

# Data Export and Import

## IN THIS CHAPTER:

- Data import into Easy Trace
- Data export from Easy Trace.
- Characteristics of import and export from/to different formats.

Effectiveness of vectorizing depends much on simplicity of mutual transfer between GIS and vectorizer. Nobody needs «just vectorized data» - they should be attributed to different layers, comprise topological connections and correspond to data classification adopted in the target GIS.

Do not err about significance of task order! It is impossible to vectorize data anyhow and then «to stuff» them into GIS without waste of time and labor.

Development of data model should always forego vectorizing, and it is better to fulfill it in GIS environments. It means creation of a tiny but real trial project. Import of this project into Easy Trace unambiguously «explains» the program, what you want to receive. That's why data import is just as important as ability to return results of vectorizing and editing.

Easy Trace is an universal vectorizer able to prepare data for different geoinformational systems. The systems are developing of course and rather often change their formats unexpectedly.

This problem is tractable. You may transfer data through the format of a previous version if the vectorizer «does not understand» the current one.

Nevertheless, we constantly simplify and update data exchange with different GISes and CADs to the best of our ability. .

## General information

One may consider settings of export / import excessively sophisticated but they are aimed at complete and flexible data exchange between formats that differ a lot.

Absolute data conversion is actually impossible as different GIS and CAD applications adhere to different ways of data representation (data appearance first of all - line types, symbols, etc.). Below, you will find a description of every format's subset supported by Easy Trace.

Easy Trace supports export and import of the following file types:

- SHP, MDB, GEN (ArcGIS);
- MIF (MapInfo);
- MAP (Panorama);
- DWG, DXF (AutoCAD);
- DGN (Intergraph);
- TOP (Credo);
- CSV (Comma Separated Values);
- MAP (OziExplorer).

Data exchange with the latter format comes to import of images and their georeference files. You may return vectorized data to OziExplorer as SHP files.

For some file types, we support import and export of objects' semantic data (attributes saved in a database).

Naturally, Easy Trace imports its own JET-files. As a rule, this operation serves for integration of vectorizing results but its importance grew a lot when ET 7.99 free version appeared.

Later versions of the vectorizer cope well with color image «lamination» into subject layers, automatic tracing and primary processing of vector data. But it is reasonable to equip several working places with free packages for inevitable manual backfitting.

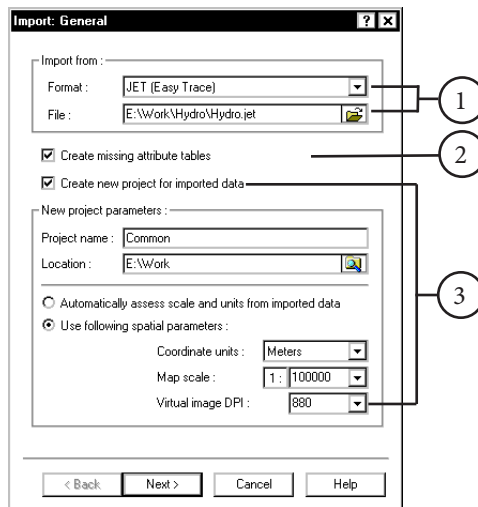
Final merging of projects, topology correction, and optimization of the resulting vector model should be done in a modern version of course.

## Data import into Easy Trace

This section contains a stepwise scheme of data import followed by detail description of general aspects common for import of all formats.

### How to import data into Easy Trace (File -> Import command):

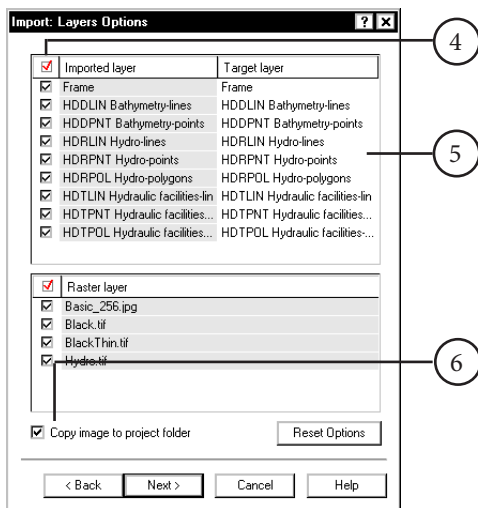
1. Select an input file type in the *Format* field and specify the files you want to import (or the folder for multifile formats) in the *File* field on the first (*General*) page of *Import Wizard*.
2. Switch on the *Generate missing attribute tables* option if necessary (see below - Attributive data import).
3. To create a new project on the base of imported data, switch on the *Create new project for imported data* option and specify parameters of project creation (see below - Target project).



New project name and folder as well as map scale, unit, and DPI of the virtual image should be specified similar to how you do it in *Creating Project Wizard*.

Switch on the *Automatically assess scale and unit from imported data* option only if you know nothing about the map you want to import. The program will assume resolution of the virtual image to be 400 DPI. Project scale and unit will be either taken from the imported file or estimated reasoning from data extent, subject to data format.

4. Select layers to be imported on the next page of *Import Wizard* (*Layer Options*).



The «Imported layer» column contains a list of all vector layers available for import. They correspond to layers of the source document or files in the folder selected to import, subject to format.

The tick near the header of the column enables you to select / deselect all layers at once.

- Change names of target layers in the right column if necessary. They coincide with names of selected layers by default.

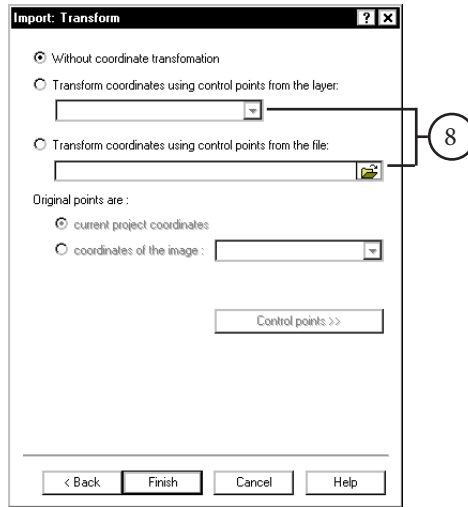
You may select target layers from the list of existing project layers or input a new name to create a new layer. The *Reset Options* button restores default names.

- If raster layers are available for import, select the images you want to add to the project.

When the *Copy image to project folder* option is on, the program copies selected raster files to the <Project>\Images directory first and then links them to project.

- Additional options should be specified for import of some formats. Corresponding pages of the Wizard are described for every format individually.

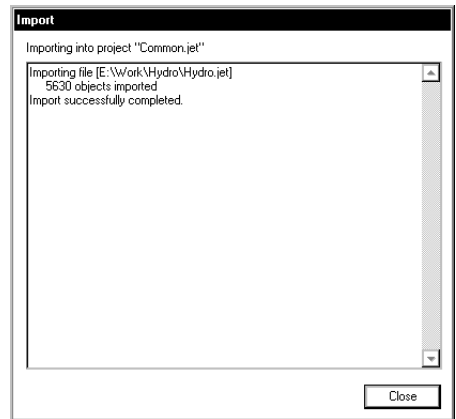
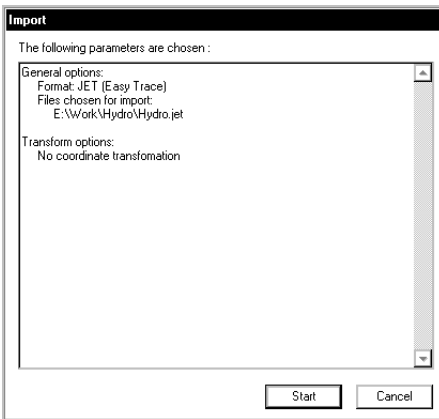
- The last page of *Import Wizard (Transform)* controls coordinate transformation. Reference points for this operation may be taken from the layer or a file. In more details transformation is described below in this section.



The «Transform coordinates using control points from the layer» and «Transform coordinates using control points from the file» are meant for selection of the source of data that control coordinate transformation.

The «Original points are...» option is inaccessible at import and always has default value «... current project coordinates».

9. Click *Ready*. You will see a window summarizing all import parameters, selected or set by default . If you click *Cancel*, the operation will be postponed but the program saves all import parameters in the project. To start import, click *Start*.



While import, the program shows information about progress of the process as well as error messages in this same window.

## Particular features of data import into Easy Trace

### 1. Target project.

Easy Trace may import data into an existing project or into a new one generated in course of the operation.

At import into a new project, the user specifies its name and location (folder) similar to how it should be done in *Creating Project Wizard*.

Parameters of new-created project's coordinate system (project unit, map scale, and DPI of the virtual image) may be input manually or calculated automatically on the base of data being imported.

### 2. Vector field of the project.

At import into an existing project, which has raster layers or vector objects, its vector field should be compatible with the data being imported. It means that coordinates of the project's vector field should approximately correspond to coordinates of the objects being imported.

“Approximately” here means up to the order of values. Coordinate representation in Easy Trace is fixed-point, and its accuracy allows about tenfold extension of the vector field along both axes (that will be done automatically at import if necessary).

If coordinates of an object being imported still overstep the limits of extended vector field, the object may be skipped. First time, you will see a message that suggests you to select whether you want to interrupt the operation or skip the object. All other such objects will be skipped automatically with coordinate information recording in the log-file

At import into an empty project without vector objects and raster layers, the program calculates parameters of its vector field (coordinates and exactness of representation) on the base of data being imported.

### 3. Layer selection for import.

Files of some formats may contain many layers and objects of different types. It is true for AutoCAD drawings (DXF and DWG), files of Intergraph (DGN), geodatabases of ArcGIS (MDB), maps of Panorama (MAP), and Easy Trace projects (JET). Other supported formats (CSV, GEN, MIF, SHP, TOP) provide individual files for every layer and even for objects of the same layer but different types (we shall call such formats multifile ones).

