

Laser-Scan Ltd.

Software Product Specification

LASERAID

Issue 4.2

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Document "LASERAID SPS"

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1 General Description

LASERAID is the interactive data capture program for the Laser-Scan LASERTRAK automatic digitiser. Features are selected and digitised from a graphical source, typically a map or drawing. LASERAID produces a digital representation of the source in a file containing the description and coordinates of each feature.

LASERAID digitises points, lines and areas quickly and accurately using the LASERTRAK scanning hardware. It will also identify and capture junctions in linework automatically, creating 'link-node' structured output files.

Features are selected and coded either by the operator, or by digital pre-guidance data. All digitising operations are under operator control, and the progress and results of data capture are continuously displayed to ensure correctness and completeness of the output data.

2 Input

The input to LASERAID is a 100mm * 70mm monochrome photographic negative (dark background) usually at a reduction of about 1:5. Line widths should be no less than 30 microns on the negative. Junctions which are to be measured automatically must be formed with solid linework.

Digital pre-guidance data is provided in an IFF file (see below).

3 Output Data

LASERAID produces a Laser-Scan Internal Feature Format (IFF) file on disc. IFF is Laser-Scan's standard format for cartographic data storage, and is used extensively by other Laser-Scan software products. It is capable of holding large quantities of data efficiently, and the only limits on feature size and number of features are those imposed by the maximum file size (30 megabytes) and by the capacity of processing programs. Externally, IFF files are standard DEC Files-11 structure and hence can be written to magnetic tape for transfer or storage using standard DEC utilities.

4 Operation

LASERAID is run at a LASERTRAK automatic digitiser. A large (1000mm. x 700mm) screen displays the source graphic and the digitising operations. A colour graphics terminal provides high magnification views of the scanned data, and displays status and confirmatory messages.

The operator controls the data capture primarily using the tracker ball and function buttons of the LASERTRAK. Additional commands are entered using the keyboard of the graphics terminal.

5 Facilities

5.1 Digitising capabilities

LASERAID will digitise:

- line features, including broken lines, by following. The centreline coordinates are recorded.
- junctions in solid linework, while following the lines. The intersection point and the arms are recorded. The incoming line features record the presence of the junction, thereby completing a link-node structure.
- area features, by following their edges. The outline is recorded.
- point features depicted as dots, small circles, crosses or filled squares. The centre point (and an orientation for squares) is recorded.
- control points, fiducials and grids. The coordinates are used as registration information.

Features less than about 1mm square on the negative can be captured in a single scan, unless they contain junctions.

LASERAID also provides mechanisms for the operator to interpret missing or corrupt graphics by manual construction of features, using the LASERTRAK screen or the graphics terminal to input coordinate data.

5.2 Feature selection

Features are selected for digitising by:

- manual cursor pointing. The operator selects the features using the LASERTRAK screen.
- use of digital pre-guidance data. An IFF file containing the coordinates of a point on each feature and information about the type of feature may be created either on a LASERTRAK or a digitising table and used to reduce the amount of operator action during digitisation.
- automatic digitising of unmeasured junction arms. If a pre-guidance file is not used, the junction list may be used to select unmeasured linework.

In the first two cases, an automatic 'search-and-capture' procedure may be invoked to reduce the positioning accuracy required.

5.3 *Feature coding*

Each feature may be coded with the following information:

- a feature number. This may be input from the keyboard for an individual feature, or may be that of the previous feature plus or minus a (possibly zero) step. Each feature is also assigned an unique sequence number.
- a primary feature code. This code is determined by the function button pressed to start digitising.
- multiple ancillary codes. Any further attributes may be added, and a fixed code may be added to all features if desired.
- height values (eg of contours). The current value is displayed to the operator, and may be incremented or decremented automatically or manually.

The IFF output file is divided into layers, generally separating features of different natures. Any feature has an associated layer.

5.4 *Feature capture*

- LASERAID automatically follows lines and edges, and determines the locations of points and junctions. The operator can stop the data capture process and force the digitiser to take a particular path if it sees ambiguous data, thus practically eliminating the need to correct the data after it has been captured. The program will stop if the end of feature is encountered, or if operator guidance is required.
- Whenever the operator intervenes or the program pauses for operator intervention the last few centimetres of line digitised are displayed in red refresh superimposed on the image of the map on the screen of the LASERTRAK.
- After each feature has been captured it is drawn on the orange photochromic film sandwiched against the negative. This reduces its visibility to both the operator and the machine. The 'paintout' mechanism enables the operator to check on the accuracy of the digitisation, as well as providing a simple and effective means of identifying those features yet to be digitised.
- A feature may be abandoned at any time and incorrect features may be selected for deletion by positioning the cursor close to them.
- The operator does not have to do any accurate positioning or keep track of features digitised.
- A session may be stopped at any time, and then restarted with the previously digitised features being painted out.

5.5 *Capturing junctions*

- On measurement of a junction, which may be at any position in a feature, the intersection point and the number of arms are displayed in refresh. The feature may be terminated at the junction, or line-following may proceed along one of the arms. The program offers an out-going arm based on a user-specified criterion: either left, right or straight ahead, and will optionally resume line following automatically on this basis. The operator may, however, interrupt this process at any time and select any arm to continue digitising. The junction may be disregarded entirely if not required.
- A list of previously measured junctions is maintained to enhance the speed of the digitising procedure. On returning to one such junction, the outgoing arm is selected from those known not to have been measured yet (although the operator may override this). If there are no such arms, the feature may be terminated.
- The junction list may also be used for preguidance (see Feature selection).

5.6 *Registration of data*

- By the automatic measurement of 4 control points or a grid, the coordinates in digitiser space can be related to those in map (target) space. One of these points (or optionally a user-specified point) is selected as a check fiducial, and is measured at intervals to maintain registration.
- Any distortions inherent in the photographic reduction process can be compensated for by digitising a known grid, photographed at the same time as the original document. If the document has a grid on it, an option is available to digitise this grid and compensate for any distortions in the document.

6 *Hardware Prerequisites*

LASERAID uses a Laser-Scan LASERTRAK digitiser connected to a DEC (Digital Equipment Corporation) VAX computer with a Unibus and a floating point processor. The DEC MicroVAX 2 computer is also supported.

7 *Software Prerequisites*

LASERAID runs under VAX-VMS Version 4 concurrently with other interactive and batch processes. A minimum working set of 500 pages is recommended.

Laser-Scan provide all relevant libraries and drivers.

8 *Support level*

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