1       1       0       0       0       Unknown feature type
FRT     1       7       1       0       0.5     7       areas
FRT     2       7       2       0       0.5     5       nodes
FRT     3       1       3       0       0       0       lines
FRT     4       8       4       0       0.3     6       points (degen. lines)
FRT     10      7       2       0       2.0     1       corner points
FRT     11      10      2       0       5       1       text annotation
FRT     64      1       1       0       0       0       Unknown feature type
FRT     101     10      1       0       2       1       area annotation
FRT     102     10      2       0       2       1       node annotation
FRT     103     10      3       0       2       1       line annotation
FRT     104     10      4       0       2       1       point annotation
! then the SCT which defines symbol components
!       FC      GT      Colour  Width   Size    SC      Description
SCT     0       1       0       0       0       0       linear
SCT     1       1       0       0       0       0       linear
SCT     2       2       0       0       0       0       clockwise arc
SCT     3       3       0       0       0       0       anticlockwise arc
SCT     4       4       0       0       0       0       circumcircle arc
SCT     5       5       0       0       0       0       full circumcircle
SCT     6       6       0       0       0       0       interpolated curve

! then the group definitions
!       name       range,range
!GROUP  CENTRES          66,80,85-102,352-371

! then the pattern definitions
!       Pattern  Major  Minor  Major  Minor  Overall Major  Minor  Major  Minor
!       Index    UC     UC     Repeat Repeat Size    Size   Size   Width  Width

PATTERN 5       0      0      0      0      0.9     0.6    0.0    0.     0.
PATTERN 6       5      0      0      0      1.8     0.6    0.0    0.3    0.
PATTERN 7       12     0      0      0      2.58    1.8    0.0    0.9    0.
PATTERN 8       0      0      0      0      2.4     1.44   0.0    0.     0.
PATTERN 10      0      0      0      0      1.8     1.2    0.0    0.     0.
PATTERN 12      0      0      0      0      2.76    2.16   0.0    0.     0.
PATTERN 15      0      0      0      0      2.7     1.8    0.0    0.     0.
PATTERN 20      1      0      0      0      4.0     3.99   0.0    2.0    0.
PATTERN 22      0      0      0      0      3.0     2.5    0.0    0.     0.
PATTERN 25      0      0      0      0      4.5     3.0    0.0    0.     0.
PATTERN 28      0      5      0      0      5.4     3.6    0.6    3.6    0.3
PATTERN 30      0      0      0      0      5.4     3.6    0.0    0.     0.
```

```
PATTERN 32       5      0      0      0      5.4     3.6    0.0    1.8    0.
PATTERN 80       0      0      0      0      14.4    9.6    0.0    0.     0.
PATTERN 81       5      0      0      0      5.0     0.6    0.0    0.3    0.0
PATTERN 82       0      0      0      0      9.0     6.0    0.0    0.0    0.0
PATTERN 83       0      0      0      0      11.0    6.0    2.0    0.0    0.0
PATTERN 84       0      0      0      0      6.0     4.0    0.0    0.0    0.0
PATTERN 85       1      0      0      0      6.0     5.99   0.0    1.5    0.0

!
!=============================================================================
!
!   A T T R I B U T E   C O D E S
!
!=============================================================================
!
!
ACD TABLE 0
ACD I   120     OLD_DLG
!
!
!=============================================================================
!
!
ACD TABLE       1               ! Header record contents ( 1:24,000 scale)
!
!*****************************************************************
! DO NOT ALTER THE NAMES IN THIS TABLE AS THEY ARE ENCODED IN I2DLG
!*****************************************************************
!
!       Code    Name
!
! A.1 record
ACD I     1     CARTO_UNIT              ! held in text string (A40)
ACD I     2     SOURCE_MATER            ! held in text string (A10)
ACD C     3     DATE_QUAL               ! P, L or I
ACD I     4     SOURCE_SCALE
ACD C     5     QUAD_NUMBER
ACD C     6     CONT_INT_L
ACD C     8     BATHY_INT_L
ACD C     9     CONT_INT_S
ACD C    11     BATHY_INT_S
ACD C    12     FLAG_A
ACD C    13     FLAG_B
ACD C    14     FLAG_C
ACD C    15     EDGE_FLAG
ACD C    16     EDGEWS
ACD C    17     EDGEWR
ACD C    18     EDGENS
ACD C    19     EDGENR
ACD C    20     EDGEES
ACD C    21     EDGEER
ACD C    22     EDGESS
ACD C    23     EDGESR
ACD I    24     REG_SW_LONG             ! held in text string (A24)
ACD I    25     REG_SW_LAT              ! held in text string (A24)
ACD I    26     REG_NW_LONG             ! held in text string (A24)
```