To unify the layer selection procedure, Easy Trace suggest the user to select a folder with files of required type in the case of multifile import. All files in this folder are regarded as potential layers that you may import.

In case of a «mono-file» format, the user selects a file, and potential resulting layers depend on its content. Filling of the table of selected layers may take some time, subject

to the format and complexity of the document you want to import.

Layers may be imported selectively. The program imports every selected source layer into an individual target layer of ET project. Names of source and target layers coincide by default, but the latter may be changed. You may import data into existing project layers (if their names are specified as target) or into new-created ones (if there are no layers of the specified names in the project).

*ATTENTION! Names of target layers should be unique! It is impossible to import 2 different source layers into the same layer of ET project during one session of Import. Apply Group Editor to merge several imported layers in Easy Trace or fulfill Import several times.*

Easy Trace supports import of raster layers for some formats. Optionally, imported images may be copied to the folder of ET project.

#### 4. Attributive data import.

Import of attributes is provided for JET, MAP, MDB, MIF, and SHP formats. At data import into an existing layer, which already has an attribute table, the program always tries to fulfill attribute import.

If one or several attributes of source data are not listed in the table (or are of a differing type), you will see a message about discrepancy in attribute structure. You may interrupt the operation or continue import with partial loss of attributes.

In the latter case, there will be no messages about other incompatible attributes but the program records them in the log-file of Import.

*ATTENTION! Import does not alter structure of existing attribute tables in the project!*

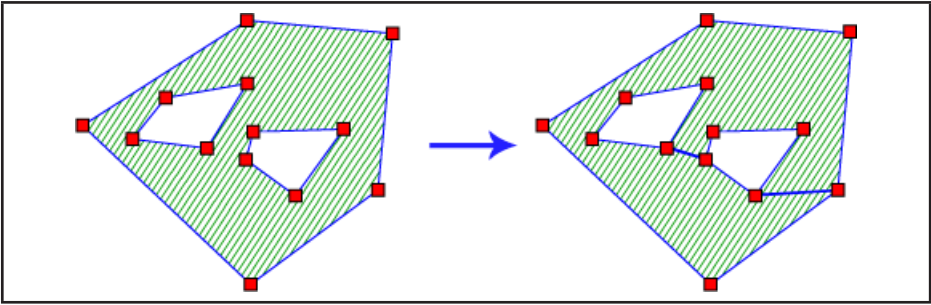
At import into a new layer or a layer without attributes tables, Easy Trace generates the table automatically if the *Create missing attribute tables* option is on

#### 5. Import of complex polygons.

Currently, Easy Trace does not support import of complex multi-contour polygons. It imports multiply connected contours (i.e. polygons consisting of several components) in parts, as several individual polygons.

Polygons with holes are being imported as «slit rings» - their outer border is connected with inner one (see the figure). Topologically, these are equivalents to source objects.

«Bridges» at slit sites look strangely and unwanted but they do not hamper editing and other polygonal operations. To transform polygons back into a multi-contour object at export, switch on the corresponding option.



Besides, number of vertices in one polyline can not exceed 8190 in the current ET format. At import, the program automatically cuts big polygons into polygonal fragments with borders that meet this requirement.

So, a polygon may be parted by vertical and horizontal lines approximately in the middle and imported as several adjacent contours.

## 6. Coordinate transformation.

It is possible to transform coordinates of objects being imported into a Easy Trace project. Only affine coordinate transformation based on a set of control points from a *layer of control points* or a *file of control points* (CPT-file) is provided in this Easy Trace version.

*Layer of control points is a vector layer; its point objects are linked to an attribute table with fields of the Float type called `_X_CPT_` and `_Y_CPT_` (the fields must contain coordinates of control points in the external system). There is a special command, which generates these fields at editing of attribute structure.*

*CPT-file is a text file in which an individual string corresponds to every control point. Each string contains 4 coordinate values separated by spaces: the first pair corresponds to coordinates of a control point in the project, and the second - to its coordinates in an external coordinate system*

The set of control points determines transformation between two coordinate systems (CS)- internal one, i.e CS of the project, and external - CS of the GIS you import data from (or export to).

*ATTENTION! Affine transformation is a linear coordinate transformation that comprises only shift, rotation, and stretching (with different coefficients along different axes). It is correct only for coordinate systems interconnected by linear correlations.*

For example, the latitude-longitude system has no linear correlations with the Gauss-Krueger projection. One may sometimes get a fair result (if the projection is not too “wry” in relation to the grid), but mathematically this result is incorrect.

There should be at least three control points that do not belong to the same straight line in the set. If additional points are specified, affine transformation will be calculated using the least-squares method considering all the points.

Thus, “superfluous” control points are used for averaging-out / dispersion of possible

errors. To verify transformation accuracy, open the *Control Point Statistics* window.

N	Project X	Project Y	Orig X	Orig Y	E
1	2031.651	8376.251	-44500.000	73500.000	10.0
2	2624.588	8371.312	-44000.000	73500.000	9.6
3	3215.033	8365.567	-43500.000	73500.000	7.7
4	3807.929	8360.593	-43000.000	73500.000	7.6
5	4396.378	8355.562	-42500.000	73500.000	4.6
6	4990.871	8349.662	-42000.000	73500.000	5.3
7	5585.100	8343.792	-41500.000	73500.000	6.6
8	6173.402	8338.322	-41000.000	73500.000	3.6
9	6762.680	8335.100	-40500.000	73500.000	1.3
10	7357.128	8332.096	-40000.000	73500.000	2.5

It contains initial and resulting coordinates of all control points as well as transformation error calculated for every point.

Initial coordinates are represented in project or raster units (depending on the type of control points); resulting coordinates and the error - in the unit of the target coordinate system. The table is not editable, it's intended for examination only

It is much easier to click control points in a layer than to type their coordinates into a CPT file, even more so as it is impossible to confuse the order of coordinate input in that case. The program reads coordinates of the specified point automatically and you have only to input their coordinates in an external coordinate system.

Nevertheless, use of another method has some advantages as well. First, the file of control points enables transformation at import into a new project.

Second, the same CPT-file may be used repeatedly for a group of projects that require similar transformation.

Besides, transformation at export may be based on the CPT-file applied at import. It may be useful at merging of data received from different sources.

For example:

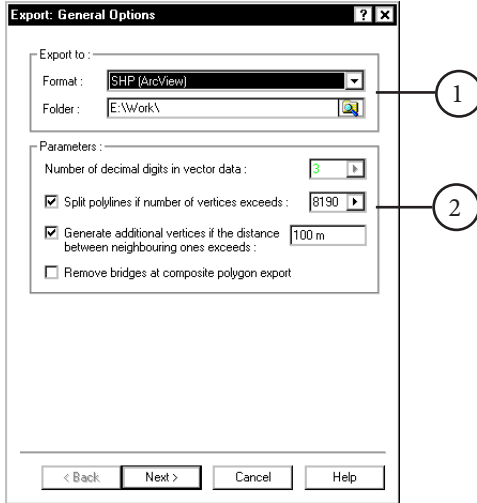
Project with data 1 -> Import with coordinate transformation 2 -> Data integration / editing -> Export with coordinate transformation.

## Data export from Easy Trace

This section contains a stepwise scheme of data export followed by detail description of general aspects common for all target formats.

### How to export data from Easy Trace (File -> Export command):

1. Select an output file type in the *Format* field and specify the target file (or the folder for multifile formats) in the *File* field on the first (*General*) page of *Export Wizard*.



2. Specify export options for different objects on the same page (see below - Options of object export):

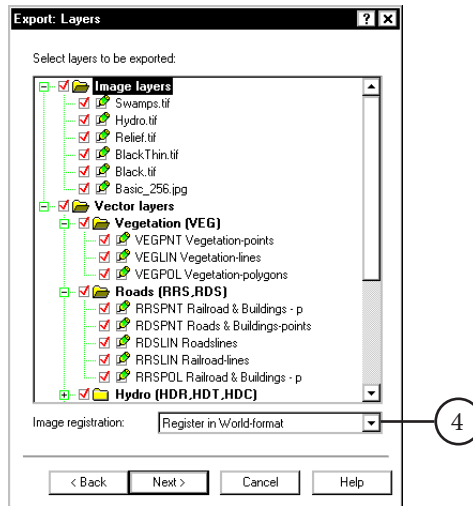
**Number of decimal digits in vector data** - controls precision of coordinates and distance representation. It makes sense at export into text formats only.

**Split polylines if number of vertices exceeds** - enables you to limit number of vertices in exported polylines. When on, polylines consisting of more vertices than it is specified in the *Maximal number of vertices* field will be parted at export into individual polylines that meet the requirement.

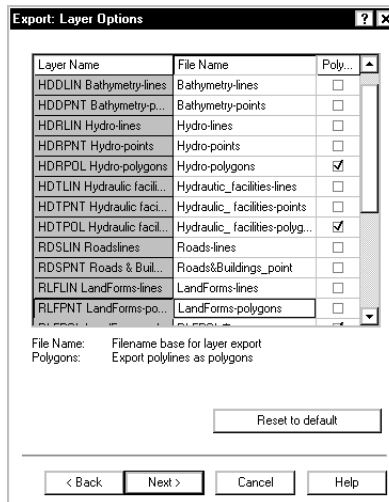
**Generate additional vertices if the distance between neighbouring ones exceeds** - guarantees that vertex-to-vertex distance in exported polylines will not exceed the specified value. The program applies linear interpolation to calculate additional vertices, including their Z-coordinates (for 3D-polylines).

**Remove bridges at composite polygon export** - forms normal polygons with holes out of their «slit ring» representation in Easy Trace.

3. Select raster and vector layers you want to export on the next page of *Export Wizard (Layers)*.



4. For raster layers, select the method to be used at export of their georeference information in the *Image registration* field.



If a multifile export is selected, the *Layer Options* page will be the next. Here you may change file name for every layer being exported (see below - Name generation for output files).

