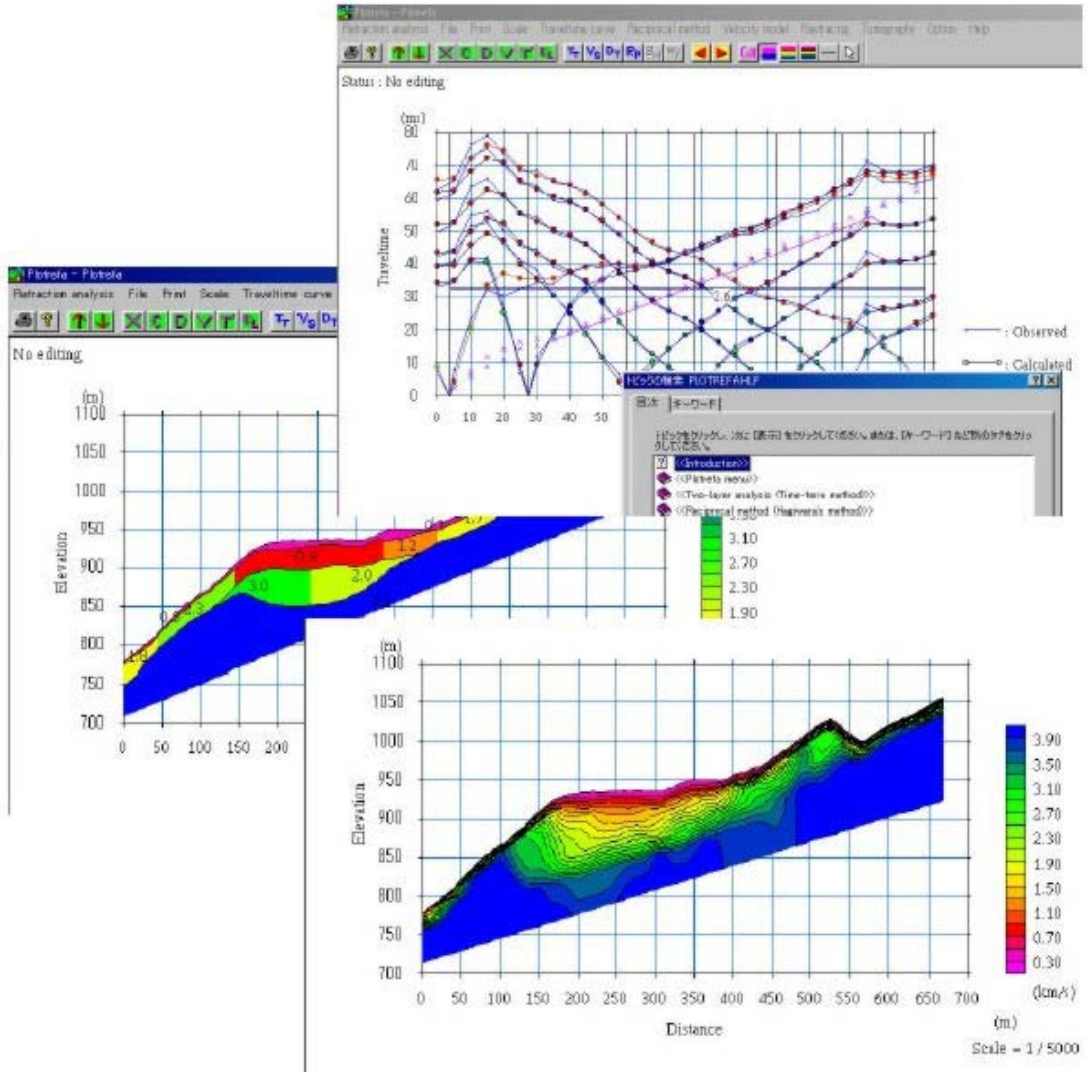
SeisImager/2D™ Examples

Version 1.1

January 18, 2005



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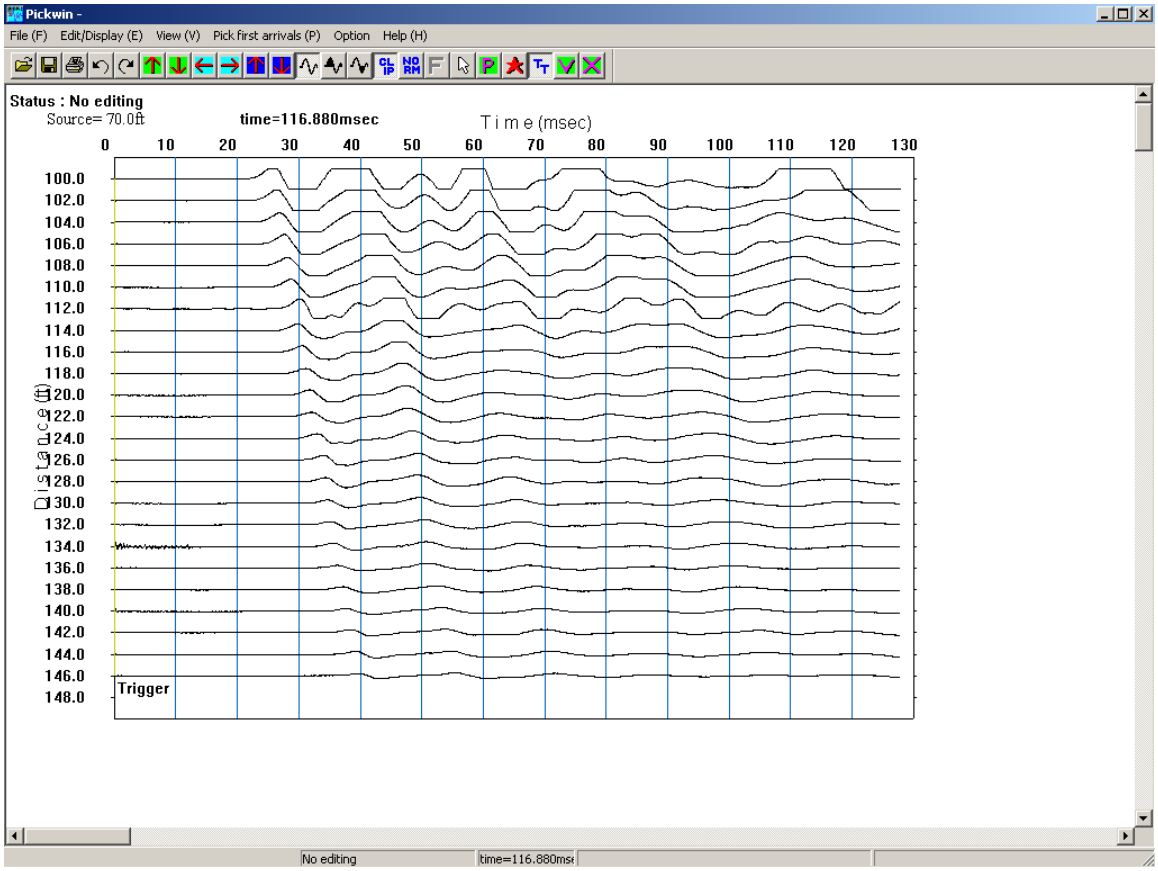
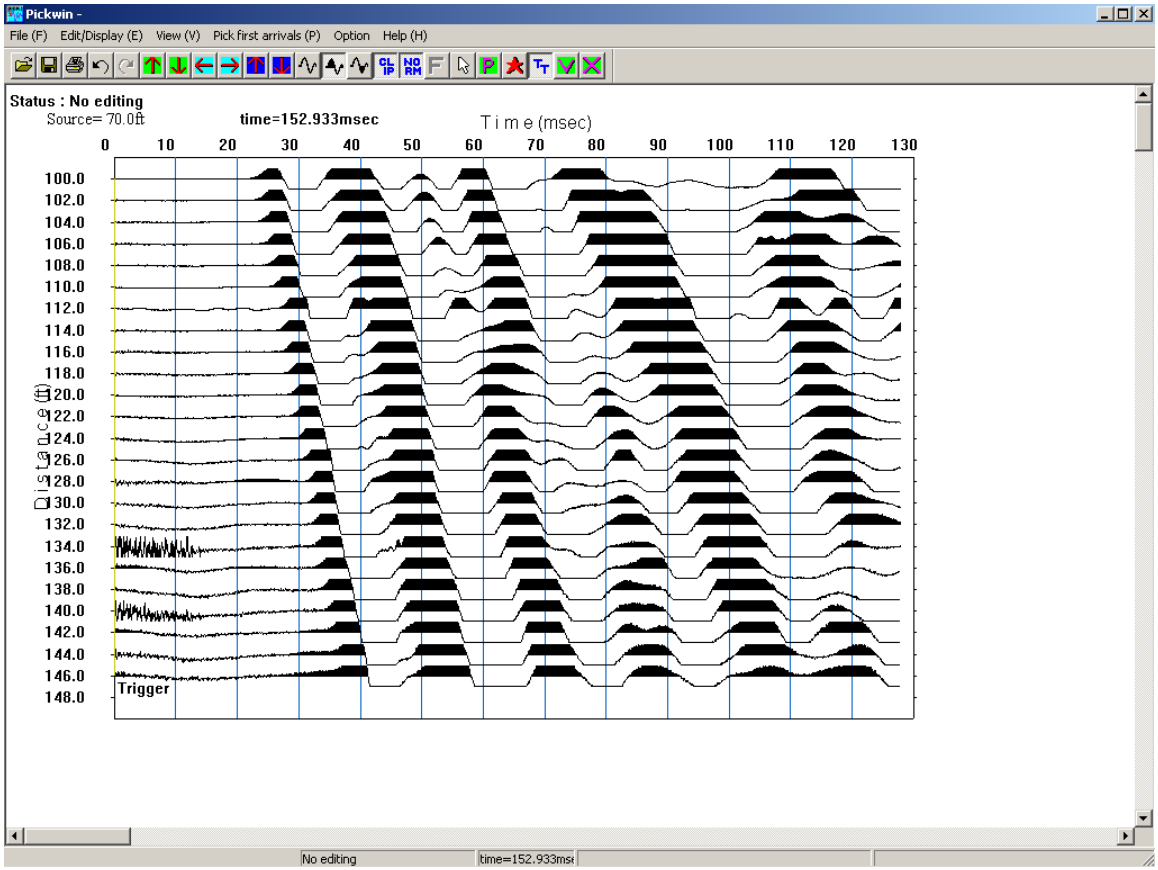
1 Pickwin Examples

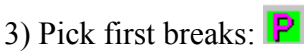
1.1 Example 1 – Simple 5-shot spread

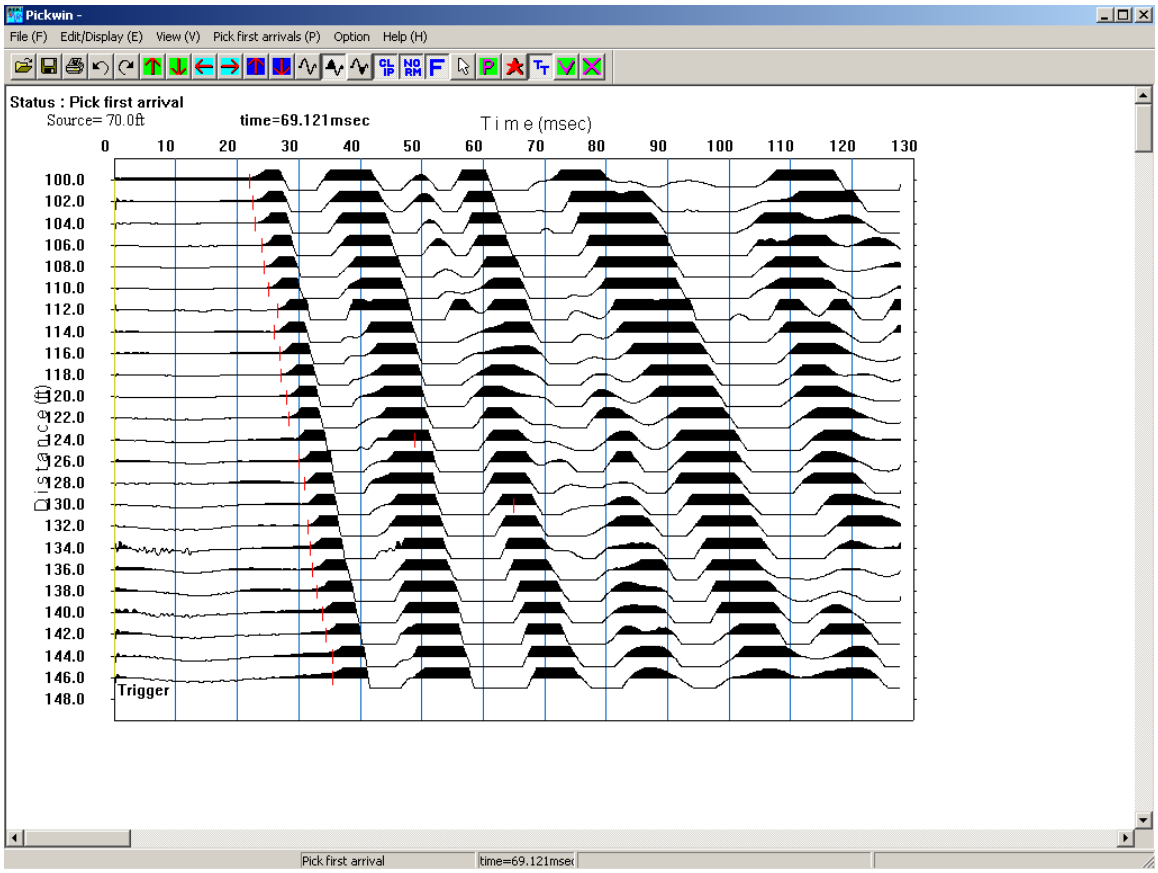
1) Open a SEG-2 file: 



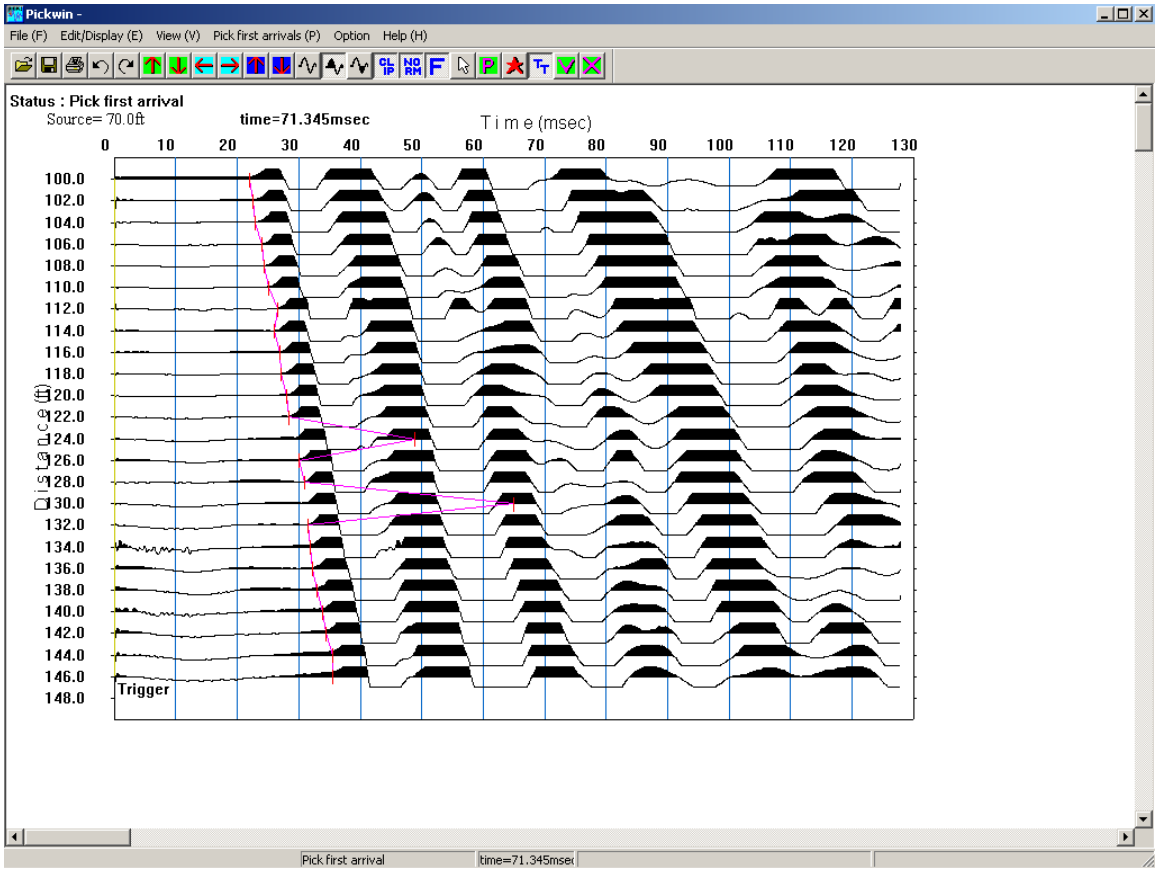
2) Optimize display: 