```
ACD I    27     REG_NW_LAT              ! held in text string (A24)
ACD I    28     REG_NE_LONG             ! held in text string (A24)
ACD I    29     REG_NE_LAT              ! held in text string (A24)
ACD I    30     REG_SE_LONG             ! held in text string (A24)
ACD I    31     REG_SE_LAT              ! held in text string (A24)
ACD I    32     PROJ_A_ONE              ! held in text string (A24)
ACD I    33     PROJ_A_TWO              ! held in text string (A24)
ACD I    34     PROJ_A_THREE            ! held in text string (A24)
ACD I    35     PROJ_A_FOUR             ! held in text string (A24)
!
! Special Areas
!
ACD I   998     OUTSIDE_AREA
ACD I   999     BACKGROUND_AREA
!
!=====================================================================
!
ACD TABLE       2               ! DLG base categories on 1:24,000 scale
!
! The codes and names in this table are user defineable.
!
!       Code    Name                    Minimum Maximum Min. Step
!
!               01234567890123456789
ACD I   020     HYPSOGRAPHY             0       614
ACD I   021     HYPSOGRAPHY_ELEV_A      0       9999
ACD I   022     HYPSOGRAPHY_ELEV_B      0       9999
ACD I   023     HYPSOGRAPHY_ELEV_C      0       9999
ACD I   024     HYPSOGRAPHY_ELEV_D      0       9999
ACD I   025     HYPSOGRAPHY_ELEV_E      0       9999
ACD I   026     HYPSOGRAPHY_ELEV_F      0       9999
ACD I   027     HYPSOGRAPHY_ELEV_G      0       9999
ACD I   028     HYPSOGRAPHY_ELEV_H      0       9999
ACD I   029     HYPSOGRAPHY_COINC       0       99
ACD I   050     HYDROGRAPHY             0       618
ACD I   051     HYDROGRAPHY_ELEV_FT     0       9999
ACD I   052     HYDROGRAPHY_ELEV_M      0       9999
ACD I   053     HYDROGRAPHY_ANGLE       0       999
ACD I   055     HYDROGRAPHY_RIV_MILE    0       9999
ACD I   056     HYDROGRAPHY_FT_BELOW    0       9999
ACD I   057     HYDROGRAPHY_M_BELOW     0       9999
ACD I   058     HYDROGRAPHY_BEST_EST    0       0
ACD I   059     HYDROGRAPHY_COINC       0       99
ACD I   070     SURFACE_COVER           0       201
ACD I   078     SURFACE_COVER_BEST      0       0
ACD I   079     SURFACE_COVER_COINC     0       99
ACD I   080     NON_VEG_SUFACE_COVER    0       300
ACD I   088     NON_VEG_SUFACE_BEST     0       0
ACD I   089     NON_VEG_SUFACE_COINC    0       99
ACD I   090     BOUNDARIES              0       301
ACD I   091     BOUNDARIES_FIPS_CODE    0       99
ACD I   092     BOUNDARIES_CNTY_FIPS    0       999
ACD I   095     BOUNDARIES_MONUMENT     0       9999
ACD I   099     BOUNDARIES_COINC        0       99
ACD I   150     SURVEY_CONTROL          0       609
ACD I   151     SURVEY_CONTROL_A
```