*Why to change names of output layers (files)?*

*Geoinformational systems often use short incomprehensible layer names for some reasons. As*

a rule, operators do not understand these abbreviations and it slows vectorizing down. That's why we recommend to use more sensible names - for example, initial abbreviations plus short explanations.

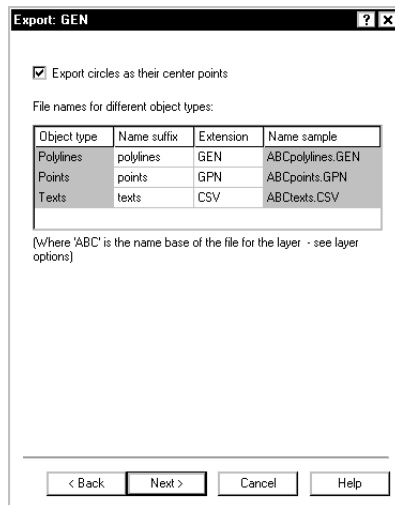
When vectorizing is over, you may delete explanations at export and thus restore initial names.

There are other export parameters that may be specified for selected layers subject to the target format. For example a column with the *Polygons* flag is provided for some of them.

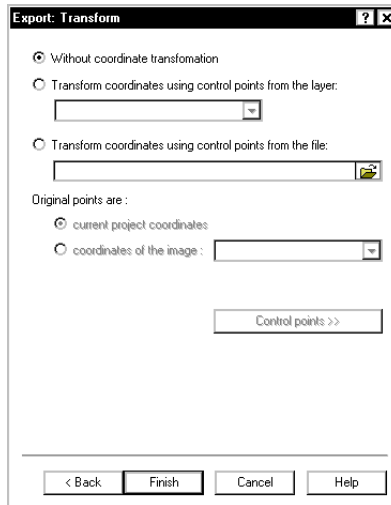
The flag controls how closed polylines will be exported - as polylines or polygons. Default value coincides with the layer polygonality characteristic in ET project.

The *Reset to default* button restores standard line names.

5. File name suffixes and/or extensions should be specified for different types of objects at multifile export on a special Wizard page provided for the selected target format (see below - Name generation for output files).



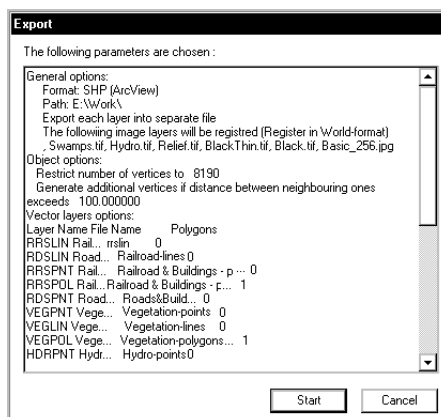
6. The last page of *Export Wizard (Transform)* controls coordinate transformation. You may specify the source of control points for transformation of objects' coordinates at export and operation method.



***Transform coordinates using control points from the layer*** and ***Transform coordinates using control points from the file*** - these options enable selection of the source of control points.

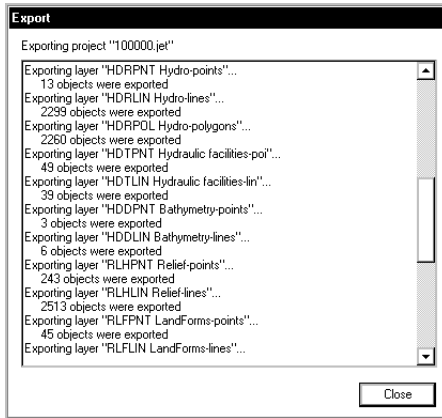
***Original points are ...*** - controls interpretation of the source coordinate system - whether it is CS of a raster layer or CS of the project (see below - Coordinate Transformation).

7. Click *Ready*. You will see a window summarizing all export parameters, selected or set by default.



If you click *Cancel*, the operation will be postponed but the program saves all export parameters in the project. To start export, click *Start*.

8. While export, the program shows information about progress of the process as well as error messages in this same window.



## Particular features of data export from Easy Trace

### 1. Selection of the target file or folder.

Files of some formats may contain many layers and objects of different types. It is true for AutoCAD drawings (DXF and DWG), files of Intergraph (DGN), geodatabases of ArcGIS (MDB), and maps of Panorama (MAP).

Other supported formats (CSV, GEN, MIF, SHP, TOP) provide individual files for every layer and even for objects of the same layer but different types (we shall call such formats multifile ones).

Moreover, «file» may be understood as a group of files connected by the same name (e.g., MIF/MID files at export into MapInfo).

It is necessary to specify a folder at multifile export where to these files should be placed. If the folder you have selected already contains files and their names coincide with names of the files being exported, data will be overwritten without warning.

Unifile export needs input of the target file name. At name conflict, you will see an enquiry about overwriting.

### 2. Generation of output files' names at multifile export.

Some target formats imply creation of separate files not only for every Easy Trace layer but also for different types of objects belonging to the same layer. Names of these files should be unique.

The *Layer Options* page (common for all formats) enables input of filename base. Unique name of every output file consists of its base + a suffix and/or extension depending on the object type and target format.

To form unique names of output files, use the *File names* table on the special format-dependent page of the Wizard provided for GEN, MIF, and SHP formats. The table consists of 4 columns:

- *object type* - list of object types to be exported as separate files;
- *file suffix* - allows forming of different filenames for files having the same extension;
- *extension* - editable for GEN-format only;
- *name sample* - shows output file's name if its name base is «ABC».

Easy Trace forms names of output files in the following way:

[filename base] + [suffix] + «.» + [extension]

### 3. Options of object export

Some formats are ASCII-files that may be opened by a text editor. These are CSV, DXF,

GEN, MIF, and TOP formats. Precision of coordinate and distance representation may be specified for these formats in the *Number of decimal digits in vector data* field on the *General* page. The field is inaccessible for other export formats.

You may specify maximum number of vertices in exported polylines and restrict distance between neighboring vertices.

Multipoligons may be formed at export of polygons with holes to MIF and SHP formats. In Easy Trace, these objects are represented by ring-shape polygons with a bridge between outer and inner boundaries. To form multipolygons, switch on the *Remove bridges at composite polygon export* option

The program forcedly switches this option on if MDB or MAP format is selected for export as polygons with bridges are not admissible in them.

#### 4. Export of raster layers.

Together with images linked to your project, you may also export information about their position in the coordinate system. To do it, tick off the images and select one of the *Image registration* options on the *Layers* page. Easy Trace writes references to images into DWG, DGN, and MDB (MXD) files; besides, it can generate georeference files of the following formats:

- World;
- TAB (for export into MapInfo only);
- CPT.

For TAB and CPT files, coordinates of raster corners are being exported as control points in the following order:

- upper left corner (raster coordinates 0,0);
- upper right corner;
- lower left corner;
- lower right corner.

#### 5. Coordinate transformation

Coordinate transformation at export is provided in Easy Trace. Everything written about coordinate transformation at import is also true at export, with some additions.

Besides a layer of control point and a CPT-file, TAB-files of MapInfo and MAP-files of OziExplorer may serve as the source of control points.

*TAB- and MAP-files - are georeference files of MapInfo and OziExplorer correspondingly. Easy Trace supports georeferencing in projection coordinates only (meters and not degrees!).*

At export, coordinate system of an image may be used as internal one instead of the project CS. Raster CS is a Cartesian rectangular coordinate system with measurements

in pixels. Coordinate origin is in the upper left corner of the image, and Y axis is directed downwards.

Source coordinates in a CPT-file (first pair of numbers in every string of the file) will be interpreted as coordinates of the project or an image depending on the value of the *Original points are...* option.

If a TAB- or a MAP-file is the source of control points, Easy Trace always uses coordinate system of an image (i.e. forcedly selects the value «Original points are coordinates of the image»). At that, image name specified in the georeference file should correspond to the name of the selected raster layer.

## Format-depending particular features of import and export

### Import of JET-files (Easy Trace)

Reading of own format can hardly be considered as import, but use of the import interface provides additional abilities in comparison with ordinary file loading.

When is it reasonable to import JET-files?

- If you want to unite map sheets vectorized separately.
- If you want to introduce «vectorizing environments» into your project - a qualifier, strategies, custom tools, etc.
- If you want to change the coordinate system of your project. Global affine coordinate transformation based on a control point set will be fulfilled then similarly to import of other formats.
- If you want to make the vector field of your project more that ten times as much. Easy Trace inner representation of coordinates does not allow such enlargement in the *Project Properties* dialog box because the program stores coordinates as fixed point values.
- If your production process comprises use of additional working places equipped with free ET 7.99 packages.

Some parameters of JET-file import should be specified on the special page of *Import Wizard*.

Full import of a JET file transfers to the current project the following data:

- line types;
- text styles;
- block types ;
- fill patterns;
- selected raster and vector layers, including vector objects;
- attribute structure and domains of attribute values;
- settings of attribute-depending thematic representation.

If a name clash arises, preference belongs to data already existing in the project unless the *Overwrite existing project data* option is on, i.e. import may only add missing information

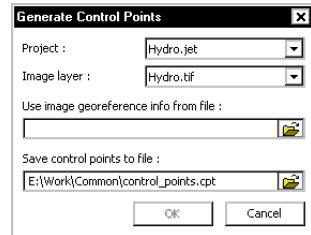
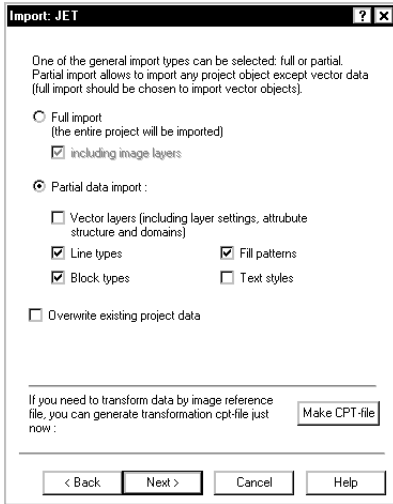
*Attention! At raster layer import, not images themselves but only references to them are being copied. That's why you may add raster layers only if coordinate transformation supposes nothing but shift and scaling, as additional correction is not necessary in this case for correct positioning of added images on the project field.*

*The program adds imported raster layers to the project but does not load, i.e. you will not see them at once.*

*If coordinate transformation includes rotation, raster layers will be skipped and the program*

will write a warning in the log-file of import.