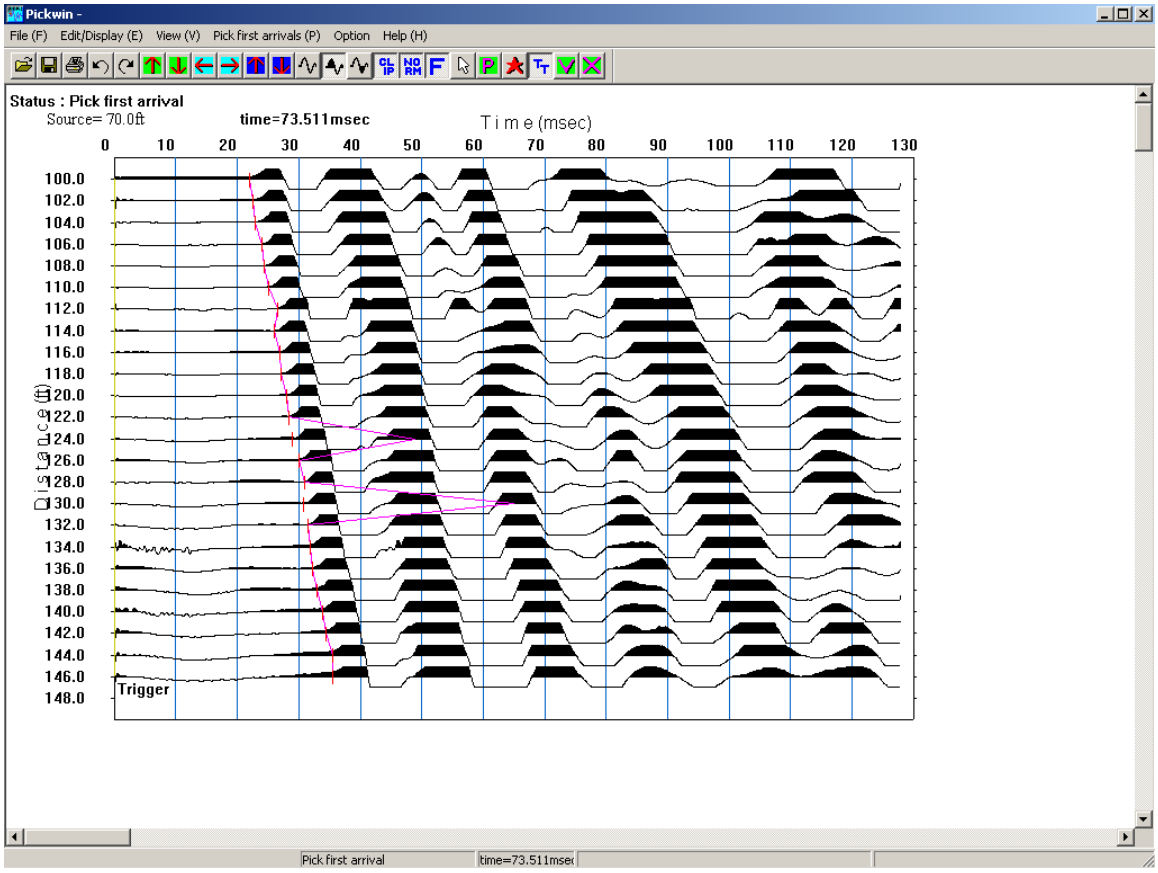
3) Pick first breaks: 



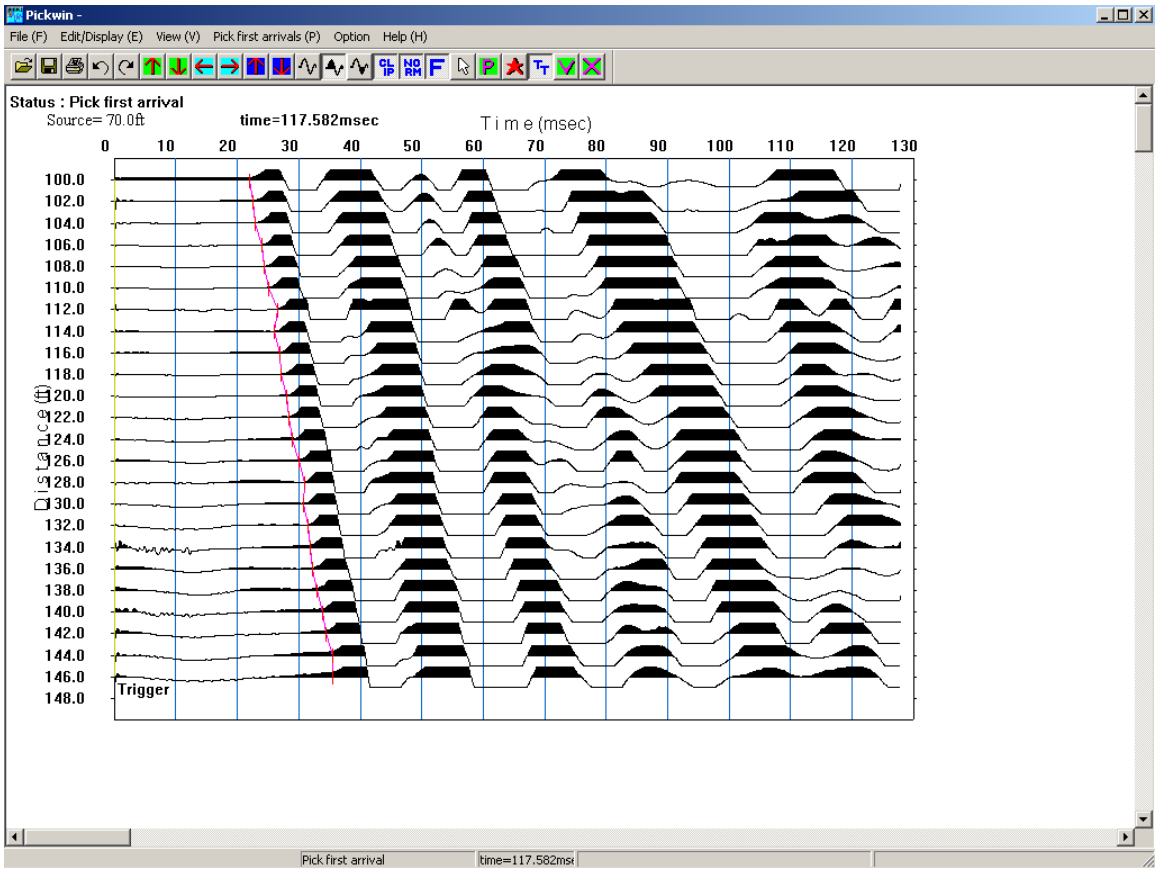
4) Connect first breaks: 



5) Manually adjust first breaks:

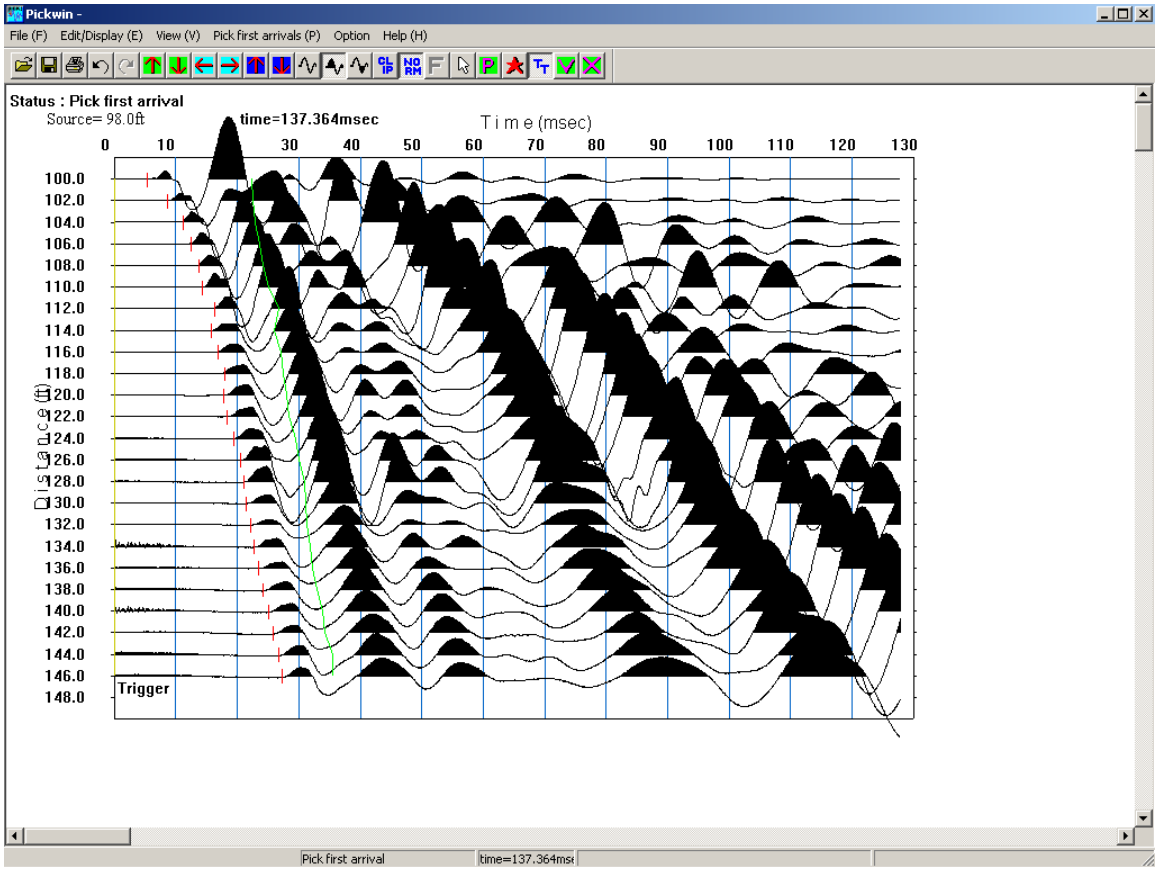


6) Connect first breaks again: 

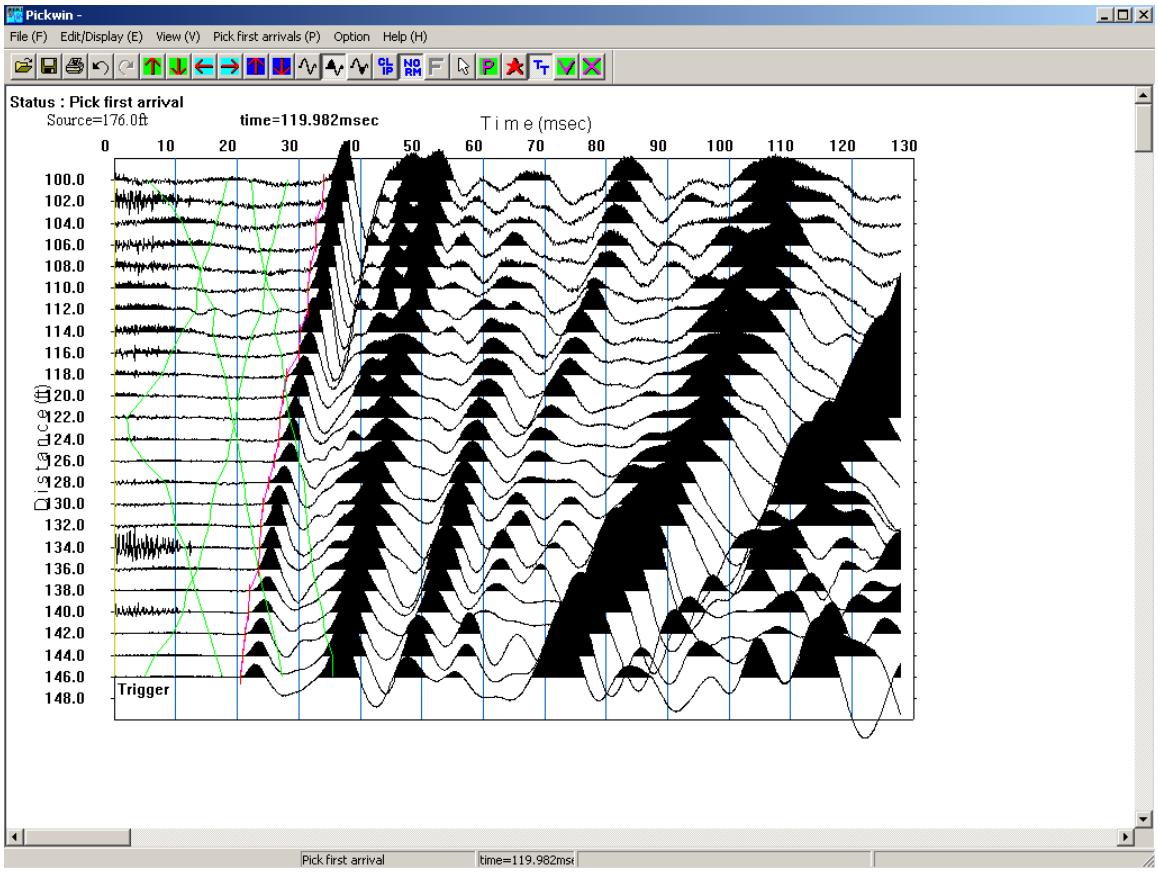


7) Save first break picks file (optional).

8) Read in next SEG-2 file as *New* file: 



9) Repeat above steps until all files have been picked:



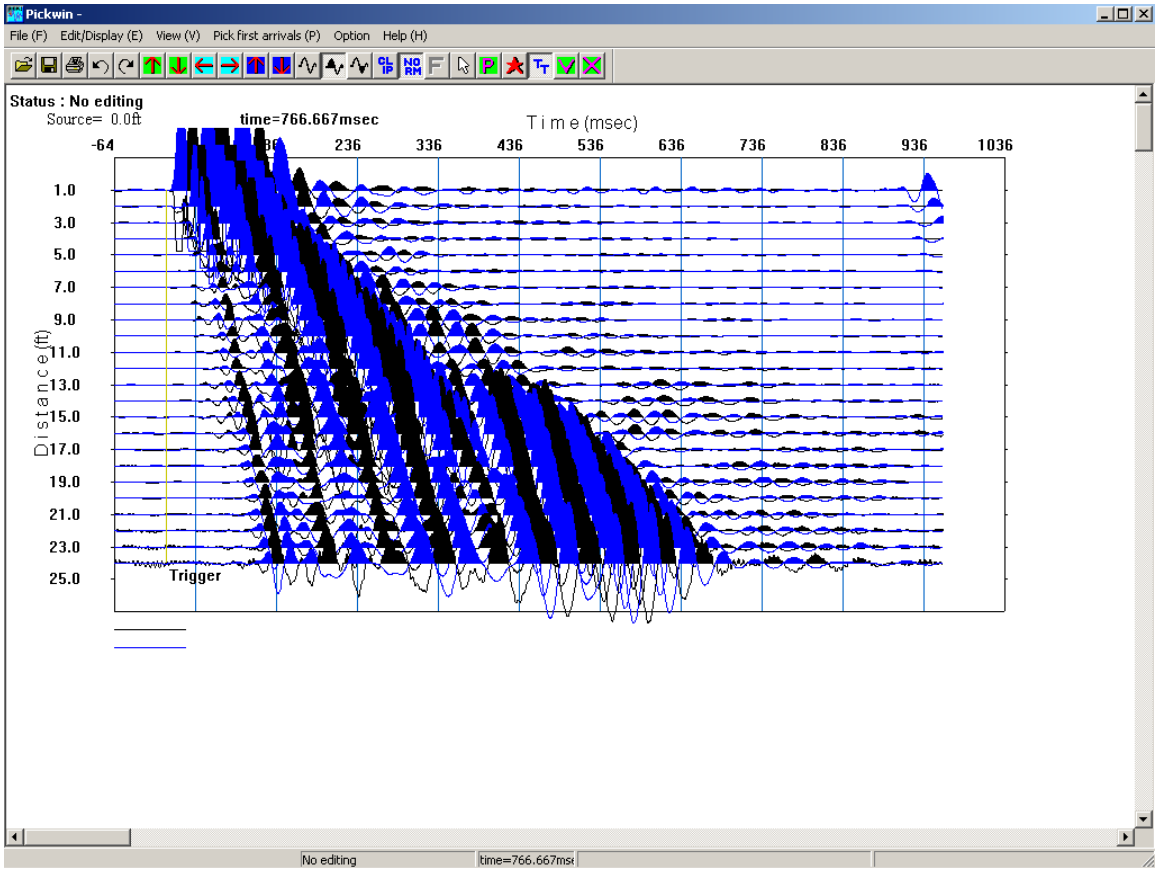
10) When all files have been picked, save the first break picks file (mandatory!).