```
ACD I   152     SURVEY_CONTROL_B
ACD I   153     SURVEY_CONTROL_C
ACD I   154     SURVEY_CONTROL_D
ACD I   156     SURVEY_CONTROL_E
ACD I   159     SURVEY_CONTROL_F
ACD I   170     TRANSPORT_ROAD
ACD I   171     TRANSPORT_ROAD_A
ACD I   172     TRANSPORT_ROAD_B
ACD I   173     TRANSPORT_ROAD_C
ACD I   174     TRANSPORT_ROAD_D
ACD I   175     TRANSPORT_ROAD_E
ACD I   176     TRANSPORT_ROAD_F
ACD I   177     TRANSPORT_ROAD_G
ACD I   178     TRANSPORT_ROAD_H
ACD I   179     TRANSPORT_ROAD_I
ACD I   180     TRANSPORT_RAIL
ACD I   181     TRANSPORT_RAIL_A
ACD I   188     TRANSPORT_RAIL_B
ACD I   189     TRANSPORT_RAIL_C
ACD I   190     TRANSPORT_SYSTEMS
ACD I   193     TRANSPORT_SYSTEMS_A
ACD I   198     TRANSPORT_SYSTEMS_B
ACD I   199     TRANSPORT_SYSTEMS_C
ACD I   200     MANMADE_STRUCTURES
ACD I   202     MANMADE_STRUCTURES_A
ACD I   203     MANMADE_STRUCTURES_B
ACD I   208     MANMADE_STRUCTURES_C
ACD I   209     MANMADE_STRUCTURES_D
ACD I   300     US_PLSS
ACD I   301     US_PLSS_A
ACD I   302     US_PLSS_B
ACD I   303     US_PLSS_C
ACD I   304     US_PLSS_D
ACD I   305     US_PLSS_E
ACD I   306     US_PLSS_F
ACD I   307     US_PLSS_G
ACD I   308     US_PLSS_H
ACD I   309     US_PLSS_I
!
```

Structuring of IFF Files for Transfer To DLG

DLG format is a 'structured' format and hence an IFF file must be fully structured into a consistent link-node structure encompassing all the features in the file before attempting to convert from IFF to DLG formats. I2DLG converts the data and structure of a junction structured and left/right labelled IFF file into a 'standard' DLG format, (level 3) file, the program does not perform any further data structuring as part of the conversion.

Before structuring the data the user must ensure that the node, area, line and point features are correctly feature coded, that the attributes of the features are held in appropriate AC entries (see

above for a description of ACs), that different categories of data are in different layers and that a feature in layer 0 has all th required ACs detailing the header record contents. This can be achieved with the LITES2 interactive editor - remembering to use the DLG FRT file.

The IFF file must have a complete type 2 Map Descriptor entry prepared with the IMP utility ITRANS with qualifier /DESCRIPTOR. The units of the coordinates must be in thousandths of an inch, and the origin of the data is normally at the centre of the data area defined by the corner points. This can be achieved with the transformation capabilities of the IMP utility ITRANS.

The IFF file must be prepared for conversion with programs from the Laser-Scan software packages STRUCTURE and POLYGONS. The user is expected to be familiar with the ILINK and IPOLYGON modules of these packages.

It is necessary to label the IFF line features with the Feature Serial Numbers (FSN) of the area features to the left and right of the line. This information is held in the ACs of code 4 and 5, and is used to cross-reference the DLG lines to the DLG internal identification number of the DLG area records to the left and right of the line. The relevant ACs are created in the IFF file by the IPOLYGON module of the POLYGONS package.

For efficient operation of IPOLYGON it may be necessary to split the data into 2 IFF files; one containing the lines and area features (seed points) and another containing the rest of the data. This can be done using the IMP utilities ISELECT and IMERGE as appropriate.
It is necessary to structure the data before running IPOLYGON so an initial run of ILINK with at least the qualifiers /STRUCTURE and /LAYER=0 is required.
IPOLYGON can then be run with at least the qualifiers:
/ONEARM=USE - to label both sides of line segments that do not connect to any other,
/SEED=USE:FSN - to label with the FSNs of the seed (area) points,
/SEGMENT=(LABEL,JUNCTION) - to label the line segments and retain the junction structure.

After running IPOLYGON to label the line segments the FSNs of the data must not be altered.

All the data can then be merged together again and a final run of ILINK with at least the qualifiers /STRUCTURE and /LAYER=0,... made. The data is now in a form suitable for input to I2DLG.

CHAPTER 3

I2DLG UTILITY

UTILITY I2DLG

FUNCTION

I2DLG reads an Internal Feature Format (IFF) file, and produces a file on disc or magnetic tape in U.S. Geological Survey Digital Line Graph (DLG) format.

FORMAT

$ I2DLG input-file-spec output-file-spec

Command qualifiers	**Defaults**
/AREA=feature-code(s)	/AREA=1
/BLOCK_SIZE=block-length	/BLOCK_SIZE=144
/[NO]BY_LAYER	/NOBY_LAYER
/[NO]DATUM	/NODATUM
/[NO]DECIMAL_HEIGHTS	/NODECIMAL_HEIGHTS
/FRT=file-spec	/FRT=LSL$FRT:DLG.FRT
/HEIGHT_UNITS=feet/metres	/HEIGHT_UNITS=F
/LINE=feature-code(s)	/LINE=3
/[NO]LIST	/NOLIST
/[NO]LOG	/NOLOG
/NODE=feature-code(s)	/NODE=2
/POINT=feature-code(s)	/POINT=4
/[NO]REWIND	/NOREWIND

PROMPT

_Input-IFF-file:	input-file-spec
_Output-DLG-file:	output-file-spec

PARAMETERS

input-file-spec

- This parameter specifies the name of an IFF file, and is compulsory. The data written to the output DLG file is read from this file. Only one filename may be specified for each run of the program.
  The default device and extension LSL$IF:.IFJ are applied to the input file specification when it is parsed.

output-file-spec

- This parameter specifies the name of a DLG file, and is compulsory. The data read from the input IFF file is written to this file. Only one filename may be specified for each run of the program.
  If the output file specification does not end with a colon (:) it is assumed to be a disc file, and the default device and extension

HERE:.DLG are applied to the output file specification when it is parsed.
If the output file specification ends with a colon (:) it is considered to be a magnetic tape device name and I2DLG will write the data file to a magnetic tape that has been mounted /FOREIGN.

COMMAND QUALIFIERS

/AREA=integer[,...]

- This qualifier is used to specify the feature code(s) of the IFF point features which the program is to convert into area features in DLG format.
  The default feature code is 1.

/BLOCK_SIZE=block-length

- The /BLOCK_SIZE command qualifier specifies the length in bytes of the blocks written to the magnetic tape. The specified block length must be a multiple of 144 and be between 144 and 5760 inclusive.
  The default block length is 144. This accords with the Data Users Guide specification of 1 record (144 bytes) per block. However, mag. tape usage and writing speed are improved with a higher value. The maximum 5760 bytes will give 40 records per block.
  The qualifier is ignored if given without specifying a magnetic tape device for output.

/BY_LAYER
/NOBY_LAYER (default)

- When the /BY_LAYER command qualifier is given I2DLG will output a DLG dataset consisting of nodes, areas and lines in a particular category for each layer in the input IFF file. So a many layered IFF file, after layer 0, will produce multiple datasets (of different categories) after a single set of header records.
  The default action is to ignore any IFF layer structure and output a single category dataset. In each case layer 0 is used to construct the header records.

/DATUM
/NODATUM (default)

