

Laser-Scan Ltd.
Software Product Specification
MAPPING
(Laser-Scan Mapping Kernel Package)

For LAMPS V4.3 - 25-Feb-1994

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1 DESCRIPTION

The Laser-Scan IFF Mapping Kernel package (MAPPING) provides basic support and interface libraries for the applications packages that make up the Laser-Scan Automated Map Production System (LAMPS).

It is recommended that the reader becomes familiar with the LAMPS Environment Guide which outlines in some detail the hardware and software environment required by the LAMPS package as a whole (of which MAPPING is the kernel).

IFF stands for Internal Feature Format and is the Laser-Scan vector file format generated by VTRAK and other Laser-Scan mapping systems and used as the data structure throughout the Laser-Scan LAMPS system. IFF files are binary and cannot be manipulated directly using a text editor. The MAPPING package provides two interface libraries, IFFLIB to allow customers to write programs to read and write IFF files, and FRTLIB to look up the representational attributes of IFF features in Feature Representation Tables.

2 FACILITIES

The following facilities are included in the MAPPING package software. Further details can be found in the IFF User Guide, the IFFLIB Reference Manual, the FRT User Guide, and the FRTLIB Reference Manual, but the presence or absence of a facility in such a manual does not imply any commitment by Laser-Scan.

1. The IFFLIB interface library supplies Fortran callable routines to provide the following facilities:
 - * Accept Laser-Scan IFF (Internal Feature Format) data as input from disk.
 - * Write IFF data to disk, creating new IFF files.
 - * Modify existing IFF files by rewriting selected entries.
 - * Decode the binary entry structure of IFF files.
 - * Scan IFF files sequentially, entry by entry.
 - * Reposition to any previously read entry by remembering the word address in the file.
 - * Delete existing entries by converting them to "Void" entries.
 - * Create new entries either at end of file, or by writing into a void.
2. The FRTLIB interface library supplies Fortran callable routines to provide the following facilities:
 - * Read Laser-Scan FRT (Feature Representation Table) files from disk.

- * Read Laser-Scan SRI (Symbol Representation IFF) files from disk.
 - * Read Laser-Scan TRI (Text Representation IFF) files from disk.
 - * Look up the Feature Code (FC) from IFF features in the FRT information, to return:
 - Graphical Type
 - Colour
 - Width
 - Size
 - Secondary code
 - Flag bits (optional)
 - Hardware symbol number (optional)
 - Priority level/alternative feature code pairs (optional)
 - * Look up the secondary code for lines to get line pattern.
 - * Look up the secondary code for symbols to get symbol shape from SRI.
 - * Look up the secondary code for texts to get character font from TRI.
 - * Look up the secondary code for areas to get fill style.
 - * Draw symbols and text characters using GKS calls.
3. The SRI/TRI Normalisation Utility SRINORM can scale symbols to fit a (-1,-1) to (1,1) "unit" box, removing the need for symbols to be digitised to precise scale, and allowing a single SRI symbol to be drawn at different sizes via the FRT size entry.

3 IFF FILES

3.1 Storage

LSL IFF files are word-addressed direct-access binary files, with a variable length record mechanism (Entries) superimposed. Coordinates within IFF are held in ST, ZS or CB entries, depending on whether they are 2D, 3D, or multi-dimensional points. Regardless of entry type, coordinates are held as 32-bit (single precision) floating point binary numbers. This gives them a range of 10^{+38} to 10^{-38} , and between 7 and 8 significant figures.

All coordinates in a file are assumed by the software to be relative to a local origin, the value of which is held in a Map Descriptor at the start of the file, as a pair of 64-bit (double-precision) floating point binary numbers. This gives a range of 10^{+38} to 10^{-38} , and between 15 and 16 significant figures. It is not necessary that this local origin should be one of the corners or the middle of the area, merely that it should lie reasonably close to the area. Conventionally, it is often set so that the bottom left corner of the sheet lies at (0,0), but it is quite acceptable for several files to share the same origin offset, eg of the current UTM zone "brick".

4 Units

One of the main advantages of coordinate storage as floating point rather than integer numbers, is that IFF files are largely independent of the units of the data stored in them. Map data is often stored with ground metres as the unit, but IFF data can and does handle units as distinct as lat/long degrees, seconds of arc, feet, miles, nautical miles, sheet mm, sheet thou.

5 Precision

A DEC 32-bit (single precision) floating point binary number has 1 sign bit, 8 exponent bits, and a 23 bit mantissa. Because the value is always normalised, the first mantissa bit which would always be a 1 is assumed, giving an effective mantissa of 24 bits. This gives a precision of approximately 1 part in 2^{23} , allowing 33,554,433 positive values, doubled to 67,108,865 if negative values are used.

The 64-bit double precision origin offset has the same structure, but has a 55 bit mantissa, allowing more than 1,000,000,000,000,000 distinct values.

The combination of the single precision coordinate with the double precision offset allows us to store coordinates in a uniform space, which can typically cover the whole earth to a ground precision of much better than 1mm in typical sized IFF files.

6 PREREQUISITES

6.1 Computer Hardware Prerequisites

- * Any DEC VAX, MicroVAX, VAXstation, or Alpha AXP computer supported by the current version of OpenVMS.
- * At least 2MB available disc space for software, plus sufficient for data files.
- * At least 4096 pages working set per process for efficient use.
- * Any DEC-compatible alphanumeric terminal.

6.2 Software Prerequisites

OpenVMS VAX Version 5.5-2, or OpenVMS AXP V1.5 (or higher version, assuming continued upwards compatibility by DEC) concurrently with other interactive and batch processes.

Laser-Scan's LITES2 interactive digitising and editing software running on the same host computer is recommended for digitising and editing vector input data. VTRAK automated digitising is recommended for volume input of documents. The PLOTTING package (FPP program) is recommended both for check plotting and for

high quality photoplotting.

The MAPPING package, and the IMP (IFF Map Processing) utility package are software prerequisites for LITES2, VTRAK, PLOTTING, and any other LAMPS software.

It is recommended that the reader becomes familiar with the LAMPS Environment Guide which outlines in greater detail the hardware and software environment required by the LAMPS package as a whole (of which MAPPING is the kernel).

6.3 *Growth Considerations*

The minimum hardware and software requirements for any future version of this product may be different from the minimum requirements for the current version.

7 *SUPPORT LEVEL*

MAPPING is a fully supported Laser-Scan standard software product.