1.2 Example 2 - Shear wave survey

1) Open a SEG-2 file: 

2) Optimize display: 

3) Open reverse-polarity record as an *appended* file (display parameters for appended will be the same as the first file):

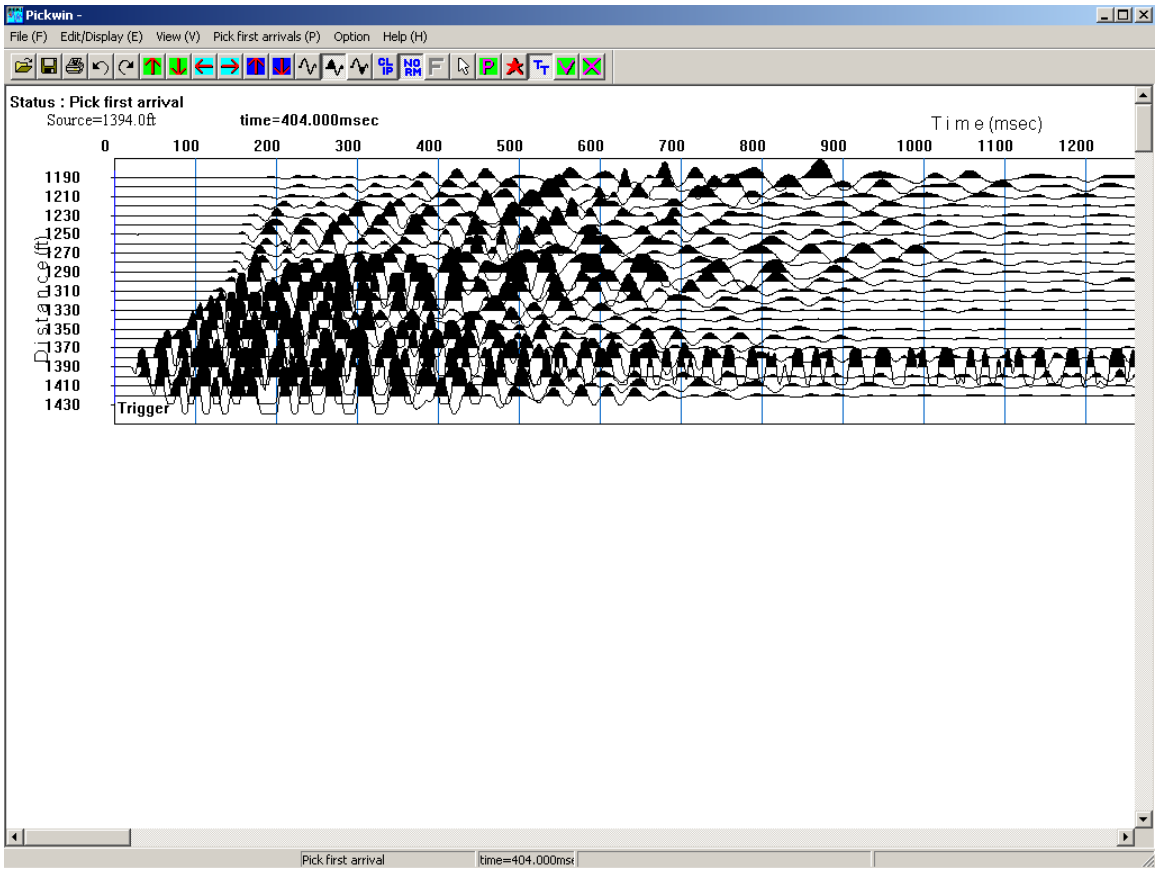


4) Pick first breaks. 

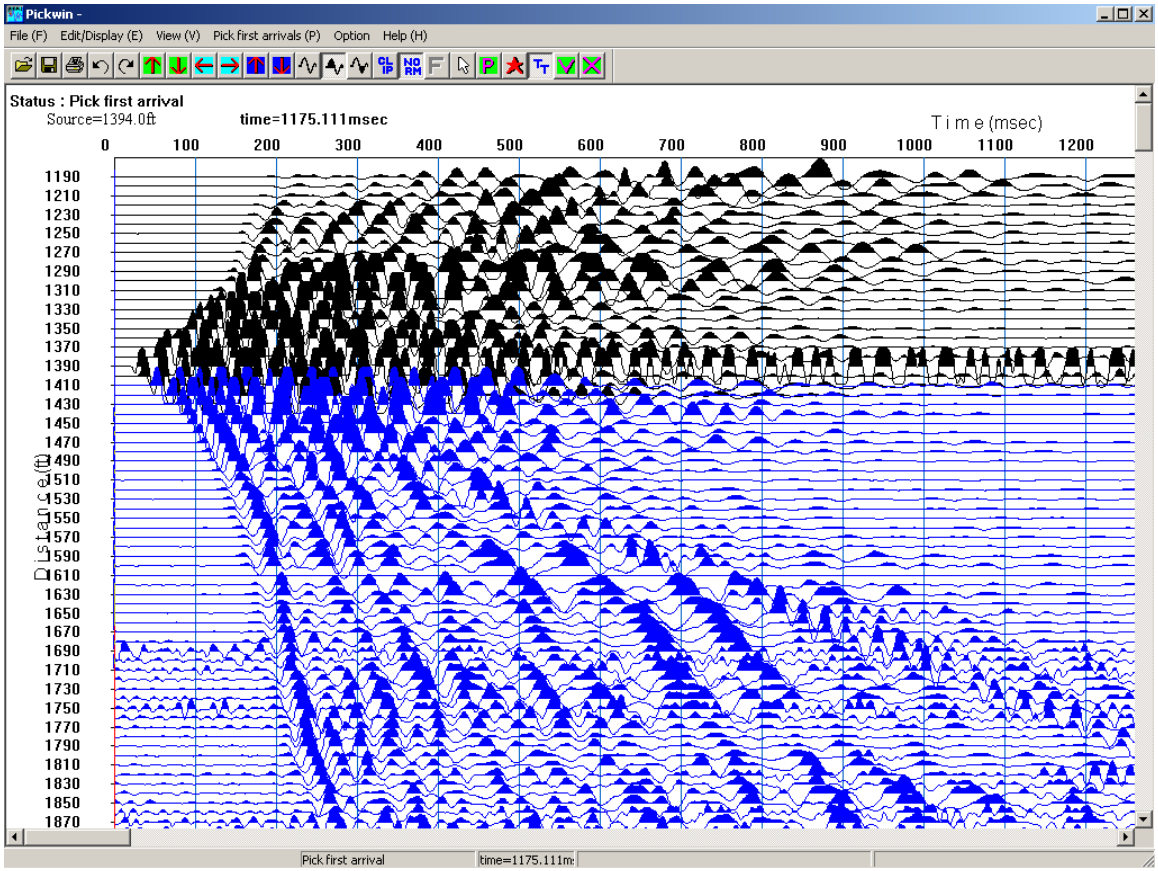
5) Follow procedure described in Case 1 until all files have been picked.

1.3 Example 3 – Multiple Spreads

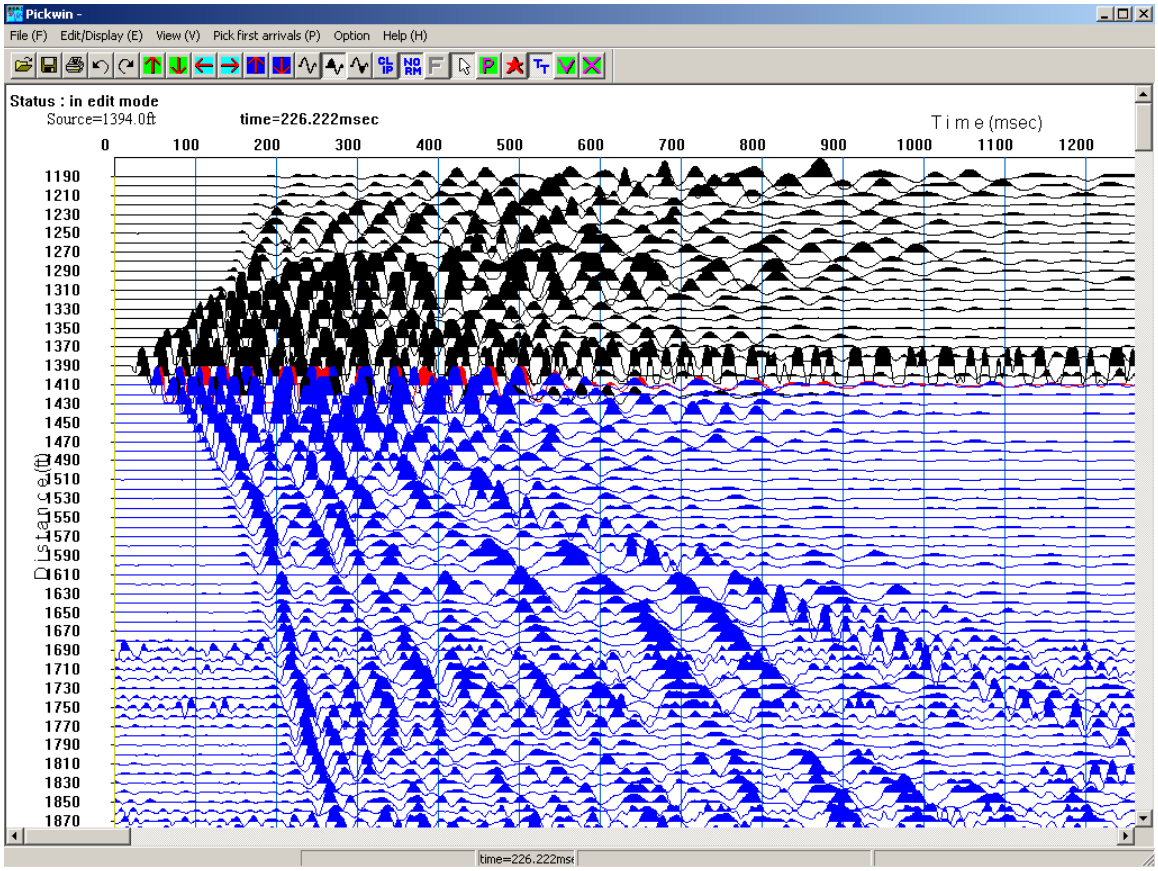
1) Open a SEG-2 file: 



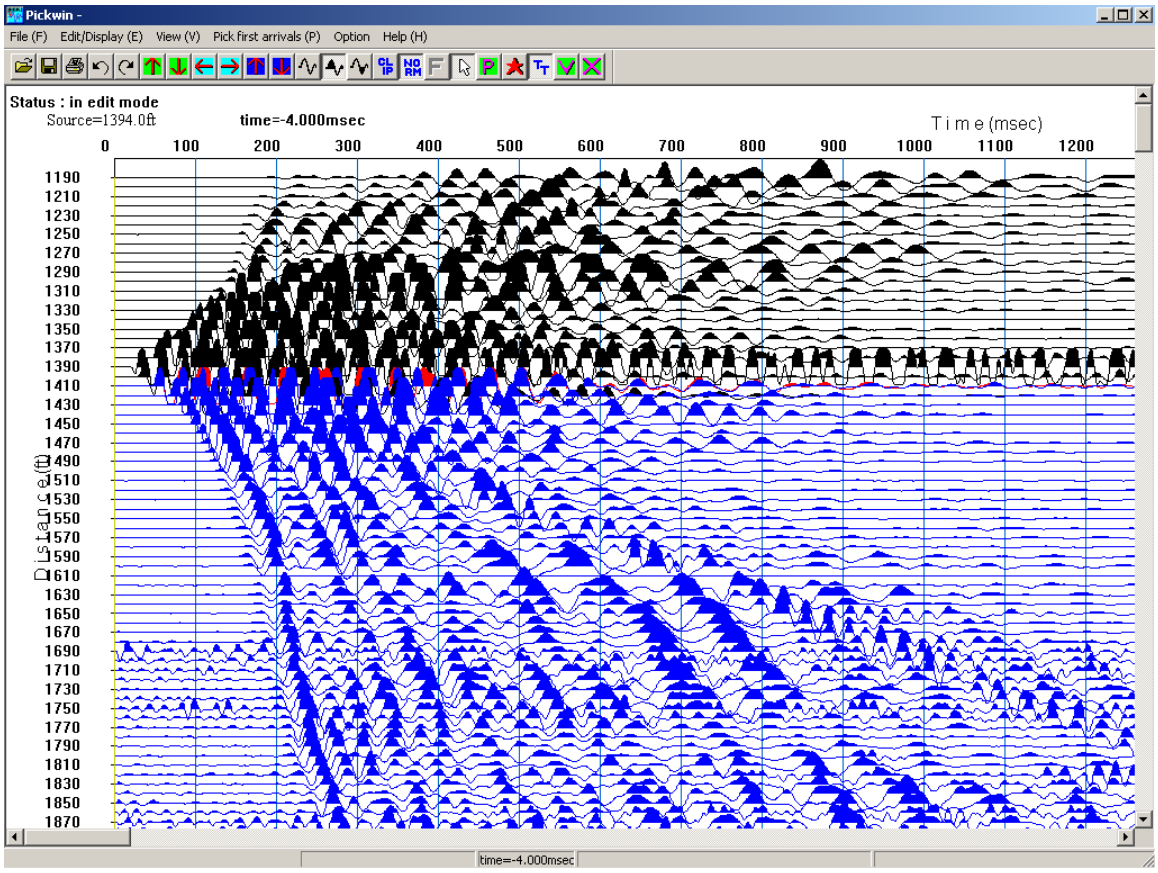
2) Open next SEG-2 file as appended file: 



3) If you have overlap, select overlapping traces:



4) Use the automatic shift function to correct data:



5) Pick first breaks. 

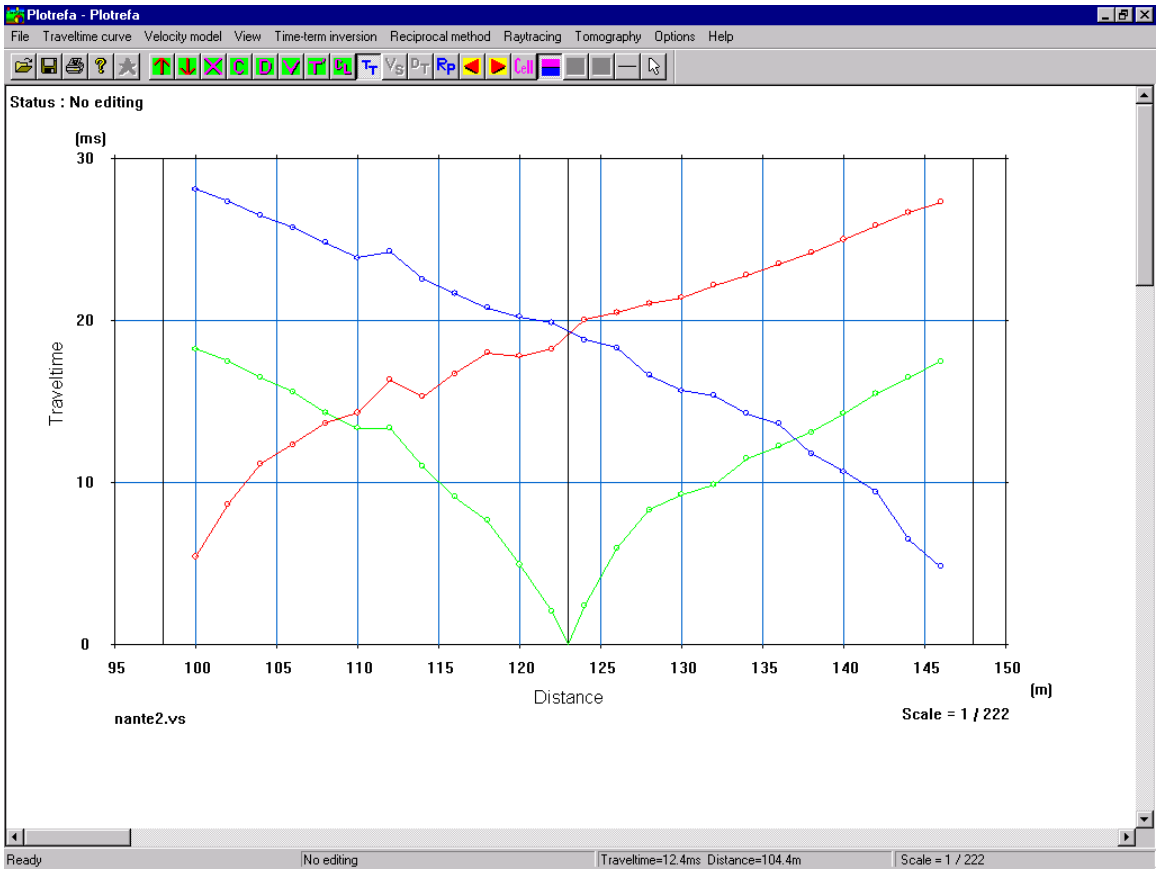
6) Follow procedure described in Case 1 until all files have been picked.

2 Plotrefa Examples

2.1 Example 1 – Three-channel Refraction Survey

Most refraction surveys are conducted with seismographs consisting of 12 or more channels. Generally, this is considered to be the minimum number of travel times you need per shot to come up with a reasonable velocity model. Twelve or more geophones are laid out on the ground, and a series of shots are done at intervals along the line. Twelve or more traveltimes are recorded for each shot.