- When the /DATUM command qualifier is given I2DLG will output the height value (AC 3) for a given feature with a DLG attribute code indicates that the value is a height below a datum. For categories which never have datums the the attribute code used is one for heights without a datum.
  The default action is to output the height value attribute codes for heights without a datum.

/DECIMAL_HEIGHTS
/NODECIMAL_HEIGHTS (default)

- When the /DECIMAL_HEIGHTS command qualifier is given I2DLG will output the height value (AC 3) for a given feature with an additional DLG attribute code which gives a decimal for the value so that heights given as accurate 'reals' can be represented.
  The default action is to not to output decimal attribute codes for heights.

/FRT=file-spec

- The /FRT command qualifier specifies a Feature Representation Table (FRT) file which the program will read to determine the AC codes given in the AC entries, in the IFF file, created to hold header and feature attribute information. The program I2DLG always refers to the header ACs using the same names, but the user may alter the codes, onto which these names map, by changing the ACD Table in the FRT file. The names and codes of the feature attribute ACs may be altered by the user similarly.
  The default file specification is LSL$FRT:DLG.FRT. If a file specification is given with /FRT, it is parsed against this default.

/HEIGHT_UNITS=metres/feet

- The /HEIGHT_UNITS command qualifier specifies the units that heights will represent. The parameters given can be either F for Feet or M for Metres.
  The default units are feet (F).

/LINE=integer[,...]

- This qualifier is used to specify the feature code(s) of the linear features which the program is to convert into line features in DLG format.
  The default feature code is 3.

/LIST
/NOLIST (default)

- The /LIST qualifier, when present on the command line, will cause I2DLG to list each record to the user's terminal (SYS$OUTPUT) as it is written to the output DLG file. Two lines of 72 characters each are written for each record.
  It is primarily a diagnostic aid and should be used with discretion as it may generate substantial amounts of output at the terminal.
  When /NOREWIND, the default, is used, the data is written only to the output file.

/LOG
/NOLOG (default)

- The /LOG command qualifier causes I2DLG to write to the users terminal (SYS$OUTPUT) informative messages when files are opened, IFF layers are read, and indications of the progress of the program.
  The output of these messages can be suppressed by the /NOLOG qualifier.

/NODE=integer[,...]

- This qualifier is used to specify the feature code(s) of the IFF point features from which the program is to convert into node features in DLG format.
  The default feature code is 2.

/POINT=integer[,...]

- This qualifier is used to specify the feature code(s) of the IFF point features from which the program is to convert into 'degenerate lines' comprising node and line features in DLG format.
  The default feature code is 4.

/REWIND
/NOREWIND (default)

- The /REWIND qualifier, when present on the command line, specifies that the magnetic tape should be rewound, by I2DLG, to the 'BOT' position before writing of any DLG file is started.
  Note that existing data on the tape will be overwritten
  When /NOREWIND, the default, is used, the data is written starting at the current position of the tape.

RESTRICTIONS

I2DLG operates with the following restrictions:

- o I2DLG cannot be used to generate Optional DLG Distribution format.
- o Features in IFF layer 0 will not be formatted into Standard DLG format, as these features are reserved for use as digitising control and registration marks. Only relevant AC entries will be used to generate the header records.
- o No IFF text entries will be processed.
- o The /AREA, /LINE, /NODE and /POINT qualifiers can each take a maximum of 1024 arguments (including, of course, burst numeric ranges) only.

- If writing to magnetic tape the block size must be divisible by 144, and lie in the range 144 to 5760.

DESCRIPTION

I2DLG is a utility to transfer an Internal Feature Format (IFF) disk file to a 'dataset' in Standard DLG format on magnetic tape or disc. A 'dataset' is a single file on the output tape comprising a series of header records and data records of nodes,areas, and lines. The program allows the creation of multiple sets of data records after one set of header records on one tape but does not currently support datasets spanning more than one tape. Very large files should be divided into smaller files with identical 'header' features in layer 0, and then transferred to separate tapes.

Note that only a single map sheet may be transferred during a single run of the program.

If the /LOG qualifier is used on the command line, the program produces messages giving information about the progress of the program, and any errors or difficulties which may be encountered.

I2DLG transfers ancillary information from a dummy feature in layer 0 of the input IFF file to the header block or blocks of an DLG format tape. Header information is held in the IFF file in a number of AC entries with codes as defined by the FRT file read by the program. The other details of the dummy header feature are ignored by I2DLG.

I2DLG initially scans the whole IFF file to determine the total number of nodes, areas and lines (on a per category basis if /BY_LAYER qualifier is given) and counts point features with FCs given with the /POINT qualifier as a node and a line. Category codes are derived from the first AC entry (after layer 0) with a valid code defined as a category in the ACD tables of the specified FRT file. If the default situation of /NOBY_LAYER applies then all subsequent AC codes must be in the same category (ie have identical first 4 characters in their ACD names). Where the /BY_LAYER qualifier has been given then the AC codes must be consistent within each layer.

The IFF file is then searched for all the Junction Block (JB) entries and a node is counted for each junction that is not already represented by a node feature.

I2DLG then reads all the AC entries in layer 0 of the IFF file and extracts the relevant entries (as defined in the ACD table of the specified FRT file), to generate the DLG header records. To complete the header the scale, corner points and map projection parameters are extracted from the Map Descriptor (MD) and Corner Point (CP) IFF entries. The header records are then written to the DLG file.

The IFF file is then searched for the nodes, areas and lines, previously identified in the initial scan, which are then written as 3 groups of data records together with their attribute information and

coordinates. Also output, for the lines, are the cross-references to the start and end nodes and adjacent areas which constitute the structural information.
This will be repeated for each layer if the /BY_LAYER qualifier has been given.

Details of the structure, content and characteristics of an DLG format tape are to be found in the 'Data Format' section of this modules's documentation.

It is essential that the tape is mounted as a foreign volume with a write-permit-ring prior to running I2DLG. This is achieved using the DCL command MOUNT with the /FOREIGN qualifier e.g.
$ MOUNT MSA0:/FOREIGN.

EXAMPLES

Rewind tape and transfer IFF file to the beginning of the tape

