

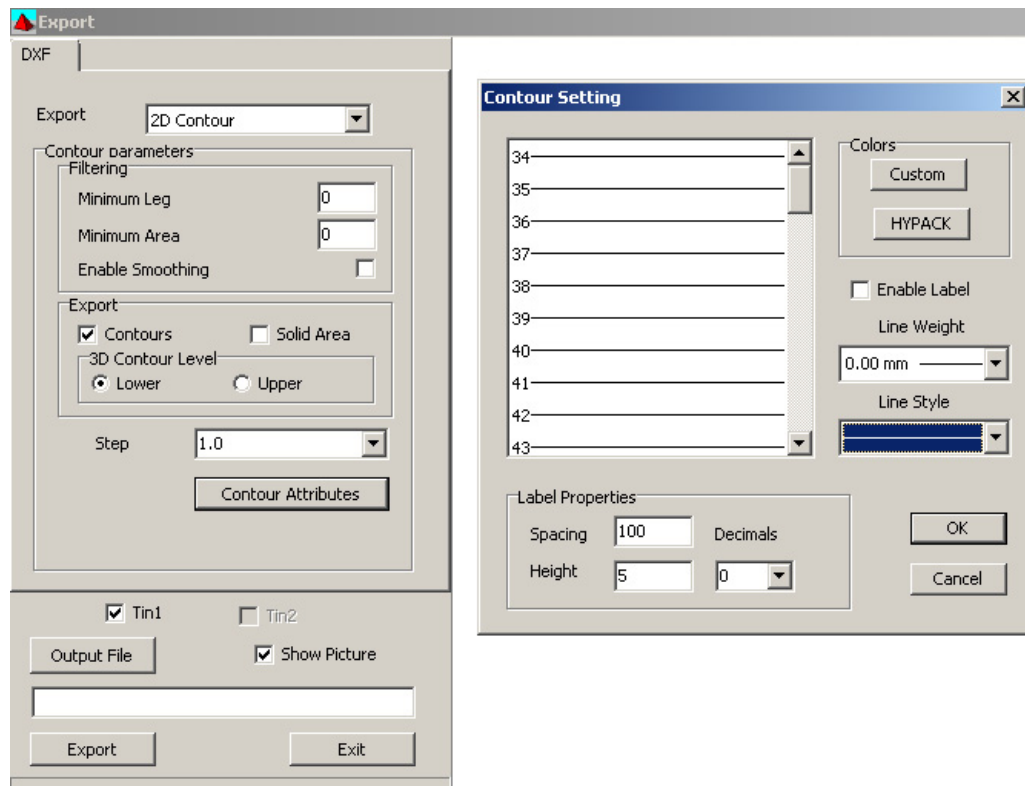


Problems Importing Depth Information into your Electronic Chart and their Resolutions

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One of the more important pieces of information conveyed in an ENC chart are Depth Areas and Contours. After all, available depth is a key component in determining safety of navigation. Your HYPACK® software has the tools available to allow you to quickly and easily get this vital information into your chart. The result, however, may have unexpected problems in the form of errors being reported during chart validation. In this article, we will examine the tools and procedures for bringing depth data into your chart, the issues which may arise and how to address them.

STEP 1: SOUNDINGS TO DXF



After your data is collected and cleaned, generate a TIN model. The encEditor has support to easily generate Depth Areas and Contours from a properly formatted AutoCad DXF file so the DXF Export option from TIN MODEL is the perfect solution.

The default Export mode, 2D Contour, is what we want:

- The **Export Contours** and **Solid Area** check boxes control whether contours and/or depth areas will be available. Check both for ENC production.
- The **Step** mode limits how densely the output contours and areas will be.

- **Smoothing** alters the output from a mathematical exactness to allow for more gentle curves. (That is pretty pictures have a cost!)
- The **Minimum Leg** and **Minimum Area** checks can influence the smoothing effect as well as prevent certain areas from being generated. This can prevent thin sliver areas which aren't very useful.
- Finally the **Contour Attributes** dialog is already setup correctly by default, so I would dissuade you from altering them for our purposes here.

STEP 2: DXF TO ENC

Importing the contours and depth areas into your chart in the ENC Editor is very simple.

Select ENC-IMPORT and choose your TIN generated DXF. You will see a dialog similar to that in the picture above.

Features named cArea represent the Depth Areas being imported. Likewise, the Contours are associated with an item named cPoly2D. These should be the only two feature item types in the file. Click the Tin Import button to finish the import process. Depth Areas and Depth Contours will be inserted into your chart.