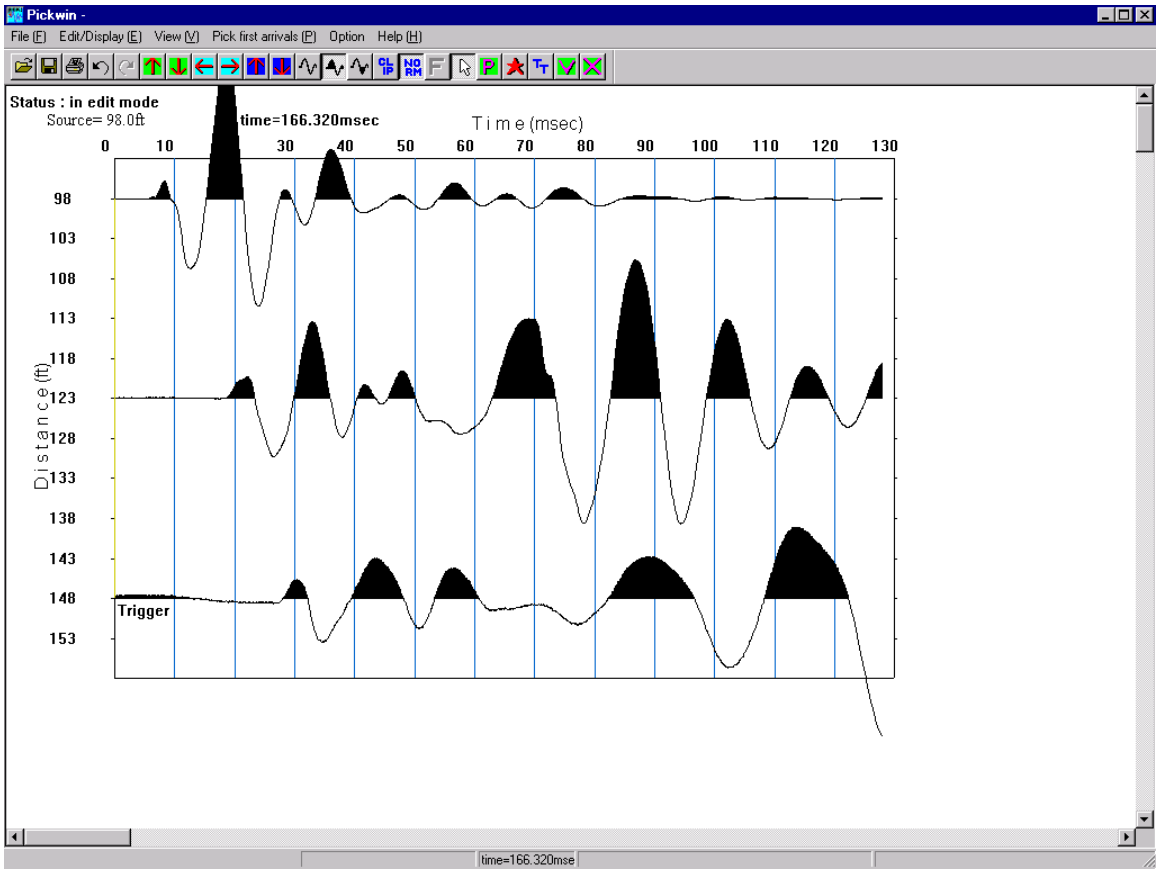
This style of surveying naturally leads to first arrivals being plotted relative to the *source* location. Plotting all of the traveltime curves together in one plot (below), is therefore referred to as a "common source gather".



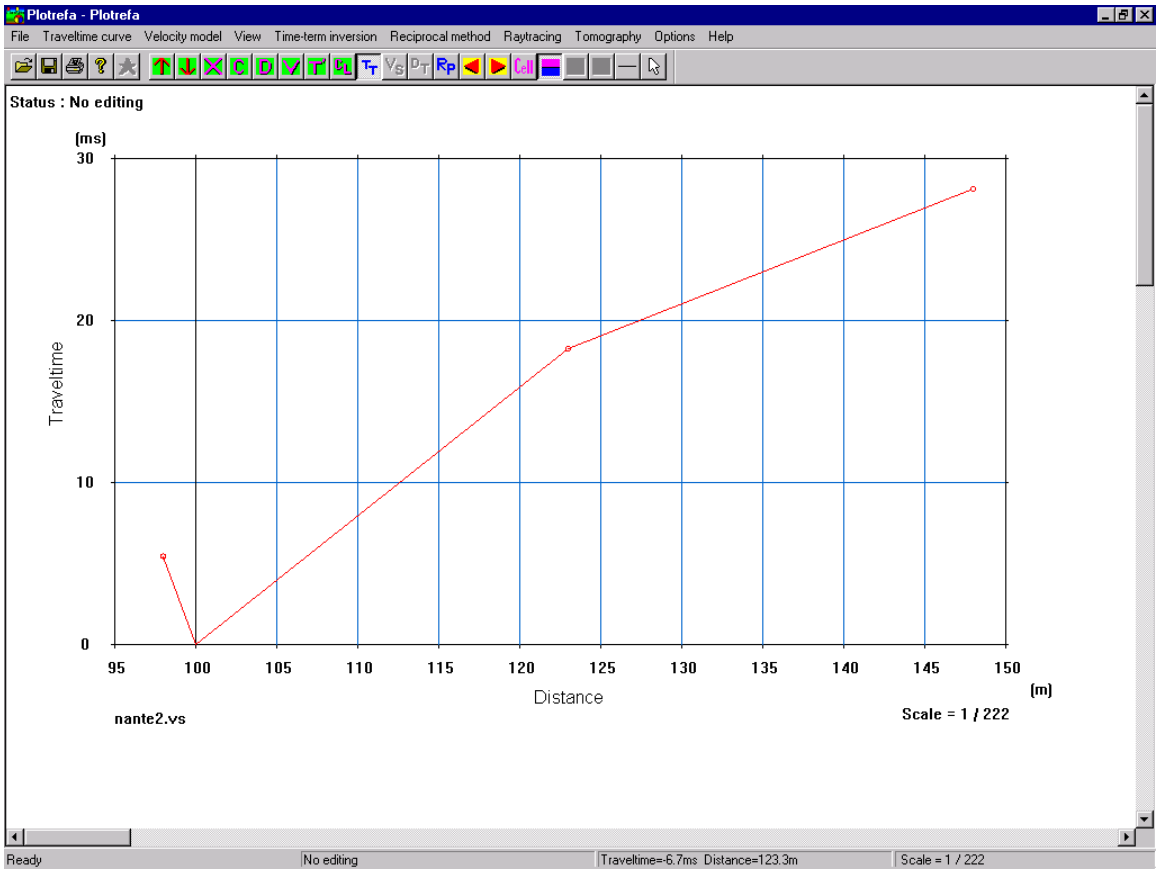
If the number of channels that you have available is less than the number of traveltimes you want to record for each shot, you can take advantage of the principal of *reciprocity* and interchange the geophones and the shots. This is best illustrated by example.

Suppose you have a 3-channel seismograph, but you would like to end up with a traveltime plot like the one above, with 24 traveltimes per shot. Essentially, you must simulate having a 24-channel seismograph. You can do so by placing your three geophones where the shots would normally have been (in this example, at 98, 123 and 148 meters; see above), and doing your shots where the 24 geophones would normally have been. Instead of only shooting at three locations, you shoot at 24. It's more work, but results in the same thing.

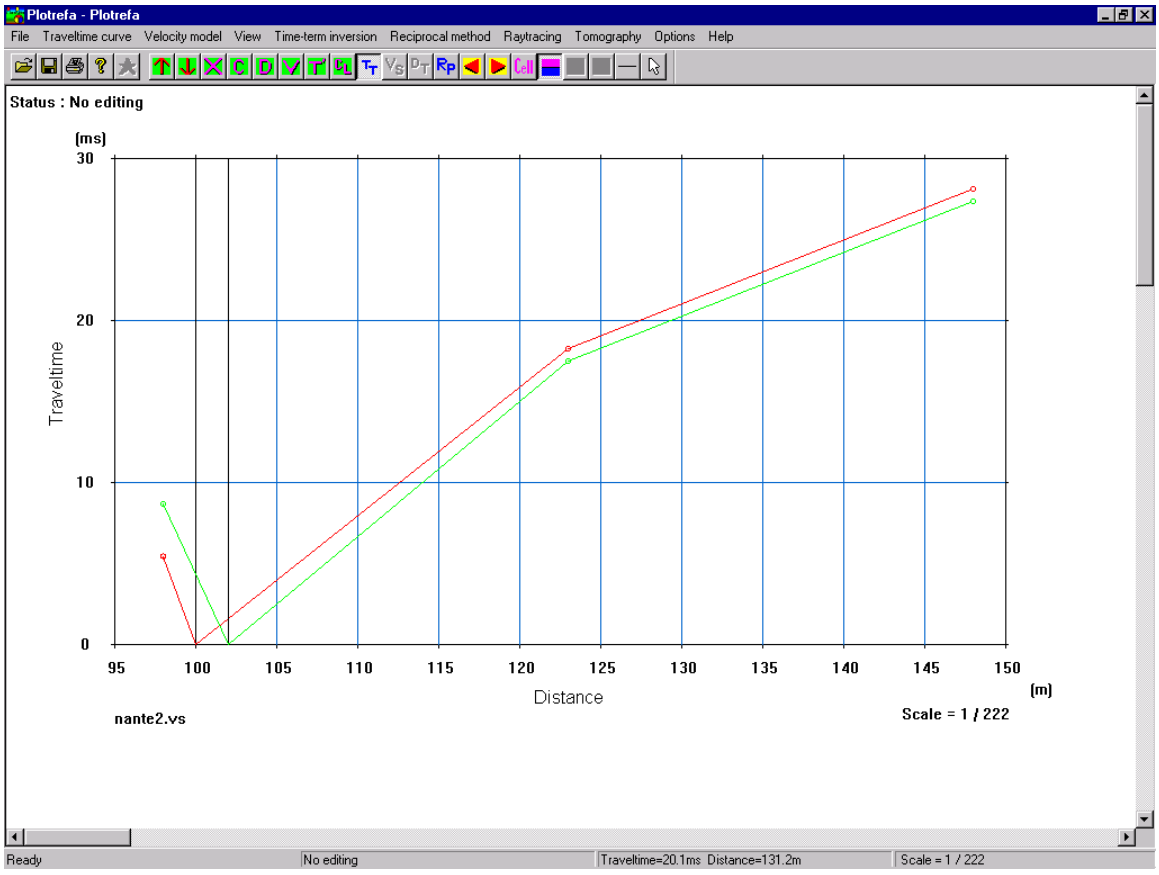
To simulate the above example, you would place your first shot at 100 meters (the location of the first geophone above). You would record three traveltimes, common to that source. You shot record would appear as shown below,



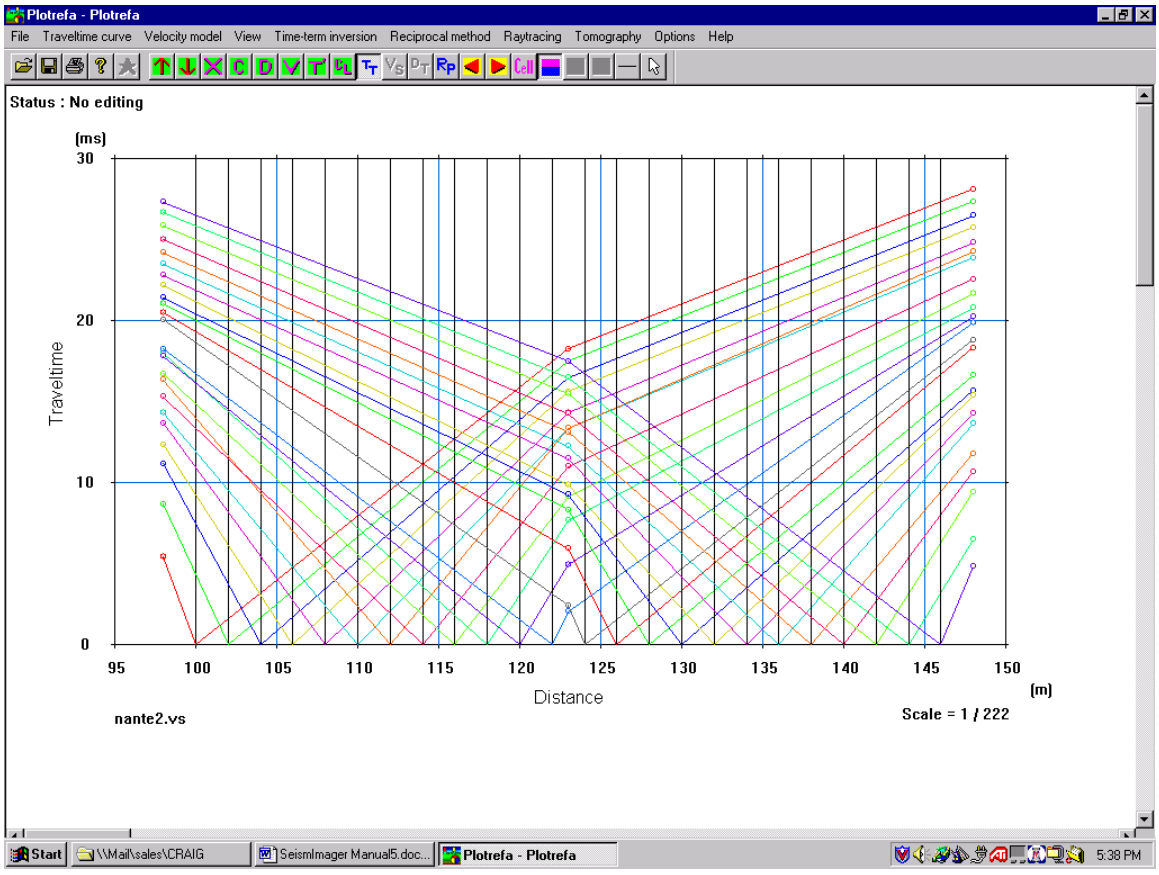
and the common source plot follows:


Plotrefa - Plotrefa
File Traveltime curve Velocity model View Time-term inversion Reciprocal method Raytracing Tomography Options Help
Status : No editing
(ms)
30
20
10
0
Traveltime
95 100 105 110 115 120 125 130 135 140 145 150
(m)
Distance
nante2.vs
Scale = 1 / 222
Ready
No editing
Traveltime=-6.7ms Distance=123.3m
Scale = 1 / 222

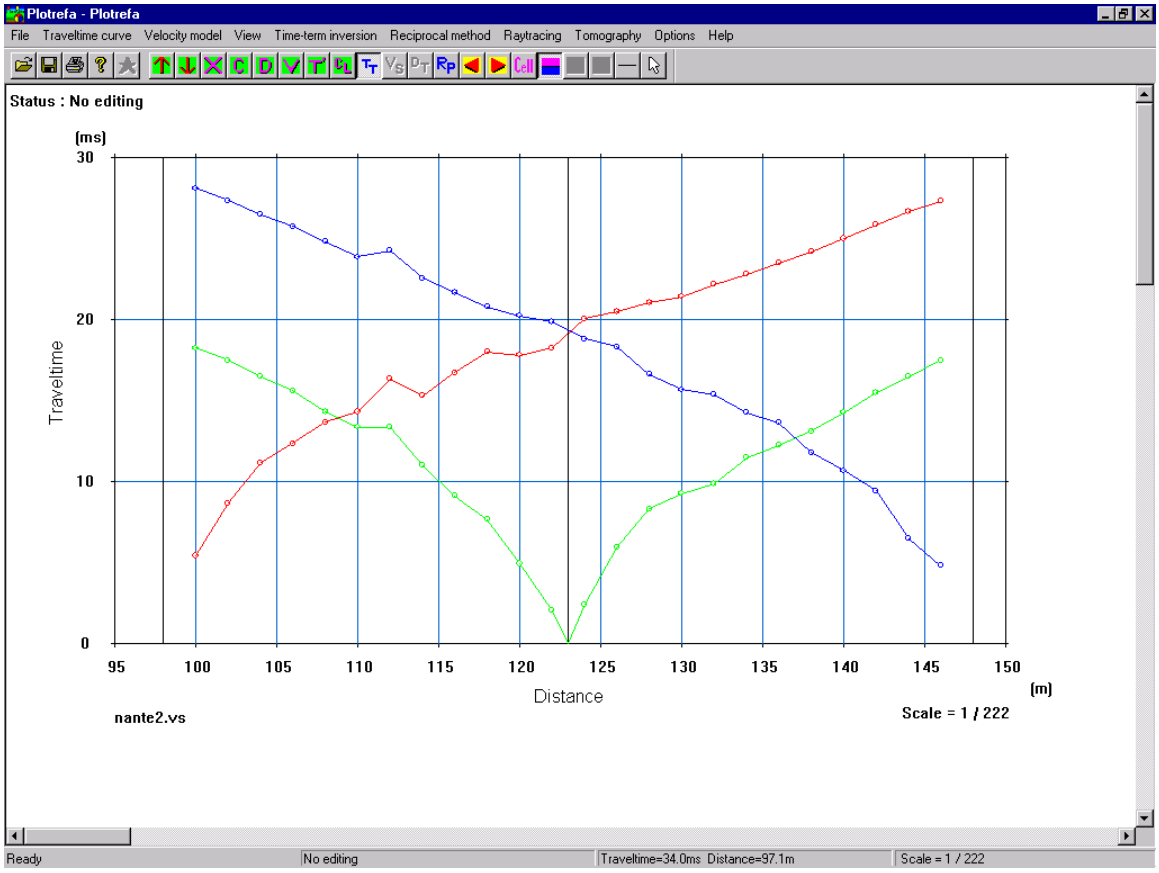
This is your first record. Next, you would move the source to 105 meters, and repeat:



You would repeat the process until you had occupied all of the “geophone” stations. In the end, the common source *gather* would appear as follows:



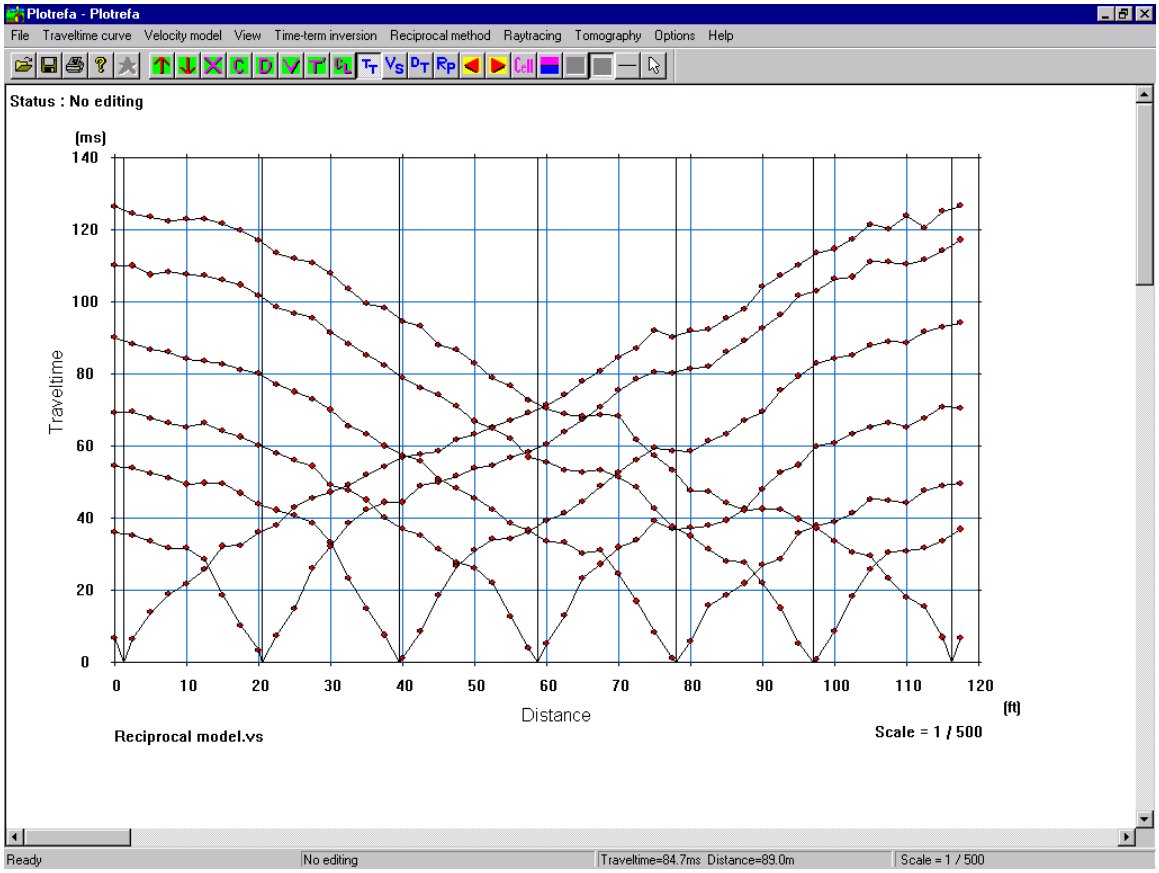
You have acquired 24 three-channel records, rather than three 24-channel records. But since you interchanged the sources and receivers, you must reorganize the above into a common *receiver* gather. To do so, simply click on the *Common source <-> common receiver* toggle switch:



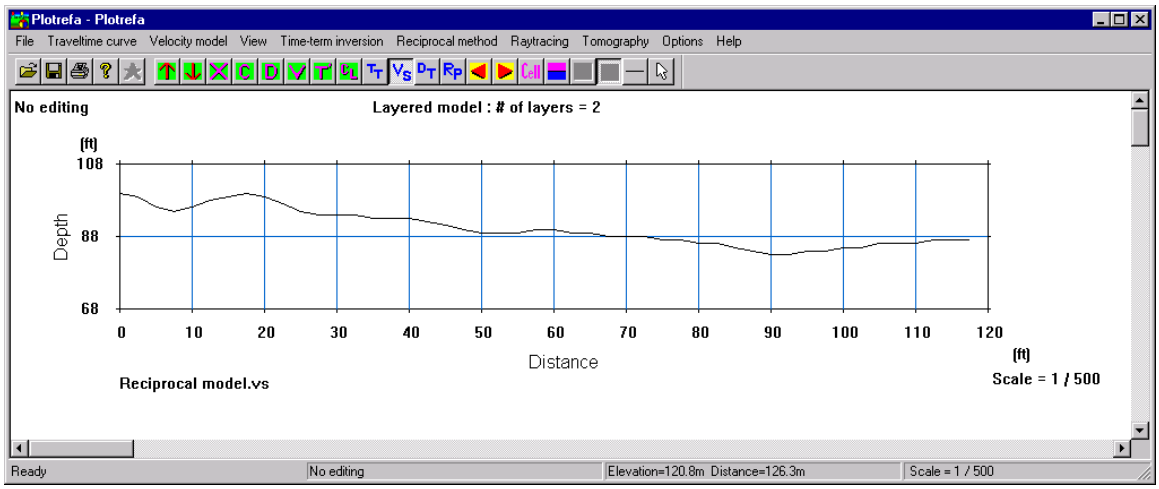
You can now interpret the data exactly the same way you would have had you acquired it with three shots and a 24-channel seismograph.

2.2 Example 2 – Two-layer Time-term Interpretation

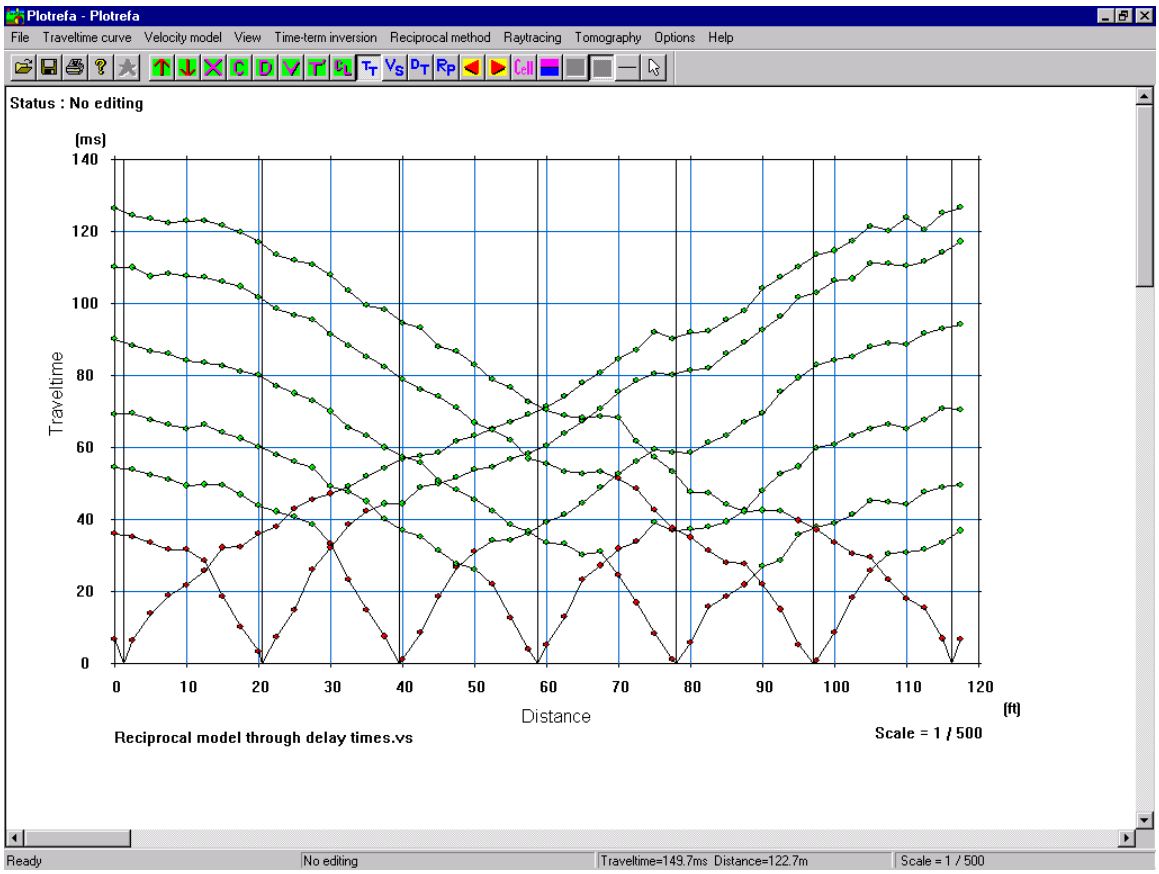
1) Open Plotrefa file: 



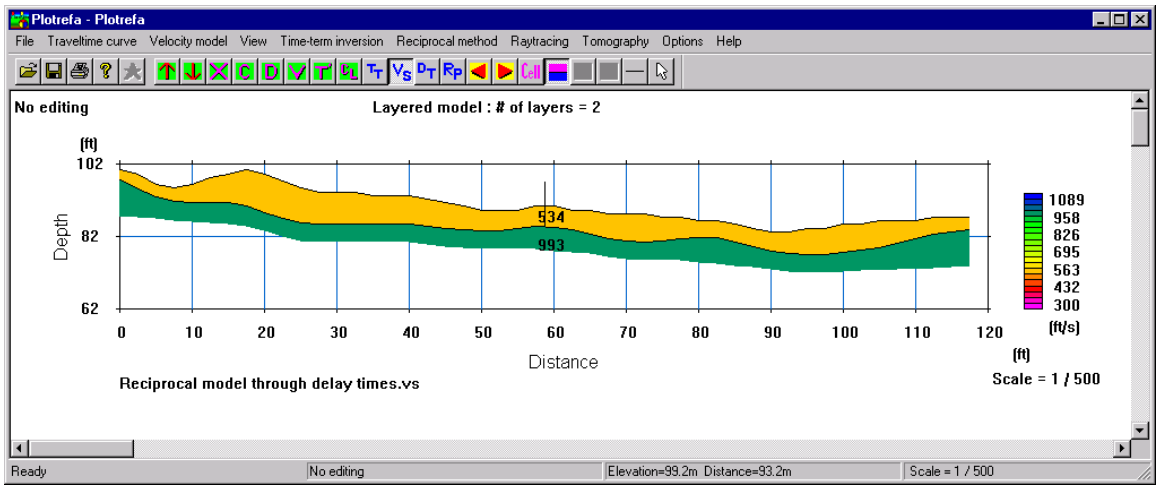
2) Import elevation file (if applicable):



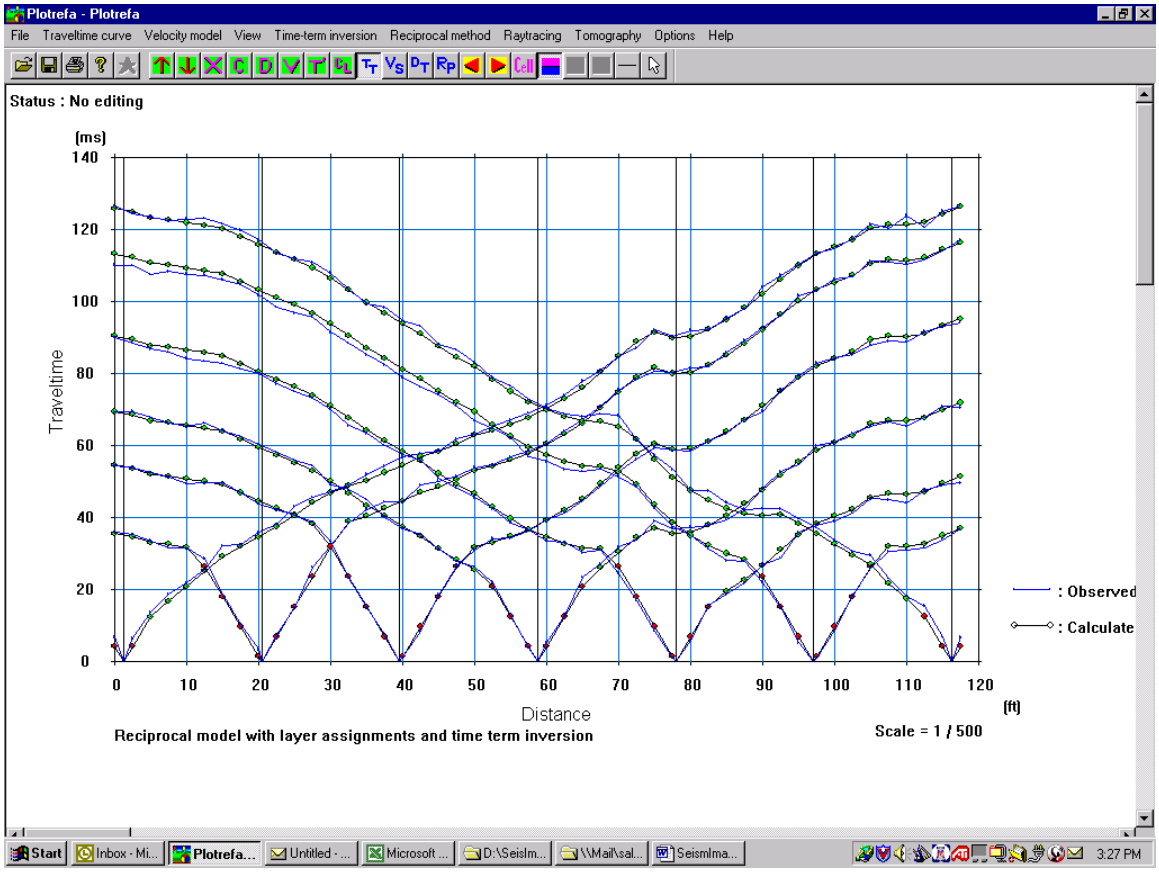
3) Assign layer 2 arrivals:



4) Do time-term inversion:



5) Run ray tracing routine and compare theoretical traveltimes to observed traveltimes:



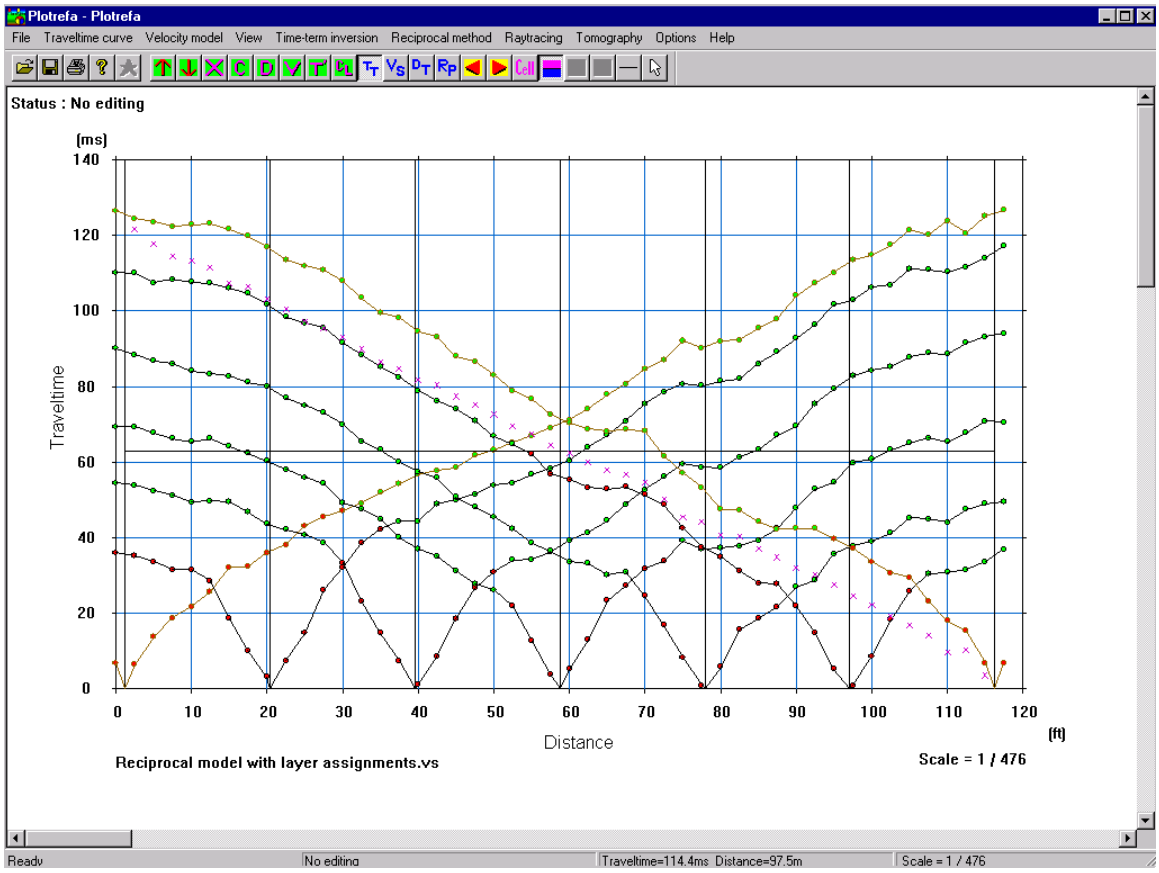
6) If necessary, adjust picks and layer assignments and repeat steps 4 and 5 until reasonable agreement is obtained between observed and theoretical traveltimes.

Alternatively, press on the  tool button to modify the velocity section directly (see Section 4.3.14). Run the ray tracing routine after each set of modifications to see the effect on the traveltime curves.