```
$
$ alloc mua0:
%DCL-I-ALLOC, _LSLV3C$MUA0: allocated
$ mount/foreign mua0:
%MOUNT-I-MOUNTED,  mounted on _LSLV3C$MUA0:
$ define lsl$frt_acdmax 200
$ i2dlg/log/frt=here:dlgtest/block_size=5760/rewind frank_s12.ifj mua0:
%LSLLIB-I-IFFOPENED, LSL$DATA_ROOT:[LSL.IFF]FRANK_S12.IFJ;2 opened for read
%I2DLG-I-DLGTAPOPN, DLG tape on device _LSLV3C$MUA0: opened for output
%I2DLG-I-INITSCAN, Scanning IFF file for category totals.
%I2DLG-I-LAYER, layer 0
%I2DLG-I-LAYER, layer 1
%I2DLG-I-JUNCSCAN, Counting junctions.
%I2DLG-I-HEADOUT, Writing DLG header records.
%I2DLG-I-JUNCPOS, Finding junction positions.
%I2DLG-I-NODEOUT, Writing DLG node records.
%I2DLG-I-AREAOUT, Writing DLG area records.
%I2DLG-I-LINEOUT, Writing DLG line records.
 ELAPSED:    0 00:00:26.47  CPU: 0:00:13.13  BUFIO: 21  DIRIO: 176  FAULTS: 259
```

Transfer IFF file to a disc file and list at terminal.