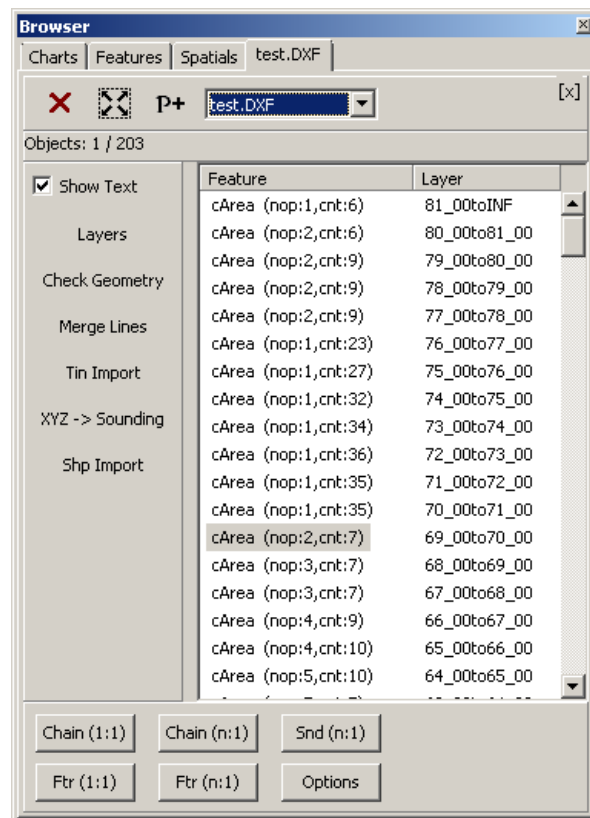


CHART VALIDATION

FIGURE 1. Chart Validation in the ENC EDITOR

Your final step is to check the import process. Select PROCESS- VALIDATE CHART and look for Error (red) items. If all went well, the worst condition reported will be 'Segment contains duplicate points' which the Validator tool can auto-correct for you.

ERROR RESOLUTION

The next part is devoted to any Errors reported, why they showed up and how to address them.

If you receive an error regarding depth areas it always due to some violation of the encoding rules for an ENC. Most rules are satisfied correctly by the import routine, however a few of them are intrinsically tied to the points making up the polygons as input from the file. These source errors can not be automatically corrected. A few examples of this type of error would be: Not enough distinct points in the polygon, a self intersecting polygon, and an inner area not contained within an exterior boundary. The cause for these problems is either that the input data is initially faulty or the that it becomes during the import!

FAULTY DATA COMING IN: SMOOTHING

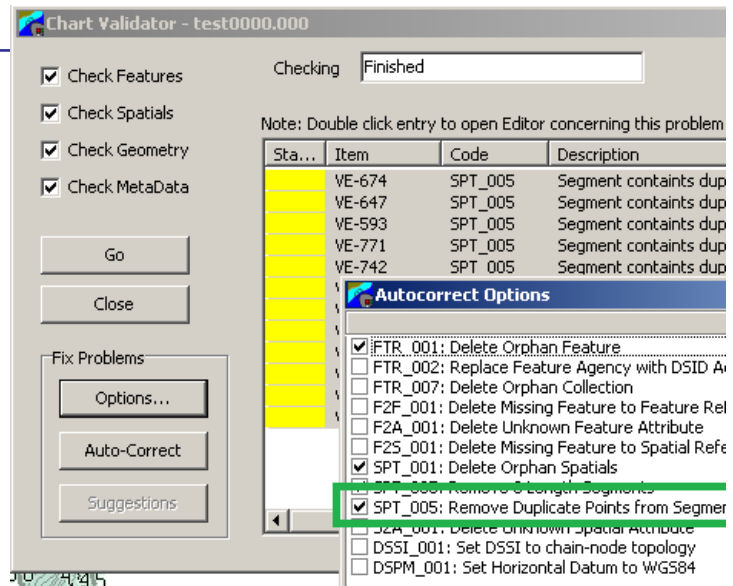
ENCs are often a transitional point from hydrography (absolute accuracy) to cartography (make it look nice). Smooth contours is a prime example.

Beware! The smoothing algorithm in TIN MODEL may produce crossing contours as a byproduct!.

TIN MODEL does a nice job of smoothing out contours, but the pleasing effect comes at a cost — more points in the contour certainly, but also contours that may 'drift' outside of mathematical accuracy. As a result, contours which initially are contained within other contours may end up overlapping.

Correcting this error:

- Output contours without using smoothing.
- Use smoothing but use the Contour Editor to manually correct invalid contours. This entails dragging points of the contour to untangle any overlaps or self intersection problems.



DATA BECOMING FAULTY: UNDERSTANDING THE LIMITATIONS OF THE ELECTRONIC CHART

The precision of data in the S57 chart is no greater than the DXF input and, most likely, is quite a bit less.

The TIN MODEL works in double precision. ENC Charts, on the other hand, are stored in WGS-84 with precision limited to the Coordinate Multiplication Factor.

For tightly packed contours or points in close proximity (from a resolution perspective) the storage conversion may cause once well-defined and separate contours to no longer maintain their separate relationship. It may also cause contours to collapse to a line or even a point depending on point separation.

Correcting this error:

Make sure the Coordinate Multiplication Factor for the chart is at maximum capacity - 10 million. This is safe for all charts. A greater value may cause data loss depending on distance from the equator and prime meridian (I would say never exceed this value), however a lesser value always causes precision loss and does not save any space, so there is little reason not to use 10 million!

OVERLY DENSE CONTOURS MAY LOSE SEPARATION

Very dense contours will suffer from little separation for points in close proximity. This may exceed the resolution of the charts storage.

Correcting this error:

Output contours at a greater step rate in TIN MODEL so they don't pack so tightly.