2.3 Example 3 – Two-layer Reciprocal Method Interpretation

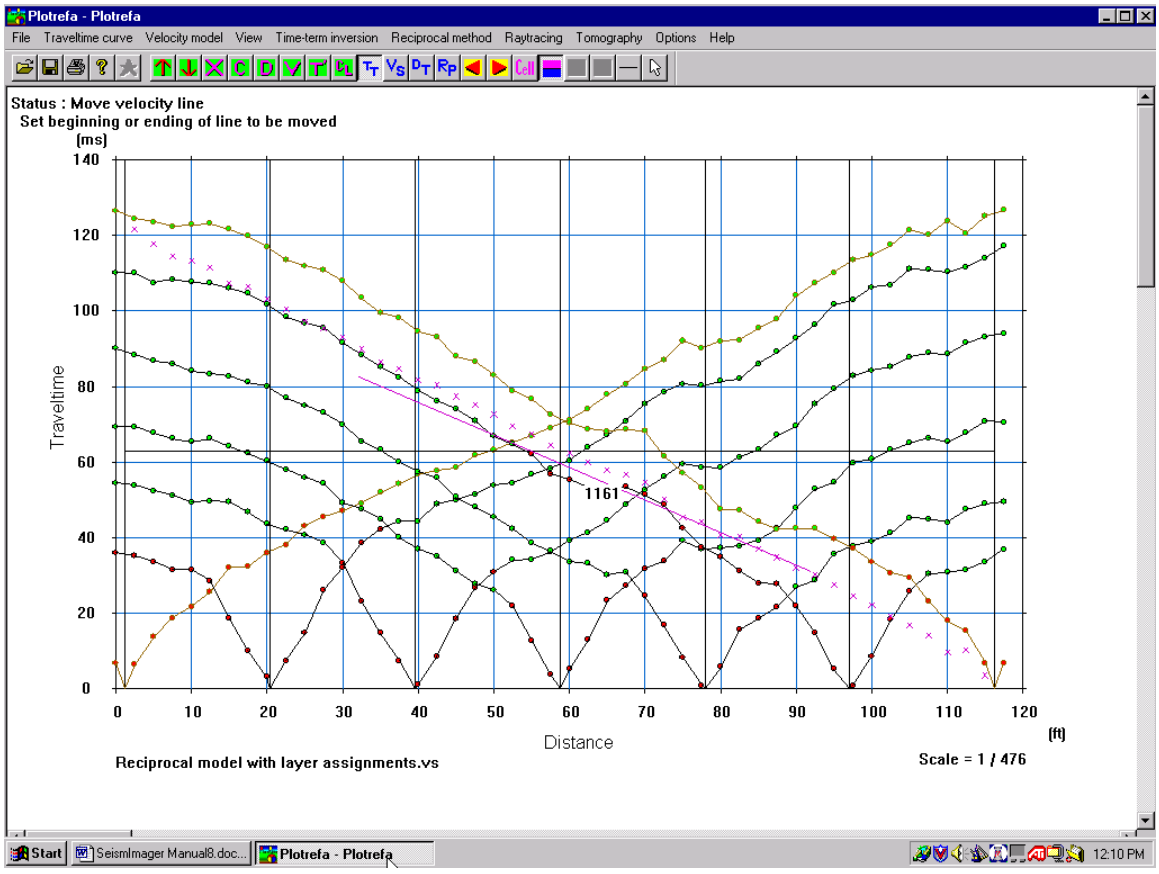
1) Calculate reduced traveltimes for opposing end-shots:

- Click on 
- Click on appropriate traveltime curves



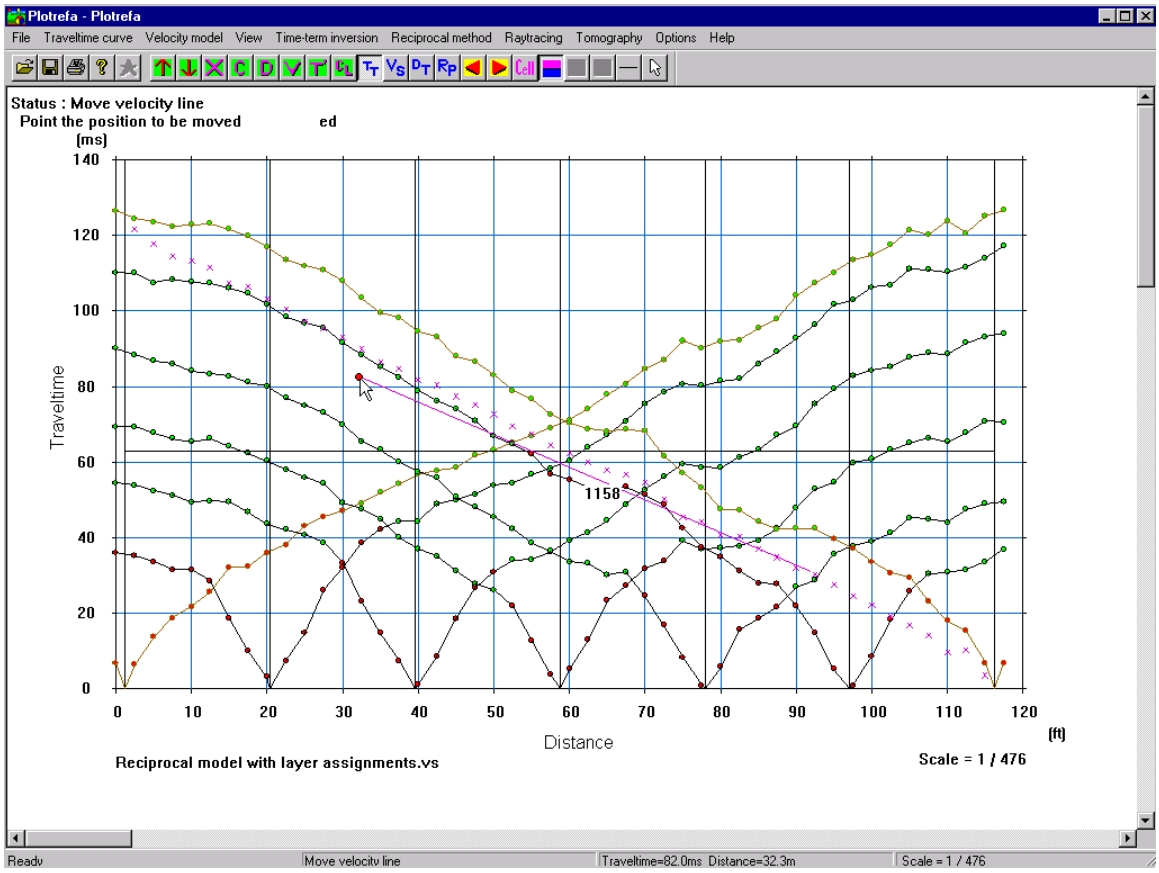
2) Fit velocity line to reduced traveltime curve:

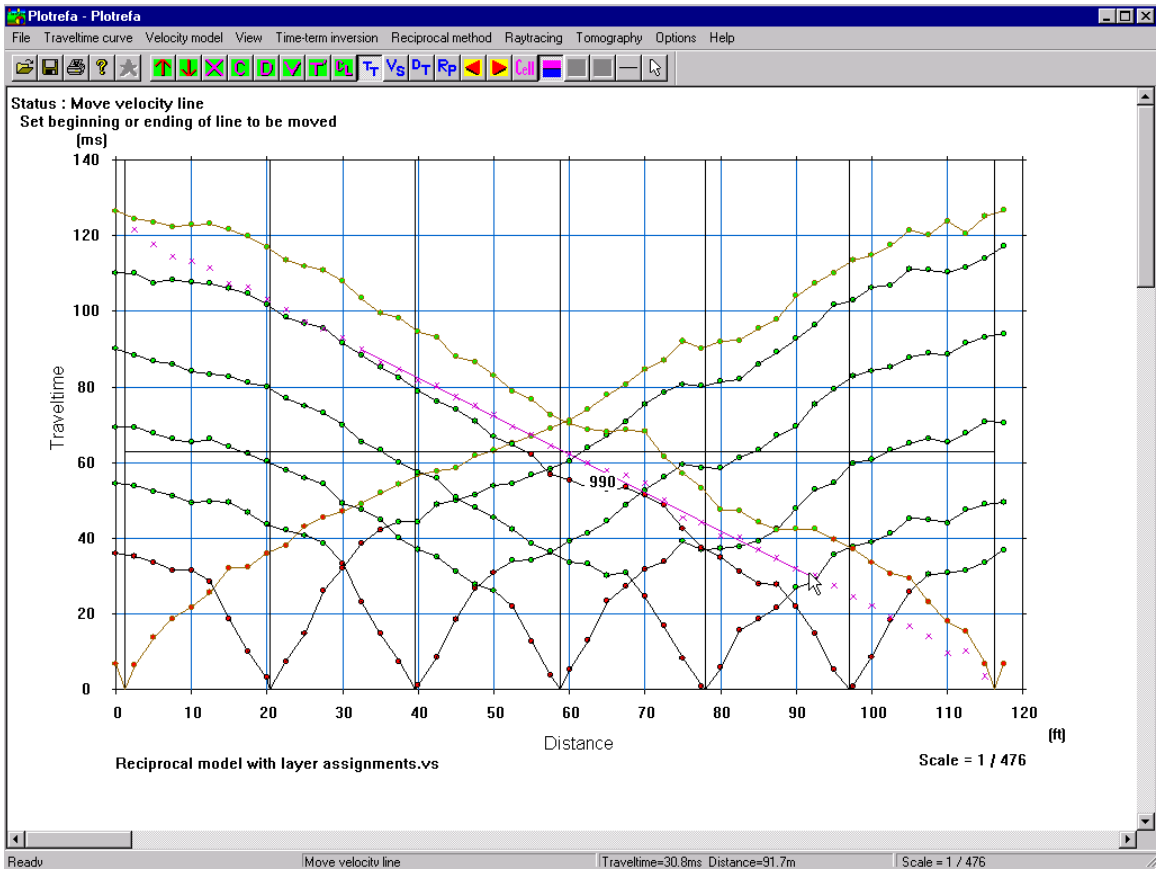
- Click on 
- Click on reduced traveltime curve at left end of overlap zone
- Drag to right end of overlap zone to fit line
- Right click to set velocity line



3) Adjust velocity line (if necessary):

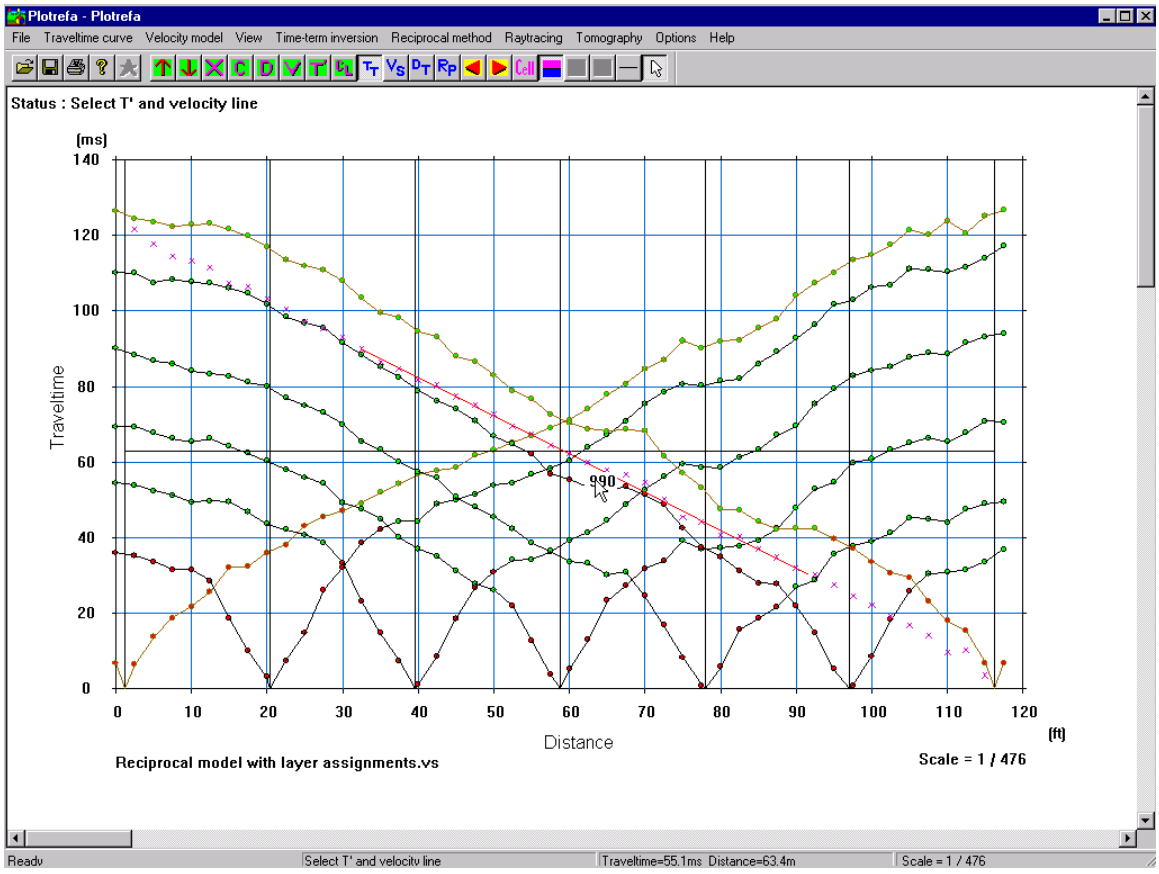
- Click on *Adjust velocity line*
- Click one end(s) of velocity line and drag to new location




Plotrefa - Plotrefa
File Traveltime curve Velocity model View Time-term inversion Reciprocal method Raytracing Tomography Options Help
Status : Move velocity line
Set beginning or ending of line to be moved
(ms)
140
120
100
80
60
40
20
0
Traveltime
990
0 10 20 30 40 50 60 70 80 90 100 110 120
(ft)
Distance
Reciprocal model with layer assignments.vs
Scale = 1 / 476
Ready
Move velocity line
Traveltime=30.8ms Distance=91.7m
Scale = 1 / 476

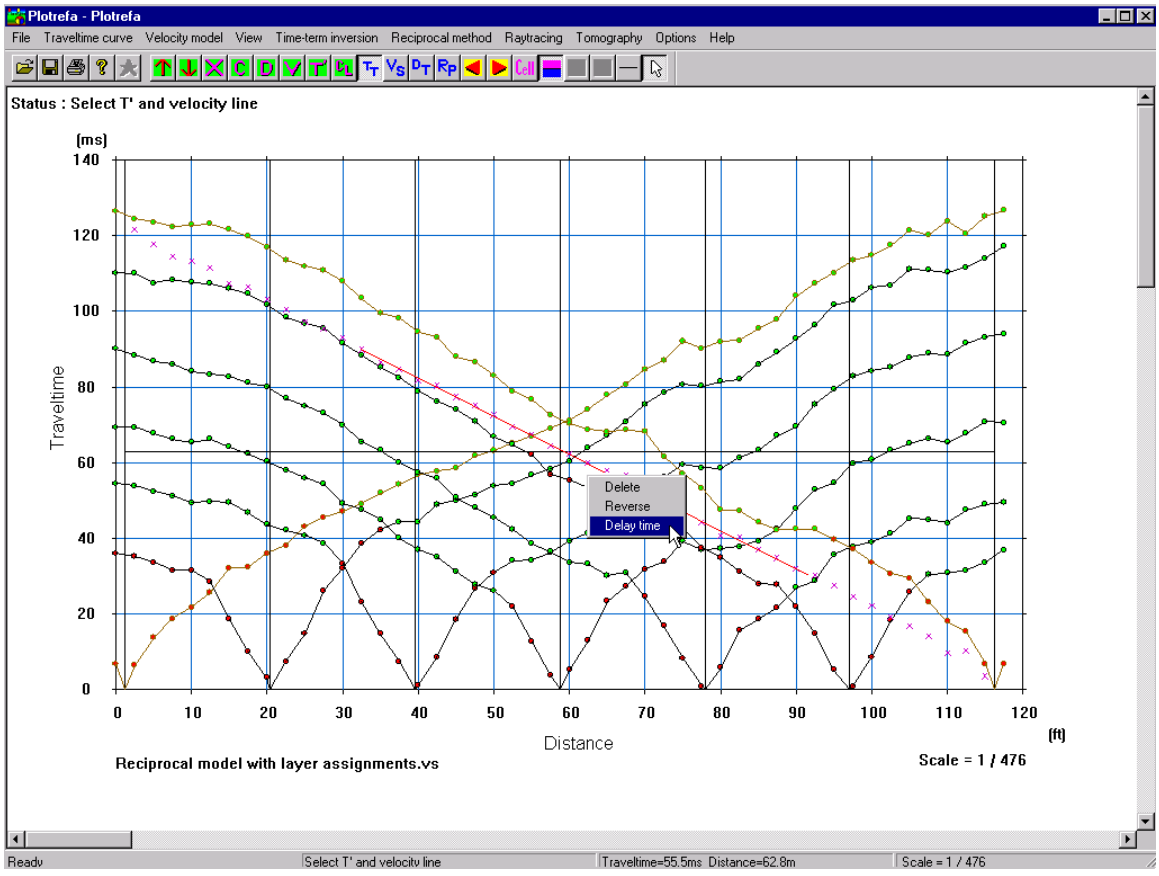
4) Select velocity line:

- Click on 
- Click on velocity label; velocity line should turn red

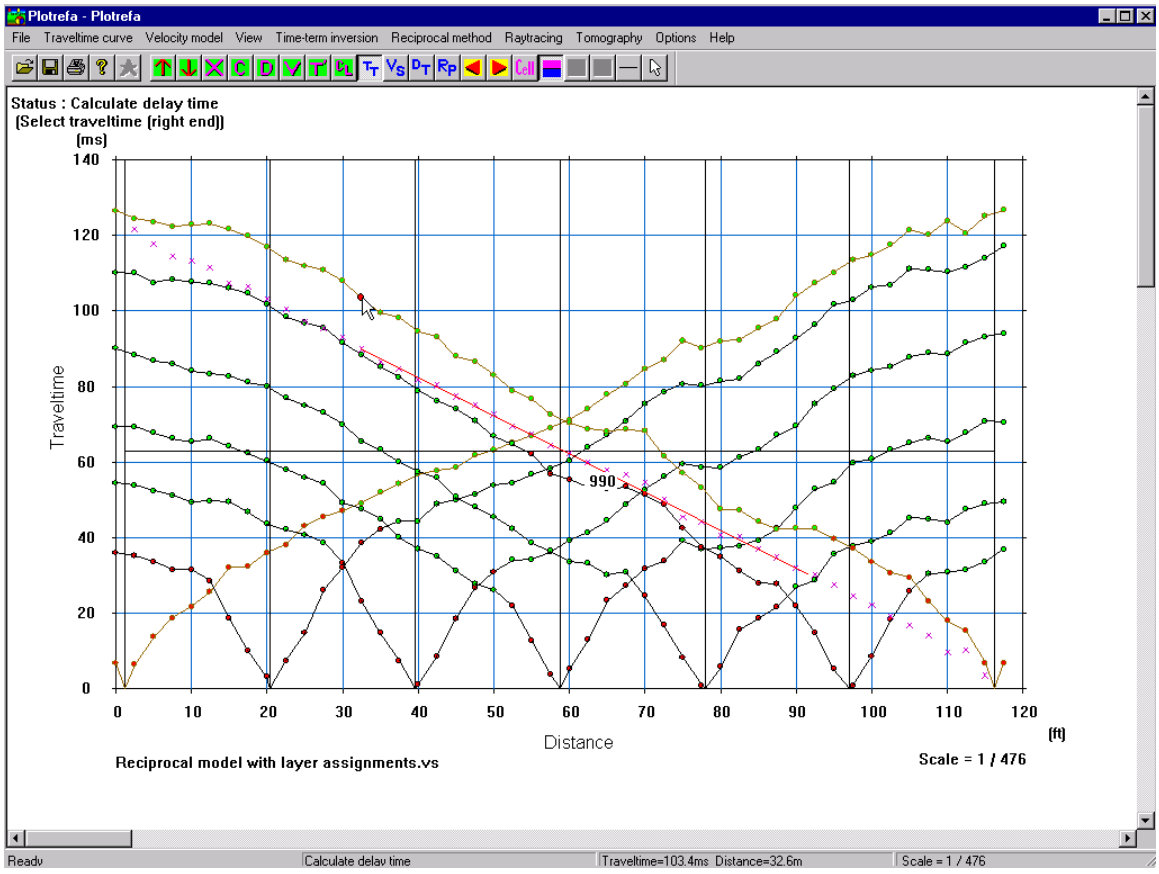


5) Calculate delay times for first traveltime curve:

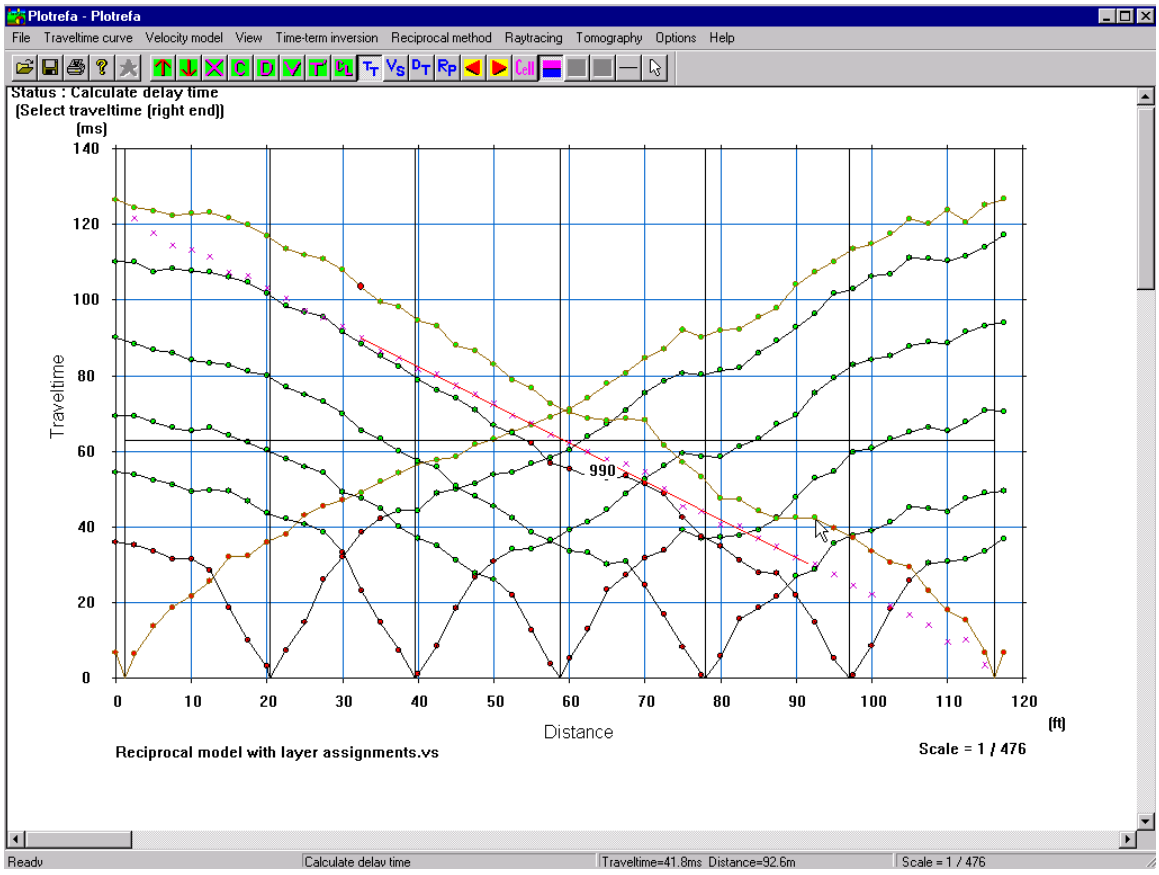
- Right-click on velocity label to expose menu
- Click on Delay time



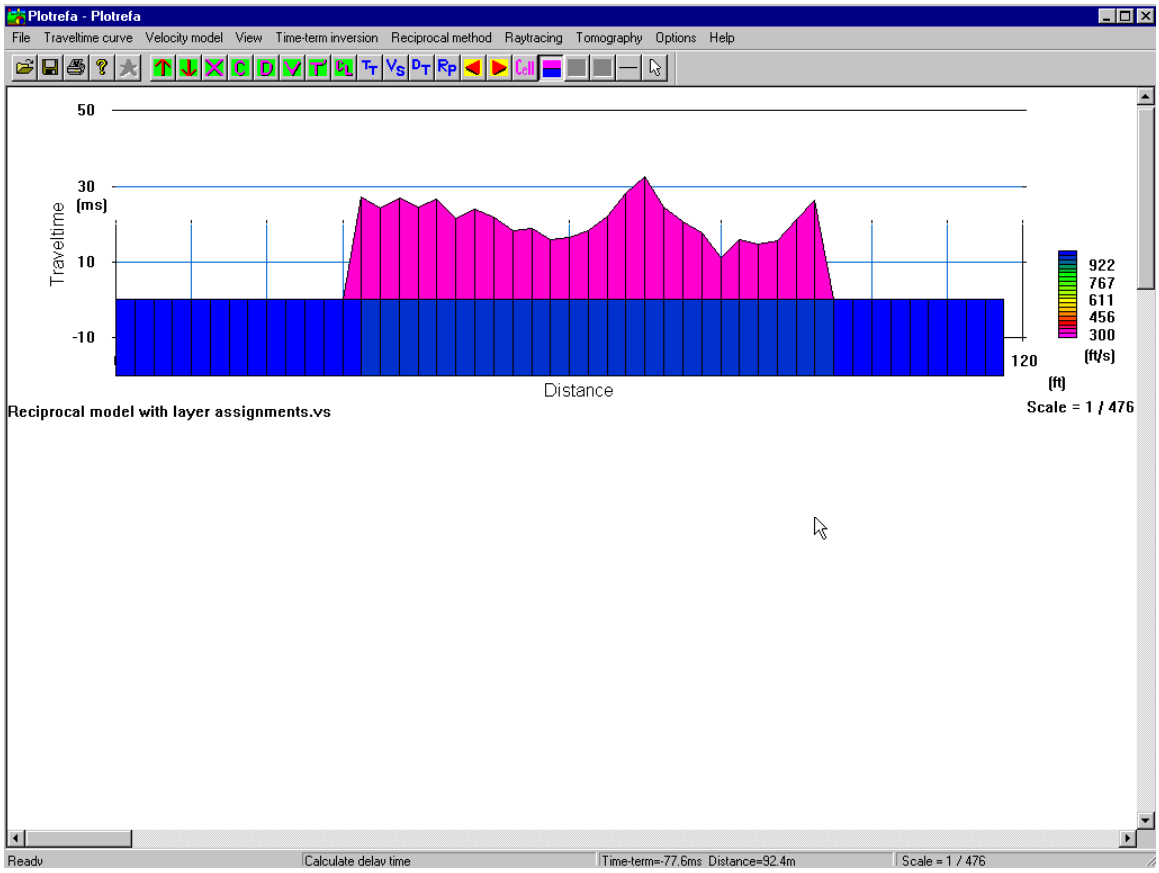
- Click on left-end traveltime within zone of overlap on traveltime curve parallel to reduced time curve



- Click on right-end traveltime within zone of overlap on traveltime curve parallel to reduced time curve

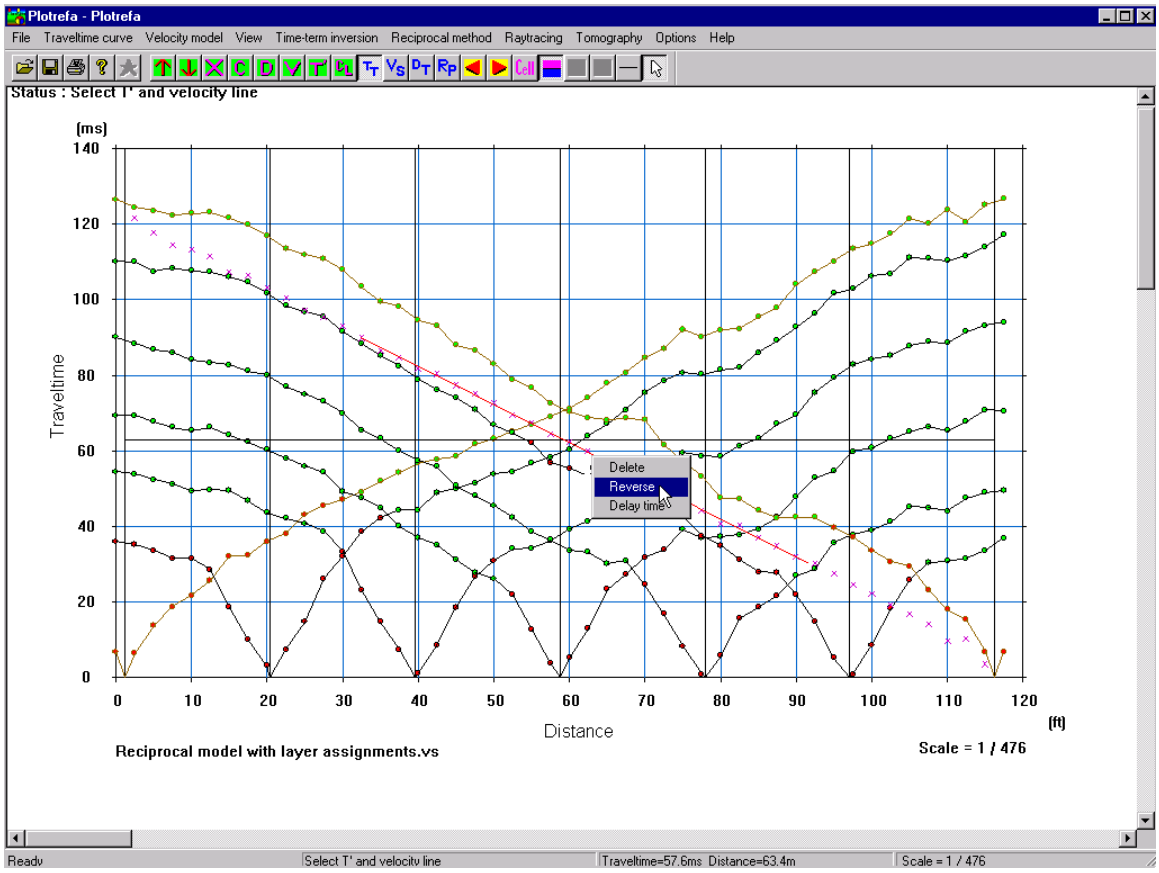


- Delay times will be displayed.

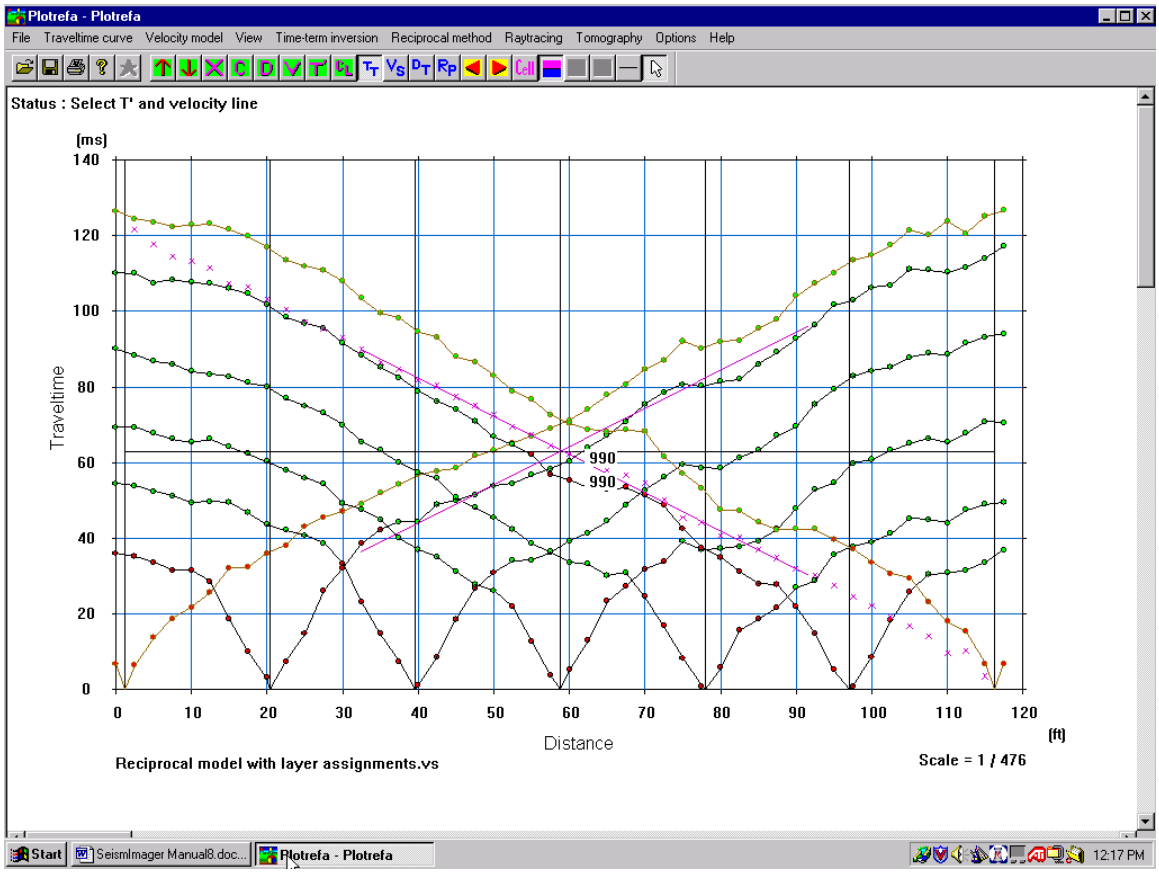


6) Calculate delay times for opposing traveltime curve:

- Click on  to display traveltime plot
- Click on  and then click on the velocity label to select the velocity line, which should turn red
- Right click on the velocity label to reveal the menu, and choose *Reverse*



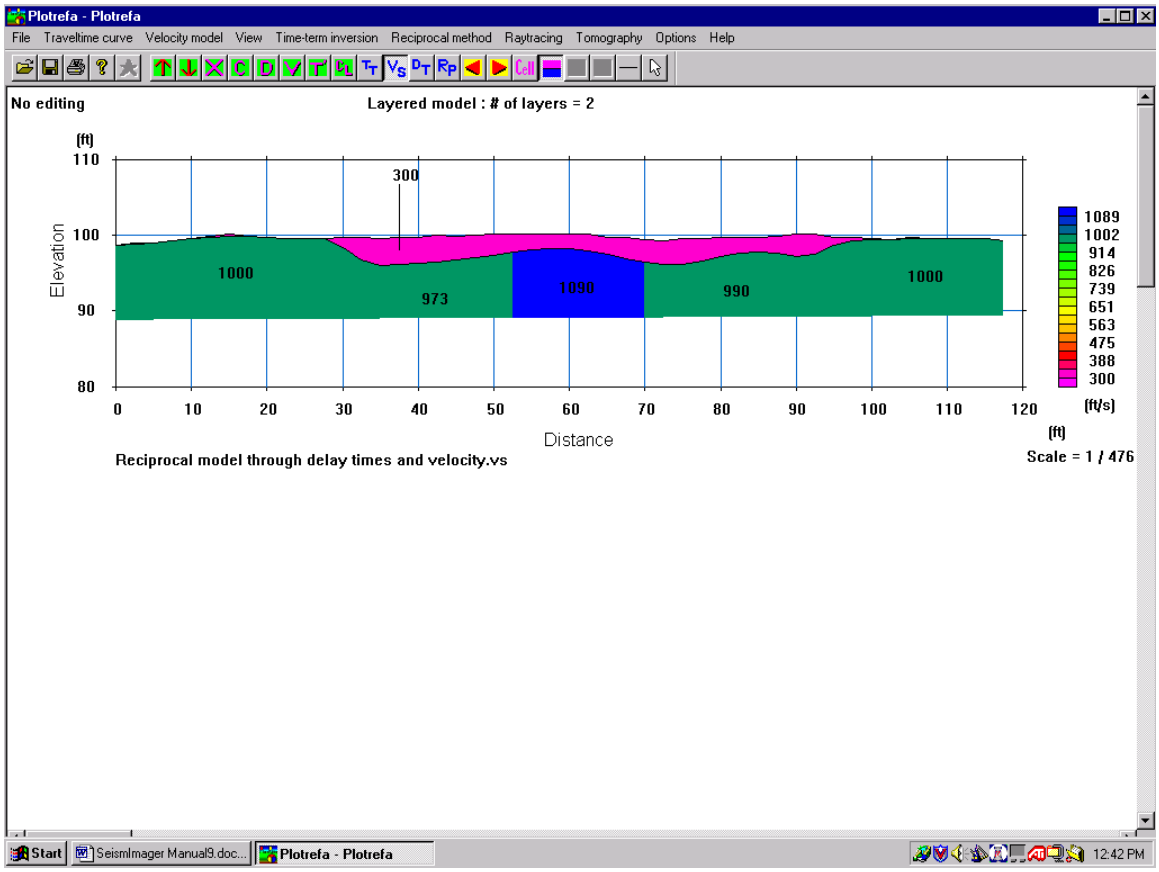
- Click on the ½ $T_{(ab)}$ line
- The velocity line will reverse:



- Repeat (4) and (5) above to calculate delay times for opposing shot record.
- Delete all reduced traveltime curves
- Delete all velocity lines
- Repeat (4), (5), and (6) for all other opposing shots having reasonable overlap

7) Create velocity model.