```
$
$ alloc mua0:
%DCL-I-ALLOC, _LSLV3C$MUA0: allocated
$ mount/foreign mua0:
%MOUNT-I-MOUNTED,  mounted on _LSLV3C$MUA0:
$ define lsl$frt_acdmax 200
$ i2dlg/log/frt=here:dlgtest/list frank_s12 testfile
%LSLLIB-I-IFFOPENED, LSL$DATA_ROOT:[LSL.IFF]FRANK_S12.IFJ;2 opened for read
%I2DLG-I-DLGOPNOUT, DLG file HERE:TESTFILE.DLG;0 opened for output
%I2DLG-I-INITSCAN, Scanning IFF file for category totals.
%I2DLG-I-LAYER, layer 0
%I2DLG-I-LAYER, layer 1
%I2DLG-I-JUNCSCAN, Counting junctions.
%I2DLG-I-HEADOUT, Writing DLG header records.
laserscan                                frank_s12 p   24000   1
                                         10  ,100  2   ,5   abcdefghijkl
     3     1     0       0.000000000000000       0.000000000000000
 0.000000000000000       0.000000000000000       0.000000000000000
       0.000000000000000       0.000000000000000       0.000000000000000
       0.000000000000000       0.000000000000000       0.000000000000000
       0.000000000000000       0.000000000000000       0.000000000000000
       0.000000000000000     2       0.000000000000000     0     4
```