The *Partial import* option excludes raster layers and vector objects from the operation and imports only data structure. Such import may be partial - for example, you may take only line types or blocks but if you choose to import vector layers, the program necessarily copies line types, fill patterns, and blocks as layer settings may comprise these data.



*Make CPT file* command generates a file of control points for data transformation using the georeference file of any raster layer.

The operation makes sense if georeferencing of images in the project you want to import and in the target project is done in different coordinate systems. For example, it helps to unite (bring together) map sheets representing different projection zones. In that case, you need georeference file of the image added to the project you want to import in coordinates of the project - receiver.

The *Make CPT file* button opens the *Generate Control Points* dialog box. Select the JET-file you are going to import in the *Project* field and one of its raster layers in the *Image layer* field, then specify georeference file of the selected image and CPT-file name.

At import, this CPT-file should be specified as the source of control points on the *Transform* page.

## SHP format (ArcGIS)

SHP-format (shape-file) is one of operating formats of ArcGIS. It consists of three individual files - a top file (SHP), an index file (SHX), and a dBASE (DBF-file) table. All these files should have the same name and should be stored in the same folder. They are

being referred to as an integer unit called a shape file. Shape-files support the following object types: points, polylines, and polygons. At that, every shape file stores one-type objects only.

The top file (SHP) contains records of variable length that describe a geometrical object as a set of its vertices. Index- and DBF-files contain one record for each object of the top file. At that, the order of these records coincides with that of the objects in the top file. More detail information about shape file structure may be found in «ESRI Shapefile Technical Description»

## Import

Vector data import from SHP-format has the following particular features:

- Easy Trace imports the following types of shape-objects: Point, MultiPoint, PolyLine, Polygon, MultiPatch, and their Z- and M-modifications; it ignores information about measures)
- Easy Trace imports Shape-polygons as closed lines. If there are cutout areas inside a shape-polygon, the resultant polyline will be ring-shaped, its internal boundary connected with the external one (see above - Import of complex polygons).
- Easy Trace imports shape-objects consisting of several parts (complex polylines and polygons as well as MultiPoint objects) as several individual objects. At that, it generates an individual copy of the set of attributes for every object that previously was a shape-object's component.
- Easy Trace imports MultiPatch objects as a set of polygons (closed polylines).

While attributive data import, keep in mind the following:

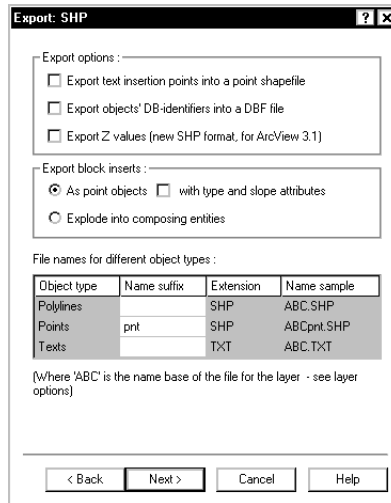
- At export from ET to SHP-format (see below), it is possible to include database identifiers into the set of attributes being exported. At subsequent import of the same shape-file, this field becomes an additional attribute, as Easy Trace always generates identifiers for object-to-database connection by itself.
- While import into a project that has a database (e.g. the project from which the export was executed), a warning about structure incompatibility error of attributive data may appear (it should be ignored in the case in question).

There is no *Import SHP* page in *Import Wizard* as import of shape-files has no additional options.

## Export

SHP format is a multifile one, i.e. Easy Trace generates a set of shape-files for every exported layer - separately for points, polylines/polygons, and text (text is being exported into a .CSV file). As extensions of the files are fixed, it is necessary to use suffixes to make

the filenames unique (see Generation of output files' names at multifile export). The suffixes may be specified in the *File names for different object types* table on the *Export SHP* page of *Export Wizard*.



## 1. Export of polylines

Polylines of any layer may be exported as polylines or polygons (in the latter case, all polylines of this layer should be closed). Use the *Polygons* flag on the *Layer Options* page (an additional column with check-boxes) to indicate how to export lines of every layer. I

If a box is ticked off, polylines of the corresponding layer will be considered as polygons. It means:

- the output shape file will contain polygons;
- at export, Easy Trace does not form polygons from lines of the layer, but exports existing closed polylines as polygons. Unclosed polylines will be skipped with error message writing in the export log-file.

Polylines may be exported as 2- or 3-dimensional (an enhanced format with Z-value and measure for every point). The *Export Z-values* option on the *Export SHP* page controls these alternatives.

«Measure» value is always equal to «no data», i.e. -1e39.

So, depending on the selected options, Easy Trace polylines may turn into shape objects of the following types: PolyLine, PolyLineZ, Polygon; PolygonZ.

## 2. Export of points and circles

Easy Trace exports points with Z-coordinate or without it depending on the state of

the *Export Z-values* option. It corresponds to forming of Point or PointZ shape-objects; Easy Trace exports circles as their central points into the file of points.

### 3. Export of text objects

Easy Trace exports text (separately for each layer) as .CSV files of the following structure:

X, Y, text\_string

Text insertion points may be additionally exported into the file of points depending on the state of the *Export text insertion points into a point shape-file* option.

### 4. Export of blocks

Easy Trace exports blocks as point objects with coordinates of the insertion point or splits them into composing entities.

In the former case, the `_BLCK_NAME` and `_BLCK_ANGL` fields containing the name and rotation angle of every block may be added to attributes of the point object with the help of the *With type and slope attributes* option.

In the latter case, resultant entities are quite independent. Easy Trace attributes entities of the block to one or another file according to their type.

### 5. Export of DB identifiers

Connection of objects and their attributes in a shape-file is supported by the order of records and thus doesn't need identifiers. But DB identifiers may be added to the exported attribute table if the *Export objects' DB identifiers into a DBF file* option is on.

## MDB format (personal geodatabase, ArcGIS)

This format enables data exchange with personal geodatabases of ArcGIS stored in a MS Access database (MDB-files) and ArcMap documents (MXD-files).

MXD-document contains references to sources of data included in the map and controls the way of data representation. Use of a MXD-document enables minimal information loss at data transfer from Easy Trace to ArcGIS or vice versa.

Unlike SHP, this format supports direct exchange of raster layers, coded value domains of attributes, color settings of vector layers and thematic displaying.

As the target GIS must support operations with ArcObjects for MDB reading and writing, it should be ArcGIS 9.1 or later version.

*Attention! Easy Trace can import and export data from/to MDB format only if ArcGIS 9.1 or later is installed in your computer.*

MXD export and import are somewhat asymmetric. Easy Trace optionally generates a MXD-file at export into the MDB format but MXD import may be selected directly in the list of formats.

The asymmetry is connected with the fact that there are no data in a MXD-file - it contains only references. Data sources should be specified explicitly at export, but it is enough to make use of the references at import.

### MDB import

Classes of spatial objects (FeatureClasses) containing points, polylines, polygons and annotations as well as raster classes may be imported from MDB-files. For every spatial class selected for import:

- Easy Trace generates a project layer of a user-specified name (of the same name with the class by default).
- Easy Trace generates an attribute table. Table structure coincides with one of the imported class (with the exception of service fields containing object identifier, polyline length, polygon area, and geometry type). The program uses Coded Value Domains to write «value» - «description» pairs in tables of corresponding ET attributes' values. The same is true for Subtypes. Subtype-determinative attribute becomes the key of thematic displaying in Easy Trace.
- Easy Trace imports spatial objects (vector entities) and their attributes if the *Import only settings* option is off.

Image extraction from MDB-file and linking to the ET project will be executed for every selected raster class. As Easy Trace does not support the Imagine format typical of images in MDB, it saves them as TIF-files to the project folder. The operation may take rather long time.

## MXD Import

Layers of the current Map may be imported from a document of ArcMap (MXD-file). Available layers are based on classes of spatial objects (FeatureClasses) containing points, polylines, and polygons as well as layers of annotations.

The MDB file not necessary stores data linked to the MXD-document. Shape- and other files may serve as data source if the installed ArcGIS version supports their formats. Besides, it is possible to import raster layers from the MXD-document. In addition to data taken from MDB, Easy Trace uses the following information from the MXD-document:

- Colors of imported layers as they are specified in the document of ArcMap.
- Varied representation of objects depending on unique values of one of the attributes. In that case, attribute values and corresponding colors of object representation become parameters of thematic displaying in Easy Trace.
- Polygon fillings based on raster templates. Filling import is partial as ET supports only black-and-white templates and has to turns color fillings into monochrome ones.
- Simple line types (corresponding to system ones) and predefined point markers.

Pages of additional options are similar for MDB and MXD import. They contain only the *Import only settings* option. If it is on, Easy Trace takes only map structure with all its settings but ignores raster layers and vector objects.

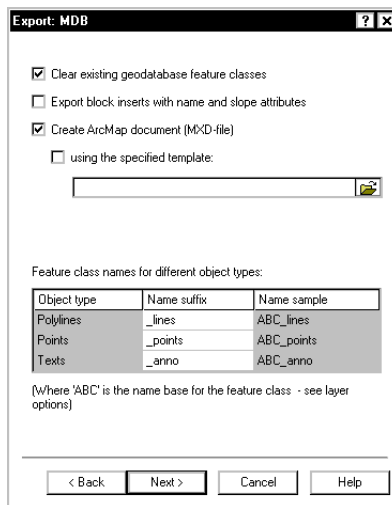
## MDB & MXD export

Export into these formats is of unfile type, i.e. Easy Trace exports all vector objects into the same user-specified personal geodatabase. Objects from different ET layers are being exported into different FeatureClasses of ArcGIS.