- Click on *Calculate velocity model from delay time data*
- Velocity model will be displayed:

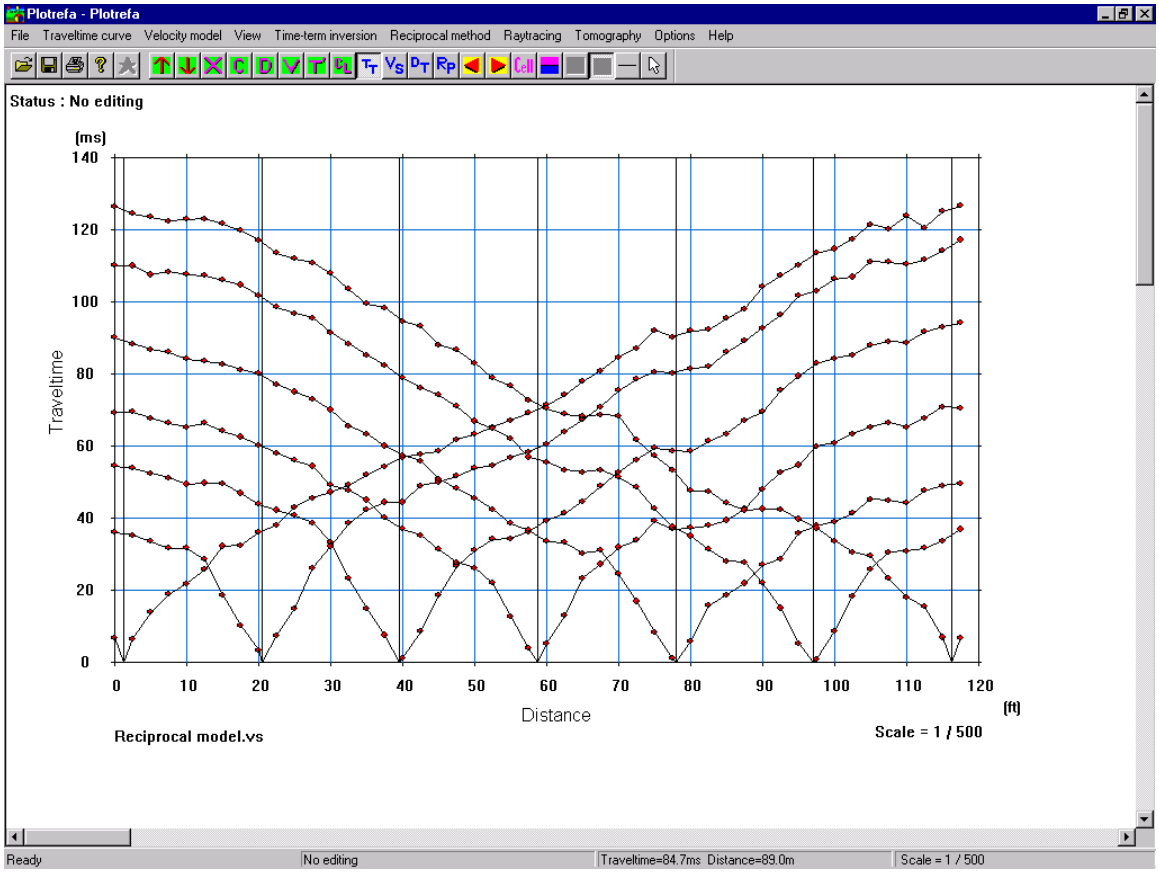


8) Run ray tracing routine and compare theoretical traveltimes to observed traveltimes

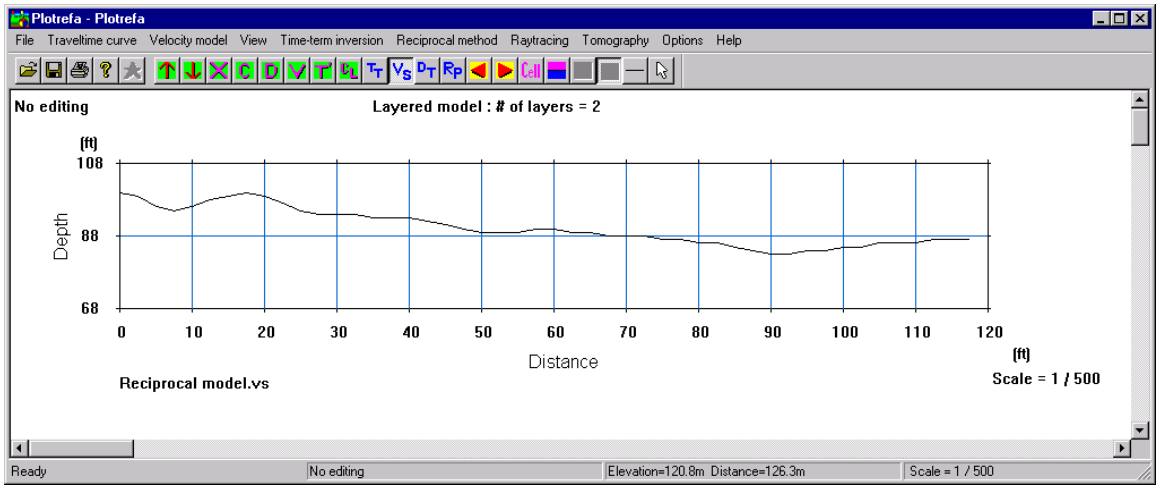
9) If necessary, adjust picks and layer assignments and repeat steps 4 and 5 until reasonable agreement is obtained between observed and theoretical traveltimes. Alternatively, press on the  tool button to modify the velocity section directly (see Section 4.3.14). Run the ray tracing routine after each set of modifications to see the effect on the theoretical traveltime curves.

2.4 Example 4 – Tomographic Interpretation

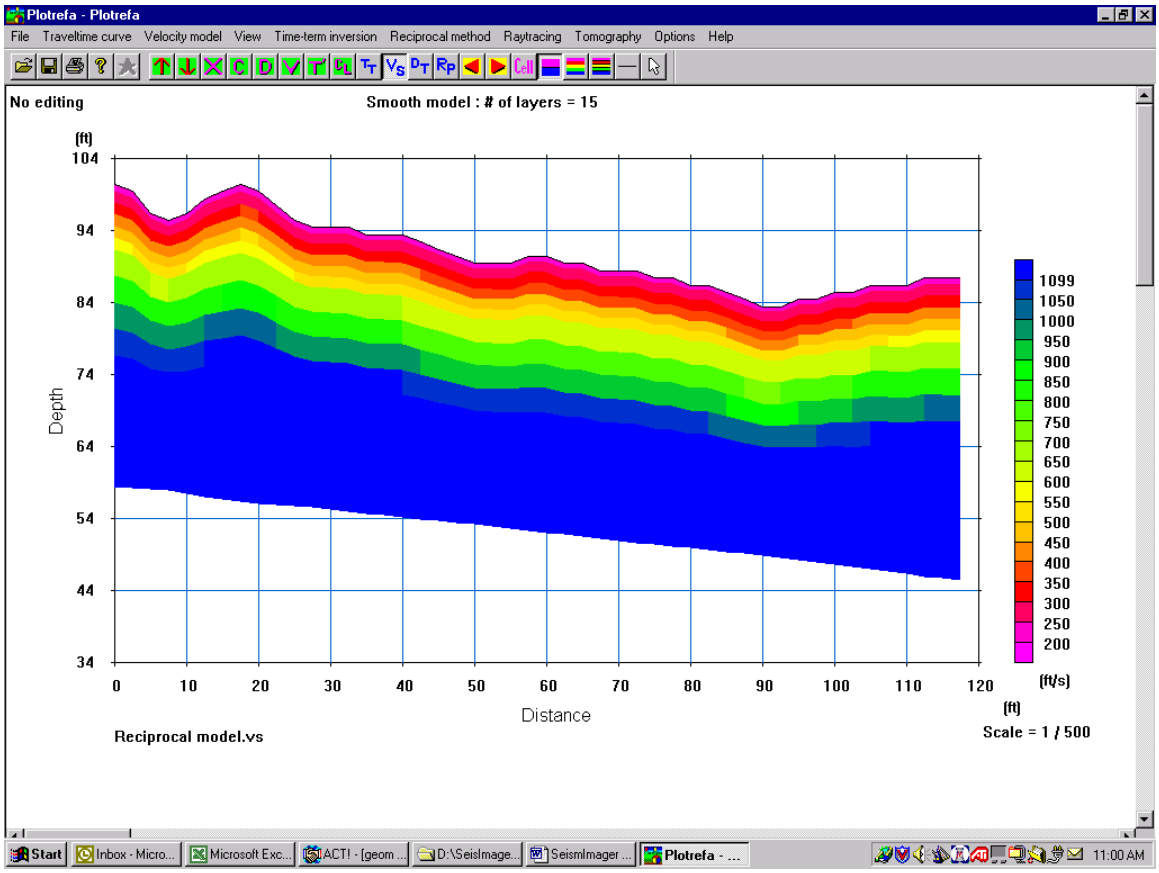
1) Open Plotrefa file: 



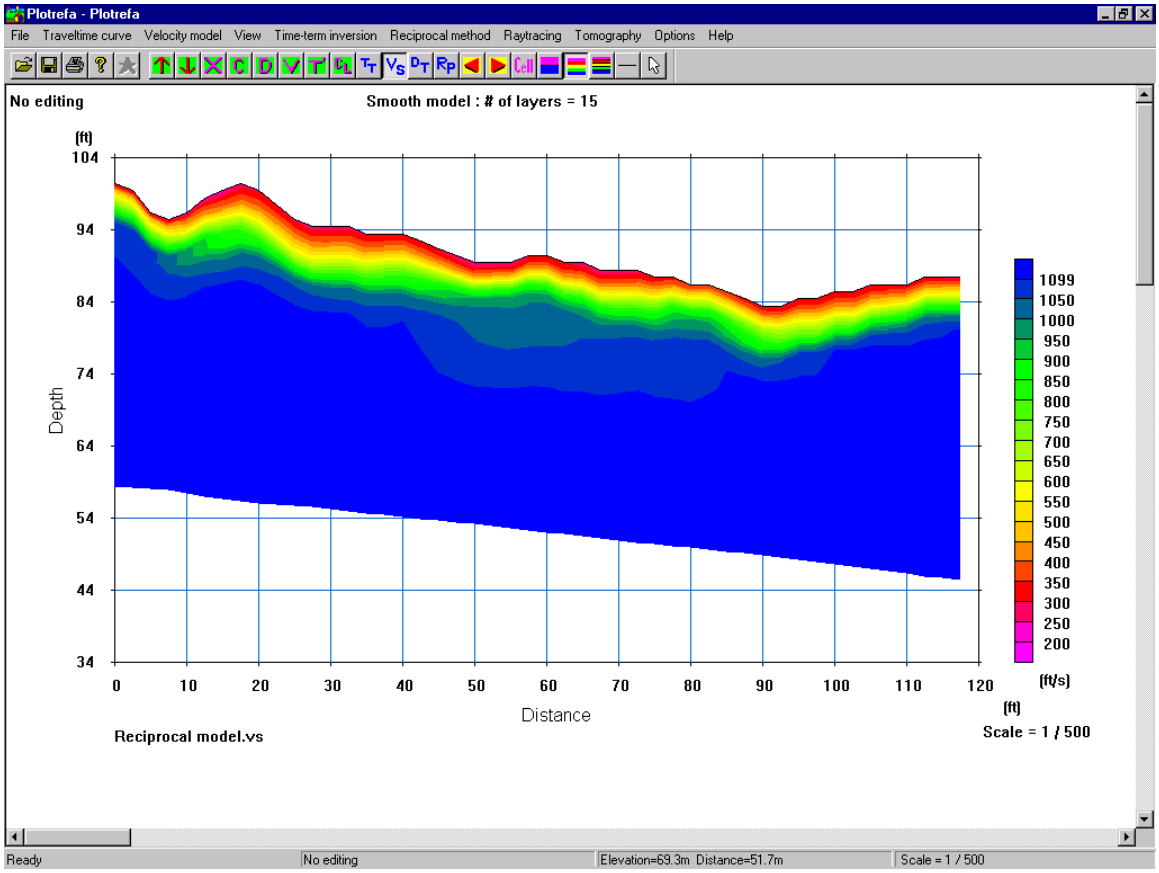
2) Import elevation file (if applicable):



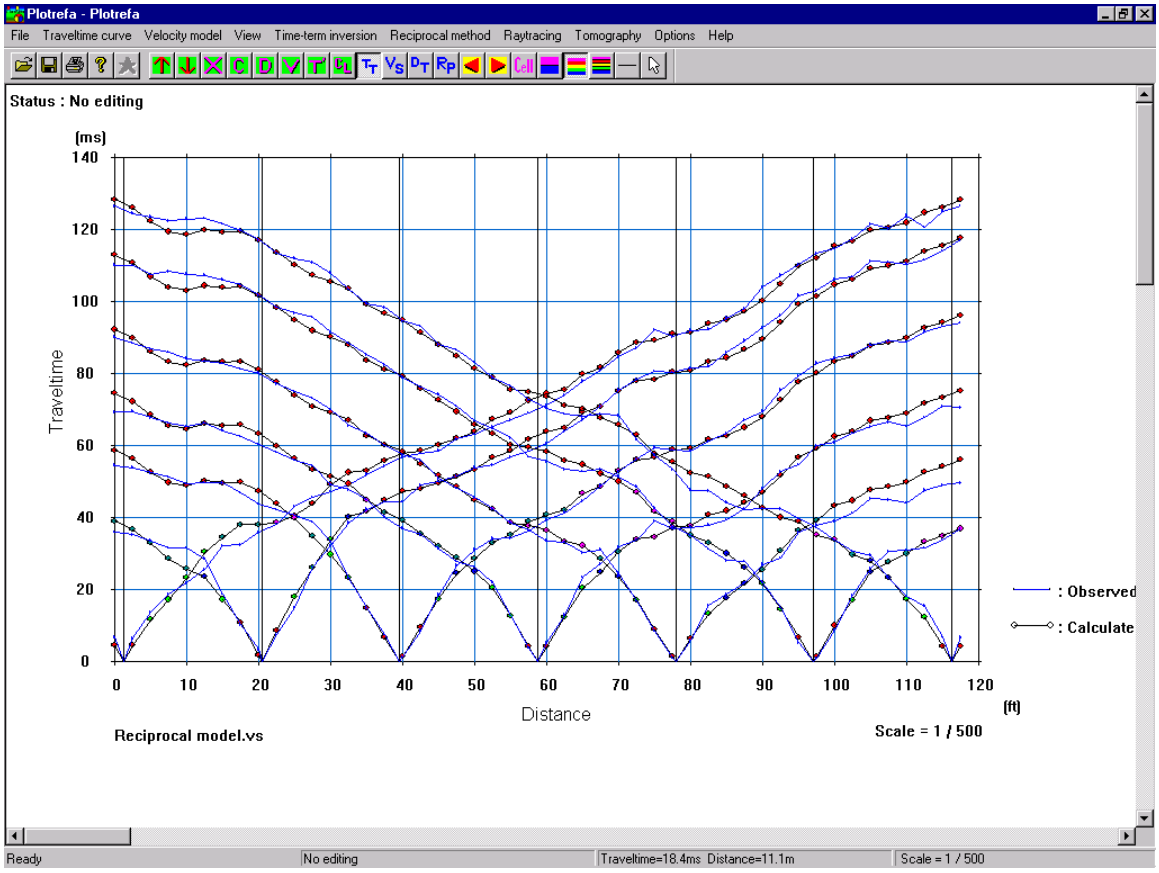
3) Create initial velocity model:



4) Do tomographic inversion:



5) Check agreement between measured and theoretical traveltimes, repeat analysis with different starting model and tomography parameters if necessary:



6) Convert to layered model (if applicable):