```
SW     0     0NW     0    38NE    38    38SE    38     0

     1

SURVEY_CONTROL          12    12     4     4    14    14

%I2DLG-I-JUNCPOS, Finding junction positions.
%I2DLG-I-NODEOUT, Writing DLG node records.
N      1    33    16     4     0

   150   300   150   301   150   302   150   303

N      2    33    33     1     0

   150   100

N      3    19    21     0     0

N      4     0    38     0     0

N      5    38    38     0     0

N      6    38     0     0     0

N      7     4     9     0     0

N      8    19     0     0     0

N      9     0    23     0     0

N     10    19    10     0     0

N     11    11    14     0     0

N     12    12     5     0     0

%I2DLG-I-AREAOUT, Writing DLG area records.
A      1     0     0     1     0

     0     0

A      2     9    11     0     0

A      3    12    28     0     0

A      4    29    17     0     0

A      5     4     4    14     0

   150   300   151  1234   151    10   151    20   151    30   151    40
   151    50   151    60   151    70   151    80   151    90   151   100
   151   110   151   120

%I2DLG-I-LINEOUT, Writing DLG line records.
L      1     4     5     1     3     2     0     0
```

```
     0    38    38    38

L       2     5     6     1     4     2     0     0

    38    38    38     0

   ...
   ...
   ...