Furthermore, only objects of the same type may belong to the same class of spatial objects in ArcGIS. That is why Easy Trace generates up to 3 classes at export of every layer (for point objects, polylines/polygons, and text separately) - if it contains objects of corresponding types.

Name forming for classes resembles one at multifile export: you specify a name base in the *Layer Options* page of *Export Wizard* and suffixes in the *Feature class names for different object types* table.

At export, you may create a new geodatabase or write data into an existing one. In the latter case, the *Clear existing geodatabase feature classes* option controls, if new data will be added to existing ones or substitute them if the geodatabase already contains a class of the same name.



Easy Traces exports the following object types into the MDB personal geodatabase:

- polylines - as polylines or polygons, depending on the state of the *Polygons* flag on the *Layer Options* page. It should be specified for every layer you want to export individually;
- points;
- blocks - as points objects with coordinates of the blocks' insertion points. If the *Export block inserts with name and slope attributes* option is on, *BlkName* и *BlkAngle*

fields will be added to the set of attributes. They contain name and rotation angle of every exported block.

- text objects - into the annotation feature class of the personal geodatabase.

Easy Trace exports all object attributes with the exception of DB identifier (as ArcGIS generates them independently). Field names are based on attribute names in Easy Trace with substitution of national symbols for Roman ones and special symbols for “\_”. Initial attribute names are being exported as fields’ aliases.

Domains of attributes in Easy Trace serve as a base for generation of coded value domains in ArcGIS.

If the *Create ArcMap document (MXD file)* option is on, Easy Trace generates an MXD-file of the same name in the folder where to it saves the MDB file of exported vector objects.

The *Use the specified template* option enables you to create a prototype-based ArcMap document.

In that case, exported layers missing in the template will be generated with line color and polygon filling applied in Easy Trace.

Images will be added to the ArcMap document if registered in the World-format.

## GEN format (ArcInfo)

GEN is an old text format of ArcInfo. This format is of rather simple structure - each file contains information of one-type objects belonging to one layer (coverage).

The file of polylines has the following structure:

```
ID1
X1 Y1
X2 Y2
...
Xn Yn
END
...
END
```

Description of every line begins with an integer identifier followed by strings containing coordinates of individual vertices, and the polyline is finished by the “END” word. Another “END” finishes the file

The file of points has the following structure:

```
ID1 X1 Y1
ID2 X2 Y2
...
END
```

Description of every point is placed on a separate string and contains an integer identifier and X,Y coordinates. The file is also finished by the “END” word. The file of points has the “GPN” extension sometimes

The file of circles has a similar structure but all identifiers are equal to 0.

```
ID1 X1 Y1 R1
ID2 X2 Y2 R2
...
END
```

The text file contains strings of the following type:

ID, X, Y, Angle, H, Text.

## Import

At import, the user selects a folder containing files with the GEN, GPN, and CSV extensions on the *General* page

Files for import and the target layer for every file should be specified on the *Layer Options* page of *Import Wizard*.

While GEN-import, Easy Trace expects that file structure is similar to one it generates at export, otherwise an error message interrupts the operation.

Nevertheless, export and import to/from the GEN format are not quite identical.

- The file of point does not contain any information about type and size of points. That is why all imported points will be of the same standard type («cross») and size (3);
- The CSV-file of exported text objects does not contain any indication of style (font). That is why imported text objects will be of the standard style;
- Easy Trace exports blocks as points, but it does not generate blocks while import as there is no opportunity of their identification. The program generates points instead of blocks;
- Easy Trace does not import circles;
- Easy Trace does not import attributive data, so all the imported objects have no attributes.

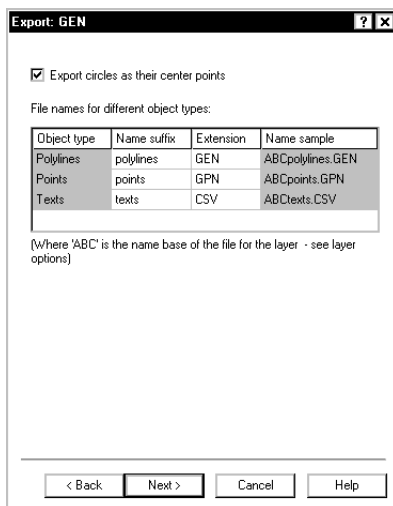
There is no *Import GEN* page in *Import Wizard* as this type of import has no additional options.

## Export

GEN-export is a multiframe operation, i.e. Easy Trace exports objects of different layers into different files. Moreover, as every .GEN file may contain objects of one type only, objects of different types belonging to the same layer are also being exported into different files.

Objects of the following types may be exported into the GEN format:

- polylines including 3D ones, but Z-coordinate will be ignored;
- points (the same);
- circles (may be exported as points if the *Export circles as their center points* option is on);
- text (into a CSV file);
- blocks (as points).



No specific attributive data export is provided; Easy Trace exports the identifiers linking points and polylines with the database. In other words, it is supposed that ArcInfo will directly use the same DBF-files that constitute the project database. Identifiers of objects without attributes are equal to zero

Thus, 4 different files may be generated for every layer while export into the GEN-format: a file of polylines, a file of points, a file of circles (if they are not exported as points), and a CSV-file of text objects/block attributes.

To form file names, specify their suffixes and extensions in the *File names for different object types* table on the *Export GEN* page

## MIF format (MapInfo)

MIF/MID is an exchange format of the MapInfo GIS. This format comprises two individual text files - a file of geometry description (MIF) and a file of attributive data (MID). Both files should have the same name and should be stored in the same folder

Every MIF-file consists of the header and the data section. The header contains format version information, symbol set name, information about field delimiter in the MID-file, coordinate system parameters, coordinate unit, and descriptions of attributive data columns in the MID-file.

The data section contains description of vector objects that may be of the following types: point, segment, broken line, region, arc, text, rectangle, round rectangle, and ellipse.

The MID-file contains attributes of vector objects described in the MIF-file; every its string corresponds to one vector object. Fields-attributes are separated by the symbol specified in the DELIMITER section of the MIF-file header. Record format and order should correspond to the description of columns in the header; records of the CHAR and DATE types are in quotes.

## Import

The user selects a folder containing files with MIF extension on the *General* page. Files for import should be selected on the *Layer Options* page. Easy Trace imports objects of the following types from files of MapInfo:

- point (POINT) - as Easy Trace point;
- segment (LINE) - as polyline;
- broken line (PLINE) - as one or several polylines;
- area (REGION) - as one or several closed lines; If there are cutout areas inside the region, the resultant polyline will be ring-shaped, its internal boundary connected with the external one.
- rectangle (RECT) - as closed polyline;
- round rectangle (ROUNDRECT) - the same as RECT, rounding of corners will be ignored;
- text (TEXT) - as a text object with the FIT type of alignment (i.e., with two defined points and a fixed height);
- ellipses (ELLIPSE) - as circle (its radius is the mean of semi-axes).

If the DELIMITER sentence is omitted in the MIF-file header, fields-attributes are considered to be separated by the tabulation symbol.

There is no *Import MIF* page of additional options in *Import Wizard* as this type of

import has no additional options.

## Export

MIF/MID-export is a multifile operation, i.e. Easy Trace exports objects of different layers into different files. Moreover, although the format permits different graphic entities to be written into the same file, the program generates two MIF-files of vector data (for polylines and points separately) and two corresponding MID-files of attributive data (if exist) for every layer selected for export. Isolation of polylines and points in different files is caused by possible semantic difference (different structure of linked tables of attributes).

The “;” symbol separates record in MID-files.

Easy Trace exports only polylines (polygons) into the MIF-file of polylines. Unclosed polylines are being exported as broken lines (PLINE objects). Export mode of closed polylines depends on the *Polygons* flag status specified on the *Layer Options* page for every layer (an additional column with check-boxes). When this option is on, the program exports polylines of the corresponding layer as REGION objects, when off - as PLINE objects (broken lines).

The following objects are being exported into the MIF-file of points:

- points;
- circles;
- text.

Blocks may be exported in several ways (depending on the *Export blocks* option):

- as points of the “star” shape (code 41) and coordinates corresponding to ones of their insertion points (*As point objects* option). If the *With type and slope attributes* option is also on, the program adds `_BLCK_NAME` and `_BLCK_ANGL` fields containing the name and rotation angle of every exported block to the attribute table;
- as a totality of composing entities that have no links with each other. (the *Explode into composing entities* option);
- as composite Collection objects (the *As compound objects (MapInfo 6.5 “Collection”)* option). Totality of entities composing the block will be placed into a Collection object and thus block integrity will be preserved. Some entities of the initial block (text, for example) may be lost yet, as Collection objects may comprise only points, polylines, and polygons. Circles belonging to blocks will be transformed into polylines.

The *Circle-to-poly conversion precision* option controls exactness of this transformation measured in project unit. Default value is 1 pixel of the image. The field is accessible when the *As compound objects...* option is selected.

**Export: MIF** [?] [X]

Coordinate System :

Use : Built-in projection list [Browse]

Category : Non-Earth [v]

Projection : Non-Earth [v]

Units : metres [v]

Export block inserts :

As point objects  with type and slope attributes

Explode into composing entities

As compound objects (MapInfo 6.5 "Collections")  
with circle-to-poly conversion precision: 8 m

File names for different object types :

Object type	Name suffix	Extension	Name sample
Polylines	l	mif	ABCl.mif
Points	p	mif	ABCp.mif

(Where 'ABC' is the name base of the file for the layer)

< Back   Next >   Cancel   Help

The necessity to describe the coordinate system and to specify project unit in the MIF-file header is a specific feature of the MapInfo format. If coordinate transformation based on a TAB-file is selected, Easy Trace copies these parameters from the TAB-file header, and they are inaccessible for editing. Otherwise, you may select the coordinate system (projection and unit) on the *Export MIF* page and thus write them into the MIF-file. Default coordinate system is NonEarth.

The *Use* field enables you to select your own file with the list of MapInfo projections, otherwise Easy Trace makes use of an integrated list.

*Attention! Selection of a projection differing from the NonEarth one does not cause any coordinate transformation: these parameters will be simply written into the MIF-file header.*

Easy Trace supports Cartesian coordinates only. That is why coordinates of control points in the TAB-file selected for coordinate transformation should be represented in projection units; longitude-latitude system is inadmissible.

## MAP format (Panorama)

It is typical of the Panorama GIS that every digital map or plan is connected with a qualifier that strictly defines the set of layers, objects, and attributes (called semantics in Panorama, but we shall use customary Easy Trace terms).

Object type specified at object creation controls its belonging to a certain layer, representation method (linear, polygonal, point, etc.), and the set of attributes.

In most GISes, all objects of the same layer have a similar set of attributes. That is not true for Panorama - its layer may contain objects of different types having different attributes.

There are also other peculiarities of data preparing for Panorama that should be taken into account:

- A special attribute called OBJ\_TYPE is provided in Easy Trace for vector object ascription to one of numerous object types in the GIS. It contains the key taken from the qualifier.

Only objects with attributes and correctly filled OBJ\_TYPE field may be exported to Panorama.

- At data preparing for Panorama, the project should be created on the base of a prototype prepared specially for that purpose. The main goal of this approach is to ensure correspondence between vector objects' OBJ\_TYPE values and the target qualifier.

Easy Trace distribution disc contains several projects-prototypes prepared for Panorama on the base of standard topographic qualifiers for different map scales.

To form a prototype for another qualifier, import a proper map from Panorama to Easy Trace and revise settings of object representation.

- X-coordinate in Panorama has an additional shift dependent on projection zone. Actually, this fact may be ignored at vectorizing but some problems may arise at data addition from other sources.

If you are going to export data taken from Panorama to another GIS, switch on the *Remove zone number prefix from X-coordinates* option at import. The symmetrical *Add zone prefix to X-coordinates* option is provided for export into Panorama.

- Inner names of semantics in Panorama look like SEM1, SEM39, etc. Easy Trace attributes receive the same names at import. More understandable descriptions of attributes in Panorama are very long and unsuitable for use as attribute names.

Besides, one should restore original names anyway at data export into the GIS, otherwise the attributes will be lost. Use of the semantic translation table at import enables attribute renaming for their life time in Easy Trace. The same table should be specified at data export, of course.

The table is an XLS (MS Excel) file with the [semantic name] - [attribute name] pairs specified in two columns on the first sheet. Names of missing semantics will not be translated.

At table compiling, do not forget that attribute name in the current Easy Trace version is restricted to 10 characters. The program automatically cuts longer names and they may become incomprehensible. Our ready prototypes comprise XLS-files of semantic translation tables.

- The «vector» object type of the Panorama GIS has no direct analogue in Easy Trace. It is an oriented marker with two insertion points. The second point is unimportant sometimes (slope-indicating strokes and other objects of point localization). In that case, Easy Trace blocks may well serve as «vectors» .

It means conversion of «vectors» into blocks at data import from Panorama and reverse operation at export. But this approach is unsuitable if position of the second point is important. In that case, «vectors» should be represented in Easy Trace by lines consisting of two vertices, belonging to the proper layer and having the code of «vector» objects. Besides, the layer must have an attribute table for points. These segments will be converted into «vectors» of Panorama at export.

- Text has no attributes in Easy Trace by default, but every inscription in Panorama has a classification code. Text objects will not get to Panorama from Easy Trace if they don't receive correct codes as well. That's why it is necessary to switch on support of text objects' attributes when you prepare data for this GIS (*Project -> Properties -> View and Editing -> Options -> Support attributes of text objects*).

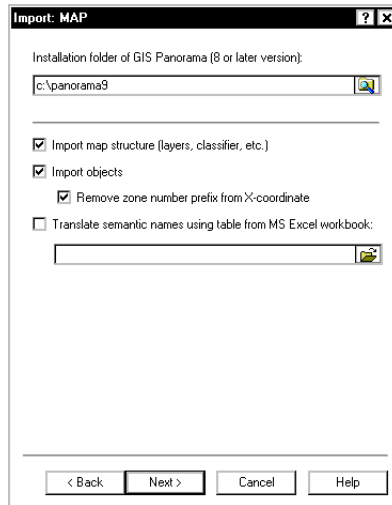
As Easy Trace uses dynamic-link libraries of Panorama at data reading and writing in its format, the GIS should be installed in your computer (version 8 or later).

*Data import and export are possible if Panorama (GIS Karta 2003) or later is installed in your computer!*

## Import

Select a MAP-file on the *General* page of *Import Wizard* to transfer data from Panorama.

Specify the folder of Panorama (GIS Karta 2003 or later) on the *Import MAP* page of the Wizard to provide access to dynamic libraries of the GIS (the *Installation folder of GIS Panorama* field).



Up to 3 layers may correspond in the Easy Trace project to every Panorama layer described by the qualifier of the map you have selected for import - for point, linear, and polygonal objects separately.

Objects of different types are attributed to different layers for the purpose of attribute structure simplification. Every layer of Panorama may contain several types (classes) of objects with different semantics. The list of attributes becomes too long (even subject to individual attribute tables for point and linear objects) if we ascribe all of them to the same ET layer.

The *Import objects* option enables import of point, «vector», linear, and areal objects and their semantics as well as inscriptions. Easy Trace supports attributes of text objects optionally, so this option should be on to import text attributes.

Easy Trace imports «vector»-type objects as block insertion points. For every type of «vector» it generates a block of the same name. It looks like a stroke as Panorama does not provide handy interface for «vector» form reading.

The *Remove zone number prefix from X-coordinate* option makes coordinates of a projection zone «pure» (without shift), with coordinate origin within the zone.

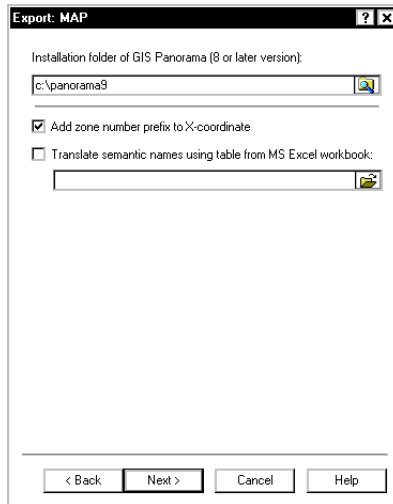
The *Translate semantic names using table from MX Excel workbook* option is meant for transformation of inner semantic names (like SEM2, SEM39, etc.) into understandable names of Easy Trace attributes.

## Export

Easy Trace can not generate new maps in Panorama format; that's why it is necessary to specify an existing MAP-file for export. What is more, this file should be related just

to the map sheet being exported (i.e. it must have the corresponding extent), otherwise you will not be able to see exported data in Panorama.

Specify the folder of Panorama (GIS Karta 2003 or later) on the *Export MAP* page of the Wizard to provide access to dynamic libraries of the GIS (the *Installation folder of GIS Panorama* field).



To get into the output MAP-file, the object must be of an identifiable type specified as its OBJ\_TYPE attribute. Easy Trace does not export to Panorama objects without attributes or ones with empty OBJ\_TYPE field.

Belonging of the object to a certain ET layer is unimportant at export to Panorama as a matter of fact as its layer in the GIS depends on the code. This fact allows you to redistribute objects by Easy Trace layers in any convenient way.

For example, different types of relief contour lines and other topographic objects may belong to different layers in your project but form one layer of relief in Panorama.

Easy Trace has no full analogue of the Panorama «vector». Blocks may partly substitute this type of objects but they have no the second insertion point and their position depends on the rotation angle. If the second point is important (for joining with other objects), use another possibility of data preparing.

To form «vectors», export to Panorama lines consisting of 2 vertices and having semantic of «vectors» (i.e. corresponding classification code). The layer of these lines must have an attribute table for points - it serves as an additional feature to enable export.

Switch on the *Add zone number prefix to X-coordinates* option if your project was created in «pure» (without shift) coordinates of the projection zone (i.e. coordinate origin is within

the zone). That may be the case if the *Remove zone number prefix from X-coordinate* option was on at map import from Panarama for project creation.

The *Translate semantic names using table from MX Excel workbook* option is meant for transformation of Easy Trace attribute names into inner semantics of Panorama (like SEM2, SEM39, etc.).

## DWG format (AutoCAD)

As DWG is AutoCAD (AutoDesk) inner format, it ensures minimal data loss at transfer from or into Easy Trace.

In particular, you may register rasters directly in AutoCAD (at export) or Easy Trace (at import) unlike the case when you use the DXF exchange format.

As file exchange with AutoCAD is based on its assignable automatization interface, AutoCAD of the corresponding version should be installed in your computer.

The current Easy Trace version supports AutoCAD 2005 and 2006 and does not support later versions (2007+)

## Import

Select a DWG-file for import on the *General* page of *Import Wizard* and then specify the layers you want to import on the *Layer Options* page, and rename them if necessary.

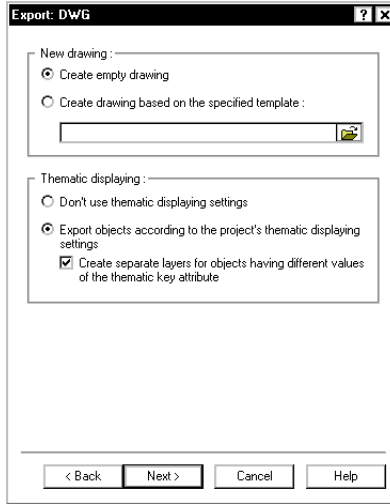
There is no page of specific options for DWG-import

## Export

At export, Easy Trace generates a new AutoCAD drawing first and then fills it with data. DWG-export settings allow you to create the new drawing in two ways:

1. to create an empty drawing just as AutoCAD does it be default;
2. to use an adjusted AutoCAD drawing template (a .dwt file) as a prototype. This option may be useful if export should resulted in a completely adjusted AutoCAD drawing containing necessary line types, text styles, etc. As it is rather difficult to provide absolute conformity of these features in Easy Trace and AutoCAD, you may prepare the template in AutoCAD first and then use it as a pattern at export.