L     14     2     2     0     0     2     1     0

    33    33    33    33

   150   100

 ELAPSED:    0 00:00:29.69  CPU: 0:00:13.54  BUFIO: 146  DIRIO: 189  FAULTS: 273
```

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, Normal, successful completion

> **Explanation:** I2DLG has finished its operations successfully and without problems.
>
> **User action:** None.

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.

AREAOUT, Writing DLG area records.

Explanation: The area records for the DLG file are being written out.

User action: None.

AUTONOD, 'integer' nodes generated from junctions.

Explanation: The number of nodes generated from junctions.

User action: None.

DLGOPNOUT, DLG file 'file-spec' opened for output

Explanation: The file specified has been opened for writing the DLG file to

User action: None.

DLGTAPOPN, DLG tape on device 'file-spec' opened for output

Explanation: The magnetic tape device specified has been opened for writing the DLG file to

User action: None.

HEADOUT, Writing DLG header records.

Explanation: The header records for the DLG file are being written out.

User action: None.

INITSCAN, Scanning IFF file for category totals.

Explanation: The IFF file is being read and totals for nodes,areas and lines generated.

User action: None.

JUNCPOS, Finding junction positions.

Explanation: The IFF file Junction Block entries are being read and node locations for the current category saved.

User action: None.

JUNCSCAN, Counting junctions.

Explanation: The IFF file Junction Block entries are being read and node locations counted.

User action: None.

LAYER, layer 'integer'

Explanation: The start of the specified layer has been found in the IFF file

User action: None.

LINEOUT, Writing DLG line records.

Explanation: The line records for the DLG file are being written out.

User action: None.

NODEOUT, Writing DLG node records.

Explanation: The node records for the DLG file are being written out.

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.

HADOUT, Duplicate outside area feature - ignored

Explanation: Subsequent area features defining an outside area are ignored.

User action: If the area feature is required then edit the IFF file with LITES2 or IPATCH and rerun I2DLG

HEINOTREQ, Category 'category' does not require heights (FSN 'fsn')

Explanation: A feature with an AC 3 (height) is in a category which does not use heights.

User action: Check that the feature is in the appropriate category

INVALACNOD, Inconsistent AC value 'integer' ignored

Explanation: An Ancillary Code entry of a node feature has been found in the IFF file with a value that is incompatible with a DLG node record. The attribute is ignored.

User action: If the attribute is required then edit the IFF file with LITES2 or IPATCH and rerun I2DLG

INVALACPT, Inconsistent AC value 'integer' ignored

Explanation: An Ancillary Code entry of a point feature has been found in the IFF file with a value that is incompatible with a DLG point record. The attribute is ignored.

User action: If the attribute is required then edit the IFF file with LITES2 or IPATCH and rerun I2DLG

NOTALINE, 'line' feature (FSN:'fsn') ignored - not a line

Explanation: The feature has a specified line feature code but is not held as a line in the IFF file so is not output to the DLG file.

User action: Examine feature in IFF file with IPATCH or LITES2 and correct as necessary.

NOTASYMBA, area feature (FSN:'fsn') ignored - not a symbol

Explanation: The feature has a specified area feature code but is not held as a symbol in the IFF file so is not output to the DLG file.

User action: Examine feature in IFF file with IPATCH or LITES2 and correct as necessary.

NOTASYMBN, node feature (FSN:'fsn') ignored - not a symbol

Explanation: The feature has a specified node feature code but is not held as a symbol in the IFF file so is not output to the DLG file.

User action: Examine feature in IFF file with IPATCH or LITES2 and correct as necessary.

NOTASYMBP, point feature (FSN:'fsn') ignored - not a symbol

Explanation: The feature has a specified point feature code but is not held as a symbol in the IFF file so is not output to the DLG file.

User action: Examine feature in IFF file with IPATCH or LITES2 and correct as necessary.

TOOAC, Attribute limit exceeded - AC 'integer' 'integer' ignored

Explanation: The limit of 24 attributes for a feature has been exceeded. Subsequent attributes will be ignored.

User action: If the attribute is required then edit the IFF file with LITES2 or IPATCH and rerun I2DLG

UNK0ACNAM, AC name 'name' is not a valid DLG record type A field.

Explanation: The name of the AC type read from the ACD table in the FRT file does not correspond to any of the valid field names as defined within I2DLG for the record type A. The entry will be ignored

User action: Check the contents of the ACD table in the specified FRT file.

UNKATYP, invalid AC type 'integer' ignored

Explanation: An unknown AC entry has been found in the IFF file and ignored.

User action: If the attribute is required check that the correct FRT file is being used or amend IFF file using LITES2 or IPATCH and rerun I2DLG.

UNKDTYP, unknown AC data type in an AC type 'integer' entry

Explanation: Entry will be ignored

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.

BADACD, error initialising ACD table in FRT file 'file-spec'

Explanation: I2DLG has not been able to correctly read the ACD table in the specified FRT file.

User action: Check the contents of the ACD tables of the FRT file

BADDEV, error enquiring about device 'name'

Explanation: The specified device is not available. The associated system error messages should give further information.

User action: Rerun I2DLG with amended qualifiers.

BADFEAT, error processing feature 'fsn' ('isn')

Explanation: An error - usually with the AC entries - has been encountered while processing the feature. The associated error messages will give further information.

User action: Investigate the cause of the error using IPATCH or LITES2 and rerun I2DLG on the data.

BADFRT, error initialising FRT file 'file-spec'

Explanation: I2DLG has not been able to open the specified FRT file. The associated system error messages will give further information.

User action: Check the spelling of the FRT file-spec and that the required FRT is available in the directory LSL$FRT:

BADLEFTFSN, Invalid or missing lefthand AC label in feature FSN 'integer'

Explanation: An AC entry of type 4 has an invalid or missing label containing the FSN of the area feature to the left of the line.

User action: Enter a correct value using IPATCH, LITES2 or IPOLYGON.

BADRIGHTFSN, Invalid or missing righthand AC label in feature FSN 'integer'

Explanation: An AC entry of type 5 has an invalid or missing label containing the FSN of the area feature to the right of the line.

User action: Enter a correct value using IPATCH, LITES2 or IPOLYGON.

BADUNT, Map Descriptor has wrong units - must be Thousandths

Explanation: The data must be in thousandths of an inch (Codes 103 or 104) in order to be translated into DLG format.

User action: Amend Map Descriptor and/or data using ITRANS and rerun I2DLG.

ERROPNDLG, error opening DLG disc file 'filename' .

Explanation: I2DLG was unable to correctly open a disc file for DLG data.

User action: Subsequent system error messages will give further information.

ERROROUT, error outputting a record

Explanation: I2DLG was unable to correctly output a record to the magtape.

User action: Report possible program problem to Laser-Scan.

EXPNUM, number of digits ('integer') is too large for output field

Explanation: The value of an AC entry exceeds its DLG defined size.

User action: Check ACD table is correct.

FORDEV, device 'name' not mounted foreign

Explanation: The magtape has not been mounted with the /FOREIGN qualifier.

User action: Issue the correct mount command and rerun I2DLG.

INTMAX, value 'integer' exceeds defined limits for AC 'integer'.

Explanation: The integer value in the AC entry lies outside the limits defined in the FRT table.

User action: Check that the FRT table has the correct limits defined or amend the IFF file using LITES2 or IPATCH.

INVALBLK, invalid blocksize 'integer' - valid range 144 to 5760

Explanation: An invalid argument was given to the /BLOCKSIZE qualifier, the value must be in the range 144 to 5760 (bytes) and a multiple of 144 (1 record)

User action: Reenter the command line with a correct value.

INVALFCA, 'integer' is an invalid argument to /AREA qualifier - value must lie in range 0 - 32767

Explanation: The feature code value given in the /AREA qualifier is incorrect.

User action: Reenter the command line with a correct value.

INVALFCL, 'integer' is an invalid argument to /LINE qualifier - value must lie in range 0 - 32767

Explanation: The feature code value given in the /LINE qualifier is incorrect.

User action: Reenter the command line with a correct value.

INVALFCN, 'integer' is an invalid argument to /NODE qualifier - value must lie in range 0 - 32767

Explanation: The feature code value given in the /NODE qualifier is incorrect.

User action: Reenter the command line with a correct value.

INVALFCP, 'integer' is an invalid argument to /POINT qualifier - value must lie in range 0 - 32767

Explanation: The feature code value given in the /POINT qualifier is incorrect.

User action: Reenter the command line with a correct value.

INVALMAJAC, Inconsistent AC type 'integer' ignored in feature FSN 'integer'

Explanation: An Ancillary Code entry of a feature has been found in the IFF file of a type that is incompatible with the specified DLG category. The attribute is ignored.

User action: If the attribute is required then edit the IFF file with LITES2 or IPATCH and rerun I2DLG

LASTBLK, error completing last data block

Explanation: I2DLG is unable to complete the last block of data on the magtape.

User action: Report possible program problem to Laser-Scan.

MTBLK, error writing magnetic tape block

Explanation: The program has been unable to write a block to the magtape. The associated system error messages will give further information.

User action: Check correct mechanical operation of the tapedeck and rerun I2DLG.

MTOPEN, error initialising tape unit 'name'

Explanation: The program has been unable to initialise the magtape. The associated system error messages will give further information.

User action: Check tape has been physically loaded correctly and mounted /FOREIGN.

MTORWD, error rewinding tape unit 'name'

Explanation: The program has been unable to rewind the magtape. The associated system error messages will give further information.

User action: Check tape has been physically loaded correctly and mounted /FOREIGN.

NOACHD, No header information found in layer 0.

Explanation: The IFF file must have the header infomation held as AC entries in layer 0.

User action: Update the IFF file using LITES and rerun ILINK and I2DLG on this data.

NOAREAS, left and rght areas not known for line feature (FSN 'integer')

Explanation: I2DLG is unable to determine the left and right areas for this line feature.

User action: Check consistency of junction structure and AC entries 4 and 5 in the IFF file using IPATCH and rerun I2DLG.

NOCOORDS, no coordinates found for a feature (FSN 'integer')

Explanation: I2DLG is unable to read any coordinates from the IFF file.

User action: Amend the IFF file using IPATCH and rerun I2DLG.

NOJUNCTN, no junction found from junction pointer in line feature (FSN 'integer')

Explanation: I2DLG is unable to correlate a stored junction position with the information in the junction pointer entry in a line feature.

User action: Check consistency of junction structure in the IFF file using IPATCH and rerun I2DLG.

NOMD, IFF type 2 map descriptor not found

Explanation: The IFF file must have a type 2 map descriptor entry.

User action: Update the IFF file using ITRANS and rerun I2DLG on this data.

NONODES, start and end nodes not known for line feature (FSN 'integer')

Explanation: I2DLG is unable to determine the start and end nodes for this line feature.

User action: Check consistency of junction structure in the IFF file using IPATCH and rerun I2DLG.

NOOUT, no area feature found defining the outside area.

Explanation: I2DLG did not find an area feature with an appropriate AC entry that indicated it was an outside area.

User action: Create an area feature with a suitable AC entry in the IFF file LITES and rerun ILINK and I2DLG. Also check that the correct FRT file is used.

NOTMULTREC, invalid blocksize 'integer' - not a multiple of 144.

Explanation: An invalid argument was given to the /BLOCKSIZE qualifier, the value must be a whole multiple of 144 and in the range 144 to 5760 (bytes)

User action: Reenter the command line with a correct value.

RELMAX, value 'real' exceeds defined limits for AC 'integer' - output may be incorrect

Explanation: The real value in the AC entry lies outside the limits defined in the FRT table.

User action: Check that the FRT table has the correct limits defined or amend the IFF file using LITES2 or IPATCH.

TOOPTS, more than 3000 points found in feature (FSN 'integer')

Explanation: the DLG format is limited to 3000 coordinate pairs per line.

User action: Amend the IFF file and rerun I2DLG.

UNEXPEOF, unexpected end of IFF file

Explanation: The IFF file has an incorrect structure or missing entries.

User action: Amend the IFF file using IPATCH and rerun I2DLG.

UNEXPEOFL, unexpected end of IFF file when locating start of a line

Explanation: The IFF file has an incorrect structure or missing entries.

User action: Amend the IFF file using IPATCH and rerun I2DLG.

UNKDEV, unknown device 'name'

Explanation: The specified device is not known. The associated system error messages should give further information.

User action: Rerun I2DLG with amended qualifiers.

UNSETMD2, IFF type 2 map descriptor is unset

Explanation: The IFF file must have a type 2 map descriptor entry.

User action: Update the IFF file using ITRANS and rerun I2DLG on this data.

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 IFF library and by the Laser-Scan I/O library, LSLLIB. IFF library messages are introduced by '%IFF' and are documented in the IFF library users' guide. In most cases IFF 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.