Easy Trace does not support AutoCAD's representation of attributive data. But it is possible to export thematic coloring of objects corresponding to attribute values (thematic displaying), i.e. to form representation of objects similar to their thematic representation in Easy Trace. The *Export objects according to the project's thematic displaying settings* option is provided for this purpose.



The *Create separate layers for objects having different values of the thematic key attribute* option enables you to ascribe objects with different values of the key attribute to different layers of AutoCAD. At that, the name of every layer consists of the source layer name and the corresponding attribute value.

## DXF format (AutoCAD)

DXF is an exchange format of AutoCAD (AutoDesk) and most of modern GIS/CAD applications of other producers support it as well.

The DXF-file consists of several sections; Easy Trace supports the following of them:

- HEADER section - general parameters of AutoCAD drawing and environment;
- TABLES section - partly (see below);
- BLOCKS section - description of compound graphical objects (blocks);
- ENTITIES section - all graphic entities of the drawing including references to blocks.

Easy Trace does not process other sections of the DXF-file.

The following of the tables described in the TABLES section are being processed:

- the table of line types (LTYPE);
- the table of layers (LAYER);
- the table of text styles (STYLE).

The program ignores other tables at import and does not create at export.

The DXF format is based on so called “groups”, each consisting of two strings. The first string contains the group code (a positive integer number). The second string is the value of the group; its format depends on group type (defined by its code).

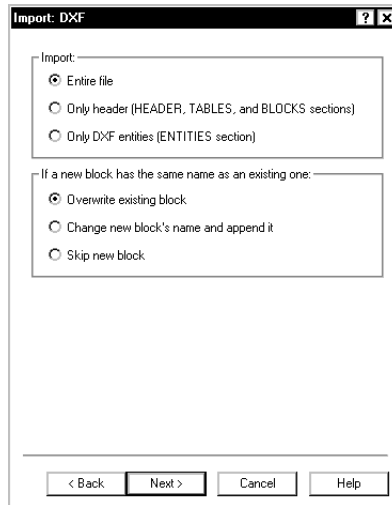
## Import

You may selectively specify the layers for import on the *Layer Options* page of Import Wizard. Rename them if necessary, i.e. specify the name they will have in your ET project..

The header only (i.e., the HEADER, TABLES, and BLOCKS sections), graphic objects only (the ENTITIES section), or the entire DXF-file may be imported at user’s option specified on the *Import DXF* page.

You may use import of a DXF-header for project adjustment.

If the ENTITIES section only is selected for import, Easy Trace creates missing layers and text styles the entities refer to with default settings. Insertion of the blocks missing in the project will be skipped



At import of DXF objects, Easy Trace analyses only the groups it can generate at export:

- Line types - only names are being imported;
- Layers - color and line type are being imported;
- Styles - font, stretching coefficient, slope angle, fixed height, flags, and attributes are being imported. Easy Trace does not apply all the attributes besides the first two, but it stores them. Also, the program does not support the fonts used in the latest AutoCAD versions, only old SHX-files in DOS-coding. All other fonts will be substituted for the standard font of the Easy Trace project.

Easy Trace imports the following AutoCAD entities:

- POLYLINE;
- LWPOLYLINE;
- LINE;
- 3DLINE;
- SOLID;
- TRACE;
- 3DFACE;
- INSERT;
- CIRCLE;
- POINT;
- ARC (being a block part only).

Variable width of polylines and the shape of arcs connecting their vertices are being ignored at import, i.e., the program always imports polylines as broken lines of constant

width.

Easy Trace imports objects of the SOLID, TRACE, and 3DFACE types as closed polylines consisting of 3 or 4 vertices.

The *If a new block has the same name as an existing one* option controls reaction of the program at block name clash. It may happen that one or several blocks in the DXF-file selected for import have the same names as blocks in the project. T

he option may have one of 3 values:

- *overwrite existing block* - imported block substitutes the block of the same name in existing the project;
- *change new block's name and append it* - the program adds consecutive numbers to the block name until it becomes unique;
- *skip new block* - all the references to this block will be actually substituted after import for references to the old block of the same name.

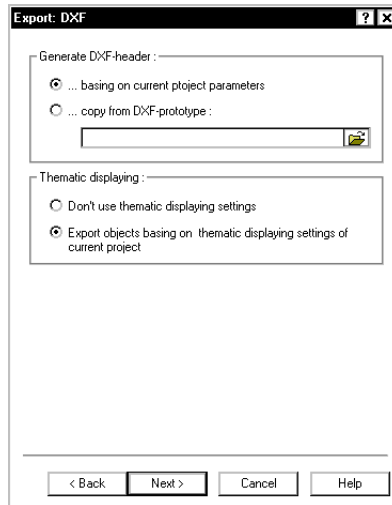
## Export

You may select how to form the header of the DXF-file (i.e. the sections HEADER, TABLES, and BLOCKS) on the *Export DXF* page. It may be done in two ways:

1. Automatic generation on the base of the project being exported;
2. Use of an existing AutoCAD drawing's settings. It means that Easy Trace copies the header of the specified DXF-file. In that case all the sections of the file-template up to the ENTITIES section are being copied completely.

Remember that no examination or checking of the file-template is executed while copying, i.e. Easy Trace does not verify correctness of the DXF-template's format and compatibility of its data with project parameters. Such errors will be revealed at loading of the resultant DXF-file into AutoCAD only.

It is reasonable to use copying of the header from a file-template at export on condition that parameters of your Easy Trace project were previously imported from this file. We would like to draw your attention once more to the fact that project parameters critical with respect to export into AutoCAD are names of layers, text styles and blocks.



If Easy Trace generates the DXF-file header by itself, it will be done in the following way:

1. The HEADER section will contain only drawing dimensions, i.e. the \$EXTMIN and \$EXTMAX variables.
2. The TABLES section will contain the following tables:
  - LTYPE (a table of line types). Line types of Esay Trace can be converted into the DXF format rather roughly; actually only their names are exported. As AutoCAD forbids interword spaces in line type names, all of them will be substituted for the underline symbol “\_”;
  - LAYER (a table of layers). The following features of every layer are being exported: its name (code 2), color transformed into the AutoCAD palette (code 62), and linetype name (code 6);
  - STYLE (a table of text styles). The following features of every style are being exported:
    - style name (code 2),
    - font file name (code 3),
    - fixed height (code 40),
    - stretching coefficient (code 41),
    - slope angle (code 50),
    - attributes (code 70),
    - flags (code 71).

Easy Trace does not directly use or support most of these parameters. Their values different from standard ones may appear as a result of previous import only. The program stores them in the project. being stored in the project emerge only during previous import.

3. The BLOCKS section contains descriptions of all the blocks existing in your Easy Trace project. The following features of every block are being exported:

- block name (code 2);
- name of the layer to which the block belongs by default (code 8);
- block description (coincides with the name, code 3);
- flags (code 70);
- base point of the block (codes 10,20,30).

Easy Trace does not support block attributes, and so it does not export them. The entities the block consists of are being exported in the same way as independent ones.

4. The ENTITIES section (graphical entities) is being formed in the following way:

- Polylines are being exported as POLYLINE objects of a constant width with the following features:
  - layer name (code 8);
  - flags (code 70);
  - width (codes 40, 41);
  - layer name and coordinates (codes 10,20,30) for every vertex.Polyline flags may include 0x1 (closed line sign) and 0x8 (3D-line sign).
- Blocks are being exported as INSERT objects with the following features:
  - block name (code 2);
  - layer name (code 8);
  - scaling coefficients (codes 41, 42);
  - rotation angle (cpde 50).
- Text is being exported as TEXT objects with the following features:
  - text value (code 1);
  - layer name (code 2);
  - lower left corner (codes 10, 20, 30);
  - height (code 40);

- stretching coefficient (code 41);
- rotation angle (code 50);
- style name (code 7);
- alignment (code 72);
- additional insertion point (codes 11, 21, 31).
- Circles are being exported as CIRCLE objects with the following features:
  - layer name (code 8);
  - coordinates of the center (codes 10, 20, 30);
  - radius (code 40);
- Points are being exported as POINT objects with the following features:
  - layer name (code 8);
  - coordinates (codes 10, 20, 30).

E+

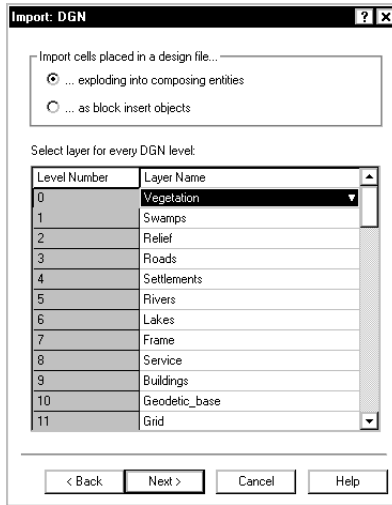
## DGN format (Intergraph)

DGN is a working format of Microstation and Intergraph IGDS. A DGN-file is a binary file of variable-length records describing geometrical objects of different types.

Transition from an arbitrary set of named layers to a strictly determined set of 64 numbered levels is a special feature of data exchange with this format. The same problem arises when you want to export/import text style, line color and line width ascribed to every particular level.

## Import

One should set correspondence between project layers and DGN-file levels while vector data import into Easy Trace. To do it, use the table of correspondence on the *Import DGN* page. For every DGN layer you may specify either a layer of your project or the name of a new layer that will be created while import of vector data from this level. Thus, input of correct layer names for empty DGN levels is not compulsory.



Import: DGN

Import cells placed in a design file...

... exploding into composing entities

... as block insert objects

Select layer for every DGN level:

Level Number	Layer Name
0	Vegetation
1	Swamps
2	Relief
3	Roads
4	Settlements
5	Rivers
6	Lakes
7	Frame
8	Service
9	Buildings
10	Geodetic_base
11	Grid

< Back   Next >   Cancel   Help

Easy Trace imports the following types of DGN objects:

- blocks - Cell Header (Type 2);
- segments - Line Elements (Type 3);
- polylines - Line String Elements (Type 4);
- polygons - Shape Elements (Type 6);
- ellipses - Ellipse Elements (Type 15) (only ones with equal semi-axes);
- text - Text Elements (Type 17);
- references to images - Raster Reference Elements (Type 90) (as raster layers).

Objects of the Line, Line String, and Shape types that have either one vertex or two coinciding ones are being imported as points of the standard type («cross»).

The *Import cells placed in a design file...* option controls how compound objects will be imported:

- ... *exploding into composing entities* - Easy Trace imports every block as a collection of its components, without any relation between them.
- ... *as block insert objects* - Easy Trace imports Cell Header elements as block insertions. If the block of the corresponding name does not exist in the project, it will be created.

## Export

Export into the DGN format is a unifile one - vector objects from all the layers you have selected for export will be written into the same file. It is necessary to specify numbers of DGN levels and line parameters for every layer being exported on the *Layer Options* page

As the format is binary, precision of coordinate representation is of no use. That is why the *Number of decimal places in vector data* field on the *General* page of *Export Wizard* is inaccessible.

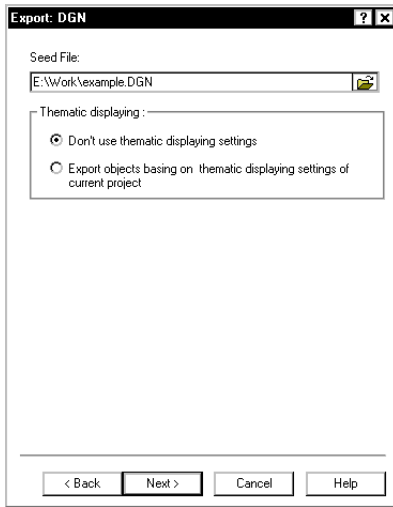
Easy Trace exports to DGN objects of the following types:

- polylines;
- points (as segments with coinciding vertices);
- circles (as ellipses with equal semi-axes);
- text;
- georeferencing information for raster layers to be exported.

Use of a DGN-file as a template is another peculiarity of export into this format. Easy Trace doesn't create File Header, IGDS Digitizer, and Level Sym sections, but copies them from the DGN-file you have specified.

The *DGN-prototype* field of the *Export DGN* page is provided for this purpose. It is convenient to use an empty DGN-file with desirable settings as a template.

One should remember that there are 2D and 3D DGN-files. Use a 2D file as a template if Z values are not required in the resultant file and a 3D pattern if you need them. At export into a 3D DGN-file, text objects always have zero rotation angle.



Easy Trace does not export attributive data into DGN but it is possible to export thematic coloring of objects corresponding to attribute values, i.e. to form representation of objects similar to their thematic displaying in Easy Trace (the *Thematic displaying* options).

## TOP format (CREDO)

TOP is an open exchange format of the CREDO\_TER system designed for creation and use of large-scale topographic schemes. The format consists of two files - the TOP-file containing point metric (X, Y, Z) and point object properties, and the ABR-file containing description of linkages (point-connecting lines) and properties of the formed linear or areal objects. Both files should have the same name and should be stored in the same folder

The following string in the TOP-file corresponds to every point, polyline vertex, or text object:

```
point_number status_code x y z layer_number [text descriptors]
```

The 3-digit status code controls belonging of the point to a surface, Z-mark representation, and also determines whether the point is a station (i.e., the initial point of the working session). If that is the case, the point\_number field contains a unique station number. All the points following the station till the next station or the file end form a single group of points and have a unique number within it

Station numbers and point numbers (taken from the TOP-file) corresponding to vertices of every polyline are being stored in the ABR-file together with the number of the line layer, list terminator, and a closure flag (if necessary).

## Import

The user selects for import only TOP-files on the *General page of Import Wizard*. These files contain point metric (X, Y, Z) and point object properties. If an ABR-file of the same name is found while import of the selected TOP-file, the polylines described in it will be imported automatically, but presence of ABR-files is optional.

Easy Trace imports vector objects into layers with names corresponding to layer numbers in the TOP/ABR files. If such layers are missing in the project, they will be added automatically.

All the entities are being imported as mapped onto a plane (Easy Trace ignores the first figure of the status code). A point with TS, TH, and TA parameters will be imported as a text. Otherwise Easy Trace imports a point only if it does not belong to any polyline of the same layer (the ABR-file).

All descriptors besides ones relating to text are being ignored.

CREDO format export and import are not interconvertible:

- There is no any information about type and size of points in the TOP-file. That is why all imported points will be of the same standard type («cross») and size (3);
- There is also no information about text style (font) in the TOP-file you have exported text objects to. That is why all imported text objects will be of the same standard style;

- Blocks and circles are being exported as points. They will not be generated at import as it is impossible to identify them. Easy Trace generates points instead them.

There is no *Import TOP* page in *Import Wizard* as import of TOP-files has no additional options.

## Export

TOP format export is a unfile operation as vector objects of all exported layers will be written into a common TOP-file and its corresponding ABR-file.

Easy Trace exports into CREDO objects of the following types:

- polylines, including 3D ones;
- points;
- text;
- circles (exported as their central points);
- blocks (exported as insertion points).

Easy Trace does not export attributive data into CREDO.

Relief representing points are sufficient to make a surface (relief) digital model in CREDO. Characteristic relief features (thalwegs, watersheds, ravines, etc.) are represented by 3D polylines.

That's why it is necessary to specify at export (on the *Layer Options* page) names of the layers that contain relief data. Information about horizontal polylines attributed to these layers will not be written into the ABR-file then (but vertices of these lines will be described in the TOP-file)

Besides relief-concerning, the following features should be specified for every layer you want to export:

- number of the CREDO layer where to objects will be exported from the given Easy Trace layer (it may be the same for objects belonging to different Easy Trace layers);
- code of the object (this value will be assigned to the /K:xxx parameter) for objects of the given Easy Trace layer (the column Object);
- code of the contour (this value will be assigned to the /KL:xxx parameter) for objects of the given Easy Trace layer (the column Contour).

Easy Trace numbers points exported into a TOP-file one after another starting with 1. The program verifies coordinate uniqueness (X, Y) for every point at the precision specified in the *Number of decimal places in vector data* field on the *General* page.

If any point in the target TOP-file has the same coordinates (at the specified precision), its number becomes the number of the new point.

For the layers you have specified as relief data bearing:

- Easy Trace exports vertices of polylines as additional points with a height mark belonging to a surface (status code 011);
- Easy Trace exports points as ordinary points with a height mark belonging to a surface (status code 001);
- Easy Trace writes 3D-polylines to the line description file (ABR) with the /KR:2 parameter (a structural line of an irregular shape).

For the layers that do not bear relief data:

- Easy Trace exports points with zero value of Z coordinate as ordinary points without a height mark that do not belong to a surface (status code 102);
- Easy Trace exports other points as ordinary points with a height mark belonging to a surface (code 002);
- Easy Trace exports polylines and 3D-polylines with /KL:999 parameter (solid lines).

Text is considered at export as an ordinary unprocessed point without height mark (code 100) with text parameters (TS, TH, and TA descriptors)

Only insertion points are being exported to TOP for circles and blocks - as ordinary points without a height mark that do not belong to a surface (status code 102).

One should always remember that the CREDO system applies geodesic coordinates, i.e. its X axis is directed northwards, and Y axis - eastwards. That's why one should select corresponding directions of the axes at project creation (the *Project Properties* dialog box) if you are going to export it to CREDO later.

## CSV format (Comma Separated Values)

CSV is a simple text table format intended for users of GIS/CAD systems that don't support any of Easy Trace exchange formats

Export and import to/from this format is provided for points and polylines only. Easy Trace does not support attributive data exchange with the CSV format.

Easy Trace forms an individual file for every layer with an individual string corresponding to every point or polyline vertex. Values in the string are separated by a symbol-delimiter (“;” by default).

Every string of the CSV-file may contain coordinates (X, Y, Z) of a point or polyline vertex and a point type indicating numerical value.

The <X Y Z Type> row in the beginning of the file determines the order of parameters.

Key words indicate the beginning and the end of every polyline. Default key word for line beginning is BEGPOLY, for line end - ENDPOLY.

The succession of parameters, a symbol-delimiter, and key words indicating polyline beginning/end should be specified on the *Export CSV (Import CSV)* page. The page of special options is similar for export and import.

The image shows a dialog box titled "Import: CSV". It has a standard window title bar with a question mark and a close button. The dialog is divided into two main sections: "Column order:" and "Parameters:". Under "Column order:", there are four dropdown menus. The first is set to "X", the second to "Y", the third to "Z", and the fourth to "Type". Under "Parameters:", there are three fields: "Delimiter:" with a small square containing a dot, "Polyline beginning label:" with a text box containing "BEGPOLY", and "Polyline end label:" with a text box containing "ENDPOLY". At the bottom of the dialog, there are four buttons: "< Back", "Next >", "Cancel", and "Help".

*Column order* - allows you to select the succession of parameters (X, Y, Z, or type) in the output CSV-file. The succession is arbitrary and permits repetitions.

The number of the columns varies from 1 to 4. To exclude the last column, select the value “Empty” in the corresponding list. You may consecutively select this value in three columns (starting with the last one) but the first column should be filled.

#### *Parameters:*

*Delimiter* - contains the symbol-delimiter of columns in the output CSV-file; it is «;» by default.

*Polyline beginning label* - contains the key word that will be written in the output CSV-file previous to the first vertex of every line.

*Polyline end label* - contains the key word that will be written in the output CSV-file after the last vertex of every line.



